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RAIN

Journal of Appropriate Technology

APRIL 1977

VOLUME III, NO. 6

ONE DOLLAR



INSIDE:

Job-Making Windmills

Gourmet Eating: Earthworms, Leaves

and Dishwater

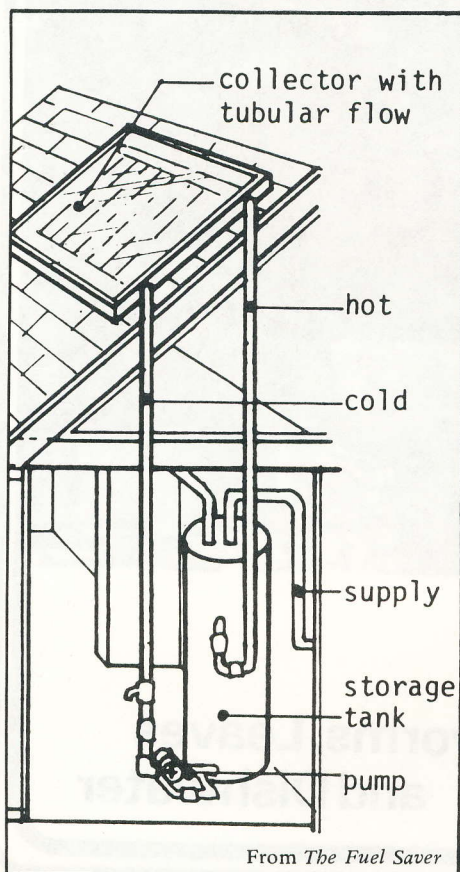
RAIN *access*

ENERGY

Evaluation of an Operational Anaerobic Digester for a 350 Cattle Unit Dairy at Monroe, Washington: Phase I Organization Report, Ken Smith, 9 pp., \$1 post-paid from:

Ecotope Group
747 16th Ave. East
Seattle, WA 98112

A status report is now available on a proposed program to re-start the digesters constructed at the Monroe State Dairy Farm in 1975. Prepared for the Dec. 13-14, 1976, meeting of the "Fuel Gas Production from Animal Residue Coordinating Group" in Palo Alto, Calif., it is a supporting document in Ecotope Group's contract negotiations with US-ERDA, Div. of Solar Energy, Fuel from Biomass Program. Other coordinating group team members are



From *The Fuel Saver*

William J. Jewell, Cornell Univ.; John T. Pfeffer, Univ. of Illinois; Warren Coe, Hamilton-Standard Labs, Windsor Locks, Conn.; Andy Hashimoto, USDA-Animal Meat Research Center, Clay Center, Nebr.; and Perry L. McCarty, Stanford Univ.; the entire group being coordinated by Don L. Wise and Ralph Wentworth of Dyna-Tech R&D Corp., Cambridge, Mass. This report is useful to bioconversion researchers and to dairy farmers who already have Ecotope's earlier feasibility study. (LJ)

Analysis of Bacterial Populations in the Final Product of the Clivus Multrum, H. Wayne Nichols, Dec. 7, 1976, from: Center for the Biology of Natural Systems
Washington University
St. Louis, MO 63130

Final report of bacteriological study of the compost generated from nine Clivus Multrum installations—two in the U.S. and seven in Sweden. The number and types of bacteria found were similar to those occurring in soils. The pathogenic bacteria found in Multrum samples were species known to occur widely in soil and were quite low in quantity—less than two percent. The indicator species for fecal contamination was not found in any Multrum samples. The study concluded that the bacterial composition of the Multrum product is similar to that of soil, the pathogenic potential is similar to that of soil, and the Multrum product appears suitable for use as a soil amendment. (TB)

The Fuel Savers, Dan Scully, Don Prowher, Bruce Anderson and Douglas Mahone, 1977, \$3.00 from: Northwest New Jersey Community Action Program
Old Firth School, Prospect Street
Phillipsburg, NJ 08865

A kit of solar ideas for existing homes—an outstanding how-to manual describing 20 methods for heating homes and hot water using low-cost techniques and conventional materials. Economic evaluation, disadvantages, where and how each will work is given, and the ideas are shown applied to eight different houses. This is the first sensible guide to low-cost solar remodeling of existing houses. (TB)

Residential Solar Hot-Water Heating and Space Conditioning Systems in Northern California: A Brief Survey, B.A. Greene, October 1976, LBL-5229, available at cost (\$2.50) from:

Publications Office
California State Energy Commission
2111 Howe Ave.
Sacramento, CA

Presents data on 60 residential solar systems located within San Francisco Bay area and Northern California regions. Includes details on the building itself, the solar system, collector, storage, auxiliary (backup) system, initial costs and performance to date. An excellent example of what each state energy agency, office or commission should do to take up, on a state-wide level, where Bill Shurcliff's 13th and final solar building survey on a national level left off. (LJ)

Shower Flow Controls, \$1 from: Noland Company
2700 Warwick Blvd.
Newport News, VA 23607

They're selling at \$1.29 in local discount stores but, as you might expect, it's cheaper direct from the manufacturer. This small, unnoticeable plastic device reduces the maximum flow of water through a 1/2" I.D. shower arm from the normal 7-10 gal./min. to 3 gpm. This is a substantial reduction in the volume of water used, and especially hot water, which you now pay less to heat less of. Yet the "quality of life" . . . how the spray feels . . . is not noticeably different. Ask about their units for kitchen and bathroom sinks when you order and about how cheap these things get if you order with friends. (LJ)

Instatherm and ThermAtrace
Barnes Engineering Co.
30 Commerce Road
Stamford, CT 06904

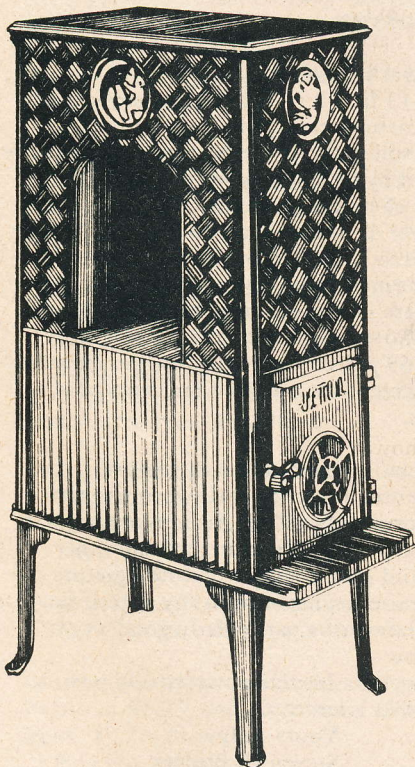
Barnes has developed new simplified thermal monitoring tools that promise lower cost thermography applications for monitoring insulation levels in buildings. Instatherm checks one spot at a time, and ThermAtrace scans one line at a time, as opposed to a TV-like thermal picture of earlier thermography equipment. They are priced nearer to

RAIN is a monthly information access journal and reference service for people developing more satisfying patterns that increase local self-reliance and press less heavily on our limited resources.

We try to give access to:

- * Solid *technical support* for evaluating and implementing new ideas.
- * *Ecological and philosophical perceptions* that can help create more satisfying options for living, working and playing.
- * *Up-to-date information* on people, events and publications.

\$700 and \$7,000 respectively, as opposed to \$2,500 to \$40,000 for previous equipment. (TB)
(Suggested by Morgan Campbell)



A Wood Stove Buyer's Guide, Albie Barden, 1977, \$3.50 retail, \$2 wholesale, from:

Northeast Carry
110 Water Street
Hallowell, ME 04347

A handsome 2'x3' poster that brings together in one place the now bewildering assortment of imported and locally made wood stoves so you can compare them and their vital statistics, costs and features. The reverse side contains a comparative discussion of different stoves. The discussion of operating principles of different stoves isn't as useful as Jay Shelton's fine analysis (no one else seems to mention that a stove-pipe damper is as useful as an airtight stove or that burning efficiency isn't as important as combined efficiency of burning and heat transfer), but contains useful information. (TB)

Spectralite Fluorescent Lighting Fixtures

Garcy Lighting
1822 N. Spaulding Avenue
Chicago, IL 60647

For people interested in the full spectrum lighting advocated by Dr. John Ott in *Health and Light*, the fluorescent fixtures are finally being produced by Garcy Lighting. Not cheap—\$100-\$170 for 1'x4' or 2'x4' fixtures without lamps, and will not be available with D.C. stabilizers for another year. Other full-spectrum products now available include:

Ultraviolet transmitting eyeglass lenses are available from:

Armorlite Lens Co.
130 N. Bingham
San Marcos, CA 92069

Ultraviolet transmitting contact lenses are available from:

Wesley Jessen, Inc.
P.O. Box 6368
Chicago, IL 60680

And two companies produce ultraviolet-transmitting window plastic:

Rohm and Hass Co.
Independence Mall West
Philadelphia, PA 19105
(UVT Plexiglass)

and

American Cyanamid Co.
Berdan Ave.
Wayne, NJ 07470
(UVT Acrylite)

A.T. Information Needed in Nürnberg, Germany. If you have something useful to share, send it to:

Tina, Otto U. Gisbert
EICHENMULE
Gögelmann/Otterbach/Eyb
Rieterstrasse 5, D-8500
Nürnberg, Germany

According to a letter received from this group, there is very little information about old and new alternative techniques in Germany. They would appreciate

help in building up an organized library covering small-scale waterpower, restoring old houses, building with recycled materials, renewable energy systems, biodynamic agriculture, farming with animals, community craft industry and solar greenhouses. They are planning, as a first step, a renewable energy conference and exhibition and would appreciate help from anyone with experience in these areas visiting Germany in 1977, trading room (and board?) in exchange. RAIN has sent the 12 A.T. sourcelists. Can you help?

(LJ)



**New A.T. Job of the Month:
Chimney Sweeps**

Eva Horton of Kristia Associates, Box 1118, Portland, ME 04104, the U.S. importer of Jøtul woodstoves, is acting as a clearinghouse for developing a chimney sweeps guild for professional chimney sweeps in the U.S. to help reduce the \$19 million damage from the more than 41,000 chimney fires in the U.S. last year. Oslo, Norway, has 28 chimney sweeps, paid by the government, that clean 46,000 chimneys twice a year. As a result, Oslo has only 1/10 the chimney fires reported in Boston, Mass. (TB)

I met Steven Bridges at Habitat Forum in Vancouver, B.C., last June. He was just starting out on a tour of West Coast worm ranches. I suggested he do an article for us on his findings. I didn't hear from him again, though, and I assumed he'd gone the way of so many of the articles I "commission" at conferences. Then last week the mail brought a whole huge manila envelope full of information from Steve. Hurray! Most of it is reprinted here. We left off a long list of ranches in California, Washington and Oregon. But you can find them—look under "earthworms" in the Yellow Pages or write to Steven. Californians should check with the Northern California Worm Growers Association, 21415 Hyde Road, Sonoma, CA 95476, 707/938-2513.

Dear Lane,

Here is some information for you about earthworms and West Coast Worm Ranches. As you can see by the quoted materials, there is a great variance between worm culturists (vermiculture = worm farming) as to feed quality, prices, number of worms per pound and even as to number of hearts and livers! I have found that worm ranchers are a very individualistic group of people. They seem to go their own way, developing their own methods, continually experimenting to determine the perfect feed or to perfect the giant Nite Crawler, hence the lack of standards for the industry. There may be a lack of standards, but there is no lack of diversity!

Personally, I have been raising worms for 14 months. We started with 1000 mature "red wigglers" in 2 tubs. Now I have 19 tubs, a large loom-sized packing crate half full plus a good-sized styrofoam cooler with several thousand worms that were given to friends for a wedding present. A few months after starting with the "red wiggler" we got 1000 Nite Crawlers. Our total investment in "stock" was \$30—\$20 for Nite Crawlers and \$10 for the "red wigglers." By the West Coast prices, we paid too much for starters.

From my experience I have found that worms will really swarm to all kinds of kitchen scraps, coffee grounds, melon rinds and others, especially if they are a few days old. For bedding I generally use leaves, grass clippings and even newspaper. If you can shred this bedding and feed so much the better, because the worms have some trouble with large unshredded items. Newspaper should be soaked and torn in thin strips.

I have tried to stay away from spending much money for worm feeds like Peat Moss or packaged manures. I try to keep it a low capital project. Some ranchers have estimated that a box or container sunk into the ground below the frost line and filled with bedding and 20,000 worms could handle the kitchen wastes (and some paper waste) for a family of four, besides producing plenty of great fish bait and great earth-

worm castings for the garden. If every family in America had one or two of these worm boxes, we could go a long way toward cutting back on our solid waste problems on a very appropriate household scale.

Some facts about earthworms:

- * A mature breeder can produce an egg capsule every 7 to 10 days.
- * Each egg capsule will hatch from 2 to 20 young earthworms with an estimated average of 7 worms per egg (the number depends on the quality of the environment!).
- * Each earthworm will mature to breeding age in approximately 60 to 90 days. They will be full grown in several months and will average 3 to 4 inches in length.
- * One mature breeder can produce 1200 to 1500 offspring in a year under favorable conditions. Under just average conditions 1000 mature breeders can produce more than 1,000,000 worms and capsules in a year. In 2 years this can reach 1,000,000,000 worms and eggs.

Some facts about earthworm castings:

- * One commercial bed (3 ft. x 8 ft. x 1 ft.) can produce up to 600 pounds of pure castings each year.
- * Chemical analysis of soil without earthworms and the same soil after being processed by worms showed an incredible increase of the available chemical nutrients. There was a 500 percent increase in nitrate of nitrogen; a 700 percent increase in available phosphorous; a 1200 percent increase in available potassium; a 150 percent increase in exchangeable calcium, and a 200 percent increase in organic carbon. Other experiments with crops have shown approximately 250 percent increase of corn yields; 65 percent increase for rye, 3 percent for oats, and 135-300 percent for potatoes and field peas. Pretty incredible figures.

I am continuing to collect information on earthworms, the worm business, the potential for using earthworms in agriculture, applied earthworm technology. Also my interests in worms have expanded to poetry, literature, art and other fields. I am trying to build up a complete cultural picture of the earthworm. If you raise worms or have any special favorite story about worms or review of a particularly good worm ranch, please let me know . . .

Oh, yes, I am working on a bicycle-powered compost shredder, but more on that later.

Yours truly,
Steven H. Bridges
Earthworm Technology
603 Greenway Terrace
Kansas City, MO 64113
816/363-1466



EARTHWORMS

***Harnessing the Earthworm*, Thomas Barrett, 1959, \$2.95 from:**
 Wedgewood Press
 Box 68, Back Bay Annex
 Boston, MA 02117

My favorite earthworm book. Very visionary and very well written. This man was talking about saving the planet through the action of earthworms in the 1940s. Also an excellent chapter, "My Grandfather's Worm Farm," about how worms were used in 19th century Ohio. This technique can and will work now.

***Earthworms for Ecology and Profit*, Vol. I and II, R.E. Gaddie, Sr. and Donald Douglas, \$4.95 each from:**
 Bookworm Publishing Co.
 1207 S. Palmetto
 Ontario, CA 91761

Vol. I is a great book and very necessary for anyone interested in *real* production of worms. Vol. II hasn't been released yet but is going to be about using earthworms for land restoration, large scale waste management and farming.

***Profitable Earthworm Farming*, \$2.50 from:**
 Charlie Morgan
 Box 116
 Bushnell, FL 33513

Charlie is one of the classic entrepreneur/worm rancher/writers. Write to him for all kinds of interesting free information.

***Raising Earthworms for Profit*, Earl B. Shields, \$2.50 from:**
 Shields Publications
 Box 472-C
 Elgin, IL 60120

Earl is another old timer who really knows how to raise worms and write about them.

***Over 300 Questions and Answers on Raising Worms*, from:**
 Hugh Carter
 Carter Worm Farm
 Dept. 6
 Plains, GA

Hugh is Jimmy's cousin and has one of the largest ranches. I'll bet they feed them peanut shells!

***Sensible Questions and Answers about the Earthworm Business*, \$1.25, and *Earthworm Harvester Plans and Instructions*, \$3.28, from:**

Eco-Enterprises
 Rt. 6, Box 755
 Sequim, WA 95382

"The harvester can pick and pack up to 200,000 worms in 1 day and 1 man operating it. No hard work either."

***The Biology of Earthworms*, C.A. Edwards and J.R. Lofty, 1972, \$8.95, from:**
 Halsted Press
 605 Third Ave.
 New York, NY 10016

***The Challenge of Earthworm Research*, Robert Rodale, 1961, Rodale Press. Out of print—look for it in the library.**

Earthworm Eating

Ronald Gaddie doesn't squirm a bit when he hears the adage "You are what you eat."

Gaddie eats worms—lots of them. In fact, he's made a business of it.

"Try 'em, you'll like them," he said in a telephone interview from Centralia, Wash., where he's teaching classes at Pacific Northwest Bait and Ecology. Gaddie is president of North American Bait Farms, Inc., Ontario, Calif.

For the second straight year, the company is sponsoring a nationwide worm recipe contest. Last year's winner was Earthworm Applesauce Surprise Cake.

Worms "taste like shredded wheat," said Gaddie. "I like them best in oatmeal cookies, but I've eaten them with rice, sprinkled on top of salads rather than bacon bits, with scrambled eggs and with steak and gravy."

Besides their nutritional value, Gaddie says worms are an important asset in fighting pollution.

"They are the only animal I know of that you take the third worst pollution problem in the world, solid waste, and feed it to them," he said.

Gaddie says eating earthworms is strictly a case of "mind over matter."

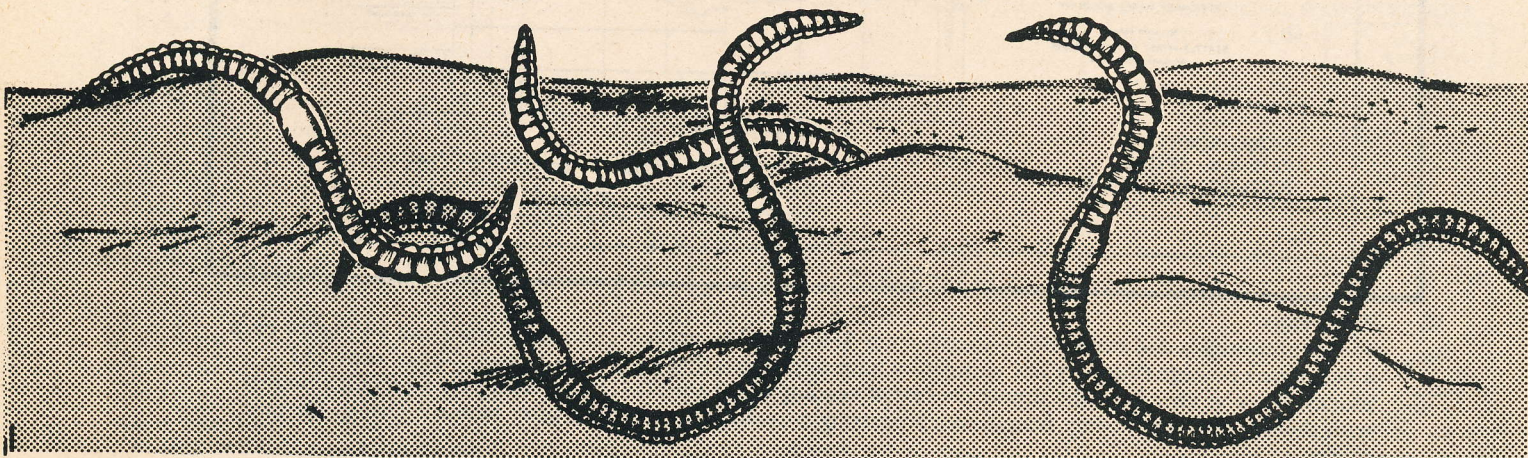
"People in this country are reluctant to try them, but people in other countries, especially in Asia, eat them."

Gaddie, who has written a two-volume set of books called "Earthworms for Ecology and Profit," says the annual sales of his company will be almost \$1 million this year. The firm distributes worms and related products.

—From *Sunday Oregonian*, March 20, 1977

"Earthworms, though in appearance a small and despicable link in the chain of Nature, yet, if lost, would make a lamentable chasm . . . worms seem to be the great promoters of vegetation which would proceed but lamely without them."

—Gilbert White of Selbourne, 1770



Better Business

New School of Democratic Management
 256 Sutter Street, 5th Floor
 San Francisco, CA 94108
 415/434-1705

We had just been feeling what a need there was for ways to learn good business skills to operate small businesses as right livelihood, and along came the New School. It is brought to you by the folks that brought you the Institute for Policy Studies, *Mother Jones*, and the Alternative State and Local Public Policy Conferences, and promises to be as good. They are offering a summer program in San Francisco from July 17-29 on general business skills (\$250). In addition, a series of 2-1/2 day workshops is being planned around the country on democratizing the workplace and basic business skills (\$85)—


write them for locations and dates near you. (TB)

Economy Post Cards

California state government can teach us all a lot about how to make an impossible morass out of a bureaucracy, but they're also making some noteworthy efforts to straighten out the mess. Small but effective are their Economy Postcards. Replies to many inquiries are being sent on postcards with the following message: "It can cost the taxpayers as much as \$6.00 to send an official letter. This includes postage, stationery, stenographic, filing and other services. This post card can be sent for 9¢ or less. For official use only."

Small-Time Operator, Bernard Kamo-
 roff, CPA, 1976, \$5.95 from:
 Bell Springs Publishing Company
 P.O. Box 322
 Laytonville, CA 95454

How to start your own small business, keep your books, pay your taxes and stay out of trouble! While you're waiting for a good course in business skills to happen in your area, it might be worth your while to get hold of this book, especially if you are just starting out. It will help you get a feel for what kinds of records you need to be keeping both for your own purposes (so you know how you stand) and for the IRS. Suggestions are sensible and clearly put. The back of the book has the blank ledgers and worksheets to get you started. (LdeM)



Pacific Northwest Laboratories
 P.O. Box 999
 Richland, Washington, 99352

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1. 1 copy Bender, Thomas
 Environmental Design Primer. 1973

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Trust Pays

In most businesses and institutions it costs from \$50 to \$60 to process a purchase order and billing for even a pencil or a postage stamp. A few companies have discovered that a little trust saves a lot of time and money. They've struck on the simple process of sending blank checks (!) (not valid over a certain amount) with their orders. The savings from lower processing costs have proven far greater than the cost of the rare chisler.

Large Corporations and City Taxes in Idaho, Report No. 1 of a series entitled "Who Rules Idaho," 50¢ each, \$5 for the series, from:

Idaho Study Group
Box 8482
Moscow, ID 83843

An excellent and concise four-page white paper outlining tax avoidance strategies used by industrial plants in almost every state and, more importantly, sensible strategies for control. Proposals include increased payments for services to such industries, annexation, redistribution of state educational funds and state laws allowing revenue compensation to districts impacted by outside industries—similar to Minnesota's law. A useful series for supporting local initiatives if succeeding papers are as good as this one. (TB)

The Formula Book and The Formula Book II, Norman Stark, 1975, 1976, \$5.95 each from:

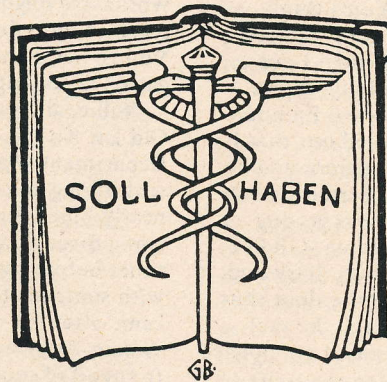
Sheed, Andrews & McMeel
6700 Squibb Road
Mission, KS 66202

We've grown so accustomed to buying highly merchandised products that we often don't realize that most household chemical products—from soap to drain opener to electric pre-shave lotions to glass spray cleaner to toothpaste—can be made simply and much more cheaply at home or as a neighborhood business. The *Formula Books* help take the mystery out of do-it-yourself Proctor and Gambler and provide simple, easy-to-follow instructions for making several hundred household products. The second volume is particularly skimpy and full of white space for the price, and I have a hunch you might get a better bargain if you can find a copy of Stark's earlier textbook, *The Formula Manual* (we couldn't). People being what they are, this valuable approach needs to be taken a couple of steps further—a book that lists the formulae for Ivory or Dial soap, Breck shampoo or Johnson's baby oil so people don't think the formulae are for some inferior "homemade" stuff. Secondly, a listing of relative costs for homemade, generic and brand-name production of the same product would be an eye opener. An important and useful beginning, and

an excellent resource book for beginning neighborhood industries. If you have a used bookstore around, you might also look for *The War-Time Guide Book* put out by *Popular Science Monthly* and Grosset and Dunlap in 1942. David Morris recommended it to us, and it contains a wealth of formulae for home products. (TB)

Good Health

The good people down at the Briarpatch Network in San Francisco have put together an excellent shared Health Insurance Plan for Briarpatch businesses in the Bay Area. The plan provides life, medical and dental insurance, including coverage of wholistic approaches to health such as acupuncture, iridology, homeopathy, biofeedback and chiropractic treatment. For more information on the plan, write to Briarpatch Review, 330 Ellis Street, San Francisco, CA 94102. (TB)



The Invisible Hand: Questionable Corporate Payments Overseas, Gordon Adams and Sherri Zann Rosenthal
Council on Economic Priorities
84 Fifth Avenue
New York, NY 10011

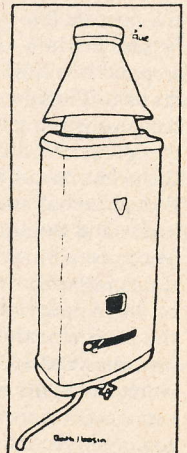
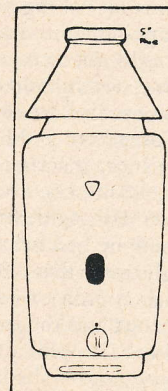
This should go on your shelf next to *Global Reach*, *Phantom Taxes in Your Utilities Bill*, and *Size, Efficiency and Community Enterprise*. Documents self-admitted questionable overseas payments and outright bribes by American companies. Read, if you have any doubt that excessive economic power leads to political abuses. (TB)

\$10 Reward

for Demand Heater Information

Demand heaters, flash heaters, or ascots used to be easily available in this country. They heat water right when and where you use it rather than storing it in a large tank where it can lose the heat. I remember lighting them in European pensions before taking a shower. They're also used in Japanese baths to keep the water in the bath as hot as you want. (I also remember someone leaving one on all night and walking into the bath in the morning to discover the tub merrily boiling away!) Demand heaters are real useful with solar water heating because you can use solar heat to warm the water in your existing hot water tank as hot as it can, then have the water go through a demand heater to give it a final boost to desired temperatures when enough solar heat isn't available.

We'll give a \$10 reward to whomever can find us the best information on available electric, gas or wood fueled demand heaters or designs for do-it-yourself heaters by May 15, 1977, and will pass on the information in RAIN. We're interested in everything from automatic, thermostatic-controlled designs to ones where you throw in the wood and light it! Some that we know of now: Instant-Flow Water Heaters (automatic, electric, non-thermostatic), Ascots (British, gas, apparently no longer imported), Blazing Showers (wood stovepipe water heaters), Paloma (gas, thermostatic, semi-automatic). Tell us more! (TB)





CHINA LETTER

Eleanor McCallie from Earthworks in San Francisco gave us this letter sent to her aunt from her family who live in Tientsin, China, where the earthquake happened last summer. It is yet another example of the Chinese people's ability to pick up and help each other when need strikes.

Dear old Ma and Willie,

I got your letter of July 28th, asking about the earthquake. What a day! I shall never forget. That night (July 27th) I couldn't go to sleep because of asthma; so I stayed up and wrote you two a letter till 1:30 a.m. (28th). It was raining cats and dogs. Then I read a while, and about 3:45 a.m. I turned out the lights and suddenly saw a flash of reddish purple light which I thought was lightning. Then came a roar and the whole house began jumping up and down for about four times. By this time I had turned the lights on again. When the jumping stopped for a few seconds I heard what I thought was hail and rock raining. I later found out it was house tops falling down. Then we started to rock back and forth. (Mimi's husband) En-hua was sleeping in the outer room and for the first time we had the door between the rooms shut as I did not want to disturb him with my reading with the lights on. By this time Shao Yun had waken (Mimi's little girl). I was still sitting in the bed holding her and telling her not to be afraid and we'd go down to the basement when the rocking stops. (They live on the 2nd floor.) But the rocking seemed to get worse, and then I heard the wood frames of the windows begin to crack, so I said to Shao Yun I think we better start going and I got off the bed and tried to open the door. It wouldn't open. I pulled and pulled; then I put Shao Yun down on the floor and pulled with all my might. It was stuck tight. Then the lights went out. I heard En-hua shouting on the other side of the door and I called out that I can't open the door, and I heard him kicking the door and he finally kicked it open. When we went into the corridor, all the neighbors were in the corridor and the rocking was getting better. You can't imagine what happened to En-hua. I didn't know whether to laugh or to cry. He had been very busy and had little sleep for quite a few days, and he had the door shut, so he was sleeping very soundly like the dead. Well, he said afterwards he didn't know what hit him; he jumped up, opened the outside door and dashed out. When he got to the stairs he said he didn't know what happened; he seemed to have stepped in a hole and went rolling down the stairs, hurting his arm. Then he jumped up and dashed outside, the most dangerous thing he could do, so many people were killed by going out too soon and were crushed by the falling debris. Outside, the cold rain on his bare skin woke him up, and he thought what am I doing here and he dashed up into the house and ran up the stairs meeting Mrs. Mopsy (a neighbor of theirs, a model of cleanliness. She mops all the time, hence the name we gave her) dashing down the stairs. She said later on she wondered where he had been. Instead of going into the basement through the hallway, Mrs. Mopsy also dashed into the yard and then couldn't find the gate. That was just when the lights went out and the loose wire of toppled poles came coiling around her. People in the basement yelled at her to come into the house, and if she had been a few seconds later she would have been electrocuted.

We then went into the basement in Fat Mrs. Liu's room; she is the chairman of our courtyard. There were about six or seven children and I don't know how many grownups. Although frightened herself, Mrs. Liu started her stove and made what seemed to be pots and pots of mung bean soup. She kept saying: "Oh, I am so scared! Drink! Let the children drink the soup." I will never forget the kindness people showed each other. People were giving each other their last bit of things. Our part of Tientsin was one of the hardest hit. When dawn came and everyone came out into the streets, I could hardly believe my eyes. (Here she began to describe what she saw, but she struck it out.)

En-hua left soon afterwards for his office, returning around 3:00 in the afternoon; then we went to Shengli Road (the widest street in Tientsin). The rain was still pouring down. There we met one of his colleagues who welcomed us into his little tent in which were his family of five or six. I don't know if I would have had the kindness in me to have welcomed other families in so graciously. While we stayed there En-hua went to the Water Works. He came back around 5, saying the Water Works said for us to go there, but we must hurry as there was going to be another quake around 6:00. So to the Water Works we went and have been staying there off and on ever since. The forecast was really accurate, and the big aftershock came at 6:50. Food and water are easy to get, and the shops began to sell necessities the very next day. The Water Works workmen worked like mad fixing up the pipes in 3 days time, while the earth was still quaking. It is not over yet. Yesterday there were six medium sized ones.

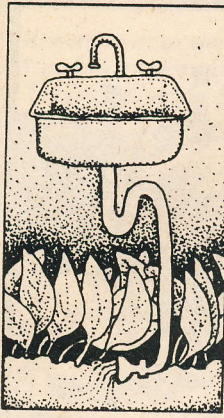
I've been home the past 3 to 4 days living in front of the house; it's not so safe here, so we are going back to the Water Works. We might be able to live in the outer room in the winter if no more big quakes. We are thinking of sending Shao Yun to her grandmother's for the next six months. Her kindergarten's building is badly damaged.

Willie, all your friends are safe; K.L. and his family are well. Old Dr. Ko and his family, Prof. Li (chairman of the English Department where we taught) and his wife all came through with flying colors; remember how the little quake last year nearly killed Mrs. Li! People with heart trouble seemed to come through all right. Miss Chou came looking for me 3 times before I got to see her. She's going to work and is living with some relatives in a tent near Tientsin Hotel. Her brother came after the quake and took their mother and his boy to Wuhan. Mary and her family are all well. I have seen Mousy (a friend of mine, named after the way he knocks on the door) often. His uncle and aunt were killed and their three children are living with the Mousies now.

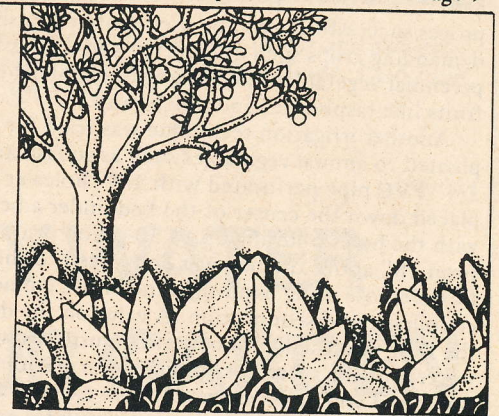
Things are so well organized. These old ladies of the neighborhood are really something! They work night and day patrolling in the night with the militia, seeing that everybody has food and care, looking after the old people (those who have no family). They know exactly in what condition everyone in their neighborhood is in. Many people have gone off leaving all their things in the care of the neighborhood committees. To the bad elements who want to plunder and steal, the punishment is both fast and drastic; so I haven't seen a single incident around here. You can leave things on the street for days and no one will touch them.

I must stop now as I'm very busy. I still have asthma and I have chest pain. I will have to ask for some medicine to be sent. I'll tell you in my next letter.

Love,
Nini



Effective water conservation measures at Farallones reduce water use per person by almost 90 percent, resulting in less waste flow for 35 people than that produced by a conventional suburban family. A by-product is the concentration of pollutants in greywater and the need to develop reclamation systems for concentrated wastewater. The following account of Farallones efforts to develop such neighborhood-sized systems is excerpted from the 1977 Farallones Report (\$2 from The Farallones Institute, 15290 Coleman Valley Road, Occidental, CA 95465). The report contains reports on various current projects, including a 100 percent solar heated greenhouse, a comparison study on three solar space-heated cabins, an update on the Farallones compost privies, a comparison study of replacing grass lawns with alfalfa and rabbit production and much more.



NO DROUGHT ABOUT IT

reusing wastewater at Farallones

—Max Kroschel

Our preliminary assessment of greywater was somewhat naive. (Greywater is defined as household waste water from sinks, laundry, shower and bath; it does not include discharge from flushing a toilet.) It was assumed that eliminating toilet flushings from the waste stream would reduce the level of contamination, and the remaining waste water would be easier and safer to deal with. This viewpoint is fostered by practically every proponent of the waterless toilet, and so it was a relatively easy trap for us all to fall into. After a year and a half of working with greywater, we realize that the problem is much more complex and will require a longer term investigative effort.

It is hard to generalize on the characteristics of greywater, because they depend so much on individual factors: life style, water use habits and environmental consciousness level. Each area of the house generates a waste water with different pollutants. The kitchen sink produces the most heavily polluted water, containing detergents, grease, oils and food particles. The shower water contains a minimal amount of suspended matter but is most contaminated biologically with trace amounts of fecal mater potentially harboring pathogenic organisms.

Our initial studies have concentrated on the development of a cost-effective, small scale wastewater management system designed to reuse greywater for agricultural purposes. The problems of distribution, irrigation and filtration have been the focus of our efforts. Future studies dealing with the biological and chemical makeup of greywater and the effects on soil and plant growth are being developed.

Irrigation—Distribution

When the Rural Center started in the summer of 1975 our first thought in this dry part of California was to get the waste water to the garden for reuse. We tried to develop a system with a minimum amount of physical treatment, maintenance and energy input. We had no established criteria for sizing the treatment units, so our approach was empirical. A system using 50 gallon drums was decided upon because the drums are cheap, watertight and a readily available salvage commodity. Theoretically, various size waste flows could be handled by adding or deleting drum units to a system, in parallel or

in series as needed. Semi rigid black plastic tubing purchased in quantity on sale was used exclusively for conducting greywater. It is joined by clamps and friction fittings and is easy to work with, as it requires no special tools or skills.

Our first system was a straight line from the house and kitchen to 50-gallon drums in the garden, where we distributed it by hand using five-gallon cans. This labor intensive and time consuming method also proved to be aesthetically unpleasant. After a month or so accumulated grease and settled food particles in the drums went septic (anaerobic) and we gained a better appreciation for greywater and its nearest relative, raw sewage.

Geography worked against us in the development of our next irrigation system. The kitchen is situated below most of the garden. Only a small flat patch can be reached by gravity flow; and that only by a minimally sloped pipe that brings the water to the garden with little or no velocity or pressure. We decided to cultivate and irrigate a forage crop on the patch of garden accessible by gravity flow and investigate the possibility of a windmill to pump the water to storage at a higher elevation so that it could be used more extensively in the garden. Because of the septic nature of the greywater, the irrigation system needed to be subsurface. Perforated 3/4" black plastic tubing was placed under a heavy mulch layer on top of an intensively cultivated bed. Grease and suspended solids clogged the tubes and they had to be flushed out periodically with hot water—a time-consuming and wasteful procedure.

Conventional leach fields use large diameter perforated pipe in a gravel-filled trench. An adaptation of this idea was tried alongside of a permanent bed of asparagus. To take advantage of on-hand materials we used a triangular redwood culvert constructed of scrap boards in a gravel-lined trench 6" wide and 10" deep and covered with sod. Because of the minimal velocity of the grey water reaching the culvert, distribution of the water was not very even along the bed. However, some water did reach the end, and this system is currently in use.

In the summer of 1976 a settling tank was added to remove most suspended and floating solids. To utilize this less concentrated flow, an irrigation line of 1" perforated tubing surrounded by pea gravel in a 4"x4" trench was installed along a permanent forage crop bed. If this type of distribution system

proves successful, it will be used more extensively for water-demanding crops such as comfrey and alfalfa for forage, perennial vegetables like asparagus and artichokes, and bush fruits like raspberries and blueberries.

Another irrigation technique was tried for intensive beds planted to annual vegetables such as squash and beans. Rigid 3/4" PVC pipe perforated with 1/8" holes at 6" spacing was placed down the center of the bed under a heavy mulch layer with the holes pointing up. A 50-gallon drum set up on a platform 18" above the bed was connected to the PVC tube by a flexible hose using hand-tightened hose connections for easy coupling and disconnection. A valve on the drum controlled the flow into the line. For testing purposes we used pond water, but the system is applicable to clarified filtered greywater and will be investigated more extensively next summer. We feel the idea has promise and simulates greywater distribution under adequate pressure head.

The first week of winter rains made it apparent that greywater reuse would be limited to the dry summer months. Some alternate disposal system would be necessary during the rainy season. The simplest and most conventional water disposal system is the leach line that is used with standard septic tanks. In the summer of 1976 we installed two 100-foot leach lines with a switching manifold to divert greywater away from the garden.

Filtration—Sedimentation

A grease trap similar to those used by restaurants was installed in the kitchen drain. Its service was problematic and it was very difficult to clean. Sediment accumulated in the bottom and went septic, causing odors. A coarse filter was devised to strain out food particles and floating scum, and incorporated into a larger grease trap. A cage was made of galvanized wire mesh (hardware cloth) which sat on supports at mid-height of a vertically placed 50-gallon drum. Various coarse organic materials were used as filter medium: wood shavings, chopped straw and leaves. Other suggested materials we didn't investigate were: pine needles, wood bark and pine cones. The cage could be raised out of the drum and the entire contents composted, thus recycling the trapped grease, scum and food particles. The lower half of the drum was a grease trap with a gravity "cleanout" pipe emerging downhill with a valve on it. Periodically the entire contents could be drained through this pipe into 5-gallon cans and incorporated into hot compost piles for recycling.

The system worked quite effectively at first but was undersized for the flow volume, and amounts of filterable particles. Maintenance became necessary weekly. An anaerobic slime developed on the cage that became increasingly difficult to deal with. A similar unit could be developed for a household kitchen greywater system that would require only monthly maintenance and could easily be owner-built for a low cost greywater system. This application is being investigated.

The original farmhouse at the Center houses a dairy kitchen and a small bathroom formerly serviced by a septic tank. We disconnected the sinks and tub from the main drain and re-plumbed them to a pipe going to the garden. A series of settling tanks and scum traps was devised out of 50-gallon drums (three in a series). They were ineffective in removing detergent scums and toothpaste residues which clogged the distributor lines (3/4" black plastic tubing perforated with 1/6" holes every foot). The system was eventually abandoned and the sinks reconnected to the house septic system for the winter.

We had planned a settling system of four 50-gallon drums for the kitchen to augment or replace the filter grease trap, but our experience with the house settling system made us re-evaluate our approach. The scale was wrong. We practice water conservation in every area and use minimal amounts of water (our total waste stream for 35 persons is the same total gallons as the average suburban family of four—350 gallons per day). But even though we are very conscious of what goes



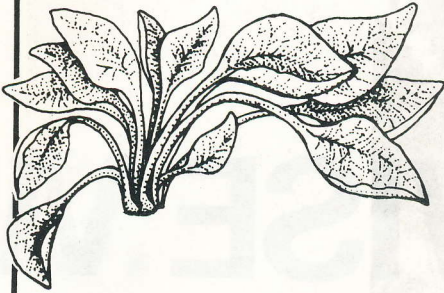
down the drain (scraping plates, pots and pans before washing, etc.) still the pollution load contributed by 35 persons through a shower and communal kitchen is considerable, and the end result is a highly polluted and concentrated waste water.

We decided on a large permanent settling basin that would retain the greywater in a quiescent state long enough to settle out the majority of the suspended solids and trap all the floating solids and scum. We calculated the cost of materials for the size tank we wanted and discovered a commercial septic tank of 1500 gallon capacity was cheaper than we could build ourselves. It was purchased and installed in a day. A larger grease trap was added ahead of the tank following plans from United Stands Privy and Greywater booklet. The effluent from the septic tank now goes to the disposal field via the switching manifold.

We had avoided slow sand filters from fear of frequent maintenance problems. Again, it was a question of scale. We had been thinking 50-gallon drum units, but what was needed would have to be much larger. Our greywater consultant, Timothy Winneberger, came up with a sand filter he designed and has successfully implemented. It is quite large—10' x 20'—and quite costly, over \$1,000 in materials. We are planning an adaptation of the design for installation next spring or summer. We anticipate that our design will give us a clarified effluent that we can use more extensively in the garden without the elaborate gravel-encased irrigation lines described previously.

Experiments at the Farallones Urban House indicate that Wastewater treatment for a single family can be much simpler. The following are excerpts from a four-page Grey Water Fact

Sheet prepared by Tom Javits and Tom Fricke and available for \$1 from the Farallones Integral Urban House, 1516 Fifth Street, Berkeley, CA 94710.



USING GREY WATER IN YOUR GARDEN

How much grey water can be used in an urban garden?

Use only as much grey water in your garden as is required for reasonable irrigation; scale your waste water recycling effort to suit your garden water requirement. A good, safe rule is that a square foot of loamy garden soil, rich in organic matter, is capable of handling one-half gallon of grey water per week. Sandy, well-drained soils will accommodate more water; clayey, poorly-drained soils less. If your garden area suitable for grey water application is 500 square feet, then up to 250 gallons of waste water may be discharged each week. This rate might be greater during the summer months when surface evaporation and plant transpiration is considerable and less during the winter, when evapotranspiration is minimal. Frequently check soil moisture to determine precise application rates for your garden.

Follow these suggestions for sound waste water application:

1. Apply the grey water to flat garden areas; avoid slopes where runoff might be a problem.
2. Use the waste water on mature vegetation or well established vegetable plants rather than young plants and seedlings.
3. Minimize waste water application to acid-loving plants such as rhododendrons and citrus since waste water is alkaline.
4. To the extent possible, disperse the grey water application over a large garden area.
5. When available use fresh water for garden irrigation on a rotating basis with grey water to help cleanse the soil of sodium salts.
6. Apply thick compost mulches to areas receiving grey water to improve natural decomposition of waste residues.

What about soaps and detergents? Are they harmful to the soil and plants?

As a general rule, soaps are less harmful than detergents, but either presents potential problems over periods of sustained use of grey water containing them. The common problem of soaps and detergents is that they both contain sodium, an element which in excessive amounts is harmful to soils (destroys soil aggregation) as well as to plants (induces tissue burn). The best strategy is to minimize the use of cleaning materials, and wherever possible choose soaps rather than detergents. Gentle soaps, such as soap flakes, are preferred to those heavily laden with lanolin, perfumes and other chemicals. Where detergents must be used, select those which do not advertise their "softening powers" (softeners are rich in sodium-based compounds). If you plan on reusing washing machine water, bleach should be minimized or eliminated, and boron-based (Borax) detergents absolutely avoided. Phosphates in detergents are not as great a problem in soil application as they are in sewage discharge into water bodies; nevertheless, low phosphate detergents are preferable. Ammonia is acceptable in reasonable amounts.

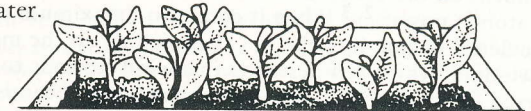
How should the grey water be applied to the garden?

Apply the waste water directly to the soil; *do not* overhead sprinkle or allow the waste water to contact the above-ground portion of food plants. Waste water is best conveyed to the garden by a standard 3/4-inch garden hose. A central hose may feed several lateral short hoses by way of a "y" junction such that the waste water is distributed evenly over larger areas of soil. The lateral arms should be rotated around the garden frequently to reduce the possibility of localized flooding or excessive residue buildup.

At the end of each hose lateral, attach (by hose clamp) a cloth bag (cotton or canvas), to intercept particulates and soap residues conveyed in the grey water. The bag will allow for dispersed water outflow while trapping undesirable materials. The bag should be removed periodically, washed, turned inside out and allowed to sun-dry, and re-used.

Must any precautions be taken to protect against damage to the soil from sustained use of grey water?

Over extended periods of grey water application, sodium may build-up in the soil resulting in poor soil drainage and potential damage to plant tissue. High levels of sodium may be detected by conducting a pH test of the soil using litmus paper (obtained from a pharmacy or nursery). If the pH reading exceeds 7.5, the soil has become overloaded with sodium. Correct the problem by spreading gypsum (calcium sulfate) over the soil at a rate of 2 pounds per 100 sq. ft. per month. Continue treatment until the soil pH drops to 7.0. As a precaution against further sodium buildup, gypsum may be applied to the soil at a rate of 3 pounds *per month* for every 50 gallons *per day* discharge to the area being watered. Normal dilution of waste water by rainfall and/or fresh water irrigation will help to cleanse the soil of the sodium. When available use fresh water for garden irrigation on a rotating basis with grey water.



Is there any danger of pathogen transmittal by using grey water in the garden?

Waste water from the shower, bath tub and washing machine can conceivably contain human pathogens (disease-causing organisms). However, when the grey water is discharged to the soil, potentially harmful viruses and bacteria are quickly destroyed by the abundant soil organisms better suited to the soil environment. Also, if the pathogens were to survive, it is unlikely that they would be assimilated by the plant roots and translocated to the edible portion. Nevertheless, if you are particularly suspicious of the sanitary quality of your grey water, do not apply it to root crops which are eaten uncooked, or perhaps only to soil in which ornamental plants are maintained.

The development and demand for "appropriate technologies" today arise from the realization that our resource conditions are changing and that our present ways of doing things are inappropriate for the futures we face. They arise also from a realization that our present technologies serve ends which threaten the fundamental values of our society and new ways of doing things must be developed which support and evoke those values.

Appropriate technology demands that we ask, "Appropriate for what?" "Appropriate for whom?" No technology is value-free. Some technologies are appropriate for conditions of growth, vast resources and small populations. Others are appropriate for conditions of stability, plentiful labor and scarce resources. Some technologies increase the wealth of a few while impoverishing the many. Others tend to equalize wealth and power. Some technologies degrade and destroy the people using them, while others give opportunity for growth of skills, confidence and abilities. Some technologies consume energy, some provide employment. Some technologies produce goods, others produce good.

The existence of a technology does not require its use any more than the existence of a gun requires us to shoot. It only requires that we examine what happens if we don't use it and others do, and the effects its use would have on our lives.

Appropriate technology reminds us that before we choose our tools and techniques we must choose our dreams and values, for some technologies serve them, while others make them unobtainable.

"It takes an awfully long time to think of the simplest things."

—Kenneth Boulding

Appropriate technologies can be simply defined but not so simply created. Schumacher's four main criteria which are now being increasingly applied to our technological possibilities are:

- smallness
- simplicity
- capital-cheapness
- non-violence

Windmills, even if their towers fall over or their blades fly 750' as did the Smith-Putnams', still must be considered non-violent and environmentally and socially benign, relative to other electrical energy prime movers, nuclear power and fossil-coal. Wind energy produces no long-term waste storage problem; no cancer, black lung, stripmine or smog effects; no bomb-making radioactive materials at large in the land and no psychic violence to our human spirit as we humbly use the ample energies nature provides rather than greedily ripping it from beneath prime food-producing topsoils or becoming dependent on the costly thermodynamic inefficiencies inherent in atomic power.^{2, 3} When it comes to "maximum credible accident" jargon, it is obvious that picking up the metal from a windmill which self-destructs in a wind storm is to be preferred to trying to decontaminate hundreds of thousands of acres or a few million people likely to be affected by a nuclear plant meltdown on a windy day.

Windmills have been built over the last 20 years which, when their past costs are adjusted for inflation, would still require less capital than nuclear power and about the same investment per installed kilowatt as fossil-coal, if their designs were rebuilt today.⁴ One foreign engineering and machinery company, F.L. Smidth of Copenhagen, not so subtly hinted, at an NSF-ERDA wind conference, that its 200kw Gedser Mill could be built for 1/3 to 1/2 the cost of similar NSF-NASA-ERDA windmills.⁵

How could this possibly be? How could a Danish wind generator built in 1957 be cheaper than one built in 1977 America using all of our best scientific and manufacturing brain power?

WISE WI

Des

The Gedser was the final output of over 80 years of wind work in Denmark, illustrating Boulding's dictum. For this penultimate mill, low cost came from elegant simplicity in materials, construction techniques and controls.

To control the wind-turbine, three separate, inexpensive, and straight-forward techniques were used. The airfoils were

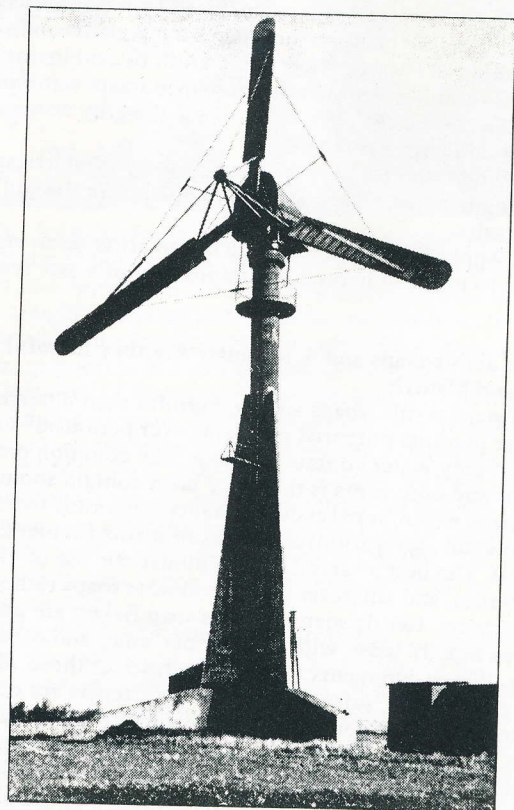


Figure 1: The Gedser Mill, 24 m. diam. (78.7 ft.), 24 m. hub height, 200kw rated in 32.5 mph wind

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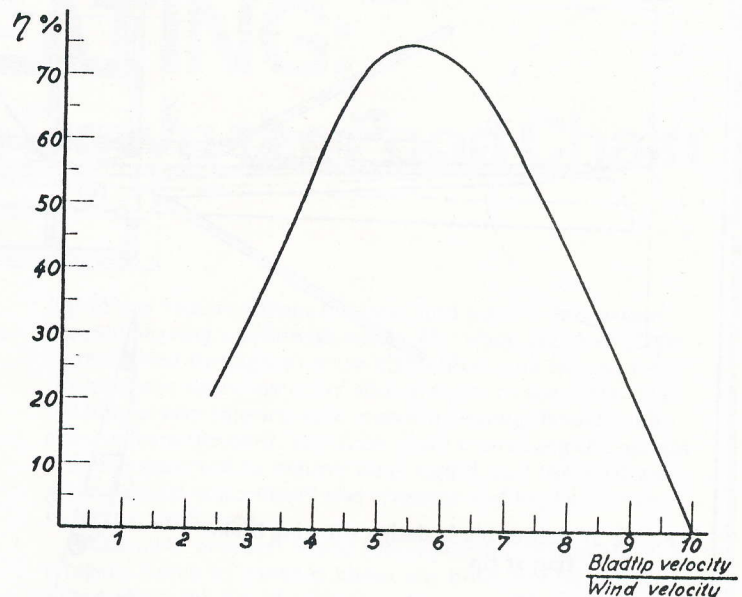


Figure 2: Airfoil Efficiency relative to Tip-speed Ratio

designed to extract energy from the wind most efficiently at a narrow range of tip-speed ratio, as illustrated in Fig. 2. Instead of hydraulically rotating the blades to change their angle-of-attack for greater efficiency in higher winds or to feather the blades in gales, as is common in today's complicated and costly rotor-hub designs, the familiar "stalling" phenomenon was put to work. With unmovable blades set to get the most power out in a narrow band of windspeeds, the windmill automatically slows in higher winds as its blades rapidly get less efficient in sucking off energy from the wind-stream. Instead of complex and hence expensive blade-feathering mechanisms, *the feathering task itself is eliminated*, as the interaction of wind and airfoil do the work almost naturally. Simplicity need not preclude scientific sophistication.⁶

Emergency stopping, in case of potential lubrication problems or disconnection from the electrical grid, is handled by a simple brake flap on the tip of each blade, shown in Fig. 3. Or, as Juul explains,

*The blade flaps (1) constitute 12 percent of the surface area of the blades and are, under normal operating conditions of the mill, an integral part of the blades. Each of the flaps is fixed to a tubular carrying rod (2) which will, when actuated by the automatics of the mill, travel about 300 mm along the longitudinal axis of the blade and move in a link-motion (3) in the fixed part of the blade. By this movement, the brake flap is twisted about 60 degrees out of the plane of the blade, thus counteracting the remaining part of the blade and bringing the mill to a dead stop. The brake flaps are governed by a hydraulic servo-motor (5) in connection with the mill system of automatics. When the mill starts, the servo-motor will pull the brake flaps into working position. When it stops, the centrifugal power will force the flaps out into braking position.*⁷

Here the simple centrifugal forces naturally produced by the wind turning the blades provides the fail-safe power for an effective braking system.

If the oil lubrication system fails to properly cool vital bearings, another ingenious mechanism working on a temperature rise stops the wind-turbine before damage results:

*Between the bore (6) in the fixed spindle and the rotating oil pipe system of the hub, a self-tightening stuffing box (7) is inserted. Connecting with the oil pressure pipe of the spindle is a safety valve (8), sealed by a stopper made of a metal which will melt at 110 degrees C. In case of heating of the spindle, due to defects in the bearings, the stopper will melt and let out the oil, thus stopping the mill.*⁸

Simple, workable, understandable, inexpensive.

Often the most appropriate solution to a problem is to totally ignore the supposed problem. Present day wind-machine designers pay much attention to bringing the power down the tower from a blade-hub-generator configuration which is usually set on a rotating turntable. The conventional wisdom says "slip rings," and we've had all manner of them, engineered to the nth degree. Gedser just avoids them:

The cables to the generator as well as the control cables are carried to the machine cabin through a rubber tube fixed in the floor of the cabin and freely suspended in the tower so that it will stand being twisted ten turns either way without being damaged.

In that way the use of slip rings for cable connection to the cabin has been avoided. Experience shows that the yawing will cause, annually, only about 10 turns, clockwise.

*In the tower is placed a relay (31) connected with a cord that passes a pulley and is wound round the rubber tube (30) so as to disconnect the control cables, thereby stopping the yawing mechanism and the mill, in case the cables get too many turns. At the monthly inspection the mill—if necessary—is turned back the opposite way, by manual operation of the yawing mechanism, until the cord round the rubber tube has been unwound.*⁹

One need not say more.

Yet there is more of this mechanical sensitivity:

*Another cord is also fastened to the relay. It is connected with a loosely placed weight that will fall off its stand and influence the relay, thus stopping the mill, in case abnormal vibrations occur in the tower.*¹⁰

Lou Divone, manager of ERDA's Wind Energy Program Branch, visited the 200kw Gedser and put it this way:

Joe [Savino of NASA-Lewis], Jean [Fisher of F.L. Smidth & Co.] and I were in the top of the cab there, leaning up against the somewhat rusty electrical generator and trying to keep from being embarrassed by the height, when we saw something and started to laugh. And then we stopped for a minute and looked at each other and decided that maybe we should not be laughing and maybe the designer of this machine was both frugal and smart. I turned to Joe and I said I would like to get a separate cost estimate for putting that component on the 100kw machine. As you can see, the automatic shut-off device for the Gedser mill is a pipe that comes up from the floor and bends around some equipment, and on the top of the pipe there is a cup in which sits a heavy, oversized ball. That ball is connected by a string to an old-fashioned Square-D type switch on the wall. When the

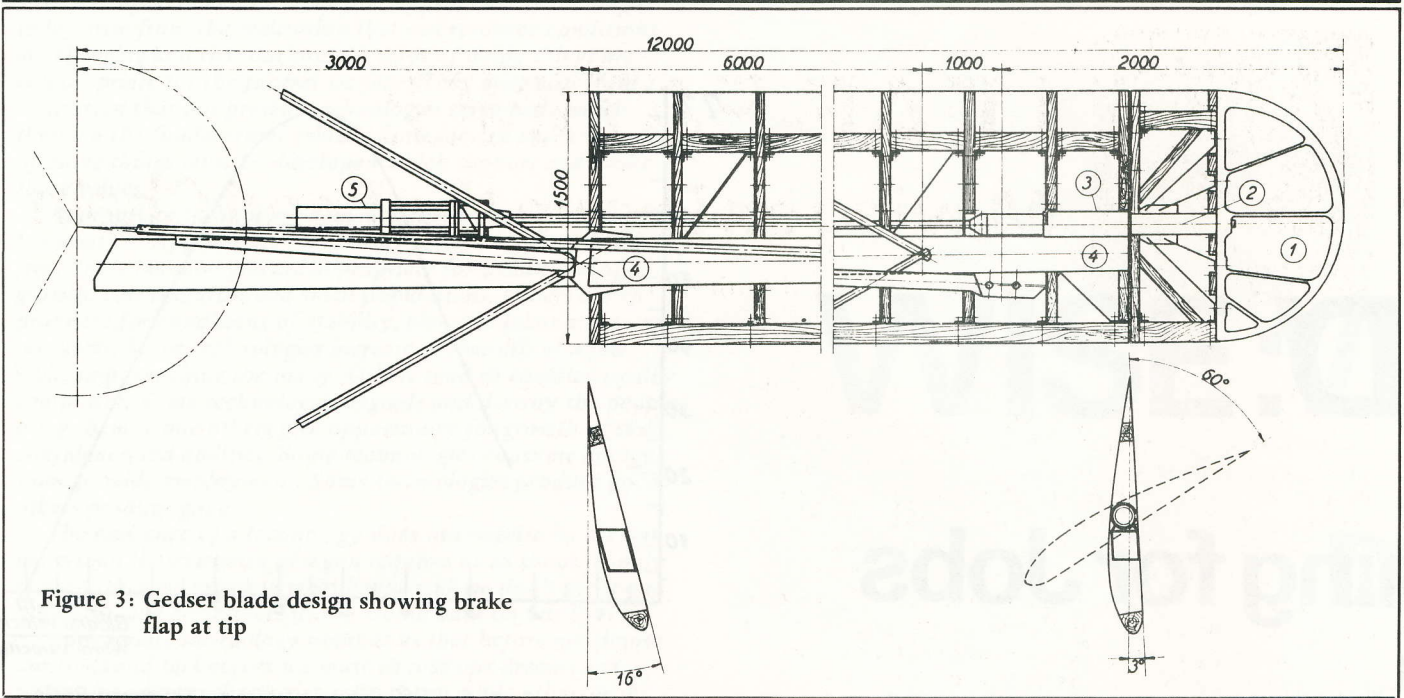


Figure 3: Gedser blade design showing brake flap at tip

tower starts to vibrate the ball rolls out of the cup and the string pulls the switch to stop the machine.

I am still trying to get the NASA-Lewis cost estimate on that device. I estimate that it will cost about \$1.50, without chrome plate.

I am not being completely facetious about this. We need very sophisticated thinking. We need very sophisticated ideas. We need very deep understanding of things we presently do not understand. But what we really need most is some very simple and very inexpensive hardware.¹¹

But more than engineering simplicity, low-cost and non-violence should be required of our national wind energy effort. A major emphasis, a major factor for the assessment of any new technology in this era of continuing high joblessness should be "how many jobs, of what kind, where and for whom?" Recent public meetings on Montana's energy conservation plan elicited statements such as "we've got 15 percent unemployment; what kind of windmills can we Montanans build in Montana" and "Why should we spend all our money for windmills built by aerospace corporations in other states; let's get those windmill-building jobs right here in this state!" It was then that Ecotope Group, consultants on the renewable energy aspects of the Montana study, started looking at the Gedser and at other large wind-turbines that could be built locally to provide local employment.

Yet Juul, engineer of a very "appropriate" windmill, apologized for the lack of high-technology and automated mass production in the Danish wind industry. He felt that these defects could be easily remedied by substituting energy-intensive materials requiring much expertise in design, such as fiberglass, for wood-and-sheet metal craftsmanship which will employ unskilled, semi-skilled and skilled workers rather than design engineers:

When the blades were designed it should be remembered that the possibilities of production were restricted, as they could only be made by manual power craftsmanship. In a possible future industrial production in series, these blades can undoubtedly be more cheaply made of pressed steel sheets welded into hollow shell-like constructions to be bolted to the hub by flanges. It is possible as well to make the blades of other material than steel, e.g., plastic reinforced with glass fibre, if this proves economically advantageous.¹²

"Manual power craftsmanship" means broad-spectrum employment for many more average American union members and workers. The more complex NASA-ERDA wind-machines require sophisticated technologies. These would undoubtedly be manufactured at existing aerospace manufacturing facili-

ties, none of which is located in Montana. On the basis of preliminary estimates using published data, the windpower employment impact section of the Montana Energy Conservation Plan concluded,

the Gedser machine could be expected to produce 6 to 7 direct jobs per 100kw installed. The effect of this on the local economy would be striking. The number of service jobs created to support a Gedser-type wind-electric program in Montana would be 20 to 30 jobs per 100kw installed, versus 8 to 12 jobs per 100kw installed for the more sophisticated machines.¹³

Wind energy development can also provide employment for many Americans, but only if we will it so. We must apply Schumacher's "law of the disappearing middle" to windpower as well, and compare the job-producing potential of various wind-turbines. Have you done that, Mr. Divone? Montana's jobless would like to know what you've found.

Lee Johnson

REFERENCES

- 1) Putnam, P.C., *Power from the Wind*, 1974, Van Nostrand Reinhold.
- 2) An Evaluation of the Potential Environmental Effects of Wind Energy Systems Development (ERDA/NSF/07378-75/1, available from NTIS)
- 3) Amory Lovins, "Scale, Centralization & Electrification in Energy Systems," in *Soft Energy Paths: Toward a Durable Peace*, 1977, Friends of the Earth Press, San Francisco.
- 4) Bent Sorensen, "Wind Energy," in *The Bulletin of the Atomic Scientists*, Sept. 1976, pp. 35-45.
- 5) H. Claude Westh, "A Comparison of Wind Turbine Generators," in *2nd Wind Energy Conversion Systems Workshop Proceedings*, 1975 (USGPO Stock No. 038-000-00258-9), pp. 156-161, Frank Eldridge, editor.
- 6) J. Juul, "Design of Wind Power Plants in Denmark," in *U.N. New Sources of Energy, 1961 Rome Conference*, vol. 7 (Windpower), pp. 233-234.
- 7) *Ibid.*, pp. 234-235.
- 8) *Ibid.*, p. 236.
- 9) *Ibid.*, p. 237.
- 10) *Ibid.*
- 11) Lou Divone, "Future Federal Plans," in *2nd Wind Energy Conversion Workshop Proceedings*, *op. cit.*, pp. 512-513.
- 12) J. Juul, *op. cit.*, p. 235.
- 13) *Montana Energy Conservation Plan*, Working Paper No. 8, Wind Energy Systems, March 1977, p. 32, section 2.6.4—Direct Employment Impacts (available from Montana Energy & MHD R & D Institute, Inc., P.O. Box 3809, Butte, MT 59701).



LEAF-EATING: Moving on Down the Food Chain

—Franklin Martin and Ruth Ruberté

Green leaves are one of the most important elements of the food chain which sustains all animal and human life. Nevertheless, because we lack enzymes to digest leaves well, green leaves are used by people chiefly in indirect forms as other plant products (fruits, seeds, roots) or through animals that have themselves used the leaves as food. Much of the food value is lost to us in these conversion processes.

Techniques for removing protein from leaves have been developed, and the process is commercial or on the verge of commercialization in various places. The production of protein concentrates useful as feed and as food for humans appears entirely feasible. Unfortunately, these processes presently depend on large and complex techniques which place leaf protein concentrate out of direct reach of the people who most need protein supplementation.

Many tropical plants such as the edible legumes, species of the Euphorbiaceae, and some tropical grasses appear to be especially suitable for leaf protein concentration. Because some of these plants can produce foliage on a year-round basis, selection of the appropriate plant as a crop could lead to high production per hectare of the protein so badly needed in the tropics.

Because reliance on large commercial ventures would negate some of the advantages of leaves, especially the fact that they are readily available, we have worked out small scale techniques that can be used in the home without the use of electrical or expensive apparatus. We focused experiments on Auropis, a plant called katuk in Indonesia. This plant is a tall, spindly, slightly woody shrub which produces very dark green leaves. The tender shoots are eaten raw, while older leaves need cooking. Katuk can be easily grown from seeds or from cuttings and is widely adaptable throughout the tropics.

Leaves were hand-picked and then passed through a small hand mill used for grinding grain. The iron burrs of the mill were adjusted as close as possible for fine grinding, but comfortable turning of the crank. Two volumes of water were added to the mixture of ground leaves, and after thorough mixing, this was filtered through a lady's nylon mesh stocking. When filtration of juice stopped, the stocking was kneaded with the hands to press out more of the liquid. The liquid was then heated to 80 degrees C., where precipitation began. The

liquid was removed from the heat, and a green precipitate formed, leaving a yellowish whey. The whey and precipitate were filtered through a cotton cloth filter, and the curd remaining was rinsed twice by adding water to the filter. This washing is very important in removing strong flavored substances from the curd. The filter cloth containing the precipitate was squeezed to remove more liquid, and the resultant green protein concentrate was removed and kept in the refrigerator until used.

With some practice, it was found possible to prepare a one kilogram batch of leaves in about one hour, not including time to heat the liquid extract on the stove. The protein curd was a very dark green color, had a leaf-like smell and an oily texture. The hardness of the curd depended on the degree to which water was pressed out, and the curd varied from a consistency of cottage cheese to that of soft cheese. The amount of protein recovered in preliminary trials varied from 11 to 45 percent. These values depended chiefly on the amount of protein extracted from the leaf by grinding and filtering technique. In the case of Sauropis, almost half of the leaf protein was recovered in the final protein concentrate.

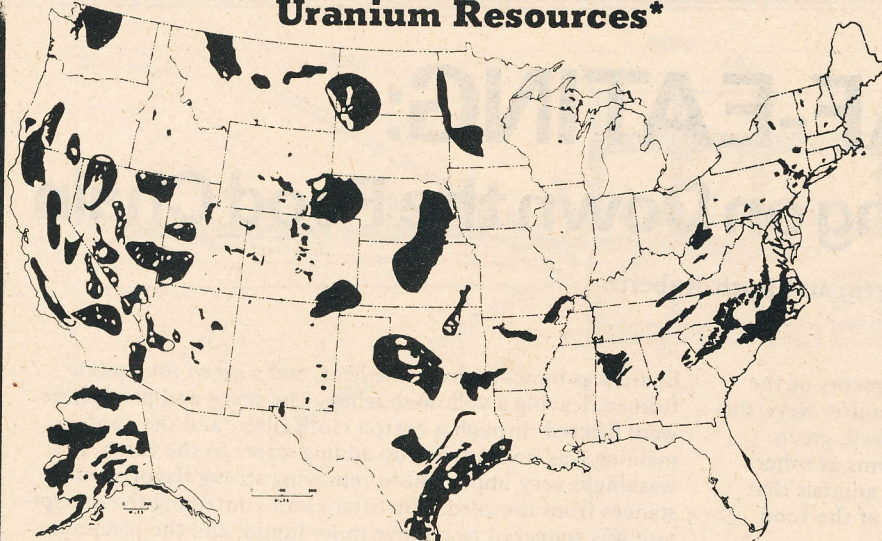
This protein concentrate was used as a food in the following ways: by itself, as a spread with bread, cooked into a soup with meat stock, mixed with white yams, used as a ten percent mixture for making pancakes, and scrambled with eggs as one third of an omelette. In Pakistan and India leaf proteins are extracted with sugarcane extracting apparatus. Heat is used to coagulate the protein, which is then incorporated into various foods. In India, the protein concentrate is made into candy and distributed to school children, where it is readily accepted and has become a valuable source of calories and protein. Leaf protein concentrates generally have strong color and flavor, and development of recipes to complement them with suitable spices and other ingredients will go far to placing home leaf protein concentrating alongside tofu-making from soybeans and cheese-making from milk as valuable culinary and dietary contributions.

Frank Martin and Ruth Ruberté are with the Mayagüez Institute of Tropical Agriculture, P.O. Box 70, Mayagüez, Puerto Rico 00708.

A COMPARISON OF 5 PLANT SPECIES FOR EXTRACTABILITY AND RECOVERABILITY OF PROTEIN FROM LEAVES AND RECOVERABILITY OF PROTEIN FROM LEAVES

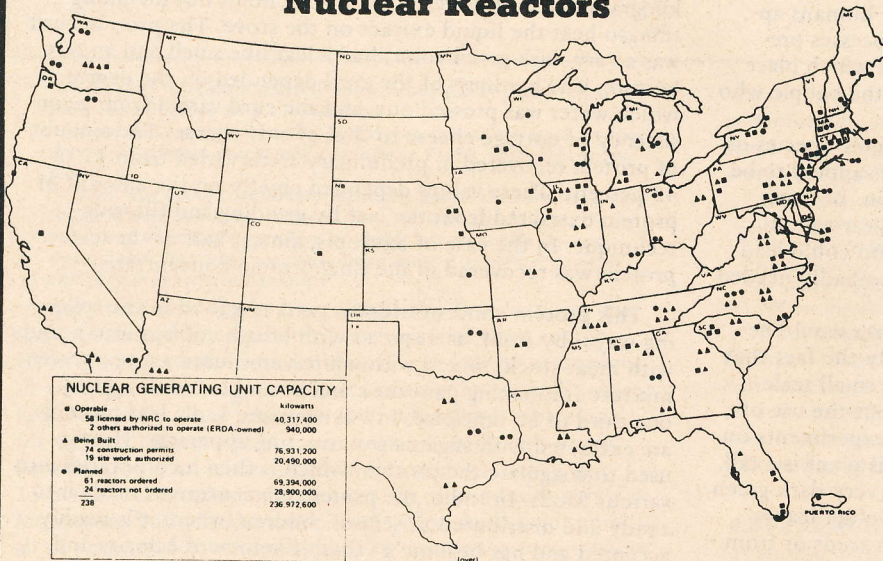
Species	GRAMS PROTEIN IN 100 G. LEAF AND EXTRACTS				Percent protein extracted and precipitated
	Whole leaves	Fibrous residue	Precipitated protein	Non-precipitant soluble residue	
Sauropis (<i>Sauropis androgynus</i>)	4.91	2.21	2.24	0.46	45.6
Sorghum (<i>Sorghum bicolor</i>)	2.83	2.82	0.32	0.70	11.3
Chaya (<i>Cnidoscolus chayamansa</i>)	3.92	1.48	0.39	2.05	9.95
Cassava (<i>Manihot esculenta</i>)	6.01	5.01	0.80	0.20	13.3
Winged bean (<i>Psophocarpus tetragonolobus</i>)	3.20	1.26	0.81	1.13	25.3

Uranium Resources*

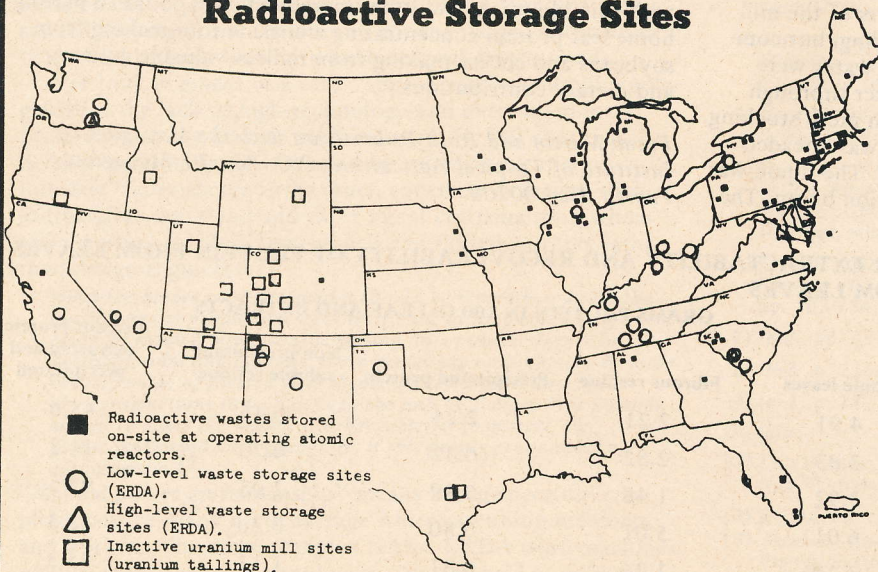


*Areas where uranium is likely to be found

Nuclear Reactors



Radioactive Storage Sites



URANIUM RESOURCES (1976, ERDA)
 —FEA assessment: "...some 1.4 million short tons of U³O⁸ [uranium oxide, the most common compound of uranium found in typical ores] will be needed to support the 240,000 megawatts of nuclear capacity in operation, under construction, or on order as of August, 1975, for their entire lives assuming 30 years of operation. The total of reserves and probable resources at \$30 per pound or less...exceeds 1.7 million short tons of U³O⁸, sufficient to fuel the 240,000 megawatts now on order or in operation and an additional 60,000 megawatts or more of capacity for 30 years of operation. Whether or not additional nuclear plants can be fueled beyond this 300,000 megawatts depends on how successful the industry is in the coming years in their uranium exploration efforts."

Energy: Ideas for Parks, 8 pp., 7 issues only, available free while supplies last from:

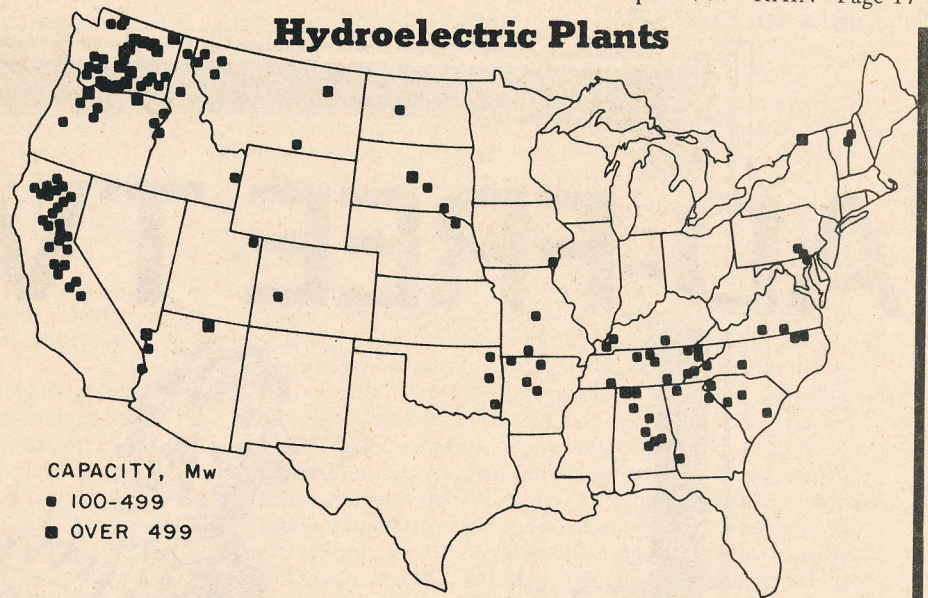
Park Project on Energy Interpretation
 National Recreation & Park Assoc.
 1601 North Kent St.
 Arlington, VA 22209

These pleasingly-designed, information- and idea-packed newsletters produced to aid national park guides and interpreters are good models of how energy consciousness can be incorporated into

NUCLEAR REACTORS (1976, ERDA)
 —FEA assessment: "Despite considerably lower forecasts this year than last, the growth in nuclear power in the next 10 years is expected to be substantial. Additions to nuclear capacity by 1985 are limited by the long construction and licensing period (about 10 years), and thus projections of maximum capacity for 1985 are well determined already.... The reduced forecast of nuclear power reflects constraints rather than economic desirability or technical potential. Nuclear energy is the cheapest source of baseload electric power, although not much cheaper than coal."

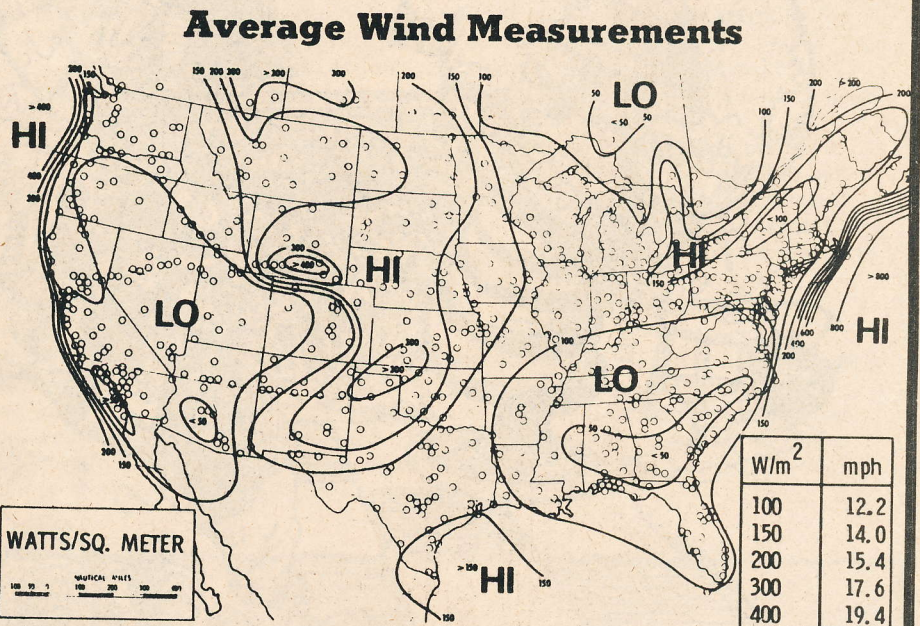
RADIOACTIVE STORAGE (1976, Critical Mass newsletter)— FEA assessment: "There are currently no commercial spent fuel reprocessing facilities operating either in the U.S. or in Europe.... Past planning for the nuclear fuel cycle has assumed that nuclear reactors would have a spent fuel pool at the plant site with enough capacity to store spent fuel rods temporarily while awaiting transportation to a reprocessing plant.... Reactor fuel storage pools were not ordinarily designed with sufficient capacity for long term storage of the spent fuel from the reactor.... While the recycling and reprocessing issues are being resolved, the problem of spent fuel discharge and its disposal is beginning to grow as the volume increases as a consequence of nuclear plant operation and new capacity additions."

HYDROELECTRIC PLANTS, including pumped storage facilities (1971, Federal Power Commission)—Hydro power is not mentioned in the FEA and ERDA documents, reflecting its limited role in federal plans for energy supply growth. As of January 1971, the total operating capacity of U.S. hydro plants was 51,900 megawatts, and growing at about five percent each year. Even if hydro facilities continue to expand at recent rates, it is not likely that it will supply a larger share of total U.S. energy consumed (1975, *Energy Alternatives*, Council on Environmental Quality).

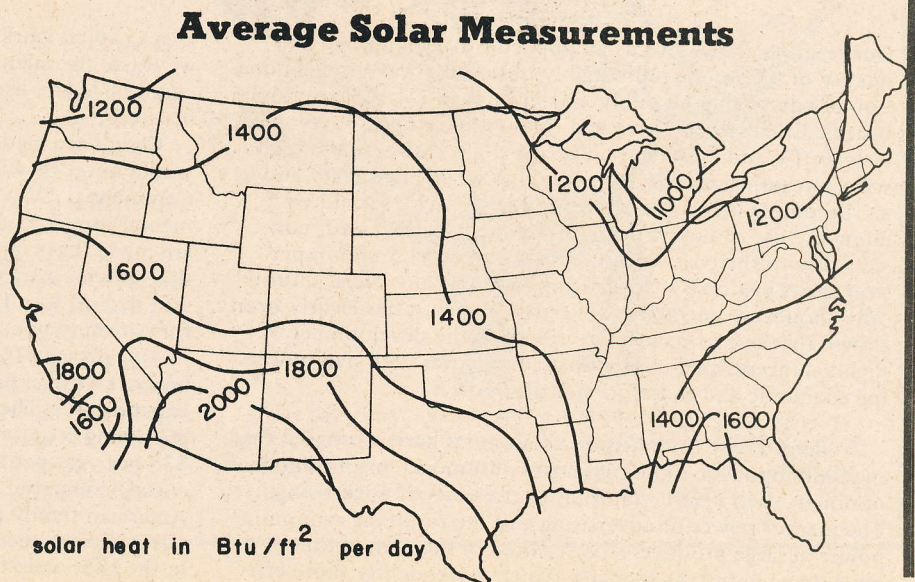


an area many people might think unrelated to energy awareness—our national parks. Especially excellent are the “People and Resources” and “Energy Maps” issues, numbers 1 and 4, respectively. We’ve reprinted here a sampling of energy maps, larger versions of which are available from PPEI as long as supplies last. Also novel yet full of common sense is the idea of “going out of business when you’re done and after you’ve gotten the ball rolling,” as they have done. (Courtesy Nancy Shirk, Kirk Marckwald)

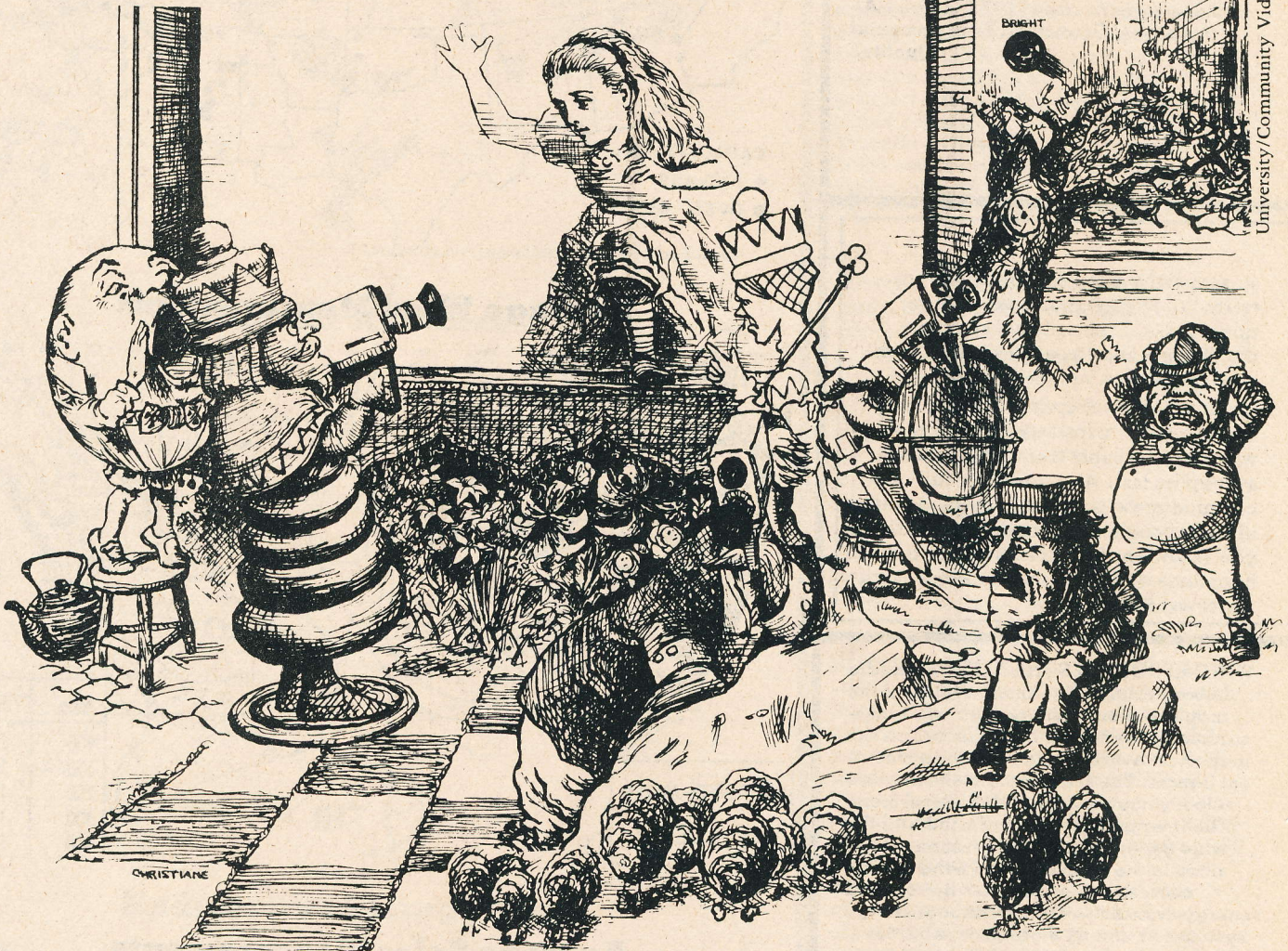
WIND RESOURCES (1975, ERDA Sandia Laboratories)—The small circles on the map are sites where regular wind measurements are taken. The numbers on the map show average wind power in electrical figures. The scale at right shows wind velocity equivalents. ERDA assessment: “The intermittent nature of wind and the wide geographical and seasonal variations in the availability of wind energy necessitates either inter-ties of wind energy systems with conventional energy systems, or energy storage capabilities.... The advances and tools developed in recent years in the helicopter industry are only now being applied to this area. No fundamental unknowns exist; however, many uncertainties remain in terms of designing for long life and low capital cost.”



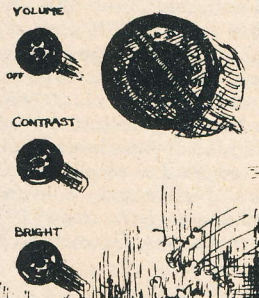
SOLAR RESOURCES (1974, Atomic Energy Commission)—ERDA assessment: “Solar energy represents a huge and virtually inexhaustible supply of energy that is widely available over the United States. It could supply as much as 25 percent of the Nation’s future energy needs by 2020 if costs of collecting and using solar energy can be reduced substantially.”



AD-FREE TV



University/Community Video Center, U. of Minnesota



Our resource limits give us an opportunity to improve our quality of life in one more highly noticeable way—the elimination of advertising on public media such as TV, radio and billboards. Endless, repetitive and frequently repugnant commercials on TV and radio and billboard-clogged streets and highways screaming at us to buy, buy, buy aren't necessary and are becoming increasingly hard to justify. Why should we allow the use of public media for an activity that adds considerably to the costs of goods (more than \$4.5 billion per year spent just on TV advertising) without any social return? Why should we encourage advertising when it has clearly been shown that one of its primary results is the development of highly concentrated monopolistic industries with overpowering economic and therefore political power?

Federal Trade Commission economists have estimated that such monopolistic industries cost consumers tens of billions of dollars each year in addition to the costs of advertising. The market power of advertising and the resultant economic power of large producers has resulted in the elimination of much local industry—industry which is frequently more efficient, more sensitive to local needs and conditions, and which

keeps capital working in local economies. And why should we waste the talent that goes into advertising—talent that could be better used communicating more important information?

Claims are made that we now enjoy *free* TV and the public would never be willing to pay for what they now get free. Commercial TV is claimed to be necessary to avoid governmental interference risked by any other system. Assertions are made that commercial TV assures popular programming—that public-financed TV would be elitist and dull. And it is said that ad-free TV would prevent people from getting information they need or want.

Our present TV *isn't* free, however—we pay more than \$5 billion a year in higher product costs to cover advertising expenditures. The actual costs of viewer-financed TV programming is quite moderate. Ad-free TV would cost about \$35 per year per household (less than a daily newspaper costs!) compared to the \$200-\$300 per year the average American family pays for the honor of commercial TV. A 1970 CBS-sponsored survey indicated that half the people in the U.S. would prefer ad-free TV, and at least 30 percent would be willing to pay a small fee for it.

Political interference with broadcasting could hardly be greater with an independent fee-supported system than at present, and such a system would also be free from advertiser pressures that overtly mold the present TV programming. A non-commercial system such as that in the Netherlands, where viewers belong to clubs or parties to whom funds and TV time are allocated on the basis of membership numbers (Lovers of Lawrence Welk or Pacifica's Peaceful People) can ensure democratic use of time and funds, as could other alternatives. Our ban of cigarette commercials on TV hasn't kept people from knowing about cigarettes. European experience also substantiates that ad-free TV doesn't keep people ignorant of commercial products, but rather allows more balanced competition between smaller regional and local producers.

What impact would elimination of advertising have on media such as TV or radio? The first and most obvious benefit is the absence of the continuous din of the commercials themselves—the relief you get watching “uninterrupted specials” or PBS. A second important impact is the strong statement of values made by a decision not to abandon public media to private gain. Such value statements are not to be laughed at—Oregon Governor Tom McCall's order to turn off advertising lighting during the 1973 energy embargo had an impact far beyond the modest energy savings involved. It became a symbol that people were serious and doing all in their power to make things better.

The invisible impact of advertising on media programming and editorial content is appalling. The Winter '76 issue of *Working Papers for a New Society* (\$2.50 from The Cambridge Policy Studies Institute, 123 Mt. Auburn St., Cambridge, MA 02138) documents much of the present impact. It goes into the cancellation of high Nielsen rated shows with strong audiences but which didn't appeal to the most lucrative 18-49-year-old bracket (Gunsmoke, Lawrence Welk and the Watergate Hearings for example). It discusses the history of TV and advertising in the U.S. and Europe—four of the thirteen countries in Europe permit no advertising at all on TV or radio, and others rely primarily on noncommercial stations, such as England's famous BBC. It recounts how, in 1930, CBS only permitted 25 percent of its shows to have commercial sponsors, and the struggle of Raymond Rubicam, founder of the major advertising firm Young & Rubicam, to minimize

advertising on radio. The PBS “Nova Series” rebroadcasts of the many excellent BBC documentaries give an indication also of the increased depth, relevance and general quality of programming that can be attained with ad-free TV.

Further impacts can be anticipated from the release of substantial advertising revenues for other purposes, and in the further development of new kinds of consumer product information, with consumer access and evaluation guides such as the *Whole Earth Catalog* or *Consumer Reports* taking a more important place alongside traditional access such as Sears Roebuck catalogs. Many kinds of products find excellent consumer access even now through routes other than slick and expensive advertising campaigns. Building product manufacturers group together, for example, in the massive multi-volume Sweet's Catalog, which gives architects and builders access to almost every product made for a specific application.

Actions on various levels can make possible this basic beginning to shift away from a consumer-exploitive society. Local communities can ban billboards and advertising on buses and subways. Where cable TV franchises exist, communities can ban advertising on them. Local communities or community groups can intervene in licensing renewal procedures for local radio and TV stations, giving clear indication of community sentiment and presenting licensing options. Similar actions can take place on the state level. Postal subsidies for magazines with display advertisements can be eliminated. Successful action at these levels can do much to make national legislation or FCC regulatory changes to eliminate abuse of public media on the national level possible.

The reasons to free public media from commercial advertising, like the reasons that have led many states to free our roads of billboards, are compelling. The costs of the present system are documented, and better options are available. Get a copy of the *Working Papers* article, and see how long it takes to get things changed!

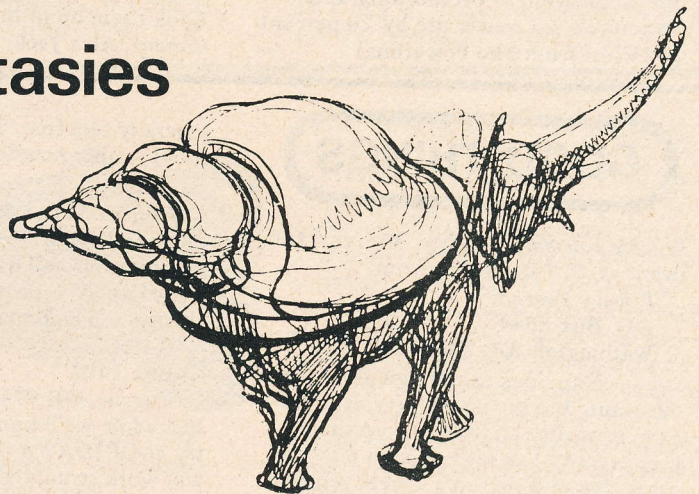
—TB

*For information on radio and TV license renewal and how to challenge a renewal request, get a copy of *How to Protect Your Rights in Television and Radio* by Ralph Jennings and Pamela Richard, 1974. \$5.95 from United Church of Christ Office of Communications, 289 Park Ave. South, New York, NY 10019.

Let Fantasies Be Fantasies

Advertising is a highly refined exploitation of something we do all the time—creating fantasies and then attempting to fulfill them. Maybe it's a fantasy about having a new car, or being famous, or making love to some certain person—it doesn't matter. What we never notice about such fantasies is that they never stop coming. We put a lot of effort into fulfilling one and scarcely catch our breath before another one arises to take its place . . . a little bit better stereo, a little bit bigger house, a little more luxurious car, a little bit more glamorous lover. No one ever tells us, and we rarely seem to see ourselves, that having fantasies is what the whole thing is about—not destroying them by making them “real.”

What if instead of knocking ourselves out fulfilling fantasy after fantasy we just kept a few as unfulfilled dreams? Think of all the energy we would save inventing new dreams as well as realizing old ones. Just dream about that mansion or that job—and savor the dream. It's likely at least as good as the reality anyhow! Dreams don't leak, get sick or need repairs.



If we can thus separate our fantasies from our needs, and just let them be that, we can live comfortable, relaxed and rewarding lives with a fraction of the effort we spend chasing after our own desire to have things to dream about.

—TB



Rush

If things have to be fashionable before they're believable . . . you can now purchase your Aquarian Amenities Module, including a Solar Greenhouse, Solarium, Sauna, Hot Tub and Deck. All in one 12'x24' package which attaches to your home. Plans, cost estimates and materials list are \$5 from Solar Sauna, Box 466, Hollis, NH 03049.

The city of Burbank, California has received an Energy Conservation Award from the Federal Energy Administration for its extraordinarily successful conservation programs. The efforts of the city's municipal utility, which included the elimination of promotional rate structures, cut power use by 20 percent in 1974. (from *The Powerline*)

Alternative Technologies, a bi-monthly newsletter of Alternative Technologies Association, P.O. Box 20571, Indianapolis, IN 46220, is available for \$3 per year, memberships in the association \$10/year. This is a new regional a.t. group based in Indiana, interested in investigating existing technologies in use of wind energy, methane gas production, electric vehicles and low-cost food production. If you live in that part of the U.S., you might want to get in touch with them.

Toward Tomorrow Fair '77 is a three-day event which offers solutions to improving the future of our world. Toward Tomorrow is currently seeking future-oriented exhibitors for its second annual fair scheduled for June 24, 25 and 26 at the University of Massachusetts, Amherst, Mass. Last year 17,000 persons from all parts of the country attended the fair.

Conference/Alternative State and Local Public Policies, 1901 Q St., N.W., Washington, DC 20009, is coordinating a series of regional conferences covering topics such as neighborhood government, criminal justice, governmental reform, controlling corporations, tax reform and long-range programs. A southern conference is planned for late spring in Atlanta, a Plains State conference in Lincoln, Nebraska, in May, and a Midwest conference in June in Cleveland, Ohio. The Third National Conference will be in Denver in mid-July. Write the conference for details.

Who is Robert Heinlein or Viktoras Kulvinskas? What is a divya or gestalt? Look them up in the *New Age Dictionary*, Alex Jack, Ed., \$5 from Kan-

thaka Press (P.O. Box 697, Brookline Village, MA 02147). It's not much on in-depth definitions but at least gives you the general idea. Future editions should provide access information—where to find out more.

The People's Silk Screen Book by Laura Seldman is \$2.25 from 2151 California St., N.W., Washington, DC 20008. It is a nice little booklet that explains clearly and simply basic silk screen techniques. Let's make beautiful posters!

Anybody wanting to teach agricultural economics in a college program that is strongly eco-agriculture oriented? An agriculture-production background and an interest in appropriate technology is preferred. Don Ward at Ambassador College would like to hear from you. Box 111, Big Sandy, TX 75755.

Did you read the Winter '76 Co-Evolution Quarterly about watersheds? Here's a group to be called "Columbia River Watch" to celebrate and learn about the river and its tributaries. Contact is John Badgley, Institute of the Rockies, 622 Evans, Missoula, MT 59801 (406/728-5352).

Zero Population Growth (1346 Connecticut Ave., N.W., Washington, DC 20036) has a lot of very good materials for teaching about population. Write to them for a complete list.



GOOD THINGS

Privacy Journal, monthly, \$45/yr. (\$60 overseas, \$15 students), from:

Privacy Journal
P.O. Box 8844
Washington, DC 20003

I've been anxious to tell you about this but wanted to see enough issues to be sure its quality stayed right up there consistently. I've seen enough now and it has. Beyond that, it's a great relief to us here at RAIN that someone is monitoring this area, which is laden with such potential for subtly or blatantly undermining our right not to unknowingly testify against ourselves (wiretaps, mail screens, bugs), to be secure in our homes (Watergate burglaries) and to

generally feel free. We'd like to hear about similar newsletters. (LJ)

Northwest Network: Journal of the Cascade Region, free (profit-making corporations and government agencies not eligible) to those involved in social change and community activities, from:

CAREL
Box 1492
Eugene, OR 97401

In a while we'll know whether this new try at ORIDAWA regional info sharing will work structurally . . . as a process, as a system . . . and be worthwhile . . . whether its content will make useful connections between people and create life-enhancing patterns between the ears and the feet. . . . But the I Ching says "Yes, Brian's working on it" and it has good things worth actualizing:

free, due to advertising, to change-makers who provide info; reader service coupon for more info on specific items at minimum cost; non-profit, cooperative, decentralist. We look for it to take some of the load off our backs here at RAIN. Hurray!

The Creation, Ernst Haas, 1971, \$8.95 from:

Penguin Books
72 Fifth Ave.
New York, NY 10011

The storyline is Genesis—the book is a collection of color photographic images of elemental natural forces by Ernest Haas. Not your normal Sierra Club nature book, this, but incredibly beautiful images you can get happily lost in and which echo the refrain of Genesis—"And God saw that it was good." (TB)

Bucky Fuller people are putting together a prototype autonomous dwelling that is to be the next step after the Now House (Habitat 1976). It should be built this summer. They're looking for input. Contact Planetary Dwelling Service, c/o Robert Blissmer, 2701 Fairview Road, Costa Mesa, CA 92626.

The Women's Community Health Center (819 Lincoln Way, Ames, IA 50010, 515/232-9078) desperately needs a doctor for their abortion clinic. Contact them immediately.

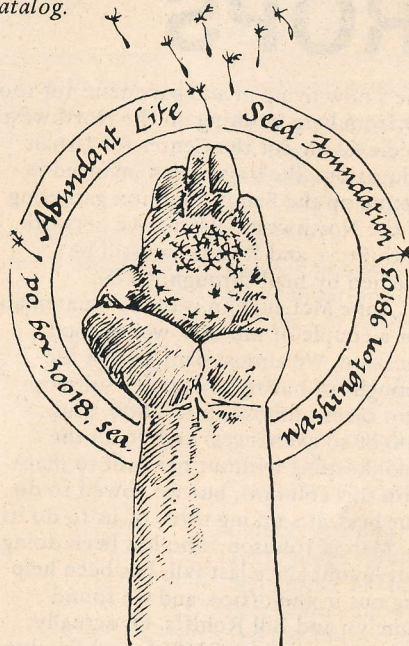
Just got a press release from a new confederation of student environmental groups in the Northwest called N'WEST. They're planning workshops and action programs. Contact Jon Alexander, Environmental Affairs Commission, University of Washington, Seattle, WA 98195, or Bruce Walker, Survival Center, University of Oregon, Eugene, OR 97403.

People keep calling us for lists of NW environmental groups. We don't really have one, but there's a useful list from EPA. It's called *Environmental Organizations Directory*, and it's free from Environmental Protection Agency, Region X, 1200 Sixth Ave., Seattle, WA 98101.

Rodale's Annual Composting and Waste Recycling Conference is May 4-6 in Amherst, Mass. Good sessions are planned on compost toilets and grey water systems. Contact Jerry Goldstein at Rodale Press (Emmaus, PA 18049).

Abundant Life Seeds Foundation (P.O. Box 30018, Seattle, WA 98103) just put out its lovely 1977 catalog. Sorry, it's not mushroom-shaped this year, but it's lovely just the same. They're good people. Send 50¢ to cover costs.

Seeds are also available from **Green Valley Seeds**, 11565 East Zayante, Felton, CA 95018. Write for their catalog.



And there'll be an Alternative Technology Festival May 7 on the State Street Mall, Madison, WI, sponsored by the Institute for Environmental Studies at the University of Wisconsin, 120 WARF Bldg., 610 Walnut, Madison, WI 53706. Contact person is Jon Sesso.

Manhattan (Kansas) Energy Fair is two days of exhibits, presentations and home tours focusing on practical household energy projects and products. Free admission to the public; exhibitors can get info by writing: The Manhattan Energy Fair, City of Manhattan Community Development, P.O. Box 748, Manhattan, KS 66502.

"Solar '77 Northwest:" the 1st Annual Pacific Northwest Solar Conference, is now being planned for four days in mid-July at the Oregon Museum of Science and Industry in Portland. It's sponsored, so far, by ERDA, the Oregon Dept. of Energy and the Univ. of Oregon. We'll have full details in the May RAIN.

1st Southern Oregon Energy Fair will be held April 22-24 with exhibits, lectures and product displays in a.t., agriculture, home ecology, recycling, transportation, health, etc. For exhibit registration info, write Kathy Ging, So. Ore. Energy Fair, 41 Third St., Ashland, OR 97520. 503/482-2265.

An Environmental Question: U.S. Economic Growth and the Third World is a conference being held in Bellingham, WA, April 29, 30 and May 1. Discussions will be based on food. Contact Huxley Environmental Reference Bureau (HERB) at Western Washington State College, Bellingham, WA 98225. Contact person is Chico Guppy.

Alliance for Better Land Management (ABLM) has gotten a temporary injunction against herbicide spraying in the Eugene (Oregon) BLM District. They're now looking for input on a.t. for the woods—tree planting, resource economics, ecology, labor-intensive forestry, etc. Good stuff. Contact them at P.O. Box 25, Lorane, OR 97451.

Laurel's Kitchen, Laurel Robertson, Carol Flinders and Bronwen Godfrey, 1976, \$13.75 postpaid from:
 Nilgiri Press
 Box 381
 Berkeley, CA 94701

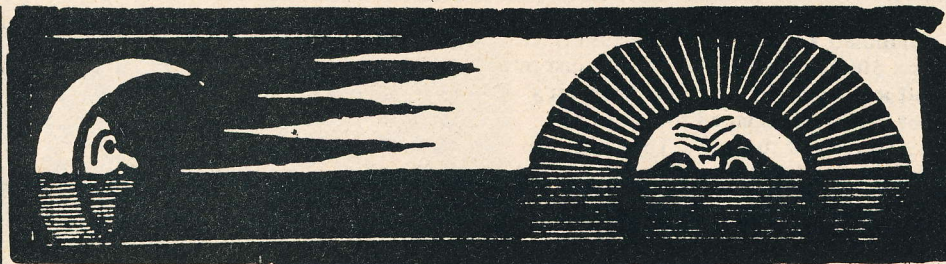


I've seen this book reviewed as the *Joy of Cooking* for vegetarians. That's not far off. Recipes galore and a hefty, helpful introduction to the hows and whys of meatless eating. It also has a great deal of information on the scientific side of food values, protein complements, vitamins, etc. It's a beautifully crafted book, written, printed and bound by a small meditation community in Northern California. Laurel herself did the lovely woodcuts in it. I almost hate to leave it to the spattered fate of my best-loved cookbooks. I think you'll enjoy. (LdeM)



Transition: Quarterly Journal of the Socially and Ecologically Responsible Geographers, \$3/year from:
 Laurence G. Wolf
 Dept. of Geography
 University of Cincinnati
 Cincinnati, OH 45221
 From the one issue I've seen, the content of this little journal is pretty

limited to geographers, but it's a nice model for the communication of alternatives within a profession: *Transition* is trying to encourage geographers to overcome their academic constipation and express themselves more freely—at least to each other. It is hard to get them to write without footnoting everything, without wrapping up their ideas in jargon, or without limiting their expressions of opinions to opinions about someone else's research. But we are trying. We are also trying to point their noses toward more contact with similar-minded groups elsewhere in academia and also "out in the real world." It is the easiest thing in the world to become parochially professional, even though, one would think geography the last academic subject in which that would occur. (LdeM)



RAIN DROPS

Things feel pretty good around here. We've been going through our usual ups and downs and changes these last couple of months. I keep telling people we're in kind of a transition period—but, then, it *always* seems that way. The faces change every so often, and the pressure of one project blends into another.

RAINBOOK is out of the way, and it feels like a huge load off our backs. It's too early to tell how it'll be for other people, but we run to it umpteen times a day for information we used to have to dig out of files or obscure corners of our brains. Hopefully before too long you'll have your own copy to use and enjoy.

After finishing this portion of RAINBOOK in early December, Steve Johnson fulfilled his long-time promise to himself to pull out and put his feet up for a while. He's found a rent-free caretaker position out in the country, is collecting unemployment and culling through his boxes and boxes of archives. He's still very much a part of RAIN—you could say he's on sabbatical—and sometime towards the end of spring he's promised to begin contributing to the magazine again.

Rhoda Epstein has left us too and our attic, where she resided with her boxes, and Steve's cat feels very empty.

She's now living in an apartment not too far from here working on the Northwest Media Guide for the Center for Urban Education. She's also been involved in setting up the Sandy Equinox gathering of the Northwest "alternative network." Both Steve and Rhoda can still be reached by mail through RAIN.

Anne McLaughlin is off to Guatemala for a couple of months' well-earned vacation. We almost panicked at the thought of having to manage subscription cards (almost up to 2000, plus 300 or so exchanges) and do all the bookkeeping without her (not to mention this column), but we vowed to do our best. It's taking three of us to do it!

Marcia Johnson, who has been doing our layout since last fall, has been helping out in the office, and we found Emelyn and Bill Rohlffs. Or actually, Mary Lawrence at OMSI found Emelyn and Emelyn recruited Bill. They're retired and are squeezing us in between building new houses, trips to Spain, a radio program for the blind, and numerous other activities they've only hinted at. We love them and hope that when Anne comes back they won't be so fed up with cheshire cards and zip code filing that they'll vanish entirely!

(For all our sakes, I'd better insert the usual Rain Drops notice here:

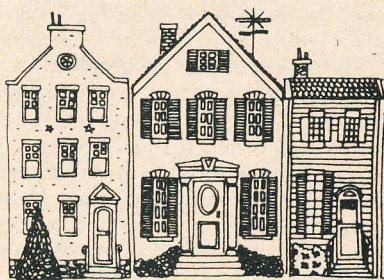
Please let us know when you move—before you move if at all possible. And include your old address as well as the new. Our single biggest headache is keeping track of you all.)

Tom Bender, Lee Johnson and I continue to putt along. In fact, at the moment it feels amazing just to be doing a magazine for a change—we've finally learned to say "no" to a few of the tantalizing and important opportunities to put our fingers in all sorts of pies that come our way. Just got back from a very nice week in California. We went down for the Schumacher conference in Davis and spent some wonderful and encouraging hours at the Office of Appropriate Technology and Farallones Institute (both Berkeley and Occidental). Lots of good things are happening, folks!

We're now trying to catch up on all the mail that piled up while we were working on RAINBOOK. Please forgive us if we're late responding to your queries and slow in reviewing your much-welcomed tidbits of new information. The volume of mail has increased considerably around here, and answering it is taking us longer than it used to. But please keep it coming—we love positive feedback, we're glad for criticism, and there wouldn't be much of a magazine without all the goodies you send us. Let us know when you have a project or a new book or a news item you'd like to share with the network. The chances are good we'll print it or at least pass it on to the appropriate person. And if you have ideas about things we should cover, please send them along. Keep in touch!

Hope the spring is good to you. Enjoy your April Showers.

—LdeM



SHELTER

Canadian Self Help Housing Association
P.O. Box 4134
Vancouver, BC V6C 1Z9 Canada
These are the folks who built the Hab-

tat House at Habitat last summer. They have a good bibliography on Self-Help Housing (\$2.50), plans for Habitat House and other designs, other design aids, and they give courses and offer consulting in self-help housing. Publications list available. (TB)

Housing Resources Manual, 1976, \$3.50 from:

Pratt Center for Community and Environmental Development
275 Washington Avenue
Brooklyn, NY 11205

A roadmap through the maze of bureaucracy in New York City dealing with housing. Where to go and whom to call for assistance with all sorts of things—rent strikes, homesteading programs, rent subsidies or sweat equity programs.

An excellent guide to the kinds of programs that are available or have been tried and who to contact to find out about them—as well as a good model for other communities. (TB)

RAIN's office is at 2270 N.W. Irving, Portland, OR 97210. Phone (503) 227-5110.

<i>RAIN Staff</i>	
Lane deMoll	Marcia Johnson
Lee Johnson	Anne McLaughlin
Tom Bender	Steve Johnson
Emelyn Rohlffs	Bill Rohlffs

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Printing: Times Litho



RAIN PUBLICATIONS

- RAINBOOK: Resources for Appropriate Technology**, 256 pp., April 1977, \$7.95.
Resources for changing our dreams and communities. Compilation of the best of RAIN through Spring 1977, with much new material on economics, communications, health, energy, community building and other areas. Fully indexed. Incorporates A.T. Sourcelists, Coming Around, and most back issues listed below.
- Ecotopia Poster**, by Diane Schatz, 2'x3', \$3. A reprint of the "Visions of Ecotopia" line drawing that appeared in the April '76 poster issue. Great for coloring.
- A.T. Sourcelists**, August, 1976. 50¢ each, any 6 for \$2.
Two to five pages each, prepared by RAIN for the California Office of Appropriate Technology:
 - Direct Solar Heating/Cooling
 - Energy Conserving Landscaping
 - Wind Energy
 - Solid Waste Utilization
 - Drying Up the Toilets
 - Diseconomies of Scale
 - Bioconversion: Methane Production
 - Weatherizing: Home Insulation
 - Costs of Urban Growth
 - Natural Pest Control
 - Appropriate Technology
 - Low-Cost Construction
- Employment Impact Statement**, October 1976, 2 pp., 50¢. A simple, step-by-step way to figure the employment impacts of a new industry and consider the benefits of different options.
- Woodstoves, Rainpaper No. 1, November 1976, \$1.** Compiled reprints from articles by Bill Day on selection, maintenance and repair of woodstoves of all kinds. Bill is a third-generation repairer of woodstoves in Portland, Oregon.
- Sharing Smaller Pies**, by Tom Bender, January 1975, 38 pp., \$2. Discussion of the need for institutional change tied in with energy and economic realities. Begins to lay out new operating principles, including some criteria for appropriate technology.
- Environmental Design Primer**, by Tom Bender, 206 pp., 1973, \$5. Meditations on an ecological consciousness. Essays about moving our heads and spaces into the right places.
- Living Lightly: Energy Conservation in Housing**, by Tom Bender, 38 pp., 1973, \$2. Early ideas on the need for change in building and lifestyle; compost privies, Ouroboros Project (self-sufficient experimental house in Minnesota) and the "problem of bricks in your toilet."
- Coming Around: An Introductory Sourcelist on Appropriate Technology**, prepared by Lane deMoll, 12 pp., revised edition, September 1976, \$1. A general listing including general theory, economics, and energetics, community, manufacturing, tools and hardware, financial institutions, agriculture, health care, shelter, transportation, self-reliance and energy. Does not include how-to publications but directs you to them.

Back Issues Available, \$1 each. Circle those desired; Vol. I, Nos. 7, 8, 9; Vol. II, Nos. 1, 2, 3, 4, 5, 6, 7/8, 9, 10; Vol. III, Nos. 1, 2, 3, 4 and 5. (Vol. II, No. 6 was a poster issue; Vol. II, No. 9 was a special issue on Northwest Habitat.)

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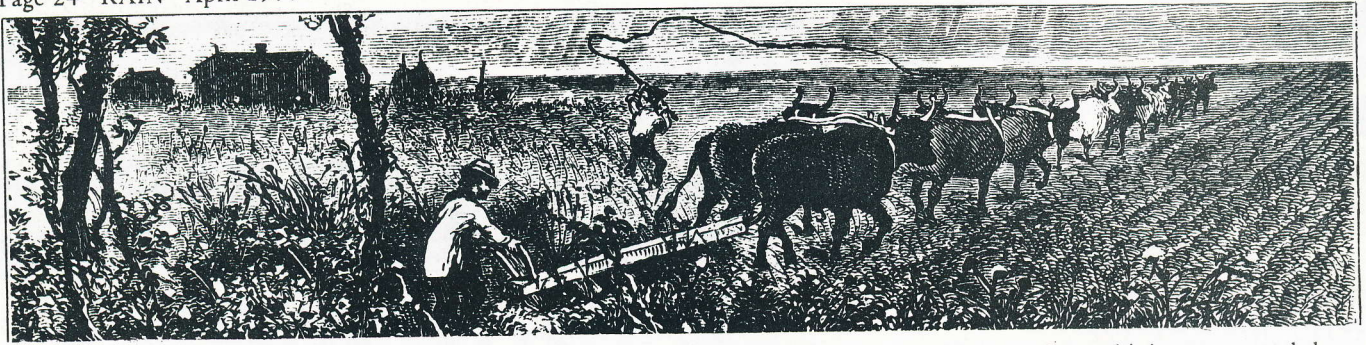
- Regular: \$10/year - 10 issues
- Living Lightly: \$5/year - 10 issues (income less than \$5,000 . . . ?)

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AGRICULTURE

IFOAM Bulletin (International Federation of Organic Agriculture Movements), \$4/year quarterly from:
Dr. Hardy Vogtmann
Research Institute of Biological Husbandry
Postfach CH-4104
Oberwil, Switzerland

The *IFOAM Bulletin* is now being printed and distributed in the U.S. by Rodale Press, making their useful information more accessible to Americans interested in organic agricultural developments. The most recent issue contains information on the Center for Rural Studies' Low Energy Agriculture Research Project, MOFGA's "extension" program, nitrogen fixation research, intercropping, use of live mulches, and success of the legal battle of Pat and Dorothy Langan in Toppenish, WA, against pesticide spraying. (TB)

The Use of Ground Rock Powders in Agriculture, Eliot Coleman, 50¢ from:
Small Farm Research Association
Harborside, ME 04642

A survey of the literature on granites, feldspars, micas and basalts. Coleman concludes that rock powders can be of considerable use as agricultural fertilizers providing: A) the proper mineral composition of the rock is taken into account, B) the rock powder is ground as finely as possible, C) it is applied

under soil and weather conditions conducive to its decomposition, and D) crops and green manures are used which can convert the rock nutrients into organic forms accessible to subsequent crops. (TB)

Food Production in the Canadian Environment, Barbara and Larry Geno, Dec. 1976, \$2.80 from:
Science Council of Canada
150 Kent Street
Ottawa, Ontario K1P 5PH

The final version of Geno's earlier draft report on patterns of Canadian agriculture and suggestions for changed practices and consumption patterns which would make it less energy intensive, less ecologically destructive and more resilient to the economic, energetic and environmental problems facing farmers today. (TB)

European Biological Agriculture 1976, Eliot Coleman
Small Farm Research Association
Harborside, ME 04642

Interesting reports from a wide variety of farms and agriculture research organizations in Europe involved in biological agriculture that were visited on the 1976 European Farm Tour. Most beneficial techniques noted were careful mix of green manure crops for more complete soil improvement, extensive use of leguminous cover crops, meticulous manure management, improved forage mix in pastures, integrated operations for nutrient recycling, greenhouse use to extend cropping season and on-farm production of cheese,

butter, wine and juices to extend the income season. Two 1977 tours are being arranged: Oct. 1-23 and Oct. 13-Nov. 4, which will overlap at the International Research Conference on Biological Agriculture in Switzerland. The tours are non-profit and as inexpensive as possible. Contact Eliot Coleman for details. (TB)

The Biology of Agricultural Systems
C.R.W. Spedding, 1975, \$19.50 from:
Academic Press
111 Fifth Ave.
New York, NY 10003

This book considers the biological processes involved in agro-ecosystems. Various kinds of systems are described from an ecological perspective. Limiting factors, energetic efficiencies, wastes, and stability factors are analyzed. Models are proposed for better understanding the dynamics of agricultural systems.

This book would be of definite interest to anyone into a systems approach to agriculture. Up to date references of European literature on a very wide range of subjects might expand the awareness of the American student. Lots of tables, charts and diagrams. I have used it a lot.

... You Coasters have sent us another high, howling Chinook. A warm cloud tosser, singing in the tree tops tonight. Thank you. It brought some rain too (small "r") and that is much needed.

Take care,
Yer pal,
Woody Deryckx



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