



## **Welcome to The Third Issue!**

We have the pleasure of introducing four new contributors to the Newsletter. Elizabeth Powers and Christina Neumann both attended the **Biomimicry and Architecture** workshops and share their insights in the following article.

Jeremy Eddy attended the Biologist at the Design Table workshop in January, and is working with Emily Hunter to revitalize the curriculum project. Check out the update on the **Curriculum Project** and his story in the **Members Corner**.

While at Stanford University, Stephanie Gerson developed her own thoughts on the application of biological principles to non-physical structures, primarily with regard to education. She recently learned about Janine's work and made contact through Marianna Grossman Keller of the Biomimicry Design Center. Check out her article on Bio-Education and creating mechanisms to encourage interdisciplinary collaboration.

The distribution list for the newsletter has grown to include a number of participants at the Biologist at the Design Table workshop. The first three issues of the newsletter are now available on the web through ThinkCycle (see **Resources**).

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## **Biomimicry and Architecture**

When I was a kid, I remember taking time to observe and interact with my surrounding environment, especially when going on hikes with my father in deep Pennsylvania forests to do photography and sketching. In the course of growing up, somehow this learning process became overshadowed by books and periodicals full of someone else's theories and observances. I neglected to exercise my intuition to its full potential. The most influential lesson I retained from the Biomimicry and Architecture course was to "re-learn" how to study with all my senses the wonderful complexity of my surroundings again, particularly in the natural world. What really blew me away was beginning to understand how various entities work together to create a balanced habitat, whether it be within



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the coral reef or the forest of St. John's Island. Janine and Dayna's lectures and insights about current Biomimicry research and philosophy, as well as scuba diving and hiking, were essential to beginning this process of "re-learning" by guiding us to be mentored by Nature.

For our design project, my team decided to study the characteristics of the forest termites and their tree-mounted cellulose dwellings. My job was to collect a few termite nest samples. I thought it would be simple and quick - I was wrong. Walking through the mangrove forest alone, I realized almost any move I made off the path would disturb the infinite numbers of small nests and spider web enclaves intermixed with the vegetation. The sun was setting over the bay in the humid late afternoon, which seemed to be spider dinner time as well as Maho Bay Camp dinner time. I came across what I thought to be the perfect sample. When I reached out to grab the piece, a large, hairless, and rather annoyed 6" tarantula quickly popped out about an inch below my hand and didn't let me take it. I thought I would just wait until she got tired and left. I waited. She waited. I waited about twenty more minutes. She didn't move an inch. I decided I had to go and an hour later finally returned to the camp with a small piece of termite nest from another spot feeling glad she had given me warning to have an awareness of her space (whether I liked it or not) around that abandoned termite nest. I guess you just can't go prying around someone's home without consequences. When you learn to respect their place, you increase your understanding of the operation of the whole. I also have a much stronger impulse to look twice before I reach for anything.

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### *Biomimicry and Architecture: From Maho Bay to the Pacific Northwest*

Biomimicry is a hopeful concept and the Pacific Northwest is a great laboratory for developing Biomimicry. These were my conclusions after attending the Biomimicry and Architecture Workshop in St. John this past February. In my work in sustainable building and sustainable business, I am almost always an optimist and value the steps, baby or giant, our clients take to bring us all closer to sustainability. Like many professionals in the field however, I am also seeking a robust, adaptable, and understandable tool for measuring sustainability to help myself and my clients identify the best steps to take.



I am fortunate to live and work in the Pacific Northwest where strong visual symbols of sustainable systems still somewhat flourish. There is a strong cultural connection to the salmon streams, Douglas fir forests and alpine meadows that surround our communities. This has led many organizations, businesses and individuals to develop tools, put programs in place, and develop products that are pieces of the sustainability solution. For the built environment, I propose that Biomimicry is first a model, and could be developed into a valuable tool, that would allow planners, architects, engineers, not just to "connect" to or "celebrate" the natural world, but to create buildings and landscapes that are functional parts of nature. Further, I think that the Pacific Northwest is a prime location for developing the use of Biomimicry in design of the built environment.

Looking to nature first as a model and, ultimately, as the measure of our success in sustainability is a natural extension of the work in sustainability currently underway in the Northwest. Low Impact Development and natural storm water management techniques like green roofs are taking root as the region grapples with preserving threatened salmon species. Meanwhile, many initiatives are underway to not only preserve forests "out there" but to integrate urban environments and forest ecosystems. Finally, our design community is chock full of leaders in the green building field who are already using natural patterns and products in their work.

I was struck at the workshop at Biomimicry (and Janine and Dayna's) ability to inspire people. Biomimicry is hopeful, in that it affirms: there is way to sustain a diversity and plenitude of organisms on limited resources - nature does it every day. After attending the workshop, I believe bringing this inspiration together with the natural inclinations of design professionals in the Northwest and our region's established leadership in sustainability could significantly contribute to the evolution of Biomimicry as a measure of the sustainability of our designs. As the field of Biomimicry develops and new tools like the Biomimicry database are developed, I look forward to helping Biomimicry blossom in the Pacific Northwest.

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## **Curriculum Project**

Imagine two high school students. One is instructed to memorize the anatomy of a leaf for a test. The other is challenged, along with a group of teammates, to design a gas exchange system for astronauts' space suits. The team is given the hint that an oak leaf might be a useful biological mentor for gas exchange. How will these two students experience "leafness" and what will they retain from that experience?

The latter example represents an exercise in biomimicry, a potentially far-reaching new framework for teaching biology and design principles. Presented with interesting, contemporary design challenges, students will naturally be motivated to look deeply into nature's mechanisms, to become admirers of species ranging from sea fans to elephants, from amoebas to willow trees, in search of insights.

As students compare the different forms of genius among these natural experts, the stage is set to explore the intimate relationship between species' form and the specific habitat conditions to which they are so exquisitely adapted. Indeed, within that exploration, an organism's form can be seen as a reflection of the selection pressures that define its habitat; they are two sides of the same coin. In other words, biomimicry can serve as an exciting and clear lens through which to learn about life's deep principles.

The curriculum project is at a critical stage where significant funding is needed. Jeremy Eddy is taking over the lead role in raising money for a pilot project and is part of the curriculum design team. Jeremy brings a wealth of experience with his background teaching middle and high school, as well as co-teaching a course on Applied Biology at the California College of Arts with Lars Tomanek.

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## **Database Project**

The Biomimicry Guild has been working with the Rocky Mountain Institute since last October on a prototype database of nature's strategies to inspire architects, engineers, and designers of built environments. We began with 12 of architecture's biggest challenges, including color, adhesion, dehumidification, foundations, building materials, protection from disasters, protection from elements, seasonal response to environmental conditions, sound, light, the building skin, and service distribution. We have five biologist interns working on gathering nature's solutions to these challenges and entering their findings into a database. We also have a handful of volunteers who have been researching current "human" strategies to these challenges. The database is scheduled to be released for testing this fall.

For more information or if you are interested in volunteering or testing the database, please contact:

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## **Bio-Education**

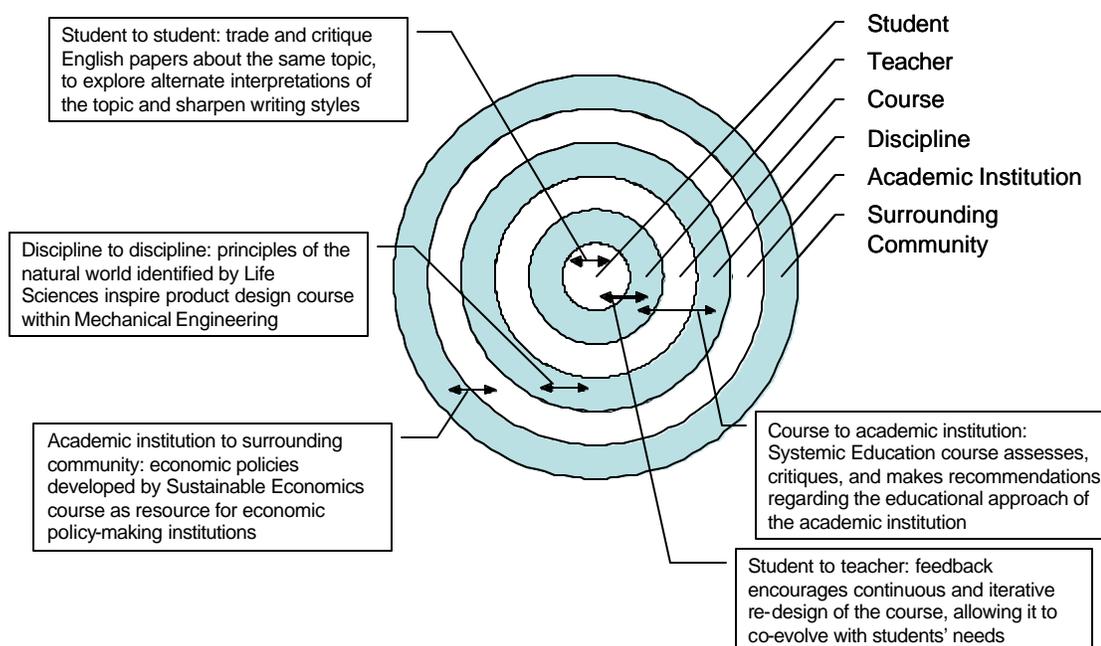
Biomimicry is design inspired by the principles of the natural world. Although usually applied to physical design (architectural structures or industrial systems), Biomimicry can also be applied to non-physical design (economic policies, political systems, or software programs). This article explores applying Biomimicry to Education - including, of course, that of Biomimicry itself - to help promote its conceptual framework among future designers.

So, what might 'Bio-Education' be like? Principles of the natural world may be applied to numerous aspects of the educational realm, spanning the design of educational policies, curricula (as with the Curriculum Project described in this newsletter), pedagogic materials, teaching tools and activities, and actual classes. To pursue a brief exploration, I will apply one principle, namely that of waste-as-resource, to the relationships between the components of an educational institution, and between the institution and its surrounding community.

Waste-as-resource, manifested by the recycling of nutrients within an ecosystem, implies that the waste of one organism may serve as a resource for another. This principle creates the "web of life" described by Fritjof Capra, as organisms' vital



processes are woven together to form mutual interdependencies and symbioses at multiple levels. In the educational realm, I propose that "nutrients" translate to ideas, completed work and projects, and "organisms" (which produce and consume the nutrients and exist at different trophic levels) translate to students, courses, disciplines, academic institutions, and the surrounding community. The diagram below shows selected interactions within and between various components at these different trophic levels. (Please note: this diagram might have been best represented as an interconnected web rather than concentric circles, and a web-making authoring tool would certainly foster systemic thinking.)



An academic institution practicing principles of Biomimicry would develop relationships amongst its students, faculty and disciplines, and with other academic and non-academic entities, allowing its nutrients to continuously circulate among these components. Students learning about sustainable agriculture design would maintain the on-site food-producing organic farm and coordinate barter with local farmers. Students learning about waste management would design recycling and resource-conservation programs together with local waste management institutions. Anthropology students focusing on Middle Eastern Cultures would contribute knowledge to Mid-East Conflict Resolution conferences. In mimicking waste-as-resource within an ecosystem, the intention is to continually identify new inter-relationships and



thereby enhance the institution's ability to generate creative solutions to problems, within its system, sub-systems and super-systems.

Far more possibilities exist than what has been described above - I have merely noted a few ideas inspired by one principle. Clearly, Gaia provides an abundance of ingredients for design within the educational realm, ripe for discovery and implementation. If learners are to think and be inspired by the principles of natural systems, educational methodologies must be developed according to and incorporate these very principles - simply put, the message must match the medium. If you are interested in exploring 'Bio-Education' further, I would love to hear from you.

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## **Upcoming Events**

The ***Sustainable Resources 2004 Conference - An International Forum Connecting People with Hands-on Solutions to World Poverty*** is planned for September 27 through October 5 in Boulder, Colorado. The conference includes a "Learning from Nature" track, headed up by John Mlade. Janine Beynus and Bill McDonough are both keynote speakers for the conference.

Track themes:

1. Waste Processing
2. Green Chemistry
3. Architecture
4. Business and Manufacturing
5. Design Process

A broad range of sessions and workshops are planned, as well as pre-/post-conference workshops on *Biomimicry and Design* and *ZERI*.

For more information, please see [www.sustainableresources.org](http://www.sustainableresources.org) (check out **2004 Program** and **Proposed Presentations**)

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## **Members Corner**

### *Jeremy Eddy - Confessions of a Biomimicry Nerd*

My own attraction to biomimicry, and my specific interest in developing K-12 curriculum based on its principles, dates to last fall. I heard Janine deliver a keynote address at the Bioneers conference in Marin, California. Her story of Namibian desert beetles harvesting moisture from mist-laden winds inspired me, as did her confident statement that we are surrounded by mentors whose adaptations light the way to a sustainable future.

A month or so later, a good friend forwarded an e-mail to me, announcing a "Biologists at the Design Table" workshop in Palo Alto for January 2004. I wasted no time filling out the application and read Janine's book right away. What excited me most was that in biomimicry I saw a unique opportunity to bring together my own long-standing interests in science and design, as well as to build my skills as a teacher and meeting facilitator.

I have been interested in biology ever since I was a tot, beholding the miracle of polywogs in Palo Alto's Matadero Creek or discovering newts under bricks in my parents' back yard. But almost equally old is my interest in design. As middle schoolers, my good friends and I started an entrepreneurial business, designing, building, and selling skimboards and snowboards. I have found myself drawn to dabble in clay, wire art, sketching, and all manner of woodwork, culminating in a 5-month vocational training program at a guitar-building school in Phoenix.

Meanwhile, I had invested five years as a middle- and high school science teacher. Following graduation from Brown University in 1994, I worked for the Ecological Society of America, promoting the use of up-to-date ecological science in the management of federal lands. Out of the blue, I landed a position teaching science at a new international boarding school in northern Thailand, outside the ancient, bustling city of Chiang Mai. It was an absolutely fascinating experience, highlighted by a huge range of English-speaking abilities and learning styles on the part of my students. The breathtaking landscape and the tender ways in which these students supported each other (and bowed to their teacher!) combined to make my time in Thailand a magical and deeply challenging experience.

I returned to the home waters of the Bay Area and taught middle school science for 3 years at a small Montessori school. It was, in part, my dissatisfaction with



science as it is taught today that drove me out of the school and motivated me to help build something better. During the Palo Alto biomimicry workshop, when Janine and Dayna highlighted the need for work on the K-12 curriculum project, I couldn't resist stepping forward.

This spring found me on a short trip to Matfield Green, Kansas, learning from Emily Hunter about the groundwork done to date on the curriculum project. As the baton is placed into my hand, I now face the task of raising \$150,000 to fund a pilot curriculum project. This curriculum, once honed through a few rounds of use in classrooms, will serve as the prototype for a full K-12 curriculum at the national level, ideally funded by one or more large foundations or government institutions.

In case it doesn't come through in writing, I'm deeply excited by this challenge. For those who are interested, there will be an update on the project at the Blacktail conference in June, accompanied by a brainstorm of next steps and allies and a recruiting of volunteers. Whether or not you will be in attendance, I welcome all comments and suggestions for what I see as an inspiring and extraordinarily important undertaking.



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## **Clippings**

*Green Machine* (Steven Butler; FastCompany, June/July 1996) Gunter Pauli, founder of ZERI (Zero Emissions Research Initiative), describes how zero emission factories are “the next breakthrough in business productivity” by implementing fully integrated, closed-loop biosystems. Gunter also shows how the Internet provides access to the knowledge of 4,600 scientists involved in 60 discussion groups. <http://www.fastcompany.com/magazine/03/gunterp.html>



## Resources

Recent BioInspire newsletters:

- [May 2004: "Faith in Sustainability"](#)
- [April 2004: "Earth Day 2004"](#)
- [March 2004: "Healthy Diet and Lifestyles in the Race for Life on Earth"](#)

[P.O.V. Borders: Environment](#) "...is the accompanying site for a PBS series focusing on practical environmental awareness. Each segment focuses on one aspect of the problem and suggests easy, practical things you can do to refrain from further damaging the planet." (Erin Gannon)

A new **Journal of Bionics Engineering** is now available free for the first two years. Send a request with your name and address to the editorial offices at [fsxb@jlu.edu.cn](mailto:fsxb@jlu.edu.cn)

Scirus ([www.scirus.com](http://www.scirus.com)) is a search engine specializing in scientific websites and journals, allowing more focused and efficient searches. For more information, see *Turning Search Into a Science*, **Wired News**, April 8/2004 at <http://www.wired.com/news/technology/0,1282,62979,00.html>

The Biomimicry Guild Newsletters are now generally available through ThinkCycle at [http://www.thinkcycle.org/tc-space/tspace?tspace\\_id=49344](http://www.thinkcycle.org/tc-space/tspace?tspace_id=49344). You do not need to register with ThinkCycle to read the newsletters; however, registered ThinkCycle members can subscribe to get notified automatically of any new newsletters, and can also use the ThinkCycle discussion group. A ThinkCycle Quickstart guide (requires Adobe Reader) is available at: [http://www.thinkcycle.org/tc-notes/show-note?tc\\_note\\_id=41609](http://www.thinkcycle.org/tc-notes/show-note?tc_note_id=41609).

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