



## **Akhil Madhani: Literally On the Cutting Edge of Robotics Inventors**

"Engineers have to invent things, because that's their job, to develop something as a solution to a problem."

As a graduate student at the Massachusetts Institute of Technology's Artificial Intelligence Laboratory, Akhil Madhani (b. 1968) designed and built the "Silver Falcon" and the "Black Falcon," robots that allow surgeons to perform minimally invasive surgery by remote control, manipulate body tissue, sew and tie off sutures, and conduct other delicate procedures through incisions as small as one inch wide.

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## **Notes From the Director**

Invention, technology, and science have long provided inspiration for utopian dreams and fantasies. At the end of the 19th century, Edward Bellamy gained fame with his novel *Looking Backward, 2000-1887*, which pictured Boston in the year 2000 suffused with futuristic technologies like the "musical telephone" (radio), the credit card, and electricity for heat and light. This sort of technological optimism culminated in visions of the future city at the 1939-40 World's Fair in New York.

Those dreams in turn inspired Walt Disney in the 1960s to propose his own urban vision in Epcot (Experimental Prototype Community of Tomorrow)—a real city-of-tomorrow laid out like a wheel, interconnected by a monorail, and protected by an air-conditioned dome. The city was never built, but became instead the famed amusement park in Orlando, Florida. In the mid-1990s, however, the Walt Disney Company revived the town idea in what is now Celebration, Florida, originally designed to serve the families working in the high-tech entertainment industries at Disney World.

In researching our recent book, *Invented Edens: Techno-Cities of the Twentieth Century* (MIT Press), Robert Kargon and I visited Celebration and several cities of a similar type. We viewed them in the broader context of what we dubbed "techno-cities," which we define as new cities of limited size built around large industrial or technological enterprises. The core idea was to move industry away from the busy metropolis to small towns in rural settings. Originating in the Garden City idea proposed by British urban planner Ebenezer Howard, the techno-city was designed as a remedy to the Dickensian squalor of the crowded, smoky, and disease-infested cities of the Industrial Revolution. Using new technologies of construction, transportation, and communication, these cities were amazing inventions in their own right. Hundreds, if not thousands, of them were built over the last century, almost all surviving today.

*Invented Edens* follows the trajectories of a dozen or so representative examples,

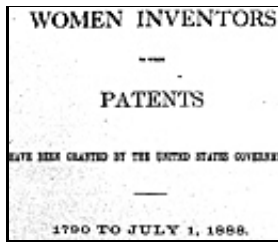
exploring their founding idealism as well as their internal contradictions. They include Norris, Tennessee, home to the Tennessee Valley Authority; Salzgitter, Germany, a new steel town established by the Nazis; Torviscosa, Italy, built by the fascist government to accommodate synthetic textiles; Ivrea, Italy, center of the Olivetti company, known for its typewriters and other office machinery; Ciudad Guayana, Venezuela, a steel town planned by a team from MIT and Harvard; and ultimately, Disney's Celebration, a real techno-city that began to enter the realm of fantasy—simulating the early 20th century while using modern, high-tech networks.

Enthusiasm for techno-cities flagged noticeably at the end of the 20th century as interest began to shift toward the so-called eco-city—environmental, ecological urban projects built from scratch. These newest invented cities will be the subject of a future column.

With best regards until next month,

*Art Molella*

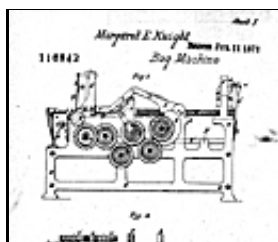
Jerome and Dorothy Lemelson Director



### Have You Seen?

When we ask young people to name some inventors, we frequently get a "*Casablanca* response"—a roundup of "the usual suspects"—of Thomas Edison, Alexander Graham Bell, and the Wright Brothers. All famous, and rightly so, but clearly not representative of the diverse population of inventors today and throughout history. As our senior historian Joyce Bedi has noted, sometimes a youngster never makes it past Edison's name!

To better showcase this diversity, Joyce wrote an essay examining the creativity and persistence, not to mention (as Edison is famously remembered for saying) inspiration and perspiration, of the many women inventors throughout history. You can read her essay on the Lemelson Center's website at [invention.smithsonian.org/centerpieces/ilives/womeninventors.html](http://invention.smithsonian.org/centerpieces/ilives/womeninventors.html) and download a resource guide for teachers at [invention.smithsonian.org/downloads/wminventorsguide.pdf](http://invention.smithsonian.org/downloads/wminventorsguide.pdf) to help share the story, significance, and contributions of women inventors.



### 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](mailto: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 Tom G. of Arlington, Virginia, and Ran R. of Fairborn, Ohio, who (among others) knew that George Beauchamp earned the patent for an "electrical stringed musical instrument" in 1937. Initially filed in 1934, Beauchamp's patent

was for Adolph Rickenbacker's "Frying Pan" electric guitar. Tom and Ran will each receive a year's subscription to *Smithsonian* magazine. And thank you to everyone who entered.

**This month's question:** While seemingly dissimilar inventions, what do the square-bottom paper bag, frequency hopping, the automatic dishwasher, and Scotchgard have in common?

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### 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. One of these inventors, Holton Duncan Robinson, invented devices and processes that changed how bridges were built around the

world.

Robinson was born in Massena, New York, in 1863. After graduating from St. Lawrence University he worked as a chain man for the civil engineering firm Buck and McNulty and later with Buck on computations and drawings for various bridges. He was in charge of many aspects of New York State bridge design and construction over the next several years, including the Williamsburg and Manhattan bridges in New York City. As chief engineer of the Glyndon Contracting Company in 1907, Robinson designed the footbridge, machinery, and plant used in the construction of previously unseen 21-inch cables. He subsequently built cables 30 inches in diameter.

During World War I, Robinson was a supervising engineer on plant extension work for war programs. In 1920, David Steinman, a previous business acquaintance, offered Robinson a partnership in an engineering firm. Robinson and Steinman completed many notable bridge engagements during its twenty-five years, including design and/or construction of bridges throughout the United States, as well as in Canada, Bolivia, Brazil, Australia, Germany, Spain, and Denmark.

Robinson's inventions for suspension bridges included a hydraulically operated cable-squeezing machine that shaped bundles of parallel wires into a cylinder; an electrically operated machine that wrapped wires around the cables; flat-band seizings, or wire loops, that were placed around a strand of cables; and a simplified method of anchoring cables. His design work on the Hercílio Luz Bridge in Florianópolis, Brazil, resulted in a new type of suspension bridge that incorporated improved stiffening trusses and cable construction. Because of Robinson's additions to the field, the time it takes to build suspension bridges was greatly reduced.

The Archives Center collection at the National Museum of American History holds Robinson's personal papers and a variety of photographs of the world-famous engineer, who remained active in the field until his death in 1945. Highlights include business correspondence, an 1889 notebook containing calculations, and five original patents. Of the numerous photographs, some are personal, but most are negatives, photographs, and cyanotypes that document bridges and the process of bridge construction.

See more of what is in the Robinson collection by visiting our online finding aid at [invention.smithsonian.org/resources/fa\\_robinson\\_index.aspx](http://invention.smithsonian.org/resources/fa_robinson_index.aspx). —Alison Oswald

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## Inventive Ideas for Schools and Families

When you hear Ben Franklin's name there are probably many roles that come to mind—a Founding Father of our nation or perhaps a science experimenter with electricity and kites. But did you know that he invented a musical instrument called the armonica? (*Armonia* is the Italian word for harmony.)

With some wine glasses and water, you can create your own armonica! Here's how:

1. Clean your finger and wet it with water.
  2. Gently rub your finger along the top edges of an empty wine glass.
  3. Move your finger smoothly in a circular motion, making sure to cover the entire rim.
  4. As you move your finger over the rim, notice the pitch of the sound produced.
  5. Now add water to the glass and repeat the same procedure. Listen for the pitch. Does it sound the same as when the glass was empty?
  6. Experiment with different water levels and create your own armonica band!
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## 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. In this month's edition, we present a behind-the-scenes moment at the Lemelson Center where our staff spends a little time studying and discussing invention and innovation. In particular, we examine the techno-cities and eco-cities that Center director Art Molella introduced in his column in this newsletter. You can download our podcasts 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](http://invention.smithsonian.org/video).

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