University *of* Oregon

The Newsletter of the Solar Information Center

Volume 9 Number 3 Winter 1999

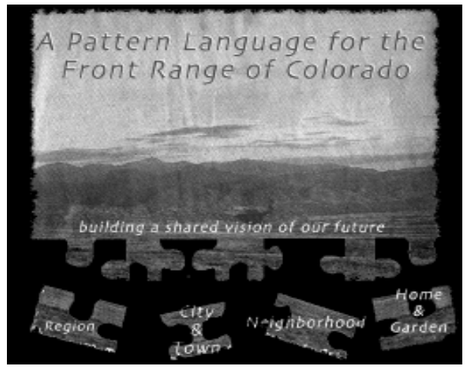
A Pattern Language for the Front Range of Colorado

by Brian Fuentes

As an architecture student and future contributor to the built world, I have set the following standards for myself:

1. I choose to pursue ecological design principles
2. I seek an equitable and democratic process for shaping the environment
3. I attempt to envision a sustainable future for the world.

Given my research and education, I have come to the conclusion that architects should help to educate and empower the public in order to accomplish the above goals. As forest biologist Chris Maser points out in his book, *Sustainable Community Development: Principles and Concepts*, people's values, belief in process, and the empowerment to act and collectively resolve problems is the first component of sustainable community development. Education that allows people to learn of their connection to social/environmental problems, both local and global, is the second part of the mechanism. Teaching participants how to plan strategically is the third part, and a sound working knowledge and practice of the democratic system of government within which to fit the three parts is the final, all encompassing piece (Maser 118).



For my senior thesis, I have created a website in order to help teach my people (fellow Coloradans in the Denver Metro area) about their connection to social/environmental problems related to architecture and planning along the Front Range of Colorado.

The site encourages people to embrace values of equity and collaboration, and seeks to empower them to act for the benefit of themselves in the context of the region and community as a whole, whether they be citizens, architects, planners, or builders. It was created in the hope of igniting dialogue among citizens regarding these issues, as the foundation of a democratic architectural and planning process.

In order to provide useful information to the public despite the complexity of the issues involved with architecture and planning, I needed a structure which both was user friendly, interactive and allowed people interested in different types of information to retrieve it quickly, as well as submit their own ideas within an existing framework. It needed to facilitate an understanding of the connection between each act of building and the environmental quality of the region and earth as a whole.

For these reasons, I chose to structure the site in the Pattern Language format, popularized by architect Christopher Alexander and the Center for Environmental Structure.

The structure of a Pattern Language is a network of interactive and interdependent strategies for resolving social and environmental issues on different physical scales, or what Alexander calls a Language of Patterns.

Each strategy or pattern, seeks to resolve a specific issue, and provide a specific solution at that same scale, suggesting an action to be taken. Each pattern is simple to understand, and is a complete argument in itself. Each of these patterns is digitally linked to other patterns, in such a way that each reinforces, supports and strengthens the others. A pattern language is one big argument comprised of many smaller arguments. This allows people to work together at different scales in order to achieve regional goals.

For example, an architect might convince a couple to use patterns which reduce building energy use such as *cross breeze windows* or a *solar angle roof* in their affordable new *house in between lots* approved by the planning department in order to help create the necessary density to support a mass transit hub at the center of the community creating a *transit corridor urban center* which reduces regional air pollution.

The strategies developed at this website focus specifically on finding solutions to the problems faced by the Denver Metropolitan region. However, Denver suffers from problems endemic to many other American cities, so this material should provide some insights into the future of architecture and urban planning in America on the whole.

Check it out for yourself: *http://marvelous.uoregon.edu/aristos_arch*

What's Inside

219 Pacific Hall
346-3696
usually open M-F, 9-5
24 hour answering machine
e-mail:
sic@darkwing.uoregon.edu
website:
http://darkwing.uoregon.edu/~sic/

The Solar Information Center welcomes submissions for articles and our Solar and Sustainable Design Showcase.

What is the SIC ?

We are a student run organization sponsored by the ASUO (Associated Students of the University of Oregon) and EWEB (Eugene Water and Electric Board). Our purpose is to serve as a research, education, and information center on solar and alternative energies, and their applications in architecture and technology.

One of our vital functions is to promote a higher awareness toward conservation and renewable energy. Throughout the year we sponsor lecturers who speak on local, regional and global issues of energy and sustainability. Our center also provides an in-house information source of books, periodicals, abstracts, proceedings, topic-files, product-files, and a World Wide Web site.

Lecture Series | **In-House Library** | **Student Work** | **ERC Project** | **Web Site**

Kid's H.O.P.E.S. 1999

by Maren Tomblin

It was a bright sunny Saturday morning when, instead of watching cartoons, some of the youngest HOPES attendees gathered outside of Lawrence Hall for the 1st annual Kid's HOPES. The Solar Information Center coordinated four mini-workshops entitled "Kids Go Solar." Participants made solar ovens, learned about passive heating with the solar doll house, discovered how photovoltaics work, and took part in a solar gameshow. Throughout the day both children and adults stopped by to see what we were up to. Favorite activities included cooking solar nachos and cookies with solar ovens, and playing with P.V. powered radios.

We are currently developing renewable energy activities for kids and hope to begin presenting them to local schools next fall. Look for us again at the HOPES 2000 conference for another day of solar fun! If you would like to help us develop a renewable energy curriculum or take workshops into the schools please contact us at the SIC.

Thanks to John Viner for the solar radios!

Renewable Energy Fair 1999

by Neil J. Peterson

This year's Renewable Energy Fair was an astounding sun filled event! Spectators were blessed with blue skys above, a host of information booths and groovin' bands. Real Goods provided the equipment for a solar powered stage consisting of 300 watts of Astro Power and Siemens Solar panels, a Trace Enginnering power inverter and 8 Trijan gel cel, deep cycle batteries, all of which fit nicely into a VW Westfalia camper van. We had three bands play for a crowd of students and members of the community. The first group, a jazz/ funk band called Honey Bee Groove really rocked the ampitheater. It was great to see everybody dancing and grooving in the sunshine and feeling good. The beat rolled on with Flynn, a local band with a hard edge blues sound. The final headliner band was, fittingly enough , Soular, a funk band with a technical eclectic sound full of fun energy. Complementing the information booths was Eugene Water and Electric Board's electric truck made by Ford Motors and Nevco's cute and quirky Gizmo, an electric scooter. EWEB also supplied alot of great information about their wind power farm which will be up and running in the year 2000. We had booths from The American Hydrogen Society, Peace Place meditation center and and the U of O Bike Taxi. The University of Oregon Solar Information Center was very proud to host such a great event. After all this fun and frivoloity Steve Musser, manager of Eugene's Real Goods store, reported that all that bright sunshine provided fully charged batteries at the end of the day, providing a net gain of power! A big thanks to the Erb Memorial Union and Survival Center who hosted Earth Week and made our day in the sun possible. See you next year for more renewable energy fun!

What's New

- The Solar Information Center recently elected staff for next year. Congratulations to Ben Gates and Maren Tomblin, our new Co-Directors, Chris Chalmers - Events Cordinator, Nathan Elliot - Newsletter Editor, Stacey Weinkauf - Educational Outreach Coordinator, and Treasurer - Billy Nachman

Photovoltaics: A Workshop by Steven Strong

by Jason Wilkinson

On April 29th Steven Strong gave a presentation to a crowd of about one hundred people at the University of Oregon in Eugene. The following day in Portland he conducted a day long workshop that detailed in depth, issues of photovoltaics in buildings. The following are notes from these two presentations and Strong's book, *The Solar Electric House* that provide a great argument for the need and possibilities for solar electric architecture.

Introduction

Steven Strong in the early 1970's, while working as an engineer designing power stations along the Alaska pipeline, came to realize the importance of energy efficiency. Upon his return to Boston he established Solar Design Associates, dedicated to the design of environmentally conscious buildings and houses. For the past 20 years he and his firm have designed many building integrated solar systems. Earlier this year he was named by *Time* as one of the environmental heroes of the decade. (*http:\\time.com*)

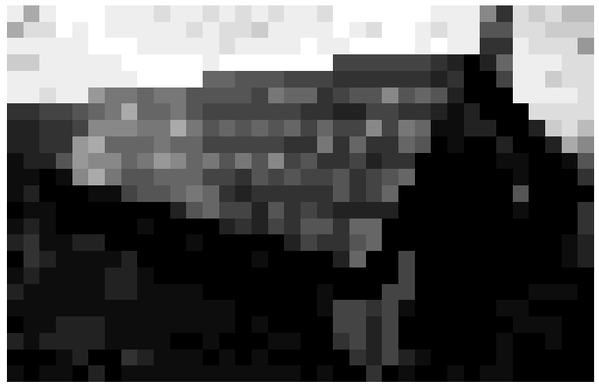
The Energy Crisis

The industrialized world, currently has a false vision of itself. The illusion of a stable comfortable society, hides the fact that the luxuries we enjoy are part of a precarious balancing act that is dependent on cheap subsidized energy. Most of this energy is derived from fossil fuels, specifically oil. C.J. Campbell, in his article "Running Out of Gas," analyses the depletion of conventional (or higher grade) oil resources. The discoveries of oil peaked during the 1960's and even with advances in technology for locating oil reserves, discoveries have steadily dropped with each decade. In comparing his calculations for the remaining amount of conventional oil with the expected increase in population, Campbell reached some disturbing conclusions. A smooth transition to a renewable energy economy will mean that we drastically cut the amount of oil use in the next two decades.

Currently the amount of oil used per person (this number is much higher in the wealthy developed countries) is about 4.051 barrels per year, in 2020 this amount would need to be 2.163, cutting oil use roughly in half, to make the smooth transition to renewable energies by 2050. This is assuming that we use the entire remainder of the conventional oil supply. It is also assuming a myriad of ever increasing silicon photovoltaic (PV) cells. Steven describes these simple contraptions as "life affirming technology."

Sunlight Into Energy

The silicon for the PV cells is derived from quartzite or common beach sand which is one of the most abundant materials in the world. When sunlight strikes the silicon crystal on the PV cell, electrons within the crystal become excited by the striking light photons. These electrons are knocked loose from the top (negative) crystal layer and flow through an external circuit and



are redeposited on the bottom (positive) crystal layer. This continual redepositing of electrons means that PVs operate in a closed loop cycle, and in the external circuit this cycling can perform work.

Types of PV

Single Crystal: molten silicon is cast into round or square bars, then cut into very thin wafers. This process requires a more refined semiconductor-grade silicon.

Polycrystalline: crystals are grown using a less refined metallurgical grade silicon which requires far less energy and materials than single crystal production. Polycrystalline cells have a complex crystal pattern and tends to be only slightly less efficient (1%). Thin extrusions of molten silicon can be laser cut to reduce material waste.

Amorphous Thin Film: in this process amorphous silicon can be applied as a thin film to a variety of material substrates. This process uses much less energy input and wastes much less materials, but the cells are currently about half as efficient as polycrystalline or single crystal PV cells. This process allows much flexibility as represented by the range of products: flexible PV roof shingles, PV metal roofing, PV vision glass. (See *Solar Incidents* Fall 1997 issue)

Wiring

PVs can be wired in series or in parallel to achieve different currents and voltages. Cells are linked to form a module and modules are linked to form arrays. PVs produce direct current or DC, which is similar to electricity from batteries but is different from typical household alternating current (AC). A converter will change the PVs DC electricity into AC.

Configurations

Direct Application - Stand Alone

This set up links a PV with a DC load. An example would be a solar powered DC pump that comes on only when there is enough sun light. With the addition of batteries this system can provide electricity during night time or cloudy weather.

Multiple Loads With A Generator Back Up

This set up has PVs on a series of houses with a central location for the batteries and generator. The benefits of this configuration are a diversity of peak loads that allow for less PVs as well as more design freedom in terms of solar orientation. It also provides for a central battery bank and generators for easy and safe servicing. The generator can be replaced with utility back up.

Utility Interactive

Applications of "net metering" allow the meter to run in both directions. If your solar panels are producing more energy than your loads the extra energy goes back into the utility grid and spins your meter backwards. In some districts the utility will pay you the retail rate (if you only have one meter) or a premium rate (if you have two meters - one spins backwards and one forward). In some utility districts, however net metering is not allowed or the payment you receive for your high quality PV electricity is only a wholesale rate.

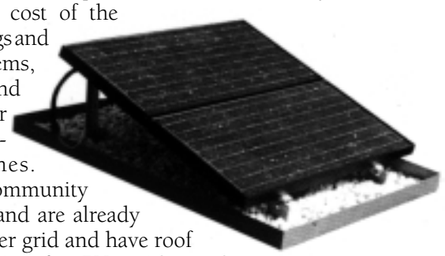
This bi-directional flow of electricity between the utility power grid and PV has several requirements. The inverter must peacefully coexist with the utility power wave form, frequency, and signal or else it "is toast." Safety is also a concern for the utility workers. Almost all inverters have built-in shut off switches and are rated with a UL listing, which it means it is very safe. As well most utilities have a dip stick test policy before maintenance is performed.

Utility Interactive Residential Development

The PV systems can be on individual houses or have a central PV array with each house using an individual meter. An example of the latter can be found in San Diego, CA in John Long's Solar 1 with an 18 to 20 house grid intertie central PV system. The utility interactive system is a win/win situation for both the owner who doesn't need to maintain batteries, and for the utility because PVs produce maximum power during the peak load demand (midday - commercial air conditioning).

Utility Scale

A large scale utility PV array as a central power plant has many draw backs compared to decentralized systems. Most obvious is the cost of the land, the footings and mounting systems, the trenches and conduit, transfer stations and distribution lines. Houses in the community on the other hand are already tied to the power grid and have roof structures waiting for PVs without the preparation of a large area of land.



Batteries

Batteries are right for the right situation, but they do present a significant liability. Because of the high amps, it is imperative to keep people away from a secure storage area. This space must also be maintained at a constant temperature range of (55-75 degrees F), freezing temperatures can cause batteries to break resulting in a big mess. Steven recommends lead acid batteries used in golf carts or fork lifts which are small enough to carry easily. Batteries also evolve hydrogen which is highly combustible, therefore electronic controls should not be keep within the storage area. A vent at the top of the battery storage box is essential.

Architectural Applications

The forthcoming advances in building integrated photovoltaics for the US can be seen currently throughout Europe and Japan. Colored PV, laser etched vision PV glass, and spaced PV grid structural glass elements are all currently in use.

Flat Roof

Old applications required hard connections to the roof structure. Newer systems use a ballast, or pans filled with roof gravel to ensure the system is not blown off the building by strong winds.

Sloped Roof

North facing skylights can have PVs added to the south slope.

PV Daylighting

As overhead glazing applications PV can act as south facing skylights that filter the sunlight. Laser etched thin film PV have holes cut by a computer controlled laser to any width and size for varying degrees of transmissivity. Spaced single crystal PV cells allow sunlight to pass between the cells in an every changing pattern over the course of the day that can bring delight to any room.

Vertical Curtain Wall

In a vertical curtain wall PV panels can replace the traditional glazing or panel element pound per pound, and fully integrate this sustainable energy producing technology into the architecture. Transmissive vision PV or spaced PV cells can allow daylight to enter the building. Designers can create patterns using these types of PV panels, glass and other panel materials for a unique architectural expression.

Sloped Curtain Wall

In slopped curtain walls PV panels can replace roofing materials or glazing elements. The slope gives the PVs a higher performance than vertical surfaces, for most latitudes. The Georgetown University Intercultural Center is a good example of a PV application for slopped curtain walls. This building is in the flight path of a major airport and is usually covered with a filthy grime. Steven described how the dirty PVs were tested along side a clean section, the results showed that there was only a 10% loss

...continued on page 10

Solar and Sustainable Design Showcase: Arroyo Del Valle Youth Camp

a terminal design project by Russ Weiser

Campers at the 138 acre Arroyo Del Valle Youth Camp learn about environmental sustainablility firsthand. They will live in buildings that integrate with the natural environment, learn to grow healthy food without polluting, and travel on permeable green roads that prevent streambed erosion. This project was developed in a terminal studio taught by professor Virginia Cartwright in 1999 and is based on a real project near San Francisco.

Renewable Energy Park
- Buildings use passive solar radiation, natural ventilation, and collect energy with photovoltaic panels
- Windmills collect wind energy for electricity
- Microhydro generators demonstrate how energy can be collected cleanly without affecting fish
- Electricity generated on the site is used to power electric carts, lights, or is sold back to the utility company

Cabins
- Rammed earth wall stores heat
- Winter sun porch becomes a shaded porch in summer with fold up garage size doors.
- Photovoltaic panels generate electricity and run the meter backwards.

Site Plan
- Buildings are located upland to preserve good soil in lowlands and fauna of riparian and protected sites
- Permaculture farm is located on richer lowland soils
- Riparian zones downstream of farm are strengthened to keep water pure and increase wildlife habitat

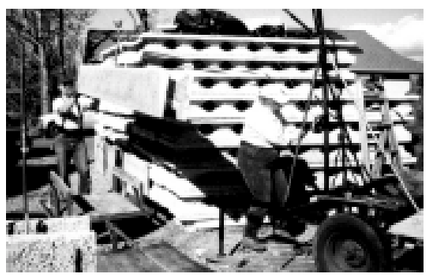
Buildings Integrate with Natural Processes
- Earth moving was minimized by using existing foundations and putting cabins on stilts
- Buildings are constructed of materials that are recyclable, biodegradable, or have low embodied energy
- Transition spaces between indoor and outdoor, natural light, and cross ventilation allow people to experience the outdoor environment in all weather conditions.

A Unique Home in an Intentional Neighbourhood

by Jerry Brule

We belong to a community on Tiara St. Our core group started out with an interest in Co-housing. In this living arrangement families share common spaces for dinners, exercise, guest rooms, etc.: all of those extras that tend to make houses so large. With co-housing individual homes can be smaller and simpler. We found that it was almost impossible to get enough like-minded people who were willing to front the necessary money to develop a piece of land with streets, sewers, etc. Instead, we found a cul-de-sac that was already developed, made an offer, and found enough people to purchase all 9 of the lots. We also added a couple of lots across the street, and a couple of families that didn't want to build, purchased homes that were already built adjacent to the cul-de-sac. We don't have a common house, but with individual ownership of lots it is much easier to get financing, and simplifies the design process.

The members of the community are all very diverse and their home designs reflect this. One house has a Japanese influence, another a Mediterranean. One member built an ADU (accessory dwelling unit) and has graciously allowed us to use it as a meeting place where we have weekly dinners. Another household purchased a lot to preserve one of Eugene's oldest and most majestic oak trees. We plan on having a common garden and share many things like lawnmowers and tools. All of the members share a desire for community and a love of the environment. Most have decks facing the street so we can visit with each other. The homes are energy efficient and many utilize non-toxic and sustainable building materials. One is a timber framed straw bale house and four of the homes use Rastra block.



Our house is one of the Rastra block houses. Rastra is what is known as a stay-in-place insulation system. Each block is 10 feet long and contains 85% recycled polystyrene with a cement binder. When the blocks are stacked up, they form a mould enclosing 6 inch cylinders every 15 inches horizontally and vertically. When the blocks are filled with reinforced concrete, a 10 inch thick wall is formed that is 8 times as strong as a conventional stick-framed house, has an R value of 36, is fireproof, and is termite and rot resistant. A completed wall is supposed to be about the same cost as a 2x6 wall, but I found it to cost slightly more. We made up for this extra material cost with a savings in labor.

Our house will probably be the largest of the Tiara St. homes, so to make it affordable we have done all of the design and most of the construction ourselves. The downside of this is the amount of time we have invested. We started when there was only one house in the neighborhood and our kids were in grade school. Now there are families living in seven completed homes and it seems like our house may not be completed until our kids graduate from high school.

Rastra block is a very good material for owner-builders, requiring little skilled labour or training. The blocks cut easily with hand or chain saws and may be sculpted to form architectural details. Electrical boxes and wire courses can be cut directly into the blocks. However, they do require some labour to assemble with the basic block weighing 140 pounds. I built a small crane to help lift them into place where they are glued together with foam.

We decided to build the top story and roof from another alternative building material called Stressed Skin Panels. These structural members are made of polystyrene panels with OSB (oriented strand board) bonded to each side. The wall panels are 5-1/2 inches thick and the roof panels are 11-1/2 inches thick. The polystyrene insulation is not recycled, but the OSB is made from "waste" wood and does not deplete old growth forests. The R value of the roof is about 50 and the walls are about 26.

The cost of the stressed skin panel is higher than conventional framing, but we wanted something we could put up quickly and easily with non-skilled labour before the rains came. In actuality, the panels took over 4 months to produce so we did not get them until the rainy season started. The panels are supposed to fit together easily, but they took some convincing. I requested that some of the panels be trimmed so that they would conform to the level irregularities in the already built wall. When the panels were put up I found the changes were not made, necessitating some trimming 35 feet up in the air.

The wall panels could be lifted with block and tackle and some help, but the roof panels had to be lifted up with a crane. Once they were up we found they were impossible to join together. The long roof panels have a 2x12 on one edge that is supposed to fit into a grove in the adjacent panel. In some cases there was a half inch difference. After hand-planing the roof panels we were able to put them together just as the rainy season had ended. All of the panels are missing the required state approval stamp so they still haven't

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Building with Cob

by Stacey Weinkauf

There are a number of alternative building methods that are being applied today in home construction. They utilize new "green" manufactured products and, recycled and reusable materials, and sustainably harvested materials. The idea behind constructing this way is to consume less energy and cycle wastes back into production and living processes.

Strawbales, salvaged stone and timber, old tires, and cans and bottles are some alternative materials being used today. If these materials weren't being used in housing they would be filling up landfills or burned, adding carbon dioxide into the atmosphere. Another method has been used for centuries, mostly in the deserts of the Middle East, Africa, and the American southwest. Here, sun-baked mud bricks, or *adobe* has been used for building. However, earthen buildings were not limited to these hot climates. In the fifteenth century Englishmen started building homes with earthen walls and floors and thatched roofs.

This material, called cob, has been brought to the United States. Many structures, including homes, are adopting this building material. Because of its recent introduction, meeting codes and obtaining a permit is a lengthy process for many of these structures.

Cob is a unique combination of clay, sand, straw, and water. It is mixed thoroughly so that every grain of sand is coated with a layer of clay. The mix shouldn't be too dry nor too wet. Once the mix is ready the walls can be constructed. Building upon a foundation, layer upon layer of the cob mixture is applied to form slightly tapering walls. Each layer is sewn together by the straw forming a monolithic wall that is highly resistant to lateral forces such as earthquakes and wind. Building a high foundation and a deep roof overhang is extremely important here in the Pacific Northwest because of the omnipresent rainfall. It is said that a cob building should have good boots and a good hat. No

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been accepted by the city.

This home is designed for passive heating, collecting solar radiation through an attached two-story greenhouse. It will have five 4'x8' solar collectors and a 500 gallon hot water storage tank to provide both domestic hot water and supply a hydronic in-floor heating system. The main heat source will be a 50 gallon water heater with backup heat supplied by a gas fireplace. Because the home is so tight, it will have an air-to-air heat exchanger for fresh air, and a fan will automatically suck warm air from the top story and blow it back to the basement to prevent stratification between the three stories resulting from the open staircase.

forms are used in cob, allowing the walls, foundation, and roof to have very organic, curvilinear shapes. Its simplicity and sculptural qualities allow the dweller to be the creator, designer, and constructor. Shelves, benches, cabinets, and ledges can be easily shaped into the walls themselves.

Before building with cob there are many things one should consider. A lot of mining can occur in the extraction of clay and sand, so it is important to consider the source of the material. There is also a limit to the size of structures that can be built with cob. Cob offers the advantage of connecting the home builder to the place in which they live. For example, positioning of the windows must be a conscious decision with regards to views, daylightling and solar access. Trees can be easily be built around offering shade and wind and rain protection as well as a habitable landscape. Walls offer a large mass to store heat from the sun. Recycled and reusable materials, such as glass, lumber, doors, and fixtures, add character. When the time comes that the structure no longer is used it will decompose back into the earth's crust without any worry of toxins or pollution.

There are many examples of cob structures that have been constructed. Here, on the University of Oregon campus, a number of people gathered during the 1999 HOPES conference to construct a cob bench that will provide seating underneath a bamboo shelter.

We are looking forward to moving in sometime this year. So far we have only subcontracted the foundation footings and slabs, interior framing and plumbing. We will have some help with the heating system, sheet rock, and siding. We would like to thank a handful of students from the University of Oregon for the great help they have given us each weekend.

This house is not only built of wood, foam and cement, but it is also built of our dreams and bound together with our sweat and blood. It should last for many generations.

The Brule Family.

SolarFest '99

Saturday, June 19, 11 am - 6 pm, Broadway Plaza/Downtown Mall, Eugene, Oregon

Real Goods is sponsoring the fourth annual SolarFest in downtown Eugene. Activities will include solar-powered music, solar cooking demonstrations, and informational booths including the Solar Information Center. For more information contact Steve or Liz at Real Goods (541)334-6960 or e-mail steve@realgoods.com.

Oregon Country Fair

July 9,10,11, 1999, 11 am - 7 pm, Veneta, Oregon

The Solar Information Center will be in Veneta, Oregon for the 30th annual Oregon Country Fair. The fair has grown into one of the most unique festivals of its kind offering themes such as Energy Park which displays alternative energy, organic agriculture and recycling. Energy Park is full of attractions that are all related to the idea of creating, conserving and using our energy resources more creatively. The SIC will be one of the many booths there offering creative solutions to our planets growing energy needs. Tickets available at FastTixx 1-800-992-8499 and the EMU (541)346-4363. For more information: phone: (541)343-4298, e-mail: ocf@efn.org, http://www.oregoncountryfair.org.

Sol West

July 24 & 25, 1999, Grant County Fairgrounds, John Day, Oregon

The Eastern Oregon Renewable Energy Association presents Sol West Fair, an occasion for learning, networking, and supporting all types of renewable energy. This two-day event offers engaging activities for all ages and knowledge levels. We expect participants from around the western region to come and learn about energy efficiency, solar and wind energy, alternatively fueled vehicles, and more. The theme of the 1999 fair is "Renewable Energy Works For You". The fair is open from Saturday morning till Sunday evening. The fair will include vendor booths and a schedule of workshops and lectures on renewable energy topics. For more information: phone (541)542-2525, e-mail solwest@eoni.com, http://www.eoni.com/~solwest.

NW Energy Coalition: Save Our Wild Salmon

Thursday, October 14, 1999, 7:30pm, Lawrence Hall 177, University of Oregon

The NW Energy Coalition will be talking about an initiative to remove dams in Oregon, Washington, and Idaho. By replacing these dams with renewable sources of energy salmon and steelhead will be saved as well as taxpayer money which would have otherwise gone into failed salmon recovery efforts. For more information on this upcoming lecture call us at the SIC.

...continued from page 5

in efficiency and that the rain was able to keep the panels sufficiently clean.

Sawtooth Curtain Wall (in plan)

Vertical PV panels in some regions will be exposed to more sun on the East and West facades then on the South. A zig zag plan on the South facade take advantage of this.

PV Sunshades

On new or existing buildings this design element has a multipurpose function. Shading for the windows allows the building to reduce unwanted heat gains, while the PV panels produce electricity. In Europe this application of PV is being heavily used, from office buildings where summer shading is essential, to preschools where children can begin learning about this life affirming technology at an early age. Some designers have taken PV sunshades to a new level with the addition of tracking systems using torque tubes, which have been called "shadovoltaic wings."

The Future of PV

Throughout Steven Strong's presentation a reoccurring idea was that the future of PV is now. The variety of applications and panel types with the existing technology allow designers to integrate PV into buildings in numerous ways. The US market has not begun to reflect the possibilities as demonstrated in Europe and Japan. If there is the demand, we too will begin to see widespread applications of building integrated PV. One way to encourage that demand is to support "Net Metering" in your community. Another way is for designers to request information, samples and engineering data on the latest panel types (laser etched, and spaced vision) from PV manufacturers. The future of PV is bright!

Resources

Strong, Steven J., The Solar Electric House. 1991 Sustainability Press,

Komp, Richard, Practical Photovoltaics. 1995 Aatec Publications, Ann Arbor, MI.

World Wide Web Photovoltaic Resources

Solar Design Associates: *http://www.solardesign.com*

Maine Solar House: *http://www.solarhouse.com*

Solarex: *http://www.solarex.com*

PV Power Resource Site: *http://www.pvpower.com*

DOE PV Program: *http://www.eren.doe.gov/pv*

Center for Renewable Energy and Sustainable Technology (Crest): *http://solstice.crest.org*

National Center for PV: *http://www.nrel.gov/ncpv*

National Renewable Energy Lab: *http://www.nrel.gov/pv*

Sandia: *http://www.sandia.gov/pv*

Energy Efficiency and Renewable Energy Network (EREN): *http://www.eren.doe.gov*

American Solar Energy Society: *http://www.ases.org/solar*

ISES Wired: *http://www.ises.org*

Northeast Sustainable Energy Association: *http://solstice.crest.org/clents/nesea*

Solar Energy Industries Association: *http://www.seia.org*

Florida Solar Energy Center: *http://www.fsec.ucf.edu*

Utility PV Group (UPVG): *http://www.ttcorp.com/upvg/index.htm*

A sampling of the books and videos in our library

Ecological Design

by Sim Van Der Ryn and Stuart Cowan, Island Press, 1996

Ecological Design envisions how the living world and humanity can be reunited by making ecology the basis for design. Ecological design, the marriage of nature and technology, can be applied at all levels of scale to create revolutionary forms of buildings, landscapes, cities, and technologies. Some examples include:

- sewage treatment plants that use constructed marshes to purify water
- agricultural systems that mimic and merge with their surrounding landscapes
- industrial "ecosystems" in which waste from one productive process becomes fuel for the next

The authors present design principles that can help build a more efficient, less toxic, healthier, and more sustainable world.

Earth in Mind: On Education, Environment, and the Human Prospect

by David W. Orr, Island Press, 1994

In *Earth in Mind*, noted environmental educator David W. Orr focuses not on problems in education, but on the problem of education. Much of what has gone wrong with the world, he argues, is the result of inadequate and misdirected education that:

- alienates us from life in the name of human domination
- causes students to worry about how to make a living before they know who they are
- overemphasizes success and careers
- separates feeling from intellect and the practical from the theoretical
- deadens the sense of wonder for the created world

The crisis we face, Orr explains, is one of mind, perception, and values. It is, first and foremost, an educational challenge.

The author begins by establishing the grounds for a debate about education and knowledge. He describes the problems of education from an ecological perspective, and challenges the "terrible simplifiers" who wish to substitute numbers for values. He follows with a presentation of principles for re-creating education in the broadest way possible, discussing topics such as biophilia, the disciplinary structure of knowledge, the architecture of educational buildings, and the idea of ecological intelligence. Orr concludes by presenting concrete proposals for reorganizing the curriculum to draw out our affinity for life.

Placing Nature: Culture and Landscape Ecology

edited by Joan Iverson Nassauer, Island Press, 1997

Placing Nature is a groundbreaking volume in the field of landscape ecology, the result of collaborative work among experts in ecology, philosophy, art, literature, geography, landscape architecture, and history. In this book, they consider the goals and strategies needed to bring human-dominated landscapes into intentional relationships with nature, articulating widely varied approaches to the task.

Every possible future landscape is the embodiment of some human choice. *Placing Nature* provides important insight for those who make such choices-ecologists, ecosystem managers, watershed managers, conservation biologists, land developers, designers, planners-and for all who wish to promote the ecological health of their communities

Rebuilding Community in America: Housing for Ecolgical Living, Personal Empowerment, and the New Extended Family

by Ken Norwood, AICP and Kathleen Smith, Shared Living Resource Center, 1995

- Explore the Village Cluster, Urban Cooperative Block, Octoganal Family House, Solar Earth House, and other ecological housing designs which support an intergenerational extended family lifestyle, stabilize society, and protect the environment.
- Discover a deeper meaning of "sustainability" and "ecological living" by restoring to daily life the tradition of cooperative sharing of land, energy, and resources.
- Learn how sharing meals in a common house and rotating responsibilities of cooking and shopping can enrich family life, save money, improve food quality, and reduce the number of car trips per person per week.
- Examine ways to share abundant amenities such as garden, library, child care room, and workshop, and still enjoy the privacy and space of your private living suite or unit.

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Spring Term 1999 Events Schedule

Saturday, June 19
SolarFest '99

July 9,10,11
Oregob Country Fair

July 24 & 25
Sol West

Thursday, October 14
NW Energy Coalition: Save Our Wild Salmon

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