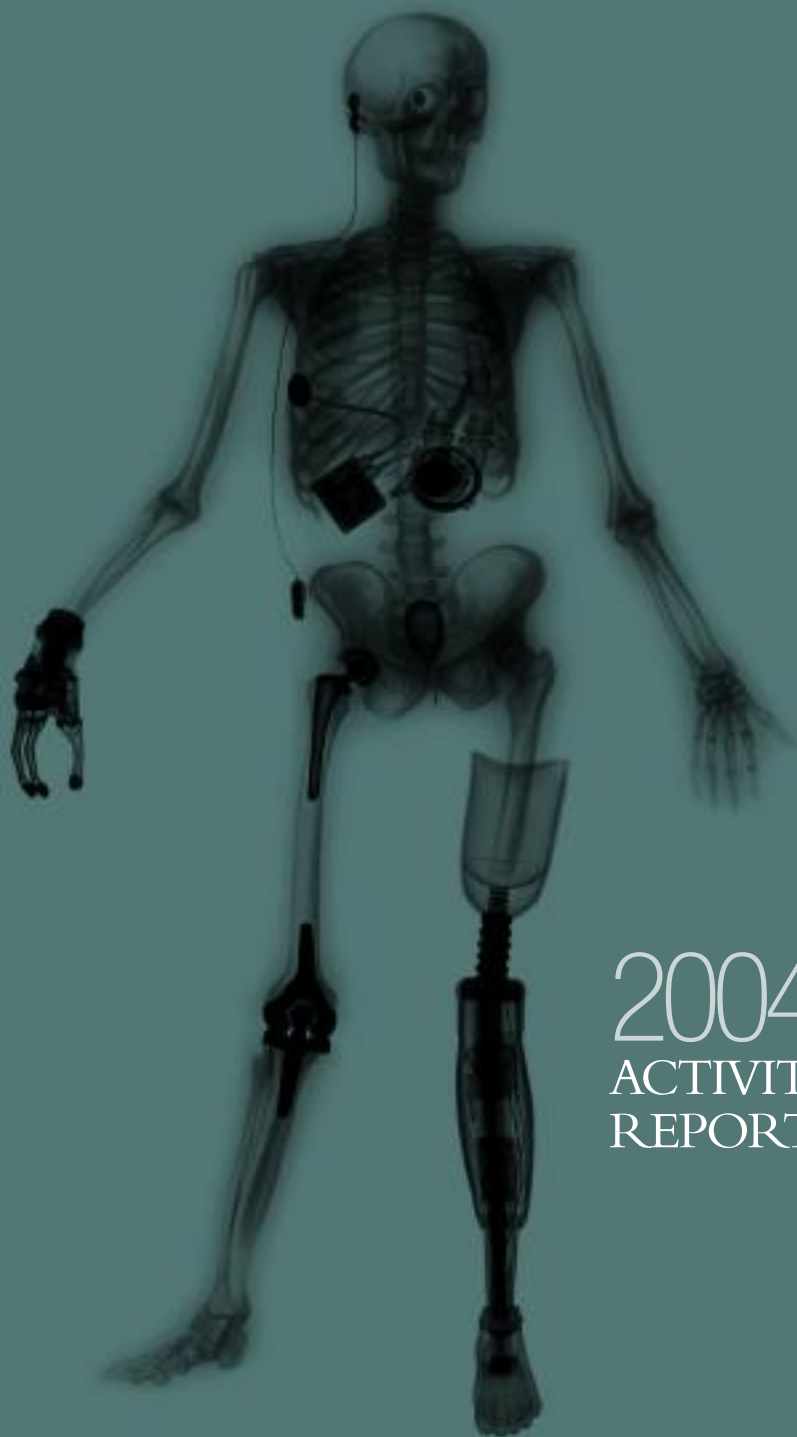


*The
Lemelson
Center
for the
Study of
Invention
and
Innovation*



2004
ACTIVITIES
REPORT



Smithsonian
National Museum of American History
Lemelson Center for the Study of Invention and Innovation

Our mission is to document, interpret, and disseminate information about invention and innovation, to encourage inventive creativity in young people, and to foster an appreciation for the central role that invention and innovation play in the history of the United States. We build on the unique resources of the National Museum of American History and: seek innovative ways to record the past by preserving and increasing access to the records and artifacts of invention and innovation; broaden our understanding of history through research, discussion, and dissemination of ideas on invention and innovation; and prepare for the future by developing programs aimed at engaging young people in the study and exploration of invention and innovation.

Cover: The concept of bionic bodies was examined as part of the Lemelson Center's 2004 theme, *Inventing Ourselves*.

Bionic Man illustration, C. Slayden; design, N. Cary; courtesy of *Science* and AAAS

Background image: Part of a Jerome Lemelson patent specification for a molding device

DIRECTOR'S REPORT

With the conclusion of the year 2004, the Lemelson Center completes its first ten years of the study of invention and innovation. Since opening our doors in 1995, we've shared much about the subject. We've examined its history, provided greater understanding of its contemporary role across geography and culture, and inspired future generations of inventors and innovators to use their knowledge and talent to create a better world.

In our past annual reports, I've taken the opportunity to give a brief, overall view of the Center's activities and accomplishments of the past year. This time, however, I choose to highlight one aspect I think represents the spirit and the essence of the Center and all of its programs.

After ten years, it is especially gratifying to see that one of our original projects, Innovative Lives, is still going strong. Inspired by The Lemelson Foundation when it provided the initial support for the Lemelson Center, Innovative Lives began in 1995 when we brought the charismatic African American engineer Hildreth (Hal) Walker Jr. to the Museum to speak with and motivate young people with his lecture "Attitude Is Altitude." Jerry Lemelson himself attended this first Innovative Lives event.

The idea was to show these students that inventors are real people, challenged by real problems prompted by real-life situations, and motivated by a deep passion for their calling. Innovative Lives shows inventors as role models. It is now one of many programs we sponsor for young people, and it helps to define one of the key messages we like to instill within them: anyone can be an inventor, and perhaps everyone should try.

When you look at the variety of inventors who have participated in Innovative Lives, you see a healthy cross section of society across gender, race, religion, education, income level, upbringing, and more. They prove that it's not who you are or where you came from that makes a successful inventor. Instead, it's how you discover, assess, and confront challenges and opportunities. The tools to achieve are within all of us.

In 2004, the effectiveness of Innovative Lives was validated when it won the first Education Innovation Award from the Smithsonian Center for Education and Museum Studies. The award gave us \$7,500 to support our initiatives, but that money is not what makes it so special. Rather, the award provides for us independent confirmation that we are making a difference. That is something infinitely more valuable than the dollars.

The Lemelson Center, like the inventors it features, will face challenges and opportunities in the coming years. We will continue to work hard and meet them with the passion of a successful inventor. In so doing, we hope to exemplify the innovative spirit that we are trying to instill in future generations.

Arthur Molella

Jerome and Dorothy Lemelson Director



Prosthetics inventor and user Van Phillips working with students on prosthetic designs during a 2004 Innovative Lives program

THE LEMELSON FOUNDATION

Improving lives through invention

The Lemelson Foundation (*lemelson.org*) is a private philanthropy established by one of the most prolific of U.S. inventors, Jerome Lemelson, and his family. It uses its resources to inspire, encourage, and recognize inventors, innovators, and entrepreneurs, with a growing emphasis on those who harness invention for sustainable development where the needs are greatest. To date, the Foundation has donated or committed more than \$90 million in support of its mission.

In addition to the Lemelson Center at the National Museum of American History, the Foundation lends support to the following programs.

U.S. INITIATIVES

The African-American Male Achievers Network, Inc. (A-MAN) encourages underserved children to develop skills in math, science, and business with programs in Los Angeles County and South Africa.

The Lemelson Assistive Technology Development Center at Hampshire College in Massachusetts provides undergraduates with experiential education in design, invention, and entrepreneurship to develop technologies that assist people with disabilities.

The Lemelson Center for Invention, Innovation, and Entrepreneurship (LCIIE) at the University of Nevada, Reno, fosters curriculum development in invention, innovation, and patent law.

The Lemelson-MIT Program recognizes inventors with the \$500,000 Lemelson-MIT Prize, the largest single cash prize for invention, and other awards. Recipients include Leroy Hood, inventor of the DNA sequencer, which facilitated the Human Genome Project.

Minority Introduction to Engineering, Entrepreneurship, and Science at MIT (MITE²S) provides a 100 percent scholarship-based academic enrichment program for promising high school juniors interested in science, engineering, and entrepreneurship.

The National Collegiate Inventors and Innovators Alliance (NCIIA) is a network of more than 200 colleges and universities that support

multidisciplinary inventing teams of students, faculty, and industrial representatives, known as “E-teams” for excellence and entrepreneurship. The NCIIA programs engage more than 5,000 students annually.

The Oregon Museum of Science and Industry’s Innovation Station engages children in the exploration of technology from an early age through interactive exhibits, to inspire them to pursue careers in engineering and technology.

INTERNATIONAL INITIATIVES

Recognition & Mentoring Program (RAMP) Centers: The Foundation is teaming with leading institutions in developing countries to create RAMP Centers to provide support systems for student and grassroots inventors and entrepreneurs who are working to advance the broad objectives of sustainable development.

- Central America—(planning grant) EARTH University, Costa Rica
- Indonesia—(planning grant) Yayasan Dian Desa, Bogor Agricultural University, and Yayasan Bina Usaha Lingkungan
- India—Indian Institute of Technology Madras, and Rural Innovations Network
- Portfolio of Technology Dissemination Projects: The Foundation supports a range of projects to test new innovations and develop distribution models, and to import and adapt proven innovations.
- Bangladesh—Emergence Energy
- Belize—Renewable Energy Policy Project
- Central America—International Development Enterprises
- Global—Schwab Foundation for Social Entrepreneurship
- India—International Development Enterprises
- Kenya and Tanzania—Appropriate Technologies for Enterprise Creation (ApproTEC)
- Kenya—Xtracycle Access Foundation
- Senegal—EnterpriseWorks Worldwide
- South Africa and Mozambique—Roundabout Playpumps

THE LEMELSON CENTER

Tenth-Year Overview



Traveling Exhibitions

Invention at Play

Play is a favorite pastime for the younger set, but somewhere along the way boys and girls grow out of it, or perhaps are forced out. They enter—at times reluctantly—what they perceive as the serious world of adulthood, and some never remember the joys of play.

But as we've learned from the Lemelson Center's traveling exhibition, *Invention at Play*, it's certainly not the case for inventors. These men and women, past and present, who invented all the things that nature didn't, created them through skills they learned as children. Tinkering and experimenting, visualizing and modeling, or brainstorming and thinking outside the box—these are all adult versions of child's play.

In 2004, *Invention at Play* continued touring the country. Through a variety of hands-on exhibits and tales of real-life inventors, *Invention at Play* reminds young and old of the connections between the playful tendencies of a child and the inventive play of an adult.

This year also marked the launch of our new, smaller *Invention at Play* exhibition. The 1,700-square-foot version began its journey courtesy of a generous \$1.5 million grant from the National Science Foundation, and it joins the original 3,500-square-foot exhibition that opened at the National Museum of American History in 2002 and started touring in 2003.



Museum staff testing the Rocky Blocks station during training for the *Invention at Play* exhibition in Jersey City

Although the smaller exhibition cannot travel with the Smithsonian artifacts, it covers all the topics of the larger version and includes the hands-on activities. It is particularly beneficial for museums that have less space or do not have the environmental controls and security necessary for hosting Smithsonian artifacts.

The two exhibitions traveled to five locations. The larger stayed for two exhibit periods at the Buffalo Museum of Science in New York, then moved to the Liberty Science Center in Jersey City, while the smaller display stopped at the Children's Museum of Indianapolis, the Cranbrook Institute of Science in Bloomfield Hills, Michigan, and the Fort Worth Museum of Science and History in Texas.

The museums that hosted *Invention at Play* created additional programs spinning off of the invention theme. For instance, the staff of the Buffalo Museum of Science held themed weekend events each month from March through August highlighting different approaches to invention, such as "Borrow

from Nature” and “Recognize the Unusual.” The Fort Worth Museum of Science and History staff held MindFest, a weekend event centered around playful invention and exploration. We receive feedback from each of the host museums, thus learning how to better tell the inventors’ stories.

Nobel Tour

“The Nobel Prize.” Many recognize these words, yet the full meaning may be obscure. Since the prize’s 2001 centennial, the Lemelson Center has worked to better explain the prize to people around the world.

In 2004, *Nobel! 100 Years of the Nobel Prize* went on display in Chennai, India, at the Indian Institute of Technology Madras. The exhibition, which is managed by the German Academic Exchange Service, shares the stories behind the Nobel laureates, with a special focus on laureates from Germany.

Via thirteen computers arranged in the midst of two semicircular walls, the laureates speak of their childhood, social views, and motivations. The Nobel exhibition is an intimate look at some of the most innovative men and women in history, along with a historical look at the prize itself. It shows, in

the words of a writer at *New Indian Express*, the “more social side” of the laureates, the person behind the prizewinner.

The exhibition was produced and developed by the Lemelson Center and the Deutsches Museum Bonn.

Partnerships

Working with partner organizations helps the Lemelson Center broaden the understanding of invention and innovation in a historical context. *Invention at Play*, for example, stems from a strong partnership with the Science Museum of Minnesota and the Association of Science–Technology Centers (ASTC). The Lemelson Center was proud to sponsor the keynote session at ASTC’s 2004 annual conference, in San Jose, featuring Steve Wozniak—inventor, philanthropist, and cofounder of Apple Computer.

We continued to work closely with our “sister programs” funded by The Lemelson Foundation. We were particularly pleased to be able to showcase the work of student inventors from colleges and high schools around the country. From the National Collegiate Inventors and Innovators Alliance, the Lemelson Assistive Technology

Development Center, and the Lemelson–MIT program, we brought these students to the National Museum of American History to show off their inventive creativity, as well as their products.

Meanwhile, the Lemelson Center Invention Ambassadors held their first meeting, in Washington, D.C., on December 3. The group includes former Center advisors, fellows, and other associates who no longer work directly with us but



Learning about the laureates in the *Nobel!* exhibition in Chennai, India



Some of the Lemelson Center Invention Ambassadors who met with us in December

want to promote our mission and success. Chaired by former Lemelson Center Advisory Committee member Ed Pershey, the members discussed ways in which they could spread the word in their communities about the Center and its activities. Fifteen people attended this first meeting.

Community Outreach

In the fall of 2004, the Lemelson Center began a new initiative aimed at reaching out to and attracting youth and their families through community-based collaborations in the Washington metropolitan area. Outreach efforts included working with educators and youth program coordinators from:

- Shaw EcoVillage, a program within the black community training youth to be effective leaders and catalysts for meaningful and sustainable change in Washington, D.C.'s urban neighborhoods.
- Self Reliance Foundation/Acceso Hispano, which works to inform and inspire Latinos to take advantage of opportunities for personal and community empowerment in areas such as health, women's issues, education, economic well-being, science, environmental protection, and access to new technologies.

And, as part of the Center's annual fall symposium, high school students and teachers from Washington-area science and technology charter and magnet schools

were invited to participate in Inventing Ourselves programs.

Publicity and Awards

One of the Lemelson Center's first public programs, Innovative Lives, was the 2004 recipient of the Education Innovation Award from the Smithsonian Center for Education and Museum Studies, which recognizes outstanding education efforts at the Smithsonian.

Over the years, Innovative Lives has brought the stories of contemporary and historical inventors to life, featuring everyone from astronauts to toy inventors. We seek out people with interesting careers who are willing and able to speak to a young audience—mostly middle-school students from the D.C. metropolitan area.

Van Phillips was the speaker in 2004. His prosthetic inventions played a large role in the Lemelson Center's exhibits and public programming. Phillips is an amputee who uses his own inventions, and he demonstrated firsthand how the devices work and how they are improvements over previous generations of prosthetics.

Newspapers from coast to coast quoted Lemelson Center staff, particularly director Art Molella, who offered insights on invention and inventors and provided a historical context to help improve understanding. Other Center programs were also featured during the year, particularly in media from the Washington, D.C., area. Major news outlets sharing Lemelson Center ideas included the *Washington Post*, *New York Times*, Fox News Channel, CNN, and MSNBC.

Publications and Presentations

Staff members were active in sharing their research and findings in 2004. The Center released *The Electric Guitar: A History of an American Icon*, edited by André Millard of the University of Alabama at Birmingham. It is based on our 1996 electric guitar



Monica Smith's history of the electric guitar played out on the cover of *Invention & Technology* magazine.

symposium and published by Johns Hopkins University Press. Meanwhile, Monica Smith authored the cover story “The Electric Guitar: How We Got from Andrés Segovia to Kurt Cobain” in the summer 2004 issue of *Invention & Technology* magazine. *Invention & Technology*'s winter 2004 issue featured Art Molella's interview with Merritt Roe Smith and Pauline Maier, the authors of *Inventing America*.

Technology and the African-American Experience, edited by Bruce Sinclair, was published by MIT Press in cooperation with the Lemelson Center. Sinclair was a Lemelson fellow and the Center supported additional research that made possible this volume and a companion volume edited by Carroll Pursell, *A Hammer in Their Hands*, also published by MIT Press. A review of Joyce Bedi and Art Molella's edited volume *Inventing for the Environment* appeared in the September 10, 2004, issue of *Science* magazine. It was one of numerous positive reviews for this book.

Art Molella and Will Eastman contributed to the recent publication *Nobel Laureates in Portraits (Nobelpreisträger im Porträt)*. The book captures cultural icons, including Nelson Mandela and the Dalai Lama, as well as the less-conspicuous faces of men and women whose discoveries influence our everyday lives. Photographer Peter Badge's portraits first appeared in the Lemelson Center's 2001 exhibition *Nobel Voices*. He has since traveled the world to capture candid, informal portraits of almost all of the living Nobel laureates.

An article by Gretchen Jennings, “Time to Listen,” appeared in the fall 2003 issue

of *Curator*, released in 2004. It discusses visitor evaluation for the *Invention at Play* exhibition. She also contributed a chapter to the book *Are We There Yet? Conversations about Best Practices in Science Exhibition Development*, edited by Kathleen McLean and Catherine McEver.

At the American Association of Museums conference in New Orleans, Art Molella was part of a panel presentation, “It's All About Innovation,” and Gretchen Jennings was on the panel for “Encouraging Multigenerational Play in Exhibitions.” Art and Gretchen served on panels at the annual conference of the Association of Science–Technology Centers, in San Jose, where Gretchen also had a poster presentation, “Creating Open-Ended Exhibitions that Work.”

Monica Smith spoke about the development of the *Invention at Play* exhibition in “Behind the Scenes at the Smithsonian: How an Exhibit on Invention Turned into an Exhibit on Play” at the Playing for Keeps annual conference in Arlington, Virginia.

In the Washington, D.C., metropolitan area, Joyce Bedi gave presentations at the annual meeting of the Society for History in the Federal Government and at the annual American Association of Museums/National Air and Space Museum program on Mutual Concerns of Air and Space Museums. She also talked about developing the *Invention at Play* website, at the 2004 Museums and the Web conference.

And Tanya Garner gave a workshop presentation to artists, designers, and teachers at the Summer Design Institute at the Smithsonian's Cooper-Hewitt Museum in New York City.

RECORDING THE PAST

Archives Center

Prior to 1984, if someone wanted to run or even walk with ease using a prosthetic leg, the options were quite limited. Amputees were forced to rely on awkward artificial limbs that left much to be desired in terms of functional ability.

Inventor Van Phillips changed that. In 1976, he lost his left foot in a waterskiing accident. Frustrated with available prosthetics, Phillips changed his college studies from mass communications and advertising to prosthetics. In 1981, he started Flex-Foot Inc. and marketed and sold his inventions, the “cheetah leg” and the Flex-Foot. They launched a new age of activity and accessibility for amputees. Phillips took quality materials and, with creative engineering, designed prosthetics that allowed for easier and more natural movement. The “cheetah leg” is now a standard for Paralympians for running and jumping.

In 2004, the Lemelson Center helped bring the records of Phillips’s inventions to the National Museum of American History Archives Center.

These records include two hours of an oral-history interview with the inventor. Along with design drawings and other printed materials, they give the Museum important documentation



Inventor Van Phillips describing features of prosthetic limbs during an Innovative Lives program. His Flex-Foot and “cheetah leg” are featured in the Center’s *Inventing Ourselves* exhibition on the first floor of the National Museum of American History.

of this milestone in American history.

In addition to the Phillips materials, the Archives Center received a collection of *Electronic Display World* newsletters from Joseph Castellano, former president and CEO of Stanford Resources, Inc., a market research and management consulting firm for technologies such as liquid crystal displays. (Castellano was a member of the RCA group who invented the liquid crystal display.) There was little information available on the growing market for new flat-panel displays, so Castellano developed market research techniques for the fledgling industry that took into account both supply and demand. All the newsletters from 1981 through 1999 are accessible via CD-ROMs in the collection.



Modern Inventors Documentation Program

Work began in 2004 on a strategic plan to guide the Lemelson Center in its efforts to document the history of invention through research and the acquisition of inventors' records. The plan will identify gaps in the historical record on invention and set goals that will focus and enhance the Center's Modern Inventors Documentation Program (MIND), introduced in 1997.

The Archives Center continued the maintenance and reconciliation of the MIND database, which identifies the locations and describes the contents of invention-related collections of archival materials in the United States. The database includes over 1,100 records in more than 300 repositories across the country. Archives Center staff members are attempting to verify the current content in the database by contacting the repositories holding the materials.

Internships and Travel Awards

In the summer of 2004, archival intern Mitch Toda wrote finding aids and descriptions for the Smithsonian's online archival catalog, made custom boxes to store materials, and identified priority materials in order to reduce the size of collections. He arranged and described several archival collections, including those of Van Phillips and Emilio Segrè (development of the atomic bomb), and the records of the Fellows Gear Shaper Company (manufacturer of precision gears and gear-cutting tools) and the ITT Corporation Industrial Research Laboratories electron tube research (special-purpose vacuum tubes and sensors). Toda's work enables researchers to have easy access to and use of the archival collections, further preserving and disseminating the history of invention and innovation in America.

The Lemelson Center teamed with the Archives Center to give two travel awards in 2004. Travel awards expand the use of the

archival collections by bringing scholars, graduate students, and independent researchers not living within commuting distance of the Museum to the Archives Center to use the materials.

One award went to Shaul Katzir, a postdoctoral fellow at Hebrew University of Jerusalem, who studied the papers of physicist Walter G. Cady. He examined the period 1917 to 1922 in order to trace the evolution in Cady's work as it fits into the larger shift from pure to applied science in the field of piezoelectricity.

Fellow travel award recipient Ovidiu Tichindeleanu, a native of Romania, came to study the 19th- and 20th-century history of aurality and mechanical transcription of sound for his Ph.D. dissertation. He is a graduate student at the State University of New York–Binghamton.

In addition to researching the William K. Applebaugh and Charles Sumner Tainter papers, Tichindeleanu decided to include the George H. Clark and William J. Hammer collections in his work. He noted that these collections contain "important materials regarding both the internal evolution and the social impact of early media technologies."

Nobel Laureates

In January, the Lemelson Center had the privilege of sponsoring an oral-history interview with Riccardo Giacconi, winner of the 2002 Nobel Prize for physics. An expert in the field of astrophysics, Giacconi led the way in discovering cosmic X-ray sources.

The interview was conducted by National Air and Space Museum curator David DeVorkin, and was a follow-up to our prior work with Giacconi. In 2003, the Smithsonian Archives, with the support of the Lemelson Center, processed Giacconi's papers. Both the papers and the oral history are available for researchers. The finding aid is online at: si.edu/archives/archives/findingaids/FARU7416.htm.

UNDERSTANDING HISTORY

Inventing Ourselves

What makes a human a human? And how much technology can be added onto and incorporated into people for us to still be considered human? In 2004, the Lemelson Center continued its Inventing Ourselves theme, which looks at how invention is impacting the function and definition of human beings. From the artificial heart to the waffle-patterned sole of a Nike running shoe to the wooden “peg leg” of centuries ago, people have used technology in an effort to improve themselves and their functionality.

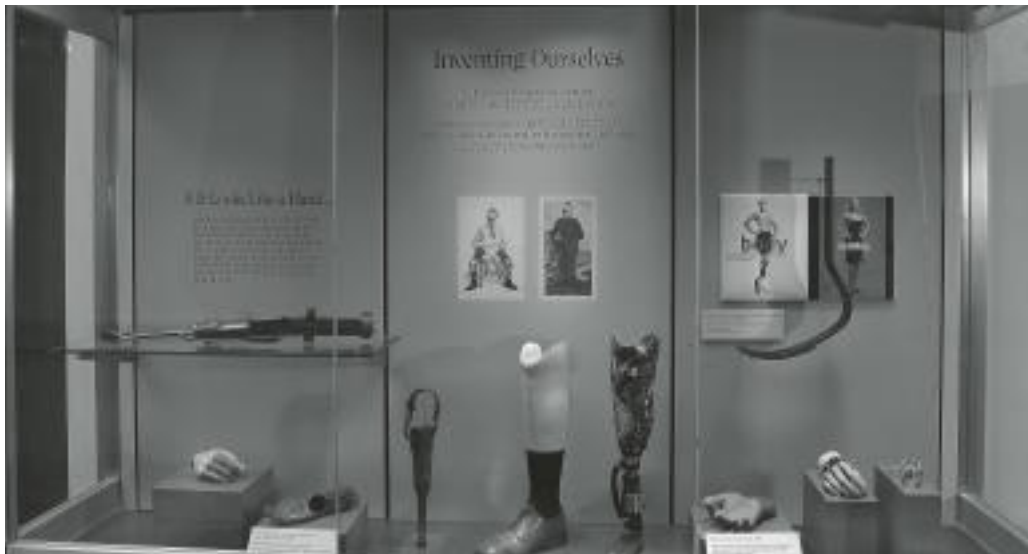
The theme debuted in November 2003; it came to life for Museum visitors with the 2004 opening of our exhibition examining the subject. Three showcases focus on three significant areas: design, performance, and reinventing the body through technology.

The “design” display case, featuring artificial arms and legs, explores the creative tension between devices designed to mimic the body’s appearance and those that attempt

to replicate the body’s function. It features a wooden peg leg from the 19th century, as well as a modern Flex-Foot prosthetic limb. The “performance” display presents marathon running as a case study in inspiring new inventions, from shoes to heart monitors. The showcase highlights the “Smart Shirt,” a prototype, wearable



The case featuring inventions designed to improve human “performance”



The “design” display case featuring prosthetics



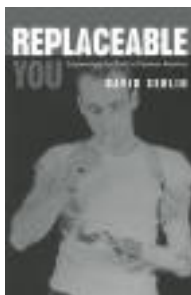
Inventions and innovations in implantable medical technology featured in a “reinventing” display showcase

monitoring device which may be used one day for gauging athletic performance.

The third showcase, which closed in August 2004, featured implantable devices and displayed the AbioCor artificial heart, one of the most sophisticated of medical inventions. Furnished with an internal motor, it pumps blood through the lungs and to the rest of the body. Displayed with the heart was Yorick, a plastic human skeleton equipped with a variety of implantable medical devices. Assembled by the Food and Drug Administration, Yorick had been used as a teaching tool to show the range of internal technologies available to extend and enhance life.

In addition to the exhibition, the Lemelson Center created public programs to further examine whether there is anything about humans that technology can’t mimic, replace, or alter. A variety of inventors and experts came to discuss the motivations and the consequences behind such inventions and innovations.

In February, inventor Van Phillips was invited to tell his story to middle-school students in an Innovative Lives program. Explaining how his frustration with the abilities of available prosthetics motivated him to create his own, he encouraged students to share prototype drawings they had submitted in advance. Phillips also demonstrated his Flex-Foot and “cheetah leg” prosthetic limbs.



Soldier Andrew McCaffrey greeting Museum visitors with his prosthetic arm as part of our “Active Lives, Active Duty” program

The following day, Ralph Urgolites, director of the Orthotics and Prosthetics Lab at Walter Reed Army Medical Center, joined Phillips to share how soldiers are rebuilding their lives through the use of prosthetic devices. “Active Lives, Active Duty” explored some of the cutting-edge technologies being made available to injured military personnel. These high-tech, electronic prosthetics were compared and contrasted to the functional simplicity of Phillips’s “cheetah leg.”

In an August “Meet the Author” program, author David Serlin and Museum medical history curator Katherine Ott discussed how medical innovations, particularly in the areas of prosthetics and reconstructive surgery, affected the lives of post-World War II Americans. Serlin is the author of *Replaceable You: Engineering the Body in Postwar America*.

In October, the Lemelson Center held its annual New Perspectives on Invention and Innovation symposium. The two-day event, called Building Bionic Bodies, was based on the Inventing Ourselves theme. It featured a “Portrait of Invention” program with Dr. Robert Jarvik, who worked on the development of the Jarvik-7, the world’s first permanently



Engineer Robert Kung speaking with medical historian Shelley McKellar during “Mending Broken Hearts” and artificial heart pioneer Dr. Robert Jarvik discussing his life’s work during “Portrait of Invention”



Audience opinions of implant technologies were recorded anonymously using handheld systems.



Bioethicist John Fielder examining the AbioCor Total Artificial Heart

implantable artificial heart, and the Jarvik 2000, a small blood pump placed inside the natural heart. Michele Norris, host of National Public Radio’s *All Things Considered*, conducted the interview.

The Jarvik-7 opened the door to the development of other, more portable devices. The AbioCor Total Artificial Heart, featured in our exhibition, might someday become a routine device for helping patients with imminent heart failure live longer, with a reasonable quality of life. Robert Kung, lead engineer in the development of the AbioCor, joined medical history and bioethics experts for another symposium program, “Mending Broken Hearts.” This discussion was designed to allow the audience to ask questions and share their opinions anonymously and in real time through wireless, handheld devices. Medical historian Shelley McKellar of the University of Western Ontario and bioethicist John Fielder of Villanova University joined Kung in examining the role of artificial organs in treating severe heart disease.

A dozen high school science students interested in careers in medicine and bioengineering joined us in the Museum’s Hands On Science Center for “Saving Face,” a workshop introducing facial reconstructive



surgery techniques and innovations. The students worked with experts to perform “surgical” treatments on plastic human skulls by applying various implantable devices.

Rounding out the symposium, student inventors showed off their creations at the Inventors’ Expo, where the inventions ranged from an alarm clock that wakes the user only in phases of light sleep to a glove that will translate sign language into spoken words or text. Many of the student teams were sponsored by the Lemelson-MIT Program and National Collegiate Inventors and Innovators Alliance. Younger children and their adult companions experimented



Student inventors from around the country demonstrating their work at the Inventors’ Expo

Designing artificial parts in a hands-on workshop

with their inventive sides at the “Extrasensory You” workshop where they designed artificial parts intended to enhance one of their senses.

Fellowships

To help the Lemelson Center explore invention, we offer fellowships to scholars and professionals. In 2004, three fellows were selected: freelance journalist Harry Allen, City University of New York doctoral candidate Sarah Gillespie, and Wesleyan University professor of history and science Charles Gillmor. (Gillespie has deferred her fellowship until 2005.)

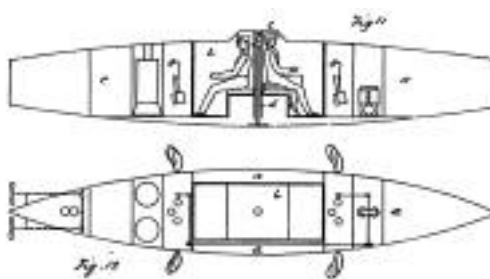
A freelance journalist for seventeen years, Allen came for ten weeks to study map and level building, the 3-D playing spaces that make up some computer games. With the help of free software applications and a little skill, game players can customize their virtual spaces. Allen says: “They decide, as they see fit, the sizes, shapes, positions, colors, etc., of walls, floors, ceilings, stairways, and other built structures in and around which the game play takes place.”

Allen tapped the Smithsonian jazz collections, the Archives, and the curatorial staff to craft a comprehensive look at customization across several areas: map and level building; hot rod creation, particularly motorcycle and low-rider; and jazz

improvisation. His goal was to produce a matrix revealing standard parts of the customization process along with the similarities and differences of the process in the three areas he researched. He would like to compile these three areas into a book on map and level building.

Gillmor will join the Lemelson Center for a two-month stay in early 2005 to further study the career of Victorian-era inventor Henry Middleton. Despite the fact that Middleton’s inventions include a telegraph sender, a telephone, and submarines, he was not commercially successful. Gillmor intends to use the Smithsonian’s manufacturing company collections and curatorial expertise to understand the context in which Middleton lived and invented in the late 19th and early 20th centuries.

Gillmor, who received his Ph.D. from Princeton University and participated for thirteen months as a U.S. exchange scientist with the Sixth Soviet Antarctic Expedition, says that Middleton “might best be seen as a member of the class of amateur devotees of science and invention in the Victorian era.” At the completion of his research, Gillmor intends to submit an article to a journal of southern history or a journal of the history of technology.



Charles Gillmor will study the career of Henry Middleton, who was awarded a British patent for this submarine featuring “whale-like” flippers.

REACHING A WIDER AUDIENCE

The Electric Guitar

2004 was the fiftieth anniversary of the Fender Stratocaster, probably the most famous electric guitar model ever designed. And when it came to bringing stories of invention to a wider audience, the history of the electric guitar had the Lemelson Center singing a happy tune. It's a subject that dates back to a 1996 Center symposium; eight years later, it proved just as popular.

Readers of *Invention & Technology* magazine were treated to a summer 2004 cover story, "The Electric Guitar: How We Got From Andrés Segovia to Kurt Cobain," written by Lemelson Center project historian Monica Smith. When Fox News Channel's Brian Wilson read the piece, he asked Monica to join him on his *Weekend Live* program.

The Lemelson Center book *The Electric Guitar: A History of an American Icon*, edited by historian André Millard, was published by Johns Hopkins University Press. It is based on the scholarship and research presented at the 1996 symposium, *Electrified, Amplified, and Deified: The Electric Guitar, Its Makers, and Its Players*.



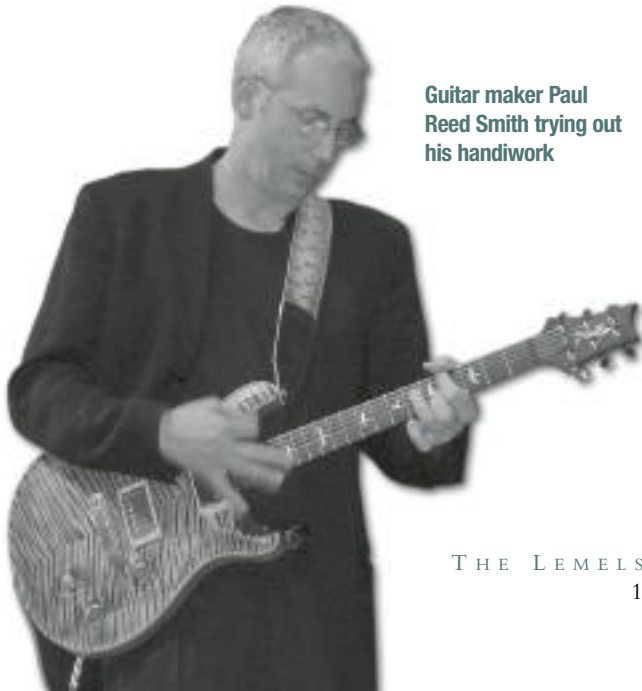
Sounds like fun; (l-r) Paul Reed Smith, André Millard, and David Grissom checking out the details on one of Smith's PRS guitars

To support the book, the Center sponsored a satellite media tour for Millard. Over the course of one morning, he was interviewed by some two dozen radio stations across the country, where he explained why the electric guitar is an American icon and a little bit about its creation. In the weeks following the interviews, sales of the book skyrocketed in the ranking numbers on Amazon.com.

About 200 people, including Smithsonian secretary Lawrence Small (who plays classical flamenco guitar), joined the Lemelson Center for a December 3 program on the subject. In a discussion moderated by Millard, guitar maker Paul Reed Smith of PRS Guitars and guitarist David Grissom explained how makers and players interact to create better instruments.

Videos

Lemelson Center videos continue to be popular tools in teaching students about the history of invention and innovation. Teachers, librarians, media specialists, and



Guitar maker Paul Reed Smith trying out his handiwork

homeschoolers can obtain free multimedia products, including our newly released *The Nobel Prize: 100 Years of Creativity and Innovation* CD-ROM, launched in May. As of late October, 3,000 schools received copies. Designed for students in grades 6–12, the CD-ROM serves as an educational tool that “explores the motivation and vision of Nobel laureates and the history of Alfred Nobel and his prize.” It is based on the Lemelson Center’s traveling Nobel exhibition, which was developed in partnership with the Deutsches Museum Bonn.

Including *The Nobel Prize* and our continuing distribution of the *Reinventing the Wheel*, *She’s Got It!* and *Lewis Latimer* videos, the audience reached is well over 2 million. Teachers continue to rate the programs highly in the areas of educational content and student interest. *She’s Got It!* was the most widely distributed video, with 3,739 copies.

In May the Center broadcast an edited

version of the 1997 video *The Electric Guitar: Its Makers and Its Players* to over 300 school districts and cable networks throughout the United States and Puerto Rico to an estimated 1.3 million viewers.

The Electric Guitar features guitar maker Paul Reed Smith and guitar player G. E. Smith showing off their wares and sharing stories about the instrument’s history.



Web

The newly redesigned Lemelson Center website was officially launched in 2004 and attracted over 1 million unique visitors who contributed more than 28 million hits. The companion *Invention at Play* site drew over 9 million hits from more than 190,000 unique visitors.



The new Lemelson Center internet home page, invention.smithsonian.org

LOOKING AHEAD TO 2005

The Changing Nature of Museums

In March, the Lemelson Center and the Johns Hopkins University Department of the History of Science and Technology will host an international conference on *The Museum in a Changing Environment*. Noting that museums worldwide have entered a period of revolutionary change, conferees will address topics such as: the museum as a “hub” of learning; the role of museums as part of regional economic development strategies; recent examples of open-air and eco-museums; and the architecture of museums as part of their evolving public presence. The conference aims to define new roles for museums and new relationships with other institutions, including schools and universities, historical sites, and theme parks.



Brent Glass, director of the National Museum of American History, will explain his vision of museums in their communities.

Cultures of Innovation Conference

It takes more than technology for emerging societies to become innovative. They must also develop a “culture of innovation”—a social climate that encourages and is receptive to invention. A Lemelson Center-sponsored conference at the Smithsonian in May will look at innovation across nations and cultures, with an eye to developing a picture of the innovative society, the factors encouraging positive technical change, the factors leading to

resistance to innovation, and the consequences of each.

Invention Institute

The Center is planning to host an Invention Institute at the National Museum of American History in August 2005. It will include staff from museums that hosted the larger, 3,500-square-foot version of the *Invention at Play* traveling exhibition, along with partners from their local community organizations.

The goals of this institute are to:

- extend and strengthen connections made between the Lemelson Center and the host sites for *Invention at Play*;
- coordinate, on a national level, the sharing of methods developed by museums and their community partners to encourage inventiveness and to teach about the history and process of invention; and
- encourage and support the collaboration of museums with community organizations on invention education.

“Green” Tours

The Lemelson Center is arranging a series of day-long tours of three environmentally responsible building projects in the greater Washington, D.C., area. The tours will give participants a behind-the-scenes look at three very different developments.

The Chesapeake Bay Foundation’s Philip Merrill Environmental Center in Annapolis, Maryland, is a prime example of sustainable architecture and the first building to receive the U.S. Green Building Council’s Platinum rating. John M. Langston High School in Arlington, Virginia, is among the first schools in the country to be certified “green” by the council. And Blair Towns in Silver Spring,

Maryland, also certified by the council, represents a sustainable approach to multifamily development. The 78-unit apartment community was built with 40 percent recycled content and 60 percent regionally manufactured materials.

Touring Exhibitions

The larger version of *Invention at Play* will be found at the Omaha Children's Museum in Nebraska, the Tech Museum of Innovation in San Jose, California, and the Science Museum of Minnesota in Saint Paul in 2005. The smaller version will tour at the Cape Fear Museum in Wilmington, North Carolina, the North Carolina

Museum of Life and Science in Durham, and the Louisville Science Center in Kentucky. Training sessions for staff at all upcoming exhibition sites are held several times a year.

The Nobel Prize traveling exhibition, sponsored by the German Academic Exchange Service, will visit Poland and Oman in 2005. Meanwhile, partnering with the Echo Foundation, the Lemelson Center will sponsor a photographic exhibition featuring fifty-eight Peter Badge portraits from the original exhibition, in *Nobel Portraits: Celebrating Innovation and Creativity* at The Light Factory in Charlotte, North Carolina.



LEMELSON CENTER TEAM

Staff

Arthur Molella, Jerome and Dorothy
Lemelson Director
Joyce Bedi, Senior Historian and Webmaster
Maggie Dennis, Historian
Yolonda Earl-Thompson, Administrative
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William Eastman, Project Historian
John Fleckner, Associate Director
Tanya Garner, Program Specialist
Gretchen Jennings, Chief of Education
Claudine Klose, Deputy Director
Alison Oswald, Archivist
Paul Rosenthal, Public Affairs Specialist
Alison Smith, Project Manager
Monica Smith, Project Historian and
Exhibit Specialist

Interns

Stephanie Barnwell
Erin Eschenroeder
Michelle Kang
Philippa Koch
Christy Shields
Mitch Toda

Additional writing and editing support for
this report from intern Emily Guevara

**Back cover: Students with an interest in
medicine and science practiced facial
reconstructive surgery techniques on plastic
skulls during "Saving Face," part of the October
Building Bionic Bodies program. With the help
of experts, these young people learned about
innovations in such implants.**

2004 Advisory Committee

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**Lemelson Center for the Study
of Invention and Innovation**

Smithsonian Institution

Room 1016, MRC 604

P.O. Box 37012

Washington, D.C. 20013-7012

Phone 202-633-3450

Fax 202-357-4517

E-mail lemcen@si.edu

For updates on activities at the Lemelson Center, visit

invention.smithsonian.org