



The Feedback Loop

*Innovation Services
&
Professional Training*

CONTENTS

Introduction by Janine Benyus	03
Integrate Development with Growth: A Lesson from Nature	04
Development and Growth at Biomimicry 3.8: A Banner Year	07
Biomimicry and Packaging Design for Natura: A Case Study	08
Teaching the Practice of Biomimicry	12
Upcoming Immersion Programs in 2015	16
Special Announcement: The Biomimicry Center at ASU	17
Launch of Biomimicry Graduate Degrees	18
Contact	19





*In the natural world,
organisms don't just grow
bigger; they grow better.*

As a tree elongates, it develops hardy “reaction wood” to withstand the winds peculiar to its place. As our bodies grow, we develop bones, blood vessels, organs, and nerve nets—platform structures for the next stage of growth. Life builds capacity and connectivity as a springboard for what’s to come. It’s one of many Life’s Principles, and we call it “integrating development with growth.”

At Biomimicry 3.8, as you can imagine, we have a habit of minding nature’s principles. (We think of them as design lessons.) In 2014, we realized it was time to develop our own capacity to meet the growing demand for nature-inspired innovation.

Soon we’ll let you know about our groundbreaking efforts to combine the power of GIS mapping to our Genius of Place process. We’ll update you on our built-world projects in Singapore, Morocco, Denver, Durban, Texas, and California. And we’ll pursue opportunities to apply nature’s wisdom to new realms such as organizational change and leadership, 3D printing, and generative digital design.

But in this short report, we want to look back—to feed back into our network some of our learnings from the past year.

We feel incredibly lucky to do what we do every day, to help our clients and students achieve their dreams of a more sustainable world by introducing them to the undisputed masters of thriving over the long haul. In 2015, with nature’s help, we’ll create products and buildings and communities that simply work better, and in the process, our relationship with the natural world will change. And that, we truly believe, will change everything. Here’s to another inspirational trip around the sun!



Janine M. Benyus

Co-founder & Partner, Biomimicry 3.8

Janine.Benyus@Biomimicry.net



Integrate Development with Growth:

A Lesson from Nature



Invest optimally in strategies that promote both development and growth to create a stable, locally attuned foundation before each growth phase thus resulting in greater likelihood of long-term success, while also reducing chances of new growth creating an unsustainable condition.



How Do Organisms Integrate Development with Growth?

Cholla Cactus, *Cylindropuntia* spp.

Cholla is a genus of cactus native to the Southwestern United States and northern Mexico. Chollas are tall thin branching cactus plants known for having numerous spines. Chollas rarely reproduce from seeds, instead growing a genetically identical plant from a severed piece of stem that gets torn off the original plant. These groups of cholla clones are referred to as cholla forests.

Thin walled cells filled with water also provide rigidity since they act like small, pressurized containers. As the plant matures, the living and active epidermis cells can function for decades before finally turning woody.



“The cholla is a good example of integrating development with growth because of the phases it goes through. As the plant grows, the functionality of the skeleton changes from being rigid and pipelike for the purpose of moving fluid, to becoming a more woody, solid supportive structure.”

~ Jamie Dwyer, Biologist & Design Strategist, Biomimicry 3.8
Jamie.Dwyer@Biomimicry.net



How Do Organisms Integrate Development with Growth?

Sea Hare, *Aplysia californica*

Sea hares are slow-moving snails that live on the ocean floor feeding exclusively on a diet of red and green algae. Without a hard shell to protect them from the snapping jaws and claws of predators, sea hares have resorted

to chemical warfare. But instead of killing it's attacker, the sea hare's inky chemical projectile temporarily silences the predator's hunger response long enough for the snail to escape.



“As life progresses in complexity from single-celled ancestors to multicellular organisms, methods of protection in our dog-eat-dog world need to be developed. Carrying around thick, heavy armor or poisonous chemical weaponry come with costs to the organism itself. By developing a lightweight, non-toxic defense mechanism, the sea hare makes an attempt at creatively integrating development with growth.”

~ Mark Dorfman, Biomimicry Chemist, Biomimicry 3.8
Mark.Dorfman@Biomimicry.net



Development and Growth at Biomimicry 3.8

A Banner Year

2014 was a banner year for Biomimicry 3.8. We spent the first half of the year focused internally on developing our systems, processes and services so we can better serve our mission and facilitate growth.

- We invested in unique collaborative systems—digital and relational—to help team with our clients and deliver biological intelligence with ease.
- We streamlined and packaged our training services to better meet the needs of students.
- We developed dashboards to see where our efforts yield real returns, and where we can grow smarter and more relevant.
- We developed partnerships to increase our chances of solving notorious sustainability challenges.
- We moved to a partner/principal model (ala architecture firms), inviting our senior staff to advance thought leadership in their particular areas of biomimicry.

In 2014, we were honored to continue our work with some of the world’s most innovative companies and thrilled to establish new partnerships with companies large and small. Our clients asked us to re-imagine data centers, 1000-foot ships, car frames, functional textiles, energy storage, beverage packaging, industrial processing plants, high-volume waste systems, skin care, and how to double your workforce without losing your company culture.

Due to the proprietary needs of our clients, it’s often impossible to talk specifically about our work. But we’re thankful that several clients were willing to share details of our work together through a case study and testimonials on the next pages.



Nicole Miller

Managing Director, Biomimicry 3.8
Nicole.Miller@Biomimicry.net



Biomimicry and Packaging Design for Natura

A Case Study

In 2014 we deepened our work with Brazil's largest cosmetics company, Natura.
We can't yet talk about the work, but we can look back at our initial engagements with Natura, which led to a case study in WIT Transactions on Ecology and the Environment that's been made widely available this year.

Background

Natura is a publicly traded company with annual revenue greater than US\$3 billion. The company sells products throughout South and Central America and Europe, and is a founding member of the Union for Ethical BioTrade, which works to ensure that sourcing practices promote the conservation of biodiversity. Natura's leadership became interested in biomimicry in 2010 and wanted a pilot project to evaluate the potential for biomimetic product development and innovation of processes and technologies.

The Challenge

Product packaging was the most viable area for a pilot, so we led a multidisciplinary scoping session with team members from Packaging Development, Science and Technology and other Natura departments.

After identifying 12 unique challenges associated with packaging development, we framed the central question to guide our search for biological intelligence: **"How does Nature contain liquids?"**



Biomimicry and Packaging Design for Natura

A Case Study (continued)

What We Did

From this question, our biological research team compiled an initial report on 30 different ways liquids are contained in nature.

We described each mechanical or chemical strategy in the context of a representative organism, such as a bird's egg or the Giant African Land Snail. We then facilitated an interdisciplinary design charrette to apply the research findings. This led to a second report capturing 17 proposals for packaging and 8 proposals for new products.

In time, the project progressed to five preliminary packaging concept prototypes, two of which were focused on single-dose packaging and were further developed for large scale manufacturing.

Natura published an article on the process from their perspective in *WIT Transactions on Ecology and the Environment*. They discuss in detail what was required to understand and integrate the biological intelligence into their internal processes.

Their Conclusion

"This approach resulted in 25 new proposals for the development of new packaging strategies and products. Our results show that it is possible to incorporate the science of Biomimetics into the creative process underlying the development of new strategies and products in a cosmetics company, and possibly in other types of companies as well."

– Neves & Francke

Read their full article in [*WIT Transactions on Ecology and the Environment*](#)



Our Client Feedback from 2014

LGA

“

Biomimicry 3.8 was placed on our team as part of a holistic team approach to understanding [the Middle Kyle Canyon project's] place, the existing flora and fauna, as well as the culture... Biomimicry 3.8 helped us bridge the gap of the built environment to the natural environment, which are often separately conceived in traditional design work.

The site design and design of structures were impacted by Biomimicry 3.8's study of the local plants and animals and integrated natural systems. The understanding of natural processes to provide shade and maintain temperature became paramount to reducing mechanical and lighting system loads for building design. We also looked at how systems could change throughout the seasons to be efficient at all times...

Our firm design philosophy is to always create an efficient, sustainable project but the concepts of this project were strengthened by the integration of the Biomimicry 3.8 team findings. It was a great pleasure to work with Biomimicry 3.8 and the team was truly strengthened by their participation.



Deborah Bergin, Project Manager, LGA
Genius of Place Research for
Middle Kyle Canyon



Interface, Inc.

In 2014, Interface needed a partner to help us design and implement training sessions for our employees and customers on biomimicry to show it can drive innovative thinking. We engaged the Biomimicry 3.8 team to plan, design and implement a series of workshops with our employees and design customers on introducing biomimicry thinking and learning how to apply this thinking into their practices and businesses.

The workshops were an excellent introduction to biomimicry thinking that left our employees inspired and with a new framework with which to view their work or solve challenges in their working lives.

We thought the team at Biomimicry 3.8 was highly knowledgeable and capable, and they worked with us to craft an experience specific to our needs.



Erin Meezan, Vice President, Sustainability
Interface, Inc.
Biomimicry Workshop Series





Teaching the Practice of Biomimicry

Teaching the practice of biomimicry is near and dear to my heart, and 2014 brought ample opportunities to facilitate the development and growth of biomimicry practitioners.

We had an incredible year with Biomimicry Professional students, including fabulous in-person sessions in the Sonoran desert, on Vancouver Island and in Costa Rica. 2015 brings a trip to the temperate forest in the mountains of North Carolina and our graduation in Botswana in November.

The graduation of this third cohort will be particularly special as they'll be earning the first **Master's of Science in Biomimicry** thanks to a collaborative effort between Biomimicry 3.8 and Arizona State University (ASU).

2014 marked our transition to offering our professional trainings in a more modularized fashion and the response has been affirming. In November, we launched an 8-week course that had 80 enrollees. That course will be

repeated each semester through ASU and is the prerequisite for both the **Graduate Certificate in Biomimicry** and the MS in Biomimicry.

In 2015, in addition to offering our online courses through ASU and opening up our application process for the fourth cohort of Biomimicry Professionals, we're planning on three immersion workshops including an exciting collaboration with Biomimicry Specialist Toby Herzlich on applications of biomimicry to social innovation.

Witnessing the inspirational and transformative moments on these journeys imprints highlights into my own biomimicry evolution. But now we want to share some thoughts and highlights from current students...



A stylized, handwritten signature in black ink.

Co-founder & Partner, Biomimicry 3.8
Dayna.Baumeister@Biomimicry.net



What Our Students Say ...

“

I have been working as a consultant in the oil industry for a few years and started to think I should really do something with biomimicry and get out of the oil business. I want to contribute positively to the environment, so I finally decided to step up and take the training!

Biomimicry 3.8 helped me realize that I don't have to be a biologist to do biomimicry (but biologists are definitely an asset at the design table!) and that biomimicry is a muscle that requires training. The potential of this discipline is huge, and I'm very much looking forward to more training both online and in the immersion workshops! I'm aiming for the Biomimicry Specialist Certificate, and considering pushing towards the Biomimicry Professional.



Michel Wolfstirn
Participant in the Essentials of Biomimicry online course, Fall 2014



“

I work with brands to develop strategy, so often it leads to discussion about their imperatives and intent. The 21st century calls for a definition of business and strategy that creates thriving cultures for people, planet and profit; I see biomimicry training with Biomimicry 3.8 as a means to that end.

Perhaps the most eye-opening part of the training for me was the pure wonder of it, and how much fun it was, even for a non-biologist like me! Yes, it was hard work and a lot of great information to digest, but spending time studying nature and her genius felt like coming home in a way that I'd never experienced before. In terms of the actual content, the Biomimicry Taxonomy and the ease of use of that tool along with the Life's Principles were the most significant learning.



Giselle Carr

*Participant in the Immersion Workshop
Discovering Nature's Genius in Costa Rica,
December 2014*



While early in my product design career I loved the infinite possibilities that molding plastics and working with metals afforded, over time I have developed much more awareness around how unsustainable product development and our trending consumption behaviors are for the long term outlook of life on the planet. I knew there had to be other ways of approaching design and B3.8's 2-year BProfessional program offered me the potential to explore this topic in depth from many different viewpoints under the guidance of global thought leaders and in collaboration with 19 fellow students—leaders in their fields from across the world.

One year down with the BProfessional program. As a key learning, my understanding of systems has expanded multi-fold and I'm profoundly aware of how much all Life (humans included) is interrelated and connected. My role in Life and career is also growing and developing to one of a systems-thinker, catalyst for change and educator. On a personal level, it's impossible to ignore the many lessons Life is teaching me (and us) around not just surviving, but thriving—hence there is some vital molecule-re-alignment happening too. I'm looking forward to creating up a storm in 2015 with my BProfessional cohort and getting to know the broader biomimicry network.



Jo Fleming
*Biomimicry Professional Certificate
Candidate, 2013–2015 Cohort*



Be on the lookout for...



IMMERSION WORKSHOP
**Discovering Nature’s Genius
in Montana**
August 2–7, 2015

Discover the montane forest in the glorious
Rocky Mountains with a biomimicry lens.
Visit our [website](#) to stay updated.



IMMERSION WORKSHOP
**Discovering Nature’s Genius
in South Africa**
November 2015

This will be a week-long dip into the world of
biomimicry in the wilds of South Africa.
Visit our [website](#) to stay updated.



Biomimicry Resource Handbook

[PURCHASE PAPERBACK HERE >>](#)

250 pages of our most current biomimicry thinking, methodology,
and tools for naturalizing biomimicry into the culture. The
text is directly applicable to designers, biologists, engineers,
entrepreneurs and intrapreneurs, but has also proven valuable to
students, educators, and a wide variety of other disciplines.



THE BIOMIMICRY CENTER AT ARIZONA STATE UNIVERSITY

MARCH
3

Launch & Symposium

SPECIAL ANNOUNCEMENT

Tuesday, March 3 | 1–7:30 p.m.

Carson Ballroom, Old Main

Tempe Campus, Arizona State University

The launch and symposium will include a day of presentations, discussions and hands-on activities that celebrate the launch of the new Biomimicry Center, a joint partnership between Arizona State University and Biomimicry 3.8. The Center is co-directed by ASU's Professor of Design, Prasad Boradkar, and Biomimicry 3.8 co-founder and partner, Dayna Baumeister, who has also been appointed a Professor of Practice in the School of Life Sciences at ASU.

This interactive symposium and launch will feature an afternoon of TED-style talks by ASU faculty about their nature-inspired research as well as hands-on biomimicry activities including a Design Jam.

Biomimicry thought leader Janine Benyus and ASU President Michael Crow will conduct a public discussion about the power of the new Biomimicry Center to imagine new collaborations and develop sustainable outcomes for global design challenges.



BIOMIMICRY 3.8

Offering the First Accredited
Master's of Science in Biomimicry and
Graduate Certificate in Biomimicry

Launch of Biomimicry Graduate Degrees Now Open for Enrollment

Arizona State University has begun accepting applications for both of its biomimicry graduate degrees: Biomimicry Certificate and the world's first Master's of Science in Biomimicry. This new joint-program incorporates the online coursework that's already proven successful through our 8-month Biomimicry Specialist and our two-year Biomimicry Professional Certification programs. Both programs will continue to be taught by Biomimicry 3.8's experienced cadre of instructors, but will be accredited by ASU, and delivered via ASU Online.

Now prospective biomimicry students will be able to apply for financial aid, scholarships or even be eligible for employer reimbursement. The Certificate has rolling enrollment with five acceptance periods throughout the year. The MS deadline is **May 1, 2015** for a Fall start date.

[LEARN MORE AND ENROLL >>](#)

3.8

3.8 Billion Years of Inspiration

We're excited to continue developing and growing in step with our clients in the year ahead. If you're inspired to bring biomimicry into your life or organization in 2015, we'd love to hear from you.

Info@Biomimicry.net

+1 406 543 4108

Missoula Office

255 W Front St, Missoula, MT 59802

Helena Office

321 E. Broadway, Helena, MT 59601