

# Discovering

## the Steps of

# INNOVATION

coloring

spacing

25pts

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Pittsburgh has a long history of generating ideas and innovation. This story is explored in the History Center's exhibition, *Pittsburgh: A Tradition of Innovation*, and the accompanying *Discovery Place* exhibition, infusing hands-on activities with historical content to inspire a new generation of innovators. The public generally views inventors and innovators as people unlike themselves, possessed of an individual genius to which they cannot aspire, but in reality, this process of innovation and creativity is one that practically everyone can engage in and make relevant in their own lives.<sup>1</sup> A core part of the exhibit explores the

innovation process, serving as a guide for understanding how innovations occurred in the past, while providing a scaffold for considering how innovation happens today. These steps include:

- 1) **observe and understand**
- 2) **generate new ideas**
- 3) **tinkering**
- 4) **creating prototypes**
- 5) **testing and modifying**
- 5) **refining and producing**
- 6) **final launch to new audiences**

These steps will be explored by looking at one part of the innovation process along with a hands-on activity, allowing visitors to leave the space with a better understanding of how ideas become real-world innovations. Innovation will be seen through the lens of science, art, music, architecture, engineering, and consumer products, highlighting the endeavors of multiple Pittsburgh innovators.



## Observe & Understand

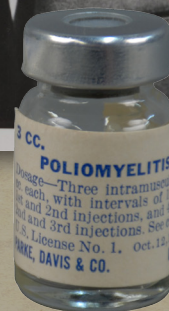
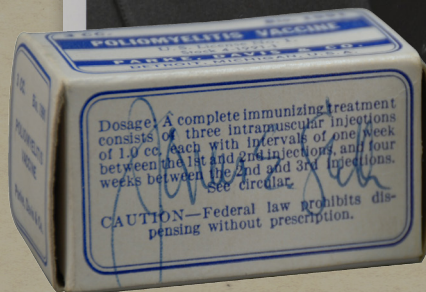
Inspiration comes from watching what happens around you. One of Pittsburgh's greatest contributions to medicine came from the work of Jonas Salk, whose story of observation begins with recognizing a new approach to developing a vaccine. When Jonas Salk arrived at the University of Pittsburgh's School of Medicine in 1947 he had already established a reputation as a pioneer in the development of killed virus vaccines due to his research work with influenza. He undertook a project to type the polio virus in order to create a vaccine that would protect against all strains of the disease. This research concluded that there were three types of the polio virus. Salk used this knowledge to work towards creating a killed vaccine for the viruses that he discovered.

## Generate New Ideas

Innovators see the world in new ways. They seek solutions to existing problems or develop something new that changes or impacts the world. This step in the innovation process includes the proliferation of multiple ideas in order to create new products or make existing products more useful. The story of aluminum illustrates the multiple ways in which new ideas must be generated around a product. In the first instance, a revolutionary manufacturing process made the metal abundantly available, which was followed by the phenomenon of a "solution in search of a problem," as the makers of aluminum needed to find profitable and worthwhile outlets for their new material. Aluminum's remarkable journey from a precious metal to a material of everyday use occurred in less than half a century. A French chemist found a way to produce small amounts of the metal in 1855 and aluminum then debuted at the Paris Exposition. Although the metal is abundant in the earth's surface, the main source of aluminum is bauxite, making it difficult to isolate. A cost effective way to make pure aluminum in large quantities had yet to

Dr. Jonas Salk.

HHC Detre L&A, Jewish Chronicle Records,  
MSS.906.B014.F061.10.



Polio vaccine vial  
and box autographed  
by Dr. Jonas Salk.

HHC Collections, 98.27.1 a.b. Photo  
by Liz Simpson.

Inspiration comes  
from watching what  
happens around you.



be found, and use for this “precious metal” aluminum remained jewelry and other luxury goods. When Charles Martin Hall, in Ohio, and Paul Héroult, in France, simultaneously discovered in 1886 how to produce pure aluminum at an affordable rate, they created a new problem: what do you do with an abundance of this new metal?

Charles Martin Hall made his way to Pittsburgh to find financial backing for his discovery. With the help of investors, he formed The Pittsburgh Reduction Company, which later became Alcoa. The company immediately had to find a market for the rapidly expanding supply of aluminum. The process to produce the metal, once started, is not stopped, so producers found they had a glut of metal with no market. Searching for a way to use this new metal demonstrates how one company

generated new ideas for their product.

Like many new materials, the first option is often substituting it into existing products, using a new material in an old way. This worked well for aluminum manufactured as cookware as it was lightweight and conducted heat well. Other ideas did not fare so well. For instance, the aluminum violin proved sturdier than wood but people preferred the traditional sound of a wooden instrument. The lightweight and metallic sheen of aluminum became the emblem of the post-WWI machine age and it came to symbolize the metal of the future. As new technologies emerged in the 20th century, aluminum’s lightweight, corrosion resistant, easily alloyed, conducts electricity, endlessly recyclable physical properties made it a vital material. Used in automobiles and aeronautics, it also

replaced glass and steel drink packaging with the advent of the recyclable pop-top can. The range of the company’s products demonstrates the strides in innovations Alcoa undertook to match a new material with new ideas.

## Tinker & Explore

The step perhaps most associated with the innovation process is tinkering, an experimental way of exploring new ideas. New ideas are tested through experimentation, play, and building upon previous ideas. Any idea can be “tinkered” with, including music. The story of Earl “Fatha” Hines, father of modern jazz piano, personifies a person exploring a new approach. Hines was born in Duquesne, Pa. in 1903 to a musically inclined family. At 15, he was hired by baritone singer Lois B. Deppe to play piano at the Leider House in Pittsburgh for \$15 a week, where he developed his groundbreaking technique.<sup>2</sup>

Earl “Fatha” Hines’ unique style of playing the piano stands out as innovative from other well-known pianists during his era since he broke the traditions of ragtime and stride piano players. In these earlier styles, the left hand plays a rhythm of single bass notes and chords



Pittsburgher Burton Morris pays homage to one of his influences, Andy Warhol, in his painting *Andy Warhol's Nightstand*. Like Warhol, Burton uses the language of pop to stylize his paintings; his work also straddles the worlds of commercial art and fine art.

HCC Collections, L2012.31.15.



Portrait of Earl “Fatha” Hines in New York, 1947.

LOC, LC-GLB13-0415\*





**Chapel of the Holy Spirit Project Architect Louis D. Astorino and Project Manager Jennifer Lucchino discuss the chapel's construction on site in Vatican City, c. 1996.**

HHC Detre L&A, Astorino Records, 2015.0154.

while the right hand plays syncopated melodies, emphasizing the notes played in the upbeat of the music. Instead, Hines developed what he called the “trumpet style,” playing octaves with his right hand and using his “tricky” left hand to break up rhythms.<sup>3</sup> This new way of playing allowed Hines to amplify his instrument like a trumpet and cut through the big band’s sound with his piano, a feat previously unmanaged by any other jazz pianist.

In the early 1920s, Earl “Fatha” Hines relocated to Chicago, Illinois, which at the time was a hotbed for jazz music. This is where he met trumpeter Louis Armstrong and formed a significant partnership; together the two recorded some of the most influential jazz records of all time, such as “West End Blues” in 1928. He ushered in many “firsts” during his prolific career. Hines and Deppe were the first African Americans to appear on the radio when they performed a duet on KDKA in 1921 and his big band was the first Negro ensemble to tour through the American South in 1931.<sup>4</sup> The legacy of Earl “Fatha” Hines is without question. He pioneered a musical style that challenged performers and listeners to think about rhythm and improvisation in new ways.

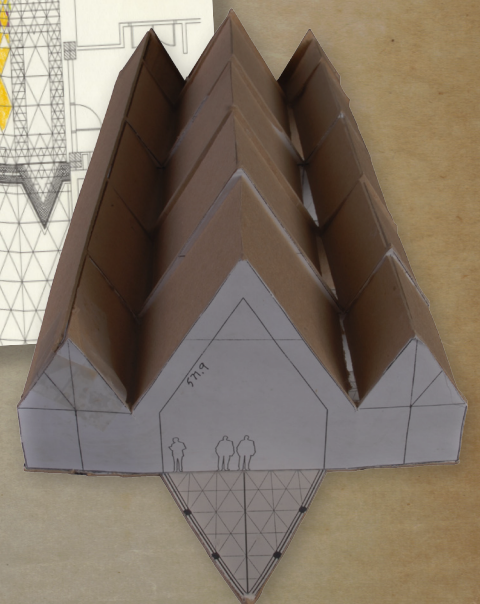


**New ideas are tested through experimentation, play, and building upon previous ideas.**



**A CAD floorplan sketch of the Chapel of the Holy Spirit illustrates how the Leonine Walls and the Domus Sanctae Marthae in Vatican City pose physical constraints for the building site, c. 1995.**

HHC Detre L&A, Astorino Records, 2015.0154.



**This is one of several cardboard prototypes of the Chapel of the Holy Spirit constructed during Astorino's early design phase, c. 1994.**

HHC Collections 2015.94, Photo by Liz Simpson.



He said, "I'm an explorer if I might use that expression. I'm looking for something all the time. And oft-times I get lost.... But it makes it much more interesting because then you do things that surprise yourself ... it makes you a little bit happy too because you say 'Oh, I didn't know I could do THAT!'"<sup>5</sup>

## Create & Build

Innovation is not limited to new enhancements to an existing product; innovation can also be exemplified by the ability to work within a series of constraints. Pittsburgh architect Louis D. Astorino was commissioned by the Vatican to design a small chapel in between the Domus Sanctae Marthae and the Leonine Wall, a 1st century structure separating Vatican City

from Rome. Astorino was the first and only American architect commissioned to design and construct a building in Vatican City. Measuring 3,300 square feet and costing over \$2 million dollars to build, the chapel is used by the 120 members of the College of Cardinals for prayer and contemplation during a Conclave for the election of a new Pope during Sede Vacante, also known as the Papal Interregnum, and is currently the site of Pope Francis's daily mass.

Besides constraints outlined by the Vatican, the site presented a unique set of challenges for Astorino as the space between the Leonine Wall and Domus Sanctae Marthae is triangular. Astorino and his team saw this geometric limitation as a sign to incorporate the triangle as a motif in the overall design of the chapel; not only did this fit the physical constraints of the project site, but the triangle is a symbolic representation of the trinity, a fundamental belief of the Catholic faith.<sup>6</sup>

## Test & Modify

A core step in the innovation process is the testing and modifying of a prototype, making the original idea or concept viable for an audience beyond the innovator. Food containers or packaging is designed to best store and deliver the contents inside – a concept to be illustrated through the Heinz Ketchup Dip and Squeeze container. Heinz has purposefully engineered their ketchup containers since at least 1890 when H.J. Heinz patented the original octagon bottle. Every element of that bottle had a purpose—from the round bottom that sits flat, to the body that holds the ketchup and provides a 360-degree window to the product, to the gently curved neck that delivers a smooth pour, to the narrow opening which protects the ketchup from air which will turn it brown. So too with the introduction of foil single serve squeeze packets in 1968 – designed for fast food outlets and restaurants to facilitate the delivery of ketchup on the go.



H.J. Heinz Keystone-brand Ketchup displayed its top-of-the-line status with an octagon-shaped bottle that sported a label with medals won in Paris in 1899.

HHC Collections, 93.240.0105.



A core step in the innovation process is the testing and modifying of a prototype

Left: Dip and Squeeze prototype.

HHC Collections, gift of Michael Okoroafor, 2014.74.75. Photo by Liz Simpson.

Right: Dip and Squeeze final product.

HHC Collections, gift of Michael Okoroafor, 2014.75.74. Photo by Liz Simpson.





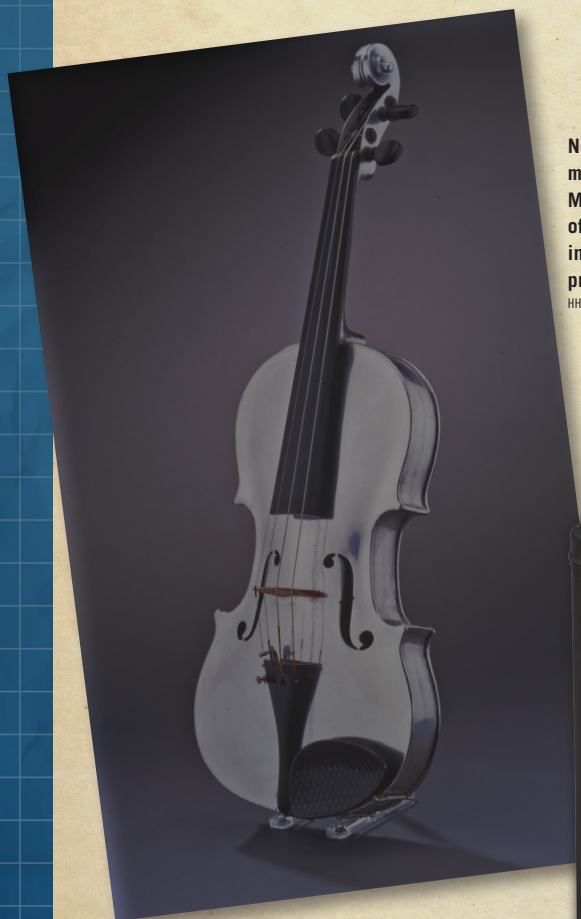
The use of aluminum for cookware and combs were both successful early ventures in Alcoa's attempts to find markets for the new metal. By 1902, more than 25,000 aluminum combs were produced every day.

HHC Collections, cookware gift of Eleanor Coleman, 2012.41.22 a-e, combs gift of Alcoa, 96.68.203.



This is one of six garments in the History Center's Alcoa collection created for the Alcoa Wrap Wild and Wonderful Fashion Match Game of 1969. The company partnered with up and coming designer Oscar de la Renta to promote their product and connect with different consumers. The winner received a custom designed aluminum garment and an international trip.

HHC Collections, gift of Alcoa, 96.68.35. Photo by Nicole Hayduk.



Not all of Alcoa's attempts to find new markets for aluminum met with success. Musicians preferred the traditional sound of a wood violin despite the company's insistence on the high quality sound their product produced.

HHC Collections, gift of Alcoa, 96.68.37 a.

This aluminum shaving kit, made circa 1880 by Tiffany & Company, demonstrates the early use of the metal for luxury goods.

HHC Collections, gift of Alcoa, 96.68.154





**Above:**  
Vehicle part with PPG Andaro HC coating, 2008. The coating has high clarity of color while also being highly fade-resistant.

HHC Collections, L2008.46.4.

**Right:**  
Advertisement for PPG Paints.

HHC Detre L&A, PPG Papers and Photographs, MSS.0667.B02.I01.

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House & Garden, April, 1981  
Woman's Day Home Decorating Ideas, June 1981  
Woman's Day Decorating Guide, September, 1981  
McCall's Best Decorating and Home Care Ideas, September, 1981  
House Beautiful Home Decorating, September, 1981

In 2010, Heinz market testing and research resulted in the development of the Dip and Squeeze packet – a container that holds three times the ketchup of the individual packets, is not as messy on the go, and allows for individual dunking. Heinz Vice President for Global Packaging, Michael O. Okoroafor, even bought a used minivan to test these packets and discovered the original prototype difficult to open and use while eating in a car. Through testing and modifying, the form of the final container emerged.

## Refine & Produce

Innovation exists in many disciplines, from science and engineering to technology and art. An artist can make refinements to both their product and process, just as an inventor would make revisions based on what they learned during the testing phase before mass-producing

their product. Native Pittsburgher Andy Warhol is a prime example of this concept in the field of art. Born Andrew Warhola, the son of Carpatho-Russyn immigrants and graduate of Schenley High School, he earned his degree in Pictorial Design from Carnegie Tech (now Carnegie Mellon University) in 1949. Warhol's innovative approach to art-making is evident in both the subjects of his paintings and the techniques he used to execute them. He became one of the most notable artists in the school of Pop Art, an art movement that developed in the late-1950s as a reaction to consumer culture. Pop artists focused on representational imagery of common objects or themes from everyday life, blurring the line between fine art and popular culture.

Warhol's interest in consumerism inspired him to make art featuring mass-produced goods, including Campbell's soup

cans, Brillo boxes, and Coca-Cola bottles. Similar to the consumer products that were the subject of his art, Warhol approached his art-making like manufacturing. He used commercial printmaking techniques, an innovative approach in the world of fine art painting, and produced silk screened paintings at a rapid rate in his studio, aptly named "The Factory." Silk screening is a repetitive, mechanical process that allows for the mass production of an image, permitting anyone to produce nearly identical imagery. In the case of Warhol, his designs were executed by himself and a number of studio assistants, with variations applied by changing colors and the addition of hand-made brush strokes by the artist. The result was a stylized look that was easily identifiable as "a Warhol," even if Warhol was not the one pulling the screen.



## Launch/Use & Sell

Innovative products make an impact when they are widely used and adopted by their intended audience. Studies show that color can be 85 percent of the driving factor in why a consumer chooses a particular product, and Pittsburgh Plate Glass' innovative use of color theory and pigments helps ensure that products really speak to consumers. PPG generates color ideas based on cultural and demographic trends, all of which are useful when deciding on final design details when products are launched. Visitors to the Discovery Place exhibition will learn the basics of color theory, along with creative and innovative examples of its application. Activities will allow visitors to see the impact of color on a product, encourage them to select a product color based on the color characteristics, and join in predicting color trends for the future. \*

**Discovery Place would not be possible without the support of our sponsors:**

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PPG Industries Foundation  
The Heinz Endowments  
Richard King Mellon Foundation  
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<sup>1</sup> "What's Next: Museums and Innovation," Lorraine McConaghy, in *Places of Invention*, Molella, A. and Karvellas, A., eds. (Washington, D.C.: Smithsonian Institution Scholarly Press, 2015).

<sup>2</sup> "Andy Warhol Biography: Pop Artist and Cultural Icon," *Warhol Foundation*, <http://warholfoundation.org/legacy/biography.html>.

<sup>3</sup> Andy Warhol. *The Philosophy of Andy Warhol: From A to B and Back Again* (New York: Harcourt Brace Jovanovich, 1975).

<sup>4</sup> "Earl Fatha Hines," *Pittsburgh Music History*, <https://sites.google.com/site/pittsburghmusichistory/pittsburgh-music-story/jazz/jazz---early-years/earl-fatha-hines>.

<sup>5</sup> *The Oxford Companion to Jazz*, ed. Bill Kirchner (New York: Oxford University Press, 2000).

<sup>6</sup> "Earl Fatha Hines," *Pittsburgh Music History*, <https://sites.google.com/site/pittsburghmusichistory/pittsburgh-music-story/jazz/jazz---early-years/earl-fatha-hines>.

<sup>7</sup> *Earl "Fatha" Hines*, 16mm documentary film, directed by Charlie Nairn (ATV Television: London, 1975), Television.

<sup>8</sup> "Architectural Design for the Chapel of the Holy Spirit," Astorino Records, 2015.0154, Detre L&A, Heinz History Center.

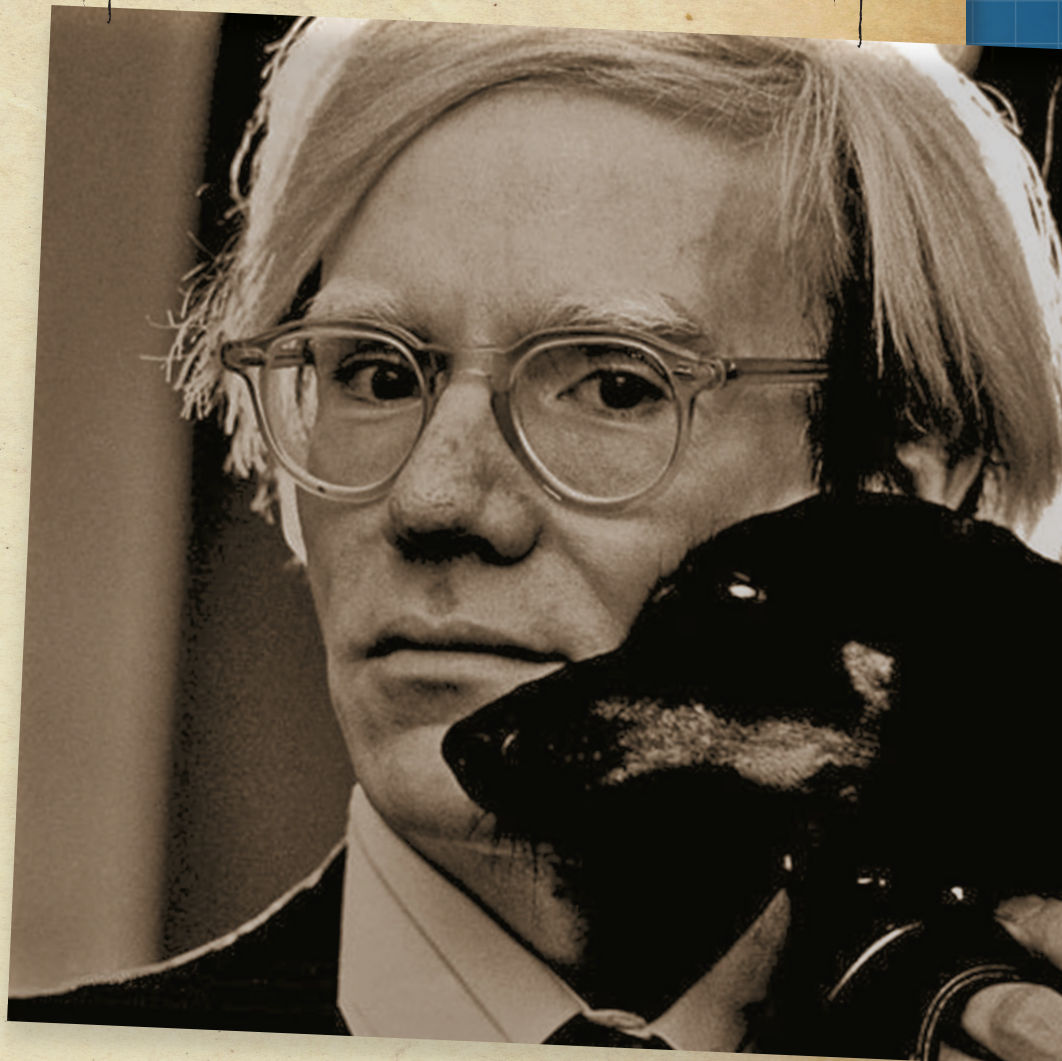
<sup>9</sup> Prout, H. *A Life of George Westinghouse* (New York: American Society of Mechanical Engineers, 1921), p. 90.

<sup>10</sup> Westinghouse Electric Corporation, *George Westinghouse: His Life and Achievements*, 1946.

<sup>11</sup> Prout, H. *A Life of George Westinghouse* (New York: American Society of Mechanical Engineers, 1921), p. 136.



Innovative products make an impact when they are widely used and adopted by their intended audience.



Andy Warhol.

Photo by Jack Mitchell.