

CREASE, FOLD & BEND





THE ARTISTS

BUILT NY Inc.— Kentaro Ishihara,
Aaron Lown, John Roscoe Swartz

Erik Demaine and Martin Demaine

GAIA

Takayuki Hori

Tina Hovespian, Cardborigami™

Kentaro Ishihara

ItsDovey

Chawne Kimber and Ethan Berkove

Robert J. Lang

PopOut Maps

Luisa de los Santos-Robinson

Matthew Shlian

Carlos Runcie-Tanaka

Anton Willis, Oru Kayak

Michael Hezel '14 and
Eduardo Rodriguez '14

Xingyi Ma '13

Jason Sheng '15

Crease, Fold, and Bend

INTRODUCTION

CREASE,
FOLD
& BEND

TO A VISUAL ARTIST LIKE ME, with no professional training in math or science, faced with a blank sheet of paper to manipulate, the magnitude of possibilities is unfathomable. A blank surface normally comes to life when dappled with marks, lines, or hand-drawn additions; therefore, the frightening but also exhilarating challenge of origami is its open-ended possibility—the possibility of giving life to the blank sheet, of creating something extraordinary out of a scrap of paper that, in turn, has the potential to become a living art form. Are there any limits to where the imagination, the exploration and transformation of the blank paper, can take us? Origami originates from a known set of common principles that begins with paper, lines, creases, and folds—the one common denominator of the art itself. This is reassuring to anyone, including an origami layman like me, attempting to understand the root of the creative process. Even the most complicated tessellated designs have a unifying sense of balance, method, and basic set of geometric organizational principles, although, from that point onward, the possibilities are infinite and the process (often a journey into the unknown) may develop and extend into the most unexpected directions, shapes, uses, and meanings. Herein lies the extraordinary magic of origami in the realm of all its spectacular variations, as well as the reason why origami continues to be a living, evolving art form centuries after its origin in seventeenth-century Japan.

When I initially pondered the various approaches to the contemporary art of origami for this exhibition, I wondered if it was possible to think of origami in one all-inclusive definition, to define it as an art form. To make sense of it, I consequently organized the styles of contemporary origami into three main categories: forms of life, forms of beauty, and forms of knowledge, based upon German educator Friedrich Froebel's model for teaching paper folding to schoolchildren, in 1837. His theory seemed to encompass the full range of creative possibilities. But as my perception (and education) deepened, the distinctions between these categories became less clear to me. The overlapping concepts and aesthetics, from the most mathematical to the most expressive and classification-defying approach, made it evident: There are no clear-cut definitions to explain any of these works. They are all unique unto themselves. Certainly, the possibilities inherent in origami fashioning have changed since Froebel defined the categories of paper folding. While exploring the range of uses and styles by the international artists included in this exhibition, I have been consistently surprised

Takayuki Hori
(Japan)
Oritunagumono,
2010, inkjet printing
on overhead
transparency sheets,
8 origami, light
boxes. Installation
view at Lafayette
College, 2013.
*Short-tailed
Albatross, Little Tern,
Ancient Murrelet,
Common Murre,
Saunders's Gull,
Green Sea Turtle,
Harbor Seal,
Dalmation Pelican*
Photograph by
Michiko Okaya

and astonished by the fresh and innovative approaches to an ancient medium that, unlike other art, design, or craft movements, resists one particular way of looking at or thinking about the work to present multiple viewpoints for both audiences and practitioners alike. Across the board, all the works, whether originating from ideas based in the sciences, math, or art, share overlapping sensibilities as artists push their medium further and further, both aesthetically and intellectually, into unknown and previously unseen areas. Since origami paper folding originated historically as an art form in Japan, its popularity extended westward and across Europe; early nineteenth-century circuses from Japan entertained audiences across the continent by folding sheets of paper into birds on stage. It's not surprising, then, that it has become, perhaps, the most democratic of art forms accessible to audiences of all ages eager to master folding, creasing, and bending at all levels of experience, imagination, and genre. Froebel was, in fact, the first known educator to introduce origami into formal education by recognizing the academic benefits of the practice to teach sequencing, mathematical/spatial relationships, and reading to children. He understood early-on the value in origami for cognitive play and exploration. Unlike specific disciplines in the fine arts that require a specialized audience or particular level of training to understand, origami incites the paper, the curiosity, and the desire to make the fabulous universally available.

The principles of origami design are equally understood, researched, and employed by scientists, mathematicians, engineers, and fashion and industrial designers, resulting

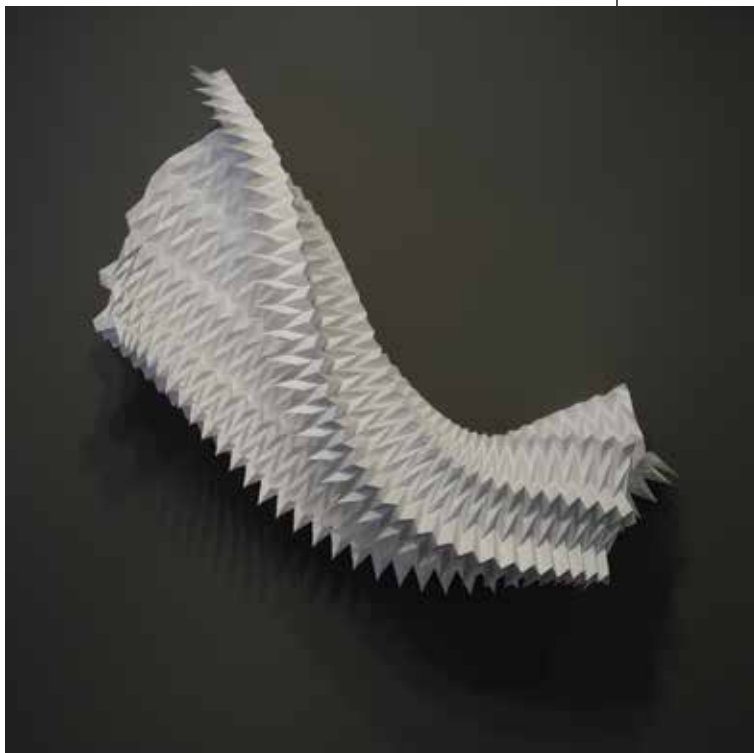


in the joy of creation, discovery, and excitement. Folding patterns are used for multiple purposes, indicating that origami folding is not merely an imitation of historical influences but an expansion of them. What goes into the thought, the conception, and the diagrams that result in the final form? The unifying commonality, I discovered, was the essence of curiosity apparent in the work by all the artists, as personified in their goals to expand the boundaries of the medium, and, in nearly every case, to achieve sheer, breathtaking beauty as a result.

Perhaps, then, the notion of creative curiosity is best summed up by Japanese graphic artist Takayuki Hori. Hori explains that he decided to make these artworks because, he believes, “People do not realize there are many interesting things around us.” His series of X-ray origami works, titled *Oritunagumono* (translated as “things folded and connected”), “reminds people that even the traditional art of origami can be viewed from a new perspective. . . . We think we know about origami, but it is a preconception. We need to see it from a different point of view—with curiosity.”

Paper engineer Matthew Shlian echoes Hori’s words: “Researchers see paper engineering as a metaphor for scientific principles; I see their inquiry as basis for artistic inspiration. In my studio, I am a collaborator, explorer, and inventor. I begin with a system of folding, and at a particular moment the material takes over. Guided by wonder, my work is made because I cannot visualize its final realization. In this way, I come to understanding through curiosity.”

Matthew Shlian
(United States)
Untitled, Tyvek,
size variable.
Photograph by
Michiko Okaya



As pointed out by Hori and Shlian, curiosity is a strong common link that contemporary origami-inspired artists share for expanding the medium from its tradition, originating during the Edo era (1603–1867) in Japan, into new directions motivated by experimentation and imagination and digital possibilities. It's not just about folding shapes into paper animals and objects but the inspiration of the actual process that is employed to bring out the potential expression of the paper.

Yuko
Nishimura
(Japan),
Kami-san,
2000.

Photograph in
exhibition.

A number of architect-artists such as Yuko Nishimura come, more evidently, from the tradition of Japanese papermaking, using traditional folding as the basis from which



to develop ever more complicated diagrammatic designs. Nishimura uses the tessellated shape to reinvent a contemporary version of the traditional Japanese teahouse that acts as half sculpture, half shelter for performing the ancient tea ceremony. She says, “In order to link the past with future generations regarding the form of folding, I do not limit myself to the category of origami but consider the pursuit of any possibility of folding paper.”

Others are employing computational algorithms and tools to create precisely folded structures that use science and math as the catalyst for applying

diagrams and systems to manipulate paper into works of three-dimensional art.

Inventive mavericks of the origami world, Erik and Martin Demaine come to folding from backgrounds in computational math, science, and art, respectively. This perfectly balanced son-and-father team plays and maneuvers paper, giving birth to a tour de force of the imagination, as in their recent origami curved-crease *Destructors* series (2013), which explores text printed on paper before folding.

As described by the team, “Each *Destructors* book sculpture is a modular combination of three or more interacting pieces that are made from a sheet of Zanders’s Elephant



Hide paper, or Mi-Teintes's watercolor paper, that has been printed with overlapping pages from Graham Greene's short story 'The Destroyers' (1954). We cut the sheet into a circle with a circular hole, score centric circular creases, and fold by hand in an alternation between mountains and valleys. The paper folds itself into a natural equilibrium form based on these creases. We weave the pieces together by squeezing one piece to fit inside the hole of

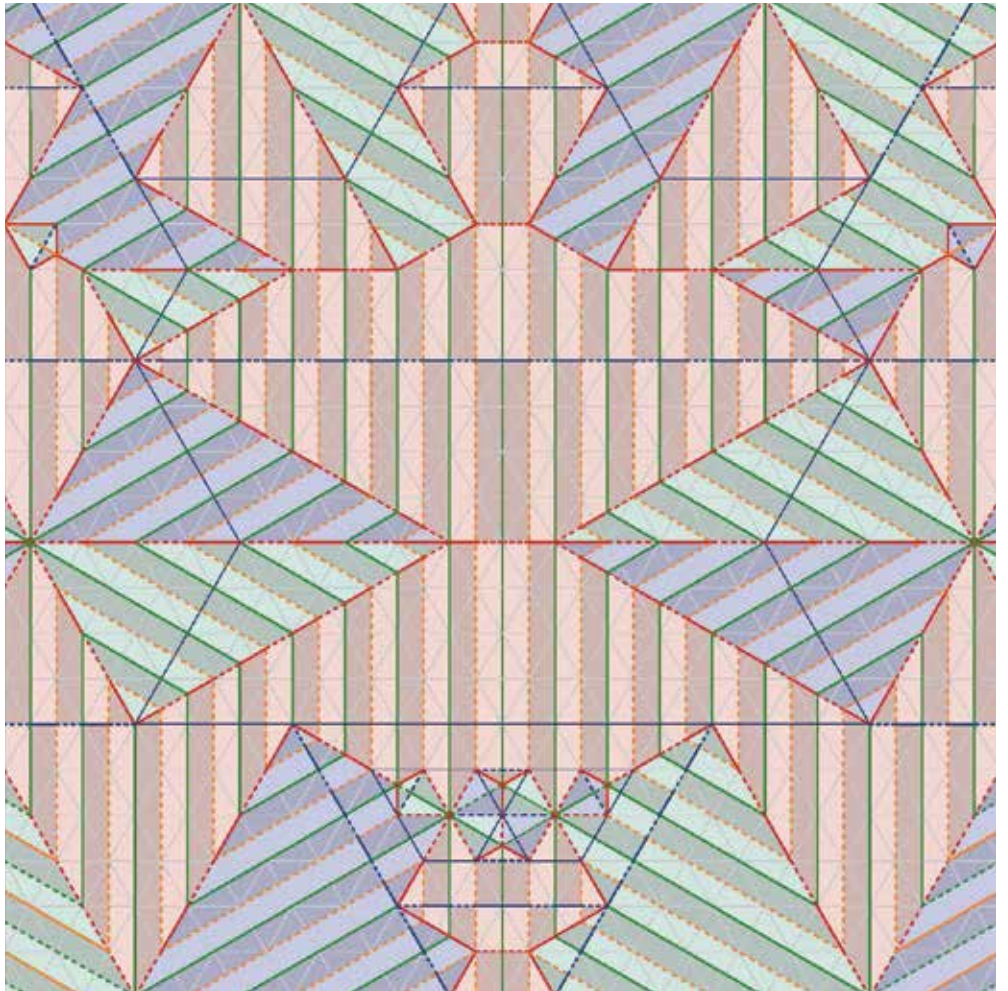
another, let these pieces relax into a natural resting state, and then glue the pieces to prevent shifting. We loved the chaos and confusion of the movie *Donnie Darko* (2001), in which the characters are inspired by Greene's short story, whose central tenet is that destruction, after all, is a form of creation. This story seemed ideal for our process, which obscures and slices the text into an unreadable book. The transformation of the flat paper into swirling surfaces creates a sculptural book that feels alive."

The Demaines turn everything inside out and upside down to discover the true nature of the material, its mysteries, and the nature of paper itself by both directing and allowing the paper to find its own physical freedom. The paper, as a result, takes on a life of its own, seeming to materialize magically without apparent human touch, thus giving birth to the most ephemeral objects by exploring the formal properties and potentialities of folded paper. Their wizardry, which combines the alchemy of math with art, continues to be a series of puzzles waiting to be solved.

Art and math visibly intersect in the mathematical theories of Robert J. Lang as well as the Demaines. Lang, a master origamist, theorist, and engineer developed Treemaker, a software program that diagrams crease patterns based on geometric designs, resulting in intricacies of color, shape, and detail beyond the boundaries of traditional folding. The crease pattern is regarded as an important part of the process. According to Lang, "To most of the world, decorated crease patterns are a glimpse into something else: the intersection of origami, art, math, perception, and their own experiences. And toward that end, the various

**CREASE,
FOLD
& BEND**

Erik Demaine
and Martin
Demaine
(Canada/
United States)
Destroyers V,
2013, Mi-Teintes
watercolor
paper, 11" high x
10" x 13".



Robert J. Lang (United States)

Above: *Brown Widow HP*, opus 586, crease pattern, Ciclee print on canvas.

Top right, *Brown Widow HP*, opus 586, one uncut square of O-gami paper.



decoration schemes, whether algorithmic, aesthetic, or a mix of the two, establish those connections, uniquely for each viewer.” Therefore, one might ask, when is a scorpion not a scorpion? Answer: When it is a piece of paper with crease patterns informing us of the 158 steps to become a scorpion. “It’s like math,” Dr. Lang told Susan Orlean, in her 2007 profile of him for *The New Yorker*. “It’s just out there waiting to be discovered.

The exciting stuff is the stuff where you don’t even know how to begin.”

Lang shows us that the crease patterns are every much as sophisticated, elegant, beautiful, and unique as individual works of art, with their own identity, as the folded objects into which they eventually evolve. His introduction of color to the drawings adds dimensions and layer upon layer of depth to the flatness of the paper sheet—a new form of expression in itself. Lang, who is known not only for his origami animals and insects folded from these exquisite crease patterns, also applies the technology to real world engineering solutions, such as in the creation of a folding design for airbag manufacturing and the development of a folding lens to be inserted into a rocket so small that, when launched into outer space, it will unfold without causing any permanent marks or creases.

New developments in technological devices, computational engineering, and three-dimensional printing have also added a new layer of possibility into play. The possibilities are infinite. Computer scientist Dr. Jeannine Mosley, another pioneer in the emerging field of computational origami, thinks both inside and outside the box. Dr. Mosley’s design for a level-three Menger sponge made of eight thousand cubes created from folded business cards—an example of modular origami—is the inspiration for a collaborative project by the Lafayette community. The Menger sponge was first described by Karl Menger, in 1926, while exploring the concept of topological dimension. A self-similar fractal, it exhibits an infinite surface area and encloses zero volume simultaneously.

In addition to the extraordinary range of paper objects to emerge in recent years, the practice has also expanded beyond the object into conceptual realms of imagination, such as in the work of Peruvian artist Carlos Runcie-Tanaka and British architect Thomas Hillier. In Runcie-Tanaka’s work, traditional origami elements are grouped together to form installations that create a poetic oeuvre, drawing the viewer into

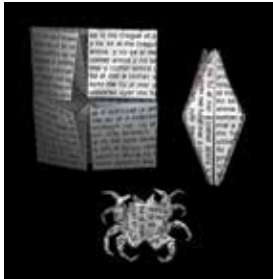
Right: Carlos Runcie-Tanaka (Peru) *Transfencia/Dos, Transference/Two* Installation, 2006, Meyers Gallery, University of Cincinnati/Art Academy, Cincinnati, Ohio. Photograph by Philip Groshong

Desplazamientos/ Displacements, Videoinstallation, (stills), 2004, V Bienal Barro de América, Maracaibo, Venezuela Photograph by Carlos Runcie-Tanaka/ Frank Sotomayor.

Opposite page: Takayuki Hori (Japan) *Oritunagumono*, 2010, detail from the site specific installation, 8 unfolded inkjet printed transparency sheets, 8 origami light boxes

Top: Unfolded *Albatross*. Photograph by Takayuki Hori

Bottom: Folded *Pelican*, with fishing lures. Photograph by Steve Gamler



the artist's vision, his family history, and a magical realm of experience that embraces the delicacy of the paper with a story woven around it. Runcie-Tanaka's use of origami becomes an *expression*, expressing a mood, movement, and feeling. The temporary, ephemeral paper explains a fragility of the human soul: "My Japanese grandfather, Guillermo Shinichi Tanaka, came to Peru in 1924 to start a new life, and formed a new home. He died early, at the age of thirty-six, leaving behind family, work, and dreams. He was an entrepreneur full of creative ideas. He started a carpentry business and the well-known Jardín Tanaka, a Japanese

nursery garden that is still remembered today by many who visited the emerging town of Miraflores. He came by sea and left with the sea. When I fold paper, the continuous exercise of repeating creases and pleats unfolds my connection with Japan. Such works as *Cloud* and *Desplazamientos/ Displacements*, and *Uno/One* are all endeavors to keep that connection alive. The crab—symbol of migration and displacement between water and land—turns into a fragile cloud that dissolves like foam in a cartography suggesting what one carries and leaves behind. Hands—together with the heart and mind—fold and unfold paper, preserving memory, renewing life."

Artist and architect Thomas Hillier employs the very craft that has defined the Japanese culture in his thought-provoking commentary on contemporary cultural and social issues in Japan in his artist's book *Emperor's Castle*. Like Yuko Nishimura's teahouse, Hillier uses the decades-old "exquisite craft" of traditional Japan to create

an architectural narrative, in which paper tessellations become magical towers, circular curves, rivers, spheres, and clouds.

Takayuki Hori (as mentioned earlier) sets the stage for political commentary in a hauntingly beautiful collection of works, *Oritunagumono*. His masterful wildlife skeletons, folded into origami “X-rays,” emphasize his preoccupation with ecology and highlight the environmental threat of pollution awaiting the number of species native to Japan’s coastal waterways. His powerfully loaded triple metaphor, consisting of skeletal renderings, and transparent paper folded into three-dimensional phantasmagoric shadows displayed on light boxes, represents the fragile, ephemeral status of wildlife disappearing through human disturbance in the most existentially haunting way. Close observation reveals images of plastic cigarette lighters, water bottles, cigarette butts, and ink bottles—all improperly discarded trash—the birds and animals have ingested.



Like the works of Hori and Hillier, political undertones, in which the paper becomes a vehicle for social commentary, are also elegantly depicted by the Italian collaborative team GAIA—Gloria Pizzilli, Arianna Petrakis, Ilaria Pacini, and Adele Bacci. Their project, Veasyble, consists of a set of wearable origami-inspired accessories that can be



GAIA (Italy)

Gloria Pizzilli,
Arianna Petrakis,
Ilaria Pacini, and
Adele Bacci

Veasible accessories.
Shown here is the
shoulder bag.

Photographs
by Alessandra

Cinquemani 2010
and Luca Nelli, 2009

*An ornament that
can be worn.*

*A gesture to
transform it.*

*A secret place for
personal intimacy.*

*A reminder of our
exterior aspect.*



converted at a touch into a means of isolation. The concept reflects on the change in human relationships within the domestic environment, because of the effects of increasing mobility, and how this has affected ideas of intimacy. This led GAIA to the design of four accessories—a visor, ruff, bag, and mask—screens for four different parts of the body: eyes, ears, face, and upper body, expressing, through their shape and color, the desire for intimacy at anytime, anyplace, on various levels. These designs for folding and creating effective patterns to transform and collapse led to their constructions of “beautiful intimacy.”

The influence of traditional folding design is evident in the engineering, fashion, and design industries, with examples of such products as the Cardborigami™, Oru Kayak, Origami Wine Tote Bag, PopOut Maps, and the HIVE dragon-tail lamps. Aaron Lown, John Roscoe Swartz and Kentaro Ishihara created the Origami Wine Tote for BUILT NY Inc. from a self-structured fabric that incorporates a rigid triangular





fold. The cylindrical tote can expand and collapse—not unlike designs utilized by engineers for deployable booms or for controlled impact resistance collapse. Additionally, on a larger scale, industrial designer and artist Ishihara applies origami folds in the creation of fluid, three-dimensional sculptures and installations that interact both with architectural spaces and the human body. His “room divider” was used by choreographers Judith Sánchez Ruíz and Simon Courchel in *Industrial Dance* (2010), during which the dancers’ movements responded to the organic forms of the origami.



Having spotted a need to cure what he calls “Map Stress Syndrome” after watching numerous tourists around the City of Bath, England, battling with oversized maps, founder Derek Dacey recalls the invaluable miniature charts he used during his days as a commercial pilot. Aiming to bring this level of usability to the city map market, a small team of designers was recruited to realize what would soon become the PopOut®.

The maps utilize a “Turkish Fold” which unfold and refold without awkward manipulation as the cover is open and closed.

Interior designer Luisa de los Santos-Robinson’s immensely popular, mythical, dragon-inspired hanging and table lampshades for HIVE is functional work. Made of hundreds of interconnected “fortune tellers,” the surface simulates a dragon’s skin. Modular origami and tessellated designs have become popular elements in the contemporary-home design as well as fashion industries.

Designer and founder of Oru Kayak, Anton Willis, inspired by an article on new advances in the art and science of origami, developed and tested an origami-inspired kayak for functional use



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Designers Aaron Lown, John Roscoe Swartz, Kentaro Ishihara, for BUILT NY Inc., New York (United States)
Origami Wine Tote, shown open and closed; EVA (Ethylene Vinyl Acetate). Photograph by Michael Roberto.

Lower:
Kentaro Ishihara, room divider. Photograph by Anna Lee Campbell at The Invisible Dog Art Center in Brooklyn, NY.



Above: Luisa de los Santos-Robinson (Philippines); *Dragon Tail Hanging lampshade*, shown on model as a headwear, oyster paper and fiber reinforced polymer diffuser. Photograph by John Louis Fernando Santos.

Lower right: Anton Willis (United States); Oru "origami" Kayak, shown assembled and folded in self-carrying case, overall length 12', 25 pounds.

in bays, lakes, rivers, and oceans. The kayak skin is manufacturer-rated for twenty thousand fold cycles without structural failure. It takes five minutes to assemble the 12'-long and 25"-wide kayak, which becomes its own carrying case.

The impact of origami extends from fashion and interior design to areas that significantly impact political and social concerns in contemporary society. As a response to combating homelessness and poverty, innovative Los Angeles architect Tina Hovsepian has developed a temporary, portable origami shelter fabricated out of cardboard to house the homeless and victims of natural disasters. Her Cardborigami™ units take thirty minutes to construct, are water-resistant and fire-retardant, and provide a strong but light enough structure (at ten pounds) to be transported by a single person. The aerodynamic accordion design, based on the Yoshimura fold pattern, not only creates a structurally sound edifice when fully open but allows the units to pop up in seconds, thus making them ideal for emergency services.



Deployable structures can fold into a small size for efficient transportation and install quickly; can solve the problem of temporary emergency housing, as well as provide movable, temporary roofs for exhibition venues and sporting events. In these applications, structures must be able to meet international design code requirements in order to provide adequate strength and stiffness under a variety of loads from people, materials, wind, or earthquakes. To ensure that deployable designs are safe, a virtual model of the structural system is first “built,” using computer modeling software. Then, the virtual model is analyzed, using finite element method software to determine material stresses, element and system deflections, and to investigate the efficiency of the dynamic deployment process for the structure. Views of the structural forms and dynamic motion of origami-inspired folded-plate structures and scissor-element structure are shown in videos. These models were developed by Jason Sheng '15 using the program Inventor™. The physical scissor-element aluminum-truss arch is an example of the “best” design found, considering the trade-off between trying to minimize the weight of the structure while also minimizing deflections under wind loads. A scale model of a scissor truss by Michael Hezel '14 and Eduardo Rodriguez '14

Tomohiro Tachi, has developed software programs—Freeform Origami, Origamizer, and Rigid Origami Simulator—for designing origami figures and origami-based constrained forms. Architectural and engineering applications of Tachi’s Freeform Origami, and Rigid Origami Simulator programs can be seen in the Tachi Lab Architectural Origami video, in which he observes “Everything is Foldable.”

Many but not all folding pursuits lead to serious scientific topics, architectural design, packaging, and medical or scientific devices. Curiosity and a sense of play also lead many contemporary artists to create origami-

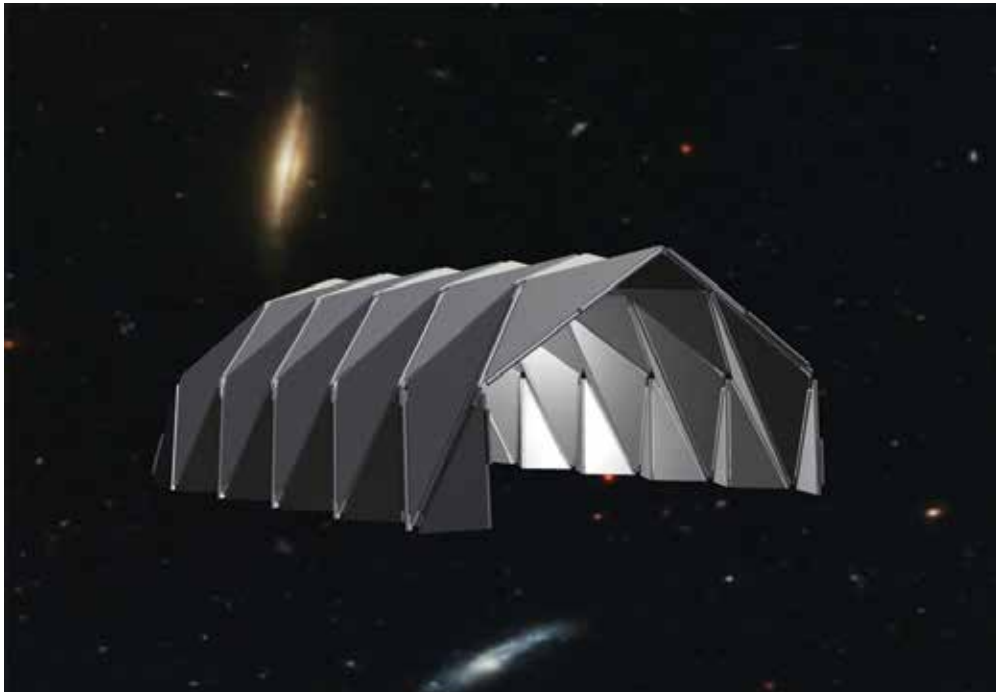
Tina Hovespian
(United States)
Cardborigami™,
water-resistant
and fire-retardant
cardboard, shown
in photograph
with door propped
open, overall
length 7',
10 pounds.
Photograph by
George Panichas.



inspired work as illustrations for imaginative folding or to create designs for new products with a playful twist. Mathematician-musician Vi Hart's video *Flex Mex*, for instance, instructs how to fold not paper but a tortilla into an edible hexaflexagon taco by using the same principles as geometric paper folding. ItsDovely designers have developed limited-edition origami tea bags, in which they pack the tea in individually sealed origami "doves"—a uniquely useful, visual, and whimsical product. In the charming *How to Fold a Bunny* video, Tomohiro Tachi uses a time-lapsed video to capture the process of making a complicated series of intricate folds of a crease pattern, created using Origamizer, which oddly negates the simplicity of design resulting in a perfectly adorable bunny.

In yet another instance where the creative imagination meets (in this case) cartography, Lafayette graduate, Xinyi (Sandy) Ma '13, a civil engineering and art double major,

Jason Sheng '15,
Screen shot from
origami-inspired
folded-plate
structure
simulation using
Inventor™.





created a tessellated-folded drawing of Venice showing a series of nine two-dimensional facades of Venetian palaces facing the Grand Canal. Hidden within, the folds, the horizontals, verticals, and diagonals of the Ron-Resch folding pattern provide structure for a Venice filled with fragments of the Venetian minore: dark alleys, small canals, bridges, chimneys, and staircases. These fragments are depicted in various perspectives, at various scales, and at various directions of light and shadow. Only this front image of Venice, a widely circulated one, is visible. Everything else

is folded inside. Through radically different approaches and viewpoints, the works of these artists illustrate that beyond the common principles of folding, the sky is the limit.

To understand what makes the process of producing this work so special is the realization of the connection between the influences at play: There is not a work of origami-related art that is not affected in some way by the cross section of math, science, and art. This makes origami the most essential and universally perfect art form. The resulting sublimity of form is the creation of universal precision orchestrated fold by fold, crease by crease, leading to the simplicity of design originating from very complex patterns, diagrams, and materials. Perhaps it is the process that has changed as radically in recent history as the outcome.

The selection of works included in this exhibition is not by any means exhaustive. Paper-folding pioneers worldwide are currently engineering new uses, both practical—as in the Oru Kayak, the cardiac stents, and the fashion designs of GAIA—and from the computational—mathematical equations of Shlian, the Demaines, Lang, and Mosely. The fascination origami holds, as an open-ended art form in the twenty-first century, is a means for invention, technological innovation, and a virtual explosion in the arts for designers, mathematicians, scientists, and explorers, all new dreamers to the medium. Our curatorial vision has been to include a range of the most surprising and original ways in which this traditional art form has been transformed by contemporary



Xinyi Ma '13,
Venice, 2013
Pencil on paper.
Ron-Resch folded
pattern.
Loaned courtesy
of Paul Felder.
Photograph by
Steve Gamler.

innovators to illustrate the story of how origami, in its ever-changing versatility and whimsical beauty, is inspired by and for the world around us. — Kathy Bruce

Weaves and Whorls, 2013

Origami folding by Ethan Berkove and quilting and finishing work by Chawne Kimber (United States)
butcher paper, cotton batting, cotton muslin, Osnaburg cotton, cotton damask;
(detail)



Installation views:

Left, Kentaro Ishihara,

Right:

Carlos Runcie Tanaka



CURATORS

KATHY BRUCE is an environmental artist-writer based in New York. She recently completed a Fulbright Senior Scholarship Grant for Lecturing and Research in Puno, Peru, 2012, where she taught environmental art at the National University of the Altiplano, and researched and built a totora reed boat in the tradition of Aymara artisans on Lake Titicaca.

MICHIKO OKAYA is director of the Lafayette College Art Galleries.

Cover Image: Takayuki Hori, *Little Tern*, from *Oritunagumono*, 2010/2013. Photograph by George Panichas

Inside Front Cover: Erik Demaine and Martin Demaine, *Deconstructors V*, 2013, detail.

Back cover: Carlos Runcie-Tanaka, *Uno/One*, Video installation (still), 2000

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Adam Machose
George Panichas, photographer
Prabhat Rimal '14
Kanako Shibano '16

**CREASE,
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September 3–
October 27, 2013



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