Scott Olson
American, born 1959

Inline skate working model, 1981
Leather, cotton, plastic, metal

Lent by Scott Olson

Brennen Olson
American, born 1962

Prototype heel brake assembly, 1983
Metal, rubber

Lent by Scott Olson

Brennen Olson
American, born 1962

Orange and black brake assembly, 1982
Metal, rubber

Lent by Scott Olson

Scott Olson identified an unmet need: hockey players wanted to skate on wheels and feel like they were skating on ice. He decided to keep the same style of hockey boot—here, a CCM Tacks hockey skate boot—and designed an expandable wheel frame and dual bearing wheel for a fast and maneuverable skate. The orange toe bumper brake was Olson's first design, adapted from traditional quad roller skates. It was scrapped in favor of a heel brake, which provided better stopping power.

James Hautman
American, born 1964

Robert Hautman
American, born 1959

Rollerblade sketches, April 4, 1992
Photocopy with graphite

Lent by Scott Olson

Scott Olson grew up in Minnesota with the famously creative Hautman family, including renowned wildlife artists James, Joseph, and Robert Hautman, and the author Peter Hautman. He enlisted James and Robert to sketch a wheel frame design and test early working prototypes.

These drawings have the feel of "thinking sketches"—practical designs give way to more fanciful ones as the designer follows his lines toward new inspiration in a kind of visual brainstorming. An idea for a three-tiered skate track around a Minneapolis lake seems unrealistic, but it may have sparked Olson's concept for an elevated exercise track, which he asked designer David Fowlkes, Jr. to draw around this time. That idea led to SkyRide.

Scott Olson and collaborator
American, born 1959

Black wood prototype of "Switch-It" blade insert, 1990s
Wood, metal

Lent by Scott Olson

Tim Rendels
American, born 1960

Black plastic boot with white Switch-It removable blade, 1990s
Black plastic boot, metal

Lent by Scott Olson

Scott Olson
American, born 1959

Skechers boot pitch prototype with quick release inline wheel assembly, 1990s
Leather, fabric, plastic, metal
Boot: Skechers, Inc.,
Manhattan Beach, CA, 1992-present

Lent by Scott Olson

This succession of ideas shows how a core concept branches out. After Scott Olson left Rollerblade, he sought to create an interchangeable blade and wheel system so that the same boot could work with blades or wheels. He tested a prototype with National Hockey League players, including Brian Bellows, who played for the Minnesota North Stars and the Montreal Canadiens.

The Skechers work-boot skate prototype shows how Olson's concept for a quick-release system was adapted for another application. Such low-cost, rapid prototyping is called "sketch modeling," which helps an inventor quickly explore and evolve an idea beyond two-dimensional drawings—basically sketching in 3D.

Scott Olson and collaborator
American, born 1959

Set of three "Switch It" drawings, 1990s
Laminated paper with marker and pencil

Lent by Scott Olson

These concept drawings show further exploration and refinement of the quick-release idea. Olson hired an industrial designer to help him develop a better locking mechanism. He created these drawings exploring three different approaches.

David Fowlkes, Jr.
American, born 1970

SkyRide concept illustration, c. 1992
Color inkjet print on paper

Lent by Scott Olson

At around the time that Robert and James Hautman drew the multi-level skate track, Scott Olson was thinking of another idea based on a similar concept: an elevated track system for pedal-powered machines. A fixed track, among other things, could enable physically handicapped athletes to safely exercise without assistance. The idea remained just that for nearly 20 years as Olson worked on other projects, the familiar fate of concepts that wait until the right conditions to fully develop.

Madeline Olson
American, born 1995

Sketch of rope harness and track,
April 1, 2011
Ink and graphite on paper

Lent by Scott Olson

Scott Olson began to think of home uses for the SkyRide concept after assisting an elderly friend with balance issues. He worked with his daughter Madeline on an idea for a safety harness attached to tracks running along the ceiling. This thinking sketch led to other ideas for future SkyRide projects that remain undeveloped.

David Fowlkes, Jr.
American, born 1970

Sketch for SkyRide drivetrain designs, before 2006
Graphite and marker on paper

Lent by Scott Olson

Scott Olson and collaborator
American, born 1959

SkyRide profile sketch with rider and calculations, 2010-12
Inkjet print on paper

Lent by Scott Olson

Scott Olson and collaborator
American, born 1959

SkyRide profile and drive mechanism sketch, 2010-12
Graphite on paper

Lent by Scott Olson

Sean Horihan
American, born 1979

Mechanical drawing, top view of front drive for SkyRide, 1:1 scale, 2012
Graphite on paper

Lent by Scott Olson

Nearly 20 years after David Fowlkes, Jr. rendered Scott Olson's concept for an elevated track-based exercise system, Olson and his collaborators finally explored how the system would actually work. Drive mechanisms were proposed and rejected. Later sketches show the working version that Olson built to test ideas once he had finalized the track design. These "talking sketches" communicate incremental changes in design while the drawing by Sean Horihan, telling a fabricator how to create and assemble the parts, represents the culmination of this evolution.

Scott Olson
American, born 1959

SkyRide photograph with overlaid dimensions and notes, 2011
Color inkjet print and ink on paper

Lent by Scott Olson

Ryan Jacobson
American, born 1985

SkyRide track rendering, 2011
Color inkjet print on paper

Lent by Scott Olson

These drawings show a concrete design, ready to be presented to a client and priced out for production. Scott Olson's notes on the photograph help a fabricator determine production costs, while the visualization of SkyRide on a ski slope promotes the idea to ski resorts.

Don Harley & Associates
St. Paul, MN 1950s–1976

Baby’s Car Seat & Gadget Bag,
1959
Colored pencil on black paper

Rendering by Leo Wildgen (1928-93)
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

"Infanseat"–Tray Attachment,
1960
Colored pencil on
gray illustration board

Rendering by Walter I. Beiger (1932–)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Deluxe Infanseat, 1962
Colored pencil on gray paper

Rendering by Clayton Laughlin (1919–2001)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

"Nipper-Tripper"–Kar-Krib, 1970
Colored pencil on gray paper

Rendering by Clayton Laughlin (1919–2001)
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Auto Safety Seat for Infant & Child, 1973
Colored pencil on brown illustration board

Rendering by Leo Wildgen (1928–93)
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Child's Car Seat, 1971
Colored pencil on
black illustration board

Rendering by Leo Wildgen (1928–93)
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Infanseat Baby Carrier
"Booster" Model, c. 1972
Colored pencil on tan paper

Rendering by Leo Wildgen (1928–93)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Inflatable Infanseat, 1961
Colored pencil on green paper

Rendering by Leo Wildgen (1928–93)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

"The V.I.B." Folding Infanseat,
1970
Colored pencil on
gray illustration board

Rendering by Leo Wildgen (1928–93)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Don Harley & Associates
St. Paul, MN 1950s–1976

Folding Infanseat-Packaging & End Use, 1970
Colored pencil on
gray illustration board

Rendering by Leo Wildgen (1928–93)
For Infanseat Company, Inc. Eldora IA
Northwest Architectural Archives

Sean Horihan
American, born 1979

Mechanical drawing for SkyRide assembly, 1:1 scale, 2012
Graphite on paper, tape

Lent by Scott Olson

Stratasys Ltd

“3D-Printed ‘Magic Arms,’” 2012
Pen on paper

Lent by Tariq Rahman

Pod World – Staghorn Garden, 2012

Mieko Fukuhara (Japan)

Mercerized cotton, linen and lace, biscuit tin, supermagnets

From the collection of the Institute For Figuring

Pod World – Wire and Beaded,
2007–13

Bronzed wire coral by unknown Chicago Reefer with beaded kelps by Sarah Simons (Los Angeles)

Beads, wire, rocks, sand

From the collection of the Institute For Figuring

Pod World – Beaded Baroque, 2007–12

Knitted wire sea creatures by Anita Bruce (UK), beaded jellyfish by Vonda N. McIntyre (Washington) and wire pseudospheres by unknown Irish Reefer

Beads, wire, rocks, sand

From the collection of the Institute For Figuring

Pod World – Red and White, 2007–12

Blue-green beaded pseudospheres by Sue Von Ohlsen (Pennsylvania), jellyfish by Vonda N. McIntyre (Washington), silver beaded corals by Rebecca Peapples (Michigan), tiny beaded bottle tree by Nadia Severns (New York), red wire jellyfish with pearls by Lucia LaVilla-Havelin (Texas)

Beads, wire, rocks, sand

From the collection of the Institute For Figuring

Pod World – Beaded Baroque 2,
2007–08

Blue-green pseudospheres and anemone by Sue Von Ohlsen (Pennsylvania), and tiny byzantine corals by Rebecca Peapples (Michigan)

Beads, wire, rocks, sand

From the collection of the Institute For Figuring

Pod World – Terra Australiana, 2007–12

Bubble corals by Jane Canby (Arizona), coral trees by Christine Wertheim (Los Angeles) and Gunta Jekabsone (Latvia), orange 'sea foam' by Margaret Wertheim (Los Angeles). With additional pieces by Dagma Frinta (New York) and Helle Jorgensen (Australia)

Beads, wire, rocks, sand

From the collection of the Institute For Figuring

Pod World – Southwest Vista, 2007–12

Coral tree by Gunta Jekabsone (Latvia), staghorn corals by Helle Jorgensen (Australia), orange patch coral by UK Reefer, plus pieces by Irene Lundgaard (Ireland), Lynn Latta (Los Angeles), Pamela Stiles and Barbara Van Elsen (New York), Evelyn Hardin (Texas)

Yarn, rocks, sand

From the collection of the Institute For Figuring

Pod World – Blue Coral Landscape, 2007–12

Noro-yarn corals by Irene Lundgaard (Ireland), staghorn corals by Helle Jorgensen (Australia), plus pieces by Pamela Stiles (New York), Christine Wertheim (Los Angeles), and Evelyn Hardin (Texas)

Yarn, beads, rocks, sand

From the collection of the Institute For Figuring

Pod World – Plastic Fantastic, 2007-12

Bottle trees by Nadia Severns (New York), water bottle anemone by Vanessa Garcia (Los Angeles), plastic "sand" detritus from the Great Pacific Garbage Patch, gathered on Kamilo Beach in Hawaii by Captain Charles Moore

Water bottles, yarn, sand

From the collection of the Institute For Figuring

Pod World – Plastic Fantastic Too, 2007–14

Orange plastic coral by Christine Wertheim, Jelly Yarn coral by Kathleen Greco, plastic "sand" detritus from the Great Pacific Garbage Patch, gathered on Kamilo Beach in Hawaii by Captain Charles Moore

Garbage bags, Jelly Yarn, plastic "sand"

From the collection of the Institute For Figuring

Margaret Wertheim
Australian, b. 1958

Sketch notebook with *Crochet Coral Reef* designs and notes, 2012

From the collection of the Institute For Figuring

Margaret Wertheim
Australian, b. 1958

Sketch notebook with *Crochet Coral Reef* designs and notes, 2013

From the collection of the Institute For Figuring

Anitra Menning
American, b. 1968

Model of a hyperbolic calla lily, 2007
Red acrylic yarn

From the collection of the Institute For Figuring

This elegant model of a hyperbolic plane swirls into a vortex resembling a calla lily. Real calla lilies and similarly fluted flowers are also hyperbolic surfaces. Physicists at the University of Texas have been studying how petals make such forms, modeling the structures in four dimensions to better grasp the structures.

Heather McCarren
American, born 1979

Series of 7 orange hyperbolic crochet models, 2007
Orange mercerized cotton thread

Collection of the Institute For Figuring

These models show what happens when you gradually increase the rate of hyperbolic crochet. The flattest model has an increase rate of one in every six stitches, the next flattest in the sequence has an increase rate of one in every five stitches, while in the frilliest form the rate of increase is one in every stitch.

Christine Wertheim
Australian, born 1958

Orange model of a hypercircle, 2007
Orange acrylic yarn

Collection of the Institute For Figuring

This model was an initial attempt at modeling the hyperbolic equivalent of a circle. It turns out this isn't actually a hyperbolic surface because the curvature isn't constant all over—note the V-like valley at the center. Making a geometrically correct hyperbolic circle (which has constant negative curvature) requires a complex algorithm formulated as a result of this model.

Unknown makers

Three lacework doilies,
19th to 20th century
Silk and cotton

Collection of the Institute For Figuring

These doilies call to mind the geometric complexity of marine diatoms and radiolarians, microscopic life forms that produce intricate and beautiful skeletons from minerals in their environment.

Christine Wertheim
Australian, born 1958

Coral Forest **design drawings,**
2015
Colored pencil on paper

Collection of the Institute For Figuring

Christina Simons
American, born 1978

Pink paper hyperbolic soccer ball model, from a pattern by Keith Henderson, 2015
Colored paper, Scotch tape

Collection of the Institute For Figuring

In the Euclidean geometry most of us are familiar with, a plane (flat surface) can be covered with six-sided hexagons, the classic beehive pattern.

To cover a spherical surface, some hexagons are replaced with five-sided pentagons, creating a soccer ball. By subtracting sides, the space contracts, creating what's known as "positive" curvature.

But to cover a hyperbolic surface, some of the hexagons are replaced by seven-sided heptagons. Adding sides expands the overall surface area by creating "negative" curvature.

Margaret Wertheim
Australian, born 1958

Crochet model of a hyperbolic plane, 2014
Woolen yarn

Crochet model of a hyperbolic pseudosphere, 2015
Woolen yarn

Collection of the Institute For Figuring

There are two basic hyperbolic forms that can be constructed with crochet: a hyperbolic plane, which is the hyperbolic equivalent of a strip of paper, and a pseudosphere, which is the hyperbolic equivalent of a cone. Here the cone-point extends to infinity, symbolized by the long central thread.

Margaret Wertheim
Australian, born 1958

Christina Simons
Australian, born 1978

Blue crochet model of swirling water, 2015
Woolen yarn

Turbulent water creates vortices that can be described by the equations of fluid dynamics. Inspired by Leonardo's drawings of a deluge, one of which is reproduced on the panel in the next room, this model simulates in crochet water's turbulent transition from chaos to order.

Brain coral and blue ridge corals

Seed pod, garlic, and dried fungus

Collection of the Institute For Figuring

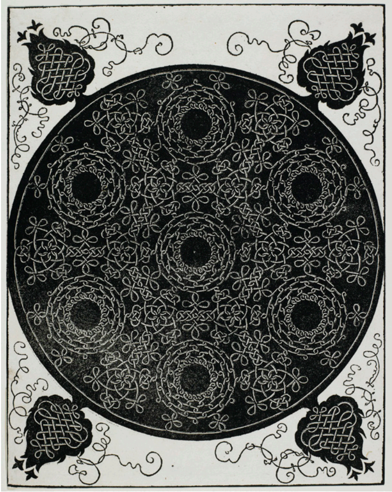
Widely found in the marine realm (in corals, kelps and sea sponges), hyperbolic surfaces also occur in many species of fungi and cacti as well as frilly vegetables such as lettuces and kales. Whenever there is an advantage to maximizing surface area—as for filter feeding animals like corals, or to gather sunlight—hyperbolic geometry is an effective solution, which is why nature has evolved these structures so many times.

Gertrude Krichau Andersen
Danish, born c. 1930

Tatted diatom doily, 2012
Mercerized cotton thread

Collection of the Institute For Figuring

A kind of drawing in thread, fine tatted lace was made by girls and young women as far back as the Renaissance, especially in the border region between Germany and Denmark. Leonardo himself was fascinated by intricate knotwork, and engravings made by his followers—likely based on his drawings—look remarkably like this tatted lacework. German Renaissance artist Albrecht Dürer made woodcuts based on these engravings.



Albrecht Dürer (German 1471–1528), *Knot with Seven Ring Forms*, 1505–07, Gift of Herschel V. Jones, 1925 P.10,489

Ernst Haeckel
German, 1834 – 1919

Phaeodaria,
illustration from *Art in Nature*, 1904

Many contributors to the Crochet Coral Reef project have cited Ernst Haeckel as an aesthetic influence. A pioneering marine biologist in the 1800s, Haeckel produced the first taxonomy of tiny, sea-dwelling creatures called radiolarians and was a scientific illustrator whose gorgeously swirling, lace-like drawings of sea creatures caused a sensation in art and design circles.

Bill Viola
American, born 1951

Planning notebook for
The Raft, 2004
Mixed media on paper

Courtesy of Bill Viola Studio

Bill Viola
American, born 1951

The Raft, 2004
Color high-definition video,
5.1 channel surround sound

Courtesy of Bill Viola Studio

Glass sponge

Glass sponges are examples of Euclidean geometry in nature. They have delicate internal skeletons composed of six-pointed spicules—the microscopic building blocks of all sponges—made of fused silica, a biologically generated glass. The spicules join in complex geometric configurations to create a mesh tube.