

Invention at Play

Overview



This exhibition brings a fresh perspective to the topic of invention, exploring the marked similarities between the ways children play and the creative processes used by innovators in science and technology. In 3,500 – 4,000 square feet of artifacts and interactive experiences, the exhibition provides visitors with opportunities to:

- Learn how play fosters creative talents among children as well as adults;
- Experience their own playful and inventive abilities; and
- Understand how children’s play parallels processes used by inventors.



Invention at Play departs from the traditional representation of inventors as extraordinary geniuses who are not “like us” to celebrate the creative skills and processes that are familiar and accessible to all people. The exhibition was developed by the Lemelson Center at the Smithsonian’s National Museum of American History, Behring Center, in partnership with the Science Museum of Minnesota. The tour is managed by the Association of Science-Technology Centers. The exhibition has been made possible by the generous support of The Lemelson Foundation and the National Science Foundation. Artifacts are on loan from the National Museum of American History, inventors, and other organizations.

Invention at Play features three main areas:

- **The Invention Playhouse**, where visitors of all ages can engage in four types of play that foster inventive thinking: exploration /tinkering; make-believe/visual thinking; social play/collaboration; and puzzle play/problem solving.

- **Playful Approaches to Invention**, offering textual narratives, interactive devices, and artifacts that support explorations of the many ways that inventors have used playful activities and skills in their work. Five main inventors are featured, clustered with abbreviated stories about a wide variety of other innovators who have used similar creative techniques.
- **Issues in Play – Past, Present, and Future:** What kinds of toys did inventors play with as children? Is the quality and quantity of children’s play changing? How do new technologies affect children at play? This area, with its artifacts, video, and experimental playthings from the MIT Media Lab, encourages visitors to reflect upon these and other questions concerning the history and future of play.

The Invention Playhouse

In the Invention Playhouse visitors can try a variety of activities that encourage inventive skills.

A large **Magnet Wall** offers three novel invention challenges using kitchen utensils that are magnetized and affixed to the 14-foot-long structure. Visitors are challenged to create faces and other constructions, spell out their names, and build trackways for rolling a ball down a magnetized ramp.



Rocky Blocks put a new spin on an age-old challenge – building a tower of blocks – by resting a tabletop on a wobbly hemisphere rather than on a steady surface. Individuals, families, and other visitor groups can collaborate on solving a complex problem involving balance, center of gravity, weight, structure, and height. Visitors try and try again until their towers reach satisfactory heights; each toppling brings experience that informs refinements of an initial idea.



Whirligigs invite exploratory play in a multimedia activity where visitors invent wind-powered devices and then try out their designs in front of blowing fans. They can test and then refine initial ideas through repeated trials as they play with principles of aerodynamics, balance, and angular momentum.

Tesselation Puzzles promote spatial reasoning and problem-solving skills through pattern-making activities that offer mathematical and artistic entry

points into play. Visitors may choose to copy Middle Eastern tile mosaics or Native American geometric pottery patterns or break with tradition and create innovative designs of their own.

Playful Approaches to Invention

Outside the Playhouse and distributed around the exhibition are five **Case Study Clusters**, each featuring the work of one main inventor and incorporating abbreviated stories about other

inventors and innovators who have used similar playful and creative techniques. Photos and stories about each inventor's childhood highlight the early experiences that influenced or foreshadowed his or her life's work. A "creativity message" acts as the headline for each cluster, signaling the playful process that characterizes the work of inventors featured in the cluster.

- **Recognize the Unusual**



Stephanie Kwolek, the DuPont chemist who invented Kevlar fiber, exemplifies an inventor's ability to see patterns and possibilities that others may not notice. Her discovery of Kevlar occurred when an attempt to dissolve two polymers did not yield expected results, but did create a new stiff, extraordinarily strong, and yet lightweight substance. An island created entirely out of Kevlar products includes touchable objects with tags that encourage visitors to find out how Kevlar improves these products. Also in this area are two testing stations where visitors can compare the weight of two bullet-resistant vests, one made of Kevlar, and compare the weight of a Kevlar rope and a standard steel cable. Nearby flip panels tell the stories of other inventors who have recognized and capitalized on the unusual properties of things: for example, Art Fry, an engineer who found a use for a failed adhesive and invented Post-It notes; and Percy Spencer, whose radar research led to the development of the microwave oven.

- **Keep Making It Better**

Newman Darby, inventor of the sailboard and improvements for catamarans and kayaks, traces his lifelong avocation to a childhood determination to build a boat that would carry him to an island where he hoped to find arrowheads. Though his first and many subsequent attempts failed, he kept trying until, as an adult, he successfully designed new forms of watercraft. Darby exemplifies the virtue of persistence and repeated experimentation. The highlight of this area is a full-scale sailboard simulator, where visitors can practice balancing as their sail catches the "wind." Panels surrounding the structure tell the stories of other inventors whose persistence paid off, including: Sally Fox, a spinner and weaver who developed naturally colored, commercially spinnable cotton; and Garrett Morgan, inventor of safety devices including the gas mask and a traffic signal.

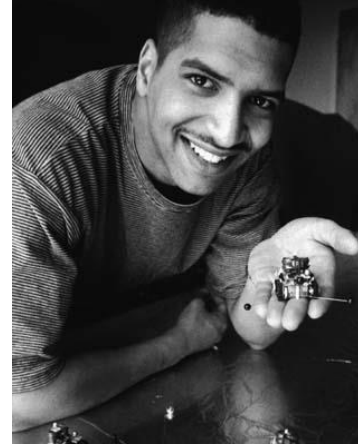
- **Borrow from Nature**

Alexander Graham Bell, inventor of the telephone, exemplifies the innovator's proclivity to observe and borrow from nature. Visitors can sit on a park bench looking out at a photomural of the "dreaming place" where Bell came up with his idea for the telephone. At an interactive component, visitors learn how Bell's anatomical studies of the human ear influenced his development of the telephone. Other inventors who were inspired by the natural world include:

George de Mestral, inventor of Velcro; and Paul MacCready, whose study of birds gave rise to new designs for human flight.

- **Jump the Tracks**

James McLurkin is a young African-American engineer who applied biological principles to innovations in robotic technology. In this cluster, a split-screen, annotated video shows how the behavior of real ants compares to interactions among McLurkin's micro-robots. Visitors can try to determine how other inventors “jump the tracks” or “think outside the box” by matching objects with their inventors and the disciplines from which the ideas came. Inventor stories include those of John Fabel, an avid hiker and backcountry skier who came up with a more stable and comfortable backpack design by studying suspension bridges; and Samuel Morse, a portrait artist who used familiar materials to invent the electric telegraph.



- **Many Heads Are Better than One**

IDEO is a product design company known for a corporate culture that exemplifies the value of social play, collaboration, and teamwork. Products designed by IDEO include the first Apple mouse, the Palm V, and the Neat Squeeze toothpaste tube. A story panel introduces the visitor to the IDEO team, the company's philosophy, and the backgrounds of the team members. Then the visitor enters the IDEO Design Room—actually a corridor that will have the look and feel of IDEO's conference rooms during a project. Each wall segment will represent one part of IDEO's five-step innovation development process: *Understanding*, *Observation*, *Visualization*, *Evaluation/Refinement*, and *Implementation*. Photos, notes, drawings, storyboards and scenarios, models, physical prototypes, and much more will be mounted to the walls. At each step, photos of the IDEO team members and quotations help visitors understand what each team member brings to the project and how they work together to arrive at a truly innovative product. Short sidebar stories of other group inventors and inventions—such as Edison's Menlo Park lab team and Linus Torvalds and the Linux computer operating system—will also be featured in this area.

Issues in Play – Past, Present, and Future

This area, with its banner message, “Shape your thinking through play,” encourages visitors to reflect upon questions and debates in the history and future of play.



Experimental playthings from the Lifelong Kindergarten program at MIT's Media Lab demonstrate how microprocessors equipped with sensors and tiny motors can be used with traditional craft materials in new kinds of play. Examples of these playful inventions will be featured in the exhibition. They will also form the basis for gallery demonstrations for which staff training will be provided.

A collage of historic and current toys and games, including many artifacts from the collections of the National Museum of American History, resonate with visitors' recollections about play. Questions in this area include: "Have you ever played with toys and games like those in the nearby cases and drawers?" and "Do you see a link between how you played as a child and what you do now?" Responses from inventors and innovators gleaned from Lemelson Center interviews and other sources are displayed next to their favorite playthings. Visitors can also leave their own answers to this question in a comment book, or draw designs for a toy that they would like to invent.

Two videos invite visitors to listen to educators, child development specialists, inventors, and children themselves reflect on some of the current questions and debates about the present and future of play.

Educational Materials and Programs

A series of educational programs designed to complement the *Invention at Play* exhibition will serve diverse families, parents, teachers, and youth groups while the exhibition is on display at the National Museum of American History in summer-fall 2002. These programs will be documented in a manual provided to each host museum, with information on program formats and content, sources for materials, and event logistics. As the exhibition travels, Lemelson Center staff will visit each site to assist with **program planning and staff/volunteer training**. The Center will also make available for each site a trainer and materials for a **teacher workshop**.

Other educational materials and programs being developed include:

- A **staff training workshop** at the National Museum of American History for museum educators and exhibit staff from sites that have booked the exhibition.
- An **Educators Manual** for teachers and students in the classroom or home school.
- A **family guide** containing exhibit-related activities and invention resources for parents and other caregivers to take home.

Artifacts and Interactive Components

Invention at Play features more than 25 **artifacts** from the National Museum of American History collections, including 19th-century patent models of Alexander Graham Bell's telephone and Samuel Morse's telegraph, Newman Darby's original sail and prototype sailboard, and an array of historic and contemporary toys. Additional artifacts from individual inventors and relevant companies will also be presented. The exhibition engages visitors in approximately 13 **hands-on and whole-body interactive experiences**, including a sailboard simulator, a Kevlar testing station, digital playthings, and the Invention Playhouse activities described above. 4 **videos** will be interspersed throughout the exhibition.