



Stephanie Kwolek's work at DuPont in the 1960s led to the development of Kevlar®, a fiber best known for its use in bullet-resistant vests.

## The Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation

The Lemelson Center was established in 1995 with a gift from the Lemelson Foundation, a private philanthropic organization founded by inventor Jerome Lemelson.

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News from the Lemelson Center for the Study of Invention and Innovation **Behind every invention there's a story**



from the Director

## Exploring the Concept of Play

Last April at the Lemelson-MIT awards, I had the double pleasure of witnessing two playful spirits in action: Steve Wozniak, co-inventor of the Apple computer, and Dean Kamen, of recent fame for Segway™, his amazing high-tech scooter. Under the spell of these innovators as they described their creative styles and demonstrated their very playful, but nevertheless significant, inventions, the black-tie scene was turned into a playground.

It is safe to say that humans, as a species, have always had a concept of play. But only recently has play begun getting the serious attention it deserves as a source of discovery. *Invention at Play*, our new exhibition, has provided us with an opportunity to work out some of our ideas about play (and perhaps play out some of our ideas about work). The subject presents an opportunity to explore play as a fundamental need and an indispensable aspect of our own inventiveness. As Ken Brown, historian of science and technology, reminds us, early scholars, such as Herbert Spencer, dismissed the social importance of play. Spencer declared in



Inventor James McLurkin displays one of his robotic ants.

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1873 that the activity was merely a manifestation of extra energy channeled in nonthreatening directions. In contrast, latter-day anthropologist Johan Huizinga finds a central role for play and goes so far as to suggest that we should be referred to as *Homo ludens*, or “playing man,” rather than *Homo sapiens*, giving a little more credit to our irrational side.

the shoulders to the back, recounts: “I really think it was the process of playing with things and turning them into new kinds of things that gave me a sense of how things go together.” James McLurkin, a young engineer applying biological principles to innovations in robotic technology through his “robotic ants,” states: “An advisor once told me, ‘A wise man finds no distinction between work and play.’ I definitely agree with that.”

I confess I have always envied the ability of many inventors to retain enthusiasms that surfaced in childhood. Listen, for instance, to Newman Darby: “I thought about sailing all the time. I wanted to explore. I couldn’t drive, but I could row a boat. I used half of a pup tent for a sail and had a great time.” Or to Paul MacCready, inventor of the Gossamer Condor: “I found myself instinctively

individuals who will shape the world in which we live.

Of course, play itself needs to be analyzed, especially in terms of new directions in which digital technologies are taking us. The sheer popularity of the kind of play exemplified by Game Boy and Nintendo® warrants study. Currently, the video game industry surpasses Hollywood in terms of domestic revenue, according to an article in the *Christian Science Monitor* noting that as of July 2000, 145 million Americans played video games. The *San Diego Union-Tribune* (May 2001) reports that approximately 40 million Americans play games online today, and the number is expected to grow to 72 million by 2004.

One section of *Invention at Play* attempts to grapple with the implications of this new form of play for the future of invention, which in the past had been nurtured primarily by

mechanically based toys and games. The exhibition offers visitors an opportunity to glimpse what the evolution of play may bring to future generations of children and to contemplate the kinds of activities in which they will be engaged. One way to glimpse the future: small microprocessors, created at MIT’s Media Lab, containing sensory motors that can be combined with traditional craft material for use within the exhibition.

If nothing else, *Invention at Play* aims to remind all of us that we are playful by nature, and that our playfulness is both necessary and useful.

I hope that you will come tour the exhibition and view it as an invitation to play.

—Arthur Molella  
Lemelson Center  
Director

MacCready realized that if he could triple the size of a hang glider without making it heavier, a human could power its flight.

From childhood, inventor Paul MacCready was interested in flight.

## A wise man finds no distinction between work and play.

Wozniak and Kamen are but the most recent exemplars of Huizinga’s powerful insight. Among the many joys of this exhibition is the discovery of historical continuities in the “play instinct.” From Thomas Edison’s notebooks and Alexander Graham Bell’s prototypes to Newman Darby’s sailboard to Stephanie Kwolek’s Kevlar®, the play impulse is primary and generative. It is remarkable how frequently inventors speak about their work in terms of play. John Fabel, inventor of the Ecotrek® backpack, which incorporates a hip belt to transfer weight from

drawn to working on [model] ornithopters, autogyros, helicopters, indoor models, outdoor models, hand-launch gliders.... In a few cases I set some records in some new category, which was fun. It was just plain enjoyable to do something that was new and different that hadn’t been done before.”

We hope that *Invention at Play* will help open up a cross-disciplinary dialogue about the history, impact, and future of this primary human function called play. At stake for us are the ways we socialize and teach future generations of scientists, inventors, artists, explorers, and other



Above

Alexander Graham Bell and his experimental liquid telephone transmitter.



## Connecting Children's Play and Inventors' Work

Just before opening time on July 19, Lemelson Center staff gathered with Mrs. Lemelson to inaugurate *Invention at Play*. Almost three years in the making, the exhibition explores connections between children's play and inventors' work. In creating *Invention at Play* with our design and development partner, the Science Museum of Minnesota, we faced two challenges. We wanted to tell the oft-told story of invention in America in an innovative way, and we wanted to create opportunities within the exhibition for visitors to discover and experience their own creative and inventive abilities. Exploring the theme of play and its role in the lives of 19th- and 20th-century American inventors has allowed us to address these challenges. We believe that *Invention at Play* will delight visitors of all ages with its hands-on invention activities and will introduce them to a wide range of American inventors, both famous and unknown, whose playful habits of mind began

with blocks and make-believe and resulted in lasting contributions to society. A special section of the exhibition will focus on the ways in which play has changed with the development of new technologies, raising questions about what play and invention will look like in the years ahead.

*Invention at Play* will be on display at the National Museum of American History through December 29, 2002. During the run, a variety of public programs (listed in the calendar on page 11) will complement the exhibition's theme. In January 2003, *Invention at Play* will begin a national tour, organized by the Association of Science-Technology Centers, to nine museums over three years. These will include history, science, and children's museums across the country.

A generous gift from The Lemelson Foundation in 1998 and a recent substantial grant from the National Science Foundation (NSF) have allowed us to design this exhibition, bring it to fruition, plan an ambitious array of public programs for the NMAH venue, and provide training and resources to host sites during the exhibition's tour. In addition, the NSF grant will allow us to construct a smaller version of the exhibition that will travel to a number of smaller venues that might not have been able to host the original version. We will begin the design and fabrication of the smaller version in fall 2002, and it should be ready to tour to an additional nine sites by late 2003 or early 2004.

—Gretchen Jennings  
Project Director,  
*Invention at Play*

*Really good improvements are not the result of inspiration [but] more or less the results of an observing mind, brought to bear upon circumstances as they arise.*

—Isambard Kingdom Brunel,  
chief engineer for the  
Great Western Railway  
and designer of steamships

### Grasping

Legend has it that Marvin Stone invented the first paper drinking straw while sipping a mint julep after work. Stone, a

### A New Bend

One day in the 1930s, while sitting in his brother's fountain parlor, the Varsity Sweet Shop, in San Francisco, Joseph B. Friedman (1900–1982) watched his young daughter Judith at the counter struggling to drink a milkshake out of a straight paper straw. Friedman, an inventor with a natural curiosity and a creative instinct, took the

straw and inserted a screw. He then wrapped dental floss around the paper into the screw threads, creating corru-

## The Straight Truth about the Flexible Drinking Straw

*from the Museum Archives*

manufacturer of paper cigarette holders, was drinking with friends, using the traditional natural rye grass straw. Dissatisfied with the way straws would break down and leave a gritty residue in the drink, Stone fashioned his first straw by winding strips of paper around a pencil, removing the pencil, and gluing the strips together. This improved device was test-marketed at a local drinking establishment and enthusiastically received. Stone then refined his design by using paraffin-coated manila paper to prevent the straws from becoming soggy and disintegrating. He patented the product in 1888, and by 1890 his factory was producing more straws than cigarette holders.

gations. After he removed the screw, the altered paper straw would bend conveniently over the edge of the glass, allowing a small child to better reach the beverage. U.S. patent number 2,094,268 was issued for this new invention, under the title Drinking Tube, on September 28, 1937. Friedman would later obtain two additional U.S. patents and three foreign ones in the 1950s related to its formation and construction.

*Applicant has met a problem long existing in the art. A view of any soda fountain on a hot day, with the glasses showing innumerable limp and broken straws drooping over the edges thereof, will immediately show that this problem has long existed. Where we have*





the conditions where certainly the straw is old, where corrugated tubing is old, and where no inventor, during those years, has seen fit or has been able to solve this problem, whereas applicant did, that situation alone is prima facie evidence of invention.

—legal claim submitted to the U.S. Patent Office on November 7, 1936

Previous page

Illustrations from early Flex-Straw ads.

The new straw virtually replaced the older glass drinking tubes that required sterilization and frequently broke. In 1939, Friedman formed the Flexible

Straw Corporation, later named Flex-Straw Company, and by the late 1940s he began producing the straws with machinery he created. Because of its unique feature, the Flex-Straw was well-received by hospitals, whose patients could easily position the straw for drinking while lying down, without compromising the flow of liquids. In fact, Friedman's first sale was made to a hospital, in 1947.

### Getting to the Bottom

Following a lead from museum specialist Peter Liebhold,

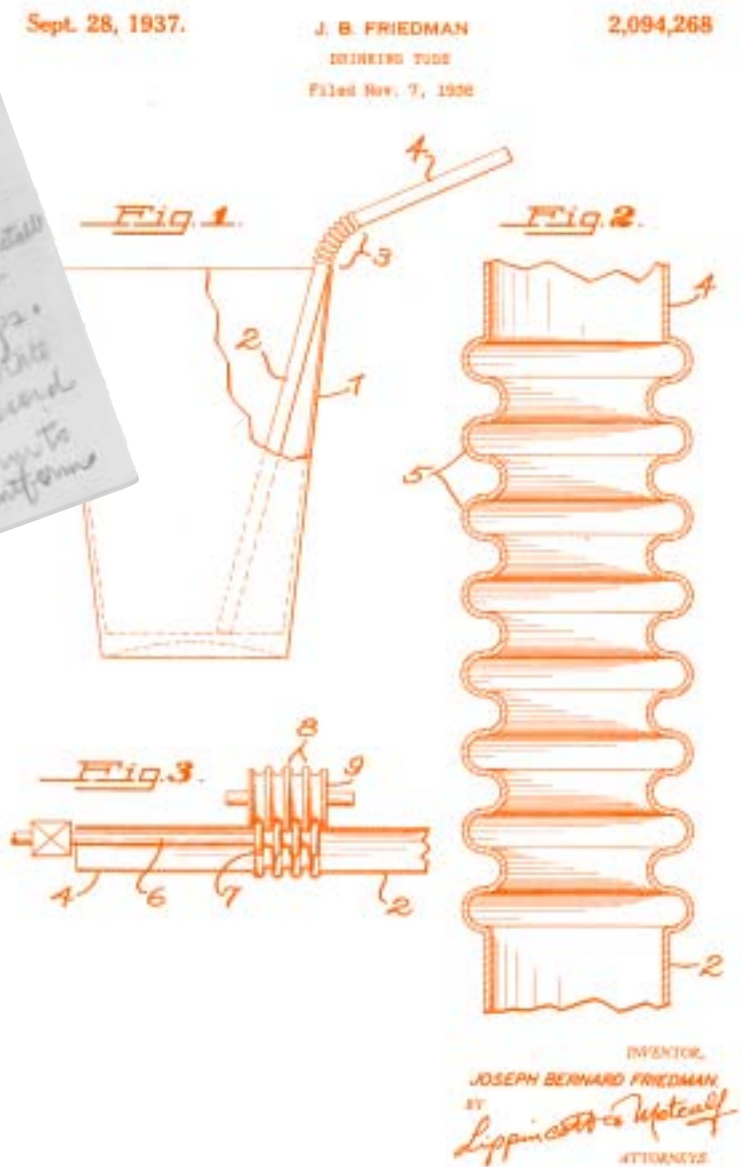
archivist Alison Oswald began tracking this invention story. After conversations and much correspondence with members of Friedman's family, Oswald learned that the flexible straw was only one of a number of inventions Friedman had developed or had begun the process of developing. In December

In February 2001, with the approval of the National Museum of American History's Collections Committee, Alison returned to California, packed 16 boxes of materials and arranged for them to be shipped to the Museum. Friedman's children—Judith Rosen, Linda Reiss, Robert



The reverse of a business card with drawings for a "nail-tire-detector," dated March 23, 1947.

Patent drawings for Friedman's 1936 Drinking Tube patent.



Joseph B. Friedman, inventor of the flexible straw

The ease of positioning the Flex-Straw made it appealing for hospital use.

2000, Oswald left on a fact-finding trip to Encino, Calif., to determine the extent, quality, and content of Friedman's papers. Stacked along the garage walls of the home of Friedman's eldest daughter, Judith Rosen (the young girl in the soda shop), were boxes that held a treasure trove of documentation revealing numerous facets of Friedman's life. After several hours of mining the materials, Alison felt confident that the boxes contained the elements of a rich and textured narrative of an independent inventor enmeshed in all aspects of the invention process: idea and conception, creation of prototype, manufacturing, and marketing and sales.

Friedman and Pamela Leeds—donated the materials.

The Smithsonian has recently processed this remarkable collection. According to Oswald, the records are unusually comprehensive. "With many inventors you get fragmented stories. This is complete: you can actually see the progression of ideas—the whole story—and that's what makes it special." Oswald says that although her focus was on the flexible straw, she wanted to carve out a larger story, of the inventive process of an American entrepreneur.

The collection is grouped in three categories: personal papers, invention material, and corporate records. It offers a



unique opportunity to get to know Joseph B. Friedman—part-time optician, real estate and insurance salesman; full-time father, husband, brother, business partner, friend, and inventor—in a markedly personal way.

Correspondence, photographs, newspaper clippings, Flex-Straw Company records, competitors' patents, advertising testimonials, and drawings make up this collection.

Exceptional resources include a business card with a drawing of and notes for a “nail-tire-detector,” dated March 23, 1947; Friedman's cartoon drawings of advertising ideas for the Flex-Straw, including one with the memorable phrase “the straw of your life”; and several doodles of the Flex-Straw created in the margins of a 1948 pinup-girl calendar.

Judith Rosen said in an e-mail interview that it meant a great deal to her and her siblings to have their father's papers and artifacts preserved by the Smithsonian. “We felt it was an honor for us and would have been for my father had he been alive and known about it.” She added, “It is comforting, also, to know that his voluminous papers are now in a catalogued form and can be of use to future researchers. I believe it would have been a great loss if they had languished and deteriorated in my garage. I would hope that researchers would be able to explore the characteristics of the inventive mind.”

In 1969, the Flex-Straw Company sold its U.S. and foreign patents, trademarks, and licensing agreements to Maryland Cup Corporation which now sells 500 million flexible straws annually.

### The Legacy Lives On

Judith Rosen remembers her father telling her that she would see the Flex-Straw “all over the world,” and he was right. Flex-Straws are distributed internationally, and Rosen collects boxes of them on her travels.

What Friedman may not have ventured to prophesy was the varied uses his invention would inspire. Pamela Friedman Leeds, his youngest daughter, has been incorporating the Flex-Straw in her artwork for some time. She refers to the invention as “the family icon.” Leeds also collects Flex-Straw-related pieces, including a six-foot-tall sculpture made from cast straws, a bronze Styrofoam cup with matching Flex-Straw, and a bronze Christmas tree with a Flex-Straw serving as its trunk.

The straw may be one of those objects that we consider mundane, perhaps only recognizing its importance by its absence—for example, when the person at the drive-through window fails to include one with our drink. But the mind behind the flexible straw was anything but mundane.

Along with the papers, the museum has acquired a number of artifacts related to Friedman, including a fountain pen, a safety razor with handle, a folding screen, a confection, and a gas range. For more on the Modern Inventors Documentation Program, the Friedman Papers, and other invention-related collections, contact Alison Oswald at 202-357-3780 or [oswalda@si.edu](mailto:oswalda@si.edu), or visit the Archives Center online at <http://americanhistory.si.edu/archives/ac-i.htm>.

## BITS & PIECES

### Crossroads

In response to the September 11 crisis, we launched a monthly lunchtime dialogue series in collaboration with the Museum's Office of Curatorial Affairs. *Crossroads: Historical Perspectives on Topics Related to September 11* debuted November 14, 2001, and over the next seven months examined such topics as biodefense, technology, photojournalism, and memorials. Each event attracted between 100 and 200 people and offered thoughtful material for Museum staff preparing the exhibition *September 11: Bearing Witness to History*, which will open on the one-year anniversary of the terrorist attacks. The *Crossroads* series will resume this October.

### Nobel Voices Exhibition

The Nobel project lives on! Our exhibition commemorating the 100th anniversary of the Nobel Prize, *Nobel Voices*, closed at NMAH on October 31, 2001, but a German version opened at the Deutsches Museum Bonn on May 23, 2002. A spin-off exhibition, called *The Nobel Prize: Celebrating 100 Years of Creativity and Innovation*, will open at the Strong Museum, a Smithsonian affiliate in Rochester, New York, in October.

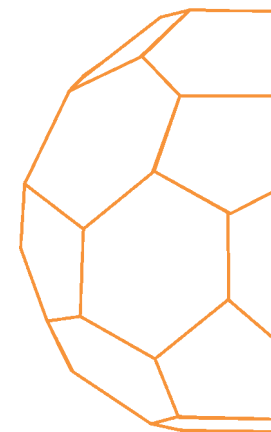
### Nobel Programs

The *Spirit of Innovation* lecture series, developed as a complement to our examination of the Nobel Prize, continued both here and abroad. During the fall of 2001, laureates Sir Harold Kroto (chemistry, 1996),

Jody Williams (peace, 1997), Daniel Tsui (physics, 1998), Jerome Karle (chemistry, 1985), Marshall Nirenberg (medicine, 1968) and Derek Walcott (literature, 1992) drew enthusiastic audiences to the Museum to hear their thoughts on creativity and inspiration.

Early in 2002, we invited Joseph Taylor (physics, 1993) and Stephen Chu (physics, 1997) to speak, and in March, Jerome Friedman (physics, 1990) participated in a symposium, “The Copenhagen Interpretation: Science and History on Stage,” which was attended by 600 people. The series extended to England, where we collaborated with London's Westminster University on programs and workshops featuring laureates Roald Hoffmann (chemistry, 1981) and Sir Harold Kroto.

On November 1, we are co-sponsoring a free conference at Georgetown University called “Vaccines: Past, Present and Future” that will address issues of bioterrorism and feature keynote Anthony Fauci from NIH. (continued on page 10)



Nobel laureate Sir Harold Kroto with a model buckyball.





Dorothy Lemelson displays her Order of James Smithson medal.



### BITS & PIECES

(continued from page 9)

### Prototype

In the spirit of *Invention at Play*, we've redesigned our newsletter to be more fun and functional. Has your address changed? Would someone you know like to receive the newsletter? Would you like to receive the newsletter via e-mail? Please write to the newsletter editor at [broda-bahm@si.edu](mailto:broda-bahm@si.edu).

### Resources for Educators

We have just completed a 45-minute classroom video, *Reinventing the Wheel: The Continuing Evolution of the Bicycle*, designed for grades 6-12. The bicycle was invented more than a century ago and has fascinated inventors ever since. Schools may order a copy of this free video through Video Placement Worldwide at [www.vpw.com](http://www.vpw.com). A teachers' guide is available on our website at [www.si.edu/lemelson/](http://www.si.edu/lemelson/).

We continue to work on a Nobel outreach product, intended to capture the strengths of the *Nobel Voices* exhibition in a format that can be used by teachers in the classroom. We expect this to be available in October.

## Dorothy Lemelson Inducted into the Order of James Smithson

On May 5 Dorothy Lemelson became the eighth inductee into the Order of James Smithson. Mrs. Lemelson and her late husband, Jerome (1923-1997), were recognized for their contributions to the creation of the Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation in 1995.

The Lemelsons were commended for their "bountiful generosity [that] has opened vast horizons for the future of the Smithsonian's National Museum of American History," according to the award citation.

"We are thrilled that this great honor is being bestowed on Mrs. Lemelson. She is a champion of American ingenuity and an embodiment of the philanthropic spirit," said Arthur Molella.

Inspired by the splendid gifts of Dr. Arthur M. Sackler (Asian art) and Mrs. Enid A. Haupt (garden), the Order of James Smithson is expected to be conferred upon a relatively small number of individuals over time for extraordinary contributions to the Institution.

Nominees are proposed to the Secretary by the Smithsonian National Board and approved by the Board of Regents.

Other members of the Order are Arthur M. Sackler (1984), Enid A. Haupt (1984), S. Dillon Ripley (1984), Sarah Roby (1985), Kenneth E. Behring (1998), Hirayama Ikuo (1999), and Steven F. Udvar-Hazy (2000).

## September

**20 Free Play Friday**  
This adults-only evening features hands-on activities designed to ignite your creativity.  
6:30-8:30 p.m.

**28 Play with the Everyday in a New Way: Chain Reaction Workshop**  
Join us for a fun-filled morning or afternoon exploring innovative ways to incorporate everyday objects into play. Designed for children ages six and up and their adult companions.\*  
10:30 a.m.-12:30 p.m. and 2-4 p.m.

## October

**5 Toy Invention Festival**  
Join us for an afternoon of toy building and celebrate the wonders of the yo-yo. Meet and invent with mechanical sculpture artist Arthur Ganson.  
12-4 p.m.

## November

**8 Portrait of Invention: An Evening with Paul MacCready**  
Join Paul MacCready, inventor of the Gossamer Condor, for an evening of conversation focusing on his visionary approach to technology and the future.  
6:30-8:00 p.m.

Cut and save this page to remind you of the Lemelson Center's exciting upcoming events!



**15 Free Play Friday**  
Join John Fabel, inventor of the Ecotrek® backpack, and the *Invention at Play* team for an adults-only evening of hands-on activities and conversation.  
6:30-8:30 p.m.

## December

**7 Digital Reaction Workshop**  
Traditional craft materials merge with new technology in these fascinating play workshops featuring the latest programmable-brick technology. Designed for children ages six and up and their adult companions.\*  
10:30 a.m.-12:30 p.m. and 2-4 p.m.

All programs are held at the National Museum of American History and are free and open to the public. For more information, please call (202) 357-2700 or visit [inventionatplay.org](http://inventionatplay.org)

\*Free tickets for both morning and afternoon workshops will be available at the Constitution Avenue entrance beginning at 10 a.m. on a first-come, first-served basis. Space is limited to 40 participants per workshop.

No. 8 1/2 All-Electric Erector® Set (A.C. Gilbert Co, 1939)—one of the toys from the Museum's collections featured in *Invention at Play*.

