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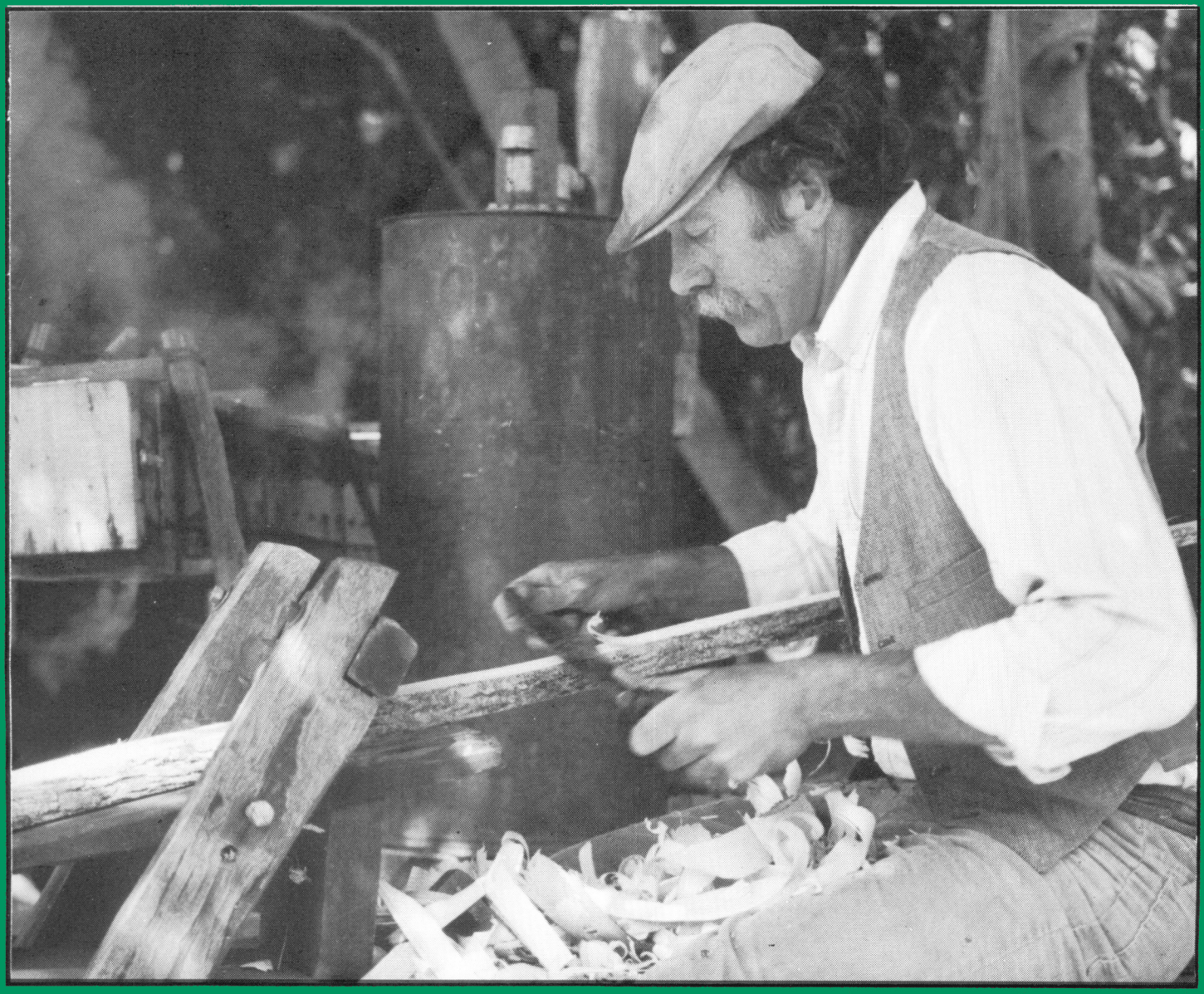

Make Them Your Own...

Peter Bane

Each issue of this magazine poses a personal challenge—not merely the work of writing, editing, collating, and organizing which publishing entails, but a deeper and more meaningful engagement with the subject: to bring the area of focus alive within my own experience. At times that journey of discovery has been magically serendipitous. Yet I confess to having approached Tools and Appropriate Technology with arched-eyebrow skepticism. Mechanics, construction, even horticulture were neither my childhood passions, nor the cultural bequest of my family traditions. I'd never built anything bigger than a bookcase. What did I know about tools?

I well understood the politics of tools, and of machines, of the human organizations which made them and controlled them—that was the study of my 20s, under Ivan Illich, who wrote so compellingly almost a generation ago in *Tools for Conviviality,*

> *"Tools are intrinsic to social relationships. An individual relates himself in action to his society through the use of tools that he actively masters, or by which he is passively acted upon. To the degree that he masters his tools, he can invest the world with his meaning; to the degree that he is mastered by his tools, the shape of the tool determines his own self-image. Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision." (1)*

Fifteen years later, when I added permaculture to my toolbox, Lea Harrison said much the same thing very simply, "Appropriate technology is technology *we* can appropriate."

And now as I assemble my print snapshot of tools, those words ring with a special resonance. For indeed I have begun to appropriate technology and to master tools which are allowing me to invest the world with my own meaning. Saws, hammers, levels, chisels, drawknives, brace-and-bit are allowing me to fashion a house out of tree bodies, to become extraordinarily intimate with the grain, the sinews of oak, maple, and poplar as I craft a building which will become "third skin," my first own-built home.

These tools are nested within a matrix of other tools and social relations which taken together enhance my freedom. The trees are growing on community land where I am a member and where the use of the resources of the land flows heartfully from an ongoing conversation with my family, friends, and neighbors. A simple two-wheeled yoke allows me to move logs and poles around without strain. The mill which turns the trees into boards is also a community tool—it can be run by any two folks who've had an hour or two of helping someone else do it. And surrounding all of these is a fine web of shared knowledge: examples available at every turn of the head from neighbors who are doing the same work on the same kinds of projects; dinner conversations that weave in and out of weight, balance, proportion, and technique.

My new image of myself as a house builder—born somewhere high on a scaffold chiseling mortise joints into a poplar upright—has the true taste about it of liberation, sweet but not cloying.

The use of tools, though not unique to humans among animals, is nevertheless a defining characteristic of our nature. To enter into the human conversation about tools is an initiation no less profound than the rituals of passion which mark our coming of age as sexual beings. To eye the particular curve of a blade, to intuit the invisible molecular bonds of forged steel, or to feel the taut binding of a broom is to examine at once the aspirations of the human soul and the fabric of our earthly destiny.

Appropriate tools return us to the body, its power, its wisdom, and its limits. The pleasure of work is something modern men and women can seldom claim and even more rarely share. Yet that immense psychic satisfaction will be one of the main supports of a post-industrial culture of conviviality. We may now find that hard to imagine, but it will—if we are attentive—be one of the touchstones by which we guide ourselves along a path of "development" toward lower, rather than higher energy use.

In the words of Illich again,

> *"Natural and social science can be used for the creation of tools, utilities, and rules available to everyone, permitting individuals and transient associations to constantly recreate their mutual relationships and their environment with unenvisaged freedom and self-expression." (2)*

This, it seems to me, is precisely the aim—and genius—of permaculture.

Tools represent choice about the way we relate to the world around us. As Paul Goodman has written, "Technology is a branch of moral philosophy." We can choose for freedom and responsibility, or we can choose for slavery and death. Appropriate technology is that which allows each woman or man the choice and the capacity to meet her or his own needs without diminishing the freedom of any other. Δ

1. Illich, Ivan. *Tools for Conviviality,* 1973, Heyday Books, Berkeley. p. 21.
2. ibid. p. 34.

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The Permaculture Activist welcomes reader contribution: features, photos, letters, and reports of work or site development are all appropriate. To write, see masthead on the next page.

Cover photo credit Don Weber

Readers expecting an index of recent back issues, which was promised for this issue, should look for it in #37a in November of this year. Space and time limitations did not permit us to publish it here.

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DEPARTMENTS

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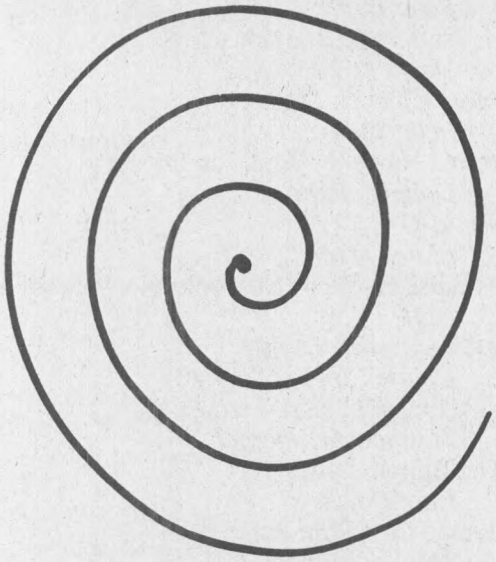
Dowsing by the Seat of Your Pants:
Tools for Connecting With It All

Lee Barnes

Body and mind are our most basic tools, and like all tools, successful use requires practice and maintenance. Dowsing is a basic tool of human intuition (intuit or "in-to-it") and ESP ("extended" sensory perception). Dowsing (or more inclusively, "divining") is a practical art for obtaining answers to specific questions. Most people have heard of water dowsing, but few realize that specific, practical information can be attained in response to any clearly worded "YES/NO" question. Diviners locate water veins, lost objects, buried treasure, earth energies, date archeological events, and even predict weather.

The human/animal body is the ultimate dowsing tool: skilled and experienced diviners practice "deviceless dowsing," sensing things within their bodies or consciousness. Animals, including fish, snakes, bees, cows, and horses appear to dowse weather events, and are aware of high energy areas. Many people use "muscle-testing" or kinesiology techniques to answer Yes/No questions by noting subtle differences in body resistance such as the strength of an out-stretched arm or resistance in separating fingers. I can, for example, consistently locate magnetic north by paying careful attention to my heart *chakra* area (I can "feel" a subtle change when I turn across magnetic lines), or by using dowsing rods. Dowsers are most sure of their dowsed answers when these are verified independently by others using their own tools and skills.



Recent scientific brain wave analysis (EEG) shows that dowsers develop unique brain wave patterns by simultaneously generating beta, alpha, theta, and delta waves while "on track" seeking specific answers to practical problems. When dowsers focus on a object or subject, they apparently make a sort of mental connection which allows further information exchange. This may be due to sensitivity to electrical or magnetic fields, or to the free connection between the conscious and subconscious mind (or "superconscious" mind). Dowsers carefully phrase specific questions where distinct Yes/No answers can be recognized. Serious diviners always ask permission to ask questions by inquiring "Can I ask this question?" (am I physically able); "May I ask this Question? (permission from the person or object to be dowsed); and "Should I ask this question? (a sort of query of the universe: am I ready for this?). A "No" answer at this point is calmly accepted and the question is dropped for the time being, or indefinitely. I always ask permission to seek answers to specific questions, and I thank my "tools" (and unknown helpers...) for their support.

Three basic dowsing tools commonly used include the pendulum, L-rods and the Y-rod or forked stick. Literally hundreds of different divining tools have been documented in both New and Old World cultures and art, and all seem to serve to magnify or exaggerate subtle sensory information. Children under the age of 15 are particularly adept at dowsing for water; dowsing skills often decrease with adulthood.

Probably the easiest dowsing tool for the beginner to use is the pendulum. A pendulum may be as simple as a washer attached to a 6" string, or a favorite crystal or found object attached to a short cord or chain. I've seen car keys used to answer specific Yes/No questions (I've also used L-rods to find lost car keys: my subconscious probably remembered where they were last seen!). The pendulum is mentally "programmed" to swing one way (clockwise or counter-clockwise) to give an answer. For example, I ask my pendulum to answer "Yes" by swinging counterclockwise and to give a "No" answer by swinging clockwise. Try this for yourself. With experience, dowsers can also get answers about quantity (on a scale of 1-10, how bad, how strong, etc.) The pamphlet "Letter to Robin - A mini-course in pendulum dowsing" by current American Society of Dowsers President Walt Woods is excellent. A free downloadable version is available from the Internet at www.discoverit.com/at/asd/robin.html.

My favorite dowsing tool is the "L-rod," named for its letter "L" shape. A simple L-rod can be constructed from a metal coat hanger, cut and bent into a L-shape with about a 4-5" handle and a 12-18" arm length. A short sleeve of plastic (such as a section of plastic soda straw) or metal tubing added to enclose the handle (allowing free rotation) will greatly increase sensitivity and successful ease of use. To get a response from the L-rod, hold it loosely in the hand (or one in each hand) like a pistol-grip and walk over a flowing stream or water pipe. Usually the L-rods will swing involuntarily open (or apart) when approaching the water flow or may crisscross indicating an energy field associated with the moving water. You should "program" the response for consistency. You can also fine-tune the rods to point in the direction the water is flowing, etc. Rods can easily be programmed to give clear Yes/No answers to any well-worded question. L-rods are a great help in finding things since they can be used to point directly toward a lost object or the best location to drill a well, etc.

The "Y-rod" or Y-shaped or forked stick is widely mentioned in history and folklore, but many dowsers find this tool more difficult to use. Traditionally Y-shaped pieces of "springy" wood such as witch hazel, alder, and apple have been used, while modern dowsers have substituted modern materials, typically 1/4" to 3/16" diameter nylon tubes 20-30" long, bent in half and firmly attached in the middle to form a "V." The open ends of the

"Y" or "V" are held loosely in the upturned palms, so that free rotation is allowed. Slight tension on the rods is applied so that top of the "Y" or "V" is in a sort of static equilibrium. When walked over a water source, the rods will rotate up or down, such that the dowser has a sense the rods are moving themselves. This technique is especially useful for locating water and energy "flows" (electrical or magnetic), but may be more difficult to learn and use consistently.

The easiest way to develop dowsing skills is by working with experienced local dowsers and by attending local dowsing society meetings. The American Society of Dowsers (PO Box 24, Danville, VT 05828, 1-800-711-9497) can supply addresses of local dowsing chapters, as well as dowsing books and tools. Numerous Internet web pages provide additional information about developing dowsing schools.

References

The following references are some of my favorites:

ASD. 1990. *Basic Dowsing Instruction.* American Society of Dowsers. 8 pgs. Short, bare-bones intro to basic tools. Comes with membership in ASD but can be purchased separately.

John Forwald and Robert Slack. 1997 *Basic L-Rod Water Dowsing: A simple, short, plain language, no-nonsense set of directions on how to find potable water.* 6 pgs. Even if you barely know what L-Rods are, you should be able to follow these instructions and be a winning water dowser— the subtitle says it all!

Tom Graves. 1989. *The Dowser's Workbook: Understanding and Using the Power of Dowsing.* Sterling Publishing, NY. 173 pgs. Great workbook with beginner's intro, dowser's tool kit, some applications and challenges. Recommended for beginning and advanced dowsers!

Sig Lonegren. 1986. *Spiritual Dowsing.* Gothic Image Press. A great book that encourages readers to try specific exercises. A must-read!

Walt Woods. 1996. *Letter to Robin - A mini-course in pendulum dowsing.* ASD. 20 pgs. (can also be down-loaded for free from www.discoverit.com/at/asd/robin.html.) Nice intro to dowsing, very specific about "programming" your subconscious to give clear answers. Δ

Lee Barnes lives in Waynesville, North Carolina.

No Destination:

How Perceptions of Time and Space Influence Choice of Travel Modes

Patrick Clark

What motivates people to adopt new modes of transportation which are faster than old ones? After over 200 years of making transportation changes, our society is still trying to go faster. This article looks at how the choice of travel modes varies with a culture's or individual's relationship to time and space, and asks: is the quest really for speed, or is it for something more sublime?

From the travels of Marco Polo through China to those of Lewis and Clark across North America and Neil Armstrong's walk on the moon, people have long been fascinated with travel and mobility. Today, as for so much of America's past, transportation dominates the social landscape. A cursory glance at any town or city shows how thoroughly our lives are impacted by our transportation vehicle of choice—pavement for ease of travel, billboards informing where to buy what, signs instructing where to turn or not to turn, drive-thru banks, restaurants, car-washes, and the staggering hubbub of autos and trucks coming from every direction. The landscape has been so shaped to facilitate the movement of people, goods, and information that one feels almost uncomfortable not moving. In many places there is hardly a blade of grass or a tree upon which to rest one's eyes. In remote wilderness the vibrations of a restless society can be felt when jets fly overhead—shiny slivers of civilization shooting from city to city. How did Western society get to this point?

From the Neolithic era until the advent of the steamship and steam locomotive in the 1800s, human travel and transport had been shaped primarily by three innovations: the invention of the wheel, the domestication of the horse, and the perfection of the sailing ship. These were sufficient to build and topple numerous civilizations; to move the Roman legions from Britain to Persia, to allow Genghis Khan to conquer most of Asia, and to move millions of Europeans to the Americas. Nevertheless, these developments, however radical, took centuries and millennia to unfold.

Since 1800, Western civilization has rapidly advanced from one transportation mode to another—the horse, steamship, clipper ship, steam locomotive, bicycle, automobile, airplane—and is still trying to go faster (e.g. wider highways) and farther (space exploration). Although exciting at first, each new travel mode has been superseded by the introduction of a yet another new technology. For example, the introduction of the steam train in the early 1800s held the promise of salvation for the nation. The train would open up new land to settlement and resource exploitation, and would allow people to move about, interact, and exchange ideas more freely. When, 50 years later the bicycle was introduced, the country fell head-over-heels in love with it. And 20 years after that, history was again repeated when the motorcar became the star. Did the train and the bicycle fail in their promise?

View of Time and Motion

The key to understanding the transportation choices a culture makes is understanding its worldview, particularly its perception of the scale of the world and the movement of time. The Europeans brought with them to America a predominantly *linear* view: time advances from an inherently inferior past, through a fleeting present, which will in turn be measured against a superior future world. "Progress," according to this worldview,

is based on a relentless manifest destiny: a requirement of constant upward and forward motion in science and commerce. There is a corresponding belief that tribal cultures are innately or developmentally inferior in their humanity and lifeways.(1)

In contrast, tribal people see time and process as cyclical, or sacred. From the cyclical perspective, past and future are united in the present, within a perennial reality of the now.(2) Even in the languages of most Native American cultures there are no past or future tenses. Instead of focusing on the forward march of progress, there is a focus on enjoyment of the here and now in all its manifestations. Says Brown in *The Spiritual Legacy of the American Indian,* "The rich mythic accounts of creation, for example, do not tell of chronological time past, but of processes that are eternally happening. The same processes are recurring now and are to recur in other future cycles.(3)

A high level of sophistication and appreciation for this cyclical perspective can be seen in the following statement of Luther Standing Bear, a chief of the Oglala Sioux in the late 1880s. *"The man who sat on the ground in his tipi meditating on life and its meaning, accepting the kinship of all creatures and acknowledging unity with the universe of things was infusing into his being the true essence of civilization. And when native man left off this form of development, his humanization was retarded in growth."(4)*

Let's look at how cultural perspective has influenced the transportation systems of these different societies.

When the train was first introduced in the early 1800s, life for Euro-Americans was primarily agrarian—almost the entire population lived on farms. But people were far from content. Tired of being stuck on dirt roads which became impassable in the rain, they demanded a transportation system that could get them—and their produce—around with greater ease. Farmers and residents of small towns were fascinated with the passenger trains that sped by their otherwise "sleepy" rural communities. Often the whole town would stop business to watch the trains go by. According to John Stilgoe in the book *Metropolitan Corridor,*

"All the wonders of the metropolitan corridor (railroad), the elegance, the speed, the precision, and above all, the energy, sapped the traditional strength of small town America...At the end of the nineteenth century, such communities existed as shadows of their once-prosperous selves; their "best" citizens deserted them for places with "get-up-and-go," while American slang identified them as "wide places in the road."(5)

The train had indeed opened up the continent for the new American nation. At the same time, the train created a new definition of accessibility—a new transportation context. Before the railroad, people had no expectations of getting to outlying areas. With the railroad, people came to expect to travel to far away places—and *fast.* By the late 1800s when the continent was linked by the iron rail from the Atlantic to the Pacific, the prairie and plains fenced in, the wilderness "tamed," and people could buy and sell goods at will, they still wanted more. Although the pace of life had become much faster, it would continue to accelerate as more and more people competed for a piece of the prosperity. To slow down meant to miss opportunity; to do things as quickly as possible meant to "succeed." This thinking would later lead to the first fast-food restaurants and the term "rat-race."(6) From the dawn of the steam locomotive, every new vehicle or other invention which could facilitate commerce would be seen as improving the quality of life.

While European Americans became convinced that new machines and increased trade represented "progress" and would lead to prosperity and wellbeing, Native Americans held a different worldview. Plains Indians, for example, saw their world as contained within established territorial boundaries.(7) All their needs were met within the universe bounded by migrating buffalo on the plains, summer camps by the tree-lined rivers, the tipi of sapling trees and hides with its smokehole open to the sky, and sheltered winter camps in the mountain valleys. Each detail of the land—every knoll, river, and crevice—told of some memorable event filled with meaning and purpose. Within this territory, the world was perceived as infinite and timeless. The impact of a mythical event which occurred at a particular landmark remained ever present.

Before Europeans brought the horse to this continent, bands of Native Americans roamed the Great Plains and prairies, transporting their tipis and gear on *travois,* or drags harnessed to dogs. The buffalo which they hunted provided food, housing, clothing, tools, and implements. The introduction of the horse by Spanish explorers in the 1400s gave this already nomadic culture a greater power of mobility. The horse allowed the Kiowa, Sioux, Crow, Arapahoe, Blackfeet, and other tribes to carry larger homes and more equipment while covering the vast stretches of the prairie. Not only did obtaining sustenance become easier, but contact with other tribes increased and alliances formed (this is the element of expanded communication which transportation provides). The horse became more than a mere animal or vehicle. It came to represent the character of the Plains Indians.

The Plains Indians found the horse sufficient for their needs. They adopted it because it fit within their worldview, and they were equally able to eschew the mechanical pursuits of the white settlers. When they observed long caravans of horse-drawn wagons carrying settlers across the frontier, the natives made no effort to obtain this new mode of transport. Unlike the Euro-Americans they were not focused on increasing the complexities of their technology or the speed and power of their transportation. In the 1860s railroad trains (the "iron horse") came rolling down the fresh-laid tracks venturing west, intruding on the land and lifestyle of the native peoples. Roman Nose, an intrepid chief of the southern Cheyennes, declared at a council in 1866 near Fort Ellsworth, Kansas, *"We will not have the wagons which make a noise (steam engines) in the hunting grounds of the buffalo."(8)*

The Plains Indians, though nomadic, were already in the center of their universe; they didn't need to expand far from their home. Their home was a center—and this center was an essential part of their life. Living within set territorial boundaries was a way of dealing with the indefiniteness of space and of recognizing human limits. The fire inside each tipi was the ritual or conceptual center of the Plains Indian territory and of the universe. The fire provided an anchor in the physical realm which grounded individuals in the experience of the present moment. "Living in the moment of the present allows us to be in immediate and continual interrelationship with the qualities and forces of our natural environment."(9)

Euro-Americans, however, had lost their sense of center. Home and community had been left behind when fleeing the mother country. The landmarks of the new world were strange and couldn't serve as comforting points of reference. In an attempt to feel at ease and in control, these people set out to "conquer" the continent (an idea incomprehensible to the Native Americans).

Without the view of sacred place and time, people are bound within the confines of a mundane or mechanical world (that which is measured quantitatively and scientifically). While linear thinking can come in handy, for example, in the practical task of building a bridge, by itself it cannot provide meaning and purpose to life. The bridge may really improve our ability to cross the river. But without cyclical, holistic thinking, one may see improving navigation as the prime purpose in life. The linear orientation of never-ending progress cannot provide a sense of wholeness and completion. Searching for the feeling of expansiveness in the material realm is futile, for it is an inner experience.

Western society has been trying to conquer time and space through transportation "improvements" for ages, and is still trying to reduce the gap between physical time and distance. But there is no transportation vehicle or communication device which can solve our longing to experience unlimitedness and unboundedness. We are looking in the wrong place. As long as this quest is on a physical and, thus, quantitative order, even the seemingly limitless reaches of outer space are limited, bound to the laws of the material realm. It is not speed we seek—it is a feeling of ease and security within our surroundings, which can only come about by feeling the unity of all things. Unless we come to realize this, we will continue to repeat history with every new technological invention and find our thirst for the ultimate unquenchable.

Notes

1. Brown, Joseph Epes, *The Spiritual Legacy of the American Indian*, pg. 50. New York. 1982. Crossroad Publishing.
2. Ibid. pg. 50.
3. Ibid, pg. 50.
4. McLuhan, T.C., *Touch the Earth: A self-portrait of Indian existence*, pg. 90. New York. 1971. Outerbridge & Dienstrfrey.
5. Stilgoe, John R., *Metropolitan Corridor: Railroads and the American Scene.* New Haven & London. Yale Univ. Press. 1983.
6. Ibid. The term "rat race" originated around the turn of the century as a result of the chaos of people changing trains in Grand Central Station. This led to the development of traffic-control engineering.
7. Brown, J.E., ibid., pg. 14. Native American groups of the Plains and Prairie area represent very diverse cultural histories and tribal origins. Yet over time these groups developed a common style of life and thought. This happened through adaptations to the same environment and interaction with each other due to the mobility of the horse.
8. McCluhan, T.C., ibid., pg. 88.
9. Brown, J.E., ibid., pg. 117. Δ

Patrick Clark is a graduate of the permaculture design course. From 1991-1994 he and his partner Linsi Deyo edited Kokopelli Notes, *a journal of "self-propelled living." He lives at Cullowhee, NC. This article was adapted from* Kokopelli Notes, *Vol. 3, # 2.*

Making Workbikes for the Neighborhood

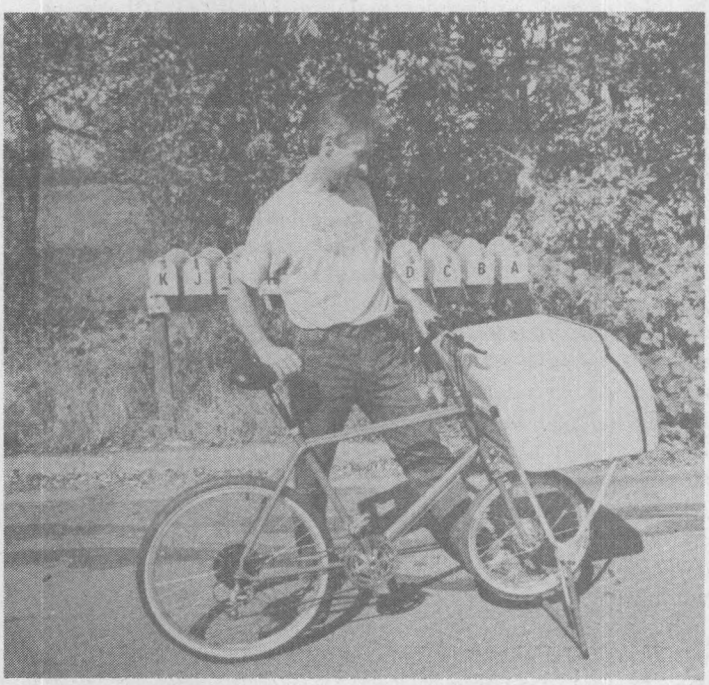
Greg Bryant

Each day, the average bike is pressed into service carrying groceries, boxes, and bags far beyond its designer's original intentions. At best we hang panniers, baskets, pods, and trailers off of it: sometimes frustrating attachments to use and maintain.

Better bike designs for hauling loads were first available nearly a century ago, then fell into disuse with the advent of the combustion engine. But today a tiny international network of ecology-minded bicycle engineers is leading a renaissance for workbikes. The old bikes are being brilliantly redesigned with lessons of the past century in mind, including the experience of being overrun by the automobile industry.

Today's mammoth bicycle corporations concentrate their marketing power on recreational and commuting bikes, perhaps unconsciously avoiding the transport territory of motor-driven trucks and vans. The primary exception in the U.S. is New York's *Workman's Cycles* (see *Rain* 14:1, p. 44), a company making workbikes since the 19th century. The U.S. market for human powered machines shrank as gasoline power caught on, and as a result *Workman's* has been conservative when investing in new bicycle design. They mostly build massive, heavy-duty bikes for use in industry, made to withstand the disrespectful treatment they receive on the factory floor.

Now Jan VanderTuin of *Human Powered Machines* has brought more workbike models to the U.S. from Europe, updating their design and broadening the social program for bicycle engineers. His designs are based upon classic European transport cycles, such as the "Long John" (or "Long Emma" as it's known to the British), and the Baker's Bike, with basket attached to the frame rather than handlebars. Contrary to current practice, however, good bike design isn't just a matter of engineering: it must take the rider's community into account.



Jan VanderTuin fetches the mail with his utility bike, whose load is on the frame rather than the handlebars. This model, with weatherproof container, is used for pizza delivery in Eugene, OR.

For example, in Italy and Switzerland many bicycles are built, frame and all, at your corner bicycle shop. Every day a variation

on some classic model is built to meet local or personal needs, and the bike is typically repaired and adjusted in the same shop for its lifetime. In fact, it is difficult to get any *other* bike repaired there. The bike shop is part of your neighborhood, and the relationship between you and your bike builder strengthens over the years. This relationship is now being hurt by mass-produced bikes, designed for the least common denominator among consumers, built by robots, or people forced to act like them, who never get to know the riders.

Local economies benefit from decentralizing and personalizing bike production. Custom Italian bicycle frames are famous throughout the world because each Italian neighborhood has bike designers and builders. Northern Italy's modern economic success owes much to a tight fabric of diverse skills in quick, custom, small-scale manufacturing. Italy has become something like the product idea shop of Europe.

In Switzerland a century of molding bicycles to local needs produced a national school for bicycle design and manufacture, a bicycle unit in the Swiss Army, and a fleet of thousands of baker's bikes for the post office. In their neighborhood bike shops the Swiss learn that this technology is adaptable, so bikes find their way into a broad range of activities. VanderTuin would like to see communities in the U.S. develop this kind of technical understanding and appreciation of transport diversity.

Large-scale bike manufacturers have failed to understand workbike technology, perhaps because a bike's design must relate to some specific social role, a situation which defies easy national marketing. VanderTuin designs and prototypes with community-sized intermediate scale production in mind. For small businesses the key is to facilitate low capital start-up of local bike construction. For example, a big expense in building bicycles is the almost immobile flat steel table "jig" (the frame used for holding the bicycle tubing in one plane for welding.) Instead of using these, VanderTuin makes jigs out of readily available rectangular steel tubes. When a given design is called for, a small manufacturer could pull out the appropriate jig from a stored collection.

If it's hard to imagine a transition to small scale manufacturing in the U.S., VanderTuin points to the experience of the Intermediate Technology Development Group (ITDG) in Britain. The OxTrike project designed a load-carrying tricycle from scratch, specifically so it could be built inexpensively with tools and materials available in any developing country. For example, the brakes are constricting bands, and the brake lever is a pedal on the frame. Most significantly, ITDG taught a detailed, intelligent, shop-worn manufacturing process to the potential builders. They've since set up dozens of OxTrike community workshops around the world.

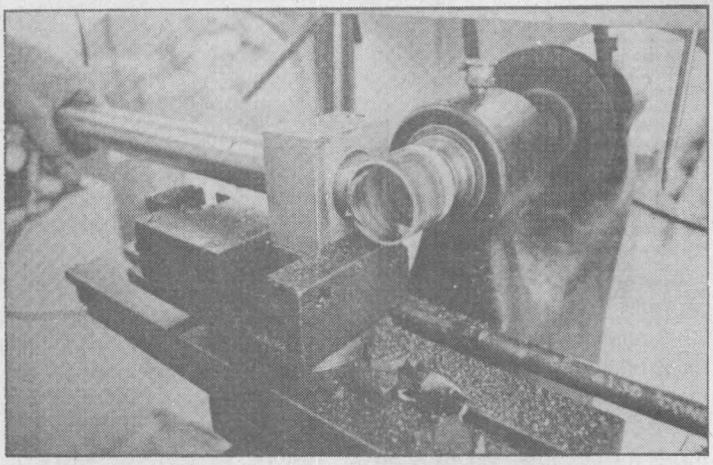
The situation in the U.S. is similar: few are now involved in community-level bike production, and setting up the appropriate scale for a new type of bike here is very much like doing a third world development project. So like a development worker, in addition to making the bikes, VanderTuin teaches workbike design and manufacture to the community, in conjunction with the University of Oregon.

Sometimes you have to start a third world project to bring appropriate technology to first world neighborhoods. VanderTuin visited such a group at the Universität Oldenburg in Germany: their international development group produced and broadcast a television show detailing the construction of a bicycle trailer. They also taught community workshops in which people built trailers—now tailing bikes and mopeds throughout Germany.

Of course communities benefit by more directly supporting their own appropriate technology research. An experimental bicycle group VanderTuin knew in Frankfurt, established as a state vocational school, created unusual, useful designs such as rainproof bikes and trikes for the handicapped. A group of ex-students from this school founded a co-op whose bicycles are now well-known in Germany. In Hamburg another group has established a neighborhood center in which they live, work, and do community service. They run a bicycle workshop cooperatively with the community where, for a subsistence fee, people come to get help creating bikes for unusual needs. In the U.S. local inventors are unable to support themselves doing appropriate technology work like this, and no one helps since the prevailing ideology pressures them to make a business success of it, alone.

Community supported organizations can incubate endless applications of appropriate technology. Workbikes are used in local delivery of mail, pizzas, groceries, laundry, and other goods. They transport the elderly, children, and anyone else who needs to get somewhere. Ideally service operations are owned and run by the neighborhood, allowing them to determine in open assembly if the appropriate services are being provided.

Greenpeace Europe's EcoBike campaign highlighted what happens when a community does *not* control its own bike technology. Greenpeace listed torrents of wastes and toxins associated with normal bike production; they constructed an alternative bike using the cleanest methods they could find, given



*With the collapse of machine tool industries in the U.S. during the 1980s, special purpose machines such as the horizontal mill at **left**, shown cutting a curved miter joint, became less readily available (except from factory closing auctions). These kinds of machiens are essential for quick prototyping of bikes to fulfill evolving community needs. The disappearance of such hardware burdens local small-scale workbike builders, but their primary burdern in the general high cost of bicycle-building tools. Custom-made bikes are usually made for the reasonably well-funded, and so the tools are priced for recreation cycling, not for more practical vehicles. One solution is to create new tooling arrangements. VanderTuin has spent years researching inexpensive tube bending, cutting, and welding.*

their limited research funds. Most current bike production is not just environmentally unsound: bicycle factories, and affiliated mining operations, wield sufficient clout to displace people in developing countries, and to overwork unionless assemblers in politically oppressive states like Taiwan. Both the technology and economics of manufacturing have to change if they are to be truly ecological.

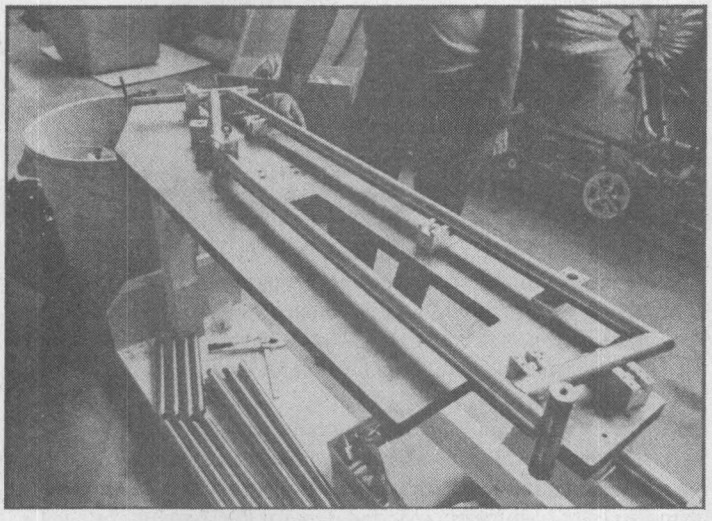
In the impersonal world market the creativity of bicycle makers is stifled and the needs of bicycle riders are not addressed. VanderTuin and his colleagues are giving us a set of solutions. But until deep problems are tackled more directly, by more people, the original vehicle of personal liberation, the modern symbol of ecological awareness, will not fulfill its potential.

Other Resources

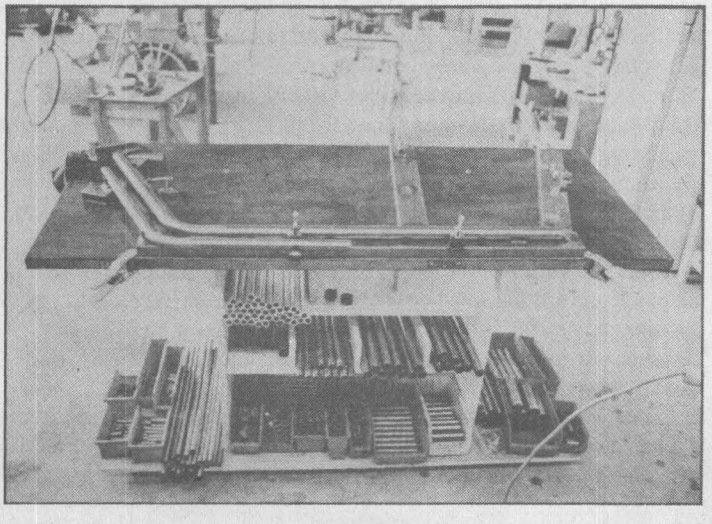
Mobility Resources, Inc. distributes all-terrain bikes and special utility trailers designed to handle unpaved conditions. In addition, MRI offers technical advice on tool selection, trains mechanics on assembly of trailers and bikes, and sets up repair workshops for on-site maintenance. Contact Ken Hughes at: Mobility Resources, Inc., PO Box 381, Santa Fe, NM 87504, phone (505) 988-9297, fx 983-4853.

Dumptrikes are used by the Village Green Recycling team to haul newspapers, bottles, and cans, and by a Manhattan construction company to deliver materials and remove debris. With a capacity of nearly 400 lbs., the various models of the dump trike, with their sturdy frames by Worksman Cycle and their Rubbermaid one-half cubic yard polyethylene containers, are ideal for heavy, messy work. Available from Human Powered Research, 600 W. 131st Street, New York, NY 10027. (212) 505-3276.

The Workbike Workbook, a collection of diverse and detailed workbike materials VanderTuin has collected over the years, is available now for $10 postpaid. He is also writing another workbike book. Contact him about the book or the bikes at Human Powered Machines, P.O. Box 1005, Eugene, OR 97440, phone: (541) 343-5568. The bikes themselves cost from $669 to $949 for the Baker's Bike, $995 to $1700 for the Long Jan, depending on gearing, racks, containers, insulation, and components. "TIG welded cromoly with powder coat finish," and every penny of profit goes into furthering community bicycling. Δ



*A standard industry jig - **above** - (a design frame that holds tubes in place for welding). A jig's plate is cut with expensive equipment out of solid steel, putting it out of range of producers for a small local market. VanderTuin builds his own jigs **(below)** by cutting rectangular steel tubes and welding them together. He then places the frame on any flat surface, such as this door, to do a preliminary, or tack weld. Not only are these light, cheap, and just as good as the solid plates: they allow one bench to produce any model with a simple change of jig. In any case, bicycles are then made true with various inexpensive straightening devices.*



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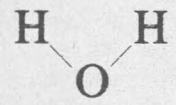
New Energy Technologies



Gary A. Schwartz

The world's six billion inhabitants currently use the equivalent of 400 trillion megawatt-hours of electricity per year for lighting, heating, air conditioning and to run appliances. Energy production and use are responsible for more environmental damage than any other human activity. Coal and oil are the predominant sources of this energy, accounting for 95% of all emissions of sulfur dioxide, nitrogen oxides, and carbon dioxide as well as considerable quantities of trace metals and particulates into our common atmosphere.

Fossil fuel combustion in the United States alone accounts for more than a billion tons of carbon emissions every year. Thus our current means for producing electricity and providing transportation create acid rain and pollution, and contribute to global warming. Americans spend at least $50 billion every year on health problems related to air pollution. We need alternatives.

Currently Available Alternatives

Reduced energy consumption through improved architecture of buildings is the most intelligent first approach to resolving this situation. This can be accomplished through designs which capture solar gain for space heating, construction methods embodying high insulation values such as earth berming techniques, provision of solar hot water systems for all buildings, and the placement of windows for natural lighting and for passive ventilation.

More efficient appliances are another means of reducing our electricity needs. Fluorescent and compact fluorescent lighting products consume one fifth of the power of incandescents for the same amount of lumens provided. One of the main energy demands in the average household is for refrigeration. High efficiency refrigeration appliances such as the Sun Frost brand are currently available alternatives with widespread improvements in efficiency expected across the industry in a few years. While initial cost on these devices is higher, they reduce energy use and pollution immediately and will generate a considerable monetary savings over their lifetime. Spring houses (the traditional enclosure of cooling groundwater for food storage) and earth-cooled thermal chimney closets use no power at all to accomplish the same purpose.

Electric power can be produced without pollution. A number of "alternative" electric energy production devices are now available. Photovoltaics, full-scale and micro-hydroelectric generators, wind-powered generators, geothermal generators, and biomass-derived ethanol are in use today, providing for many small- and large-scale energy needs.

Individual households may choose to produce their own electricity. For the average person, photovoltaics and micro-hydroelectric generators are the most practical alternatives. If one is fortunate enough to have an ample flow of water and enough of a drop in elevation (50 to 200 feet), micro-hydroelectric installations are the most cost effective. A one-kilowatt DC system can cost as little as $3,500 when there is a significant elevation drop in the water supply; figure another $2,500 for an AC inverter.

The cost per kilowatt hour for photovoltaics is still fairly high. This is partly due to a relatively low demand for these systems, and possibly because political forces are at work to keep prices high. While a 60-watt DC system can cost as little as $600, a 1.2 kilowatt AC photovoltaic powered system—enough to power a modest homestead, assuming the use of a high efficiency refrigerator—currently costs from $12,000 to $14,000.

Suppression of Possible Technologies

A number of technologies for the propulsion of vehicles and the production of electric power have been developed during the last 70 years which have been actively suppressed by those individuals and corporations which would be economically threatened by low cost alternatives. Among these inventions are "low-temperature phase-change technologies" (LTPC), high efficiency carburetors, (yes, many of those anecdotes you have heard about high mileage carburetors are true), Victor Schauberger's water and air vortex technologies, Richard Clem's vortex engine, Sparky Sweet's vacuum triode device, Ed Gray's highly efficient electric motor designs, Stan Meyer's water fuel cell, cold fusion technologies, and Nikola Tesla's energy accumulators.

A lengthy article could be written on the previous suppression of non- polluting technologies. The U.S. Patent Office still refuses to issue patents for cold fusion technologies and other "over unity" devices. This author has personally interviewed several inventors who have been harassed, bribed, sabotaged, jailed, persecuted, and even survived attempts to murder them in order to keep their helpful technologies out of the marketplace.

However, the background conditions are beginning to change. Because Japan has no oil or coal resources of its own, Japanese scientists are charging full steam ahead to develop their own versions of these new energy technologies. There are also independent inventors in the U.S. who are fast approaching the marketplace with promising alternatives to fossil fuels. Let's take a look at the front runners.

Low Temperature Phase Change Technologies (LTPC)

A means for producing pollution-free transportation and electric power from kerosene using low temperature phase change (LTPC) or refrigeration-based technologies was developed in the early 1970's by Wallace Minto and Archie Gay. These devices are based on a new application of refrigeration technologies. Mr. Minto had refined several generations of prototypes for powering automobiles on a closed loop Freon-driven engine powered by a low emissions kerosene burner. This technology was reviewed in *Popular Science* in October, 1970, where it was reported that he was negotiating with Nissan Motor Company for collaborative production of a Datsun model in 1972. Yes, the means for pollution free transportation was on its way to market 26 years ago. However, Mr. Minto apparently sold the rights to his inventions to an anonymous higher bidder who "disappeared" it.

Mr. Gay had been casually collaborating with Minto and already had a $2.5 million stock offering in hand when he too was approached by a higher bidder. He refused to sell because the "buyers" insisted on remaining anonymous. His refusal was followed by two nearly successful attempts at murdering him and his family, and sudden and contrived charges of tax fraud by the IRS. His investors withdrew their money and his refrigerant-driven generators never made it into production.

This technology surfaced again in 1988 through an American named Dennis Lee. This time the fuel source for powering the generators was not kerosene, but the thermal energy available in air, soil, or water at temperatures as low as -10°F. Lee used a highly efficient heat pump married to a unique piston engine developed by Victor Fisher.

Heat pumps are in widespread use to provide space heating and cooling. These systems are preferred over electric resistance heat as they are four times as efficient as resistive heat coils. This efficiency is derived from refrigerant-based low temperature phase change technology which transfers and concentrates the thermal energy of the ambient air, the ground, or a water source. With a heat pump it is possible to concentrate ambient temperatures into temperatures greater than 200°F. LTPC technology applies this concentrated energy to boil refrigerants (which have a boiling point of -40°F.) to drive motors and compressors as parts of these systems.

In 1988 Dennis Lee developed an electrically driven heat pump which utilized larger collector plates for the evaporator. This heat pump was two to three times as efficient as current heat pump designs, and was up to 12 times as efficient as electrically supplied resistive heat. This in and of itself was a design that could have met many domestic heating and cooling needs while significantly reducing the consumption of hydrocarbon fuels and their attendant pollution.

Some years later Lee met Victor Fisher who had produced a design for a closed loop Rankine engine which operated at efficiencies as high as 50%. The Fisher steam engine was adapted to run on the liquid/gas phase change of refrigerant rather than the liquid/gas phase change of water into steam. Then these two high efficiency designs, the heat pump and the phase change engine were combined into a hybrid unit in which the heat pump provides high temperatures (200°F.) to boil the refrigerants which drive the phase change engine. The phase change engine was then coupled to an electric generator. The generator produced enough electric energy to power the compressor on the heat pump with energy to spare - approximately 30% available excess energy. This excess electric energy was produced continuously as long as the ambient temperatures were above -10°F.

This system runs on the thermal energy (heat) which is present in air, earth, or water as long as the ambient temperature is above -10°F. It is a totally closed loop with no fossil fuel used in operation and no exhausts of any kind.

This is not a perpetual motion device because it does require energy to run. However, the energy is provided from the ambient air. Because we are comfortable in air temperatures of 50°-90°F. we do not realize that there is a great amount of energy available in the air around us. An ambient air temperature of 70°F. is actually 530 degrees above absolute zero. This is three times the temperature rise required to convert water at room temperature to steam—a significant amount of thermal energy. It is this energy which boils the refrigerant (CFC-free, of course) and is the source or fuel for this system.

Mr. Lee's prototypes have been tested by independent laboratories and shown to work as claimed. One would assume that such technology would be met with open arms and find widespread acceptance in the open market. However, Lee's inventions were suppressed shortly after their development when he refused to sell the rights to his technology to another anonymous, but deep pocketed purchaser. Shortly after his refusal to sell out, he was arrested, held on a million dollars bail, and then sent to jail for three years, without benefit of a trial. All this on a misdemeanor charge in the state of California for failing to file a business form.

Mr. Lee assumes that this persecution was initiated and paid for by those who would stand to lose business and power by the production of independently owned low-cost energy technologies. He is now out of jail and is once again manufacturing these pollution-free generators. His plan is to install them in homes all across the nation, with a utility grid inter-tie. The homeowner gets free electric energy and Mr. Lee's associates sell the excess back to the power companies. (For further information contact Steve Torma at 704-254-5613.)

In addition to the previously mentioned inventors, George Wiseman of Eagle Research is further refining LTPC technologies for the production of electricity and for motive power in vehicles. Rather than selling a product, Mr. Wiseman sells published reports of his research on improvements to these refrigeration-based technologies. (Eagle Research, PO Box 10, Yahk, BC, VOB 2PO Canada.)

Hydrogen Power

One known means for achieving non-polluting power for transport is the combustion of hydrogen and oxygen, a process which produces energy and pure drinkable water. Hydrogen, the most abundant element in the known universe, can also produce electricity directly in a fuel cell. Hydrogen burns absolutely clean and is a fine way to store power. However, the electrolysis of water into hydrogen and oxygen still requires energy input from some other source, and the amount of energy returned from combustion is, at best, only equal to the amount of energy required for electrolysis. Intelligent hopes for hydrogen as a fuel have until recently depended on its production by electrolysis from photovoltaic or other renewable, non-polluting technologies.

Dr. Randall Mills, however, has found another way to extract energy from hydrogen. He has discovered that hydrogen can be coaxed into a lower resting state than the one in which it is commonly found. The resting state of an atom refers to the stable resting place of the electrons which orbit the nucleus of the atom. When energy is added to an atom the electrons jump to a higher orbit. Correspondingly, when electrons drop to a lower orbit—closer to the nucleus, they give off that energy in the form of light or heat.

Mills' process uses a tiny amount of hydrogen and a vaporized catalyst (gaseous potassium ions) in a vacuum chamber. The hydrogen atoms become smaller than normal, according to Mills, who calls the smaller atoms "hydrinos." Tests being conducted by Peter Jansson, at Rowan University in Glassboro, N.J., are showing that Mills' process is producing 100 to 1,000 times more heat than would be produced if the same amount of hydrogen were burned. Mills claims his energy source is clean; it does not cause dangerous by-products, and only releases hydrogen, which does not pollute. This has the potential to become a dominant source of power for all large-scale power applications.

A company, BlackLight Power Inc. of Malvern, PA, has formed around this technology, and has received a million-dollar investment from PacifiCorp Holdings Inc., a public utility holding company from Oregon. In addition, other domestic and foreign utility companies are negotiating terms for investment in Mills' company.

There is promise of a simple hydrogen conversion for automobiles as well. Stanley Meyer has developed an electric cell which will split ordinary tap water into hydrogen and oxygen with far less energy than that required by a normal electrolytic

cell. Where normal water electrolysis requires the passage of current measured in amps, Meyer's cell achieves the same effect in milliamps.

Meyer's experiments, which he seems to be able to repeat to order, have earned him a long series of U.S. patents granted under Section 101. A most elegant aspect of his water fuel cell is that it is small enough to screw into your car's engine where the spark plug once was. Yes, if Stan Meyer can make it into production, we will be running our cars on water! The latest reports indicate that the water fuel cell is close, but not yet perfected. (Contact: Water Fuel Cell, 3792 Broadway, Grove City, OH 43123)

High Mileage Carburetors

For those who are still driving petroleum-fueled automobiles, Paul Pantone of Global Environmental Energy Technologies (GEET) has developed a vapor-based fuel carburetion system which reduces pollutants by 80% and doubles or triples the efficiency of internal combustion engines (thereby reducing pollution even more than 80%). The GEET fuel processor is a replacement for the standard carburetor on internal combustion engines. Utilizing the engine vacuum pressure it draws fuel vapors into a specially designed chamber where the vapors are preheated by exhaust gasses.

What happens inside the preheating chamber is more than a simple heat exchange. One test was performed at Brigham Young University using crude oil as a fuel. They detected 39 known elements entering the chamber and only 13 elements were measured in the output of the chamber. This test, coupled with Paul Pantone's report of a strong magnetic field surrounding the chamber, is exciting evidence pointing toward transformation at an atomic level.

Prototypes have run on a variety of fuels, including kerosene, paint thinner, and a mix of crude oil and water. In addition, GEET equipped engines run so clean and carbon-free, it is anticipated that engines will last at least twice as long.

GEET's emission tests have consistently demonstrated the capacity of the GEET fuel processor to reduce polluting emissions. Independent testing comparing a stock Tecumseh 10 hp engine to one with a GEET retrofit revealed the significant differences at 3600 RPM with no load:

	STOCK	GEET
Exhaust temperature	837°F	388°F
Oxygen	7.2%	12.7%
Carbon Dioxide	9.8%	6.2%
Carbon Monoxide	32,000 ppm	923 ppm
Hydrocarbons	5.8%	0.2%
Nitrogen Oxide	82 ppm	62 ppm

Other independent tests show similar figures. GEET is currently shipping 4- and 5-kilowatt generators and anticipates having retrofits for trucks and cars by the fall of 1997. (For more information contact: Light Works! Inc. 704-253-9451).

Cold Fusion

Contrary to what the mainstream press has been reporting, the 1989 cold fusion experiments at the University of Utah by Drs. Martin Fleischmann and Stanley Pons are being replicated in dozens of laboratories worldwide, particularly in Japan.

Cold fusion is an energy-producing phenomenon that occurs when ordinary hydrogen and the special form of hydrogen called deuterium are brought together with metals, such as palladium, titanium, and nickel. Usually, some triggering mechanism, such as electricity or acoustic energy, is required to provoke the "cold fusion" effects which result in more power out than power in.

Both ordinary hydrogen and deuterium are abundant in ordinary water and are easy to separate—so the process may help to end many of the world's energy concerns, if it can be developed commercially. Cold fusion releases energy in the form of heat, not radiation, as in hot fusion. This heat energy is hundreds of times what ordinary chemical reactions yield. Cold fusion is being commercialized in Japan (Pons-Fleischmann discovery) and in the U.S. (Patterson Power Cell™). Pons and Fleischmann, working with Japanese funding (from a Toyota affiliate), have made excellent strides in the development of the heavy-water, palladium cathode, electrochemical cells. These devices are capable of providing large amounts of thermal power.

Licenses for the newer Patterson Power Cell™ are being marketed by Clean Energy Technologies (CETI) of Dallas. Texas. This device has been independently tested and replicated by several universities, utilities, or corporate research laboratories, but not yet by the U.S. Department of Energy (DOE). While the Japanese have added an additional hundred million dollars to the development of cold fusion, the U.S. DOE does not recognize the technology and this mistake is echoed by the U.S. Office of Patents and Trademarks.

There are some additional inventions which have not yet made it to production stages, but are worthy of note since they do not require fuel. Other than the initial costs for the equipment, these could be considered free energy devices.

Victor Schauberger's Vortex Technologies

Victor Schauberger served as the director of forestry for Prince Adolph zu Schaumburg-Lippe of Austria in the 1920s. During this time he spent many hours sitting beside forest streams studying the movement and qualities of water. He noticed that on occasion large stones would float up to the surface of the stream for a few moments and then descend again. He also noticed that the native trout were able to swim up waterfalls as though they were riding on an invisible vortex of energy. In time, he left the forestry and began experiments with centripetal vortices of water and of air.

He created peculiarly shaped pipes which mimicked shapes found in nature, (whorl pipes). These shapes produced a centripetal vortex in the water which flowed through them. Independent testing revealed that a negative friction was measured as the water was flowing through these pipes. That is, the water flowed through at a rate that was greater than the applied pressure could account for! It was somehow picking up unaccounted for energy to speed itself along.

Schauberger built unique suction turbines which both produced electricity and seemed to enliven and invigorate the water, resulting in clean, life-giving water downstream.

World War II was soon underway and he was forced by the German government to apply his vortex machines to the development of a flying craft which utilized compound centripetal air vortices. These devices were initially motor driven, but once they had reached a certain speed they became self-generating, and produced enormous pumping power and lift. So much lift, that one such device broke loose from it's mounting bolts and literally went through the roof of the laboratory.

At the end of the war, American military officers seized everything in Schauberger's laboratory and put him into "protective custody" for six months. Then Schauberger was called to America, where, still thinking he could do some good

for the world, he was persuaded to write down everything he knew and to sign some contracts with industrial financiers. Eventually he became angry and despairing that his projects seemed to have been left sitting on the shelf, and that no work was being done about his ideas. Schauberger then discovered that he had signed away the rights to his work to these industrial concerns, and that they would do nothing to further it. Victor Schauberger was an old man when he died in 1958, reportedly crying in the last days of his life that they had taken everything from him and that he no longer even owned himself.

Some of Schauberger's papers have survived, as well as papers by some of his contemporaries on related research findings. In addition, diligent research by Collum Coats has located one of the air vortex driven devices in the possession of now retired Navy Commander Richard C. Feierabend, and he has published photographs of this device in his recent book *Living Energies.*

Richard Clem designed and built a vortex engine in Dallas, Texas which ran continuously without fuel. This engine was remarkably similar to the designs of Schauberger. However, Clem died of a heart attack soon after signing a deal with the coal industry, and, as has been typical with these scenarios, his workshop was raided by law enforcement officials and all of his notes and drawings removed. This author would like to hear from anyone who has more information on the Clem engine.

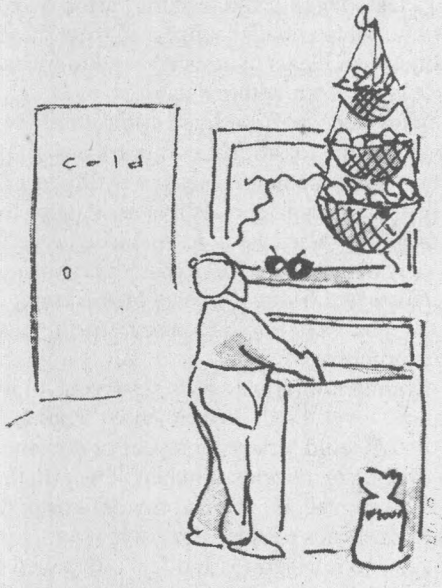
Where are These Energy Miracles?

Some of them may only be a good idea that almost works, and perhaps there is still considerable resistance to inexpensive power from those who rule the status quo. Whatever the cause, the majority of them have not yet arrived. (There are many more inventions than space allows in this article.) Paul Pantone's carburetors are available now, and Dennis Lee claims he is about to go into production of electric generators. Hopefully, we will be seeing more of these miracle machines in the marketplace soon. In the mean time, consider photovoltaics, hydroelectric systems, and GEET generators, and practice conservation.

What can you do to help this coming energy revolution arrive sooner? Start by asking your Congresspersons to increase funding for this type of research. Ask the media to give more coverage to these issues. For those who want to track these developments, a good beginning would be to read *The Coming Energy Revolution* by Jean Manning , and *High Voltage and Free Energy Devices* by George Moonhie. Those with access to the Internet can start with a visit to KeelyNet at www.keelynet.com, and The Institute for New Energy at www.padrak.com/ine/. Δ

Gary A. Schwartz is an inventor, researcher, and artist thriving in Asheville, North Carolina. He can be reached at GaryAwake@aol.com, or at 704-253-9451.

Living Without a Fridge



Kim Forhand

A couple of years ago I read an article that forever changed my kitchen. It was about the widespread use of chlorofluorocarbons (CFCs) as refrigerants and the impact of the movie "E.T." on people living in China. It posed the compelling question: What is going to happen when one billion Chinese people see E.T. drink all of that cold beer and get knocked over by the refrigerator door stocked full of conveniently chilled and well-lit food and drink items? And what will they want to do with all of those dollars earned by importing our raw materials and sending us back cheap manufactured goods for a hefty profit?

The answer was clear: they'll want refrigerators of their very own! And what will that mean to the existing $8 billion per year CFC industry? An even bigger market for those manmade industrial chemicals that end up floating around like invisible little plastic chips in our atmosphere. And what does that mean to all members (including Americans) of the plant and animal king- and queendoms? Probably a very nasty, scorching extinction brought on by ultraviolet sunlight slipping past a thinning ozone shield.

Right now, with just a few billion free-floating chlorine molecules in our atmosphere, we're only conducting a dangerous experiment. But if all of those Chinese join in, that would put the nail in the coffin.

The solution was obvious: Chinese must never find out about refrigerators. We must recall all movies and television programs that show the typical U.S. kitchen. But then the major lesson of my childhood kicked in, and that little voice in my head said, "But you must *share* your toys!" It was then that I realized that if the ozone was not something that everyone could play with, then neither could I. Within months I sold my refrigerator.

At first I wondered how a baby-boomer like myself who was raised on frozen foods and meat and dairy products could survive without a refrigerator. It seemed too much like a necessity, like air and water and CD players. I started out tentatively by unplugging it for awhile to see if I could really do it. All the while I thought about my ancestors who had survived for eons without such a contraption. At the same time, I mentally put refrigerator in the same category with heroin, morphine, LSD, fossil fuels, and television, and reminded myself from time to time that I was simply going through withdrawal.

It was not easy at first. A lot of leftovers went to the compost pile. I didn't always have quick access to what I wanted to eat right when I wanted it. It was much harder to pig out when I was stressed out. And most of all, I missed popsicles. But over time the benefits began to accrue. My monthly electric bill went down from an average of $28 per month to about $11, or 407 kilowatts per month to 110 kilowatts per month. (Warning: these figures also reflect the impact of an improved outdoor clothesline.)

In the winter I put perishables (like mayonnaise) outside, and the weather did a fine job of keeping them cold. In the summer I planted a garden so that vegetables could stay fresh on the vine; as a result, meals became tastier. After the refrigerator was sold, I had a lot more space in the kitchen. I got used to food and drink that was not ice-cold and stopped eating as much irradiated and otherwise contaminated packaged, frozen, and processed foods. I discovered that store-bought vegetables keep longer if they're in water, and eggs last longer if you turn the carton over every day. That ominous humming sound disappeared from the kitchen, and I learned to better plan meals in advance, and to prepare only the amount that could be eaten within a day.

In short, I readapted and have lived comfortably without a refrigerator in my home for almost two years now. Of course, the withdrawal period was made much easier by the fact that I eat mostly dried beans, rice, and cereals that are easily stored for long periods of time. I also live in town, close to the local food co-op, so it's easy to drop by or bike over every other day or so for fresh vegetables and fruits. I'm also blessed with a partner who assists in all phases of the food procurement, meal planning, and preparation process.

I realized it would not be as easy for everyone to live without a refrigerator. However, I still recommend it wholeheartedly. Pull that plug and go cold turkey for a year or two and experience the liberation of a refrigeratorless kitchen. Overall, the benefits far outweigh the disadvantages. The only drawback that I can think of is that sometimes people who come over to the house notice that there is no refrigerator and feel compelled to (a) justify their refrigerator, (b) invalidate atmospheric science, (c) convince me that one less refrigerator user in this world makes no difference and I should join in the party while the ship goes down, or (d) all of the above. I've found that the best response is, "Really?"

How to Keep your Cool Without a Refrigerator:

1. Catch cold night air in a cooler. Crack the lid of the cooler to let in the night air, without letting in animals. In the morning, close the lid, keep it in the shade, and you've got natural air conditioning for several hours.
2. In winter, keep food in a closed-off room or closet.
3. Hang potatoes, onions, squash, etc. in a basket.
4. Keep things in the basement, or—if you're lucky enough to have one—a root cellar.
5. Dry leftovers in a food dehydrator—use later for camping.
6. Keep several jars of canned vegetables and fruits on hand, as well as other quick-cooking foods.
7. Put a couple of gallon jugs of water outside at night to freeze (or cool in warmer months). Keep your fridge where it is after it is unplugged and place these jugs inside, on a rotating basis, to keep the food cool.
8. Dig a hole in your yard and place in it a five-gallon plastic bucket with a tight-fitting lid. (Often restaurants will give these away, or you can buy them at a department store). Food will stay cooler underground, especially if there is insulation on the lid.

Surprisingly, the biggest benefit for me has been psychological. Selling my refrigerator has lessened the quantity of guilt that I manage as someone who knows that billions of free chlorine atoms now float in the atmosphere for the first time in the Earth's four billion year history and in 50-60 years they'll reach the stratosphere where they could take out half of our existing ozone layer. And, as a consumer, I had something to do with putting them there. It has also given me a renewed sense of power that I had lost while watching the government deny the CFC problem for the past twelve years.

I still go to the polls and write letters and sign petitions, but I also get to vote in a way that probably counts the most—with my lifestyle and dollars. At the same time, I get a tremendous childlike thrill from being able to chant: "Ha, Ha, Dupont! You can't make me!"

I also enjoyed a recent visit to my electric company office to get my monthly electricity consumption record. The woman helping me pulled up my record, paused for quite awhile, and then said, "How big is your unit?"

"It's a three bedroom house," I answered. Then she said, "Hmmmm...there must be something wrong with our measuring device." Δ

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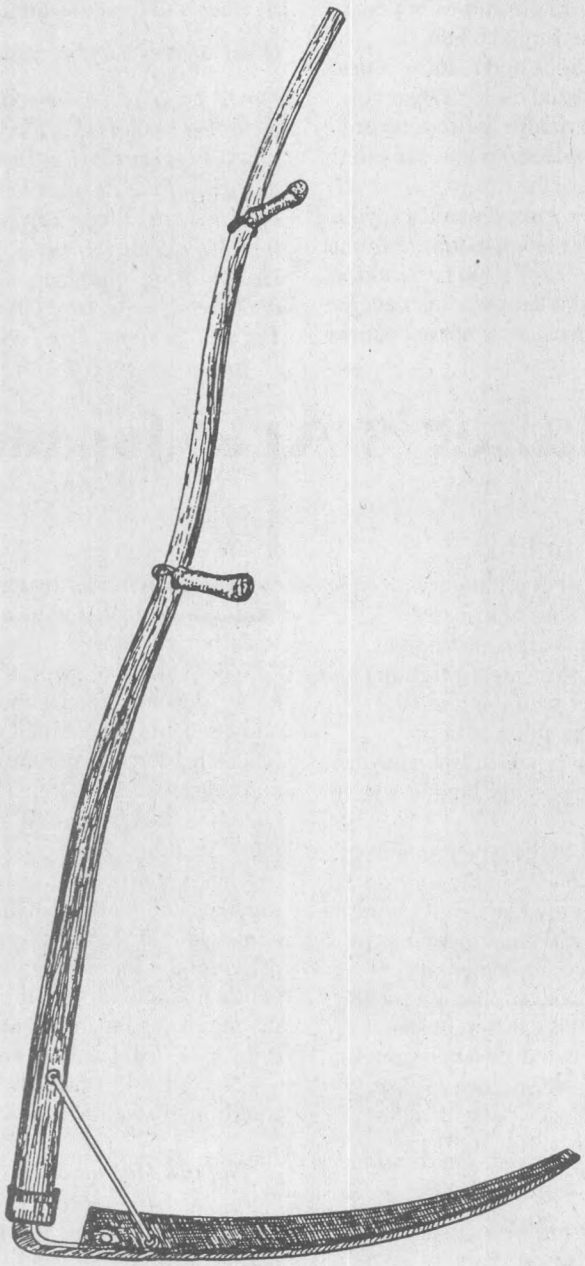
Scythes

David K. Jacke

Every tool we make and use has a culture that goes along with it— indeed, this is why we are concerned about technologies that are appropriate in the first place. Ultimately, permaculture is about culture design, and the tools we choose to use have a large impact on the cultures we create. Even variations between two tools which are called by the same name can have very different implications for the culture we live in, for the ways our bodies function, and for the quality of our lives.

One of my favorite homesteading tools is the scythe, a vegetation management tool long forgotten by most gardeners and farmers, sometimes for good reason. I was introduced to scythes by David Tresemer's book *The Scythe Book: Mowing Hay, Cutting Weeds and Harvesting Small Grains with Hand Tools,* which he wrote when he ran *By Hand & Foot, Ltd.*, sadly, a company out of business for many years. The book is an excellent treatise on the design and crafting of scythes, how to use and care for them effectively, the body mechanics of scythe use, and the human/land relationship created by scythes and scything. Basically, it is a book of culture that I highly recommend. I have two scythes: one has a short blade for cutting brush, the other has a longer, more supple and lighter blade which is used to cut grass, forbs and grains.

For most of agricultural history, scythes or tools like them have been used to harvest grains, cut hay for storage or simply to prevent weeds from going to seed around cultivated areas. I have used my scythes for these and other purposes. The brush blade is useful in rough areas where there are small saplings or woody shrubs and vines growing that I nonetheless want to cut down and set back to an earlier stage of succession. Without the brush blade, I would have to resort to loppers on each individual sapling or a noisy, smelly, expensive gas-powered machine. With the longer blade I have cut large quantities of mulch while simultaneously preventing weed seed from maturing near my gardens, and have experimented with small grains at various times. Scythes can be used to mow lawns, if you have one, though the look is somewhat shaggier than the American psyche would generally accept, unless you are an experienced mower.



Most American scythes are made in the industrial image, with heavy, curved wooden or metal handles, called snaths, and flat, stamped blades made of thick, hard steel that holds its edge through long periods of abuse. Abuse is what this tool is all about, and is why the scythe has been forgotten by so many for so long. Use of these heavy, biomechanically dangerous tools can damage your back readily as you stoop to cut grass in order to get the blade level with the ground, or worse, if you hack with the blade in an up and down swinging motion. Some European scythes have straight, lightweight snaths that allow the user to keep a straight back while swinging the blade horizontally, easing strain on the body tremendously. The blades on the good scythes are curved and angled in every dimension such that stooping is not required to get the blade parallel to the ground for an effective cut. Interesting how the Americans adapted the wood to the steel, while the Europeans adapted the steel to the wood.

Every time I see someone using a "weed whacker" I think of a scythe, and what I can do with it. Scything brush may take more effort than a weed whacker in an immediate sense, but think of the expenses: the machine breaks down, uses plastic and metal in abundance, and spits oil and gas into the atmosphere whenever and wherever it is used. The true economics of that culture cannot compare favorably to the craft of scythe production and use.

The best scythe blades are hand forged, where ductile steel and hard iron are mixed in the process, producing a blade that will bend if it hits stone, rather than storing the stress in tiny cracks that will ultimately break a stamped blade. These forged blades are much lighter, more exactingly made, and are easier to fix because the steel is more malleable. They are also more knowledge-intensive than the stamped steel blades: the craftsperson must know much more about working with the steel and about the desired end result; the user must know how to sharpen them more often and more skillfully, as well as how to repair tears and dings. In return, we are given a tool that is more adaptable,

more effective, easier on the body in use, and longer lasting if well taken care of.

Good scythes are a pleasure to use. I once mowed 2 acres of rye for grain with my scythe, and I found the work pleasurable, fast, and rhythmic. My friends followed after me, gathering the bundles of rye into shocks to stand in the field until we could thresh them. It seemed a scene out of an old painting, a connection to ancient history, something out of an old race memory, and it felt really good. I found myself in a meditation in which I became one with the tool, the work, the grain and the land. My body didn't hurt afterwards. Of course, I wasn't sitting listening to a CD player in an air-conditioned cab either, but I'm not into heavy metal anyway!

These simple, useful, beautiful tools are not that easy to locate (see listings below). Most of the good blades are made in Austria and shipped to North America. Since David Tresemer's company went out of business, straight snaths are hard to find. Curved snaths require heavier wood to hold the curves in place, but are acceptable as long as you have the forged blade. I strongly recommend getting *The Scythe Book* and reading it prior to making any purchase of a scythe or related tools. When you buy your scythe, make sure to get a good quality whetstone or two, and the peening hammer and anvil with it, so you can take good care of it.

You can expect to pay around $115 for a good quality scythe blade and snath, plus another $50 - 60 for the whetstone, hammer and anvil. Compare this to the up front cost of $200 to $250 for the bottom of the line homeowner's weed whacker, plus the gas can, gas and oil to run it, plus additional true costs not accounted for in these prices, and it is clear that the good old scythe comes out ahead. Add in a dash of romance, the scythe's quiet beauty and it's good biomechanics, and I'll take a scythe any day.

Sources

• *The Scythe Book: Mowing Hay, Cutting Weeds, & Harvesting Small Grains With Hand Tools.* David Tresemer, 1981. 2nd ed., Jan., 1997 by Alan C. Hood Co., Inc., Chambersburg, PA.

• "Lehman's Non-Electric Catalog," Lehman's Hardware and Appliances, One Lehman Circle, PO Box 41, Kidron, OH 44636, USA. 330-857-5757. Lehman's has a whole line of scythe blades and snaths, as well a hammer and anvil set from Austria designed for scythe blade care. Their blades are made by the Marugg Co. (below).

• Marugg Co., P.O. Box 1418, Tracy City, TN 37387 USA. 615-592-5042. Marugg hand forges its blades in a factory dating from 1540 in Austria and manufactures snaths in the US.

• Organic Grower's Supply, PO Box 520, Waterville, ME 04903. Scythes and related supplies.

Other sources may be available, but check carefully before you buy.

David Jacke is a Connecticut Valley native who has taught and designed permaculture systems for over fifteen years. A consultant to Pioneer CoHousing in Amherst, Mass., and founding member of the Eastern Permaculture Teachers Assn., he is co-author, with Doug Clayton, of "The Gap Mountain Permaculture Mouldering Toilet," available from the author for $12 ppd. He is writing a book about edible forest gardening, and is available for all aspects of landscape design. Contact him at Native Harvest Designs, Box 148, Leverett, MA 01054. (413) 548-8899.

The Swordmaker's Art: Japanese Hand Tools

Peter Bane and Noboru Matsumoto

The feudal era in Japan saw a pattern of continuous warfare among the nobility, which engendered a class of armed warriors—the *samurai*— and supported the creation of great castles and the development of horsemanship, sword fighting and weaponry. This culture was in full flower well into the 19th century, and through its unwritten chivalric code of honor, *bushido,* continues to influence the nation powerfully to this day. Many cultural arts which we identify as distinctly Japanese have their roots in this historical epoch.

The demand for superior weapons led to the development of swords with sharp, tough, unbreakable blades. In the forging of swords for the *samurai,* Japanese toolmaking reached its supreme expression. Japanese blacksmiths displayed great ingenuity in alloying different grades of steel to attain complementary qualities of extreme hardness, toughness, and suppleness. The traditional blade was made from at least three different steels: sorbite, troostite, and martensite, each with a different hardness, crystalline structure, and chemical composition. *(See Figure 1)* This long tradition of metallurgical excellence persists in the modern era in the continued hand crafting of fine tools for carpentry, forestry, and agriculture.

Iron and Steel

The first iron smelted in Japan came from iron sands. To this raw ore was added a good quality of hardwood charcoal in the reduction kiln, where high temperatures were achieved with the use of a bellows. Carbon added to iron is, of course, what makes steel, a much harder material than either of its constituents. The hardness of steel, and its ability the take a sharp edge are related to carbon content.

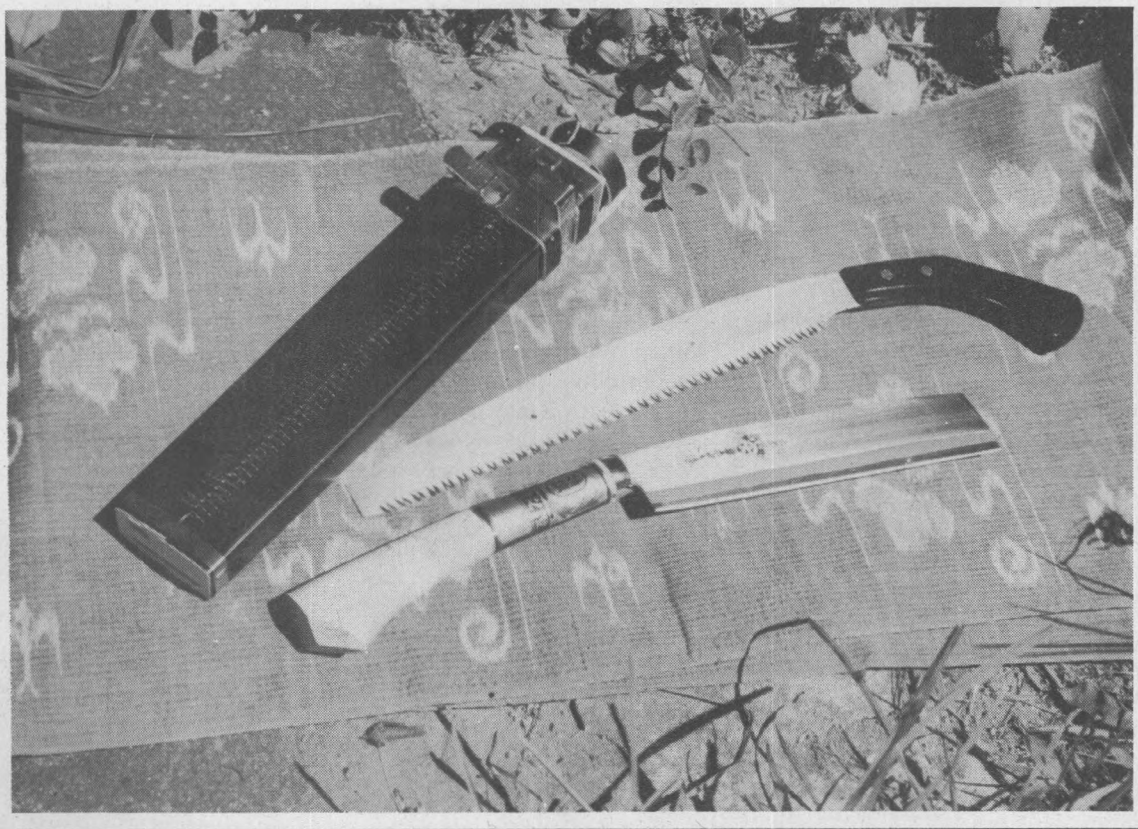
The making of swords, just as the crafting of tool blades today, depends upon a complex process of forging, tempering, and quenching the joined steels many times over. This makes the blades harder, sharper, more resistant to abrasion and breakage, and improves the "temper" of the steel. A metallic alchemy occurs in the blacksmith's forge which does not depend on the metal melting. Steel can be made to "flow" before it melts. In this heating process, the carbon content of different steels forged together will tend to equalize. Differential heating and cooling is achieved in different parts of the blade by wrapping it in clay of different thicknesses prior to quenching and heating. It is this subtle manipulation of the molecular structure of the steel that distinguishes Japanese handmade steels from the stamped industrial steels used in most garden tools today.

The tools illustrated herein are examples of this living tradition of steelmaking adapted to the horticultural arts. Δ

Noboru Matsumoto is the director of Permaculture Activist Network, a Japanese organization committed to ecovillage development and permaculture education. They will sponsor two permaculture fundamentals courses in November and December of this year. For information, write 402 Shiyona-cho, Kasugai-shi, Aichi-ken 487 Japan.

Tosa **kamas** *shown above include #1 for forest work and #2 for garden and farm work. Price $23 each.* ***Native whetstones*** *for sharpening (top to bottom):* ***$16*** *(under oil bottle), $28, $7.* ***King sickle stone*** *(with character imprint) $7. Prices related to size and grades of fineness.* ***Camellia oil, 100ml, $7.***

All Tools in limited supply. Please add 10% for shipping



The
Permaculture Activist
Post Office Box 1209
Black Mountain
NC 28711

Pruning shears (above, top to bottom) #2 for twig cut and fruit harvest, ***$23;*** *#3 for flower cutting (blossom can be held between blades),* ***$30;*** *#3 heavy-duty for tree pruning,* ***$46.***

Tosa orchardist's set shown at left includes pruning saw and nata *(hatchet) with wooden case for both.* ***Price $89.***

Japanese Hand Saws

Peter Buhl

Recently while attending a workshop on timber framing at the Heartwood School in Washington, Massachusetts, I was able to sample several different kinds of hand saws for cutting tenons in large pine beams. I was greatly impressed with the design and performance of a Japanese hand saw called a *ryoba.* Japanese hand saws, also called razorsaws, are different from western hand saws in a number of ways. The teeth are set in the opposite direction from the teeth on western saws so ryobas cut on the pull stroke rather than on a push away from the body. Many woodworkers prefer this characteristic of Japanese hand saws because it provides a greater degree of control and accuracy than the cutting action of western saws. Two other wonderful features of these saws are that they cut a very narrow kerf in the wood and they cut wood very fast.

Ryobas are traditionally used by Japanese house and boat builders to cut large joints in wood. One side of the saw has teeth set in a crosscut pattern while the other side features teeth set in a rip pattern. Ryobas come in several different lengths (300mm, 270mm, and 210mm), each with a different number of teeth per inch on the crosscut and rip sides. The blade, made of a very high quality tempered steel, is held securely in a long wooden handle and is replaceable. The *ryoba* I now own has a 10.5" blade (270mm) and has 11 teeth per inch (TPI) on the crosscut and 6 TPI on the rip cut side. This saw has performed beautifully cutting various pieces of pallet lumber, which I use to build chicken tractors. *(See pg. 19)*

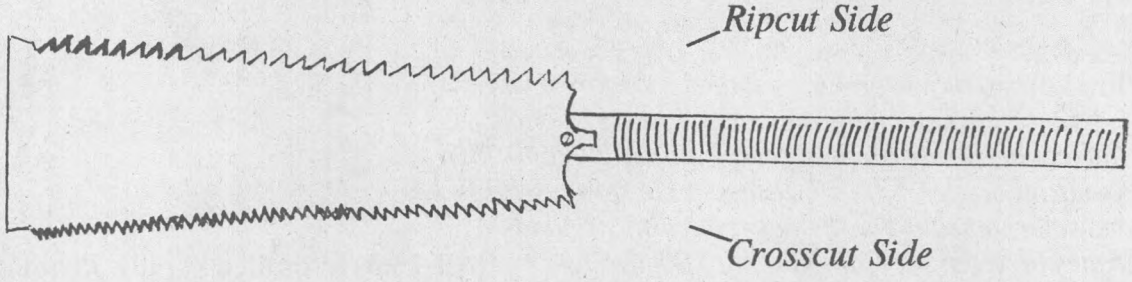
In addition to ryobas, a number of other saws are available for more specialized tasks. *Dozuki* saws have traditionally been used for cabinetry and furniture making. These saws are also available in different sizes and TPI count with blades for softwoods and hardwoods. As with the ryobas, the blade can be maintained with a special file or easily replaced by the removal of a screw.

Resources

A source for more information on the use and care of these exceptional tools is *The Care and Use of Japanese Woodworking Tools* by Kip Mesirow, published by Bookcrafters, 3591 Lee Hill Drive, Fredericksburg, VA 22408, tel. (540) 371-3800.

Mesirow's book and a selection of Japanese saws are available from Woodcraft, 210 Wood County Industrial Park, PO Box 1686, Parkersburg, WV 26102-1686. Also, The Japan Woodworker, 1731 Clement Avenue, Alameda, CA 94501. Δ

Ryoba Saw



House Bees and Bee Houses

David K. Jacke

I imagine it must be possible to create a way to have, shall we say, "closer cooperation" between ourselves and our bees.

I live surrounded by bees. I have honeybees living in the wall of my house, though not by any design of mine. One or two have begun to visit me inside at night, when I have my lights on. There are two kinds of wasps living here, too. A beautiful long-legged wasp of dark metallic blue flies around my office now, trying to find its nest and companions out on the upper deck. I'm not sure where the more common brown wasps are building their nest(s), but they often appear inside my office windows trying to find their way out to the sun.

In watching these critters, I ponder the following. The honeybees in my walls must keep themselves warm all winter in order to survive. In order to do this, they collect honey all spring, summer, and fall to build a strong colony and put aside reserves for the winter. The warmer they are during the winter, the less honey they need to survive, the more they can build into a reserve, the bigger and faster the colony can grow, and the more honey they can collect: the classic spiral dynamic.

Humans also need to keep warm in the winter. The warmer we are in the winter, the less energy and time we need to spend collecting the reserve of energy we need to make it through the winter. We then not only spend less time and energy building a reserve to live on, but we can spend more time having fun. It appears that we may have a confluence of interests here!

So I ask: has a way been invented somewhere on the planet for people to build bee houses in, on, under, over, surrounded by or containing a human house—or vice versa? If you have any knowledge or information about bees and humans cohabiting, please write me at PO Box 148, Leverett, MA 01054, or contact The Permaculture Activist. Δ

Pallet Chicken Tractors

Peter Buhl

Appropriate technologies should be fabricated from local materials using simple hand tools for their construction and maintenance, and have a neutral or beneficial ecological impact when used properly. Chicken tractors made from pallet wood meet these criteria in a way that turns wastes (pallet wood and chicken manure) into valuable resources at several levels of resource recycling.

A chicken tractor is a movable enclosure that is used to allow chickens to scratch and forage in the garden or on pasture in an intensive grazing system that benefits the chickens, the garden, and the gardener. By locating the chickens where we can obtain the benefits of their natural behaviors and their manure we derive a multitude of uses such as preparing new garden beds, increasing the fertility of existing beds, controlling insects, and growing healthy chickens for food and/or companionship.

A-Frame Design

While there are many useful designs for chicken tractors, the one that I favor for smaller home or market garden applications is an A-frame on wheels. The A-frame can be made from a variety of lumber sizes, and its triangular design requires less material to enclose the same area as rectilinear box designs, while maximizing the strength of the structure. The particular design that I use incorporates a coop area for the comfort and safety of the birds, and a run where the chickens do their scratching and foraging.

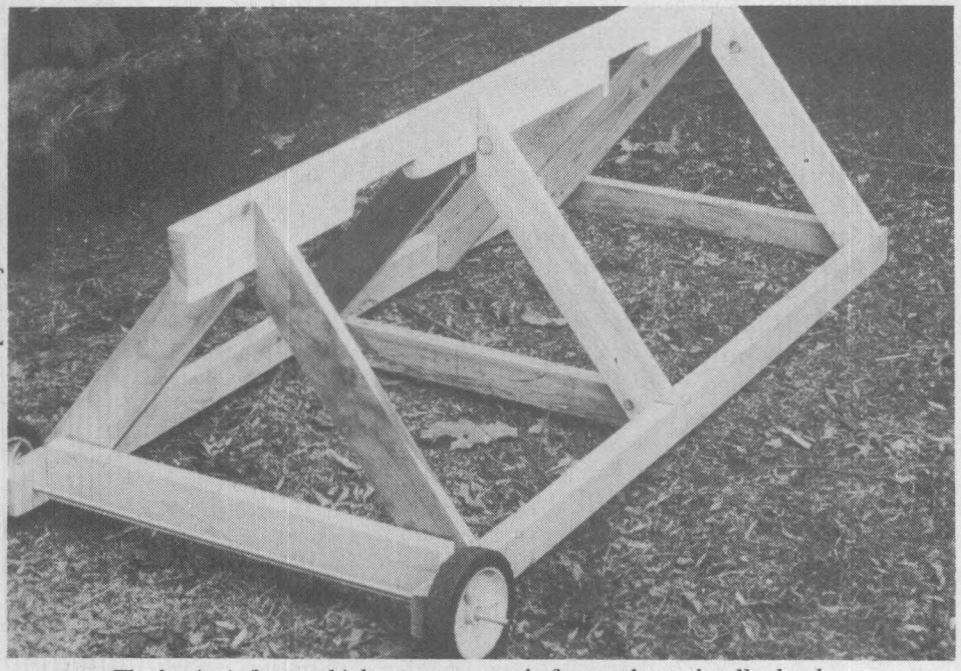
Using Pallet Wood

Wooden pallets can often be found that, with an initial investment of labor to disassemble them, yield extremely valuable material suitable for many purposes. *(see Sidebar)* When choosing pallets it helps to be able to identify the different kinds of wood used. Most pallets are constructed of soft woods like spruce, fir, and pine. However, you may occasionally find pallets made of oak and even mahogany. The high quality and natural rot resistance of these woods suggest their use as the bottom pieces of the tractor, since these have contact with the ground.

Carefully inspect pallets for cracks and twists since the wood may have been subject to rough treatment propping up some expensive inappropriate technology while traveling half-way around the globe. I use a hammer, lineman's pliers, visegrips, and flathead screwdriver to disassemble pallets, but for anyone contemplating the commercial scale use of pallet wood, there is a tool available specifically for breaking pallets apart. It costs about $80 but I have not used it.

In the struggle to remove nails and staples, reclaiming pallet wood becomes an act of faith, requiring me to keep a constant vision of the beauty and righteousness of transforming "waste" wood into functional and aesthetically pleasing tools. (Ain't gonna let no staple turn me 'round...)

photos by author



The basic A-frame chicken tractor made from salvaged pallet lumber.

Methods and Materials

My design goals for chicken tractors are to have a structure that is functional, durable, predator-proof, mobile, and aesthetically appealing. For a small garden-sized tractor housing three to four hens, I use a 6' x 2.5' tractor that has a 3.5' x 2.5' run and a 2.5' x 2.5' coop. Two key improvements I have made over older A-frame designs are the use of galvanized 1"x 2" wire mesh for enclosing the run and for creating a predator-proof floor, and a hinged plywood door along the side of the coop. Additionally I use a 1/2" threaded rod as an axle for salvaged lawn mower wheels that are placed under the rear of the coop.

The 1"x 2" hardware cloth has a number of advantages: it will last much longer than hex-weave chicken wire. The latter, although much cheaper, represents a false economy since it may need replacement and does not provide the structural support for hinged openings as the heavier gauge mesh does. Also the chickens can "roost" on the wire and their manure falls through the 1"x 2" openings.

In order to allow the chickens to till the area under the coop floor, the coop box can be suspended 12" above the ground, effectively extending the run to the whole area of the tractor.

To build the A-frame I set the ridge beam in place by fastening a vertical support to hold the beam at its proper height exactly at the midpoint of the front and back end pieces of the base. Next, I set my rafter stock up against the ends of the ridge beam and the ends of the bases and scribe in the angle cuts I need to make at the ridge as well as the birdsmouths I need to cut along the bases. Although you could use a hammer and nails to assemble

the tractor I prefer coated deck screws and an electric drill-driver to avoid splitting the wood.

I add several coats of boiled linseed oil to the wood as a natural preservative. (Regular flaxseed oil never dries—you could try mixing it with mineral spirits to help it penetrate the wood.) Finally, I use old tarp pieces or vinyl rug runner sections to waterproof the coop. During very warm weather I fasten a piece of shade cloth over the run and during spring and fall this is replaced by a piece of clear plastic.

Using the Chicken Tractor

I visit the tractor just before nightfall to lock the chickens in the coop (chickens go to bed early) and in the early morning to open the coop door or move the tractor. Keeping chickens enclosed in a floored coop greatly reduces the risk of injury to the birds during tractor movement since they have no choice but to go along for the ride. After I move the tractor I slide the wheels off so that the whole thing sits on the ground. This design also allows me to add mulch to the run in the morning before the birds are released from the coop. I have used hay, straw, and fallen leaves in the range area when I want to keep the tractor stationary and build up a thick layer of organic material. With one chicken for every two to three square feet of range I have found it takes about two days to clear a site for a new bed or to remove the leftovers from an established bed. Cracked grain thrown into the range on the second day will motivate the birds to continue scratching.

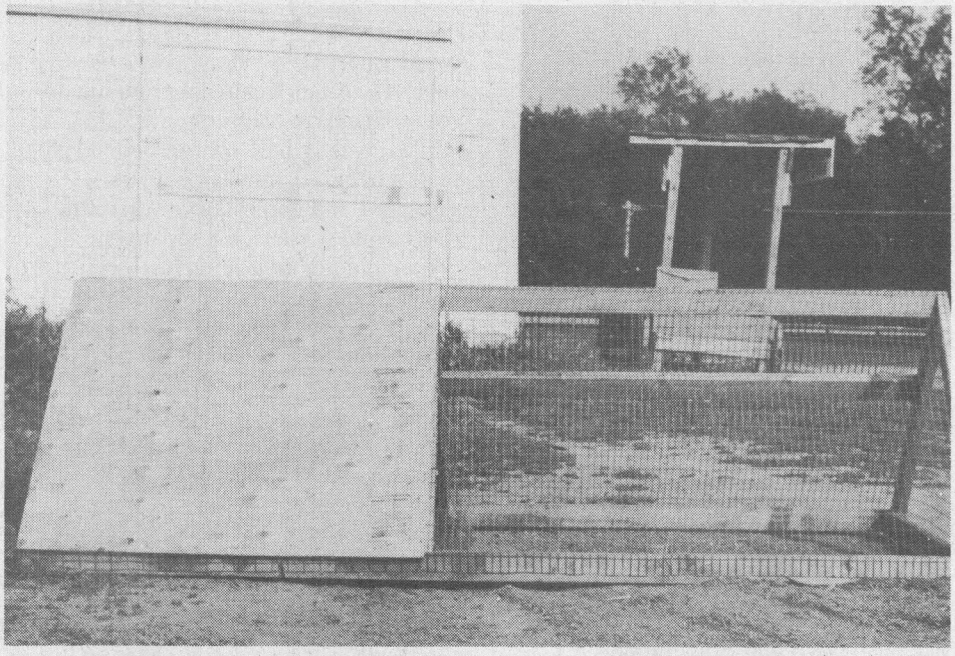
I would like to thank Dan Sweet and Ed McDowell for their help in the design and Dave Jacke for his review of this information.

Resources

**Chicken Tractor.* Andy Lee. 1994, Good Earth Publications, Columbus, NC.
The Backyard Poultry Book. Andrew Singer. Prism Press, Bridgeport, Dorset, U.K. Available from Atrium Publishers Group, Lower Lake, CA 95457.
Skid-Buster pallet tool available from Gempler's, PO Box 270, 211 Blue Mounds Rd., Mt. Horeb, WI 53572.

*Available from The Permaculture Activist. See list on pp. 47-48. Δ

Peter Buhl has studied Permaculture for five years. As a horticulture instructor he has worked with emotionally disturbed and at-risk youth. He is currently collecting information for a book on the design and use of animal tractor/tillage systems for chickens, ducks, turkeys, goats, sheep, and pigs. Peter welcomes comments and contributions of information about both animal tillage and hand tools. You may contact him in writing at 15 Carol Drive, Mount Kisco, NY 10549, or phone 914-666-4616.



Nest box (on left end) provides shelter for chickens on range. Note durable 1" x 2" wire.

Pallets: An Overlooked Resource

Peter Buhl

"Pallets" can include the crates and containers as well as the flats that are used to ship and support large bulk items. You can often find them for the taking behind warehouses or loading docks. Lawnmower and landscape supply businesses are a good bet for high quality, hardwood pallets.

I had been using pallets for different projects for several weeks when I came across an article in *The New York Times* about a business in the South Bronx, NY called Big City Forest. This company gets paid to remove unwanted pallets which it then proceeds to disassemble in order to reuse the wood. High quality wood goes into crafted furniture for the residential market while the inferior wood becomes reconstructed pallets. The company employs and trains homeless and underemployed South Bronx residents and has won the support of numerous progressive business investors.

Inspired by this great example, I went back to my favorite pallet wood "supplier" and was rummaging through the selection when I noticed an unusual looking pallet made with a dark red- and brown-colored wood. The wood was cut to a true 2"x4" size and was heavier and more dense than any wood I had ever come across! I almost destroyed my table saw trying to rip one of the pieces which, I noticed, had a waxy resin along the new edge. A woodworker and a lumber yard owner each confirmed that this was mahogany! Lucky for me that it was destined for the dumpster and I was able to perceive a use for this beautiful and exotic material. I guess when all you have is a hammer, everything looks like a nail. Δ

Start a Nursery—Make an Impact

Douglas Bullock

My brothers and I grew up in a small California town with abundant open space—some large lots and horse pastures. Down the road from our place lived a man we called Crazy John who had a modest house on a big lot packed with unusual trees he had collected from around the world—almost a jungle. John also had a small nursery where our parents would occasionally take us to buy trees for the yard.

Sometimes John would give us kids a big sack of seeds to plant. Big seeds. Weird seeds. More like curiosities than seeds, really. He told us to plant them somewhere, but I don't think we ever did. Years later when we were into plants, fruit trees, and exotic stuff, we noticed some really eye-catching things here and there around town. We would stop and talk to people and they would invariably say, "Well, you know, there used to be this guy..."

Most people thought John was a bit "touched" because he often carried on about international conspiracy theories and the like. And his place definitely didn't fit in with the suburban landscape growing up around him. But people didn't mind his eccentricities. He had good plants and trees, he knew about microclimates, and he made a difference.

If you want to make a positive impact on the world as John did, I encourage you to start a home nursery. Spreading useful plants is a good thing, and you will learn and grow tremendously from doing it.

Save money and get the right plants

One major benefit of starting a small nursery is that you will develop the skills to propagate the huge number of plants required to flesh out the skeletal/framework plantings that so many permaculture sites start with. If you really want to stack species and mimic natural systems, which is the ideal in a permaculture system, it takes masses of plants over years of development. Purchasing these quantities of plants from commercial sources may provide instant gratification, but it can be prohibitively expensive. On the other hand, it doesn't take long to root hundreds of shrub cuttings or graft all the fruit trees you could ever want—and it costs very little money.

In addition, you may not be able to get the best plants for your site through local or mail-order nurseries. The species and varieties currently in vogue may have been chosen for characteristics such as compact growth, large flowers, or purple foliage. Though these may be considered attractive, they are not necessarily desirable characteristics for your site.

More suited to the permaculture model may be plants that are generally adaptable, nitrogen-fixing, bee forage providers, cold or drought hardy, tolerant of wind or salt, or providers of massive regular yields of a valuable product under adverse conditions. You may be looking for plants that contain strange extractable chemicals, fountain of youth elixirs, or other such qualities or yields that fit your needs and conditions—and you may just have to grow them yourself due to unavailability or extreme prices on the open market.

Propagating your own plants also allows room for error, which is inevitable. When you have just one specimen of some cool plant, the tendency is to protect and coddle it, planting it in what you believe is just the right place. This is natural.

photos by Mollie Curry

Propagating cuttings in perlite-filled plastics bags.

However, occasionally we are ignorant of some cultural facet and we make mistakes, sometimes losing the plant.

When you have 50 or 100 of some little plant or tree, on the other hand, it is easy to try them in all kinds of situations and give some to friends who probably will plant them in ways and places altogether different than you ever would have tried. Some may languish or die, but others will thrive in areas you wouldn't expect, outperforming your wildest dreams. These plants may even become a part of the local ecosystem—resources for future generations of humans, animals, plants, and fungi—and eventually becoming fossil records for others to ponder. What could be better?

How do I start?

Sources of plants, seeds, and cuttings abound in this world. Of course you can buy some suitable plants from nurseries and seed companies, (see references), but there are many other sources as well. You can get seeds, cuttings, bulbs, and even plants from wild places, vacant lots, other peoples' gardens, etc.

Plants are just about the most basic thing you can talk about. I have found that barriers of race, culture, age, politics, and sex seem to evaporate when speaking enthusiastically with someone about plants, especially the cool plants in their yard. You are likely to get a positive response if you ask, "Just what do you call that weird tree with all that smelly fruit anyway, and can I have a few seeds to grow at home?"

Making connections with other permaculture people and local people interested in plants can greatly expand your sources, especially if you have propagated extra samples of interesting things to trade. Friends and acquaintances will often give you surplus plants, and let you take cuttings or collect seeds from their gardens. If you join widespread groups like North American Fruit Explorers (NAFEX), the Permaculture Plant and Seed Exchange, or other seed exchanges (see references), you can learn a lot and your sources will become even more far-flung and diverse. Other possible sources for plant material include areas slated for construction or clearing where you can dig up transplants before the bulldozers move in.

The modern age with its postal system, express mail, parcel services, jet air lines, and tourist travel to exotic destinations allows all manner of plant acquisitions from around the world. Having a small nursery on your site and being familiar with

propagation techniques will enable you to grow out the unusual plant material that mysteriously arrives in the mail, or that somehow finds its way into your snorkel tube, to be discovered only upon return from their paradise to your paradise.

After you have acquired seeds, cuttings, or a few specimens of a plant, you can proceed to propagate them. If you don't know much about propagation techniques, there are good books on the topic (see references) that will tell you what you need to know—like how and when to graft, which seeds need stratification or scarification to germinate, etc. In the process of propagating your nursery stock, you will learn a lot about the plants and their requirements.

Where to put it?

The best placement for a small nursery stock propagation area, shadehouse, or greenhouse is very close to your center of activity, in Zone I. This way, you can easily check for pests and moisture levels daily, or even more often. During the growing season, I check for moisture and slugs first thing every morning as I drink my tea.

Large container stock that doesn't need to be watered or checked as frequently can go a bit farther away, in Zone II. Field stock—plants and trees rooted in nursery rows in the ground for later transplanting—should be in your best soil. Growing nursery plants in the ground requires less irrigation and care and allows you to grow plants to specimen size and to grow large numbers of plants for broadscale planting with relatively little effort. This needn't take much room—maybe just a row or two at the edge of the veggie garden—but in general, field stock can do with less attention, so it can go farther out in Zone II or III.

Grafting

Grafting is a method of attaching fruiting wood (scion wood) of a desired variety of fruit tree onto existing rootstock of the same or a related species. This technique is extremely useful for producing true-to-type multiples of a given variety or cultivar quickly. Grafting is also a way to adapt a particular variety of fruit tree that you like to local conditions, by choosing rootstocks according to moisture requirements, disease resistance, ultimate size, soil type, etc.

Selecting appropriate rootstocks allows you to make use of marginal land and microclimates in ways not normally possible. On several occasions, I've seen the same cultivar of a given fruit tree, when grafted on different rootstocks, take levels of inundation or drought that I found hard to believe, while still producing lots of high-quality fruit. For example, a European plum on Pixie roots will survive months of standing water and still fruit, while on Siberian-C peach roots, the same plum will endure extreme drought and thin soils. Some of our pear trees grafted onto quince rootstock and planted at the edge of our marsh do fine with their roots under water for six months of the year!

Whether you graft large-nutted pine species onto native pines, tip graft your durians, or approach graft your melons and cucumbers, the world of grafting will expand your options enormously. What you can and cannot graft, delayed incompatibility, delayed bleed through of rootstock characteristics, and graft hybrids (chimeras) are all fascinating aspects of nursery work that continue to show us more about plants, their relationships, and life on Earth.

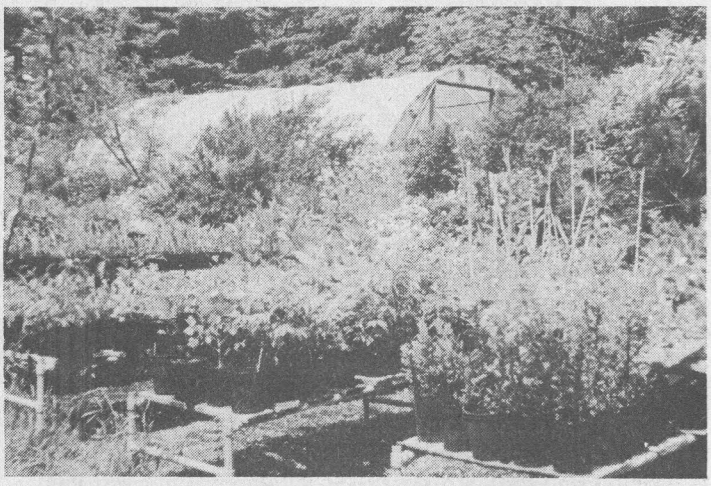
Natural Nursery Areas

Other good sources of plants that are often overlooked are naturally occurring "nursery" areas. Whenever you are travelling, or out and about locally, keep your eyes peeled for places where plants are naturalizing—that is, germinating and growing vigorously on their own. You may see this in the wild, or in large older landscapes, wild parts of parks, campuses, botanical gardens, estates, abandoned arboretums, vacant lots, or overgrown backyards. Often these plants may be transplanted to your nursery or your site, saving you time and energy. In any wild or naturalizing area, be sure that you harvest ethically and sustainably, leaving representatives of the best plants to regenerate that population. Of course, this caveat doesn't apply to ecosystems in imminent danger of destruction.

As your site develops, natural nursery areas will happen more and more frequently. Stay alert for these areas so as not to mow or weed out valuable plants inadvertently. A natural nursery area often indicates that conditions are near-perfect for those particular plants. Pay attention and try to recreate these conditions in your new planting areas.

You will become attuned and knowledgeable

Nursery work allows us to interact with plants in many ways and learn things we cannot even imagine. It is one of the best ways to learn about and become intimate with plants and their needs. It almost forces you to focus on aspects of these little green beings that often escape notice.



Greenhouse and nursery stock at Bullock brothers' homestead.

Whether it is their seeds, germination requirements, leaves, flowers, bark, root structure, pests, seedlings, soil fertility, or water needs, you will find yourself studying and observing the plants in your nursery so closely that you won't soon forget what you're looking at. Latin names will come more easily, family relationships will become apparent, and provocative new planting themes and strategies will drift through your thoughts.

As human beings, we have these great bodies and minds, specifically designed, it would seem, not just to observe, but to interact. Just think, you could have been born as powdery mildew or something nameless, but you ended up human this time around! On a practical level, one of the best ways to interact with the natural world is to start a small nursery.

Besides the practical, economic, and educational benefits of propagating plants for your permaculture paradise, nursery work is fun—and you could become famous as well! When you discover that new variety of your favorite fruit in the natural nursery area of your permaculture system, then propagate it in your Zone I greenhouse, then hit your local farmer's market with a thousand of them, you can name it whatever you want! Whether it's "Cosmic Bob's Earthly Delight," "Gem of Lemuria," or "Jan's Honey Nugget" is up to you...immortality can be yours!

And remember, if you ever see one of these tags...

WARNING: Asexual reproduction using scions, buds, or cuttings whether for sale or own use is prohibited by US plant patent laws. Infringers will be prosecuted and [this nursery] offers a $2,500 REWARD for evidence used in the arrest and prosecution of violators.

...don't you ever, because you mustn't, and it's naughty!

References and Sources

1. Dirr, M. *The Reference Manual of Woody Plant Propagation.* 1987. Athens, GA.
2. Facciola, S. *Cornucopia.* 1991. Vista, CA.
3. North American Fruit Explorers (NAFEX), c/o Jill Vorbeck, 1716 Apples Rd., Chapin, IL 62628.
4. Forest Farm, 990 Tetherow Rd., Williams, OR 97544-9799 (Catalog $3)
5. The Permaculture Seed and Plant Exchange, 3020 Whiteoak Creek Rd., Burnsville, NC 28714 USA.
6. Western Australia Nut and Tree Crops Association (WANATCA), The Tree Crops Centre, PO Box 27, Subiaco, W.A. 6008, Australia.
7. California Rare Fruit Growers. Inc., Fullerton Arboretum-CSUF, Box 6850, Fullerton, CA 92834-6850.
8. Nurseries—see also extensive listings by Lee Barnes in *PCA* #34, "Bioregional Plant Allies." Δ

Douglas Bullock, along with his two brothers and their families, stewards ten acres of marsh, bottomland, and dry rocky hillside on Orcas Island in Washington State. They have propagated and planted thousands of fruit and nut trees, along with countless understory shrubs, herbs, and vines. At every opportunity, they eat themselves silly on plums, raspberries, apples, and all manner of fruit grown on their land.

S-L-U-G-S

Elaine Myers

In cool, moist climates, slugs are the most common devastating garden pests. Poisons and stale beer are often used to control slugs. I find beer too expensive, and poisons too dangerous to the total garden environment. Through 15 years of gardening experience in prime slug country, the maritime Northwest, I have developed an integrated program for keeping slugs from overwhelming my gardening efforts.

Stress-free environment. Minimize the stress plants have to cope with, and you will have vibrantly healthy plants that are unattractive to slugs. Common stresses include inadequate light or nutrients, sudden chilling, transplanting shock, weed competition, and crowding.

Liquid fertilizer. Slugs prefer to eat soft, slightly rotting tissue. When plants are deficient in nitrogen, their lower leaves turn yellow and gradually decay. Such nitrogen hungry plants are attractive to scavenging slugs. I protect my plants from the stress of nitrogen deficiency and help them outgrow mild damage by feeding them diluted urine, liquid manure, or fish emulsion. To make manure tea, mix manure and water together in a 5-gallon bucket. Use manure protected from the rain which leaches out the same soluble nutrients you want. Eliminate weed seeds by putting the manure in a fine mesh bag in the bucket. For tender young plants, dilute with more water. Be careful not to splash on the leaves, as it can burn them.

Under cover. When I set out my tender young transplants in the spring, they are often suffering from the stresses of low light levels, cool temperatures and transplanting shock. To give my plants a safe, cozy home while they recover, I take clear plastic two-liter pop bottles, remove the bottoms and labels, and use them as mini-cloches for my early spinach, lettuce, and broccoli. I just have to be sure that all the enemy is on the outside, otherwise I have a very happy slug.

Garter snakes. As unattractive as we find slugs, they are tasty morsels to garter snakes. The snakes like to live in warm, protected places, such as a compost pile covered with black plastic. I build several compost piles around the edge of the garden early in the spring. Left covered and undisturbed through the summer they function as snake condominiums. The snakes eat up all the slugs. Even the slug eggs. So learn to love the garter snakes. The spring compost piles include much slug-infested mulch and green manure: To prepare beds for early spring planting, I scrape up the mulch, weeds, and garden trash that protected the soil over the winter. Most of the slug problem gets moved to the compost pile where it becomes a resource for the snakes!

Sand. Slugs' skin is only one cell thick, so they make their slime to ride over sharp or unpleasant terrain. Baby slugs, being very small, have a thin layer of slime, and are easily discouraged by a texture that would not deter an older, bigger slug. When peas are planted in early spring, most slugs are young, tiny babies. They do not like to crawl through sharp river sand, but they hang out in force in nice rich, humusy soil. Pea seed planted there will be breakfast, lunch and dinner for the baby slugs. Some people think their early seeding "rots" when it doesn't come up. Well, it probably didn't rot, but was eaten. Plant early seed in a layer of sand to protect it from baby slugs.

Although I live in an area where the slugs sometimes have a gardener reduced to tears, I can honestly say that slugs are no longer a problem in my garden. Vigorously healthy, unstressed plants, and a balanced ecosystem keep the slug damage to an acceptable minimum. Δ

Elaine Myers, known among her friends as the "Queen of Compost," and an eloquent advocate for the use of urine in the garden, contributed articles to PCA *#25 and #26, and hosted a popular local radio show in Rosburg, WA before her untimely death in 1993.*

Paradise Gardens: No Tools, No Technology

The contents of this article are excerpted from a very long inspirational piece we recently received from a woman living a radically different lifestyle than has been seen in the Western world in a long time. The whole may be available from the author. Living in rural Ireland, and taking the ecological viewpoint to an extreme that few Westerners have had the guts to attempt, she (with others) has been practicing what they call "ecotarianism" and "Paradise Gardening." Along with excerpts from the article/letter, we reprint here the "Ecotarian Guidelines" (see box).

Isatis

So what is Paradise Gardening? Ho! A long story.... Ten new commandments and a small piece of land and you get another crack at Eden. All you need is patience and a willingness to **really** change.

Paradise Garden is not so much a perfect place as a dynamic new way of being, and it can **NOT** be done with money, machines and electric power. Paradise does **NOT** provide 20th-century consumer goods and gratifications. It **demands** a complete surrender of the human ego and it winkles out and stamps on brattish I-wantism. It gives us back **ALL** our time, and offers us a pure simplicity on the one hand and an awesome, blissful I'll-never-get-enough-of-this dynamic complexity on the other. In giving with both hands, our lives are filled, satisfied—and there is **no** stress, **no** toxicity, **no** damage, and **no** lurking guilt.... And the living Earth and all her creations speak (and I mean **speak!**) to the empty-handed, bare-footed, open-hearted, clear-headed, tool-less, power-less Man...And when creation speaks to man...and when man in humility listens...miracles happen!

On a practical level, what do wei *(sic)* do? Not enough space to tell all. Wei have eight acres of rocky, wet mountain land. An ex-sheep semi-desert. Wei got rid of the car, the electric. Wei bought sacks of organic grains, hemp seed, nuts, oil, beeswax candles, and a lot of honey, and quit buying **anything else.** Wei learned the wild foods growing here and learned to love eating them. Wei plant and plant and plant. No tools. Not many. One hand sickle, one chicken foot (a three-pronged cultivator on a short handle), two buckets, one sack. That's all for the garden.

We cut vegetation (like an herbivore) with the hand sickle, and scratch holes in the ground (like a big chicken or rabbit). We collect shit and leaves and thusways make many, many garden beds. We eat well from our land. No cardboard sheet mulch - it requires a throwaway civilization to be sustainable! Thick grass mulch or leaf mold does the job just as well and needs no factories. Woven willow living fence is kinder and quicker than wire, and needs no nails or fence posts. And supplies a lifetime of free baskets, etc.

Our house is stone, thatch on poles, and second hand glass. We have a hammer, an adze, a chisel, a saw that sharpens itself - all of which will last a lifetime with no further inputs. We take only dead or thrown timber for fuel and burn every scrap, every last twig, on the stove. We sweat lodge to keep clean once a fortnight (ish!) and wash clothes on rainy days (the wind and rain do most of the work!) Wei cut only branch wood or small poles from coppice species for building and construction work. Wei would **never** cut a mature tree - wherever it stood. It would be like chainsawing your mother.... By next winter wei will be eating **only** what has grown or is growing here (wei have been here only 18 months).

Telempathy... and Technology

...They say that 80% of the human brain is unused. A great part of that is designed for telempathic communication with the whole of sentient, intelligent nature. Earth evolved us, DESIGNED US, to function this way. Many things about our culture deprive us of full-brain

functioning. Chiefly because if we were not extremely brain-dead, we could not earth-rape and kill. Cultural beliefs (telempathy does not exist, animals are dumb, nature has no feelings etc., etc.), state education, obsessive shoe wearing, tarmacking, eating non-local food, too much protein, cooked food, toxic chemicals, over-insulation from the elements, TV, newspapers, electricity (distorts and disturbs the subtle electromagnetic fields that telempathy operates through), not drinking enough water, bad water, not eating enough fresh green leaves and fruit straight from the plants, all cause brain dormancy.

...It has been our ever-increasing inability to be in clear telempathic communication with Nature that has led us, as a species, into this horrific mess. Tools and technology, however clever, GET IN THE WAY. They absorb and trap our energy and attention. They magnify our actions and massage our individual egos. Wei become fixated on the non-living world. Our actions become selfish, human-centered, and out of harmony. Nature shuts down and runs when wei approach in a state of aggressive I-want.

Most tools and technologies of the 20th century are inappropriate because they are really weapons of destruction, disguised as bringers of an "easy" life. Easy for humans!

...The car destroys the living link between the human body and the land where it lives, seducing us here, there, and everywhere, and suffocating under asphyxiating tar and poison the soil our soles crave. Every electric gadget and gidget and labor-saving device destroys the subtle energies around us and ties our time to their service instead of our own, slaving away to pay the bill. Electric light destroys our connection with the natural rhythms of day and night and season. It puts out the moon from our consciousness and disconnects us from the whole.

A Hard Look at "Sustainability"

There is nothing eco-friendly or sustainable about the production of the materials that make the solar panel, the battery, the wind generator, the long-life light bulb, the cardboard, the plastic lemonade bottles, the catalytic converter, the newspaper log-maker, the tractor and chainsaw down on the eco-farm. ....No small community could keep a computer running for long, let alone build one from scratch out of local materials.

...Earth repair does not mean designing middle-class eco-suburbs in what is left of our forests, with every "eco" mod-con. It means fundraising like fuck and buying as much trashed out farm land as possible and hurling seeds and plants into it, creating oases of diversity in the heart of the agri-industrial war zone.

...Yes, of course we **have** to use **some** technologies in the transition phase. Wei do! Wei still cause airplanes to stream toxics across our skies to bring this article to you, and you to us. Wei still have plastic buckets and (very old) lemonade bottle plant pots, and wear (very old) 20th-century clothes. But there is a whole world of difference in aim, intention, and outcome between designing truly harmonious systems and lifestyles that do **not** include money, machines, or power while efficiently utilizing technologies of communication for a few more years with the understanding that

Ecotarian Guidelines

- Do not buy anything that you cannot or will not ultimately produce yourself. If you cannot produce an essential item yourself, make sure it will last your lifetime, without further input.
- Buy **only** foods that are **organic, bioregionally grown** (start big and shrink it), **unprocessed** (uncooked, unshelled, unhusked, etc.), and **unpackaged** (bulk, or refillable containers).
- Materials: Reuse things, use scavenged or found things, and buy only second-hand. Use only natural materials.
- Do not buy new timber or wood products.
- Do not purchase electricity.
- Do not purchase animal products.
- Do not store surplus money in anything other than an eco-institution.
- Learn to be strong-willed inside shops. The pressure to buy what **you** want is fantastic, but can be overcome.

Ecotarian guidelines can be fully implemented within a rough year and a day. Any item that does not fit these guidelines can be given up, or alternatives found in a year and a day. It takes the kindling of a fierce love of the living earth, an ability to keep **guilt** active until the change is made, deep determination to succeed, support and research, willingness to change habits dramatically, perseverance, effort, organization, time, money, and a willingness to do without.

START THE CHANGE
NEXT TIME YOU GO SHOPPING!

they will be phased out; and continuing to assume that the big business industrial infrastructures and primitive materialistic mindsets will be with us way into the future and designing systems that include a continued reliance on these things.

The Truly Necessary Skills

This is **our** short list of what wei reckon are the main skills we need to learn and teach: How to stone wall; fuel and light a fire; make rope, string, thread, and needle; knit, weave, and felt; make a knife, sickle, chicken foot, adze, chisel, and saw. Make pots, containers, and baskets. How to fully utilize a dead animal if one is found (not so much for food as useful bits). Cooking, preserving and storing foods. Garden: mulch, compost, seed-saving and raising. That's it basically. Pen, ink, paper, and candles if wei have time!

Wei as individuals have done everything wei can to stop our contribution to the Earthrape. Wei are **being** the change wei want to see in the world.

...As wei understand it, if humans want a living future, there is only one thing they can do - STOP SHOPPING (and persuade others to do the same), BUILD PARADISE GARDENS (to replace the shops, factories, farms, dumps, freeways...) and so LEARN TO LIVE WITH LIFE!

...If wei do this in large enough numbers, wei **will** arrive – exhausted but happy! – at a beautiful new beginning... From our example, know that REAL, RAPID, RADICAL LIFESTYLE TRANSFORMATION **IS** POSSIBLE, **IS** ENJOYABLE, and **IS** VITALLY NECESSARY. And the more people that do it, the easier and more fun it is. There **is** life after money and machines–brilliant life, awesome life, blissful life. There will certainly be **no** life if we continue with money and machines. Δ

Who ARE These People?

Wei are two humans and eight acres of sentient land - Tyaya - who is experimenting with us to see if indeed humans can change into something gentler, simpler, more surrendered, and less self-obsessed. Wei are keen to share our experience with others.

Wei were zombie shoppers with all the "modern conveniences" and money until January 1996, when wei met Tyaya. Year One wei followed the ecotarian guidelines. Last solstice the Paradise Garden blueprint emerged. Wei are now well beyond the point of no return, which goes to show that radical changes can be made quickly and for good! Wei offer both the Ecotarian Guidelines and the Paradise Garden guidelines as short papers. Please send an addressed envelope, an International Reply Paid Coupon, and a small currency note to cover our printing costs.

Wei far prefer to talk than write - one can cut grass and talk, writing is a resource-heavy mono-yield! Wei welcome visitors as this gives a real understanding. One month minimum stay up to a year. Very small expenditure on the foods wei still have to buy. No fee. Full participation in lifestyle expected.

Wei are about to expand Tyaya, being given 115 acres of commercial sitka spruce plantation. It is ugly and polluting as it stands, created by money and machines to meet future sheet mulch demand! Wei aim to transform it into a wilderness food forest and a Paradise Garden Village. So wei also seek permanent residents. Little or no capital needed. You would need to stay a whole year first to see if you really wanted to stay forever.

If you want to support our work, donations of seeds are all-ways welcome. Or small money for the pens, paper, and stamps of outreach.

If you want to write to tell us we are fascists, that the quality of your life would be seriously diminished without such and such, etc., please don't bother, wei have heard it all before.

If you want to visit, just write and say who you are, when you are coming, and for how long. To save global postage wei will send our reply now! Looking forward to meeting you. Leave your boots, camera, watch, and walkman at home! When you get to Sneem, ask for Jack the Tailor taxi - he will run you up here for £3. Or it is a four mile walk. Ignore any gossip you hear about us - the natives don't know nothing!

If you are doing anything like the same thing - GET IN TOUCH!

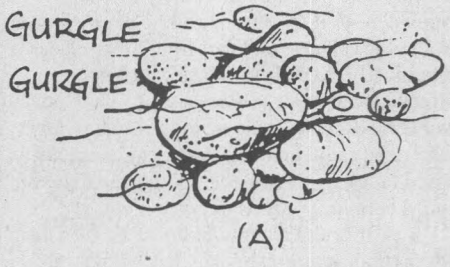
Tyaya People, Bocare, Sneem, County Kerry, Eire (Wot! No numbers!!!)

Paleo "Bashed" Tools - A Story

Pick up a rock. Any rock will do. Well, almost any rock. Soft rocks such as grainy sandstones will not work very well. That's the beauty of this type of tool. Half the fun is searching for the best rocks until you learn by sight what will make good bashed tools.

What is a bashed tool? Webster defines "bash" as to strike; to strike with a violent blow; to smash. A "tool" is any object apart from the body used to perform work or a specific task. A bashed tool is a tool created by striking a violent blow. The object of this bashing is a stone.

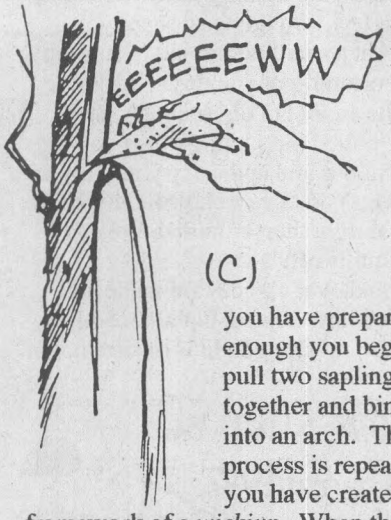
Let's look at a scenario. You are thrust into an environment similar to that of paleo-man. It is the first day. You have very little in the way of belongings. You are either naked or clothed minimally with plant fibers stripped and woven, or the skins of animals which you killed with your bare hands. You are in need of a shelter to avoid the eventual elements. Your tool kit lies in a stream in the form of water-smoothed stones and pebbles. (A)



(A)

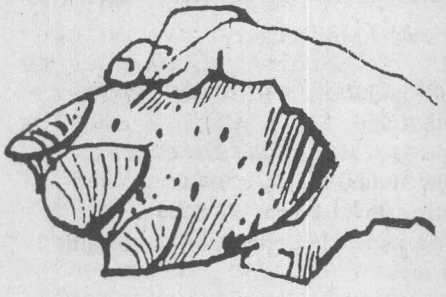
You walk down to the stream and pick up several random stones. With each, you strike the end against another, larger stone in the stream. A sharp-edged flake flies off the end of the cobble, revealing a corresponding sharp edge on the stone. (B) You have not created a tool until you pick up the flake and use it to cut into the base of a nearby tree, pulling off the long soft plant fibers, scraping away the outer bark

(B)

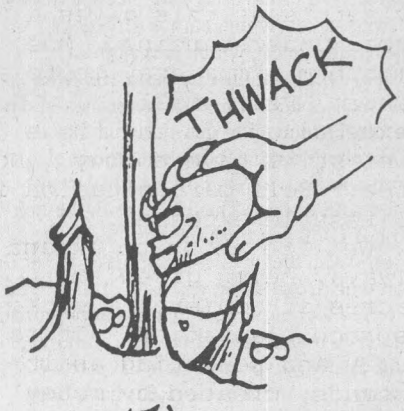


(C)

as you proceed. (C) These you roll and twist into cordage. When you have prepared enough you begin to pull two saplings together and bind them into an arch. This process is repeated until you have created the framework of a *wickiup.* When this is complete you take the bashed stone and strike it again on the same end but on the opposite side near the first flake scar. You flip it over and strike the same end again next to that last flake scar. The result is a jagged tooth—edged stone: a hand axe. (D)


(D)

The opposite end is still smooth. You hold this stone around its circumference slightly above the middle and use it as a hand-held axe to cut a pile of small saplings. (E) These will be woven



(E)

horizontally between the vertical saplings, creating the "wattle." Done with the hand axe, you discard it. The two new flakes (F) are kept to cut handfuls of grasses for weaving into a thatched roof between the framework supports, starting at the lower end of the roof and progressing towards the peak. The wattle spaces are then loosely filled with leaves and humus litter to provide insulation. A small opening is left in the back of the hut to create a smokehole for the fire. This opening is of equal area to the door opening. Later, you will weave a door to adjust the amount of draft created by the

(F)

(G)

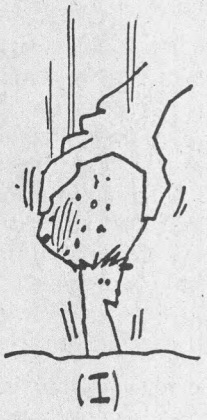
rising heat. The two flakes are no longer needed so they too are discarded. The remaining stones are laid nearby until needed. (G) You are tired and fall asleep.

It is the second morning and the need for food has now gotten your attention. From experience, you have learned that without the help of other hunters, a spear is less effective than a snare. You go about collecting plant fibers. In order to do so a cutting edge is required. You pick up one of the stones you collected earlier and strike it with a violent force to release a new sharpened flake. (H) You begin collecting plant fibers until you have enough to make several small snares

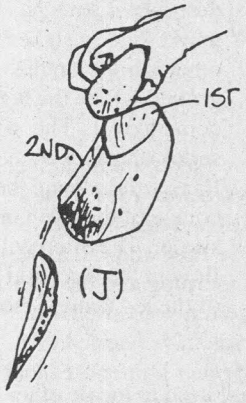
(H) GO BACK TO...
(B)

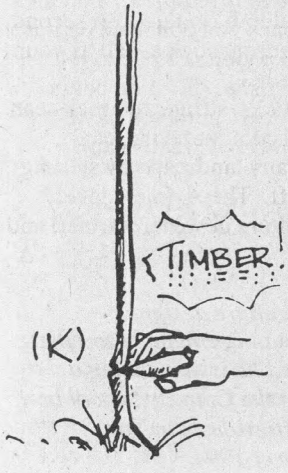
which will be set on game trails as spring traps. You use a flake that you discarded earlier to cut several stakes, which, when driven into the ground with a smooth stone hammer, act as triggers. A second stick is

inserted between the stake and the springy sapling. (I) A noose is spread on the trail above the ground so that the animal will catch its foot, pulling the trigger stick and releasing the sapling with its connected noose.



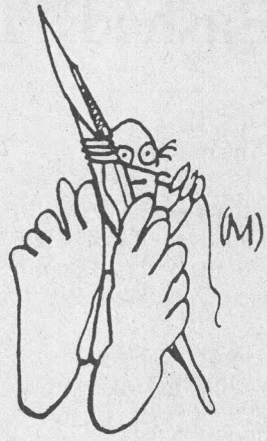
After some thought you decide you want a weapon to dispatch the animal quickly, because you cannot afford an animal bite. After the traps are set you return to the shelter and knock loose a flake from a finer grained stone. (J) A second blow is struck, causing the energy to travel more into the stone releasing a longer, thinner flake. (K) With the first flake you notch a sapling at the base and break it off. Again this is repeated at the narrower end. (L) The shaft is six feet long. Now you can take the first flake and cut a slot into one end of the shaft. Into this slot you wedge the flake, rocking it from side to side until it is snug. With leftover cordage you bind the rock flake into the end of the shaft, pulling with your feet and teeth to tighten the cord. (M) The end of the cordage is then tied off. And the second day comes to a close. You sleep still hungry.





In the morning you awake with a starved feeling in your stomach. You grab your spear and crawl out of the wattle hut and stand and stretch. As you pass a bush you stop and pick some berries you missed seeing the first and second days. To conserve your hunting instincts, you eat only a few. On the third snare you have caught a small porcupine. Standing in an opportune spot you thrust the spear tip into the animal to dispatch it. After you have pulled the sapling down you untie the noose and and carry your prey to the shelter. You have a choice to butcher the animal right then or build a fire and burn the quills off.

Over and over choices are made and simple tools are created, but are readily discarded. Travelling light is of paramount value, and your bashed tools make it all possible. The rule of thumb: create and discard. Δ



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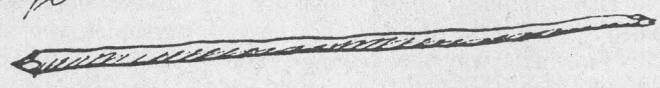


REVIEW

Make your own: alternatives to the consumer culture

Review by Mollie Curry

BART and ROBIN BLANKENSHIP
Earth Knack:
Stone Age Skills for the 21st Century.
Gibbs Smith Publisher, 1996.
PO Box 667, Layton, UT 84041.
$14.95 paper, 192 pages, 17 photos, line drawings.

This book is full of the how-to's of so-called primitive technology (basketmaking, leather tanning, making fire by friction, etc.)—the original appropriate technology. What could be more appropriate than useful and beautiful goods you can make yourself from natural materials found in your own corner of the Earth? No money (no job!) needed to buy stuff from stores, which comes off trucks (planes, trains, etc.), which comes from factories, which got the raw materials from mines, wells, plants, or other factories—and no fossil fuel burned up to get it to you.

Talk about reconnecting with the cycles of the Earth, as well as your own ability to provide for your needs! This book, with the help of a bit of knowledge (thank you, Stone Age ancestors) and the physical support of the non-human world, can show you how. It is full of time-tested techniques for making or procuring the material essentials of life. The authors provide a new perspective on what is truly necessary, how those basic needs have been met in human history, and how they can be met in the context of this crazy modern world.

We have forgotten how to survive without the car. The immense insecurity of total dependence on food from other places, clothes from other places, and fuel from other places is psychically overwhelming. *Earth Knack* offers a remedy for this alienation. Get your hands (feet! teeth!) into action providing for your needs, and that deep worry and insecurity could fade as you gain the knowledge that you **could** care for yourself directly if you had to.

A skill-oriented, how-to book, *Earth Knack* covers brain-tanning buckskin, tool-making, flint-knapping, net making, pottery, making clothes and moccasins, food and cooking, and making musical instruments. The authors also describe how make a glue from the hides of animals that is one third stronger than five-minute epoxy. It is water soluble, but can be waterproofed with fat, oil, or varnish made out of pitch and rubbing alcohol. They also address what plants can be used for soap, how to make bowls and spoons with fire, and how to make your own containers out of bark and cordage.

The easy-to-understand text is full of line drawings and simple but complete instructions. It is written in an encouraging from-me-to-you style that is very appealing. It anticipates potential difficulties and addresses them with solutions. ("If you're having trouble with ___, try doing it this way.") The Blankenships are experienced teachers of so-called primitive skills and it shows in their book. The step-by-step instructions don't leave anything out, and manage to inform without being condescending or boring. The projects described range from very simple and quickly accomplished to quite involved and time-consuming. Δ

Leveling with an A-Frame

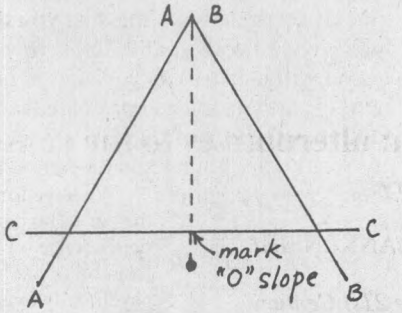
Matthew Arnsberger

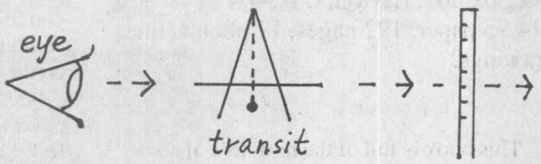
A-frames are easy to use and are accurate to 0.03%. Their uses include measuring contours and slopes; building swales, terraces, Keyline, irrigation, and drainage ditches; road-making and building construction. A-frames are simple to construct and can be made out of locally available material.

Constructing an A-Frame

You will need three sticks, poles, or boards of approximately equal length, better than 2cm x 2cm diameter (1" x 1"), and about two meters (6') in length for the structure. Twine, nails, or screws can be used to fasten the sticks securely together. Finally a couple of meters of string and a weighty object to serve as a plumb-bob will complete the assembly.

Lay out the three sticks on flat ground. Measure and mark an equal length for all three pieces using string or a ruler. Fasten them together in an equilateral (equal-sided) triangle. Move one bar (which will become the horizontal "bottom" piece), 30-40cm up from the bottom ends of the other two "upright" sticks *[see illustration]*. Placing this bar higher will make the level more convenient to use in high grass or vegetation, but lower placement is more accurate. Use your length of string (or ruler) to double check that all of your sides are still equal. Mark your points of attachment and secure the parts to one another. Your triangle should stay stiff, with no flexing or shifting. Attach the plumb-bob to the string and attach the string to the apex of the A-frame.





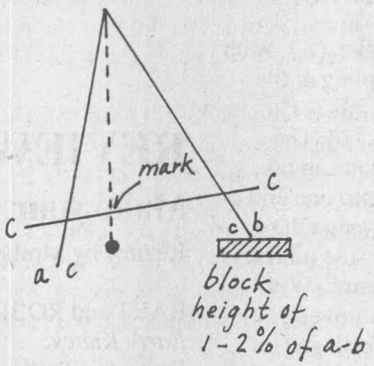
Marking the Center Point (Level)

With one leg on a slightly elevated block, mark the horizontal bar where the plumb string comes to rest. Repeat the process after having reversed the placement of the two "feet" of the level. Take one half the distance between the two marks you just made to find your center mark. This can be done with a ruler or by using an extra piece of string, measuring the distance between the two points and folding the string in half to find your center point. Mark this as "0" percent slope (or level).

Calculating the Percentage of Slope

In addition to a center mark indicating level, it is useful to calibrate the A-frame for standard slopes. Slope is expressed as a percentage or ratio of rise to run, e.g., a 10% slope rises 10 feet vertically for every 100 feet of horizontal distance. One and two percent slopes are used when building irrigation and drainage ditches. Zero percent slopes (level) are used when building swales.

Measure the distance between the two "feet" of the A-frame and divide by 100. (For this procedure, metric measurements are more convenient.) For example, if the feet are two meters apart, one-hundredth of this distance is two centimeters. Locate or make two blocks or shims of this thickness and, beginning with the A-frame feet on (measured) level ground, place a block under one foot of the level. If you block up one leg of the two-meter level by two centimeters, the resulting slope of the horizontal bar will be 1%. Use the second block stacked under the first to calibrate 2%. English measurement can be approximated by allowing 1/8" rise for each foot of run, e.g., a five-foot crossbar would need to be propped up 5/8" on one end to achieve about a 1% slope (1.04%), 1-1/4" to achieve nearly 2%. After marking one side of the bar where the plumb-bob comes to rest, reverse the legs and mark the opposite side.



Drainage ditches and swales can now be laid out on these slopes by pivoting the A-frame from one leg to another, taking care to place the moving leg so that the plumbstring will come to rest on the desired percentage mark. Place a stake or other marker on the ground where the legs come to rest. The series of stakes or flags will indicate the course of the ditch or swale. The ditch will flow in the direction of the leg nearest the plumb-string, so be consistent!

A-Frame Transit

An A-frame can also be constructed and used to locate other points of equal elevation over great distances. Build a smaller version of about 50 cm in length and, holding it up to eye level, sight along the horizontal bar with the plumb centered. A second person is needed to hold a vertical measuring stick as tall as your eye level and to mark your transit points.

These tools can be built anywhere sticks, string, and rocks can be assembled, and by helping us to find contour levels, can enable us to reverse the degradation of any landscape by starting to slow down and direct the water runoff. The A-frame level belongs in the toolkit of every permaculture designer, farmer, and land manager. Δ

Matthew Arnsberger has taught permaculture design in Maryland, Virginia, and North Carolina. For many years the farm manager at Twin Oaks Community, he is now taking a Masters degree in Landscape Design at the Conway School in Massachusetts. This article appeared previously in The Permaculture Connection, *Spring/Summer 1994.*

The Bunyip Level

Nate Downey

Out here in the wild west the tools we use are changing, but basic survival issues remain the same. The pattern used to be: you, your partner, and your six-shooter heading for the nearest watering hole. These days I often find me, my partner, and my bunyip flagging out contour lines for future swales.

Be it a bunyip, an A-frame level, or a transit, the day is near when nearly every land steward will need a tool for measuring slope because (even with all the power of technology) over-population, lack of conservation, and almost unbridled pollution are making water supplies exceedingly scarce.

My tool of choice is the bunyip—also called a water level. It is more accurate than the A-frame and less cumbersome than the transit. The only problem is that bunyip use requires two people. The problem is of course, the solution here, since the point of using the level is to create a swale, which is a ditch dug on contour to soak runoff into the ground. And if you've done any swaling lately you'll know that two people can dig a swale in less than half the time it takes one person to dig it. (Dig it!) Levellers and Diggers unite!

You can easily make your own bunyip. You'll need two sticks numbered with equal units of measure, about 40 feet of clear flexible tube, and some wire or string. Any hardware store should have the necessary parts. The free yardsticks you can get are adequate for small leveling jobs, but usually break after a short while. Better would be sturdy wooden or metal sticks (you could craft your own). Attach the two sticks to the ends of the tube using the wire. A few scraps of copper electrical wire with the insulation still on are just about perfect for this purpose. Make sure the zeros on both sticks are at the top or at the bottom or you will never find level! I like to put the zeros both at the top because then matching measurements to movements is more intuitive: the partner with the lower number needs to move uphill (to reach level), the partner with the higher reading needs to move downhill. But you can learn to do it in the reverse just as well. All you need now is water.

During my first permaculture course we were told that the best way to fill up a bunyip is to submerge it, because sticking one end of the tube under a hose gives you air bubbles and therefore inaccurate measurements. Since I wanted to start a permaculture landscaping business, this was a major drawback. What was I supposed to do? Slink through a client's home, run their bath, make a bunch of bubbly sounds and emerge five minutes later with a 40-foot hose dripping liquid?

I suggest using a funnel—which you can easily make out of an empty plastic soda bottle if you don't have a kitchen funnel at hand. Whether you submerge, pour from a pitcher, fill with a hose, or use a funnel, you will probably have some air bubbles to work out of the line. Hold the ends of the tube up and make sure any loops and kinks are out of the tubing. You may have to wiggle and flip the tube around a bit until it clears. You'll quickly learn in doing this that you must keep both ends of the tube covered with your thumbs, or you'll lose a lot of water. This lesson will help you as you start to lay out contours, because both bunyip partners must coordinate their movements so as to minimize the loss of fluid.

So flip that funnel upside-down, fill her up and ease down on those groovy contours. Δ

Nate Downey lays out swales with his partner Melissa McDonald in Santa Fe, NM. He also teaches permaculture design.

Recipe for a Ram Pump

Mollie Curry

We all know that water flows downhill, so it's wonderful if your spring or reservoir is above your house, but what do you do if you've got water, but it's below where you need to use it? You can go to the water, which is what many early settlers did, building near springs and streams, and live with dampness, mold, and maybe tuberculosis; or you can carry the water, or these days more likely pump it up to where you need it (a constant energy cost if you use electricity or fossil fuel); or you can find a higher source of water.

In planning a home and market garden for himself and his wife Geni Stephenson in the mountains of North Carolina, my neighbor Leon Birstein faced just these choices, but being a clever fellow, he found a way to make water flow uphill with very little work: he designed and built a ram pump to move water from a potable spring below the homesite to a reservoir above it.

What is a ram pump and how can it do that? The beauty of a ram pump is that it uses the power of water flowing downhill to raise some of that water above the source. In fact, water can be raised up to ten times the height of the vertical fall between the source and the pump. It's basically a piece of plumbing that makes falling water "bounce" back up. But God, it has been said, is in the details, so read on.

Self-acting ram pumps have been around since 1797, when Joseph de Montgolfier of France invented them. In America, they were widely used from the 1840s until the early 20th century, when rural electrification provided greater pumping power cheaply. They are gaining popularity again as people grow more concerned about energy conservation and the pollution and harm to wildlife caused by the extraction, transport, and use of fossil fuels.

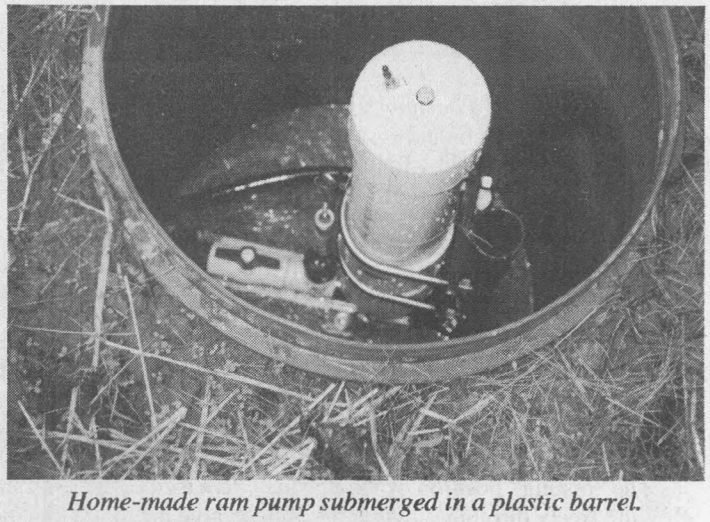


photo by Mollie Curry

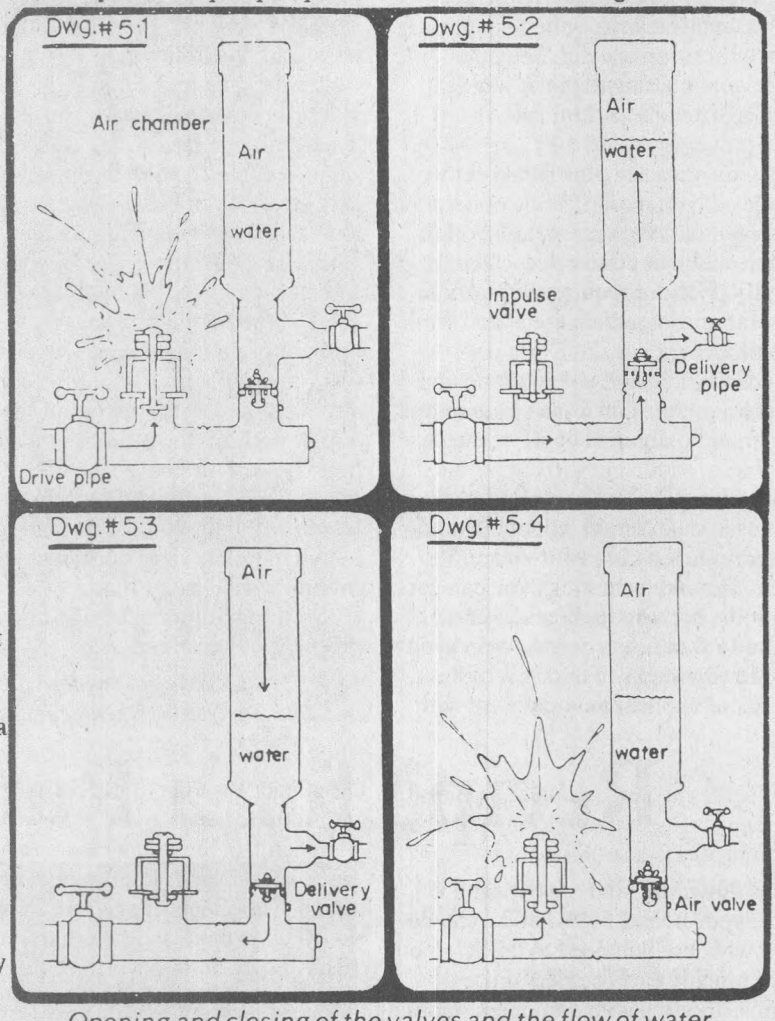
Home-made ram pump submerged in a plastic barrel.

Though a ram pump, like any other mechanical device, takes energy to create, and will wear out eventually, it is a truly appropriate tool because it will capture, over its lifetime, more

energy (or conserve more energy, if you will) than is required to create it. Thus it meets the ethical and energetic criteria of good permaculture design. Ram pumps don't need the constant input of fuel or electricity that other pumps are sucking down like water. In fact, once a ram pump is up and running, it costs **nothing** to operate.

With these advantages, why were ram pumps abandoned and why are they not more widely used today? A ram pump requires a certain amount of "head" or fall between source and pump to work. In mountainous and hilly areas this is more commonly available than in flat country, so ram pumps are somewhat limited in their applicability. The primary disadvantage of rams however is their inefficiency. At most about ten percent of the total flow may be lifted and usually much less. For example, Leon's ram, fed by a small spring, delivers about a quart a minute—most of the flow gushes through the outside valve, spilling past the pump. While this translates to 360 gallons per day—a generous volume for domestic purposes—it might be insufficient for irrigation if dry periods were extended in our climate.

While looking into buying a ram pump, Leon discovered that a model of the capacity and quality that he wanted would have cost about $300. There are certainly cheaper ram pumps on the market, but the cost inspired him to make his own—based on a design by local teacher and technical wizard Clyde Hollifield—for about $30, using common off-the-shelf plumbing parts.



Opening and closing of the valves and the flow of water during one pumping cycle of a hydraulic ram (Nepal)

Illustration from "Use of Rams in Nepal," M. Silver, UNICEF, Kathmandu

How does it work?

The basic components of a ram pump are the drive pipe, through which water flows from the supply to the pump; the outside or overflow valve; the inside or check valve, which leads to the air chamber (a pressure chamber to stabilize outflow); and the delivery pipe. A means of injecting air into the pressure chamber (automatic or manual) may also be necessary in order to prevent it from filling up with water.

The "resting" position of the outside valve is open with water flowing freely through it, while the inside valve is closed. As the velocity of the water coming down the drive pipe from the supply increases, it will force the outside valve to close. The sudden pressure increase opens the inside valve, forcing water into the air chamber, compressing the air within it. "When the pressure in the air chamber equalizes and overcomes the driving force behind it, the water in the drive pipe rebounds, or backs up," (1) the inside valve closes, and the outside valve opens, while the pressure in the air chamber forces the water up the delivery pipe. This cycle repeats over and over: in Leon's pump, at the rate of about 40 strokes per minute.

If you imagine the column of water that is flowing through the drive pipe suddenly stopping because the outside valve closes, you can easily see how enough pressure can be created to open the inside valve and lift a small portion of that water higher than the source. How high the water can be raised is proportional to its flow and to the fall from the source to the pump. In other words, the water flowing through the drive pipe develops power according to its weight and velocity. There are extensive charts to help you figure out the variables of elevation, fall, and flow and what they mean in your situation. Refer to *Rife's Manual of Information.*

Off-the-shelf parts

The components used to make the pump are all pretty simple: they include a seat valve, a check valve, a pressure gauge, a section of 4" PVC pipe about 18" long with a cap on the end (the air chamber), a smaller pipe, various fittings, and a bicycle tube air valve. Says Birstein, "There's going to be a certain amount of pfaffing about to adjust the pump to your reality." In the first month of operation he replaced one valve, while a bit of fiddling around with the whole set-up has been necessary to get it to work consistently. Flowing water has personality, and some hard-to-pin-down variables are involved, so he cautions to interpret the facts and figures in the charts conservatively until you find out what is really going to happen in your situation.

As we stand looking over the future hillside garden and homestead, the "kerr-CHUNK, kerr-CHUNK" of the pump sounds like a heartbeat, steadily pumping the lifeblood of the planet round and round. That most simple, most familiar rhythm touches something primal and makes you want to dance!

Notes

1. *Rife Manual of Information.*

Sources

Rife Hydraulic Engineering Manufacturing Company, 60 Parrish St., Box 70, Wilkes-Barre PA 18702. (717) 823-5730, fx/-5731.
Lehman's Non-Electric Catalog, 4779 Kidron Rd., PO Box 41, Kidron, OH 44636. (330) 857-5757, -5441, fx/-5785. Δ

Mollie Curry lives at Earthaven Village near Black Mountain, North Carolina.

Ferrocement

David Baty

Ferrocement is a type of reinforced concrete which is strong, cheap, flexible, and efficient in its use of material. With ferrocement it is relatively easy to enclose large volumes of space with a durable, waterproof, structural membrane, making the material a superior choice for the construction of water tanks, roofs, boat hulls, and a wide variety of architectural and sculptural forms.

Ferrocement is made by applying a plaster of portland cement, sand, and water over a form made of wire mesh. While concrete is typically a mix of sand and gravel (called "aggregate") bound together by cement and water, ferrocement plaster doesn't use any gravel. This method generally does not require the heavy and expensive formwork of regular reinforced concrete, and wire mesh replaces the usual steel reinforcing bars.

Ferrocement is a fairly old technology—at least in the industrial scheme of things. Not long after Europeans figured out how to manufacture wire mesh some Frenchmen experimented with structures made from wire mesh, sand, and cement in the 1850s. The ultimate refinement of ferrocement construction was achieved by an Italian engineer, Pier Luigi Nervi, who built some very beautiful and daring structures during the 1940s and 1950s. Ferrocement is an interesting and unusual technology because, although it relies on industrial products (wire mesh and cement), it is ultimately too labor intensive to find much of a place in a heavily industrialized and capitalized society. For this reason, it is truly what E.F. Schumacher called an "intermediate technology."

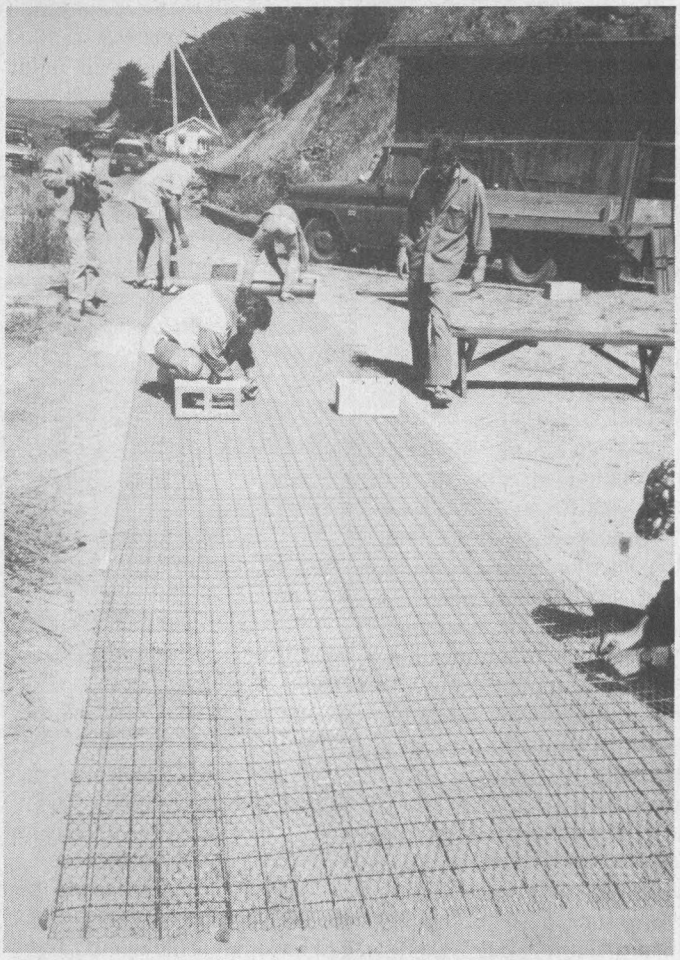
Some Cautionary Advice

From the environmental, political, and personal health points of view portland cement is not nice stuff. It requires considerable energy to manufacture, and the industry is a source of significant pollution. Cement kilns in this country are a largely unregulated incineration vehicle for toxic chemical wastes, and a tiny handful of European companies control most of the world's cement capacity and trade. It is estimated that this cartel extracts an excess economic rent of $8 billion per year from the European economy alone. (1)

Cement, being highly alkaline, is also caustic. Both the dry dust and the wet cement are highly irritating to tender mucous membranes, eyes, and skin. It is important to protect eyes, lungs, and skin by wearing masks, safety glasses, and gloves appropriately when handling the material. It is even more important to take these precautions with ferrocement than with regular concrete since ferrocement typically uses a higher percentage of portland cement.

Tools and Materials

Tools for working with ferrocement are simple and can vary depending on the size of the project and what is available. Cutting the wire mesh calls for tin snips, or possibly bolt cutters for heavier wire. The mesh form is assembled with soft tie wire (baling wire) and a pair of pliers or wire cutters. A wheelbarrow and a shovel—or better still a mason's hoe—are useful for mixing the plaster. For larger projects an electric cement mixer or gas-driven plaster mixer can make things a lot easier. The cement plaster is usually applied with a wooden or metal trowel from a hawk (a square plate with a handle attached to the middle of one face, used hold the plaster). Steel swimming pool trowels with rounded ends are nice for working on curved surfaces.



Laying out the wire reinforcing at a workshop on tank building.

When I'm making a tank or a sculptural garden fence I use sheets of 1/8" or 1/4" masonite, or sheet metal as temporary forms. The sheets can be wired onto the reinforcing mesh and cut off once the plaster has hardened. They can be reused many times. Forty dollars worth of masonite is enough to build a 4000-gallon tank. To minimize cracking and to develop maximum strength, concrete or plaster must dry slowly. Sheets of plastic or damp burlap or carpeting will prevent evaporation, ensuring that the cement cures properly over a few days.

Learning more about ferrocement

I first learned about ferrocement 26 years ago when I helped tie wire for the construction of a friend's 48' sailboat. I was 15 years old. There wasn't much to it. By the afternoon of the first day I could tell that being a good conversationalist was going to be important.

The best way to learn anything is by doing it, ideally working with someone who has some experience. After you understand how the basic process works, the material begins to suggest all sorts of possibilities to you. If experienced help is not available locally, one way to begin learning is by building something simple such as a planter or a curved border for some raised garden beds using chicken wire and a plaster made of three or four parts of sand to one part of cement.

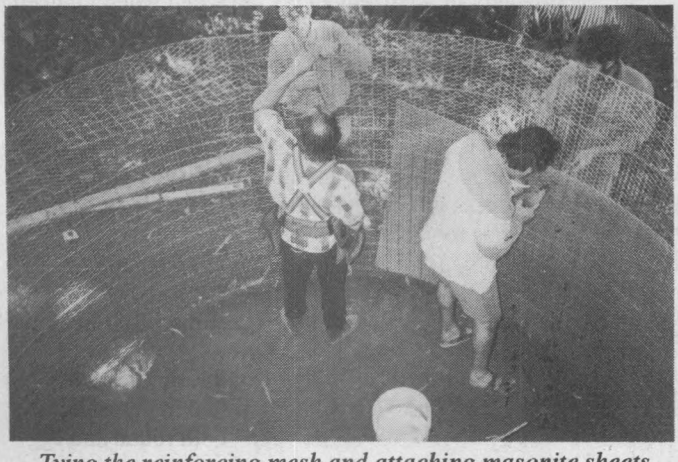
A water tank is the most likely and sensible application of ferrocement construction for anyone interested in permaculture. I've built a variety of tanks over the years, both round and egg-

shaped, with and without roofs. My first water tank was based on a publication by the University of Arizona College of Agriculture, Bulletin A-41 (1965), "How to Make a Plastered Concrete Water-Storage Tank." The tank design described in this publication is perhaps the ultimate in simplicity of means and frugality of material. These tanks were intended to be components of the water supply for cattle on range and so had no roofs. Since they were expected to be built a long way from the local sand and gravel plant, this pamphlet also tells a little about how to use native sands and gravels which might be found nearby. This design works for tanks ranging in size from 3,500 to 31,000 gallons. The tanks are all six feet high and vary from 10 to 30 feet in diameter.

Making a simple water tank

Tank construction begins with leveling the tank site, allowing at least two feet of clearance around the tank perimeter for construction. The next step is to assemble the wire reinforcing for the walls. This consists of two layers of 10 x 10 gauge, 6" x 6" reinforcing mesh, 7 feet wide, plus two layers of 6-ft. wide chicken wire. Two pieces of the 6" x 6" mesh are cut 6" to 12" longer than the circumference of the tank. The piece that is intended to be the outside hoop is folded over 180 degrees along its length 12" from one edge of the roll. A similar fold is made in the other, inside piece 15" from one of its edges. These two pieces are laid over each other so that the 12" fold will become the top of the tank and the 15" fold will be at the bottom of the tank, reinforcing these critical edges. The ends of these pieces are offset 6" to 12", and the two layers of wire are then offset 3" from one another in both directions, so that the wire crossings of one piece bisect the openings of the other; the openings in the resulting wire mesh will now be effectively 3" x 3". Fasten the two wire mesh strips together with a few baling wire ties. Finally, more baling wire is used to attach the chicken wire to both sides of the 6" x 6" mesh.

This wire sandwich can be assembled directly into a cylinder on the tank site, or laid out on the ground if there is a long flat place nearby and enough helpers to move the finished sandwich to the tank site. Once the wire sandwich has been made into a cylinder on the site the bottom edge of the cylinder can be staked into a circle using pieces of 1/2" pipe or rebar driven into the earth and wired onto the sandwich. The circle can be accurately laid out with a stake at the center of the tank attached to a piece of wire or twine equal to the tank radius. The small amount of reinforcing wire in these tanks makes this design suitable only for cylindrical tanks. Other shapes would require heavier reinforcing or more concrete or both.



Tying the reinforcing mesh and attaching masonite sheets.

all photos by the author

Applying plaster to the mesh form.

Once the ends of the sandwich are connected to form a cylinder, some means of gaining access to the inside of the tank is needed. The University of Arizona article suggests leaving an access hole in the side of the tank which will have to be patched and plastered later. I prefer to build a scaffold with steps on both sides and a flat spot on top large enough to hold a 5-gallon bucket full of plaster. I use scrap lumber and plywood for this and make it tall enough to straddle the wall of the tank.

More baling wire ties can now be added to the cylinder to begin to pull the layers of wire together. It is important to remove all substantial bulges or puckers in the wire; in no case should the thickness of the wire total more that an inch or so. Once the bulges are mostly under control, pieces of sheetmetal or masonite can be wired onto the outside of the cylinder. I've built tanks using these sheets on only the lower half of the tank wall, applied the plaster, then removed the sheets another day and reused them on the upper half of the tank, thereby reducing the number of sheets needed by half. With more sheets and more helpers it is possible to plaster the whole six foot high cylinder in a day. It is worth taking some time to do a thorough job of compressing the wire sandwich and wiring the sheets snugly to it. Time spent here will save time, cement, and effort in plastering.

Three coats of plaster make up the walls of the tank: a core coat and a finish coat on either side of it. For water tanks I use a plaster made of three parts sand to one part Type I-II cement. Mix the sand and cement dry and then add the water. Lime or plastic cement can be added to improve workability at a ratio of one part lime or plastic cement to four parts type I-II cement.

The first coat of plaster which is applied to the wire sandwich will become the middle or core layer of the tank wall. Plaster can be applied to the wire with a wooden or metal trowel, and it is desirable to leave the surface rough so the subsequent layers will adhere well. As soon as the plaster sets it is a good idea to cover it with sheet plastic or damp fabric to allow it to cure and to minimize cracking. Once the core coat is complete, finish coats about 1/2" thick can be applied to the inside and the outside of the tank. These finish coats should be troweled smooth.

I have done tank floors in two ways. The University of Arizona article suggests pouring a 4" concrete floor after the wall is plastered. This seems to work but I am more comfortable pouring a 6" structural slab containing 1/2" rebar spaced one foot apart and running in two directions. To do this, I assemble the wire cylinder to stand on the 1/2" rebar grid and pour the slab around the wire cylinder. This gives me a strong foundation for the tank and a more solid connection between the tank floor and walls. A bigger tank with a thicker floor would best be done with the help of a ready-mix cement truck if at all possible.

Be sure to put all the tank drains and outlets in place before pouring the floor. Pipe fittings can be plastered into the tank wall as desired. The tank can be sealed using a cement-based waterproofing such as Thoro-Seal or an acrylic-based waterproofing. Problems with cracking due to poor curing of the cement plaster may require epoxy paints and patching compounds intended for swimming pools.

Ferrocement and Community:

Because ferrocement doesn't require fancy and expensive tools and skills, and because it is such a versatile technology, I have found it to be a powerful tool for freeing folks' minds and spirits from our consumer culture, and for building community. Larger tanks and ornamental deer fences, windbreaks, and garden sculptures make wonderful school or community projects. Ferrocement can be embellished with paints, pigmented plasters, or mosaics of salvaged tile, old or broken cups, plates, mirrors, colored glass, etc. Used in this way ferrocement has a lot of potential for teaching us that we can begin meeting more of our needs by working together, and that we can do so beautifully.

References

Ferrocement: Building with Cement, Sand and Wire Mesh, by Stanley Abercrombie, 1977, Schocken Books, is a good general treatment of ferrocement.

Ferrocement Water Tanks and Their Construction, by S.B. Watt, 1978. ITDG, Intermediate Technology Development Group was founded by E. F. Schumacher in the 1960s and produces a large selection of books on appropriate technology. Their addresses are ITDG North America, PO Box 337, Croton-on-Hudson, NY 10520 and I.T. Publications 103-105 Southampton Row, London WC1B 4HH, United Kingdom.

Architectural Books showing the works of Pier Luigi Nervi and Antonio Gaudi can give some idea of the structural and decorative possibilities of ferrocement.

A photo copy of the University of Arizona publication "How to Make a Plastered Concrete Water-Storage Tank" with some additional construction notes by the author of this article is available for $15 from David Baty, 22667 State Rte. 1, Marshall, CA 94940, 415-663-8708.

Notes

1. Ferguson, J., "The Sultans of Cement," in *The Nation,* August 3/10, 1992. Δ

David Baty will be leading a two-weekend workshop in the construction of a 14,000-gallon ferrocement water tank September 20-21 and 27-28. Contact Sonoma Permaculture, 3696 Burnside Rd., Sebastopol, CA 95472. (707)829-5524. See the Natural Building Calendar on page 68 for details.

Household Greywater Systems

A version of this article appear in PCA *VI, 1. This revision reflects the author's experience operating a constructed wetland greywater system in southern New Hampshire for three years.*

I have been investigating household wastewater disposal systems for a number of years, looking for systems that can work in a permaculture context and which might be candidates for eventual acceptance by regulators. From living with a composting toilet, I became convinced of their utility and attractiveness, and I recommend this method for the disposal of solid waste. What remains to be recycled from the household effluent then is the fraction we call "greywater."

Greywater is everything flowing into the household drainage system except toilet waste and hazardous chemicals, i.e., wastewaters from sinks, tubs, washing machines, even dishwashers, and sometimes including urinals. Though greywater contains bacteria (chiefly from skin, soiled clothing, and food scraps) and some other pathogens, the chief contaminants which must be dealt with are soaps and fats, along with nutrients such as nitrogen (from urine, if present) and phosphorus (in some detergents). Presented below are brief summaries of some of the systems I have encountered in my search, including wood chip composting, greenhouse, and constructed wetland greywater systems. I will also briefly discuss intermittent sand filters.

Please note that these descriptions are very brief, and that there are many details left out that can make the system work or not work in a safe manner. I strongly recommend a thorough investigation into local codes and regulations, and getting a good handle on the parameters and risks so you can design, build, and use a safe system. If you want to build one of these based on this information, you do so at your own risk!

"Mulch-Maker" Wood Chip Greywater System

The wood chip composting greywater system was developed by Doug Clayton at Gap Mountain Permaculture in Jaffrey, NH, and has been running since 1987. The system is intended to "dispose of greywater in a safe and sanitary manner and to recycle this water to a second productive use," which in this case is to hasten the decomposition of wood chip piles so the resulting humus can be used as a soil amendment. Doug wanted to avoid the problems of salting which others had experienced from the use of greywater. The "Mulch-Maker" consists of a 100-

gallon grease trap, which empties into a 70-gallon tank with a dosing siphon, a simple switch mechanism, and two 40-foot long piles of wood chips, used alternately, with PVC perforated pipe suspended in the middle of them (see Sketch 1).

The grease trap allows the greywater to cool off so that oils and fats can float to the surface and some solids can settle to the bottom (essentially a mini septic tank). It holds about five day's worth of water (maybe a bit excessive). If the kitchen sink isn't going into the system, a grease trap may not be necessary, but some way of getting out large solids would be.

The dosing siphon is a patented device which accumulates a set volume of liquid, and then releases it all at one time. It does this without any electricity or moving parts to fail, by trapping an air bubble between a bell jar and a plumbing trap until the tank fills to a certain level. The siphon is needed so the effluent will flush evenly throughout the 40-ft pile of wood chips, rather than just trickling in and saturating the area near the inlet pipe. This flushing/holding action also allows the pile to re-aerate after getting hit with a load of water, so that decay will remain aerobic (composting), rather than becoming anaerobic (fermentation or putrefaction).

The switch is a simple cast-in-place concrete chamber about a foot in diameter with two outlets. An elbow is slipped over one outlet at a time, and turned up to "close" that side of the switch. Each pile can be used for two to three years before it breaks down completely. Experience has shown that the wood chips rot nicely into beautiful black humus, with no odor or gruesomeness.

The piles consist of two swales, which were roughed in with a bulldozer during the house construction and finished by hand (lots of boulders there). The diggings were piled up on the trench sides as berms (to hold the water in), with fiberglass (non-rotting) stakes every few feet to keep the perforated distribution pipe level as the wood chips rot around it. The distribution pipes turn up and come to the surface at either end of the pile to allow air to flow through. Pile length and width were figured using flow estimates and the state's guidelines for leaching areas based on percolation rates in the existing soil. Freezing has not been a problem, as wood chips are excellent insulation!

Mulch-Maker in the Landscape

Permaculture is about turning wastes in to resources, making functional connections in the landscape, and using natural energies efficiently. Wood chips are pretty abundant in southern New Hampshire, and can sometimes be had by the truckload for free if one catches the road or utility company crews at the right time. Sawdust from a lumber mill (also readily available) could also be used. The mulch-maker turns greywater and wood chips (both wastes) into fine compost, but Doug didn't stop there, he locate his chip piles so the finished compost can simply be loaded onto a cart and wheeled downhill into his orchard for use as mulch.

Doug put his nursery just below the mulch-maker piles too, so that it gets indirect irrigation from the filtered greywater. The challenge is how to make use of the swale berms. Two alternate strategies present themselves: planting with annuals avoids the problem of woody roots invading the piles. On the other hand, the wild raspberries seem to grow very well there, and some advantage might be had from planting the berms with species that would invade the piles. This would make digging out mulch more difficult and time consuming, but this problem might be avoided by frequent root-pruning of the plants on the berms.

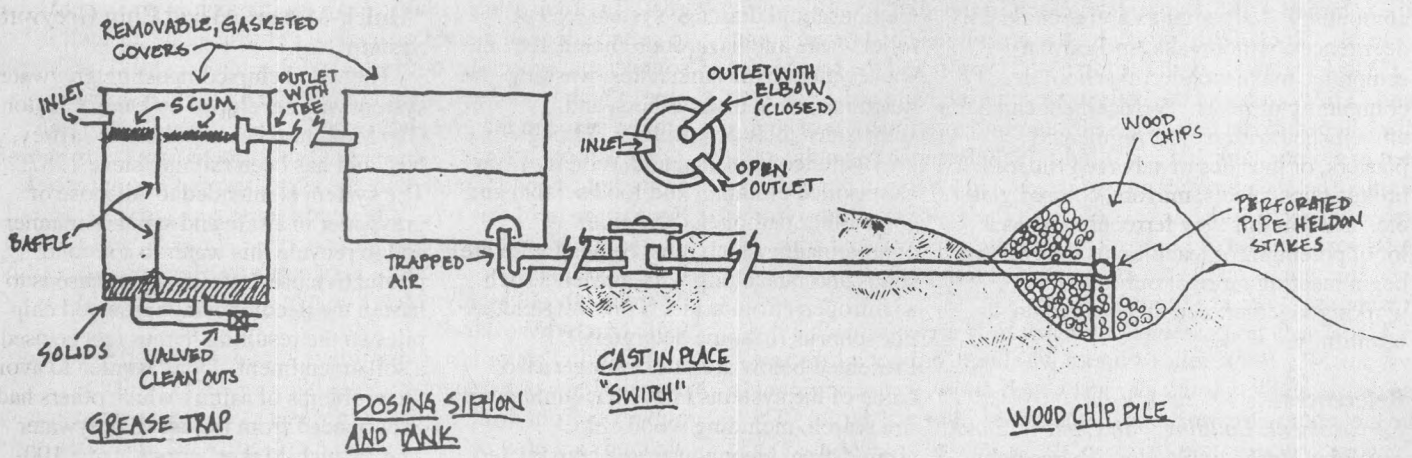
One possible modification of this design would be to put a second set of perforated pipes under the pile to collect the filtered effluent and direct it to a storage for later use as irrigation water. The yield of water from such a system is likely to be low, due to low flow rates (at least for a single household) and evaporation from the pile, unless a clay or other impermeable barrier is placed under the lower pipe.

Bacteria, viruses, and other pathogens are at usually at very low levels in greywater. The greatest danger comes from diaper washings and such, since live polio vaccine viruses can survive there. I don't know how thick a layer of chips would be needed to filter them out to a safe level. (Four feet of sand is considered sufficient for combined wastewater.) Keeping a minimum of two to three feet of chips between the pipes at all times should ensure decent effluent renovation, but more would obviously be better. If this is a concern, then it is best to let the effluent leach into the ground, where soil particles and microbes are likely to bind and attack pathogens before they can do any harm. In either case, let the pile rest after switching off and before digging into it for mulch.

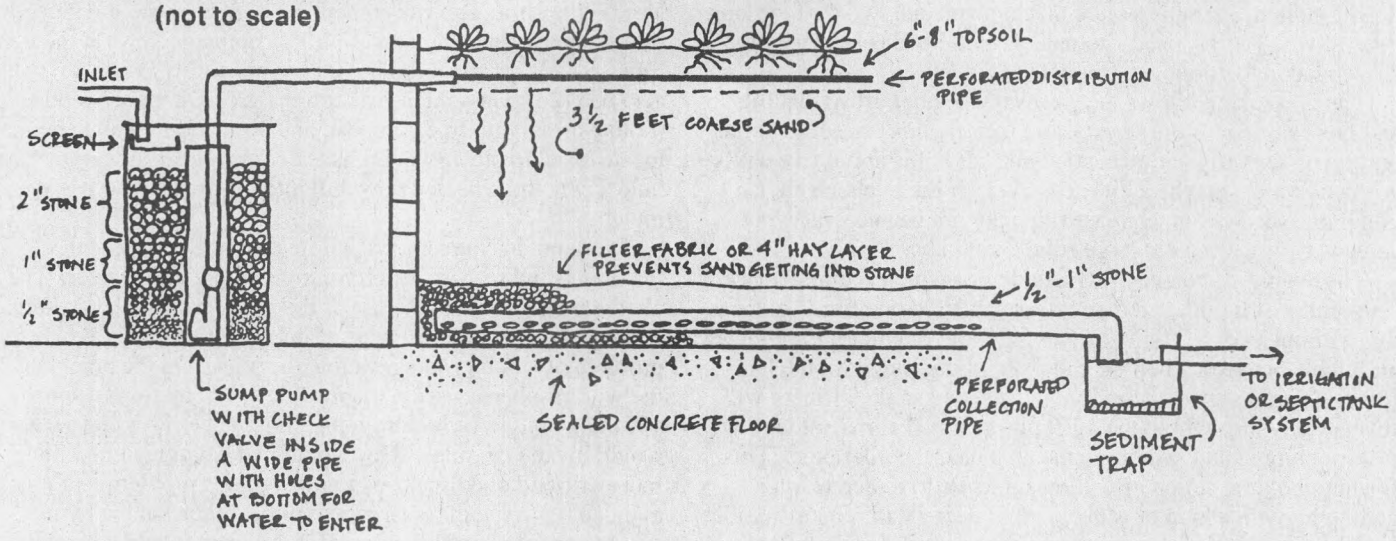
Greenhouse Greywater

The greenhouse greywater system was almost made famous by the Clivus Multrum folks in years past as they bravely attempted to break down America's blind barriers to humane treatment of our fecal and other household wastes. I have seen two versions of this concept, one which has operated in Abby Rockefeller's home in New Hampshire for more than ten years,

SKETCH 1: "Mulch-Maker" Greywater System (not to scale)



SKETCH 2: Greenhouse Greywater System
(not to scale)



and the other a more humble system in Concord, Massachusetts.

Greenhouse treatment of greywater is simple in concept, but I feel it has some problems, which I will discuss later. The basic idea is that the greywater goes through an initial filtration before being pumped to the greenhouse in doses. The greenhouse soils act as the effluent renovation medium, while the greenhouse plants take up some of the nutrients and water (Sketch 2). Such a system could be rigged up for outdoor irrigation in a warm climate, but in cold climates the greenhouse is necessary for year-round operation. In effect, the system is a sand filter with plants growing in it. However, read on for the downside.

The first filtration is usually accomplished by a screen, a series of successively smaller rock sizes, and then maybe some sand. Clivus Multrum sells a rock filter/pump unit combo for the initial filtration, but the folks in Concord, Mass. just used an old oak barrel, filled with stone in a range of sizes, with a sump pump in the bottom. This filter removes solids so they won't clog the pump or the tiny holes in the distribution lines, and it must be cleaned periodically.

Filtered effluent is pumped to the greenhouse and distributed through 1" plastic pipe with little holes drilled in it. If you want to get fancy, you can use two pipes, one inside the other, the inside one with tiny holes drilled in it all facing up, and the outer one slitted along the bottom to distribute the flow more evenly and make it less likely that plant roots will get in and clog the pipes. It seems to me either way would work. In any case, this pipe is buried 4"-6" deep in the greenhouse beds.

In Ms. Rockefeller's system, the greenhouse beds were about 3-1/2 to 4 feet deep, with the top 6"-8" topsoil and the rest coarse sand. The bottoms of the beds were concrete, with collector pipes sloped to run the excess effluent into a sediment trap, and then to a septic tank and leach field (New Hampshire public health officials are rather conservative). In Concord, the beds were connected to the earth, saving all the expense of the extra stuff—except a lot of leg work to get state approval and some legal limitations on the use of the food coming out of the greenhouse—i.e., not for public sale.

I have seen no guidelines for leach field areas for such a system. Ms. Rockefeller's house was huge, but not a full-time residence, and it was unclear just which drains were connected to the greenhouse treatment beds (the initial filter was large). The Concord system employed about the same size greenhouse (>125 s.f. of bed) to serve a three-person household with two baths and a washer, but not the kitchen. I expect that the size of the Concord system had more to do with percolation rates since it was earth connected, whereas the Rockefeller installation had a standard septic system afterwards.

Limitations and Cautions

The major problem with this kind of system stems from the salts (mainly from soaps and detergents, but also other things) and especially boron that can build up in the soil from continuous greywater application in one spot, especially in a greenhouse where temperatures can go high and add dramatically to the evapotranspiration rate. Some of this, especially the boron, can be avoided by using soaps rather than modern detergents and by avoiding anything containing boron or "borax." Bleaches are also hard on plants. Neither of the greenhouse systems I saw were in use for growing plants when I saw them (I don't know why), but they had both had a fair amount of use as greywater disposal systems and the soils didn't seem salted. No one had any test results for salts or pH in their greenhouse soils to allay my fears, but they hadn't had any problems with their plants either, which is somewhat of a surprise. It is possible that the additional watering which a greenhouse requires leaches the salts out of the root zone.

The second problem I see is the use of a pump in the system, which requires electricity. Pumping water into the house is bad enough, but to have to pump it at the other end really gets my goat! In order to use gravity and a dosing siphon one would have to get an adequate height difference (which can be difficult in some cases, especially with attached greenhouses) and use bigger pipe, which would end up hogging more expensive, already limited space in the greenhouse bed.

However, in some cases these disadvantages can be overcome or are not a concern, and there the system would be appropriate. For treatment of this type, it is important to provide some sort of alternate system for the greywater, in case someone gets typhoid fever, dysentery, or infectious hepatitis, any of which can readily be spread through greywater, if it is in contact with food.

Constructed Wetlands

Purifying water is a major function of natural wetlands. But humans have only recently applied this model to prevent ourselves from drinking our own waste as tap water. Constructed wetlands are now being designed, built, and used in various parts

of the world for treating industrial, municipal, and domestic wastewaters, agricultural and urban runoff, as well as acid and highly alkaline mine seepages.

I designed and built for my home in New Hampshire a constructed wetland that was approved by the state after five years of testing and assessment. The design was derived from an extensive search of the literature, visits to municipal scale installations, and discussions with leading researchers in the field. If you would like a copy of my design, some guidelines for household systems, and other information, send me $30 (P.O. Box 148, Leverett, MA 01054), and you'll get a packet in return.

First of all, let me warn people against using natural wetlands for wastewater treatment, for several reasons: 1) the surface and subsurface flow hydraulics are much more difficult to figure out *in situ*, so that design and monitoring become sketchy, and safe and sanitary operation is much harder to assure; 2) the continental U.S. has already lost almost 60% of its wetlands due to the Caucasian invasion, so why run the risk of further disruption, and why not rebuild?; 3) natural wetlands are usually in a low topographic position, and we would rather purify our wastewater at a higher elevation so that we can use it afterwards; 4) the politics of modifying native wetlands, and especially adding wastewater to them, at least where I live, are VERY touchy and can consume inordinate amounts of time and energy.

There are many basic types of constructed wetland systems. Those I am familiar with include surface flow and subsurface flow emergent wetlands, riverine mimics, marsh/pond/meadow or marsh/pond systems and a number of hybrids of these. This article will describe subsurface and surface flow wetlands.

Subsurface Flow Wetlands

Subsurface flow wetlands (Sketch 3) are usually constructed with a clay and/or plastic liner (or native soil if it is impervious enough) and are filled with crushed stone or sand. Into this medium are planted emergent species such as Cattails *(Typha latifolia),* Bulrush *(Scirpus validus* or possibly other *Scirpus* species), Reed Canary grass *(Phragmites communis),* and/or Canna Lilies *(Canna flaccida,* a southern species), among others. The water level in these systems is maintained below the surface to control mosquitos, reduce evaporative losses, increase safety and, in my estimation, improve winter performance in cold climate areas.

These systems work because of the physical filtration and the large surface area available for microbial attachment on the stone or sand medium and the plant roots, but also because these plants in particular are known to supply oxygen not only to their roots, but to a small region of the soil around their roots as well (the "root zone"). This creates a lot of edge between aerobic and anaerobic microsites within the bed, which in turn radically increases the rate of pollutant degradation because of microbial diversity and the diffusion of chemicals back and forth across the aerobic-anaerobic edge.

Surface Flow Wetlands

Surface flow wetlands are similar to the above, except that the bed liner of clay or plastic is overlain by some sort of clean fill, and the water flows through the stems and roots of the emergent species above the soil surface. Here the plant stems provide physical filtration and bacterial attachment sites as well as supplying oxygen to create microsites of aerobic activity within the water column in addition to whatever oxygen diffuses through the water surface. Surface flow wetlands have been used at a municipal scale in Canada, but for greywater treatment they probably would not work due to the low flow rates and subsequent freezing potential, not to mention increased mosquito control problems.

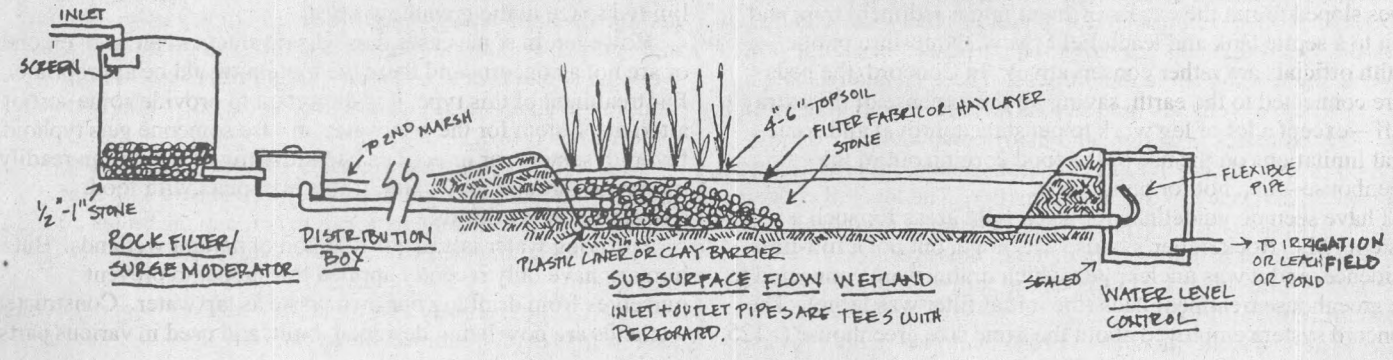
The Ideal Design

The ideal greywater system I've designed consists of a 60-gallon surge moderator and rock filter, a distribution box, two wetland "cells" in parallel—each with a water level control, and some sort of disposal system—either trenches in the ground, a pond, an irrigation system, or some combination. Due to regulatory intransigence, I had to build a single bed and lift it up out of the ground so that marsh effluent could flow into my septic system. As a result, the wetland has stone walls on three sides, and it runs colder in the winter. Some advantages of the two-cell system are that one can alternate flows and harvesting of plants, try different species and insulation strategies to make the system work in winter, more easily fit the marshes into a sloping site (such as mine), and so on.

The rock filter/surge moderator is basically a large recycled apple juice barrel with a foot of pea gravel in the bottom. This unit is needed to store surge flows from a bathtub or washing machine so that slow infiltration into the marshes doesn't back water up into the house plumbing. The filter also removes large solids from the waste stream to prevent clogging down the line. The rock filter serves the separating function of a septic tank, but doesn't turn the effluent anaerobic, which is important to support the aerobic-adapted marsh organisms. The distribution box which follows the filter splits the flow into two equal amounts for each of the two wetland cells.

Each fill medium for the marshes has its advantages and disadvantages in terms of hydraulic conductivity, or how easily the water can flow through, and in terms of treatment efficiency and wastewater renovation. Sand, having a higher surface area, will remove more phosphorus from the water by electrochemical

SKETCH 3: Subsurface Flow Wetland (not to scale)



attraction than will stone, which can be good or bad depending on your needs. Sand will also require a wider bed as well as a bigger bed overall because it has a lower hydraulic conductivity and less pore space per volume. For both these reasons I used stone, since I wanted both to minimize the bed size and to apply the phosphorus in irrigation.

This design was also an exploration of the limits of wetland operation in wintertime, so I chose to put the marshes outdoors and to try various ways of insulating them. The ideal plan calls for foam buried in the ground around the marshes to create an upwelling of earth heat, in combination with thick layers of wood chips or straw over the top. In subsequent years after good vegetative growth takes place, simply leaving the plant biomass after it dies back may be enough. As a last resort, the marshes were designed to fit inside a standard garden greenhouse structure, which could be added afterwards. In more southern climes, these considerations are null and void, as there are many installations of wetland systems from Pennsylvania to Louisiana which have shown fine winter performance.

Experience over the last two winters suggests that, with the less-than-ideal aboveground system I finally built, the outlet water level control structure is the weakest link. I believe that had the system been built below ground as designed there would have been little problem with freezing.

Controlling the water level is necessary in both surface and subsurface wetlands systems, and can be accomplished by various means, the flexible pipe shown being one of them. It is a good idea to lower the water level in subsurface marshes in the late summer and fall to encourage deep root penetration of the beds. Otherwise water can flow under the plant roots, thereby getting less treatment, especially if the top of the bed freezes.

A number of studies have shown adequate removal of pathogens, including viruses, from wastewaters in marsh systems, though more research is needed to confirm these. Nitrogen, suspended solids, and BOD (biochemical oxygen demand) levels are low enough for surface water discharge in most cases. Some fascinating work has even shown removal of highly toxic organic compounds from industrial wastes! At the same time, the system I designed would be much cheaper to build (1/3 the cost at my site), than a conventional septic tank/leach field system—which pollutes the groundwater with nitrates anyway—while using fewer resources, and it would actually be beautiful. The biomass generated in the marsh can be used as an essentially seed-free mulch in gardens, while cattails and reed canary grass produce an edible harvest.

Potential problems with this system include the high evapo-transpiration rates of the marsh in summer coinciding with the greatest need for irrigation, removal of nitrogen from the effluent when we might like that for irrigation, and the potential for inadequate treatment during high rainfall periods. On the first point, this is what storages are for, ponds or otherwise. If nitrogen is desired in the effluent for irrigation purposes, then some other system might better serve the purpose. There is much debate in the constructed wetlands field as to how to deal with high rainfall and other extremes in design, and many conclude that you just have to overbuild. My feeling is that if you are only dealing with greywater, the concerns are much smaller. The level of concern is also dependent on the type of disposal system used (trenches, surface water, or irrigation). In general, however, constructed wetland systems have a lot of potential for recycling wastewater.

Intermittent Sand Filters

Intermittent sand filters have been developed mainly for use with combined wastewater, but they are eminently adaptable to greywater treatment: "...the application of pretreated graywaters to intermittent sand filters may be advantageously employed. There is some evidence that higher loading rates and longer filter runs can be achieved with pretreated graywaters" (EPA, 1980, p. 116). The Ifo company in Sweden sells a whole set of components for buried sand filters to treat greywater in accord with Swedish regulations. These components are hard to get in the U.S., but not impossible.

The advantages of sand filters over some other methods include: very clear design guidelines, furnished by the U.S. EPA (EPA, Oct., 1980, *Design Manual: Onsite Wastewater Treatment and Disposal Systems,* EPA 625/1-80-012); and a solid record of research showing good removal of pathogenic organisms (2-4 logs, i.e., reduction to 1/100th - 1/10,000th of influent levels), BOD, suspended solids, phosphorus and nitrogen, producing "high quality effluents" (if you are a purist). As an alternative to the conventional septic tank plus leach field systems many states require for greywater, sand filters are almost sure to carry a lower initial cost while providing water that can be used for irrigation or other purposes.

Filter size is based on various characteristics of the sand itself, as well as flow rates and filter type. Filters can be buried, free access, or recirculating filters, which require pumps. Buried filters are harder to maintain and replenish, though they don't show above ground. And unless there is a good slope to the land, these will need a pump for getting the filtered water back to the surface for use. They are loaded at approximately 1 gallon/day/sq. ft. or less, depending on media and effluent characteristics. Free access filters have removable covers for regular maintenance, which makes them longer-lasting and easier to replenish. They can also be built above ground to make the effluent more accessible, although the filter must be kept warm in winter if it is to function properly and for the longest possible period. Free access filters can be loaded at between 5 and 10 gpd/sq. ft., the higher number being more appropriate for greywater, as it is less polluted. I would choose this type were I intending to use a sand filter. Pumps break down and cost electricity, so I avoid them when I can, which eliminates recirculating filters from consideration unless there is a need for an extremely high quality effluent. Recirculating filters (loading 3-5 gpd/sq. ft.) actually take more space than the simpler free access filters.

Sand filters must be dosed, or pulsed in order to function properly. Dosing makes the sand medium, and therefore the biological community, alternate between aerobic and anaerobic conditions. This alternation provides the conditions for the optimum elimination of organic compounds and the transformation of pollutants into other forms.

The effluent can be distributed in many ways, including ridge and furrow application, drain tile distribution, surface flooding, and spray distribution. Most buried filters drain through tiles, while most free access and recirculating filters use surface flooding in an attempt to insure even spreading of the effluent over the filter surface.

Most of the wastewater renovation takes place in the top 9-12 inches of the medium, yet most filters are at least 24" deep. Shallower beds can keep installation and replenishment costs low, while making the effluent more available for gravity flow distribution.

I have heard recently that some states are no longer allowing sand filtration of combined wastewater because the filters needs

to be maintained periodically and this is not always done. Indeed, this is one of the drawbacks of sand filters: they need periodic raking and resting, and once in a while complete replenishment of the sand medium. The requirement for resting means that two must be built, each the standard size, and this can take a fairly large area. Again, the size will be less when treating only greywater, but two systems can still take up a lot of space.

The other design challenge is finding multiple functions for the sand filter itself. Thermal mass? Use the covers as part of a deck surface? Basement space filler? What makes the most sense to me is to turn it into a wetland and grow plants in it, but then the size increases, as does the evapotranspiration!

The greenhouse greywater system described above is similar to a sand filter in some ways, but is not as well documented in terms of effluent quality or longevity. Clearly, intermittent sand filters can be useful in a number of situations, and may be relatively easily approved because of the large amount of data supporting their design and construction.

David Jacke is a graduate of the Conway School of Landscape Design. He is the co-author, with Doug Clayton, of The Gap Mountain Permaculture Mouldering Toilet, *and can be contacted at PO Box 148, Leverett, MA 01054.*

Third in an on-going series on Natural Building—

Straw Bale Construction

Ted Butchart

Building with straw bales goes back over a century, but the technique nearly died out after the 30s, and has only recently been revived. Used again by a handful of brave new pioneers during the mid-80s, it has now sprung up to be the fastest growing form of alternative building. With over a thousand buildings built in America and perhaps that many more again across the globe, straw bale construction is beginning to meet my dream of being "completely mainstream."

There are now three good books on straw bale construction and a quarterly journal (see below), so I will not describe the entire process here. Instead, I will discuss in some detail one particular aspect of building with bales: setting bales on a wood-frame floor. There are other floor options, such as concrete slab-on-grade floors, or bearing the bales on their own footer and filling the floor area with poured adobe or tiles set on a sand bed, but in many cases a wood-frame floor is a good choice, and on the second floor it is usually the only choice. So how do you best achieve the connection of wall to floor in that case?

Protection from moisture

Normally we would be quite concerned about moisture protection at the bottom of the bale wall. When setting bales above a concrete floor or concrete grade beam, you must always take into account the tendency of concrete to wick up moisture. But with a wood floor, you have already intercepted the moisture with your rot-resistant sill-plate. By the time you get to the floor decking, ground moisture should not be a problem. We do still need to concern ourselves with moisture, however.

It is the accidental dumping of a bucket of water on the floor, or the over-flowing washing machine, or the failed hot water tank that we are concerned with. If the bales are placed directly on the floor surface, when the inevitable spill happens, the water could run under the bales and be trapped there with little opportunity to evaporate. At above 20% moisture content, fungus can start decomposing the straw. Not a happy scene, but the solution is quite simple: just raise the bales up out of harm's way. The easiest way to do that is simply to nail down some wooden sleepers (boards laid flat on the floor deck) under the bales. These sleepers do not have to be particularly good quality wood—Utility grade 2x4s would work fine. Run them the length of the wall at the outer and inner edges of the bales. You can run one down the middle, or use foam insulation , or otherwise pick up the weight of the middle of the bale.

Multiple functions

As in all good permaculture, these sleepers are doing several things at once. They accomplish the critical task of protecting the bales from a spill, give you nailers for attaching your stucco wire prior to plastering, and give you a place to attach baseboard if you decide to use it. In practice, I like to hold the interior sleeper a little proud of the bales. If the bales are 18" wide, I might set the inside edge at 18-1/2" or even 19" in from the outside edge. This allows for the irregularity of the bales and makes it unlikely the sleeper will be tucked back under the bales when you go to staple off the stucco netting. If you are going to use a baseboard or mopboard, consider using the detail in the diagram. After stapling off the stucco netting, nail on a 1x3 or 1x4 "plaster ground." Bring the plaster down to and even with the outer edge of the 1x board. The plaster ground should be shorter than your intended mopboard. This gives you a nice straight nailer for the baseboard while the wall above can be as undulating and uneven as you please. If you don't want a baseboard, leave off the plaster ground.

A similar detail is used when going up from a concrete floor or masonry foundation, with the sleepers then being rot-resistant and attached with anchor bolts to the foundation. They can then be used in your tie-down system for weight bearing structures.

Further resources

Build It With Bales, just revised and enlarged. At $30, my personal favorite of the straw bale books, especially for the owner-builder.

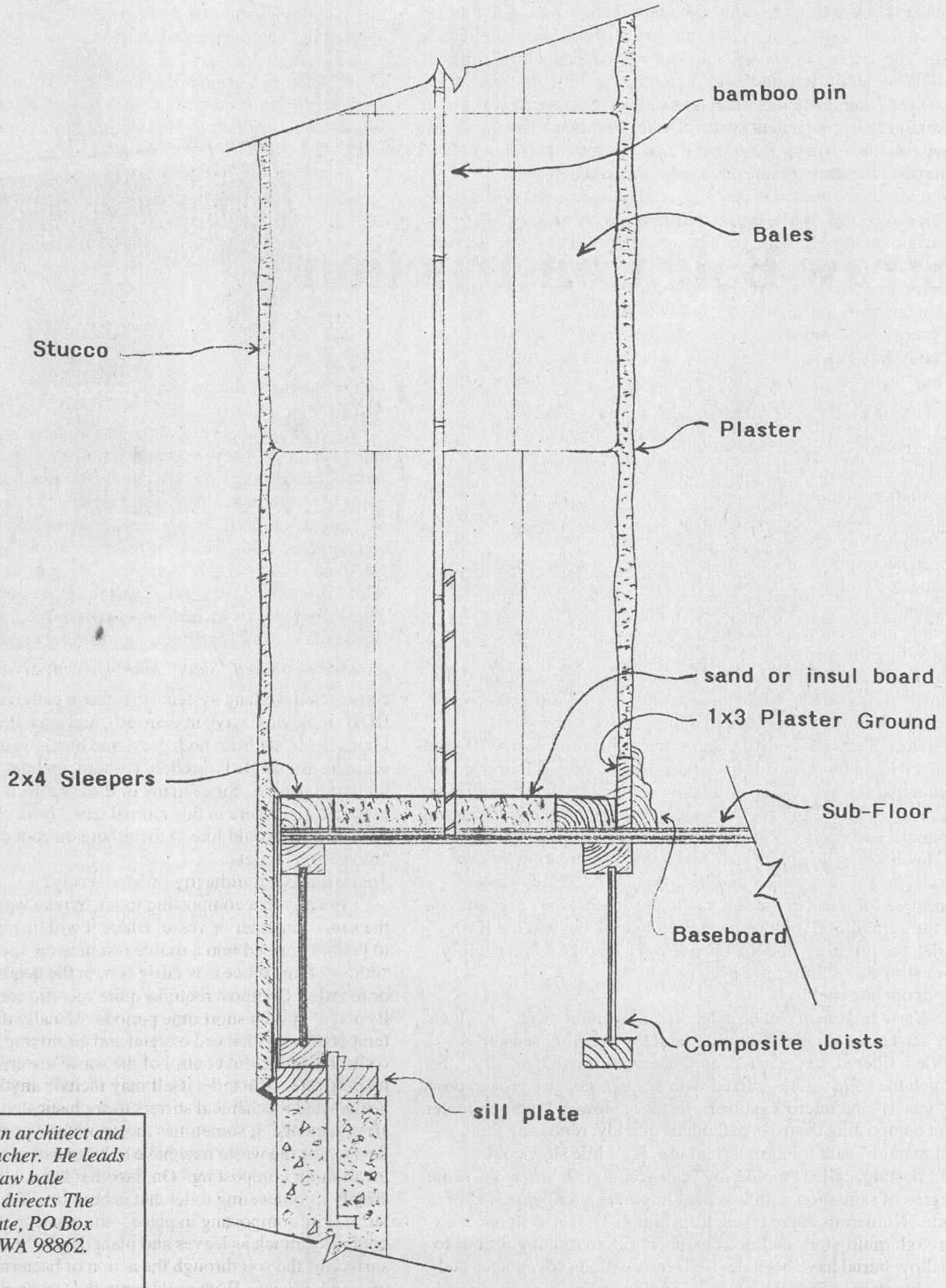
The Straw Bale House Book ($30) can be a bit confusing to the novice builder due to the plethora of ideas, good, bad, and indifferent. However, the wealth of photos gives a good feel for the variety of solutions possible.

Buildings of Earth and Straw ($25) is written from the engineer's perspective. Solid technical analysis and a good once over of engineering forces and how these alternative buildings respond to them.

These titles are available at most bookstores, or send an additional $1.50 for postage and GreenFire Institute can send them along to you.

(Ed.: See next page for diagram.)

Straw Bale Wall on a Wood Joist Floor



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The Sunny John

Design for a Solar Moldering Toilet

John Cruickshank

One of the most basic characteristics of any human community is how it deals with its body "wastes." Rich societies have developed quite complicated and expensive systems for removing human wastes from houses and cities, usually by dumping them, treated to one degree or another, into subsoils or bodies of water. While this avoids most of the problem of contagious diseases which can be spread by contact with human wastes, it hastens the loss of soil nutrients from farmland and it carries other risks of contaminating surface and ground water.

In contrast, traditional peoples and societies with lower levels of energy and resources available to them have usually disposed of body wastes by returning them to farm and garden soils. While these practices are more ecologically sound because they close the nutrient cycle from field to table and back again, they have often been linked with high levels of bacterial, viral, and parasitic infection and mortality.

Historic advances in public health were associated with the installation of underground sewer systems in European and North American cities, ensuring that public officials in those countries remain heavily invested in technologies of disposal. No politician or government official wants to be even remotely connected with an outbreak of cholera! This common sense, but incomplete view has become more and more entrenched as society has become increasingly regulated and homogeneous. Extending the mentality of "out of sight, out of mind," the septic tank and leach field system has become the disposal method of choice in rural areas, while an economic tug-of-war goes on in the suburban fringe between municipal sewers and septic systems. Since passage of clean water legislation nearly 30 years ago, city and town wastes have been more thoroughly treated by municipal sewage plants, mitigating some of the worst pollution of streams, lakes, and coastal waters, but at a huge and increasing financial and energy cost.

In choosing an appropriate technology for treating human waste, how do we walk a middle ground? To render wastes harmless for reuse in the soil and to ensure that they are returned to the agricultural food web we need to look beyond the flush toilet, the pit privy, and the open sewer. To take responsibility for eating and shitting, we need new tools.

Appropriate methods

Waste treatment can be categorized as either "wet," in which the wastes are diluted with water and the resulting sewage is settled, filtered, oxygenated, and otherwise treated; or "dry," in which the solid wastes, mixed with urine or not, are broken down by macro- and microorganisms, faster or slower, hotter or cooler. Hot composting destroys pathogens quickly, rendering the "humanure" safe for agricultural use, (1) while slow cool composting, called "moldering" can accomplish nearly the same degree of sanitation with less handling over a longer period of time. Numerous approaches, from simple bucket systems through multi-story inclined chambers (2), to rotating drums, to shallow burial have been devised, each with its advantages and disadvantages. Extensive private and government research and long-running installations have also proven the ability of constructed wetland systems to remove pathogens, nutrients, BOD (biological oxygen demand), and even heavy metals and toxic chemicals from both grey- and black-water wastes on every scale from a single household to municipalities of many hundred thousand people. Since many of these subjects have been explored elsewhere in this journal *(see "Household Greywater" pg. 34)*, (3) I would like to focus here on cool composting or "moldering" toilets.

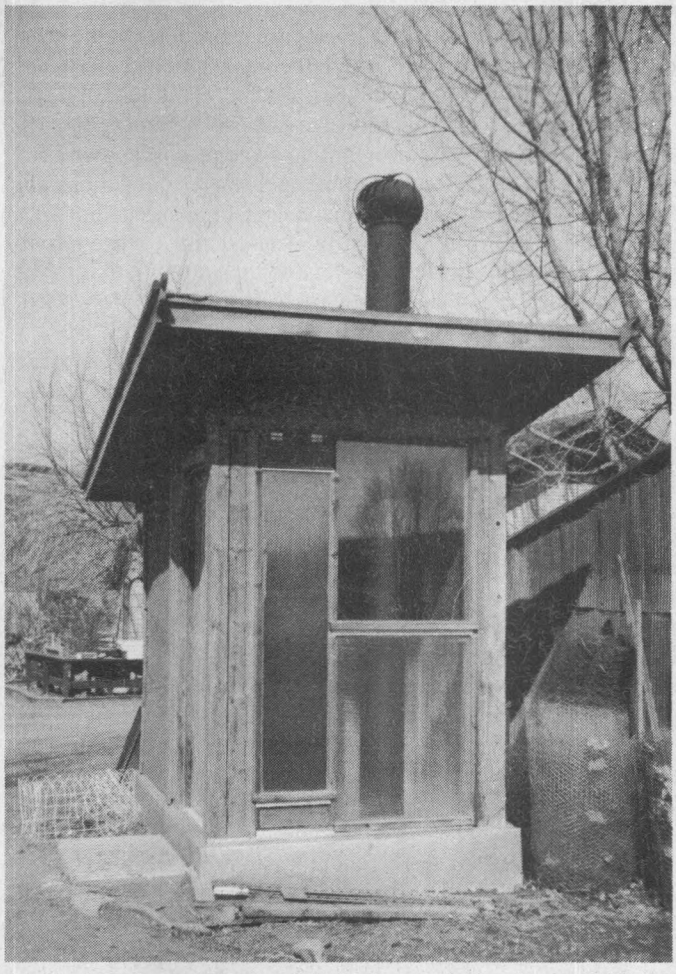


photo credits John Cruickshank

South elevation of "Sunny John" showing solar heat to chimney.

Just what is a moldering toilet anyway?

Typically in a composting toilet, human waste is deposited in the same container or vessel where it will be treated, allowing it to be transformed into a usable resource on-site. The "composting" process is fairly fast, in the neighborhood of weeks or months. Compost requires quite specific conditions to work its magic in such short time periods. Usually this means elevated temperatures, enhanced oxygen and air mixing, proper moisture control, and careful control of the waste material makeup and loading rate. The toilet itself may include anything from electric heaters and mechanical stirrers to sophisticated baffle arrangements. It sometimes incorporates a portable collection device, for the waste may have to be transferred to another location for composting. On the other hand, a moldering toilet is simply a composting toilet that is built to allow for very long-term, slow composting in place—the waste molders, rather than composts, much as leaves and plant debris "molder" on the surface of the soil through the action of bacteria, fungi, and microorganisms. With moldering, the "technology" applied for waste treatment is mainly isolation, and time itself!

Advantages

Composting and moldering toilets use no water. On the other hand, the flush toilet is pretty much the be all and end all of human living in much of the modern world. The major objection to all variations of water-based waste disposal is the expense of infrastructure. Rural septic leach field systems cost anywhere from $6,000 to $20,000, while municipal sewer connections are no less costly and require continual energy inputs to maintain. Basically both take drinking quality water, dump sewage into it, use the water to transport the waste, and then attempt to remove that sewage from the water somewhere else. Most water-based systems give little consideration to completing the cycle of nutrient movement where it begins—on the farm or in the garden, instead they turn a locally useful resource into a regional waste nightmare. Worst of all, water-based systems are usually installed for the lack of knowledge of legal, workable alternatives.

There are immediate advantages to using a long-term moldering design that requires maintenance only once every few years. Besides the work spared (over hot composting), moldering lends itself to maintaining an atmosphere around the home of simplicity and repose. Traditional portable-sized composting toilets need frequent maintenance; their processing is much quicker and so their products need more frequent handling. A moldering toilet may only need attention every four to five years if you like. As the size of the moldering container or vault decreases, the time between emptying can shrink to as little as one year and still yield properly treated products to cycle back into the system.

Portable composters are efficient waste processors, so their overall size is fairly small. They can handle their load quickly, and so do not need to have large amounts of internal storage.

loading of a composting toilet ever exceeds the design limits, it will stop doing its job of transformation. It will just fill up and need to be abandoned or cleaned of raw waste! (That workshop you dreamed of hosting at your site—with 35 people showing up for 14 days—will mean only one thing!) On the other hand, a design which incorporates long storage times will also be able to handle load fluctuations without breaking down. The moldering toilet is more resilient.

The main reason for composting wastes is, of course, to make available to the soil—to which you are permanently indebted—all the products of your labor and partaking. Completing this simple cycle quietly and with little effort stands out as the major advantage. Whatever the method, an important ritual for any and all can be letting the products of our bodies be returned to the earth whence they came.

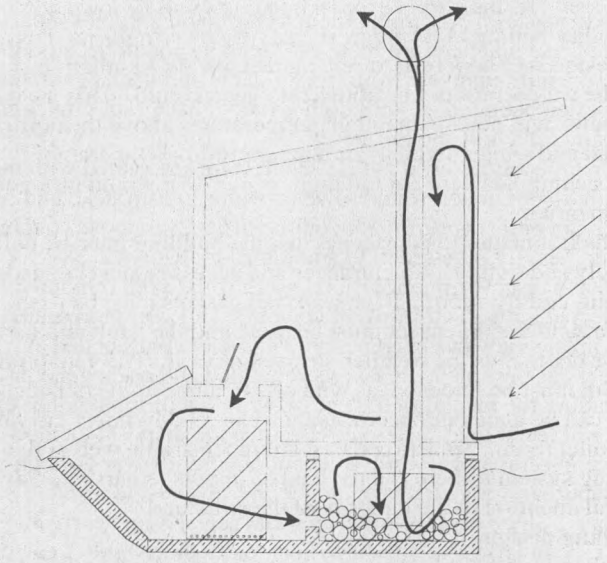
Disadvantages

The obvious reason not to choose any on-site dry waste treatment system is that sooner or later you will have to handle human waste directly. This will be the point of departure for many; the thought of it will send the squeamish running. That is just the way things are, and will always be the objection to any kind of composting of human waste. However, do not fear, when properly functioning, the moldering toilet produces material which looks and smells just like forest duff.

The second disadvantage is the size of the chamber required. Portable composting toilets and water-based systems don't need a lot of building space, whereas a moldering toilet must incorporate a large chamber in order to store up to several years' wastes. And this chamber must be beneath the toilet room, sheltered from severe cold, and protected from vermin.

As well, with any new approach being prototyped and perfected, the lack of experience and skilled execution of designs may be a problem. While the general approach to this type of waste treatment may be well understood, a lack of hands-on knowledge of the finer details of construction and use may put the whole process in jeopardy. (This report is intended to provide practical introductory guidance only. The perfect design always requires the application of the designer's imagination to the basic principles.)

Another possible hindrance is the legality (or lack of it) that may surround this approach. I don't know of any law that makes it illegal to do your thing in a bucket (essentially, that is what all composting toilets amount to), but what you do with the bucket when it needs emptying may be an issue! Let common sense and the applicable codes determine the right and fitting thing to do. Composting toilets are accepted in many areas of the country now. Look for precedents in your area, and go from there.



Schematic of airflow through solar moldering toilet.

The basic operation

Implicit in the moldering process is a long-resting period: the filled chamber must be left undisturbed for a minimum of six months, while bacteria and microorganisms break down the waste. This requires that you build a second vault to be used while the first is resting. The vaults can be sized to hold more than six months' loading, allowing for a longer resting period, up to several years. As the first one is filled, it is capped off, and use directed to the other. Once the second vault is nearing capacity, the first vault's contents can be harvested as finished compost, ready for the orchard and fields. The second vault can then be capped off, and the first brought back into service.

My first design used removable 55-gallon containers in each vault to allow for more flexible loading rates and easier handling of the finished product. Two of these barrels provide a year's capacity for a family of four. Alternately, the entire vault can be used as a collection vessel.

During the summer, the design relies on wind power for ventilation, and ambient air temperature for heating. During the winter, when the sun is lower in the sky, it is used to boost venting and to heat both the toilet space and the vault.

Design considerations

If the waste is to be collected for long periods, there must be enough elevation difference from the floor of the vault to the level of the toilet stool to allow a pile to accumulate. Four feet or more is not unusual. The overall size of the vaults will be determined by the projected loading requirements and the space available.

Access to the vault will have to be provided for harvesting. A wheelbarrow, cart, or vehicle will likely be required, as the volumes involved will be large. This means a large door which seals well, and a location adjacent a flat, unencumbered space for unloading and transferring the material.

The vault must be very well ventilated too. Ventilation provides the oxygen required to maintain aerobic bacterial activity, thus reducing strong odors. Ventilation will also evaporate excess urine and help to keep the toilet room fresh. A vent stack which draws air through the toilet seat, around and under the pile before exhausting it above the roof line will serve these purposes well. If free energies such as sun and wind can be harnessed for this purpose, operating costs will be low and reliability built in. Of course, if passive powering is not possible, the design will be forced to rely on mechanical ventilation.

The waste must not be allowed to get too cold. This means the vaults will need to maintain temperatures above the normal ground and winter ambient air temperatures. Temperatures approaching 90°F are not too high, while 70°F would be a good design target.

The last matter to consider is that the building must be built soundly and tightly. All entrances and accesses must be made vermin- and fly-proof. Door seals and gaskets must be used, a seal around the toilet seat must be used, and the vault and its access doors must be weather-stripped as well. The vent piping, if used, must be screened, as with all openings to the outside. Flies can be a major concern, as they can readily infest the vault and toilet room. Spiders can cast an impenetrable web in the venting system if there is a payload of insects to harvest. Pay careful attention to the integrity of the structure!

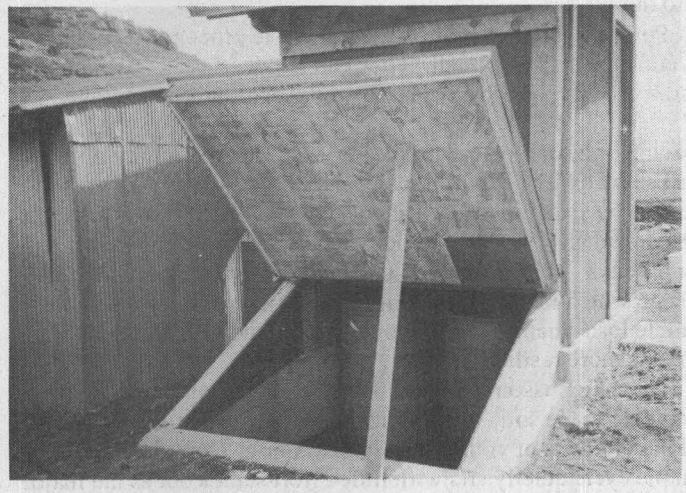
Building design

When I built my first moldering toilet it had to be placed in the central working area of a farm. There was no opportunity to add onto the farmhouse. We had no elevation to use to our advantage. The design had to be built around a modified pit setup. The space also did not allow direct solar exposure of the vault for heating.

I built a timber frame, straw-clay structure, almost totally free of modern materials. Straw-clay walls lent themselves well to the needs of the building. Their permeability provides many air exchanges per hour to handle the ventilation requirements. The mass of the walls makes heating easier. The small size of the building required only a few framing members, so it was easier and cheaper to build with a timber frame. Since I was concerned with groundwater contamination, I built a concrete foundation and vaults. To take advantage of the investment in all this mass, I surrounded the foundation with closed-cell insulation. Because much of the foundation was above ground, I sheathed it with galvanized sheet metal for protection from the elements. I used a solar collector and direct solar exposure through south-facing windows to heat the building. To prevent overheating, we had to exclude massive summer solar gain with a large roof overhang.

I had to design in more ventilation capacity than natural convection alone could provide. Winter sun coming in through the windows heats a 10" metal solar "chimney." The solar chimney is effective only when the sun is low in the winter sky, however. In the summer a wind-driven turbine vent, of the type generally available for attic and roof ventilation, enhances air flow. A temperature-controlled automatic damper regulates venting: it is adjusted to begin opening when the stack temperature reaches 50°F, and to open fully at 70°F. For an extra heat boost in the winter months, we converted part of the south glazing into a solar collector, directing heated air into the room.

Access for harvesting was only possible on the north side of this small building. We built a small ramp down into the vault, and used a regular cellar door arrangement for sealing it off. We placed 55-gallon plastic barrels for collection containers, modifying them slightly to our needs. The tops were cut off in such a way as to reuse them as perforated strainers in the bottom of each barrel. Each top was drilled full of 5/16" holes and supported up off the bottom with a few broken bricks. The sides of the barrels were heavily perforated with 5/16" holes for air exchange, and the very bottom has a ring of 3/4" holes for drainage. Each barrel was lined with 2" of coarse wood chips over the strainer to prevent solids from leaking. The portability and low cost of the containers ($10 as a "non-returnable, no deposit" item) makes it easy for us to cycle more of them into the operation if needed. The vault is large enough to store several containers. Using the vault alone is also an option, and would provide a 4-5 year cycle between the two chambers. To provide a thermal flywheel in the design, half the vault is filled with large stones, which are placed just in front of the vent openings in order to retain heat in the building.



Storage chamber with barrels and clean-out door.

Some other choices

The range of options in moldering toilet design is much wider than what I have built. If the toilet is to be integrated into an existing house, the scope of design alternatives changes. Ideally, the best arrangement will involve direct solar exposure to the vault, rather than the room. This means placing the room on the second floor, on the south side of the house, with the vault space at ground level. The venting can be set up to take better advantage of the sun and the wind, avoiding excessive solar gain to the room by rearranging the floor plan and using solar hot air exchangers exclusively.

I used two stools in a side by side bench arrangement, but you could just as well have the two stools facing each other, the sealed unused stool area serving as a small counter. You can build one stool on a small bench that is portable and seal the other vault at the floor level. That way you will gain the extra

floor space, moving the whole bench and stool to the opposite vault when needed. The toilet stools can be placed on the north or south side of the room, in the sun or the shade.

You need not feel bound to the idea of using portable containers. Two separate vaults built large enough will function well if their access allows for easy shoveling when it comes to harvest time. Vault design like this usually requires sloped bottoms and venting of the heap. Just keep in mind the basic requirements: space for adequate storage, ventilation (to reduce odors and moisture), heat (to maintain breakdown, comfort, and evaporation), integrity (to exclude vermin and pests) and easy harvesting access.

A word about costs

My first moldering toilet project (in 1993) involved the construction of a separate building, with its own foundation, framing, and roof. If the toilet can be designed into the house, most of this expense can be avoided. The cost of walls, roof, etc. will already be included in the basic construction of the home. The added cost of the toilet may only be the hardware items involved. Building materials for my first design cost $357 off the shelf. New hardware added $335 to the total. Since then I have contracted the construction of another moldering toilet locally for $1200 complete, including paid labor. A slightly smaller arrangement designed for the sloping site of the Central Rocky Mountain Permaculture Institute has been built for a cash outlay of only $150.

The original moldering toilet, now dubbed "The Sunny John" is open for viewing at:
Sunrise Ranch, 5569 North County Road
Loveland Colorado 80538
(303) 679-4274

Notes

1. Jenkins, J., *The Humanure Handbook,* Grove City, PA. 1994.
2. Jacke, D. "Household Greywater Systems," *PCA* Vol. VI, No. 1, Feb. 1990.
3. Hylton, M. "Municipal Reed Bed Sewage Treatment," *PCA* 32(36), Schellenberg, D. & C.; "Rock Reed Filters: On-site sustainable waste treatment," *PCA* 32(39); and *Guide to Building Your Own Compact Composter,* De Twaalf Ambachten, Boxtel, The Netherlands, reviewed in *PCA* 26(35). Δ

John Cruickshank runs Going Concerns Unlimited, dedicated to "getting your concern going!" He has provided electrical/ mechanical and educational services at Sunrise Ranch since moving there from Calgary, Alberta twelve years ago. Fully detailed construction drawing plans for both the original flat land design and slope site design "Sunny John" are available for $20 postpaid. Contact the author at (970) 679-4342.

Mow Slow

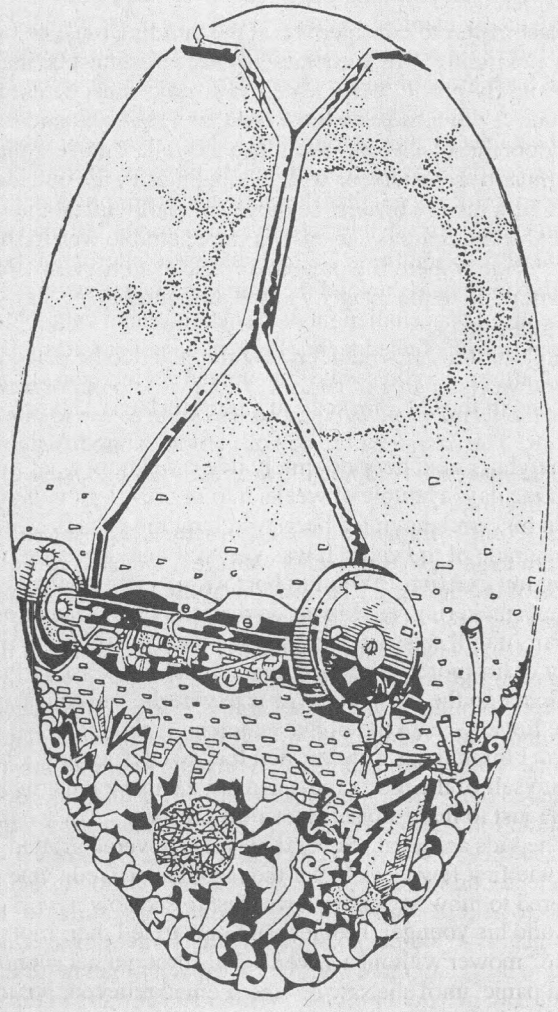
Mack Van Dyke

It was the third straight Saturday morning that I was awakened by a kid at the door asking, "Do 'ya want your grass cut?" that I decided to do it. This time it was one of the *neighbor's* kids asking. I took that as a hint that things were getting out of hand, even though my grass was only a couple of inches high. (OK, maybe four inches, but Spring came really early last year.)

These appearances always guilted me into dragging out the old Gas-smog and wrestling its wheezing engine into operation. It was the third and worst Smog in five years—all of them had been old, oily, and generally a pain to use. If it started, it was guaranteed to be noticed a half block away. The poor beast was starting to shake as if trying out for the lead in the next *Exorcist* sequel; its tortured screams bounced off all the windows in the neighborhood. The Smog had to go, and something new had to take its place.

It would turn out to be a momentous occasion, leading me once again to the threshold of one of those heavy decisions everyone eventually faces: Do I make a choice based solely on *convenience* or *cost,* ignoring the real costs, or will I choose *economy, efficiency,* and *harmony* in the products and machinery I buy? I was ready to take a radical plunge. No more used junkers, which work now but cause headaches and nasty problems by the end of the summer. No easy answer this time, but a *simpler* one. When the door knocked the following Saturday morning, I was ready. "No thanks," I told the two kids standing on my stoop, smugly waiting to tackle my weeds for the usual price. "I've got the *ultimate* machine now."

It was embarrassing at first; mine is a very traditional neighborhood. I had brought the new machine home in the late afternoon the previous day, but for some reason waited to unload until dark. Then with only the glow of moonlight to illuminate the way, I pushed my non-motorized All-American mower onto



Warren Smith

the yard for its trial run. I thought, how great, it's so quiet. With a silent shot a whole new era had begun in the life of my lawn.

The trim did look a bit raggedy that next morning, the kids on my door step were pointing out. "No problem," I said, "just missed a few places in the dark." That night, I tried again, this time with the porch light on. The tall grass patches stubbornly yielded, and if the neighbors noticed the taming of my field, they never heard a thing.

The next Saturday I was ready to come fully out of the closet. I waited until 7:30 a.m. to pull the machine out. Never would I have cranked up The Smog so early—a 200 watt stereo blasting Motley Crue would've been less invasive. As I quietly trimmed a path around the outside edge of the driveway, an early-rising neighbor drove by in his pickup truck. He slowed along my lot, looking at the mower, then at me. He made a distinct chuckle, then stomped the gas and was gone. Ten minutes later, he passed again, this time with his wife, both necks craning as they went by. I tried not to show signs of exertion (which wasn't much more than the old push mower, but I was sweating some), while imagining a crow gathering at my driveway to marvel at this ancient technology being reintroduced by their resourceful neighbor.

Another ten minutes went by, and, no kidding, the same truck drove by again, this time with the kids in back. I was pushing fast and headed for the backyard a.s.a.p., when one precocious child sneered something about my need to "join the 20th century." Without breaking my linear stride back and forth across my nicely manicured grass, I replied calmly, " This *is* the mower of the 21st century." Its simple existence simultaneously attacks at least three of the worst modern-day ills of civilized society: environmental toxicity, oil dependence, and noise.

As I beat a hasty retreat to my backyard, I was beginning to realize the seriousness of my actions. In the eyes of the immediate world, my neighborhood, I wasn't simply engaging in environmentally responsible activity; I was travelling the fast track toward "eco-nuttiness." I had chosen an alternative farther outside the norm, way beyond recycling and water-saving showerheads. I was challenging a basic American value: the utilization of fossil-fueled technology in the never-ending Battle Against Nature. I could see it in their eyes. "He's gone and become one of those 'whackos,' just like Rush talks about on TV."

My neighbor next door definitely does not know what to make of this. One day, a couple of weeks into my revolution, he was sitting on his porch having a beer, watching me push the mower along the grade of the yard. It was very hot that day; there was no hiding my exertion. "Want to borrow my lawnmower?" he called out, snickering, as if I was down on my hands and knees with a pair of dull scissors, snipping the lawn one blade at a time. I thought of his motor-propelled Sears mulching beast, with the grass catcher on the back and over-size wheels. He can steer it with one finger—just kind of walks behind it and nudges it into the turns. I think it has a stereo. On that sweltering day, I had to remind myself of the mortgage-sized payments he must make on that thing just to make myself feel a little better.

The kids are great. Several bicycles hovered around my yard for the first few weeks after the machine arrived. One little boy offered to mow my entire lawn, just to see how it worked. I let him, and his younger brother ran home to tell their mother about the "mower without a cover." This brought her running over in a panic, until she saw it. She seemed relieved, but took her children home anyway.

The Pros and Cons of the Reel Mower

Pro: No gas, oil, or smoke, negligible noise, low maintenance, and best of all, never a problem starting the damn thing. It's easy and effective to use. They cut around trees and posts as good or better than the gas machines, as long as you keep the blades in motion. The modern, high gear ratios and light-weight metals make a reel mower no more effort than a motorized push mower. You don't necessarily have to walk fast, although for thick spots or tough grasses special techniques or a second pass may be necessary. The effort is a low to moderate workout.

Con: They don't do well in tall grass, or on reedy grass stalks such as rye shoots, which just pass through the reel. Vines and shoots tend to wind around the reel until they clog the axles, which is a hassle to remove. But if you trim your lawn at least every other week in moderate growth periods then this is no problem.

The only real hassle (besides the nosy neighbors) is that the reel gets stuck easily on medium sized (5" or longer) twigs and sticks. this can be bothersome at least and possibly dangerous if you trip over the mower. Of course, problems caused by lawn obstacles can be exceptionally dangerous with power mowers.

Where to get them: Real Goods at 1-800-762-7325. Their reel mower is made by the oldest lawn mower manufacturer in the U.S., and retails for $119. Other sources are Gardener's Supply Company at 128 Intervale Rd., Burlington, VT 05401, (802) 863-1700 and Lehman's non-electric catalog at 4779 Kidron Rd., Kidron, OH 44636, (216) 857-5757.

A manual mower is the latest small addition to that beautiful and growing arsenal in my tactical environmental behavior, which began when I threw out the clothes dryer two years back. and replaced it with good old Sunshine and Air. It's true, Mr. Limbaugh, and I have a big ol' rottin' heap of compost in my backyard, too. A real Whacko!

All in all, I love my solution to what had become one of the worst hassles about having a yard. If you have a small-to-medium-sized yard, little or no tolerance for complicated machinery, and a sense of adventure to your eco-spirit, I heartily recommend a manual reel lawnmower for your next grass season. The neighbors will leave you alone eventually. Δ

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The Waldee Forest Inventory Stick:

A Layman's Tool for Forest Management and Restoration

Lee Barnes

An exceptionally useful and appropriate tool for forest management and restoration is the forest inventory stick (a.k.a. Biltmore Stick, or forest cruiser's stick). Various forms of this simple measuring device for estimating standing timber information have been developed for hardwoods and pines. The late Walton Smith, a widely renowned consulting forester who pioneered the sustainable management of small-scale mixed hardwoods and softwoods in the Southern Appalachians, developed an improved inventory stick which allows quick estimation of standing saw timber and of all standing tree volumes (tree basal area). The Waldee Stick also carries a rule for the number of commercial logs from a tree of a given size, a table of estimated board feet per sawlog, and a scale for estimating slope (an important criterion for road building and management decisions).

You can buy various cruising sticks from forestry supply catalogs, or make your own from a piece of wood or bamboo. the standard stick has four sides and measures 1" by 1" by 36" long, although slight modifications could result in an inventory stick which doubled as a stout walking stick (This could be custom-fit to the individual. A recommended length is about from ground to the center of the breastbone; I would mark the scales from the upper end of the stick.)

Walton preferred basswood, a lightweight, pale yellow hardwood which he harvested selectively from his small, intensively managed Waldee Forest (named for Walton and his wife, Dee). After drying, planing, and the addition of further value with calibrations, tables, and scales, the ready-to-use Waldee stick—which contained 1/3 of a board foot of dried basswood—sold for $10. (Walton liked to point out that he was getting $30.00 a board foot from some of his forest!).

Measuring Standing Timber Volume

The Waldee stick has scales on each of four sides (one can still print these on a round stick or bamboo). The first scale (S1) is an inch-by-inch yardstick, with a narrow groove cut into the stick at 33" which holds snugly a 1" diameter washer attached to a cord at the end of the stick. This washer allows an estimation of the standing volume of timber in the forest. Sighting from the butt end of the stick, count all the trees of an apparent diameter larger than the the washer while turning in a 360° circle. Multiplying by ten the count of trees visibly larger than the washer will yield a figure for the basal area (square-feet cross-section of trees per acre). Basal areas less than 80-100 indicate a medium aged forest while old growth forests (e.g., rich cove forests in the Great Smokies) have had basal area estimates of greater than 200. You can also estimate basal area by holding a nickel at arm's length (for me, about 28" from my eye) and doing the same count and multiplication. Knowledge of the basal area is very important for determining best management practices. These will vary if one has older forests with large diameter trees or younger forests with many small stems. Standard forest texts contain more specific information about managing forests based on basal areas. Check with local Extension and state Forestry Divisions for information and suggested publications.

Estimating Tree Diameter

The second scale (S2) allows estimation of tree diameter. By holding the scale against the tree horizontally 25" from your eye, visually lining up the butt end of the stick with the left side of the tree at 4.5' above the ground (official "breast height"), then sighting from the right eye to the right edge of the trunk, you can read approximate tree diameter across the scale. This is a much faster way to estimate tree diameters than by wrapping a measuring tape around each tree. This scale can be produced from the measurements given in Table 1. printed below.

photo credit Mollie Curry

Using stick and washer to estimate basal area of forest.

Walton added a scale to this side to allow estimation of slope at 10% increments from 0 to 80%. This scale works by letting the stick dangle as a pendulum or "plumb-bob weight" from the cord, and sighting along the marked angle lines to estimate the slope. You can mark these lines on any stick using a simple ruler to measure the percentage slope, or ratio of vertical rise to horizontal run.

Roads should be constructed across slopes at a maximum of 10-15% grade (20% for very short distances), due the potential for erosion, and the danger of traversing steeper grades. Slopes greater than 60% are best retained in undisturbed forest to prevent major soil erosion.

Counting Sawlogs, Measuring Board-feet

The third scale (S3) allows an estimation of the number of 16-foot logs in a standing tree. The viewer stands 66 feet (four rods or one chain length in surveyor's parlance) from the base of the tree (measure 22 lengths of the stick, pace off the distance, or use a tape measure), holding the stick vertically 25" from the eye with the bottom of the scale at stump height, and then counts off the number of 16-foot logs sighted. Each six inches along the scale equals one log. Taped to this scale is a table which gives tree volume in board feet (International Quarter Inch Rule, tree

Table 1. Variable Scale for Tree Diameter Estimation

(top row is distance in inches from butt end of scale to mark; bottom row is numbers to be marked on scale at each distance)

Measurement from Butt end of Scale to Mark											
1-14/16"	3-11/16"	5-6/16"	6-15/16"	9-7/16"	9-13/16"	11-3/16"	12-7/16"	13-11/16"	14-14/16"	16"	17-2/16"
Gradations in inches on scale											
2	4	6	8	10	12	14	16	18	20	22	24
Measurement from Butt end of Scale to Mark											
18-3/16"	19-3/16"	20-3/16"	21-3/16"	22-2/16"	23"	23-14/16"	24-12/16"	25-10/16"	26-7/16"	27-4/16"	28-1/16"
Gradations in inches on scale											
26	28	30	32	34	36	38	40	42	44	46	48

form class 78—see table 2.). Other standard board-foot tables (e.g. Doyle's Log Rule, which actually underestimates board-feet from trees less than 28" in diameter) can be substituted.

Walton's stick uses the fourth side to continue the board-foot table begun on side three. I have customized the remaining space on this side by adding a narrow version of Lee's Low-Tech Sun Locator (see figure and tables in *PCA #36*). The Locator allows determination of sunrise and sunset locations on the horizon for each month of the year, as well as sun altitude at solar noon: useful information for determining sun/shade patterns and building placements in relation to trees and surrounding topography.

The Waldee Forest Stick is a valuable tool for forest management when we remember the entire forest community of trees, plants, small animals, earthworms, mycorrhizae, and complex soil solution chemistry and biological activity. By helping us to gauge development of forest health and density, forest inventory estimates allow us not only to manage for timber, but to help restore native diversity, protect unique habitats and animal migration corridors, and to help restore the sacredness of an intact forest community.

References

Paul Kalisz. 1996. ASPI Technical Series Paper (TP)#32, "The Practice of Ecoforestry. Part 1. Inventory and Description." Appalachian Science in the Public Interest. 50 Lair St., Mt. Vernon, KY 40445. - ASPI has an excellent collection of easy-to-read pamphlets on appropriate technology, including TP#33, "The Practice of Ecoforestry. Part. 2. Ecological Restoration," TP#34. "Part 3. Tending and Harvest," and TP #35, "Sustainable Logging and Lumber Production."

Walton Smith. 1994. "Waldee Forest Stick: General Information and Instructions For Use." Available from WNC Alliance, 70 Woodfin Place, #4C, Asheville, NC 28801. - 2 page instructions on using Walton's improved inventory stick, which includes tree diameter, % slope, basal area, estimate of 16 foot logs, and International board feet scale.

NC Cooperative Extension Service. 1995. Forest Stewardship Program. - produces a wide variety of publications on forest stewardship and an excellent diversity of Wildlife Notes.

Patrick Byington et al.199?. Landownwers: Don't Miss Out!: The Many Ways to Benefit From Your Forest. Alabama Conservancy, 2717 Seventh Ave. So., Suite 207, Birmingham, AL 35233 205-322-3126. Easy-to-read guide to small woodlot management. Δ

Lee Barnes is a volunteer with the Western North Carolina Alliance's "Forests and Communities- Sustainable Forestry Education for the Southern Appalachians," a pro-active educational program to develop additional information for small landowner forest restoration and sustainable management. Contact WNC Alliance, 70 Woodfin Place, #4-C, Asheville, NC 28801. 704-258-8737 (Fax: 704-258-9141).

Table 2. Estimated Board Feet by International Quarter-Inch Log Rule (16' logs)

Tree DBH	12"	16"	20"	24"	30"	40"
1 log	56	106	171	251	403	731
2 logs	92	180	296	441	718	1329
3 logs	120	241	401	505	991	1868
4 logs	—	285	480	723	1198	2294

Homemade Log Yoke:
A tool for low-impact forestry

Mollie Curry

In forestry work, when you cut down a tree, your next challenge is moving it to where it can be turned into useful bits. While industrial forestry has "solved" this problem with big fossil fuel-dependent, capital-intensive machinery that often tears up the land in the process, there **are** other options.

Before bulldozers, skidders, log trucks, and helicopters were the norm, horse-drawn yokes, arches, or "carriages" were sometimes employed to bring logs out of the forest. Horse loggers still use these tools today. Tom Moestl of Earthaven Village near Black Mountain, North Carolina saw a picture of one of these log yokes in a book by Roy Underhill and had an inspiration. Not having a horse, but having a need to move logs around, Tom thought people could do the work if the tool were modified just a bit. So he set out to make a human-powered log-moving machine.

With the help of the local welder, Tom designed and constructed a very maneuverable log yoke that can go where a tractor can't, treads lightly on the land, and uses no fossil fuel in its operation! So far, it has mainly been used to move logs from where they were felled to a portable bandsaw mill, set up near a building site where the wood will be used. Two people (and sometimes one) can move logs of quite a great size and weight, easily traversing bumpy ground and maneuvering between standing trees and other obstacles. In moving a log of about 1000 pounds, an old Ford tractor failed (being unable to lift the log without tipping), where the log yoke and four people succeeded.

Treasure out of trash

Put together out of salvaged parts, the log mover rolls on two pickup truck wheels, which are connected by two square trailer axles to an arch made from half of a big steel pipe joint. A chunk of metal pipe makes a fitting for the long wooden shank, which has two wooden handles wedged into it; a chain holds the log in place, a metal hook secures the chain, and a bungee cord stabilizes the suspended log.

At its widest, the log mover measures 4-4.5 feet, while the shank is about 12 feet long (for a total length of about 13 ft.). The shank is made from a 3-4 inch hickory sapling. (Though hickory is strong and springy, making good tool handles, other species would serve—there's not much strain or weight on the shank.) The radius of the steel pipe clamp arch is about 1'4", which means logs up to 30" can be moved.

It works like this: position the chain under the log; roll the whole contraption over the log so the wheels straddle it at about the midpoint (the balance point); tip the shank up until the metal yoke and the hook touch the log; attach the chain; pull down on the shank until it reaches a comfortable height and the log is suspended off the ground; wrap the bungee cord around the log and the shank to keep the log from swinging; and heave ho!

The traditional version of this tool used big spiked tongs instead of a chain to grip the log. Whereas that was probably faster to attach and detach, the chain has the advantage of being able to handle a wider range of log sizes.

The principles behind it

The components of this tool were improvised—for instance, the "yoke" part could have been made from three straight pieces

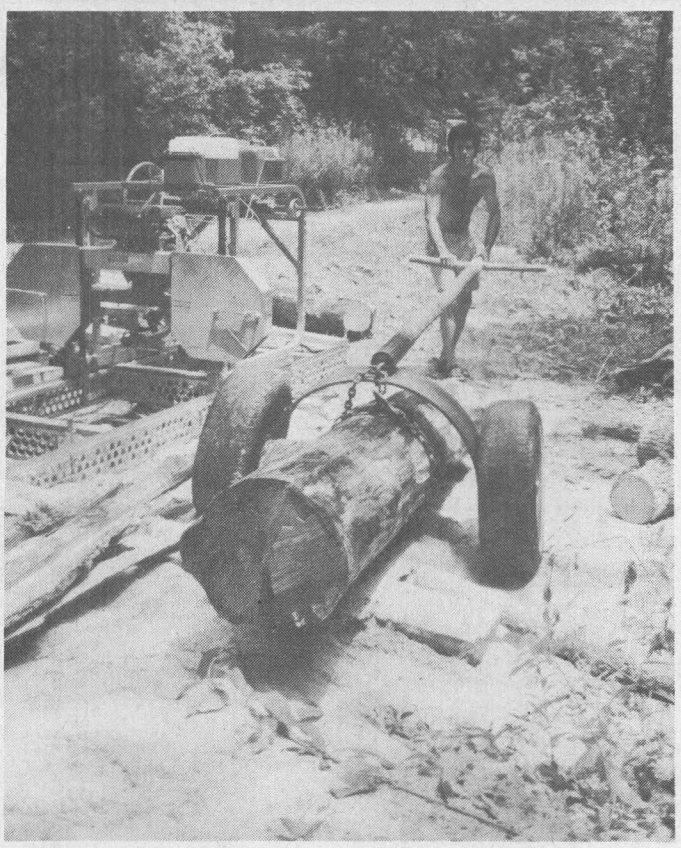


photo credit Mollie Curry

Tom Moestl demonstrates lifting log with two-wheeled yoke.

of I-beam welded into a crude arc. (It is important to used forged steel, which can flex, not cast steel, which is more brittle and would be prone to breakage in this application.) The shank could be metal, the wheels could be bigger... Any number of things could be different, but there are some essential principles that make this tool work well.

Dragging a log across the ground creates a lot of hard-to-overcome friction, so lifting it up and attaching it to wheels lends a great advantage in moving it. What allows a couple of average 150-lb. humans to lift the weight of a 700-lb. log in the first place is the mechanical advantage of the lever. The whole log yoke is essentially a lever on wheels, much like an inverted wheelbarrow for logs!

There must be a difference in height between the axle and where the log is chained to the yoke (in this case, about 18"). This makes leverage possible by allowing the yoke to pivot around the axle in order to reach the log as it lays on the ground, then pivot back up (as the shank, which is a lever arm, is pulled down) with the log attached via the chain. The degree of difference in height between the axle and the top of the yoke (as well as the width of the yoke) determines the maximum size of log that can be carried. And the bigger the wheels are, the easier it will be to get the thing rolling.

Sometimes we forget that our bodies (with a little help from our minds!) can do amazing things, especially when we understand simple mechanical principles. Levers, wheels, pulleys etc., can make our work easier, even without the use of motors. The machine age has conditioned us to think that we need fossil fuel engines to do any heavy work; that if work involves hand labor, it must be drudgery—but this is not true. The beauty and simple efficiency of Tom's human-powered log yoke show how drudgery can be transformed into joy! Δ

Green Woodworking

Mollie Curry

Once upon a time, in Britain and elsewhere, bodgers travelled the land with a few simple tools, making rakes, hurdles (movable fences), chairs, and other useful items out of green, mostly small wood. When they were done, they made charcoal from their scraps, then moved on to another place while the woodland they had just coppiced grew quickly back from the roots.

In this day and age, the modern wood products and forestry industries have pushed the time-tested techniques of green woodworking (and the forestry practices associated with it) to the brink of extinction. Fortunately, there are still a few experts and advocates who can teach you how to work green wood, whether you get the wood from your own sustainably managed woodlot or scavenge it from other people's "wastes."

Green woodworking is a completely different experience from working with milled, seasoned lumber. The wood is softer and easier to shape with hand tools (such as drawknives and gouges), and the craftsperson can work without motorized tools in the forest from which the wood is harvested. Wood too small to be milled can be turned into useful objects, so the thinnings and leavings of a sustainable forestry operation become an economic yield rather than a "waste" or "fuel-load" to be reduced by burning. The shavings produced as the wood is worked stay in the forest where they are recycled as native mulch.

Homemade tools for your own use as well as fine craft items with high resale value can be made from green wood. While selling "raw" (unworked) logs to a sawmill brings very little return to the landowner, value-added products that you make can form the basis of right livelihood.

The nature of the craft

The two main tools of green woodworkers are the shaving horse and the spring-pole lathe. To quote Glenn Gordon's informative and inspiring article in February 1996's *Woodwork* magazine:

"To someone accustomed to working in a shop elaborately equipped with machinery, benches, clamps, and an armory of hand tools, the shaving horse and spring-pole lathe are miracles of simplicity and economy of means. They may look primitive, but the way they operate is positively elegant. Since they are not motor-driven but powered by your arms and legs, they can't satisfy the appetites of modern industry (which is why they almost disappeared) but their real value has nothing to do with the current marketplace. They speak to something deeper, they speak to the longing—as you sit atrophying before the twitching screen of your computer—to feel a gut connection to what you do. You don't work green wood in the abstract, but with all your senses engaged."

If you want to learn more, there are a few good books on the subject and at least two people in the U.S. teaching workshops and distributing hard-to-find tools. *(See below)* For workshop information or tools, contact Don Weber, PO Box 1322, Mendocino, CA, 95460, telephone: 707-937-0920, or Country Workshops (Drew Langsner), 90 Mill Creek Road, Marshall, NC 28753-9321, telephone: 704-656-2280.

Resources

- *Green Woodwork: Working with Wood in the Natural Way.* Abbott, Mike. 1989. Guild of Master Craftsmen Publications, Ltd. 166 High Street, Lewes, East Sussex BN7 1XU, England.
- *Green Woodworking: A Hands-On Approach.* Langsner, Drew. 1987. Rodale Press, Emmaus, PA. Reissued 1995. Lark Books, 50 College St., Asheville, NC 28801. 800-284-3388.
- *Make a Chair from a Tree: An Introduction to Working Green Wood.* Alexander, John. 1978. The Taunton Press, Newtown, CT. Reissued and enlarged, 1994. The Astragal Press, PO Box 239, Mendham, NJ 07945. 201-543-3045. Δ

Green Woodworking & Basic Blacksmithing Workshops Held in No. California

Don Weber, a bodger and blacksmith from Wales who now lives in Mendocino, CA, taught a week-long workshop at Humboldt County's Sandy Bar Ranch in June, 1997. Participants gained hands-on experience in blacksmithing and forging tools such as draw knives, chisels, gouges, knives, and hammers for use in green woodworking and other crafts. Old car parts and other scrap metal provided the materials for these tools. After the tools were tempered and heat-treated, each student made their own handles using a treadle (spring-pole) lathe.

The group also made charcoal from on-site hardwoods and Don taught the art of coppice craft with a stand of Sandy Bar's black locust. Don demonstrated and explained various green woodworking techniques, and the group built a split-rail hurdle. Each student built their own shave horse and the Sandy Bar Ranch folks built a treadle lathe for use in furniture making.

Since trades such as green woodworking are ideal for forest communities, Sandy Bar Ranch looks forward to holding another workshop, possibly two weeks long, with Don next year.

Contact Sandy Bar Ranch about up-coming events by writing PO Box 347, Orleans, CA 95556, or calling 916-627-3379.

REVIEWS

The Craft of Green Wood

Review by Mollie Curry

DREW LANGSNER

Green Woodworking: A Hands-On Approach

Lark Books, 1995 (reissue).
176 pp., 150 b/w photos, 30 illus.
15.95 paper. US, $21.95 Canada.

While *Green Woodworking* covers the how-tos of more than 20 projects or techniques in depth, it is much more than an instruction book. Besides giving clear information on how to make a bark container, carve a spoon, hew a large bowl, fashion a garden rake completely from wood, or make a post-and-rung stool, a hickory bast woven stool seat, a firewood carrier, your own shaving horse to do the work on, and more, Langsner tells how to make your own tools (clubs, gluts, froes, knives, wood-drying kilns, etc.), explains the how's and why's of the common tools of the trade (drawknives, carving knives, gouges, hand adzes, steamer set-ups for bending, etc.), and gives special attention to tool care and sharpening.

continued on page 62

Wood-Saving Cook Stoves

Susana Kaye Lein

Most Guatemalan families still depend upon the wood fire to cook their daily meals. Although gas stoves have made in-roads in larger *pueblos* where more villagers have the means and access to buy tanks of gas, generally even these families center their meal around the corn *tortilla* made over a wood fire; the gas burners cannot sufficiently heat the large (usually clay) griddles used to make the great quantity of tortillas eaten daily. Solar box cookers have had limited appeal for similar reasons. The wood cooking fire retains a strong cultural base with the rural majority.

At the same time the problem of deforestation in Guatemala has become grave. As the scarcity of firewood spreads, family members—often small children and the already over-burdened mother—must travel farther and farther to find fuel, which they carry home in heavy loads on their backs. Much of the day is spent this way; meanwhile, a kettle of beans takes most of the morning to cook on the fire.

The destruction of forests has more to do with the pressures of population growth and the fact that, since the Conquest, nearly all the good agricultural lands have been taken over by a privileged few; the majority of Guatemala's peasant farmers have been pushed into an unsustainable cycle of slashing and burning the forests—higher and higher on steep mountain slopes—in order to grow their staple corn and beans. These social and political problems are beyond the means of individual development workers to address; yet by recognizing them, and respecting the local cultural context, we can direct our work more effectively.

Smoke from the wood cooking fire creates a serious health hazard in most rural homes. Usually three stones support the tortilla griddle or large kettle of beans above an open fire. With no chimney to draw it out, smoke fills the hut, turning everything inside black with soot—including the lungs of the woman cooking over the fire. During my time in one small village, two women died of the "black lung," one while trying to give birth.

In response to these problems, several types of wood stoves have been developed and built in Guatemala. The *Lorena* was much promoted through the mid-80's, but its acceptance has declined. Like the *Ceramica* stove, the *Lorena* uses preformed ceramic parts available in only a few areas of the country. These are difficult to transport intact from the factory. I've seen many broken and no longer functioning *Lorena* stoves, the parts and know-how to repair them not locally available. In regions where the parts are made and local know-how exists, the *Ceramica* and *Lorena* stoves are viable; they conserve firewood and keep smoke away from the user's lungs and eyes. Locally available materials and know-how are critically important to the future of any technology, no matter how well it may seem to solve a problem.

The *Chefina Mejorada* ("improved Chefina") stove was developed in the mid-80's from a predecessor, the *Josephina,* through the cooperation of the *Cuerpo de Paz* (Peace Corps) agroforestry program, the non-governmental organization (NGO)*CARE,* and the national appropriate technology program, *ICAITI.* The improved Chefina is made almost entirely of brick and clay and when made well, it is sturdy, durable, easy to maintain, and can save up to half the firewood used by an open fire. The main burner is fitted to the family's tortilla griddle and largest corn/bean kettle; two smaller burners are heated by the rise and passage of hot air towards the chimney (see diagram).

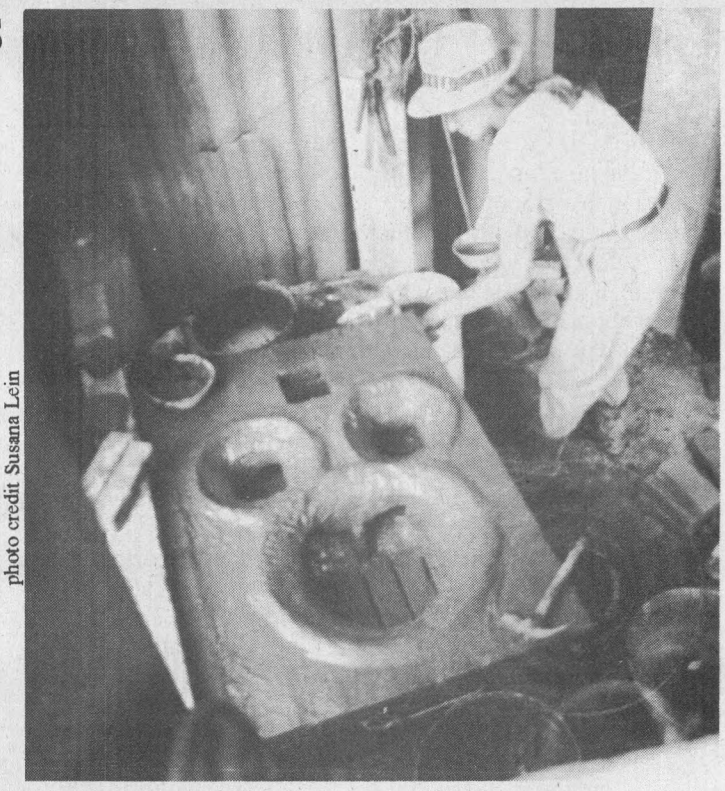


photo credit Susana Lein

Author finishing the top of a Chefina Mejorada stove

In most areas of Guatemala, clay and bricks are readily available; if not *made* locally, bricks can either be purchased at a higher local price or transported (without fear of breakage) from a nearby area where they are made. The humid highlands where I live and work has good sources of clay but gets too much rain to make bricks; yet a cheap source of bricks is only 1-2 hours away. If after intensive use the *Chefina M.* stove develops a broken piece or a crack, some clay (or a brick if needed) can easily be gotten to fix it up. Having built more than 20 such stoves over the past few years, I've often seen the need arise for small repairs; they've been made quite easily by the family itself. An important factor making repairs easier is participation in building the stove—especially by the woman who will be using it—and clear communication and follow-up on its use and maintenance.

The cost of materials for the *Chefina M.* stove has averaged a modest 80 *quetzales* (about $13), but I've built it for less—using fewer bricks and more on-hand materials (in the first level and around the sealed edges). Making the stove without a base platform (the ash-cleaning box at ground level) can also save material and cost. Women in isolated *aldeas* are accustomed to cooking on a ground fire and a lower stove presents them few problems, although it's more desirable to cook without bending over.

One drawback of the *Chefina M.* is its complexity and the time needed to make it—usually 2-3 days, depending on the amount of help and the quality of materials. Because there are many brick shapes to be cut, it takes inexperienced stove builders a while to gain confidence in the construction process, especially those not accustomed to reading plans.

Another stove recently developed, the *Finlandia,* has the advantage of being very simple, easy-to-build and cheaper *initially*— but in the long run it costs more because it doesn't save a significant amount of firewood—a major drawback. The durability of this stove design is also compromised by the use of steel rods, which heat up when the stove is in use and tend to

crack the clay molded around them.

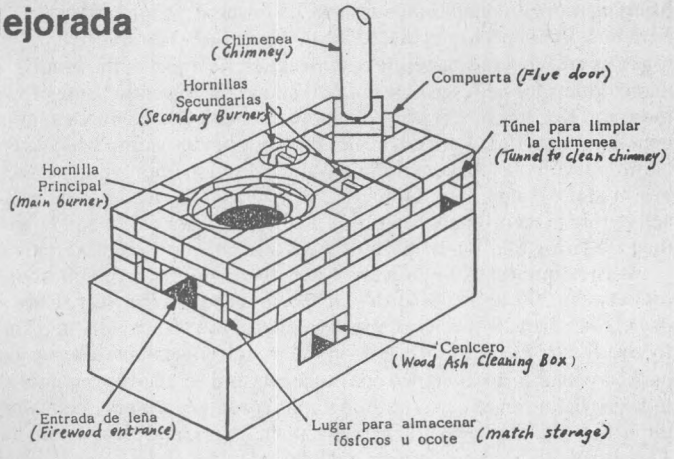
I've successfully taught only two people to build the *Chefina M.* stove by themselves, and even they cannot consider building stoves for a living because most people cannot afford to pay them enough. Because Guatemalan men must often work away from home, I've made most stoves with the help of women and children. While women can be empowered to maintain their own stoves in this way, they do not extend stove construction locally because they don't work much outside the household.

In a few areas of Guatemala, the governmental extension agencies actually serve people in need; in those regions training extension workers in stove-building would be one answer to this problem. Unfortunately, many regions are similar to Alta Verapaz, and I believe that *non-profit* organizations must fill the gap—by training local Guatemalans in such appropriate technologies, and paying a salary to those with proven abilities who desire to help build their communities. *Altertec*, with which I am working in organic, sustainable agriculture (see bio below) models this potential of NGO's: started by Californians with grant money, *Altertec* is now run almost entirely by local Guatemalans.

There is no one solution to any problem. Developing healthier and wood-saving means of cooking must be combined with reforestation which is *locally-usable* and integrated into sustainable agricultural practices.

Susana Lein has worked for four years with peasant farmers in the highlands of Guatemala. Formerly in a Peace Corps livestock program with the government agricultural agency DIGESEPE, she is currently with the non-profit organization Altertec ("alternative technology"), for whom she is developing and managing a Permaculture center to train local farmers in organic and sustainable practices including: soil conservation (living fences, terracing, use of A-level, etc.); organic soil fertility (earthworm composts, liquid fertilizers, green manure cover crops, NFTs, etc.); site biodiversity (intercropping, crop associations and rotations, medicinal herbs, permanent and flowering plants, livestock, etc.); integrated pest management practices (insect balance and attracting beneficials, natural pesticides, etc.); appropriate technologies (dry composting latrines, solar cookers and fruit dryers, wood-saving cooking stoves, food preserving, etc.) Plans for the Chefina Mejorada wood stove are available (in Spanish) through Susana Lein. Write her at Tactic, Alta Verapaz 16004, Guatemala.

Chefina Mejorada



Hayboxes:
Fireless Cookers that Save Fuel

Dean Still and Jim Kness

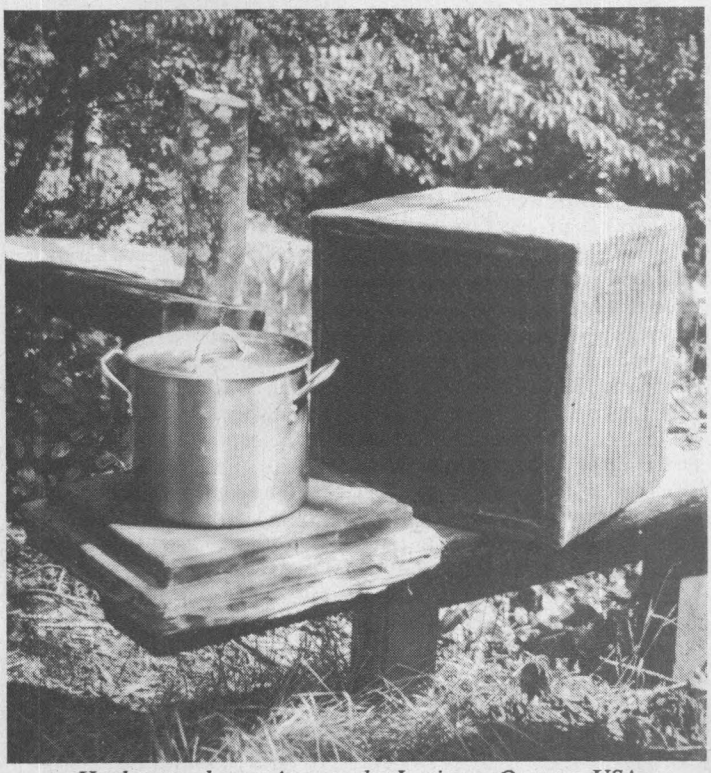
Hayboxes have been used for centuries in different countries. They work by keeping food hot enough (over 180°F.) for cooking to continue after the pot has been removed from the heat source. Where people are cooking with wood, a lot of energy can be saved by using a haybox. (Hayboxes are sometimes called fireless cookers.) After the food has been boiled over a fire for a few minutes, the hot pot is placed inside an insulated box, bag, or pit where it finishes cooking. The retained heat is enough to simmer the food to completion. A haybox does all the simmering for us, saving not only energy but effort also. The savings in firewood can be tremendous!

A haybox also makes cooking much easier—no watching pots to guard against boiling over or scorching. At Aprovecho, we usually make lunch while getting breakfast. All we do is quickly boil up the beans and rice and pop them into hayboxes from which they'll emerge in a few hours, hot and ready for lunch.

The design criteria for making a haybox are simple:

- Make sure that there is plenty of insulation around the pot, especially the bottom and top.
- The pot should fit into the box as snugly as possible.
- The lid on the haybox should make a good, airtight seal.

A wide variety of materials, besides hay, can be used for insulation. Any material that traps isolated pockets of air will insulate well. Examples of insulation are: straw, rushes, chaff, popped grain, wood shavings, sawdust, newspaper, fiberglass, feathers, cotton, sponge, fur, wood ash, charcoal, etc. If you use one of these materials, allow 4" of wall thickness. If you use cork, cardboard, aluminum foil, styrofoam, rigid foam, etc. you can reduce the thickness to two inches. *continued next pg.—>*



Haybox cooker at Aprovecho Institute, Oregon, USA.

One of the most efficient hayboxes is made by filling the air space around the pot with cushions, held in place by the box walls.

Another simple design is made from two boxes, one inside the other. The space between the two boxes is filled with insulation. An insulated lid or cushion fits over the top. Or we can invert the box and set it over the pot, which rests on an insulated base. Setting a tight-fitting piece of plywood on the base under the pot makes a double seal to keep air from escaping.

Another type of haybox is made from a double bag of material lined with insulation. A draw string closes the top. The neck of the bag should open wide so that the pot can enter and be withdrawn easily.

A haybox can be something very simple, like a hole in the ground filled with hay, straw, etc. The pot is placed inside the hole and covered by thick layers of insulation. The hole could also be made in a block of sand/clay mixture above ground so as to be more easily reached.

Simmering food in a haybox will take about one and one-half to three times longer to cook than on a stove. A large mass of food works better than small amounts. A tight lid on the pot helps as well. Use one-fourth less water with grains since less water is lost to evaporation. It's possible to wrap the pot in a towel before putting it in the haybox.

Bacterial poisoning can be avoided by two simple steps. Make sure the food is boiled for at least five minutes. Then keep the lid closed from that point on; reboil meat dishes before serving.

We can't imagine cooking now without hayboxes. They're truly one of those rare devices that save energy and make life simpler at the same time! We've used them for more than ten years and highly recommend them. Hayboxes allow us to make efficient use of cooking fuel, because the haybox does all of the simmering "for free," without using energy that would have mostly gone into making steam, anyway. Δ

Reprinted with permission from Capturing Heat - five earth friendly cooking technologies and how to build them, *available for $7 ppd from the Aprovecho Research Center, 80574 Hazelton Rd, Cottage Grove, OR 97424. (541)942-8198, fax/-0302.*

REVIEWS

Fishing and Frogging is Family Fun

Review by Linda Hull

LOUISE RIOTTE

Catfish Ponds and Lily Pads - creating and enjoying a family pond.

Storey Communications Inc., 1997.
PO Box 445, Pownal, VT 05261.
$12.95, paper, 186 pages.

Described as a water witch and expert fisherman, Louise Riotte, now in her late eighties, is author of "Carrots Love Tomatoes," one of the classic texts on companion planting. In this new book, her thirteenth, she describes her family's adventures in pond-building - from the very beginning when she and her son actually "fell" into the site of their first pond, to advice on landscaping, choice of plants, and how to stock your pond with fish and fowl. With her trademark mix of facts and lively anecdotes, Riotte explains the basics, reminding readers to be mindful of variations in water and soil conditions, climate, and state regulations which might affect plans for pond making.

Catfish Ponds and Lily Pads is a treasure trove of fishing lore as well, with tips for beginners, Native American fishing secrets, never- fail bait mixtures, and instructions for fishing by phases of the moon. Riotte suggests factors to consider in the siting of a pond—water supply, topography, soil—and explains methods for maintaining water quality and solving common problems. She also covers selecting and introducing fish, plus how to feed, catch, and cook them.

Riotte extols the virtues of having one's own private pond, not least for ensuring that the waters you fish are sufficiently clean and pure, enhancing the delights of both fishing and eating. She outlines the legal definition of a truly private pond which must be constructed rather than natural. Except during floods, the private pond must have no connection with streams or other bodies of water that would allow the passage of fish between the two. She reports that regulations have tightened significantly over the years, but acknowledges this is an attempt to protect certain species and populations.

The book contains extensive information on raising fish for culinary delight as well as on a commercial basis. She is particularly fond of the catfish, which she rates as one of the most important species of aquatic animal commercially cultured in the U.S. today. She also includes sections on raising ducks and geese and hunting frogs. To top it all, the final chapter of the book is devoted to recipes for cooking the various creatures raised in the pond— from stewed turtle to frogs' legs to barbecued rattlesnake. Simple, beautiful line drawings by the author add elegance to the presentation.

Catfish Ponds and Lily Pads is a down-to-earth, homely addition to the library of anyone interested in pond making, raising fish crops, and enjoying gourmet cuisine. Δ

Perennially Palatable

Review by Linda Hull

KEN FERN

Plants For a Future - Edible and Useful Plants For A Healthier World.

Permanent Publications, 1997.
$29.95 paper, 320 pages, photos.

For anyone committed to experimentation with new and old ways of growing common and more unusual plants for food and other uses, Ken Fern's book is an invaluable reference tool. Describing edible and other useful plants, both native to Britain and Europe and from temperate areas around the world, this book includes those suitable for the ornamental garden, the lawn, shady areas, ponds, walls, hedges, agroforestry, and conservation.

Fern strongly believes that our general health can be improved by bringing more diversity into our diets. A former London bus driver, Fern now lives and works in Cornwall, where he has established, together with a dedicated crew of colleagues, a project of the same name: Plants for a Future. Over 1,500 plants are currently being grown there and Ken has developed a database of over 7,000 edibles and other beneficial varieties. Fern advocates methods of cultivation which are in harmony with the local environment and helpful in improving the overall health of the planet. The author makes a plea for the reader to take an active role in recording what plants are being grown where and how they are faring in different parts of the world under different conditions.

Fern points out that before the dawn of agriculture, a person would eat between 200 and 1000 different species of plants in a year. These days fewer than 20 species of plants supply about 90% of all our plant foods. *Plants For A Future* is a very thorough and comprehensive guide packed with information, personal anecdote and detailed appendices and indexes, listing an extensive bibliography, useful addresses (mainly in the U.K.), plants for specific habitats, plant toxins, and plant uses. The 47 color photographs enhance a book full of experiential knowledge. Δ

Appropriate Technology Resources

This very partial list of appropriate technology resources should be considered a beginning. We invite your contributions which we will publish in future compilations. No doubt many resources are also now available via Internet.

Organizations

• Appalachian Science in the Public Interest, office and publications: 50 Lair Street, Mount Vernon, KY 40456. Phone/fax: 606-256-0077. Email: ASPI@KIH.NET. Appropriate Technology Demo Center and Appalachian Sustainable Forest Center: Rt. 5 Box 423, Livingston, KY 40445-9506. Phone/fax: 606-453-2105. Publishes concise technical bulletins on appropriate technology, along with a book catalog. The Demo Center site includes a cordwood house, solar panels, a garden, and a sustainable forestry demonstration.

• Appropriate Technology International, 1331 H St. NW, Suite 1200, Washington, DC 20005.

• Appropriate Technology Transfer for Rural Areas (ATTRA), PO Box 3657, Fayetteville, AR 72702-3657. 800-246-9140 or 501-442-9824. A publically funded information service focusing on sustainable agriculture.

• Aprovecho Research Center, 80574 Hazelton Rd., Cottage Grove, OR 97424. 503-942-8198. Does research on solar cookers, desalinators, wood-efficient cookstoves, forest management, food production, etc. Hosts apprentices during the spring, summer, and fall.

• Campus Center for Appropriate Technology, Buck House #97, Humboldt State University, Arcata, CA 95521. Maintains a reference library and publishes a newsletter called "AT Transfer."

• Center for Appropriate Technology, Machynlleth, Powys SY20 9AX, Wales, UK. Tel: +44 (1654) 702400. A popular demonstration site for many alternative technologies, including wind power and composting toilets.

• Energy Efficiency and Renewable Energy Clearinghouse (EEREC), 8260 Greensboro Dr., Suite 400, McLean, VA 22102. 800-363-3732. A project of the US Dept. of Energy, EEREC will answer your questions or connect you with others who can. They publish pamphlets on solar, wind, water, etc. A great reference!

• National Center for Appropriate Technology, 3040 Continental Drive, PO Box 3838, Butte, MT 59702. 800-275-6228 or 406-494-4572. Conducts community-based projects involving sustainable technology, including energy-efficiency.

Publications

• *Appropriate Technology* magazine, mostly focused on developing countries, covers cooking, communication, small-scale business, roads, fishing, women's issues, and much more. $29/year to: Subscriptions Manager, Intermediate Technology Publications, Ltd., 103-105 Southampton Row, London, WC1B 4HH. Or call 01 44 171 436 9761, fax: /-2013. email: itpubs@gn.apc.org, or http://www:oneworld.org/itdg/publications.html.

ITP also sells books on a vast range of topics: water pumping devices, metal casting, financial structures, intercropping, irrigation, solid waste management, etc.

• *Backwoods Home Magazine,* offers "practical ideas for self-reliant living." Issue #45 (May/June 1997) focuses on Tools and Building, PO Box 40, Montague, CA 96064. 916-459-3500, <backwood@snowcrest.net> or http://www.snowcrest.net/backwood

• *GATE (German Appropriate Technology Exchange),* a publication of the German Agency for Technical Cooperation, is a 60-page quarterly emphasizing economic development by a variety of technical means. Includes reviews of books, other GATE publications, and social and organizational "technologies" too. Box 5180, D-65726 Eschborn, Germany, Tel +49-61-96/790, fax/-797352. <gate-isat@gtz.de> or http://www.gtz.de/gate/isat

• *Lehman's Non-Electric Catalog* (Hardware and Appliances) caters to the Amish community and other sensible folk. From vegetable peelers, to gas lights, to ram pumps, to apple presses, to woodstoves, to propane refrigerators, to books, this catalog is chock full of low-tech stuff that works in everyday life. Lehman's, 4779 Kidron Rd, PO Box 41, Kidron, OH 44636. Tel: 330-857-5757, or /-5441. Fx/-5785.

• *Jade Mountain Appropriate Technology News* (catalog), PO Box 4616, Boulder, CO 80306-4616. Phone: 800-442-1972. Fax: 303-449-8266. http://www.indra.com/jade-mtn/. Email: jade-mtn@indra.com. Send $4 for catalog. Similar to Real Goods in terms of stock.

• *Real Goods Catalog* carries state of the art solar systems, as well as water filters, energy conservation gadgets, personal hygiene and health items, products for the home and bath, environmentally friendly cleaners, rechargeable batteris, compact florescents, and the list goes on. 555 Leslie St., Ukiah, CA 95482-5576. 800-762-7325. <realgood@realgoods.com> or http://www.realgoods.com/.

Books

Appropriate Technology Sourcebook: A Guide to Practical Books on Village and Small Community Technology. Ken Darrow and Mike Saxenian. Revised and Enlarged 1986. Volunteers In Asia Press. 800 pp. This invaluable collection of reviews describes each book and includes lots of illustrations. Topics include Energy, Food Processing, Agriculture, Water Supply, Sanitation, Health Care, Transportation, and more. To order, contact: Appropriate Technology Project, VIA, PO Box 4543, Stanford, CA 94305.

A Museum of Early American Tools. Eric Sloane. 1964. Ballantine Books, New York. Eric Sloane has written many books on early American life, several on tools. The pages are packed with beautiful and accurate drawings accompanied by text that explains why's, how's, and wherefore's of each tool. For a real treat and to inspire application of traditional tools to your present needs, check out his books!

Old Farms: An Illustrated Guide. John Vince. 1986. Bramwell House, New York. A British book with lovely drawings of farm implements, gates, stiles, etc. History and techniques throughout the text make for fascinating reading. Δ

...from the Regions

The Synergetic Garden

Patrice Creve

No rows of carrots, no spade, no bare earth, no manure, no compost...at first sight the "synergetic garden" looks like a great confused jumble. A closer look reveals that this disorder is scrupulously organized.

At Courmettes, a welcome center hanging high in the mountains above Cagnes-sur-Mer in the Maritime Alps, a unique experiment in agrobiology is unfolding. Emilia Hazelip, who introduced the concept of permaculture to France a decade ago, continues her work, which she now calls synergetic agriculture.

The 600-hectare property is managed by a mere fifteen or so people who strive to live in community. As one of the scarce wild spaces on the Cote d'Azur, it is threatened, paradoxically, by nature lovers themselves. Perched on a reservoir visited by two million tourists in summer, it is made terribly fragile by such frequent and often clumsy incursions. To protect this marvelous site, a request to make the area a nature reserve with educational objectives is being pursued.

Antoine, the director of the center, confirms that it's the beauty and energy of the place which motivated them to settle here : "It is a powerful place which favors transmutation and innovation." This synergetic agricultural experiment could not have found a more perfect spot to take root.

The first surprise when you enter the kitchen garden is seeing vegetables growing in a quite disorderly fashion on mounds of oblong earth 1.2m (5') wide by 8m (26') long. The rule is to make space for the feet and space for the plants because mixing the two leads to compaction of the soil. In soil where there is no air, nothing will grow. The cultivated areas are well demarcated, their rounded form giving a notable increase in surface area for production. Moreover, they are all covered with mulch— covering the soil to preserve the organic material, preventing erosion and compaction by rain, diminishing evaporation in summer and maintaining a soil microclimate which reduces the adverse effects of temperature extremes. Protecting the soil in this way removes the need to aerate it each year. There's even no need to fertilize the soil because it's left to maintain itself. Instead of pulling out all the plants and leaving the ground bare over winter to suffer the effects of erosion, here they always leave some plants or roots in the soil, their composition assuring a reserve of organic matter in the soil for the following year. It is, besides, very advantageous. Leeks for example are cut down to the white part, then left for two to three weeks to produce a second crop. Afterwards the root is left in the soil where it regenerates, making seed for the following year.

It's estimated that a plant is made up of approximately 75% water, 20% air, and only 5% soil (nitrogen and minerals). So, if you leave part of the plant in the soil after the harvest, more fertilizer is left in the ground than the plant uses. That's the grand principle of the synergetic garden: for it to produce more energy than it consumes.

In this experimental garden, the gourd is a neighbor to the tomato seedling which itself is found beside the beans or the peppers. Because thought is given to companion planting and guilds, plants cross-breed and defend themselves better against diseases and pests. This association of plants also supports the soil's "auto-fertility."

You can see, here and there, flowers and weeds, or rather what are called here "spontaneous plants." You don't pull these out (not all, in any case) because, being indigenous, they attract insects and are better able to contend with the parasites. In every way, it's better to combine the greatest diversity of plants, even those which we think of as useless.

Emilia Hazelip affirms it's necessary to allow a certain number of pests (or so-called pests) to live in the garden because sometimes they are the gardener's fundamental helpers. If, for example, you eradicate the colonies of green fly, the lady birds which feed on them will no longer come and will not be there to regulate the green fly population or to fight off the next new invasion of insects.

However, the problem of slugs is still not resolved. The ducks, which have a small pond in the middle of the garden, turn out to be inefficient (they're asleep when the slugs are in full swing!) Emilia Hazelip is looking for other predators to intervene in the biological struggle. She's going to reintroduce the hedgehog and, with the cooperation of a local agricultural researcher, experiment with the efficiency of the scarab, a small beetle which is the natural predator of the slug.

Finally, a synergetic garden is an ecosystem that is established and allowed to function as if it were really natural.

Suffice it to say, it's simple. But that's not the view commonly held in the sphere of science or in the politics of agribusiness which rule France. Emilia exclaims passionately : "The living world is not understood by the technician and since it is not understood, it is not studied for its diversity. People always want to apply mechanical laws to it, even when the laws of biology are fundamentally dissimilar." Δ

Reproduced from Produre Agrobiologie, *translation from the French by Linda Hull.*

Permaculture Growing in Israel

Malcolm and Ilana Beer

We have now been in our new home for 18 months and this Spring/Summer, I hope to see the garden begin to take more permanent shape.

The site was almost bare stones to begin with, so we decided on a season of grass, weeds, herbs, and succulents to put some organic matter into the soil before setting out a serious mulch cover vegetable jungle. There are already some dozen varieties of herbs that have thrived through the winter.

We have planted 32 fruit and nut trees, not including the various climbers or grape vines. Of the climbers, so far the only fruit bearers we have are passionfruit, kiwi, blackberry, and, of course, grapes. Other climbers include gourds, wisteria, jasmine, convolvulus, and odd native flowering vines. Banana and pawpaw (papaya) are not included in the tree count.

We have done all the tree planting and gardening ourselves, as well as most of the work on the house—certainly all the carpentry. We hired contractors for the block work and the plastering. We incorporated an under-floor draught system for summer cooling that vents into the house via the stair well. It works superbly! Heating during the winter is via the "Hot House" during the day and a gas heater that we light in the evenings.

The house stands on 85 m^2 (925 s.f.) of the land, with a covered drive for the car taking another 25 m^2 (275 s.f.). Twenty-one m^2 (231 s.f.) of the house area is the floor space of the "Hot House," which heats the upper floor rooms via low windows in the upper floor. Land area is 448 m^2 (about 5000 s.f.).

I am now in the business of designing and building "Hot Houses," and I intend to begin passive solar house design and building soon.

Our permaculture approach to our own dwelling has influenced some of the locals, and a small colored poster advertising campaign throughout the district may influence more. We'll see. The entrenched wisdoms about tree planting and gardening die very slowly. Nevertheless there has been some action by others in the *yishuv,* which is heartening. Δ

Malcolm and Ilana Beer attended the Fifth Intl. Permaculture Conference in Copenhagen, 1993. They can be contacted at Eshhar 68, D.N. Misgav, 20196 ISRAEL.

Networks & Resources

HAPI: High Altitude, High Attitude

The High Altitude Permaculture Institute, founded by Sandy Cruz, is located at 9,254 feet in the Colorado Rocky Mountains with a mission to demonstrate that permaculture principles and strategies can be applied successfully in even the harshest conditions. Steep and eroded slopes, winds often exceeding 100 m.p.h., temperatures to 40 degrees below zero, and extremely short growing seasons are a great challenge in evolving a site that can supply its own energy needs and provide fresh, vibrant food throughout the year with a minimum of work and waste.

HAPI sponsors classes and "hands-on" workshops designed to give participants the knowledge and skills they need to go home and work with their own sites.

High Altitude Permaculture Institute
PO Box 238
Ward, CO 80481
303-459-3494

Aprovecho Research Center Offers Internships

Applications are now being accepted for the three 1998 sessions (Spring, Summer, and Fall) of Aprovecho's ten-week internship program in Appropriate Technology, Sustainable Forestry, and Organic Gardening. Tuition is $1800 and includes classes, a room in the new solar straw-bale dormitory, and delicious all-organic meals. Classes typically run from 8 am to 5 pm Monday through Friday, with plenty of hands-on experience combined with lectures, field trips, and fun!

° The appropriate technology course focuses on efficient heating and cooking technologies, solar design, and alternative building.

° Sustainable forestry techniques are studied and practiced, as well as the ethical harvesting of forest products such as mushrooms, and vine maple for fencing.

° More productive and holistic methods of farming, including permaculture, are studied while working in the beautiful organic garden.

Aprovecho Research Center is a non-profit educational institute located on a forty acre land trust nestled in the forests of Oregon, 30 miles south of Eugene. Aprovecho offers the intensive ten-week internship program to up to fourteen students beginning approximately March 7, June 1, and September 1 of every year. For more information or to apply, call 541-942-8198, or write to: Internship Coordinator, Aprovecho Research Center, 80574 Hazelton Rd., Cottage Grove, OR 97424

Ethnobotanical Group Seeks Members

Diversified Botanicals, an ethnobotanical research society, has begun a national compaign for membership. Their research mission is "to preserve and enhance biological diversity through the development of sustainable agricultural and economic systems on a community basis." They currently operate a horticultural therapy program for developmentally disabled adults and disadvantaged youth, and maintain botanical collections, a seed bank, and a library in Minnesota, where they are based. Plans for the organization include buying land in Belize for research, publishing a quarterly newsletter, administrating a seed exchange, and hosting educational workshops and expeditions. For membership or further information, contact Diversified Botanicals, PO Box 307, Forbes, Minnesota 55738-0307. 218-744-3906.

Zimbabwe Pc Magazine Seeks Subscribers

The Permaculture Association of Zimbabwe and the Natural Farming Network publish the excellent 16-page quarterly *Groundcover*. It provides a platform for exchanging ideas as well as giving practical tips, views, and news about sustainable agriculture, water catchment, home gardens, small-scale economies, natural pest control, women's issues, appropriate technology, and other related topics. *Groundcover* gives a glimpse of what is going on in Southern Africa from the perspective of those who live there. A worthwhile read! Subscriptions are Z$45 in country, US$9 elsewhere in Africa, US$15 outside Africa (surface mail). For more information, write or call *Groundcover*, PO Box CY 301, Causeway, Harare, Zimbabwe. Phone: +263-726-538, or -731-541.

UC-Santa Cruz Farm Apprenticeship Program

The Center for Agroecology and the University of California Extension offers a six-month training course in organic gardening and small-scale farming called the Apprenticeship in Ecological Horticulture. The program runs April 13-October 11, 1998 at the University of California, Santa Cruz Farm and Garden. This Apprenticeship emphasizes hands-on learning with instruction in organic horticultural methods (soil fertility, cultivation, composting, propagation, irrigation, greenhouse management), cultivar requirements (vegetables, herbs, flowers, fruits), pest and disease considerations, and marketing, including a Community Supported Agriculture (CSA) program. Both garden and field-scale production are included.

Started in 1967 by master horticulturist Alan Chadwick, the training program has grown from four to 29 acres and from ten students annually to around 40. The Farm and Garden facilities include six acres of raised-bed, "French-Intensive" gardens, three acres of orchards, six acres of row crop production, and several greenhouses. Most apprentices choose to live on the Farm free of charge in their own tents.

Application deadline is November 3, 1997; tuition is $3,000. A few whole and partial scholarships are available for minorities and economically disadvantaged individuals. For further information, and to receive an application brochure, contact: Farm and Garden Apprenticeship, UCSC, 1156 High Street, Santa Cruz, CA 95064. 408-459-4140.

Southern Indiana Eco-agriculture Community Offers Internships

Michaela Farm—300 acres in southeastern Indiana owned and operated since 1854 by the sisters of St. Francis in Oldenberg—offers a year-long program in ecological farming and gardening. Facilities include a large, historic barn and other buildings, a reservoir, woodlands, pastures, vegetable and fruit gardens, herb and flower gardens and small-scale animal production. Succesful applicants can expect many benefits :

- practical training in organic and biodynamic farming/gardening,
- full-time schedule includes work in all aspects of farm operation, technical demonstrations, discussions, and special projects specific to intern needs;
- program prepares intern for work in small-scale food production, CSA, or developing own farm enterprise;
- experienced staff instructors;
- access to resource library;
- excellent room and board on farm;
- participation in Michaela Farm programs and events;
- opportunities for personal/spiritual growth.

Movement Musings

Course Conveners, Teachers Clash at Half Moon Bay

Peter Bane

A drama has been unfolding on the other side of the North American continent during the past few months, which came to an unexpectedly noisy head in mid-July. At a private ranch near the quaint seaside town of Half Moon Bay on the peninsula south of San Francisco, some 220 people gathered for what would be the largest permaculture design course ever convened in the U.S., perhaps the largest event of its kind in the world.

During the preceding months Dave Blume and Margaret Koster of the International Institute for Ecological Agriculture at Woodside, California had aggressively promoted two courses to be taught by Bill Mollison, permaculture's world-renowned and sometimes controversial Australian co-author, and his long-time Southwestern teaching colleague, builder/design/developer Scott Pittman.

Publicity reached far and wide. Dave Blume spoke to farming conferences in the Midwest. Targeted mailings topped 30,000 pieces, while radio interviews and public lectures ensured millions more heard the message: Bill Mollison is teaching his last public courses in the U.S. this summer. Mollison appeared with Jerry Brown in Oakland. Stations in New York picked up the California interviews and switchboards lit up like Christmas lights.

Mollison has taught permaculture regularly in the U.S. since 1981, reaching hundreds of students in most regions of the country: New Hampshire, North Carolina, Hawaii, Washington, California, Texas, New York, Arizona. Though from 1986 to 1993, a period of poor health, he made few appearances in the States, he has taught U.S. courses with Scott Pittman every year since 1994: at wildlife ranches in Texas, communities in California, and at the Rodale Institute in eastern Pennsylvania. But none of their previous engagements had matched the scale of this summer's courses. Nearly 350 people enrolled for the two 12-day events held near Ojai in southern California in mid-June and at Half Moon Bay in July.

The 1997 courses carried big sticker prices too, nearly $1,000 a head, but still they came from every region of the continent. The inspired and the curious flew into California from the Northeast, South, Midwest, Canada, and the Southwest, while over 200 showed up from all over the Golden State itself. Less glamorous events were bypassed—courses in Ontario, New Hampshire, Tennessee, Colorado, and elsewhere in California withered or died on the vine as would-be permaculture designers fell under the siren song of Bill's charism and the relentless publicity of the IIEA. Some switched enrollments, others never looked elsewhere.

But behind the apparent success of the organizers in harnessing 1990s American business and media acumen to Bill Mollison's prodigious international reputation, lay trouble.

When I visited California in late May at Scott Pittman's invitation to attend a think tank exploring some large permaculture projects (a credit union, the Academy, and a new town, about which more later), the tensions were muted. Organizers Koster and Blume were conspicuously absent from the invitation-only gathering which included Mollison and Pittman, their wives, real estate developers, lawyers, bankers, journalists, and sundry permaculture mavens. I had stopped in as a guest at IIEA on the way from the airport to the meetings at Santa Rosa. Talking amidst ringing phones, vegetable crates, blinking computer screens, and order forms for organic produce (they run a CSA called "Our Farm" on a rented hillside near Redwood City), the two promoters weren't shy about the challenges of working with a boisterous and opinionated genius, but their wry complaints weren't out of line with the many stories of Bill's exploits either.

A bar-room bouncer, Tasmanian devil, raconteur extraordinaire, and world-class bad boy, Bill had cultivated an image as outlaw-from-the-edge-of-the-world, which walked hand in hand with his serious scientific work as a wildlife biologist for the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia, his career as a university lecturer in Environmental Psychology, and his authorship of the brilliant and pioneering ecological design text, *Permaculture: A Designers Manual*. A keen observer and lover of nature with the delight of a child still visible on his puffy septuagenarian face, Bill is equally a charmer of young women, at ease with aboriginals and Bushman by firelight, and a fabulous recanter of tales both lurid and luminous. But he has shown no hesitation to insult heads of state, politicians, or his own students, particularly before an audience. Events organizers and his friends over the years had learned that getting Bill to "behave" in public was as delicate a task as handling a circus bear.

So I didn't take too seriously the mutterings about "difficulties" between Bill and Scott and their course conveners, until one evening in early July when the phone rang and Dave Blume began explaining in a nervous voice that Bill and Scott had "backed out" of the northern course, scheduled to begin in little more than a week. The Ojai course had gone off without disruption, but tensions had run high between Bill and Scott and Dave and Margaret. Now Dave had over 200 registrants converging on Half Moon Bay and catastrophe loomed. Would I consider joining a team of substitute teachers to meet the expectations of the multitude? Who else could help? Bill and Scott had been calling the students individually and trying to head them off, divert their registration monies, he claimed. After a tense weekend of uncertainty, a second call came through: the disputes were temporarily smoothed out and Bill and Scott would work as scheduled. An immense relief.

It came then as no surprise then when tempers flared again at the course. A confrontation between Gary Sanders (owner of Tunitas Creek Ranch where the course was housed) and Dave Blume on the one side and Scott Pittman and Bill Mollison on the other erupted on the third day of the workshop, leading to Bill and Scott being ousted from the site. The

parties differ as to the righteousness of that action. A letter recently circulated by Scott Pittman on his and Bill's behalf to students who stayed behind at Half Moon Bay asserts that demands by Sanders that Scott and Bill sign a contract releasing the landowner from liability were aggressive, unnecessary, unreasonable, and possibly confounding to the contract dispute then raging between the teachers and the IIEA.

When I spoke recently with Dave and Margaret they emphasized that they are being sued by Bill and Scott and are unwilling to make any statements for the record about circumstances surrounding the courses while the litigation is still unfolding.

Whatever interpretation of the events prevails in the end, Bill and Scott decamped from Half Moon Bay to a site near Occidental—followed by about a third of the students, where they proceeded to complete the course. About 120 of the original enrollees remained at Half Moon Bay where their course was taught by a replacement team that included Dave Blume and west coast and local permaculture teachers Simon Henderson, Larry Santoyo, Keith Johnson, David Baty, and others. Perhaps 30 students abandoned the situation, returning to their homes. My conversation with some of those who fled indicated extreme disgust with the teachers, the organizers, or both. Observers say the teaching at both sections of the split course unfolded well after the breakup, though opinions about who was at fault seemed to divide naturally enough between the camps.

Scott Pittman claims money is at the heart of the dispute between IIEA and the teachers. Both sides are claiming they don't have anything to show for their work. About $70,000 is sequestered in the project bank account awaiting the outcome of the litigation, while students who withdrew from the Half Moon Bay course have been unable to secure refunds yet. The conveners claim their hands are tied by the judicial process and the fact that funds are frozen in the bank. Scott Pittman has argued that monies in the frozen account could be used: if the conveners were willing to disburse them for refunds, he and Bill would cooperate.

Beyond the excitement of the courses, both good and bad, beyond the litigation and its outcome, with some division of the spoils and the blame between teachers, organizers, and aggrieved enrollees, lie many more demanding questions of interest to all in the permaculture and sustainability movements. Can high-pitch marketing skills work to the advantage of earth literacy and progressive social change? Can permaculture sustain an identity without Bill Mollison, or in spite of him? What is permaculture education for? Can it be successful on a mass scale? What would that look like? How much can money be useful to achieving sustainability and when is money counter-productive? Can the culture of decentralized, self-reliant, ecological design speak to an exploded American society or will the message be overwhelmed by the medium? Can we reform our relationship to landscape without regenerating our relationship to other humans?

The psychic earthquake in California is still throwing aftershocks whose meaning won't be clear for years to come, but this much looks likely: in a turbulent world the principles of local abundance, community solidarity, and ecological understanding are more important than ever before. Δ

In the Shadow of the Master

Rick Valley

Since the early 80's, Bill Mollison has been telling his students that we need to get out there and design and teach permaculture.

In 1986 I began teaching directly after taking the last Permaculture Design Course Bill was ever going to teach in North America, with our course evaluations fresh in my head and some changes in mind.

Within five years, my associates and I had evolved a design course which referred to, illustrated, and extended Mollison's *Permaculture: A Designer's Manual*— we saw no need to reiterate it— and did so with a format that allowed for a multiplicity of learning styles, blending games, hands-on work, design exercises, participant presentations, breakout groups, video, modeling, and other modes of teaching, tailored from materials appropriate to our regions. We teach in facilities where we are welcome and work with conveners who continue to support our efforts year after year.

Every course I have taught has gotten predominantly favorable evaluations from its participants. In all of these courses we as teachers have agreed to a maximum of 20 to 30 participants, depending upon the site. We have chosen to work at this scale because we believe this is the scale on which the learning can be most effective. Yet only once in 16 courses have we reached even this modest limit.

I have often wondered why, as we grew in experience and confidence, the response to our teaching was not bolder. Conversations with veteran permaculture teachers Jerome Osentowski and Peter Bane about events of this summer have given me pause to reflect on external causes which may be making a difference.

The Intl. Institute for Ecological Agriculture, headed by David Blume and Margaret Koster of Woodside, California promoted two courses to be taught by Bill Mollison and Scott Pittman in the Golden State this past June and July. This makes the fourth year in a row that Bill and Scott have taught in the U.S.: previous courses in California and Texas had been well attended, but enrollments this year totaled nearly 350, a gargantuan number. The 1997 courses were taught, but not without major drama, apparently.

The second, and larger course in Northern California broke up on the third day with the conveners forcing Bill and Scott to leave the course site (or according to other versions, the teachers refusing reasonable cooperation with the facility owners and decamping with a large block of the students for another venue). Whatever the truth of the situation, the teachers appear now to be in litigation against the course conveners, with charges of obstinacy, non-performance, fraud, and even theft flying back and forth. Close to three dozen enrollees left the second course within the first few days, not to return. What impressions of permaculture will they have taken away? And who will they talk to?

In the wake of massive promotion for this fiasco, concurrently scheduled courses all over North America were cancelled, or if they were presented, were under-subscribed and lost money.

I have met many people who, when given the chance, chose to take the permaculture design course with Bill; some dropped out of other courses this summer to make the pilgrimage to the Coast even though that meant paying higher fees and travel costs, sometimes

double or triple what it would have cost them to take the course with us or with other U.S. teachers. Each time Bill does a tour in the this country, the claim is made that it will be "his last." No doubt, this helps to stimulate interest and makes the extra effort and expense by students seem worthwhile.

Yet I do not find graduates from his courses in mailing lists afterwards: his course conveners have often been uninterested in sharing their lists or in mutual promotion. Perhaps they have been scorched by being too close to the heat. With few if any exceptions, Bill's course conveners haven't chosen to promote for him again—or perhaps he to work with them. What is this pattern telling us?

So, while it appears to me that significant numbers of potential enrollees are being siphoned off from mine and other courses, the pool of those who've completed the design course and might be available to attend or cooperate in other events which I and my colleagues offer (hands-on workshops, gatherings, advanced courses, etc.) does not grow. Many of the graduates of Bill's courses fail to connect with the network of local groups, other teachers, and fellow graduates because their teachers and course conveners have also failed to do that. And so the permaculture movement dies back for lack of nourishment. We collectively reinvent many wheels, fail to take action from lack of support, compete with each other rather than cooperate, and in many very real ways contradict and subvert our principles.

This failure of cooperation takes many forms. Some years back I agreed to support *The Permaculture Activist* by including a subscription in the cost of the design courses I teach. Is Bill doing this? Certainly his courses have carried tuition prices and have garnered enrollments which would have covered this tiny cost. I believe that supporting *The Activist*—the primary networking tool for permaculture in North America—to a point at which that publication becomes sustainable, is crucial to our long-term success.

Nor does it seem that Bill's reputation—now huge, upon which the demand for attendance in his courses hinges, is any longer proportional to his ability to inspire, train, and encourage others to put permaculture into practice. The feedback I have heard from most observers of Bill's appearances in recent years is highly ambivalent. I've heard positive comments, though no one has seemed excited. Deliberately shocking, boring, offensive, are terms frequently used, and not often favorably, as in the past. Most recently Bill's courses have been promoted by hyperbolic advertising claiming that participants "would learn to" do no end of skilled tasks. Any of us who have been in the trenches know that a little knowledge is dangerous, and that the design course is only the beginning of understanding permaculture and its applications.

The current situation, then, seems to be that I can anticipate every design course I teach will be a financial gamble with modest gain the best possible result, and thousand dollar losses a distinct possibility. Two- or three-dollar-an-hour wages the most probable outcome. There is no money for scholarships. Education is essential to this movement. If it can't be sustained, then there's no hope for any other strategy.

If the proceeds of big bang courses disappear down the ratholes of litigation and theft, then surely there is a problem of scale, not to mention ethics, when so much surplus is wanting to be distributed. Bill may not have profited by this debacle, but he bears a responsibility for its effects on others, intended or otherwise. Rumors circulating suggest that he may have been attempting to raise money by these courses for large projects elsewhere. If that is the need, how much better it would be if those of us who love him and respect his work could find a way to help directly. Certainly putting huge financial demands on permaculture education has created monstrous distortions.

With important books waiting to be written, major heart surgery already behind him, and scandal and discontent attached to his U.S. teaching appearances, it seems time to offer the master a bit of his own advice: Bill...go home and garden!

Rick Valley is a bamboo nurseryman and permaculture teacher and designer living near Corvallis, Oregon.

An Open Letter to Bill Mollison

Dear Bill,

It is with a profound sense of sadness and disappointment that I write this letter.

I am a permaculture teacher and course organizer living in Toronto. I received my certificate from Simon Fell at his course in Dunnville, Ontario in 1993. I completed a Deep Design course with Peter Bane and Chuck Marsh in 1994, and a Teacher Training course with Skye in 1996. You likely don't remember me, but we met briefly in Copenhagen in 1993.

I must first state that I have great respect for the considerable body of work which you and David Holmgren have amassed. *The Permaculture Designers Manual* is an immense achievement, and your canon only improves as it expands. I am proud to own copies of many of the seminal writings about permaculture.

I am however, deeply concerned about the future of permaculture in North America, and I regret to say that much of the blame for the situation seems to rest with you.

First, I am acquainted with many, though not all, of the foremost permaculture teachers and designers in North America. Neither untried youth nor social pariahs nor angry misanthropes, the men and women I know are all talented and gifted individuals, deeply committed to the fundamental principles of permaculture, who are doing their best to set good examples of more creative, more practical, and more intelligent ways to share the resources of this planet. In return, they need support and encouragement from you and me. If I may draw an analogy, permaculture teachers and designers are like pioneer species retaking possession of a wasted land. Their job is to disseminate the message; they need room to grow.

It therefore troubles me that you continue to teach courses to so many people here in North America. Do North Americans need more opportunities to learn permaculture? Four courses were offered last year in California alone, along with courses in British Columbia, Washington, Oregon, Hawaii, Arizona, New Mexico, Colorado, Texas, Tennessee, North Carolina, Virginia, Maryland, Pennsylvania, Massachusetts, New Hampshire, Nova Scotia, and Ontario.

Do you not believe that your reputation draws students away from native instructors, who, after all, have lived on this continent all their lives and who, many of them trained in permaculture by yourself, each knows "place" better than you could hope to? Moreover, you seem to refuse to set any practical upper limits to course enrollment. Do you honestly believe that anyone can *really* teach permaculture to 100 or 150 people at a time? I am sure that you know how to deliver a lecture, but any university professor teaching Philosophy 101 can do the same.

It has long been my belief that, to be taught *effectively*, permaculture has to be approached

creatively and somewhat spontaneously. There has to be an opportunity for a personal bond to develop between the instructor and each student, for individual expertise to be recognized and honored, for specific issues to be debated, and for unique locations or circumstances to be described in detail. If this is not the case, what does the course offer that the texts do not? How can any of this ultimately sensitive transmission of *culture* possibly happen in a classroom so crowded that you cannot even get to know everyone's name?

The events which transpired in California this summer are mired in controversy and I don't claim to know what the truth about them is, but none of the several versions I have heard are very flattering in regards to your personal behavior. In any business, complaints and dissatisfied customers carry ten times the weight of a job well done. If even half of what I've heard is true, these courses may have been largely counter-productive. If I was new to the movement and lacked the complex perspective that I have, I might dismiss permaculture virtually out-of-hand. I would probably believe that it was the preserve of a ragged group of malcontents and intellectual refugees who had been driven out of every New Age community that had ever had the misfortune to be confronted by them.

Well, obviously, I don't believe that. I've met too many men and women in this movement, people of integrity, sincerity, and compassion, representing so many cultures and ethnic groups, not to know that permaculture represents our best hope if we are to survive as a species. But, what exactly happened in California this year? The stories I heard were disturbing and even embarrassing. What can have been the reaction of students to your behavior? Or perhaps you were a victim of unscrupulous organizers and bad legal advice, and maybe I've just heard a lot of baseless lies and rumors? But now that they're all back home, what do the people who were in those courses think of permaculture and about their local teachers and practitioners? Please remember that we are still a small movement and the inappropriate actions of one person can color the reputation of us all. When that person is the author of the word permaculture, it casts a pall over everyone associated with it.

I never thought I'd write a letter like this, especially to you, of all people. I'm sorry that I've had to do so. But your recent choices have been unwise, and your strategy has been unfair to the students, teachers, and practitioners of permaculture in North America. In the end, of course, it will be the natural environment of this continent, the thing we all profess to love and protect, which will suffer the most.

Respectfully yours,
Richard Griffith
104 Bridlewood Blvd.
Agincourt, ON
M1T 1R1 CANADA

EVENTS

Greenwood Chair Making
Sonoma County, CA

Dates: October 20-24
Location: Occidental, CA
Instructor: Don Weber
Description: Spend five special days with master craftsman Don Weber as he guides us through the rebirth of green woodworking. Each student will create a Welsh chair from fresh or "green" wood. Students will use traditional human-powered English tools, such as the spring-pole lathe, shaving horse and Don's own handmade cutting tools. The simplicity and elegant efficiency of these woodworking techniques harken back to a time when managing the resources and production of the forest was pursued both as a livelihood and as an art form.
Cost: $450 residential, meals incl.
Contact: Occidental
Arts & Ecology Center
15290 Coleman Valley Rd.
Occidental, CA 95465
707-874-1557, fax/-1558
OAEC@igc.org

4-Weekends Permaculture and Natural Bldg. Design Course
Washington State

Dates: Sept. 5-7; 20-21;
October 4-5; 18-19
Locations: Winthrop, WA and
Edmonds, WA.
Description: Teaching the use of ecology as the basis for designing integrated systems of food production, housing, technology, and community development, this four-weekend intensive in sustainable systems design will teach the basics of permaculture as well as natural building. Legal greywater systems for Washington State, straw bale and cob house construction, and more will be covered.

Instructors: Michael Lockman is an environmental designer, writer, and publisher of *The Sustainable Living News*. Ted Butchart is an architect and director of GreenFire Institute, a straw-bale construction resource center. Guest instructors: Simon Henderson, Kevin Burkhart, Emily Heindsmann, Howard Langeveld, Janet Luhrs, and Mike Hylton.
Cost: $500, including tuition, lunches, field trips, and curriculum materials. Reserve space with a $100 non-refundable deposit. Make checks payable to Mike Lockman. Session One by itself: $150.
Contact: Michael Lockman, Box 45472, Seattle, WA 98145. 206-323-6567.

Permaculture Design Course
Southwestern Washington

Dates: September 6-19
Location: Oakville, WA.
Description: The basics of permaculture, plus mycology, strawbale construction, pc in public schools, eco-village design, and more. Course limit, 25 people.

Instructors: Larry Santoyo has taught over 15 design courses in the US and abroad. He specializes in subtropical design and is the foremost urban pc land-use planner in the US. Guest speakers include Paul Stamets of Fungi Perfecti; Simon Henderson, international bamboo expert; Michael Pilarski, agroforestry and wildcrafting advocate, author of *Restoration Forestry*, and founder of the Traveler's Earth Repair Network (TERN); Joanna Lee, founder of Olympia's local economic and barter system called South Sound Exchange; and others.
Cost: $675 includes tuition, camping, meals, and certification. Other accommodations, depending upon availability: bunkhouse: $150; cottages: $200. A detailed schedule of the days events is available, and a per day rate of $55 is possible. Send $75 non-refundable deposit to address below.
Contact: Permaculture West, 72 Mattson Rd., Oakville, 98568. 360-352-6509; fax: 273-7117. Email: permawest@olywa.net

Permaculture Design Course
Molokai, Hawai'i

Dates: Nov. 29 - Dec. 12, 1997
Location: Hui Ho'olana Retreat Ctr.
on the island of Molokai
Description: Students will develop the practical skills and knowledge to design and implement sustainable systems. The basics of permaculture plus subjects such as intentional communities and working in the Third World will be presented. We will emphasize design for permaculture and agroforestry systems adapted to Hawai'i and other subtropical/ tropical oceanic islands. Participants will receive a Permaculture Designer's certificate.

Instructors: Michael Pilarski has taught permaculture in the USA, British Columbia, Nova Scotia, Belize, Nepal, and Australia, and teaches herbal wildcrafting. Douglas Bullock is a horticulturalist with wide experience in Washington State, California, New Zealand, Australia, and eight years in Hawai'i. Bruce Hill was raised in Argentina and lives in Hawai'i. John Valenzuela has experience in Hawai'i and California. All are avid and knowledgeable plantsmen.
Cost: $950 includes meals, lodging, and materials. Campers pay a reduced fee. Some partial scholarships are available.
Contact: Hui Ho'olana,
PO Box 99,
Kualapu'u, HI 96757
808-567-6430

EVENTS

Permaculture Design Course
Western Oregon

Dates: December 1-13, 1997.
Location: Dexter, OR.
Description: This two-week course will cover permaculture philosophy and methods in depth, and will explore and integrate such topics as appropriate technology and housing, energy conservation, low maintenance organic gardening, edible landscaping, tree crops, perennial edibles and medicinals, water and soil management, community economics, and more. Lost Valley is an intentional community, non-profit educational center, and developing permaculture site of 87 acres near Eugene.
Instructors: Rick Valley owns Northern Groves Bamboo nursery near Corvallis, OR. He is very knowledgeable about wetlands restoration, under-utilized plants, seed gathering, culinary herbs, and fiber plants. Jude Hobbs, owner of Cascadia Landscape Design, is also an associate with Agro-Ecology Northwest, doing research for and consulting with small-scale farmers. She designs edible and native landscapes, integrating permaculture with a special interest in hedgerow development. Tom Ward is an accomplished wildcrafter and herbologist. Author of *Greenward Ho! An Ecological Approach to Sustainable Health*, he developed and taught a permaculture curriculum at D-Q University in Davis, CA.
Cost: $750-$950, sliding scale, includes organic vegetarian meals, lodging, field trips, curriculum materials, and a subscription to *The Permaculture Activist.* Limited work exchange available.
Contact: Lost Valley Educ. Center
81868 Lost Valley Lane
Dexter, OR 97431
541-937-3351

Permaculture Design Course
Southern Arizona

Dates: Sept. 20-21,
Oct 4-5, 11-12, 25-26.
Location: A 20-acre site at the base of the Tucson Mtns., and several urban sites.
Description: Topics include permaculture philosophy, water harvesting, water use and re-use, ecosystem restoration, observation and site analysis, dryland gardening, sustainable building, regenerative economics, and more, meeting the 72-hour certificate requirement. Many topics will be taught hands-on.
Cost: $495 for the design course (all four weekends). $150 for Intro. to Permaculture (first weekend). Lunch provided. Limited scholarships available.
Contact: Barbara Rose
520-744-9305.

Fundamentals of Permaculture
Gainesville, Florida

Date: February 6-14, 1998.
Location: near Gainesville, FL.
Description: This eight-day curriculum presents the principles and practices of permaculture in a rich, multi-modal learning environment integrating intellectual, spatial, interpersonal, and experiential expressions of permaculture with music, dance, and creative play. Upon completion of a second 8-day practicum in site design, students will receive a permaculture design certificate. The site is a holistic learning center on 700 acres of wild central Florida woodlands and marshes.
Instructors: Peter Bane has taught permaculture for five years in the Eastern U.S. and Canada, after living six years in Hawai'i. He publishes this magazine. Chuck Marsh grew up in South Carolina, and has applied his training in ecology to a career as a landscaper, cultural evolutionary, and principal designer of Earthaven Village in the mountains of North Carolina. Patricia Allison, a Louisiana native, is a bioregional organizer, homeschooling mother, recording artist, and veteran of eight permaculture courses across the Southeast. Andrew Goodheart Brown is an urban farmer, seed saver, arborist, wildlife biologist and experienced field guide to the Everglades and the coastal environments of the Sunshine State.
Cost: $600 includes tuition, lodging, curriculum materials, and a subscription to *The Permaculture Activist.* $50 discount for registering by January 6, 1998.
Contact: Susan Harrison Ross
Crone's Cradle Conserve
PO Box 535
Orange Spgs., FL 32182
352-595-3377

Fundamentals of Permaculture
Summertown, TN

Date: May 8-16, 1998.
Location: The Farm community near Summertown, TN
Description: The seventh such course to be offered at the Ecovillage Training Center presents 44 hours of the core permaculture curriculum: ethics, principles of design, pattern, natural systems, animals, plants, building design, aquaculture, waste treatment, economics, urban applications, tools, and more. Widely acclaimed and well received by nearly two hundred students from all parts of the U.S. and several foreign countries over the past three years, the fundamentals course uses a community-based, multi-intelligence approach to learning, as described at left under the Florida course. Upon completion of a subsequent site design practicum, students will be granted a certificate of permaculture design. The ETC facility has examples of wetland waste remediation, natural building, organic garden and greenhouse production, and solar energy applications as well as the multi-generational, socially innovative community experience of The Farm community at hand.
Instructors: Chuck Marsh, Peter Bane, Andrew Goodheart Brown, Patricia Allison, Albert Bates.
Cost: $600 includes tuition, dormitory space, vegetarian meals, curriculum materials, and a subscription to *The Permaculture Activist.* $50 discount for registering by April 5, 1998.
Contact: Ecovillage Training Ctr.
PO Box 90
Summertown, TN 38483
615-964-4324, fx/-4474.
ecovillage@thefarm.org

Introduction to Permaculture
Occidental, CA

Dates: October 25-26
Location: Occidental, CA
Instructors: Brock Dolman
Description: For those not ready for the two-week certificate course, but wanting to integrate permaculture ideas into their lives, this workshop will present basics of permaculture design and ethics through lecture, discussion, and practice. The 80-acre site will provide a laboratory for study of patterns, water catchment and infiltration, erosion control, forest farming, chicken forage systems, polycultural food gardens, microclimate analysis, alternative building materials, and more.
Cost: $125, 10am Sat.- 5pm Sun. 4 meals
Contact: Occidental
Arts & Ecology Center
15290 Coleman Valley Rd.
Occidental, CA 95465
707-874-1557, fax/-1558
<OAEC@igc.org>

Seed Saving Workshop in No. California

Dates: September 19-21
Location: Occidental, CA
Instructors: Doug Gosling
Description: Learn the lost art of seed saving in this intensive hands-on workshop in the Center's highly diverse vegetable, flower, and herb gardens. Workshop covers: botany and pollination biology basics, seed saving particulars, maintaining varietal purity, seed processing, cleaning and storing, equip-ment, and cooking with seeds. Take an in-depth tour of the gardens, learning the natural history and culinary significance of the hun-dreds of heirloom varieties growing there. The class will participate in a seed exchange and cook a meal made of seeds gathered at the site.
Cost: $225 residential, meals incl.
Contact: OAEC
15290 Coleman Valley Rd.
Occidental, CA 95465
707-874-1557, fax/-1558
<OAEC@igc.org>

Permaculture Design Course
Basalt, Colorado

Dates: August 24-Sept. 5, 1998
Location: Basalt, CO
Description: This two-week intensive permaculture course will include classroom and hands-on experience at the Central Rocky Mountain Permaculture Institute. CRMPI includes an established and economically viable high altitude permaculture system, including greenhouses, fowl, composting toilet, and forest garden. Participants will receive design certificates.
Instructors: Jerome Osentowski, Director of CRMPI and others.
Contact: CRMPI, Box 6321, Basalt, CO 81621 970-927-4158, email: permacul@rof.net

Permaculture Fundamentals
Baja California, Mexico

Dates: March 21-29, 1998
Location: Buena Vista Spa, Baja California, Mexico
Description: The first half of the Pc certificate course, emphasizing water harvesting and appropriate building and planting strategies for the dryland tropics; incl. fieldtrips.
Instructors: Jerome Osentowski, Peter Bane, Keith Johnson, and guests.
Contact: CRMPI, Box 631, Basalt, CO 81621 ph/fx: 970-927-4158, email: permacul@rof.net

Fundamentals of Permaculture and Village Design Practicum
Black Mountain, NC

Dates: September 18-26, 1998 (Fundamentals)
Location: Earthaven Village, near Black Mtn., NC
Description: The first part of a two-course series which completes the permaculture design certificate, Fundamentals presents principles and practices of permaculture design in a multi-intelligence community-based format. 44 hours of instruction are accompanied by celebration and creative play as we learn practical skills for cultivating land, conserving resources, building homes, and organizing communities.
Instructors: Peter Bane, Chuck Marsh, Patricia Allison, Andrew Goodheart Brown. *(See bios, pg. 60)*
Cost: $600 includes tuition, camping, curriculum materials, and a subscription to *The Permaculture Activist.* $50 off for registering by August 12, 1998. $100 discount if taking both courses. Other housing options available (limited) by special arrangement.
Contact: Culture's Edge, 1025 Camp Elliott Rd., Black Mountain, NC 28711. 704-298-2399. <earthaven@circle.net>

Dates: Sept. 28-Oct. 4, 1998 (Practicum)
Location: Earthaven Village, near Black Mtn., NC
Description: Designed as a stand-alone course in village design for those with a focus in community development, the Practicum will incorporate a site design exercise which will complete certificate requirements for individuals who have taken the Fundamentals course either immediately preceding or in prior years. Earthaven is a developing ecovillage in the southern Appalachian mountains which will be home to some 150 people when it is completed. Cutting edge social and physical technologies are being integrated with a complex and diverse mountain landscape to realize a new paradigm of human living. Examples of many natural building techniques and designs, alternative energy, ecological restoration, practical earthworking skills, organic gardening, and water and waste management are represented on site.
Instructors: Peter Bane, Chuck Marsh, Patricia Allison, Andrew Goodheart Brown *(bios on pg. 60)*, Greg Ramsay—architect and designer of Lake Claire CoHousing in Atlanta, and guests.
Cost: $600 includes tuition, camping, curriculum materials, and a subscription to *The Permaculture Activist.* $50 off for registering by August 12, 1998. $100 discount if taking both courses. Other housing options (limited) available by special arrangement.
Contact: Culture's Edge, 1025 Camp Elliott Rd., Black Mountain, NC 28711. 704-298-2399.

International Events

Two Permaculture Fundamentals Courses in Japan: Instruction in English & Japanese

Dates: November 15-22 (Aoyama, Mie)
November 29-Dec. 6 (Higashiura Chita, Aichi)
Locations: Aoyama, Mie Prefecture (near Kyoto-Nara)
Higashiura Chita, Aichi (near Nagoya)
Description: The first half of the Pc certificate course, (second half will be offered in 1998). This enriched curriculum will focus on village applications of permaculture andtools for cultural transformation, including group process work, developing creativity and intuition, and pattern languages for human settlement . Instruction will be in English and Japanese with simultaneous translation.
Instructors: Peter Bane, Chuck Marsh, Arjuna da Silva, all principals and founders of Earthaven Village in North Carolina, USA.
Cost: ¥75,000 includes meals and accommodation.
Contact: Marguerite Shaddy, +81-720-67-8804, <mshaddy@khc.kansai-gaidai-u.ac.jp>
OR
Noboru Matsumoto, +81-568-51-0988 ph/fx
402 Shiyona-cho, Kasugai-shi
Aichi-ken, 487 JAPAN

Networks & Resources

Rickshaws Roll in England

After successfully founding and operating the Oxford Rickshaw Company, which gives tours around Oxford, England (not an easy feat with unfriendly regulations looming), Erica Steinhauer has started a non-profit organization called the British Rickshaw Network. The aims of the network are to promote pedal-powered people- and load-carriers as part of the transportation mix in inner cities world-wide; to develop an information network focused on rickshaws and other pedal-powered transport; to lobby for legal changes to allow rickshaws to be licensed as taxis in the UK; to develop, research, and promote pedal-powered vehicles; and to promote, expand, and sustain small livelihoods based on rickshaws.

The vehicles used by the Oxford Rickshaw Company have been modified from the typical Indian design in which the driver has only one gear. The British version has 21 gears and hydraulic brakes: a fit woman can cart around two passengers in moderate terrain without much strain. Currently, students at Oxford college are the main tour operators, and tourists the main clients. Hyde Park in London may soon get a host of rickshaws on a similar tourist mission: Steinhauer hopes to expand the business possibilities for small operators and the transportation options of the general public by getting rickshaws licensed as taxis in the UK.

Rickshaws' freedom from pollution and human-friendly pace are attractive features of the pedal-powered transport: they succeed in being both environmentally- and community-friendly at the same time. If you are interested in more information or in supporting the work of the British Rickshaw Network through donations or other means, contact Erica Steinhauer, 40 Cowley Road, Oxford, OX4 1HZ, England. Tel: +44 1865-251-620, fax/-134.

New England Ecovillage To Be GEN East Coast Node

Ecovillage at Sirius is pleased to announce its commitment to be a model of sustainable, ecological living. To achieve this aim an office has been established to pursue three interrelated projects: to develop a model ecovillage through the systematic development of Sirius' appropriate technology and permaculture infrastructure; to create a School of Ecological Community Living offering courses in sustainability and implementing research, development and demonstration programs in sustainable living; to serve as the East Coast Office of ENA - Ecovillage Network of the Americas, the western hemisphere node of GEN, the Global Ecovillage Network.

The School of Ecological Community Living intends to offer credited and non-accredited programs, internships, and apprenticeships focussing on a number of —> exciting projects including ecological auditing and footprinting, solar greenhouse design and construction, solar/wind electric power system design, hydrogen power systems, permaculture design, spiritual community living, and wholistic health.

For further details contact Jeff Clearwater, ecovillage focalizer at 413-259-1254 (-1255 fax) or clrwater@valinet.com

California Newsletter Informs Market Gardeners

The *Farmers Market Outlook* reports bimonthly in its 12 page newsletter on California's thriving farmers markets, new crops, food safety, food preservation, legal issues, farmer profiles, and more. It includes interviews, book reviews, recipes, market listings, etc. A one-year subscription (6 issues) is $20. A list of back issues are also available from Farmers Market Outlook, PO Box 4220, Culver City, CA 90231.

Advice on Tools and Market Gardening

Growing for Market (GFM) is a monthly newsletter for small-scale horticultural businesses with money-making ideas and tool tips from all over the US and Canada. According to *GFM,* Europeans are way ahead of Americans in manufacturing human-powered tools that are appropriate for small scale enterprise. But some of the best of these tools are now finding their way into the American market. *GFM* carries articles and snippets on a wide range of topics from finding the right tools to advice on cooperative marketing to educating restaurant chefs about organic produce, unusual crops and times of harvest.

For further information write to: Growing for Market, Box 3747 Lawrence, KS 66046.

Reviews

Green Woodworking, cont'd from pg. 49

In addition, he touches on the history of the greenwood art, and gives a modern perspective. Neither a purist nor a traditionalist, he is happy to appropriate some modern tools into his practice of the ancient craft.

The whole book flows amazingly well, considering the huge range of topics it covers in detail, and—I might add—with loving care. Langsner is thorough: he addresses where to get wood and other materials, how to select the right tree to cut down, how to fell it safely, and what to look for if you are buying logs from a local mill or woodlot owner.

He deals at length with the factors involved in storing wood to make or keep it usable—such as ambient humidity in different regions of the country, how to slow evaporative drying to ensure good quality wood, how to deter decay and insect attack, etc. Through Langsner's explanations, you begin to know wood—the characteristics of ring-porous species, rays, reaction wood, knots, and what all these mean to you as a woodworker.

An important feature of the book are the easy-to-reference tables and charts, which outline such things as the comparative hardness and softness of many species, bendability, toughness, decay resistance, freedom from odor and taste (for food containers or utensils), riving quality, western species, and traditional craft uses for the non-lumber parts of trees. Many photos, drawings, and diagrams (like the sequence showing how to rive shingles from an oak log) illuminate the text.

The mysteries of shrinkage, wet/dry joinery, boring holes along the correct planes and angles, making ash splints for Shaker-style baskets, and bending pieces of wood for rakes, chairs, and basket handles are revealed. Body positions and techniques for sharpening and knife work lead Langsner into a sidebar on "Using Your Body Efficiently." He concludes by pointing out that "Facial grimacing is a waste of energy."

In the last of three major sections, Langsner profiles six green woodworkers: two basketmakers (Rachel Nash Law and Martha Wetherbee), a birch bark canoe maker (Henri Vaillancourt), a bowl carver, furniture sculptor, and house builder (Dirk Rosse), a part-time chair and furniture-maker (John Alexander), and a Windsor chair-maker (Dave Sawyer). While this section is not instructional, it is very interesting.

In some ways, this book is more broad than I expected, covering way more than just working with a shaving horse to make such things as rakes and chairs. My one disappointment came when I realized that the making and operation of a spring-pole lathe was not mentioned.

As the director of a traditional woodworking school in Marshall, N. Carolina (Country Workshops), Langsner has exceptional credentials to teach the craft of hand woodworking. The author of an earlier title, *Country Woodcraft,* he has put together in *Green Woodworking* a well-written, informative book that should remain a valuable resource for green woodworkers, far and wide. Δ

Permaculture Books

Introduction to Permaculture 22.00
Bill Mollison w/Rene Mia Slay. 2d ed. (1994) 216 pp. paper. illus. The basic argument for permanent agriculture: how to feed and house yourself in any climate with least use of land, energy, and repetitive labor. New material on patterns, cold climate. Supercedes *Pc I & II.*

Permaculture in a Nutshell 9.00
Patrick Whitefield. (1993) 75 pp. paper. illus. A back pocket gem, this book draws on the best examples in Britain and elsewhere to show how and why permaculture works. Excellent primer for introducing to friends.

The Permaculture Designers Manual 55.00
Bill Mollison. (1990) 576 pp. cloth. 450 illus. + 130 color photos. Global treatment of cultivated ecosystems. A resource for all landscapes and climates. Lucid illustrations by Andrew Jeeves bring Mollison's concepts to life. Essential, in-depth treatment of earth repair and practical design.

Earth User's Guide to Permaculture 16.00
Rosemary Morrow (1994) 152 pp. paper. Abundantly and charmingly illus. An informative and practical guide to permaculture, with exercises and real-life examples. Learn how to design a permaculture system on your own land, whether city balcony, suburban garden, or country farm.

Living Communities:
A Permaculture Case Study at Sol y Sombra 13.00
Ben Haggard. (1993) 152 pp. paper. illus. Permaculture through the eyes of a master gardener and the design of a particular place, the Miller estate at Santa Fe, NM. Valuable for its insights into the observation process. Haggard's prose is lyrical and his conclusions reach beyond his desert home.

Restoration Forestry:
A Guide to Sustainable Forestry Practices Worldwide 27.00
Michael Pilarski, ed. (1994) 526 pp. paper. illus. A combination resource guide to organizations and collection of essays on all aspects of sustainable forestry. Undoubtedly the most complete collection of material on the subject to date. Indexed by books, periodicals, articles, and general subjects.

Forest Gardening 18.00
Robert A. de J. Hart. 2d ed. (1996) 256 pp. paper. illus. Revised for N. American gardeners, this classic collection of essays on seven-story permaculture by the grand old man of agroforestry presents a gardener's ecology: water, energy, craft, herbs, health. Hart's tales of tree life and forest cultures thrill to the root.

Plants for a Future New Title!
Edible and Useful Plants for a Healthier World 30.00
Ken Fern (1997) 300 pp. paper. illus. Based on research conducted in Cornwall, England, and covering useful trees and shrubs, plants for shade, water plants, perennial veggies, ground covers, hedges, and more, this book describes plant characteristics and cultural requirements in depth. A fascinating read with appendices cross-referencing uses and habitat preferences, this is the book to get for temperate climate gardeners.

How to Make a Forest Garden 25.00
Patrick Whitefield. (1996) 192 pp. paper. illus. + 8 color plates. The most comprehensive guide to the subject: clearly written, well organized, and attractive, with British examples. Whitefield details garden design, pest & weed control, and planting techniques for temperate zones. Descriptions of 125 useful plants.

The Flywire House:
A Case Study in Permaculture Design for Fire 10.00
David Holmgren. (1993) 15 pp. paper. illus. spiral-bound. Succinct and illustrated with professional drawings of both building details and landscape plans, this slim volume covers a much-neglected aspect of property design with grace and clarity. Like good insurance, it's worth more than you pay.

The Independent Home: 20.00
Living Well with Power from the Sun, Wind, and Water
Michael Potts. (1993) 300 pp. paper. illus. Weaves 27 inspiring stories of the new energy pioneers and how they did it—nuts and bolts, diagrams & photos. Chapters on siting and building the home, repair & maintenance, economics of permanence, biologic energy, and community cooperation.

The Straw Bale House 30.00
Bill and Athena Swentzell Steen, David Bainbridge, David Eisenberg. (1994) 297 pp + xxii. paper. Extensively illustrated, with hundreds of b/w and 26 color photos. Straw-bale construction is sweeping the country. This book explains why in thorough detail. The best reference we've seen.

Build It With Bales:
A Step-By-Step Guide to Straw-Bale Construction 20.00
S.O. MacDonald and Matts Myhrman. (1995) 80 pp. paper. A thorough instruction manual. All you need to know to go out and do it, loadbearing or non-loadbearing. Packed with drawings.

☞ *The Cobber's Companion* New Title! 20.00
Michael G. Smith. (1997) 117 pp. spiral bound. illus. A practical and clearly written guide to building with *cob,* or lumps of earth and straw; with charming illustrations and *joie de vivre* evident throughout. Covers soil composition, sitework, materials, foundations, technique, sculpture, roofing, floors, finishes, tools.

Chicken Tractor:
The Gardener's Guide to Happy Hens and Healthy Soil 16.00
Andy Lee. (1994) 230 pp. paper. illus. Chicken tractors are mobile coops, a clever way of using domestic poultry (or other animals) for pest control and garden fertility with very little work on your part. Lee is thorough, witty, and consistently upbeat about the permaculture value of chickens.

Cornucopia: A Sourcebook of Edible Plants 40.00
Stephen Facciola. (1990) 678 pp. paper. Lists over 3,000 species with all commercially available named cultivars, sources of seed, plants, descriptions, uses, cultural notes, food products; indexed by common name, families and genera. A monumental work useful to every garden designer.

Seed to Seed:
Seed Saving Techniques for the Vegetable Gardener 20.00
Suzanne Ashworth. (1991) 222 pp. paper. illus. The best single-volume guide to saving our vegetable heritage. Discusses techniques and references botanical classification, pollination, crossing and isolation, seed production, harvest, processing, and viability for more than 150 vegetables and herbs.

Designing and Maintaining Your Edible Landscape Naturally **25.00**

Robert Kourik. (1986) 370 pp. paper. illus + 19 color photos. Permaculture in the home garden: mulch gardens, double digging, root zones, pruning, companion crops, natural pest control. Excellent diagrams, charts, species lists.

The Permaculture Book of Ferment & Human Nutrition **30.00**

Bill Mollison. (1993) 288 pp. paper. illus. 35 color photos. Comprehensive global survey of methods extending the author's life-long concern with core human survival issues. Treats food storage, preservation, cooking, fungi, yeasts, grain, legumes, roots/bulbs, fruits, flowers, nuts, oils, aguamiels, fish, algae, meats, birds, insects, dairy, beer, wine & beverages, condiments, agricultural ferments, hygiene, food toxins, vitamins, enzymes, trace minerals & nutrient sources, & use of earths to enhance food value.

The Humanure Handbook:
A Guide to Composting Human Manure **19.00**

Jos. C. Jenkins (1994) 198 pp. paper. illus. Delves deeply into the ever-present subject of human waste. Examines the various systems for disposal and treatment, and recommends thermophilic (hot) composting as the simplest, cheapest, most ecological method. Writing from personal experience and extensive research, Jenkins answers all the questions you never dared ask!

The Earth Manual:
How to Work on Wild Land Without Taming it **16.00**

Malcolm Margolin. (1985) 238 pp. paper. illus. A friendly guide to earth repair in the wild, with chapters on wildlife, tree-planting, felling, pruning and repair, mulch, erosion control, seeding, transplanting, trailmaking, ponds, and doing it all with children. Filled with good common sense.

The Man Who Planted Trees **8.00**

Jean Giono. (1985) 56 pp. paper. This timeless and inspiring tale of one man's dedicated efforts to reverse desolation has been beautifully illustrated with 20 woodcuts by Michael McCurdy. A story for all ages.

Directory of Intentional Communities **21.00**

Newly Revised (1995) 426+ pp. paper. illus. More than 500 North American and 50 international communities, 250 alternative resources, 31 articles on community living. Comprehensive, exciting survey of a maturing movement for cultural transformation.

Reclaiming Our Cities and Towns **13.00**

David Engwicht. (1993) 190 pp. paper. illus. Insightful critique of auto traffic: how it destroys the fabric of urban life. An eco-city design primer linking the built environment with social life.

Urban Permaculture: A Practical Handbook **13.00**

David Watkins. (1993) 152 pp. paper. illus. How-to's of growing food and saving energy in the urban household. Domestic waste, green economics, non-toxic cleaners, garden layouts, species lists, breeds of small animals.

Village Wisdom / Future Cities New Title!
The Third Int'l Ecocity and Ecovillage Conference **16.00**

Richard Register and Brady Peeks, eds. (1997) 227 pp. paper. illus. Compiles speakers' offerings on agriculture, housing, wastewater, women's issues, and much more. A good balance of cutting edge theory and living examples from many cultures and perspectives. Expand your concept of what's possible for cities!

Crystal Waters Village:
Conceptual Permaculture Report **17.00**

Max O. Lindegger & Robert Tap. (1989) 80 pp. pap. illus. Advanced proposal for an agricultural economy at the first permaculture village in Australia. Pioneering work.

Boundaries of Home:
Mapping for Local Empowerment **10.00**

Doug Aberley, ed. (1993) 138 pp. paper. illus. Mapping is the first step toward reclaiming the territory. How to envision the landscape of home: 19 passionate essays on bioregional mapping, theory & examples from city and country, USA, Canada, Britain. Info on using GIS, resource assessments, review of cartographic sources, many and varied example maps.

New Money for Healthy Communities **16.00**

Thomas H. Greco, Jr. (1994) 201 pp. paper. illus. Demystifies money and describes how it may be transformed to support local economies. Describes L.E.T.S. and other local trading programs, alternative currencies, barter and labor service systems, with historic examples. A prime resource!

Interest and Inflation-Free Money **15.00**

Margrit Kennedy. (1995) 144 pp. paper. illus. Pinpoints interest and compound interest as the fatally flawed assumption which both drives the global economic system and wrecks the earth. Proposes sweeping tax, land, and monetary reforms.

Sacred Land, Sacred Sex: Rapture of the Deep **25.00**

Dolores LaChapelle. (1988) 386 pp. paper. illus. "How do we begin moving toward a real culture? All we have to do is raise one generation of children right--according to the pattern laid down by hundreds of thousands of years of our mammalian ancestors." A manual of deep ecology, a guide to ritual, an essential history of our species.

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Permaculture Videos

Please include $3.00 shipping for one or both films

The Global Gardener **30.00**

120 min. VHS. (1991) Bill Mollison's review of permaculture accomplishments around the world. Made for Australian Broadcasting Corp. and aired to national acclaim. Four half-hour segments highlight subtropical, drylands, temperate, and urban systems with footage from developed sites in India, So. Africa, Australia, the U.S., U.K., and Europe.

In Grave Danger of Falling Food **35.00**

56 min. VHS. (1989) A wacky romp through Mollison's life as an outlaw. Cartoon cutaways and bizarre sound effects seem no stranger than Bill loping along the street in front of Aussie suburban sleaze, guerrilla planting hazelnuts. A campy period piece, this film tells the permaculture story with verve and imagination.

Letters

Landholding Strategies in France

Greetings,

I'm just back from a winter in Sicily, writing a manual for crop production using the self-fertility of the soil. So far, I've just written it for one climate.

Today the *Permaculture Activist* arrived—it's good to feel linked in a sane wave. Latin Europe is still asleep, although things are beginning to change. For instance, the LET System that Sego Jackson brought to France in '85, and which was once considered unrealizable, is spreading like brush fire all over France. Here, it is called "le SEL" and people who are not even eco-sensitized yet are getting involved.

I'm starting a new experimental garden in Les Alpes Maritimes, not far from where I had the previous one. People interested in apprenticing, please contact me.

In relation to Bruce Shearer's Pc Community Land Trust Network proposal: Another strategy to "lock land" is putting it in the trust of a large number of buyers. A collective purchase. Community supported homesteading. A minimum of 30 people is recommended to prevent consensual agreement on selling the land again.

In France, for example, any non-profit organization governed by the 1901 Law (and Land Trusts fall into that category), suffers from a great unsustainability: if the "authorities" don't like what is happening, they can outlaw the organization by finding something wrong in the functioning of it. They can even confiscate all property if they so chose.

In France in the 70's, to defend le Larzac and prevent the army from extending their camp, land was bought collectively. Today, to defend the last territory of the last Pyrenean bears, land is bought this way to prevent the Funneltunnel and truck route from Morocco to Lapland. Because all the buyers must agree to sell collectively-bought land, it has more chance to survive greed than land bought in any other way.

To secure the land for the eco-hamlet project in the Pyrenees, we are doing it this way: The land for the village is bought by only five people, the homesteaders. The rest of the property is bought by the homesteaders and 30 other people—the supporters. The decisions concerning the lives of the homesteaders are in their own hands. Since consensus of five people is possible, this gives the flexibility for someone to leave and another to come in, with the agreement of the rest of the settlers. Since the consent of 35 people is needed to sell the land, the "Land-Holding" has a lot of stability.

Best wishes,
Emilia Hazelip
Assoc. Las Encantadas
B.P. 217
F-11300
Limoux, France
tel: 00 04 68 31 51 11

Editor's note: See the Networks section for more on the eco-hamlet.

F-16's Bring Good News

Dear Pc Activists,

I recently came across something commemorating the aviation accomplishments of the F-16 military jet. Usually anything having to do with weapons would turn my stomach, but this time I saw the F-16 differently and experienced a realization.

By suspending judgment, the F-16 can be seen as an astounding achievement visualized and created by designers, manufacturers, consultants, politicians, and so on. These amazing jets, costing about $10 million each, can propel a pilot and heavy armament payload at three times the speed of sound. The pilots are trained at a cost of $1 million each, and, among the weapons are highly accurate and reliable "smart bombs," each carrying a price tag of $1 million.

Now, again, without judgment, let's compare the F-16 situation to another effort in our communities—permaculture. With very few exceptions, no tax dollars are being spent on infrastructure for permaculture development. Our permaculture consultants (the pilots) are self-trained. They spend their own hard-earned savings to gather useful knowledge, including attending certification courses costing hundreds of dollars.

Most people, after reading the above two paragraphs, experience sadness and disappointment, if not outright anger, and perhaps even a sense of hopelessness. I really mean most people—there are very few people in the world who think jet fighters should receive enormous funding (trillions of dollars), while sustainable community and resource development receives virtually no public funding. Nevertheless, the F-16 experience shows us what is possible to accomplish and how far we permaculturists have to go to see our visions realized on the level and scale of full community support.

What is different about the way I and other permaculturists communicate as compared to the developers/proponents of F-16 technology? I notice that most permaculture activists in my community appear to be more committed to fighting than getting the results they want. We know this simply because of the less-than-satisfying results we are individually

and collectively producing.

Meanwhile, there are many people who are getting the results they want, such as the builders of the F-16 aircraft, irradiation facilities, and waste disposal sites. These goal-oriented people are focused on specific results, not fighting. We know this simply because they are in fact achieving the results they set out to achieve. Any fighting they do is to satisfy the opposing activist's need to fight, and they do so without diminishing their own ability to get the job done. In short, they spend their main energy working towards and for something not against or opposed to something.

Zen masters say the way to be powerful is to get people to do what they are already doing. A powerful way to end this letter would to be to recommend that we permaculturists continue to communicate the way we have been. Based on our track record, this will ensure that we won't get community funding in F-16 proportions.

Please direct any comments to the editor of this magazine or electronically to me at the addresses below.

Craig Elevitch
<comcom@gte.net.>
http://homel.gte.net/comcom/homepage.htm

Low-Cost Housing

Dear Peter Bane,

An investigation into low-cost housing (such as straw-bale houses) might well include perusal of *The $50.00 and Up Underground House Book,* by Mike Oehler. Out of print, but available in many libraries or via inter-library loan. (Caution: Mr. Oehler's opinions may offend feminists, but his housing insights are still valid.)

Frank Humiston
8835 Tamberley Way, #A
Santee CA 92071-4264

P.S. I really appreciate the articles on Straw Bale Building. I am more fond of hands-on & techniques-type articles than philosophy or the like.

Ecology: For Industry or Nature?

Dear Peter,

I wish to address several issues brought up in Hardin Tibb's article, "Industrial Ecology," *(PCA* #28).

Firstly, Tibbs assumes all countries want material prosperity, and this will be achieved through global industrialization. This wish means market growth to western countries, and being in line with "current economic and democratic rhetoric this seems inevitable." What scares me is the unabashed and ruthless way in which so many western businesses and commercial ventures have barged into these new and forming markets. The transnational conglomerates are gorging themselves on this weak and disabled prey.

Secondly, an argument of "equity" is posed, making global industrialization "morally unavoidable." Exactly what type of equity is Tibbs posing? Social, commercial, financial, racial, inter-generational? Or perhaps equity in local and regional air and water pollution, food contamination, soil erosion, and typically western-lifestyle health catastrophes, such as hypertension, cardio-vascular disease, mental illness, and a plethora of cancers.

I do not accept the total industrialization of the globe as inevitable. What we as permaculturists seek is to find solutions close at hand, preferably simple and efficient, that help generate healthy, local communities and bioregions. Global industrial production and markets simply don't fit into this wholesome picture of local self-reliance and sustainability.

Thirdly, look at the Danish "model" exemplified in Tibb's article...it is ultimately unsustainable, as the system is driven by the non-renewable fossil fuels of coal and oil. It is, at best, an example of making pre-existing patterns of industry more efficient in the short term. Unfortunately, the fossil fuel industries see alternatives as competition and actually often vigorously fight the renewable energy industries. As far as proximity goes, this is very important, if not essential. Local energy supplies and industry are essential in maximizing energy efficiency and minimizing waste.

And fourthly, the example of the "green and pleasant land of 19th and 20th century England" was based on the exploitation of non-renewable energy sources and the cheap uneducated labor of the oppressed working class by the wealthy of Bonnie Britain.

I have searched hard, but in Tibb's article can find no model, conceptual or material, that will bring about the profound and necessary changes that need to take place in our thoughts and actions to arrest the impending global environmental crisis. Applied industrial ecology may offer much in the future, but until then it has a long way to go. We are in a race against ourselves and against time, and if we don't get into top gear right now the biosphere, (that includes us too), will be the big loser.

We need awareness, commitment, and action from every individual, family, community, bioregion, and nation to arrest the global environmental crisis. This may mean going witout some of the modern comforts we have so quickly and haphazardly accepted, but it is a small price to pay for the health and well-being of Earth and her offspring.

Matthew Kovacs
c/o Schillerslager Str. 37
31303 Burgdorf, Germany

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"What Have We Done ?" - new book discusses state of the Southern Appalachian bioregion. The first of its kind, supplying full details and naming the responsible parties, the book traces: the causes, effects, and interrelations of forest death in the Smokies; species extinction; clearcutting; invasive species; the decline of regional agriculture; municipal, toxic and nuclear waste; overpopulation; overdevelopment and more. This book is a valuable tool for those who want solid information backed up with statistics and research citations. $19.95+, call Jonathan Scherch at 423-524-4771 for orders. -37a

Indigenous Earthlings ! Searching for sustainability tools? Send for our new 19 page Resource List $10. Write Indigenous Earthings, 317 S Division, Suite 183, Ann Arbor, MI 48104 -37a

"Wonderful!" —John Jeavons. Discover "Permaculture Garden," "Mister Prune-Right," "Paperback Mulcher," other classics. *The Beetless' Gardening Book: An Organic Gardening Songbook/Guidebook,* $10.95 ppd., Carrotseed Press, POB 1174, Cottage Grove, OR 97424. SASE for free info. -37a

LAST CALL FOR LISTINGS: *The Pilgrim's Guide to Permaculture Sites of North America* is accepting final site and resource listings now! Write, fax, or call ASAP for listing forms or more information: Chuck Marsh, Pilgrim's Guide, 55 Grove St. #15, Asheville, NC 28801. Ph/fx: 704-254-5454.

Miscellaneous

Northern Groves - Rick and Gretchen Valley and family have a new address. For Northern Groves catalog and bamboo info, send $2.00. 23818 Henderson Rd., Corvallis, OR 97333. -37a

Green Goods

Grain Growers and Knowers needed; used small-scale equipment or plans (milk, threshers, etc.) Seed needed and available. Resources and networking for NW grain growing. Cortes Island Experimental Grain Growers c/o Forest Johnson, Gen. Del., Manson's Ldg. Cortes Is., B.C . VOP IKO. -37

Internships

5-week Intensive Permaculture Course/ Self-Reliance Internship, July 1-August 7, 1998. Incorporating the PC Design Course, high-altitude greenhouse and market gardening, aquaculture, greywater systems, and medicinal herbs. Emphasis on permaculture livelihoods and integrated systems. Field trips to local farms and Pc sites. Jerome Osentowski and guest instructors. $1700 includes camping and all meals. -39

The Little Black Dog/Earthsong Permaculture and Earth Awareness Center in upstate New York has openings for interns during the summer and fall of 1997. As the center is in its early stages of growth, participants can expect to experience natural building, forest gardening, and permacultural design, as well as nature awareness, primitive skills and more. Give us a call or write to explore the possibilities for creating a personalized, mutually beneficial experience. The internship will be based on the exchange of work and education in return for room, board and a small stipend. Little Black Dog Farm, PO Box 162, Cherry Valley, NY 13320. (607) 264 3422. -37

Help Wanted

Common Ground conducts outdoor trips, organic gardening, and straw-balin' for people of all abilities. NOW accepting applications for positions in bookkeeping, development and paid internships. COMMON GROUND, 1095 N. Main, Logan, UT 84341. -37a

Brooks Hill Farm—new pc site in central Kentucky. Visitors/pilgrims welcome. Contact D.B. Hill, 410 Redding Rd., #39, Lexington, KY 40517 (606) 271-9499. dhill@ca.uky.edu/ fax:(606) 323-1031 37a

SPECIAL NEEDS : Work and live with developmenatally-disabled children and youth in a community setting with 12 comfortable family residences. Minimum age 20, minimum committment one year. Receive room and board, vacation allowance, use of car, and monthly stipend. We are a non-denominational community of about 150 people in SE Pennsylvania. If you are looking for meaning and fulfillment in your work and life, please write to: Co-worker Admissions, Camphill Special School, 1784 Fairview Road, Glenmoore, PA 19343. -37

Wanted Immediately: 1 or 2 experienced organic farmers to join Bittersweet CSA, an established 55-share project in North Central

Massachusetts. Owner is selling farm and relocating. We are putting together a new team to work with the existing farm manager. Housing available. Long term lease or ownership opportunity. Mt. Graceland Conservation Trust will permanently secure the farm. Call Patti Stanko:(508) 297-0996 or send written description of farming experience to 683 River St., Wichendon, MA 01475. -37

Self-financed volunteers needed to help design and construct a permaculture demonstration site in Buena Vista Spa, Baja, Mexico. Work opportunities include bed building, nursery set-up, compost making, building design, plumbing, computer skills. Some Spanish language required. For information, contact Central Rocky Mountain Permaculture Institute. Tel/fax: 970-927-4158. Email: permacul@rof.net.

Business Opportunities

Understudy to eventually take over 8-10 acre organic orchard/forest garden containing berry crops and experimental tree, vine, and shrub crops from all over the world. Collection started 18 years ago. Semi-communal living situation. Very scenic area. Orchard operated in connection with Hidden Springs Nursery, introducing new perennial crops to the US. Stipend, profit share. Write H. Black, 170 Hidden Springs Ln., Cookeville, TN 38501. Phone: 615-268-9889. Email: hblack@multipro.com. -37a

Situations Wanted

Community garden co-ordinator/ budding permaculturalist/agroforester seeks internship or career opportunities in US or abroad. All contacts welcome. RY THOMPSON 120, State Avenue, NE #1444 Olympia, WA 98501 (360) 786 5393 ryth@elwha.evergreen.edu -37

Services Offered

1997 Permaculture School Naturist Co-op Camp, May 1 - October 31, 1997. Namasté Green, Barnstead, NH 03225. Featuring earth building and design (cob/strawbale/solar), poly-aquaculture, biodiversity. Seasonal tuition—$500/adult (campsite, workshops, facilities). - 37a

Vancouver PC Network Information/ Skills Exchange Bioregion. Contact D. Falvey. (604) 876 7330. -37

Domaine de Magot—SW France, 80 acre wilderness retreat, agroforestry, and farm/nature reserve. Guests/ interns, and working visitors. Fax: 00 44 1865 251 134. - 37a

Communities

Earthaven Village, a permaculture community and learning center growing in the North Carolina mountains, has home and business sites available for skillful pioneers able to co-create an eco-spiritual, bioregional village near Asheville, NC. Thirty plus members are creating the first housing cluster within the village now! To find out more, send $15 for info packet and 6 mos. newsletter subscription to Box 1107, Black Mtn., NC 28711. - 37a

Small group of fun-loving, committed Permaculturalists seeks families or individuals to create Eco-Village in Colorado. Please send your vision and brief bio. We'll respond to all replies. John English, 420 E. 7th St., Durango, CO 81301. - 37a

Barnstead, New Hampshire: Permaculture activism, land trust, wilderness preserve/conservancy, cluster co-housing, co-investment/ co-participants, intentional community. (603) 776-7776. -37

Pangaia- a tropical permaculture farm/ homestead focussed on creating our own food, fun, and consciousness with a raw food main kitchen. Open to tours, guests, interns, and residents. Steven Martin, RR2 Box 3950 Pahoa, HI 96778 (808) 965-6069. -37

N. California Land-Based Community seeking new members! Sandy Bar Ranch is a collective of fun-loving, hard workers creating a sustainable living/working alternative in the Klamath mountains. We run several businesses, including educational workshops and cabin rentals, and are designing a garden area along permaculture principles. We are seeking people interested in collective living and permaculture, with experience in general maintenance, gardening, hotel management, and marketing. Good communication, self-motivation, and a sense of humor are essential. Contact us at: PO Box 347, Orleans, CA 95556. Tel: 916-627-3379. Or email us at: sandybar@earthlink.net. -37a

Personals

Seeking young, aspiring permaculturalists to study and hang out with in VT, NH, ME. PO Box 234, Eaton, NH 03832. -37a

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CALENDAR

September 5-7, 20-21, October 4-5, 18-19. Washington State. Permaculture Design and Natural Building Course. Michael Lockman, PO Box 45472, Seattle, WA 98145. 206-323-6567.

September 6-19. Oakville, WA. Permaculture Design Course. Permaculture West, 72 Mattson Rd., Oakville, WA 98568. 360-352-6509 fx/-273-7117, permawest@olywa.net

September 11-14. Pearce, AZ. Patterning Intensive. Vicki Marvick, (520) 824-2465. vmarvick@aol.com.

September 12-20. Summertown, TN. Permaculture Design Practicum. EVTC. 615-964-4324. email: ecovillage@the farm.org

September 13-26. Masonville, CO. Permaculture Design Course. High Altitude Permaculture Institute. Box 238, Ward, CO 80481. (303) 459-3494.

September 19-21. Occidental, CA. Seed Saving Workshop. Occidental Arts and Ecology Center, 15290 Coleman Valley Rd., Occidental, CA 95465707-874-1557, fax/-1558. <OAEC@igc.org>

Sept. 20-21, Oct. 4-5, 11-12, 25-26. Tuscon, AZ. Weekend Permaculture Design Course. Barbara Rose, (520)744-9305, or PDI, PO Box 156, Santa Fe, NM 87504. (505)983-0663. http://www.amug.org/nshadetre.

September 26-28. Freeland, MD. Weekend Workshop: Integrating Perennials. Heathcote Community. (410) 343-3478.

September 27. Albuquerque, NM. Practical Permaculture: Water Catchment and Erosion Control. 505-473-CORN, or www.sfpermaculture.com.

October 3-11. Black Mountain, NC. Permaculture Fundamentals for Women. Culture's Edge, Earthaven Village, 1025 Camp Elliott Rd., Black Mountain, NC 28711. 704-298-2399. <earthaven@circle.net>

October 4. Guinda, CA. 11th Annual Hoes Down Harvest Festival, Committee for Sustainable Agriculture Benefit. Dru Rivers 916-796-3464.

October 5. Capay Valley, CA, near Sacramento. Organic Farm Bus Tour. Dru Rivers 916-796-3464.

October 10-13. Dexter, OR. 1st Annual Lost Valley Permaculture Reunion. Lost Valley Educational Center, 81868 Lost Valley Lane, Dexter, OR 97431. 541-937-3351. <lvec@aol.com>

October 20-24. Occidental, CA. Green Woodworking Course with Don Weber. Occidental Arts and Ecology Center, 707-874-1557, fax/-1558. <OAEC@igc.org>

October 21-23. San Marino, CA. The Second International Oak Conference. California Oak Foundation, Int'l Oak Conf., 1212 Broadway, Suite 810, Oakland, CA 94612.

October 25-26. Occidental, CA. Introduction to Permaculture. OAEC, 707-874-1557, fax/-1558. <OAEC@igc.org>

October 28-31. Kutztown, PA. Regenerative Agriculture for the 21st Century. Jane Fisher, Rodale Institute, 611 Siegfriedale Rd, Kutztown, PA 19530. 610-683-1428, fx/-8548. <jfishe@rodaleinst.org>

November 14-16. Western North Carolina. Sustainable Agriculture Conference. 919-542-2402.

November 29-December 12. Molokai, HI. Permaculture Design Course. Friends of the Trees. PO Box 4469, Bellingham, WA 98227. 360-738-4972.

December 1-13. Dexter, OR. 7th Annual Permaculture Design Course. LVEC. 541-937-3351.

January 21-24, 1998. Pacific Grove, CA. Ecological Farming Conference. Committee for Sustainable Agriculture, 406 Main St., Watsonville, CA 95076. 408-763-2111, fx/-2112.

February 6-14. near Gainesville, FL. Fundamentals of Permaculture. Crone's Cradle Conserve, PO Box 535, Orange Springs, FL 32182. phone 352-595-3377.

Late March. Buena Vista Spa, Baja, Mexico. Permaculture Design Course. Central Rocky Mtn. Permaculture Inst., Box 631, Basalt, CO 81621. Tel/fax: 970-927-4158. <permacul@rof.net>

May 8-16. Summertown, TN. Fundamentals of Permaculture. Ecovillage Training Center (ETC), PO Box 90, Summertown, TN 38483. <ecovillage@thefarm.org>

September 18-26. Black Mountain, NC. Fundamentals of Permaculture. Culture's Edge, at Earthaven Village. 704-298-2399.

September 28-October 5. Black Mountain, NC. Village Design Practicum. Culture's Edge, at Earthaven Village. 704-298-2399.

Natural Building Calendar

September, TBA. Western Oregon. Women's Cob Earthen Home Building Workshop. Systers of Creation, PO Box 14194, Portland, OR. 97293. 503-224-6136. sparking@teleport.com. http://www.teleport.com/~sparking.

September 5. Sandy Springs, MD. Strawbale Public Lecture and Slide Presentation. Suse Greenstone, Blueberry Gardens, 609 S.E. York Lane, Leesburg, VA 20175.

September 5-7. Ashton, MD. Strawbale Building Workshop. Suse Greenstone, Blueberry Gardens, 609 S.E. York Lane, Leesburg, VA 20175.

September 5-7. Sedro Wooley, WA. Strawbale Building. Sun Ray School of Natural Living, 1356 Janicki Rd., Sedro Wooley, WA 98284. 360-854-0413. e-mail: jkelly@ncia.com

September 6-7. Canelo, AZ. Light Clay/Fiber Construction. The Canelo Project, HC1 Box 324, Elgin, AZ 85611. 520-455-5548, fx/-9360.

September 13-14. Seattle, WA. Straw Bale Construction: Two-Story Urban Infill. GreenFire Institute. (206) 284-7470. email: Ted@balewolf.com.

September 14-19. Canelo, AZ. Comprehensive Straw Bale Workshop. The Canelo Project. 520-455-5548, fx/-9360.

September 14-28. Sedro Wooley, WA. Roof Thatching. Sun Ray School of Natural Living.

September 20-21, 27-28. Sebastopol, CA. Ferrocement Tank Workshop. Sonoma Permaculture, 3696 Burnside Rd., Sebastopol, CA 95472. 707-829-5524. <keithdj@sonic.net>

September 28-October 4. Tlaxcala, MEXICO. Traditional Mexican Building/Thatching. The Canelo Project. 520-455-5548, fx/-9360.

October 18-24. near Knoxville, . . Cob Building Workshop. Cob Cottage Company, PO Box 123, Cottage Grove, OR 97424. 541-942-2005, or 541-942-3021.

November 2-8. Canelo, AZ. Cob Construction Workshop. The Canelo Project. 520-455-5548, fx/-9360.

November 2-6. Central TX. Advanced Cob Building and Design. Cob Cottage Company. (541) 942-3021.

November 7-9. Tucson, AZ.. Load-Bearing Strawbale Building Workshop and Tour. De Havillan Workshops, c/o Out On Bale-By Mail, 1039 E. Linden St., Tucson, AZ 85719. 520-624-1673.

December 5-7. Tucson, AZ. Load-Bearing Strawbale Building Workshop and Tour. De Havillan Workshops. 520-624-1673.

January 11-17, 1998. Cuidad Obregon, Sonora, MEXICO. Straw/Earthen Construction for Developing Countries. The Canelo Project. 520-455-5548, fx/-9360.

February 21-22. Canelo, AZ. Natural Paints and Wall Finishes. The Canelo Project. 520-455-5548, fx/-9360.

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