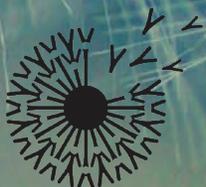


# BIOMIMICRY INSTITUTE

ANNUAL REPORT | 2013-2014



**BIOMIMICRY**  
INSTITUTE

*“Vision is not enough, it must be combined with venture. It is not enough to stare up the steps, we must step up the stairs.” ~Václav Havel*



**BIOMIMICRY**  
INSTITUTE

## THE TIME IS NOW.

For over a decade, the concept of biomimicry has swept the world, building a movement of global citizens who know that nature’s designs hold the key to solving our most intractable human problems.

But our vision has grown bolder. It is not enough to imagine a world where man-made designs and materials fit into our planet as elegantly as living systems do. We must make it so.

Now is the time when vision must combine with venture, and when aspiration must be paired with action.

In these pages, you’ll learn how we are empowering big thinkers from business, government, and academia to not only listen to and learn from nature, but to build, prototype, and deliver tangible biomimetic creations to market.

There’s no time to waste. Let’s build a beautiful world together.

**THE BIOMIMICRY INSTITUTE** is building a movement of people who view nature not as a warehouse of goods but as a storehouse of knowledge and inspiration for sustainable innovation. Our mission is making the act of asking nature's advice a normal part of everyday inventing.

Biomimicry is fundamentally about cultivating deep respect for the natural world. As such, we hope that teaching innovators to see nature differently will also lead to their ardent desire to protect and conserve it.

**WE HAVE THREE CORE PROGRAMS THAT WORK COHERENTLY TOWARD ONE GOAL: EMPOWERING PEOPLE TO CREATE SUSTAINABLE PRODUCTS AND SERVICES USING BIOMIMICRY.**

## DESIGN CHALLENGES

Biomimicry Design Challenges are innovation competitions focused on identifying nature-inspired solutions to critical real-world problems. With opportunities for both students and professionals, the Institute's design challenges provide biomimicry learning opportunities and help to build an artery of sustainable innovation inspired by nature, ultimately bringing more biomimetic solutions to market. The Institute currently hosts three design challenges: the Biomimicry Global Design Challenge, University-Corporate Challenges, and Partner Challenges.

## BIOMIMICRY GLOBAL NETWORK

The Biomimicry Global Network is a collective of nearly 20,000 educators, practitioners, professionals, and innovators all over the world who work to promote and practice biomimicry as an answer to some of the world's most challenging issues. The Biomimicry Global Network is comprised of both regional and professional networks.

## ASKNATURE

AskNature.org provides the world's most comprehensive online library of nature's solutions to design challenges. AskNature brings biology to the design table by inspiring and enabling innovators around the world to emulate nature's time-tested forms, processes, and systems as they solve this century's greatest challenges.



Photo: Biomimicry 3.8

A handwritten signature in black ink that reads "Janine M. Benyus".

## LETTER FROM JANINE BENYUS

**Co-founder and Board Member,  
Biomimicry Institute**

Letters like these offer us a chance to stop, take a breath, and marvel at how far the biomimicry movement has come.

Just 17 short years ago (a quick wink in the life of the planet), when I first published *Biomimicry: Innovation Inspired by Nature*, the concept was known to only a few pioneering scientists and thinkers. Through the work of the Biomimicry Institute and thousands of forward-thinking doers and dreamers, biomimicry is now firmly established as both a principled design philosophy and an actionable set of tools to help us create a better world.

You, our supporters and champions, have lifted us to this point. Without your passion, energy, idealism, and drive, biomimicry's message of hope wouldn't have resonated so deeply and broadly across the world.

We look forward to your partnership as we embark on our new strategy for the Biomimicry Institute, focused on empowering others to apply biomimicry to solve our planet's most urgent issues. We are harnessing the momentum of the movement to establish a new era of invention—one in which biomimicry becomes a natural part of everyday inventing because of its extraordinary track record of breakthroughs. Our job is to create opportunities for biomimics to practice and sharpen their skills on real-world challenges, and then, through our networks, to bring these nature-inspired innovations to market.

Though we are a lean organization, our light is magnified by three foci—Design Challenges, AskNature, and the Biomimicry Global Network. Our multiple Design Challenges mobilize thousands of biomimicry innovators to solve a single major design issue, then bring these solutions to market. AskNature, our award-winning online design resource, provides the biological intelligence and the chance to connect with like-minded biomimics. Our Global Network connects and showcases the vibrant community of biomimicry change agents all over the world.

Seventeen years in, biomimicry has never been more widely known nor more brilliantly practiced. We're proud to inspire, convene, champion, and challenge, with your help, this pioneering first generation of nature's apprentices. I can't wait to see what they'll solve next!

## LETTER FROM BETH RATTNER

**Executive Director, Biomimicry Institute**

I have to admit, I have an absolutely favorite day here at the Biomimicry Institute. It's not a day where I escape from the computer and meet with luminaries in the field, or when I get to go out in the woods and understand how a tree branches according to the Golden Ratio, or even the day when I finally get to be in the same room with our family of biomimics from all around the globe, though those all rank as some of the best. Each year, my favorite day is when the Biomimicry Global Design Challenge submissions arrive, because that's the day when my team and I see hundreds of solutions for a better world, right before our eyes.

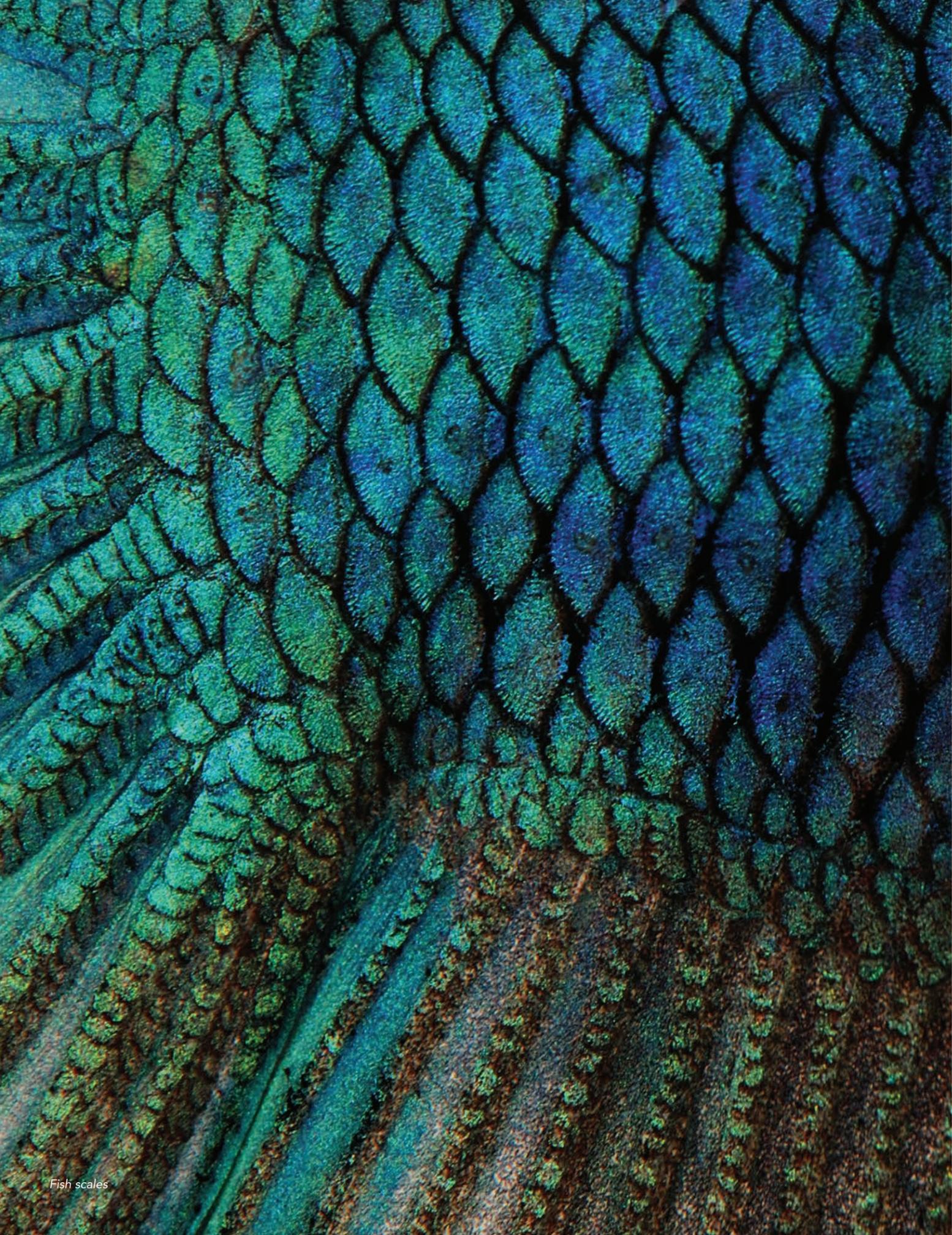
These submissions come in from all over the world, including places that are resource-scarce, and from entrants who may not have been formally trained in biomimicry. Each year, they astound me with their brilliance.

They are so good, in fact, that we realized that we needed to help these innovators get their solutions to market. That's when the Ray C. Anderson Foundation, led by Trustees Harriet Anderson Langford and Marianne Lanier and Executive Director John Lanier, stepped in to help. They knew Ray believed in biomimicry and in the power of business to change the world for the better. They have entrusted us with their most valuable possession, Ray's name, and his posthumous support, and created the \$100,000 Ray of Hope Prize. With this prize, we will empower innovators to bring radically sustainable products that "solve our thorniest challenges," as Janine Benyus would say, to the world.

On the days when hope seems a rare commodity, I take refuge in these challenge submissions and in the honeybees, frog foam nests, or other biological geniuses that made them possible. And that's why we do what we do, and why we're always so immensely grateful that you help us get there.

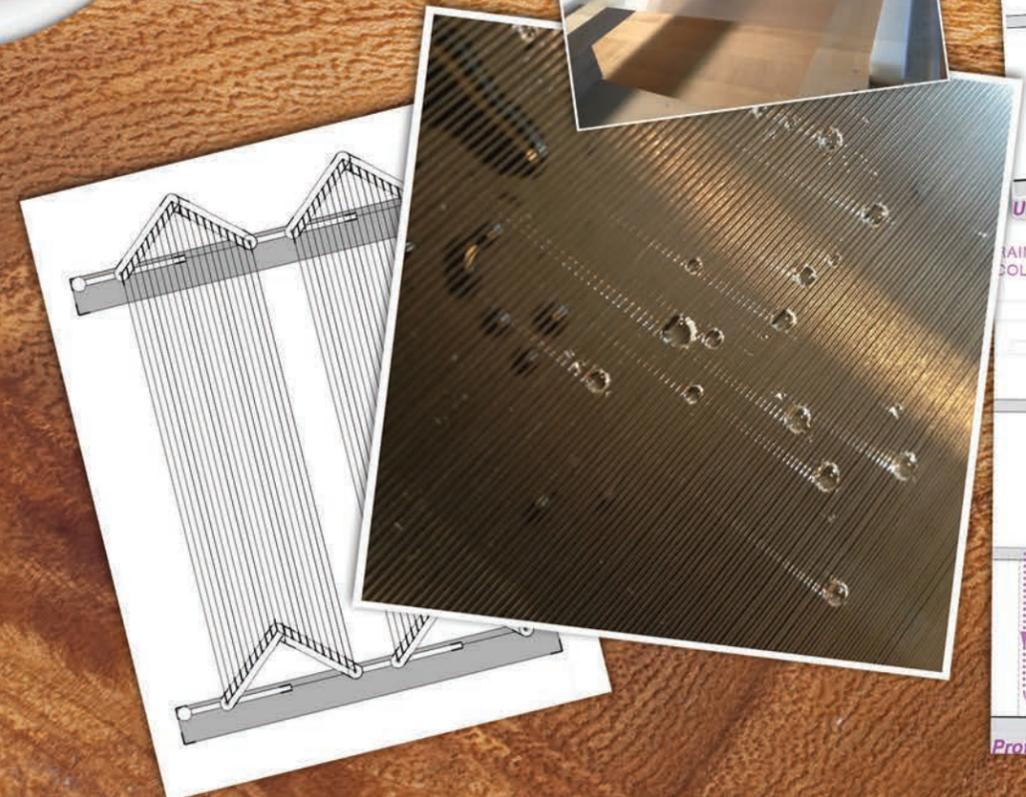
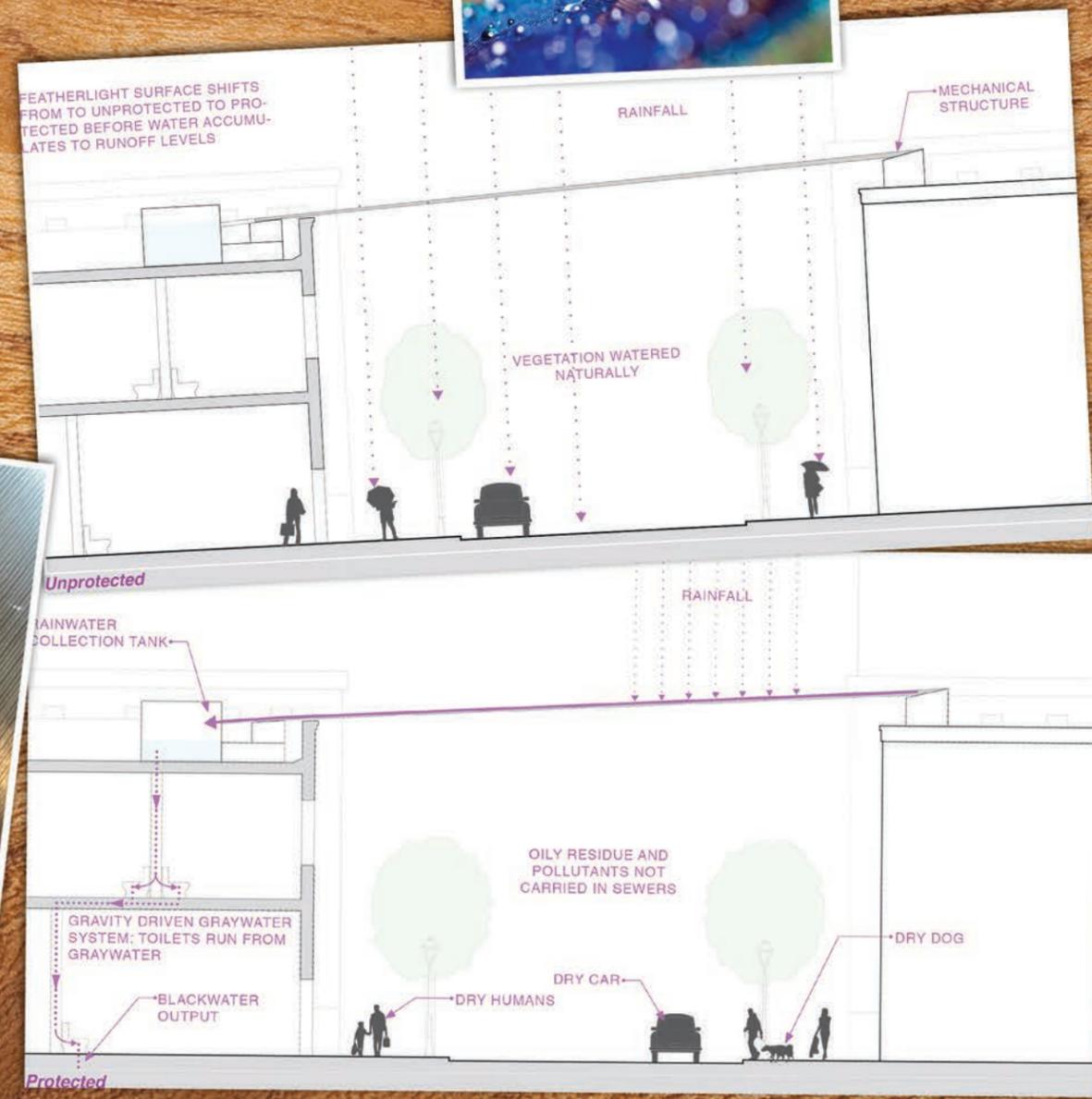


A handwritten signature in black ink that reads "Beth Rattner".



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# DESIGN CHALLENGES

Creating an artery of sustainable innovation inspired by nature

## GLOBAL DESIGN CHALLENGE - FOOD SYSTEMS

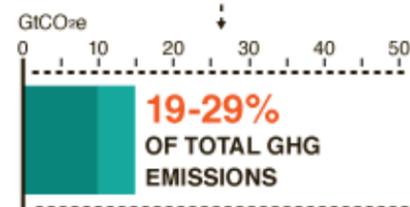
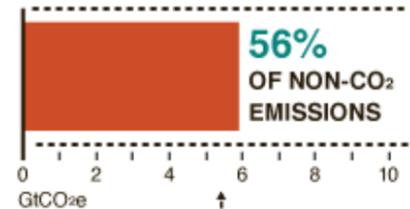
**By 2050, our planet will be home to nine billion people.** In order to feed the world, we need to design a better food system—one that reflects that a healthy planet and a sustainable food chain are one and the same. We believe that biomimicry is the best strategy to get us there.

That's why, in September 2014, the Institute, in partnership with the Ray C. Anderson Foundation, jointly announced the 2015-2017 Biomimicry Global Design Challenge on food systems at the Clinton Global Initiative Annual Meeting. The goal of this competition is to engage and mobilize thousands of students and professionals to tackle food system challenges using biomimicry design solutions, then work to help bring these solutions to market.

We partnered with renowned cinematographer Louie Schwartzberg to create the promotional video for the 2015-2017 Biomimicry Global Design challenge. [Watch the video narrated by Janine Benyus.](#)

The 2015-2017 Global Challenge is an exciting step forward. This new Challenge expands the scope and impact of the past five years of student-focused design challenges by opening the challenge to professionals, providing start-up support, and fostering a biomimicry solution incubator program.

*Right: Agriculture is the largest contributor of non-CO<sub>2</sub> greenhouse gases. Graphic courtesy of the Research Program on Climate Change, Agriculture, and Food Security.*



Food systems emissions contribute **19-29% OF TOTAL GHG EMISSIONS.**

*“Move Over Genetic-Engineering; Biomimicry Seems the Better Bet for Solving Global Hunger”*

– Forbes.com, Sept. 11, 2012

The Global Food Challenge features substantial award money, including the \$100,000 Ray C. Anderson “Ray of Hope” Prize for one winning prototype each year.

With this new accelerator model, we will create a steady stream of biomimetic products and services by advancing the most viable design concepts to prototype and pre-commercialization stages and shepherding those solutions to the global market. We will also continue to support development of a biomimicry-trained workforce by offering an awards category specifically for students.

Whether addressing waste, growing methods, pest management, packaging, preservation and distribution, soil quality, or the changing climate, nature offers strategies for solving issues around food and agriculture in innovative ways.

Learn more about the Global Challenge and how to get involved as a participant, mentor, judge, advisor, or sponsor at [challenge.biomimicry.org](http://challenge.biomimicry.org).



### STORING FOOD LIKE HONEYBEES

An example of a nature-inspired food preservation solution that could be developed further during the Global Food Challenge accelerator is “Time Capsule (Wakati),” one of the winners from our 2013 Student Design Challenge and a participant in the first business plan competition we offered as part of the Challenge:

*“Inspired by honeybees, we designed a new and superior generation of evaporation cooling to keep fruits and vegetables fresh at minimal cost (\$6.00). Our design resolves all the critical problems of the existing evaporation coolers: the limited geographical applicability, the extreme water usage, and the lack of hygiene.”*

–Wakati document

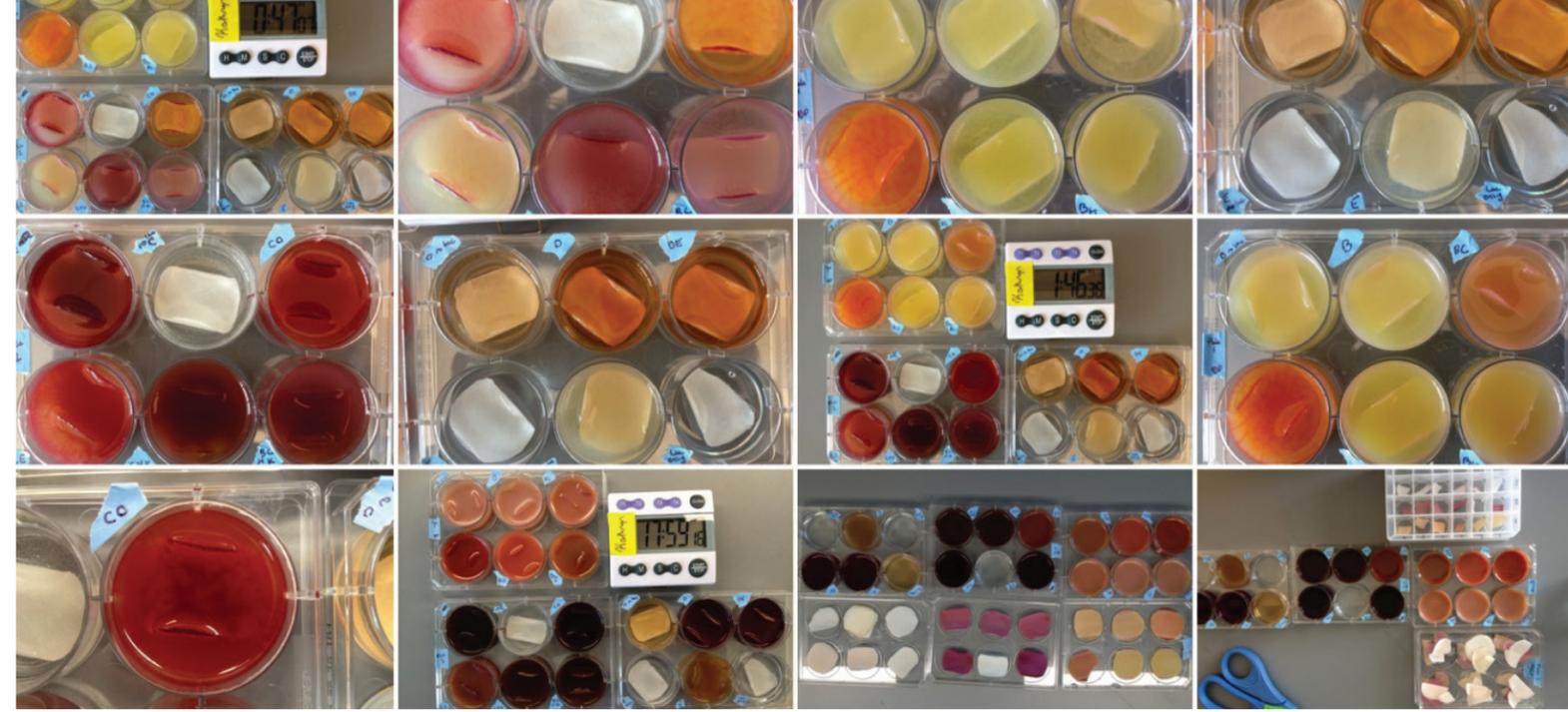


Wakati is essentially a do-it-yourself kit that helps farmers preserve their harvest. The team has successfully conducted laboratory testing, is currently doing additional field testing in West Africa, and has earned numerous social venture prizes and much recognition for the design.

## BIOMIMICRY AND THE CIRCULAR ECONOMY



When Biomimicry Institute co-founder Janine Benyus presented at the Ellen MacArthur Foundation's Circular Economy 100 Conference in 2013, it became clear to both organizations that biomimicry and the circular economy are frameworks for sustainability that must work hand-in-hand. The concept of a circular economy emulates the cycles found in living systems. Both are powerful ideas that prompt new ways of thinking and propose a radically different relationship with our world. As such, the Institute and the Ellen MacArthur Foundation have begun collaborating to further integrate our efforts to build a regenerative world. The launch of the Foundation's online Disruptive Innovation Festival (DIF) in Fall 2014 served as a catalyst to place biomimicry prominently into conversations about the circular economy. The biomimicry theme was integrated into the DIF through webinars, workshops, and roundtables hosted by Institute staff and network members. The Institute also played a lead role in defining a biomimicry design challenge which culminated with a public vote for the best entry during the DIF.



Images of the wet lab phase of development in the Greener Solutions course, a partnership between the Biomimicry Institute and the UC Berkeley Center for Green Chemistry.

## PARTNERING TO FIND GREENER SOLUTIONS

In 2013, the Institute launched a partnership with the University of California, Berkeley Center for Green Chemistry (BCGC). That fall, we co-sponsored and co-taught an interdisciplinary green chemistry graduate course called "Greener Solutions." The objective for the course was to introduce the students to biomimicry methodology through a hands-on design challenge. Beginning with biological research provided by the Institute, students examined the problem of cross-linking, a technique used extensively in industry to bind coatings and create wrinkle-free fabrics. However, while industry's techniques involve using carcinogenic compounds such as formaldehyde, isocyanate, and phenolic resins, the students discovered that nature achieves cross-linking in much less toxic ways.

Biomimicry is now a core component of Greener Solutions, and partner companies have included Levi Strauss & Co., Seventh Generation, and the Beauty Counter. BCGC gets access to our biological chemistry expertise and new ways

to approach challenges, students get the opportunity to design for top companies and develop exceptional skills to showcase to future employers, and corporate partners get unique insights into how to solve tough problems in sustainable ways. Plus, any elimination of toxic chemicals from manufacturing processes is good news for people and the planet.

In the future, we will increasingly support the technical transfer of these designs from university to corporate research and development lab, and mentor post-graduate teams in the process of taking their products to market.

## LEARNING BIOMIMICRY BY DOING: 2013-2014 Student Design Challenges

The Institute's Student Design Challenges, which have now been opened to the professional community as Biomimicry Global Design Challenges, provide a platform for students from all over the world to practice and apply biomimicry to real-life design problems. In these challenges, students have the opportunity to learn biomimicry while putting it into action, with the support of biomimicry experts, mentorship, and learning resources.



2012-2013 Student Design Challenge competition winners, "Team Egy Osmo" from the German University in Cairo.

### 2013 CHALLENGE - WATER

*"The generosity given by this community of people to us is what our world really needs. The experience gave us hope that small ideas can become realities and that a small group of young people can dream to help their country and change the world."*

—Nariman Lotfi

Product designer and winner of the 2012-2013 Student Design Challenge  
German University in Cairo, Egypt

Nariman Lotfi and her teammates at the German University in Cairo noticed a big problem in their home city of Fayoum, Egypt. Many of the farms in the region rely on canal water to irrigate their crops, but often, this water is infected with bacteria, trash, and worms. Inspired by the way that camels digest food, the students designed a new way of moving and filtering the water so that the dirty, stagnant canals could be transformed into a clean source of water for crops. This innovation won the 2012-2013 Biomimicry Student Design Challenge's \$10,000 grand prize, but Nariman and her **Egy-Osmo** teammates didn't stop there. In addition to co-teaching biomimicry workshops in Cairo, collaborating with a biomimicry travel organization, and being filmed for a future BBC documentary series, they are actively working to test and prototype their award-winning design.



BSDC Outcomes 2011–2014

Egy-Osmo's design was just one of 68 innovations from 19 countries submitted to the 2012- 2013 Challenge, which asked students to think about how nature manages water and apply that knowledge to solve a local or global water challenge.

The 2012-2013 Challenge was the first year that the Institute incorporated a business incubator round into the design challenge. We worked with a San Francisco Bay Area business accelerator called StartUp Nectar to help teams take their designs to the next step in their journey to market.

### 2014 CHALLENGE - TRANSPORTATION

*"I'm graduating and going to grad school, where I think I'll be able to do a lot of creative work. I'm excited to use biomimicry in those future intellectual projects."*

—Alexander Grant

Product engineer and winner of 2013-2014 Student Design Challenge  
McGill University, Canada

Alexander Grant, a student at McGill University in Montreal, Canada, loves to fish in the Great Lakes. On his fishing trips, it was hard not to notice the aquatic plants covered in zebra mussels, an invasive species. As Alex and his team were searching for design topics for the 2013-2014 Biomimicry Student Design Challenge on transportation, he remembered the effect that invasive species have on the region and the team decided to do something about it. Their design, the "**Air Ballast Biomimetic Cargo Ship**," mimics the methods that cuttlefish use to maintain buoyancy and stability, using air instead of water to balance trans-ocean cargo ships and reducing the spread of invasive species through ballast water. This design tied for first place in the 2013-2014 Challenge, along with a team from the Universidad Autónoma de Yucatán in Mexico, that designed the "**Mocan**," a human-powered vehicle design for carrying cargo. Over 200 teams from 22 countries around the world registered, and over 100 submitted completed entries.

**Hear more about the McGill University team's submission.**

#### 2013 & 2014 FUNDER

DAVID OAKEY DESIGNS

#### 2014 FUNDER

ARGOSY FOUNDATION

#### MEDIA SPONSOR

treehugger



INSPIRATION

REFERENCE

COLLABORATION

INNOVATION

# ASKNATURE

The leading source of nature's solutions to innovation challenges

## ASKNATURE TODAY

In the past year, over half a million people from nearly every country on the planet visited AskNature, the world's leading online resource for understanding nature's design strategies. That's half a million curious students, designers, scientists, biologists, architects, engineers, and more, tapping into nature's wisdom to create sustainable solutions. These visits sparked new ideas, empowered people to think of problems in new ways, and enabled innovators from all over the world to approach their problems with a new lens. From designers focused on structure and behavior, materials scientists exploring nano- and micro-scale protein synthesis, entrepreneurs thinking about relationships and whole systems, or research biologists documenting new natural phenomena, AskNature empowers its users to ask, "How would nature solve this?"

*"If it wasn't for AskNature, it would have taken much longer to do research, which would have made the project at the time unfeasible."*

– Carlos Rego

Product designer Carlos Rego created a water bottle that saved his client 250 tons of raw material per year.

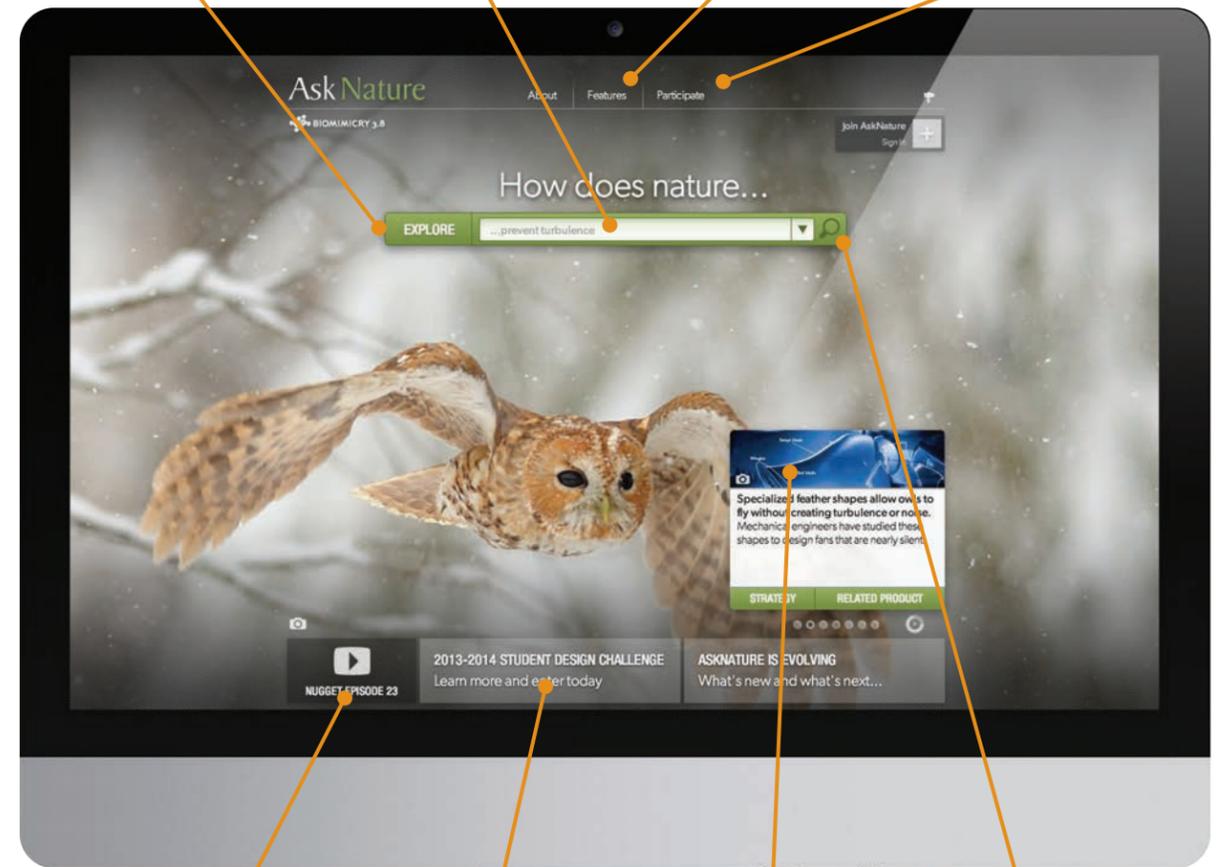
**ASKNATURE** recognized as a 2014 Fuller Challenge semi-finalist

**BFI** \* FULLER CHALLENGE

Ask Nature was selected as one of 20 semi-finalists for the Buckminster Fuller Institute's prestigious design award.

AskNature continues to grow every year. Over the past two years, the AskNature team has invested in three new full-time staff, employed a user-centered digital experience agency, and benefitted from nearly 1,500 volunteer hours devoted to developing biological content and informing site improvements. In 2013, the AskNature team held several in-person sessions to gather feedback from actual and potential AskNature users, including university students, high school teachers, tenured professors, professional designers, and entrepreneurs. The team also convened a volunteer working group to help enhance the site's usability. Input from these groups informed a site redesign launched in February 2014, and continues to impact site improvements today. In fall 2014, the AskNature team participated in Ellen MacArthur Foundation's Disruptive Innovation Festival, presenting a webinar that was one of the most-attended events at the festival. The team rounded out the year by planning for the future, including creating new content and implementing site upgrades.

Users browse content by functions, such as "capture liquids," that correspond to innovation challenges. More than 1,600 records describe natural principles with non-technical text, photos, illustrations, videos, and citations. Thematic collections organize content by specific innovation challenges. Content is contributed by staff and a mentored community of volunteer participants.



Short educational videos bring natural principles to life. Integration with other programming enriches the Institute's impact. Hundreds of nature-inspired products demonstrate biomimetic solutions. Keyword search tool prompts users to find solutions by asking, "How does nature...?"

## WORKING WITH THE COMMUNITY TO BUILD ASKNATURE

In 2013 and 2014, volunteers contributed nearly 1,500 hours of service to AskNature. During the summer of 2014, nearly 40 volunteers participated in a community contribution pilot focused on deepening biological content with non-technical summaries. This pilot was designed to be a collaborative experience that facilitated knowledge sharing and biomimicry mentoring, providing volunteers with resources to help them help us.



**ALLIE MILLER**  
Biological Curator  
Elko, Minnesota

*“My favorite part about volunteering with AskNature has been being connected to like-minded students and professionals. I always knew that nature had an awe-inspiring way of existing, but I never had the vocabulary to articulate it. Not only do I now have that vocabulary, but I am also linked to a network of individuals who carry a similar level of appreciation.”*



**LEON WANG**  
Biological Curator  
San Diego, California

*“My volunteer experience with AskNature has given me the chance to meet and connect with great people with similar passions for nature. Curating for AskNature has sharpened my writing skills and given me a greater understanding of the methodology behind biomimicry. Above all, I have gotten the opportunity to contribute to the biomimicry community and play a role in this exciting movement!”*

### ASKNATURE PARTNERS



### FUNDERS



AskNature partners with Zygot Quarterly. Beginning in late 2014, AskNature joined forces with

Zygot Quarterly (ZQ) to bring its users the best biomimicry stories. A Digital Magazine Awards Finalist for the past three consecutive years, ZQ is devoted to the nexus of science and design where they meet in the field of bio-inspired design. The magazine features case studies, interviews, book reviews, and more.



**RACHEL MAJOR**  
Biological Curator  
Cupertino, California

*“By bringing together fields previously thought to be mutually exclusive, such as ecology and engineering, biomimicry provides a platform to launch new technological solutions from a truly interdisciplinary perspective. Volunteering for AskNature has given me hope that technology and nature do not have to compete with each other, and can exist harmoniously for the betterment of mankind and the planet.”*



**THOMAS MCAULEY-BIASI**  
Biological Curator  
Ontario, Canada

*“Volunteering with AskNature is such a unique experience, as it helps connect not only like-minded individuals, but also professionals in the field, to delve deeper into the world of biomimicry. Through AskNature I was able to reach and communicate with individuals who I would have never met otherwise.”*



**2013-2014 NETWORKS**

- AFFILIATE**  
**Regional Networks:**  
 Chicago  
 Great Lakes  
 Mexico  
 Netherlands  
 New York City  
 Oregon  
 Puget Sound  
 Quebec  
 San Diego  
 San Francisco Bay Area  
 South Africa  
 Switzerland  
 Texas

- EMERGING**  
**Regional Networks:**  
 Alberta  
 Australia  
 Caribe  
 Chile  
 China  
 Colombia  
 Germany  
 Iberia (Spain)  
 India  
 Italy  
 Los Angeles  
 Northern Forest (Central NY)  
 New England  
 New Zealand  
 Taiwan  
 Yucatán

**EDUCATION NETWORK**  
 3,000 members worldwide



**BIOMIMICRY  
 GLOBAL  
 NETWORK**  
 A network of networks

## BIOMIMICRY GLOBAL NETWORK: A Network of Networks

Following publication of Janine Benyus' seminal book, a global community of changemakers came together under the banner of biomimicry. Now formalized, the Biomimicry Global Network is connected by a shared vision and community.

As nature illustrates, the most successful and resilient networks are distributed and decentralized. To encourage resiliency, over the past several years, we have nurtured the growth of independent regional and professional networks around the world.

By the end of 2014, The Global Network included 29 Regional Networks and the Biomimicry Education Network (BEN), a professional network for educators. Additionally, more than 50 other regions around the world have expressed interest in becoming part of the Global Network.

The Institute's goal is to support leaders in introducing biomimicry to their region. We have trained individuals and regional groups, and helped secure funding for a number of Global Network projects. We also provide a cohesive biomimicry agenda, such as our Global Food Challenge, which has inspired corresponding regional activities and engaged network members as mentors and advisors.

We have three types of networks nested within the Biomimicry Global Network, and more on the way:

**Regional Networks** are hosts for biomimicry activities catalyzed by individual champions and collaborative core groups that center around geographic location. Examples of projects include introducing biomimicry to local schools, creating biomimicry business incubators, and applying biomimicry to architectural and planning projects.

**The Biomimicry Education Network (BEN)** is the first professional biomimicry network. Members include educators who work with youth, university students, and informal student groups. The BEN also includes Biomimicry Fellows, who are educators extensively trained in biomimicry, and university affiliates.

**The Biomimicry Network Leaders Community (BNLC)** is a peer-based learning and action network that is forming to share strategies and work collaboratively on projects that will grow and nourish all types of biomimicry networks. Members of the BNLC are selected by their regional and professional networks to represent their networks at the global level.



Participants sit outside during a Biomimicry and Design workshop in Veracruz, Mexico. Organized by our BEN affiliate partner Universidad Iberoamericana, this week-long workshop has been held annually for the past seven years and has trained almost 200 educators, students, and professionals.

## NETWORKS IN ACTION

All across the world, biomimicry networks are educating, inspiring, designing, and creating. They not only spread the practice and philosophy of biomimicry, but work to apply nature-inspired solutions to issues in their regions. Here is just a small sample of the pioneering work that the regional and professional networks have accomplished.

### Tapping into Genius of Place in the Western Cape



Photo: BiomimicrySA

#### BIOMIMICRY SOUTH AFRICA

Biomimicry South Africa (BiomimicrySA), along with government and industry partners, is leading Genius of Place projects in key South African regions, work that has led to a 2015 nomination for a European GreenTec award. In Genius of Place projects, local ecosystems are studied to learn how to create region-specific solutions to design problems. Over the past two years, BiomimicrySA has been applying biomimetic solutions to water issues in informal settlements in the Western Cape. Starting with a feasibility study and strategic plan in 2013, BiomimicrySA teamed up with the Western Cape government to find out if there was a better way to manage the wastewater and stormwater system in these informal settlements, where residents don't have access to running water or plumbing in their homes. In early 2014, BiomimicrySA began working with the sustainable water management pioneers at John Todd Ecological Design to create an innovative engineering solution that disposes, conveys, and treats wastewater and manages stormwater. This "living sewer system" will not only treat and manage waste and stormwater, but will actually create higher-quality soil, leading to a greener community.



Nicolas Anxolabehere, son of Biomimicry Specialist Colleen Mahoney, looks under logs for salamanders and bugs.

### Inspiring People to Get Outside

#### COASTAL REDWOOD BIOMIMICRY NETWORK

Launching a brand-new regional network takes a lot of passion and dedication. One of the newest regional networks to join the Biomimicry Global Network is the Coastal Redwood Biomimicry Network (CRBN). Created in early 2015, the CRBN, which is located in the San Francisco Bay Area of Northern California, chose an ecological region for its name to honor the keystone species of the region. Led by biomimicry specialists AJ Wacaser and Colleen Mahoney, this network aims to bridge the local in-person and online naturalist and biomimicry communities by hosting

informal education events for all ages, such as bioblitzes using the iNaturalist.org app. AJ says, "We intend to participate by having fun with our friends and family outside, thinking outside, building relationships, making connections, seeing patterns, sharing photos, stories, ideas, and appreciating nature."

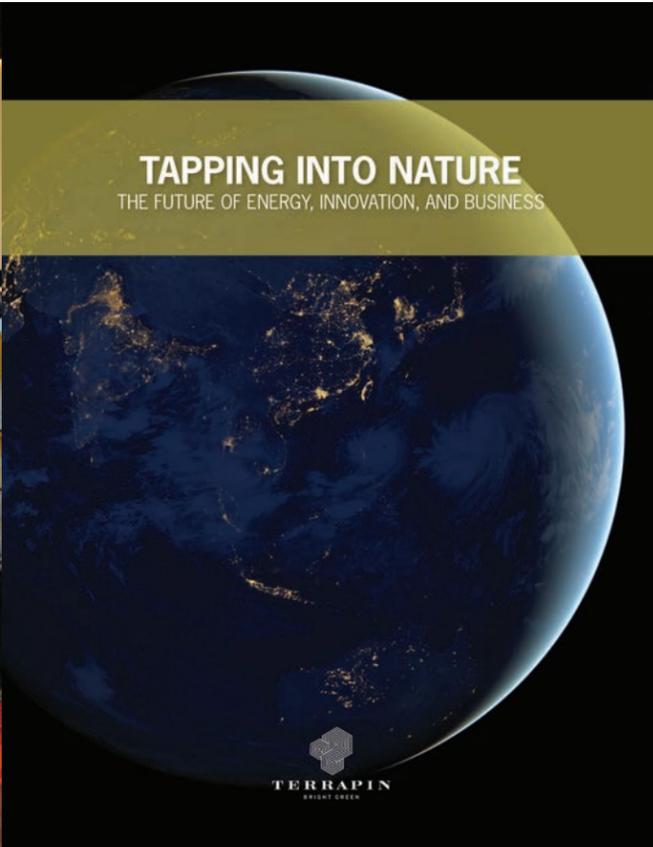
This past spring, the network had its first biomimicry bioblitz event at Redwood Regional Park in Oakland, CA, and, using iNaturalist.org, documented 106 observations and identified 36 species, all while discussing functional biology and biomimicry with attendees.

## Exploring Bioinspired Approaches to Innovation

### BIOMIMICRYNYC

As part of its effort to foster biomimicry in the New York City metro region, BiomimicryNYC co-sponsored the launch event for *Tapping into Nature: The Future of Energy, Innovation, and Business*, a paper co-authored by Chris Garvin, BiomimicryNYC board member and managing partner at sustainability consulting firm Terrapin Bright Green. The paper explores breakthrough biologically-inspired products and the vast, largely untapped market potential of a bioinspired approach to innovation. This work builds off of Terrapin's five-year New York State Energy Research and Development Authority (NYSERDA) program, a collaboration with Biomimicry 3.8, which aims to catalyze biomimetic innovation in the research and manufacturing communities in New York State.

To illustrate the breadth of innovation offered by the natural world, the paper examines nine cross-sector topics, reports on over 100 bioinspired technologies, and connects biomimicry to 37 wide-ranging industries. An interactive chart enables readers to explore the connections between these three categories in-depth. *Tapping into Nature* attests to the potential of the rapidly growing biomimicry field and provides a resource for its community. [Read or download Tapping into Nature.](#)



## Learning How to Create More Sustainable Cities

### BIOMIMICRY PUGET SOUND

In 2013, Biomimicry Puget Sound received funding from the Bullitt Foundation to support a project to explore how learning from nature can inform the way we build and construct our cities to be more sustainable. The Urban Greenprint project team identified specific strategies in nature that could help strengthen ecological systems within the city of Seattle, WA, specifically related to CO<sub>2</sub> storage, water flows, and biodiversity. Working with a multidisciplinary group of experts, the team explored five champion building and landscape projects in Seattle and evaluated each project's impact on ecological systems. The goals of this effort were to illustrate that 1) the city is an ecosystem, and every project has an impact on that larger system,

and 2) different project types contribute different ecological value, and diversity helps create a healthy functioning ecosystem.

In the next phase of the project, the team will build off these biological strategies to develop real, implementable methods for applying this learning to building and infrastructure designs. The Urban Greenprint team will be gathering local design and construction experts to develop a toolkit of building details, design strategies, and products that will enable design teams to emulate the functions of nature appropriate for this region.



Photo courtesy: Phil Masturzo Akron Beacon Journal

## NETWORK LEADER GATHERING

What better spot to share, plan, dream, and create next steps for the biomimicry movement than among the redwoods? In late November 2014, leaders from the Biomimicry Global Network (BGN) gathered at a retreat center in northern California to co-create a plan for how to work together to advance the network's reach and impact. The Kendeda Fund granted funding to the Institute to develop a strategic foundation and supporting infrastructure to nourish the

existing networks and enable the growth of the BGN. This planning process culminated in the November retreat. Network leaders came from all over the world, including India, Chile, New Zealand, China, and South Africa, to discuss how to build momentum and increase resilience of the regional and global networks, and to co-develop a strong infrastructure to sustain them. Moving forward, the network community will be focused on putting these ideas into action.

## Connecting Academia with Industry

### GREAT LAKES BIOMIMICRY

Great Lakes Biomimicry is playing a key role in connecting academia with industry to integrate biomimicry into companies' innovation processes. In 2012, they helped create and raise funds for a University of Akron biomimicry PhD fellow to work with GOJO Industries, the inventors of PURELL® Advanced Hand Sanitizer. Emily Kennedy, one of many biomimicry PhD fellows working with companies and K-12 schools throughout northeast Ohio, spends two days a week embedded in the GOJO Research and Development department supporting sustainable product and process innovation inspired by nature.

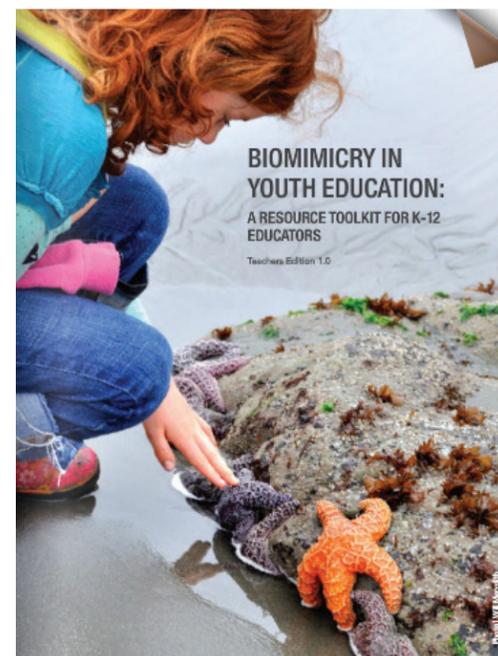
Since joining the organization, Kennedy has collaborated with GOJO staff to lead biomimicry innovation workshops focused on how biomimicry principles and practices can help the organization further its position as an industry leader and innovator. From just two workshops, the team generated six patent applications and many novel designs and approaches that GOJO is working to further develop. These innovations also have sustainable value, giving GOJO new insights to achieve significantly less energy consumption and use greener chemistries in its next generation of products.





## EDUCATION OUTREACH and Professional Development

## YOUTH EDUCATION TOOLKIT



In 2013, with support from the Kendeda Fund, the Biomimicry Institute created *Biomimicry in Youth Education: A Digital Toolkit for Teachers*. A growing amount of free or low-cost content about biomimicry is available online, but the resources are fragmented across the web and navigating the diversity of education resource libraries for quality curriculum is a time-consuming chore for teachers. We saw the need for a straightforward introduction and comprehensive resource, making it easy for teachers to integrate biomimicry into their curriculum. Our digital toolkit gives teachers new to biomimicry a high-quality entry point and offers experienced teachers a treasure trove of resources they may not have encountered before. The collection includes over 80 lesson plans, activities, curricular units, digital media, and more, from a broad survey of available material. It's all conveniently indexed by content area and then by grade level, enabling teachers to easily adapt lessons to the age group they

work with. To assist teachers new to biomimicry, the Institute also authored a brand-new introductory section containing an orientation to the core concepts of biomimicry, along with effective teaching strategies for communicating those ideas to students. This toolkit is perhaps the most accessible and comprehensive introduction to biomimicry for educators available to date.

*“This is an amazing collection of resources...biomimicry is such a fascinating and vital piece of understanding the environment and I know this toolkit will open the eyes of many students (and teachers!) to the possibilities of the field.”*

– Jeff Chandler, Program Associate,  
National Environmental Education Foundation

## YOUTH CURRICULA - NATURE INSPIRED CHEMISTRY

### LEAVING HEAT, BEAT, AND TREAT BEHIND IN THE SCHOOL CHEMISTRY LAB

Students and teachers across the globe are learning about nature-inspired chemistry by incorporating hands-on chemistry labs, created by the Biomimicry Institute, into their classwork. These labs provide students with a way to learn valuable chemistry lessons while showing them an alternative to the energy-intensive and often hazardous processes used in traditional industrial labs—processes that are mimicked in many school chemistry labs. By participating in these labs, students see evidence of how nature’s design strategies can be emulated to build our materials and products in more sustainable ways.

### CONCRETE WITHOUT QUARRIES:

The procedure for our “Concrete without Quarries” lab helps students explore how nature creates useful materials, such as the calcium carbonate needed to manufacture cement, at ambient temperatures and using abundant, readily available raw materials. The cement used in concrete is made by extracting calcium carbonate from mines, then heating it to extremely high temperatures, which releases pollutants into the earth’s atmosphere. By approximating the process for how coral creates calcium carbonate with seawater and carbon dioxide, students can see first-hand how emulating nature can lead to more sustainable

ways to build our world. Materials needed for the lab are low-cost and commonly available in most communities, plus the lab includes step-by-step video instructions.

### DYE-SENSITIZED SOLAR ENERGY LAB:

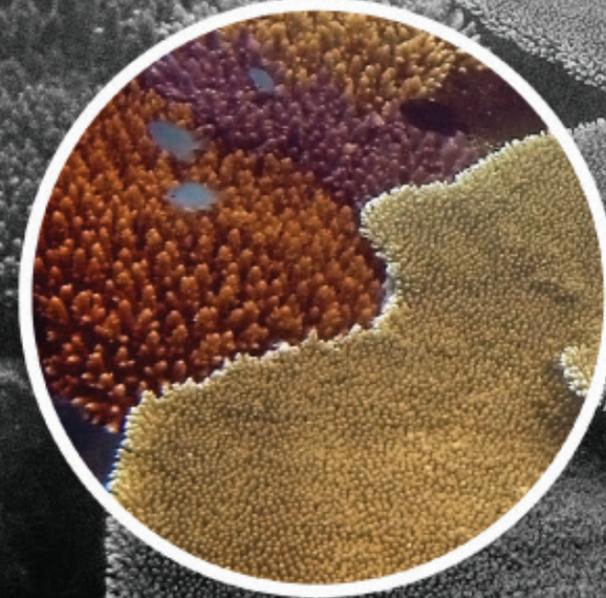
Our energy lab examines dye-sensitized solar cells, which are inspired by photosynthesizing plants. They have many advantages over conventional silicon solar cells, which require energy-intensive processes to create. In fact, it takes years for conventional cells to provide as much energy as was used to create the silicon they contain. The lab and lesson plan provide an excellent hands-on opportunity to explore a

biomimetic technology, and are based on a lab published in the Journal of Chemical Education in 1998. This lab has been used successfully with students in upper elementary grades through undergraduates in college. In this activity, students learn how solar energy can be converted into electrical energy using nature-inspired technologies.

Both of these lesson plans address key chemistry education standards and are available for upper elementary grades through high school, including versions in Spanish and for home school. View these resources on our [Biomimicry Education Network site](#).



**ENERGÍA SOLAR SENSIBILIZADA  
POR COLORANTE**  
PLAN DE CLASE DE BIOMÍMESIS



**CONCRETE WITHOUT QUARRIES**  
A BIOMIMICRY LESSON PLAN



Global Network members at the 2013 Biomimicry Summit collaborate during a breakout session.

## 7<sup>TH</sup> ANNUAL EDUCATION SUMMIT

Educators play an important role in the Institute's mission. That is why, for six years, we have hosted an annual Biomimicry Education Summit for teachers to meet, hear about advances in the field, and learn from each other. In 2013, our seventh annual summit manifested as a special track during our first Global Conference. The combined event connected biomimicry educators with practitioners and others in our wider network during shared morning sessions. In the afternoon, the education track featured workshops, panels, and presentations selected from a call for proposals from educators in the field.

The global conference attracted over 300 people, including educators working with youth, university, informal, and professional student groups.

*“The conference was an amazing event in every respect! Truly inspiring speakers and attendees. A great way to bring all the biomimics and changemakers together, grow and nurture the network, and exchange ideas and visions.”*

– Biomimicry Summit attendee, 2013

*“The Biomimicry Conference was a truly exceptional get-together of biomimics and changemakers from all over the world. The excellent combination of inspiring lectures given by leading edge thought leaders with workshops hosted by biomimicry fellows provided an effective platform to form and consolidate international ‘collaboratories’.”*

– Arndt Pechstein

*“As an elementary school science teacher guiding 4-9 year-old students, I am excited to share this perspective at the beginning of their formal education. I have learned from nature that significant change happens over generations and I believe this conference has helped me be an agent of much-needed change in the long run.”*

– Barbara Gates

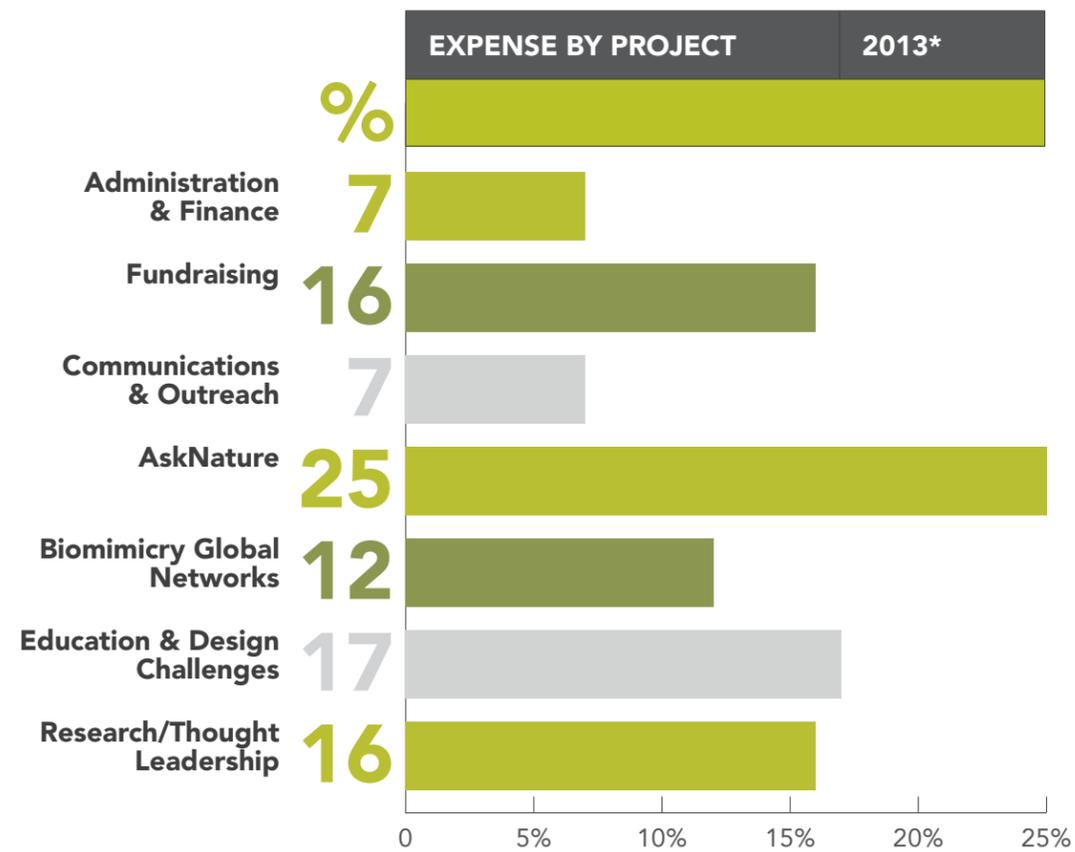
*“For me, as a scientist and educator, the ideas and conversation presented at the summit/conference were both scientifically rigorous and mind-blowingly creative. Unlike typical scientific meetings or education conferences, this one nourished my soul as well as my mind and left me feeling incredibly inspired.”*

– Amy Dickson

## FINANCIALS 2013

REVENUE BY SOURCE	2013*
<b>Grants</b>	73%
<b>Corporate Giving</b>	4%
<b>Major Donors</b>	12%
<b>Individual Supporters</b>	1%
<b>Sponsorships</b>	2%
<b>Earned Income and Other</b>	8%

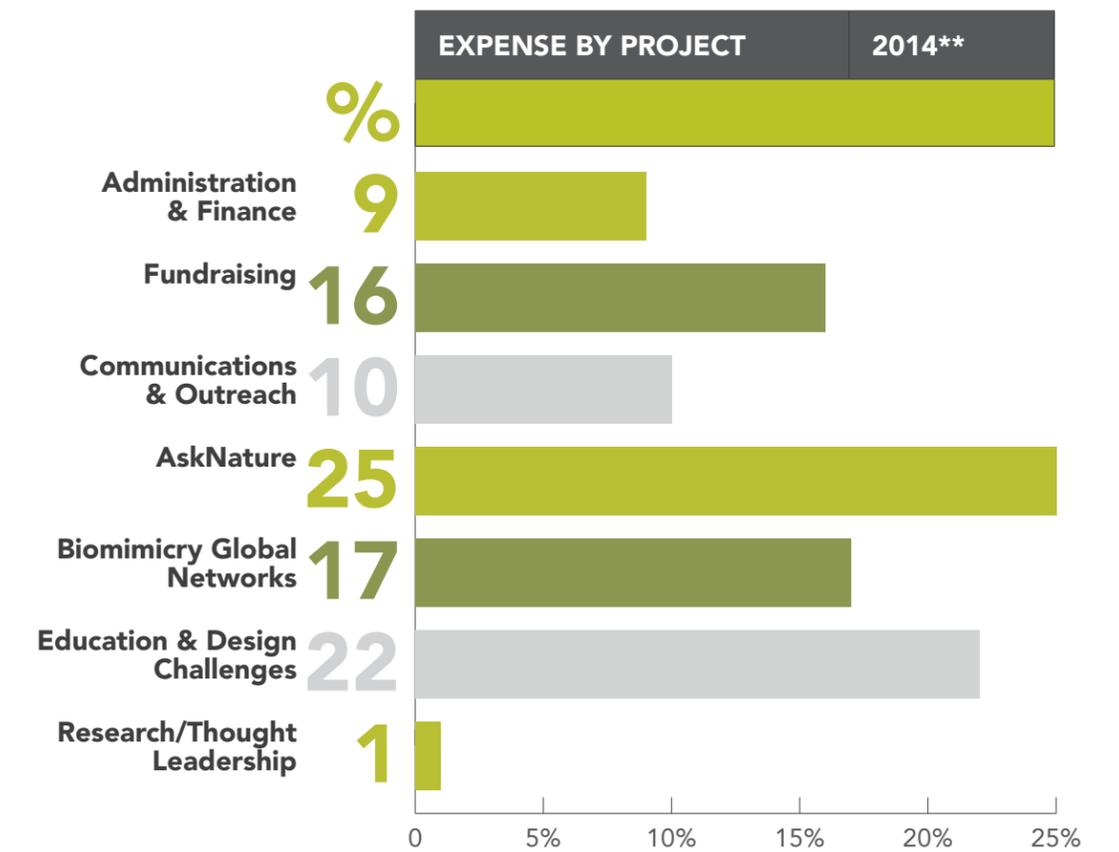
The 2013 complete audited financial statements can be found at [biomimicry.org](http://biomimicry.org) or can be requested from the Biomimicry Institute at 415-800-1477.



\* Note: The % figures are derived from the 2013 consolidated financial statements that have been audited and have received an unqualified opinion.

## FINANCIALS 2014

REVENUE BY SOURCE	2014**
<b>Grants</b>	78%
<b>Corporate Giving</b>	5%
<b>Major Donors</b>	10%
<b>Individual Supporters</b>	2%
<b>Sponsorships</b>	0%
<b>Earned Income and Other</b>	5%



\*\* Note: The % figures are derived from the 2014 consolidated financial statements that are in the process of being audited.

# THANK YOU



## 2013 & 2014 KEYSTONE SOCIETY

### BIOMIMICS (\$25,000+)

Anonymous  
Social Relations of  
Knowledge Institute

### INNOVATORS (\$10,000 - \$24,999)

Anonymous

### MENTORS (\$5,000 - \$9,999)

Susan & Randall Anway  
Janine Benyus  
Annie Berdy  
Peter Boyer  
Katherine Collins, Honeybee  
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Dr. Loring & Rev. Louise Conant  
Rebecca Winsor, William H  
Donner Foundation Fund

### EARLY ADOPTERS (\$1,000 - \$4,999)

Sharman & David Altshuler  
Tod & Fiona Bensen  
Cornelia Bonnie Trust  
Margie & John Haley  
Rebecca Jones, in honor of  
Jessica Jones & Sterling Smith  
Carole Kain  
Victoria & Sanford Keziah  
Douglas Koester  
Stephanie Pace Marshall,  
Lloyd A Fry Foundation

Russell & Suki Munsell  
Linda Paisley  
Linda Stern  
John Webb  
Eric & Maria Wilson  
Reuel Young

### ADDITIONAL SUPPORTERS (\$5 - \$999)

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Karen Allen  
Kendal Anderson  
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Anonymous  
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Tom Bersano  
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Colleen Mahoney  
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Dan & Lecia McMinn  
Terrence McNally  
Kirk Mills  
Victoria Mills

Richard Moog  
Peter O'Callaghan  
Jenna Orkin, in memory  
of Gisella & Harvey Orkin  
David & Amy Coffman Phillips  
Rachel Pokrandt  
Thomas Polefka  
Larry Purcell  
Nicole Rossi  
Jenny Russell  
Elizabeth Schenk  
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Ariel Steuer  
Mary Swanson  
Stephen & Lisa Swanson  
Linda Thompson  
Viethoai Trinh  
Amanda Tullos  
Harry Uvegi  
AJ Wacaser  
John & Amy Warner  
Patricia Waterston, in honor  
of Rachel Hahs  
John Webb  
Nancy Wilkins  
Polly Wingfield  
Jennifer Wood  
Paul Wood  
Colin Worf  
Kay & Bob Wosewick  
Brenda Young

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*“It is only on the condition of humility  
and reverence before the world that  
our species will be able to remain in  
it.”*

— Wendell Berry