



Greetings From Montana

Many thanks to Norbert and John for opening this new communication channel for the Biomimicry community. Ecosystems run on sunlight and shared information, and we're no different! Norbert has also been busy enlivening the biomimicry design space at ThinkCycle.org, and dreaming of ways to build community through our database effort. John has been instrumental in reaching out to young green builders and architects, and has successfully arranged for American Institute of Architects accreditation for our workshops. We're grateful to them, and to all the Biomimicry community helping to naturalize biomimicry in the culture. Let's use this newsletter to keep signaling.

Good news: Rocky Mountain Institute received a \$132,000 grant to support our prototype database effort. We're working with Alexis Karolides (architect and grant seeker extraordinaire) and her team at RMI's Green Development Services to catalogue biological research on some of the thornier problems in architecture --- e.g., cooling in hot and humid environments, preventing indoor mold, replacing CO₂-intensive cement, and retiring toxic adhesives (for something more geckoish?). This new rush of nutrients will buy us a year to gather biological solutions for 12 functions. Once available, for free, on the Web, we suspect the database will delight innovators and be irresistible to funders, who will send even more nutrients. If you know biologists who would like to help search the literature, please send them our way. We have one paid 9-month internship available beginning in December, and would also welcome open-source (what used to be called volunteer) help.

Janine Benyus and Dayna Baumeister

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Welcome to the Biomimicry Guild Newsletter!

This newsletter is intended to communicate the evolution of Biomimicry, update members on the status of key projects, announce upcoming events, and help keep the Biomimicry community informed about external developments. The newsletter will also provide an opportunity for the Biomimicry community to be heard, allowing them to share their experiences, update us on personal projects, and thereby encourage interaction and teamwork within the community. We plan to interview two community members for each issue, on topics including: what originally attracted them to Biomimicry, current interests, activities, accomplishments, and future plans.

Depending on the volume of contributions to the newsletter, we expect to distribute the newsletter via e-mail once a quarter. In addition, we are planning to use an electronic collaboration system called [ThinkCycle](#) to store back issues. ThinkCycle supports discussion groups, which could become a real-time method of member communication in the time between newsletters.

Ultimately, the newsletter is for and by the Biomimicry community. As editors, we rely heavily on your input, feedback, suggestions, and pointers to news clippings. To start the ball rolling, please drop us a note as soon as possible with your ideas on:

- distribution - restricted or a wider community?
- how long should the newsletter be?
- how do you like the content, format and general readability?
- should we use abstracts of articles with links to the full text on the Internet? (see example on page 7), or would you prefer a standalone newsletter?
- would you prefer electronic formats other than PDF (Adobe Reader)?
- is there interest in compiling and maintaining a history of Biomimicry?
- what would you like to see covered in the next issue?
- what is the best way for us to contact you for contributions?

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Recent Accomplishments

A major accomplishment last year was the 2-part Biomimicry special on the Canadian Broadcasting Corporation's (CBC) *The Nature of Things*, directed and produced by our very own Paul Lang. The first broadcast on November 7th and 14th met with critical acclaim, winning the Canadian Science Writers Award for 2003 as well as a Finalist Award in the 26th International Wildlife Film Festival. CBC rebroadcast the program on July 13th and 20th this year. Sales of the video by the CBC have been encouraging, and Bullfrog Films has picked up distribution rights in the USA.

The first of two *Biomimicry in Architecture* courses was held on September 28-30 at Blacktail Ranch (Wolf Creek, Montana). The course participants went home completely thrilled about Montana and with a whole new perspective on the natural world and what it has to offer. A second course is scheduled for February 16-20, 2004 (see page 6 for details).

Curriculum Project

A key objective of Biomimicry is to educate the public - "to naturalize Biomimicry within the culture". The CBC Special was a great success, not only through the television broadcasts, but also through worldwide promotion and sales of the videos to educational institutions. Dayna and Janine have been actively promoting Biomimicry through workshops and speaking engagements. Biomimicry community members have recently developed and taught university-level Biomimicry courses. The next phase is development of a curriculum to reach K-12 students.

Mid-continent Research for Education and Learning (McREL) is a leader in developing and field-testing standards-based education products, and is renowned for their science curriculum such as the NASA Gemini and Spacelink programs. McREL is continually looking for material that can bring enthusiasm and excitement into education, both for students and teachers. McREL is intrigued by the potential of Biomimicry, and has developed a proposal for a pilot program. We are approaching private donors and foundations for the \$150,000 required to launch the pilot.

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Database Project

One of the challenges facing biology has been the massive increase in textual information, with only limited improvements in our ability to search and retrieve this information. Most databases are currently organized around a limited set of concepts such as species, geography and biome, making more complex searches difficult and time-consuming. Specifically, it is very difficult to search for similarities or differences in how organisms solve physical challenges, since these searches by definition cut across species.

Janine and Dayna, with Arthur Keller from the University of California, Santa Cruz (UCSC), have submitted a grant application to the National Science Foundation for a three-year project to evaluate whether a technology called Latent Semantic Indexing (LSI) can help create an index of biological mechanisms. LSI determines whether documents within a set are semantically close or distant, based on the degree to which the documents share common words. Searching an LSI-indexed database can find relevant documents even if they do not contain all (or even any) of the search words. By rapidly identifying clusters of documents, LSI can also greatly reduce the effort required to generate taxonomies and ontologies.

Initially, the project will assist biological research, facilitating access to information about biological mechanisms across species and furthering our understanding of the origins of common attributes. A survey course organized by biological mechanism will be developed in the third year of the project, as a model for other universities. The index of biological mechanisms will also assist "biologists at the design table" who apply the principles of Biomimicry to solving engineering problems. A subsequent phase of the project will map biological mechanisms to engineering search terms, making the information available to an audience that is not trained in biology.

A tutorial on Latent Semantic Indexing can be found at:

http://javelina.cet.middlebury.edu/lisa/out/cover_page.htm

In parallel, Dr. Julian Vincent (University of Bath, key contributor to Biomimetics) has obtained funding and is actively working on a database of biological effects based on the TRIZ methodology. TRIZ is a Russian system for



organizing and communicating knowledge, and applying that knowledge to problem solving. In addition, it provides a structure for identifying the 'inventive principles' that are encountered across multiple disciplines. TRIZ is widely used within engineering, even though it has only been available in the western world for about 10 years.

To date, the TRIZ-based database contains over 200 biological effects; functional analysis to complete the classifications is underway. The research has led to a deeper understanding of TRIZ, and has suggested a number of extensions. Biological systems are often more complex than comparable technical systems, with biological functions operating at many levels of organization. Biological systems also appear to 'solve' problems using different pathways than traditional TRIZ. These unique characteristics will increase the pool of solutions that engineers can draw from, and may generally increase the inventiveness of TRIZ problem solving.

These two projects appear to be complementary. Latent Semantic Indexing can generate clusters, but may emphasize clusters that are not of direct interest. Seeding the process with preselected articles from Julian Vincent's database may help direct the clustering in more productive directions. At the same time, the enhanced search capabilities of LSI may significantly reduce the workload of manually finding, scanning and indexing biological articles to flesh out the TRIZ database of biological effects.

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Upcoming Events

The *Biologists at the Design Table Workshop* scheduled for the last week of June in Silicon Valley has been rescheduled for January 29 - February 2 in Palo Alto, CA. Please contact Marianna Grossman at marianna@kellers.org for more information.

Biomimicry in Architecture is a new course taught by Dayna, Janine and John. Key learning objectives and activities include:

- What is Biomimicry?
- Examples of biomimetic success stories
- How you can use Biomimicry to design new products, processes, systems
- Solve a design challenge by asking “what would nature do here?”
- Learn how to incorporate bio-inspired design techniques in your own organization
- A whole new way of viewing and valuing the genius that surrounds us

The next course is scheduled for February 16-20, 2004 at Maho Bay Camps (St. John, U.S. Virgin Islands). For more information and registration, please see:

http://www.Biomimicry.org/virgin_islands.htm

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Members Corner

Norbert Hoeller

Interest in Biomimicry: I stumbled upon Janine's book in 1998 through the Quality Paperback Book Club. At the time, I was intrigued that Biomimicry might provide a resolution to the perceived contradiction between environmentally sound practices and good business management... (full text available at <http://home.primus.ca/~nhoeller/nhbiomimicry.htm>)

Other Interests: Cross-country skiing, still photography (pictures of a recent European vacation are posted at <http://home.primus.ca/~nhoeller/med.htm>), scuba diving, underwater video photography (struggling with video editing), and learning how to fly a sailplane ('trying' definitely applies).



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Biomimicry in the News

A hip replacement from the horse's mouth (Anne McIlroy, The Globe & Mail, June 21/2003, page F7) Study of horse's teeth suggest new ways of bonding ceramic coating on hip implants to bone.

<http://www.evalu8.org/staticpage?page=review&siteid=2658>

Sponges Grow Sturdy Optical Fiber (Technology Research News September 3, 2003) Glass sponge skeleton has optical properties similar to fibre-optics, but more flexible/tougher. http://www.technologyreview.com/articles/rnb_090303.asp

Spiderman Becomes a Reality at The University of Manchester (News Centre May 30,2003) Researchers have manufactured a self-cleaning, reusable dry adhesive based on understanding how geckos 'stick' to surfaces and ceilings.

<http://news.man.ac.uk/1054290245/index.html>



Biomimicry Resources

Rebekah Griffin is compiling a case studies database. Please send rebekah@biomimicry.net any interesting examples or articles. We will select the best of the quarter and include in the Clippings section of the newsletter.

A collection of Biomimicry material has been stored on ThinkCycle at http://www.thinkcycle.org/tc-notes/?topic_id=40413.

Copies of John Mlade's BioInspire newsletter (with associated discussion groups used as part of John Mlade's university course) can be downloaded from http://www.thinkcycle.org/tc-space/tspace?tspace_id=41303.

Discussions with Julian Vincent on the database concept can be found on ThinkCycle at http://www.thinkcycle.org/tc-bboard/forum?forum_id=43670. Overview articles on TRIZ and sample applications can be found at http://www.thinkcycle.org/tc-space/tspace?tspace_id=43672.

ThinkCycle Registration

ThinkSpaces are used within a ThinkCycle topic to organize material of interest to different groups. To gain access, you need to register with ThinkCycle and then send me your ThinkCycle userid. Registration is relatively painless - a Quickstart guide is available at

http://www.thinkcycle.org/tc-notes/show-note?tc_note_id=41609 (download document and view using Adobe Reader). If you have any questions, please drop me a note.

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