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 independent 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
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 skies 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 Engineering power inverter and 8 Trojan gel cell, 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 amplifier. 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 headline 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 Never’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 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 frivolity 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 Coordinator, Nathan Elliot - Newsletter Editor, Stacey Weintraub - Educational Outreach Coordinator, and Treasurer - Billy Nachman

The Solar Information Center welcomes submissions for articles and our Solar and Sustainable Design Showcase.
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 abundance, the expected increase in population (or higher grade) oil resources. The discoveries of oil peaked during the 1960’s and even with advances in technology, 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, or 50% less. If oil use is cut in half, to make the smooth transition to a renewable energy economy will mean that we drastically cut the amount of oil use in the next two decades.

The silicon crystal on the PV surface is that part of the cell which converts light directly into electricity across the silicon crystal pattern and tends to be only slightly less efficient (1%). Thin extrusions of molten silicon can be laser cut to create 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 thin wafers. This process requires a more refined semiconductor-grade silicon. Polycrystalline: single wafers 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%). The 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 (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 you to run your load 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.

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 and the utility company. Almost all inverters have built-in shut off switches and are rated with a UL listing, which means it is very safe. As well most utilities have a tick stick test policy before maintenance is performed.

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Campers at the 138 acre Arroyo Del Valle Youth Camp learn about environmental sustainability 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

**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.

**Cabin**
- 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
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 dinner, 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 lawn mowers 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 homes. Rastra is what is known as a stay-in-place insulation system. Each block is 10 feet long and contains 5½% 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 1 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 15% as costly 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 we are now 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 labor 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 labor before the rainy season 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 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 lifed 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 so we had to sand down one panel so we could be 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 been accepted by the city.

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

A Unique Home in an Intentional Neighbourhood
by Jerry Brule

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" building materials that are recycled and reusable, 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 one has yet completed a building that has passed all the codes, 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.

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The Brule Family.

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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.

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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 is a set of ways to organize and stabilize the built environment at many 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" that 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 reconceptualizing 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 Ecological 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, Octogonal 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.
- Explore houses 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.

For more information on this upcoming lecture call us at the SIC.
Spring Term 1999 Events Schedule

Saturday, June 19
SolarFest '99

July 9, 10, 11
Oregon Country Fair

July 24 & 25
Sol West

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

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