



On Invention, the Price at the Pump, and the Perils of Prognostication

While watching the blur of ever-increasing numbers on a gas pump, it is small comfort to learn that the retail price of gasoline in the United States has been remarkably stable throughout the automobile age, when reckoned in constant dollars. Wars, foreign embargos, and other external events resulted in occasional price spikes, but these all proved to be temporary disruptions to a horizontal trend. Will history repeat itself and return us to the recent past when gasoline was affordable?

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Notes From the Director

Governments and corporations are spending billions of dollars today on research and development to find energy alternatives to oil. Some are even calling for a crash program on the order of America's race to the moon or the war on cancer. But it is helpful to remember that many fundamental breakthroughs are the result of happy accidents. It is no surprise that "serendipity" is very much on the minds these days of students of the innovation process.

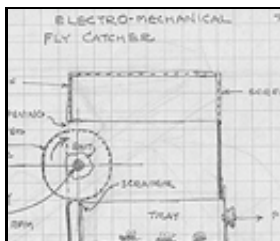
A prime example is the discovery of radioactivity in 1896 by Henri Becquerel (1852–1908). Last month marked the 100th anniversary of the great French physicist's death. Although remembered primarily for this one momentous discovery, he spent many years studying phosphorescence—the familiar glow-in-the-dark effect associated with certain materials when they absorb and later release light. Inspired by Wilhelm Conrad Roentgen's discovery of X-rays in late 1895, Becquerel wanted to see if phosphorescent compounds also emitted penetrating X-rays. In other words, was there a basic connection between the effects?

Accordingly, he wrapped a photographic plate in opaque black paper and placed on it a phosphorescent salt of uranium. He exposed the "package" to sunlight and, sure enough, found an image of the uranium salt crystal on the photographic plate. However, to his amazement, he found the same image imprinted on the plate of an unused package that had been stored overnight in a light-tight drawer. Where did the rays come from, if not stimulated by light? Becquerel's genius was to be prepared for the unexpected: he gave up his original hypothesis linking phosphorescence to X-rays and announced a new kind of ray, called "Becquerel rays" in his honor. "Chance favors the prepared mind," Louis Pasteur said, and no discovery is strictly by chance.

Becquerel's announcement received little attention at first, primarily because the discovery was not seen as particularly useful. Even Becquerel himself soon dropped the subject. Not until Marie Curie pursued the phenomenon, which she dubbed radioactivity, and discovered the powerfully radioactive elements radium and polonium did the new rays capture the imaginations of scientists and public alike. The 1903 Nobel Prize shared by Becquerel with Marie Curie and Pierre Curie recognized the research. The way was opened for nuclear physics and the enormous potential of nuclear energy, from nuclear medicine and nuclear power to the atomic bomb. Could it be that the answer to today's petroleum crisis is lying in someone's drawer, just waiting to be discovered?

With best regards until next month,

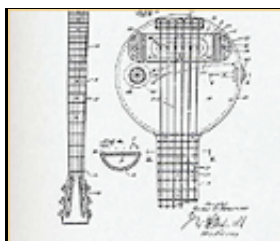
Art Molella
Jerome and Dorothy Lemelson Director



Have You Seen?

Engineers, inventors, and designers produce drawings as part of their creative process. They draw to work out and refine concepts and details. They draw to persuade. They draw to give direction. And they draw to record their ideas and to learn from others.

Doodles, Drafts, and Designs, a 2004 exhibition from the National Museum of American History, documents this important step in the invention process and features a wide variety of drawings from the Smithsonian collections. Many of the drawings highlight the beginnings of commonplace inventions. Some of these drawings (and the inventions they represent) will be included within the activities of the Lemelson Center's Spark!Lab, our new hands-on center for families that will open with the Museum later this year. Visit the online exhibition of *Doodles, Drafts, and Designs* at www.sil.si.edu/exhibitions/doodles/index.htm to see many of the fascinating images drawn by inventors and innovators as they worked out their ideas and concepts on paper.



Trivia Challenge

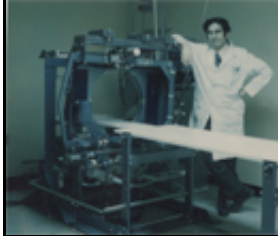
In each edition of *Prototype*, we'll offer a question about an invention or inventor that you and your friends and family can try to answer. Sometimes the answer can be found on the Lemelson Center's website, where you can also learn a little more about the subject. Email your answer to us at prototype@si.edu along with your name and mailing address.

Each month we'll select winners randomly to receive a small prize from the Center.

Congratulations to Sean S. of Washington, D.C., and Heidi C. of Parlin, N.J., who (among many others) knew that Joseph Friedman conceived of the Flex-Straw at the Varsity Sweet Shop in San Francisco. Sean and Heidi will each receive a year's subscription to *Smithsonian* magazine. And since our August issue was our debut

issue, we'll send out a little something to everyone who entered.

This month's question: Who invented the "Frying Pan?" (Be careful. This object might not be the first thing that comes to mind when you visualize a frying pan!)



From the Archives

By obtaining, preserving, and increasing access to the records and artifacts of invention, the Lemelson Center is better able to help people understand the significant and varied role inventors have played in American history. Recently added to our collections is material from Robert S. Ledley, D.D.S. (b. 1926), a biophysicist, physiologist, and radiologist who developed the ACTA (Automatic Computerized Transverse Axial) diagnostic X-ray scanner—the first whole-body CAT scan machine (US Patent 3,922,552)—which was put into clinical operation in 1973. He earned more than twenty patents, was inducted into the National Inventors Hall of Fame in 1990, and was awarded the National Medal of Technology and Innovation in 1997 for his pioneering contributions to biomedical computing and engineering, including the CAT scanner, which revolutionized the practice of radiology. He also was recognized for his role in developing automated chromosome analysis for prenatal diagnosis of birth defects.

Ledley's work on the ACTA scanner in the early 1970s built on work developed independently by South African physicist Allan M. Cormack and British engineer Godfrey Hounsfield. Ledley built a scanner that was capable of making cross-sectional images of any part of the human body—including many that had been hard or impossible to X-ray before. For diagnostic medicine, especially for viewing unobtrusively inside the body, it was a great medical advance, since previous scanners could scan the head only and required use of a water bath. Dr. Ledley developed a whole-body scanner that did not need a water bath and the ACTA scanner set the course for modern computerized tomography (CT or CAT) machines.

The collection contains Ledley's research notes and papers, schematics for the scanner, slides of the scanner and of images it produced, and a user's manual for the scanner, including drawings and assembly and operational information. —Alison Oswald



Inventive Ideas for Schools and Families

Being an inventor doesn't necessarily mean you're working on the latest and greatest technologies. Sometimes, simple creativity and imagination are all it takes for a beginning inventor. For example, why not try inventing a new game? Remember "Calvinball" from the *Calvin and Hobbes* comic strip? Anyone can invent a new game, and it can be indoors or outdoors. You can use pieces from a game you already have or you can start from scratch. Once you have all the rules figured out, play it with your family and

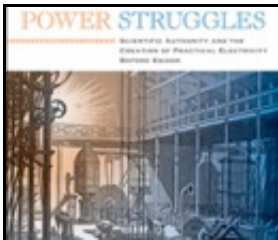
friends.



Our Podcast—Prototype Online: Inventive Voices

Imagine creating sound out of thin air. Imagine a speaker that can send sound great distances. Imagine that sound beam is so tight that you can hear it loud and clear but the person next to you can't. HyperSonic Sound is real and it came from the imagination of inventor Woody Norris. We speak with Norris, winner of the 2005 Lemelson-MIT Prize for invention, in the new edition of our podcast, Prototype Online: Inventive Voices.

Each month on our podcast, we look at some of the inventors, innovations, and technologies of the 20th and 21st centuries. You can have them downloaded automatically to your computer or MP3 player through iTunes, or you can listen to each episode from your computer by visiting our website at invention.smithsonian.org/video.



Read All About It

As you may have noticed, this issue of *Prototype* uses a lot of its space to cover the subject of energy. And while news stories about energy supply and demand seem to make the headlines every day, it's most definitely not a new debate. You can learn more about some of the "old-time" power struggles in the new book by Lemelson Center research associate Michael Schiffer that's appropriately titled *Power Struggles*.

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