



SUMMER MOVIE SPECIAL

Scary Monsters Dissected! Sci-Fi Facts Checked! Multiple Futures Revealed! p.70

POPULAR SCIENCE

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Hot Products



A 21st-Century View-Master p.20

THE FUTURE NOW

5TH ANNUAL

INVENTIONS OF THE YEAR

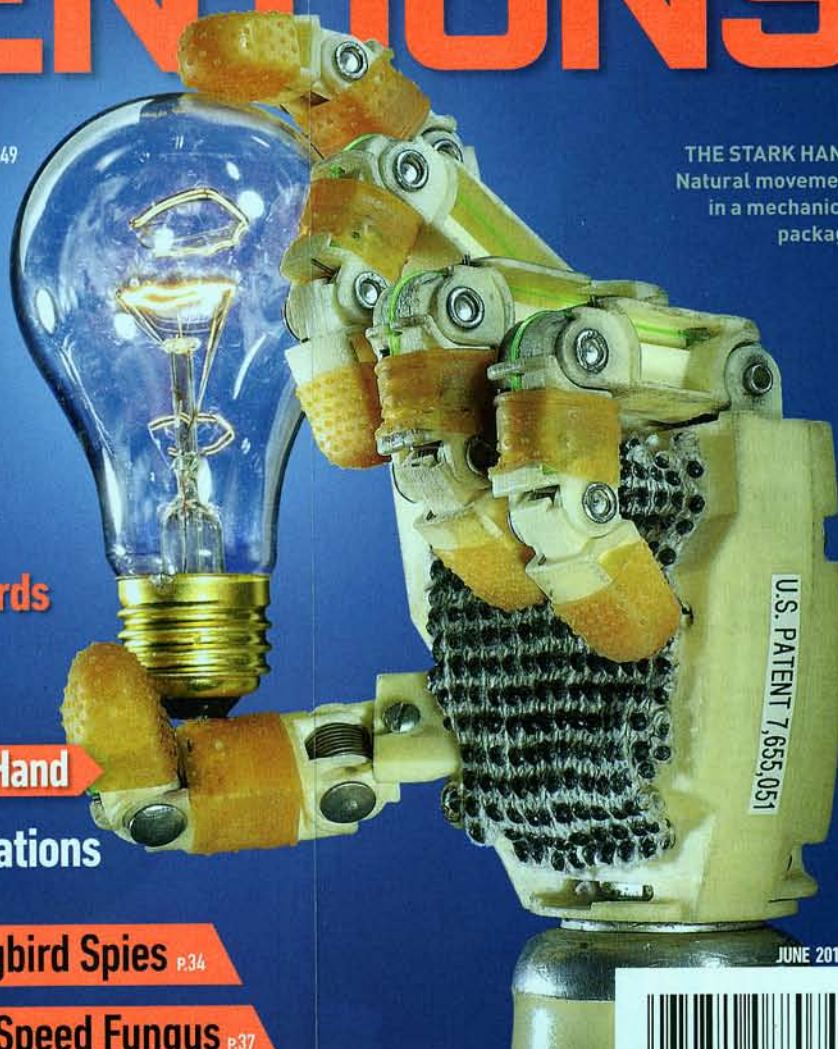
Meet the Garage Tinkerers behind:

- ▶ **Armored Stun Gloves**
- ▶ **Snowboarder Airbags**
- ▶ **Print-Anywhere Inkjets**
- ▶ **Never-Glare Sunglasses**
- ▶ **Jet-Powered Boogie Boards**
- ▶ **Disease-Detecting Pens**
- ▶ **Bedbug Sniffers**
- ▶ **The Low-Tech Prosthetic Hand**

And Other Amazing Innovations

PLUS: Darpa's Hummingbird Spies p.34

Killer Escalators p.99 High-Speed Funqus p.37



THE STARK HAND
Natural movement in a mechanical package

JUNE 2011 US \$4.99

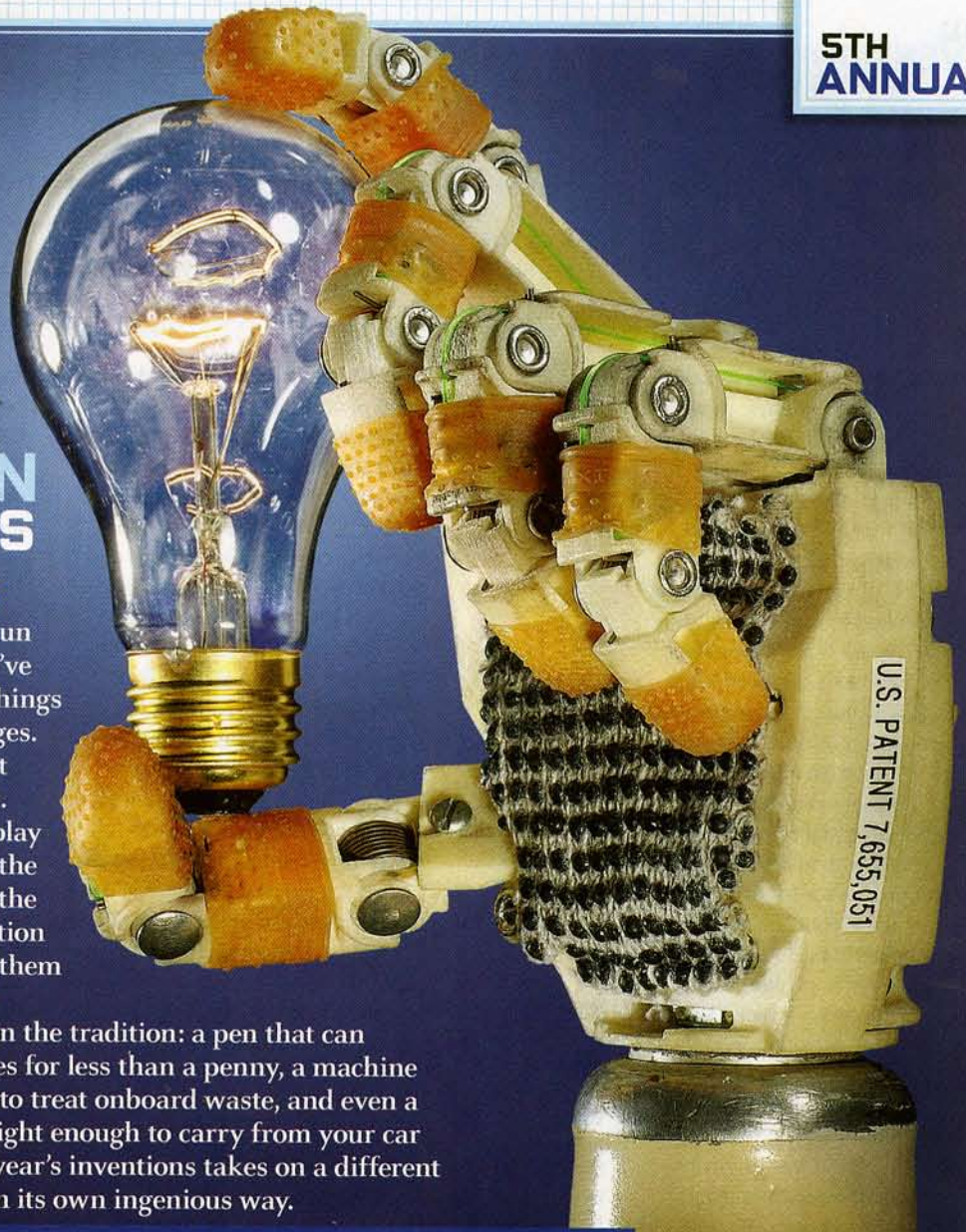


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2011 INVENTION AWARDS

IN THE FIVE YEARS

that POPULAR SCIENCE has run the Invention Awards, we've seen a lot of remarkable things come out of people's garages. Some are designed to treat the sick or save the planet. Others are simply fun to play with. But no matter what the purpose, the brilliance of the inventions and the dedication of the individuals behind them are always inspiring. This year's 10 honorees carry on the tradition: a pen that can screen for prenatal diseases for less than a penny, a machine that uses a boat's exhaust to treat onboard waste, and even a jet-propelled body board light enough to carry from your car to the water. Each of this year's inventions takes on a different challenge—and solves it in its own ingenious way.



ILLUSTRATIONS: BLANDESIGNS.CO.UK; PHOTOGRAPH: JOHN B. CARNETT



A better mechanical prosthetic hand



A crime-fighting armored glove



A printer you wave like a magic wand



A safer landing pad for snowboarders



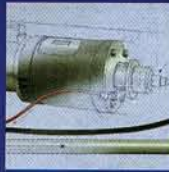
A glare-blocking LCD sunglass lens



A more effective bedbug detector



A low-cost test for prenatal diseases



An efficient way to treat boat waste



A light, motorized body board



A mirror that measures vital signs

MECHANICAL DEXTERITY

THE IDEA

A prosthetic hand that's as functional as an electronic model—but at a fraction of the cost

NAME	INVENTOR	TIME	COST	HORIZON
The Stark Hand	Mark Stark	7 years	\$17,000–\$18,000	Prototype ●●●●○ Product

PROSTHETIC hands typically come in three varieties: purely cosmetic models; hooks and other low-cost mechanical appendages that provide a limited range of motion; and electronic versions that better mimic natural hand movements yet can cost tens of thousands of dollars. Mark Stark's prosthetic incorporates the best elements of each. Although its minimalist plastic assembly is nearly as light and inexpensive as a common steel hook, it looks and moves like a high-end electronic hand.

Stark, who makes his living designing valves for dryers and other appliances, got into prosthetics in part to help his friend, Dave Vogt, who was born without a left hand. Stark's creation is electronics-free, but its fingers each have three knuckles (two on the thumb) that bend separately to conform to anything the wearer grasps, including irregularly shaped objects that a hook can't hold.

HIGH FIVE
Within an hour of putting on the Stark Hand, Dave Vogt, a friend of the inventor who helped test it, caught a ball left-handed for the first time in his life.

Hooks attach to a socket at the end of an amputee's arm and are operated by a cable that runs up to a shoulder harness. When the wearer shrugs his shoulders, the cable pulls the hook open; when he relaxes, the cable slackens and the hook closes. The Stark Hand screws into the same socket-and-cable system but adds a lever on the palm that connects to five more cables, each running up the back of a finger. A shoulder movement triggers the lever to tug all five fingers open at once, and the individual cables let each finger rebound on its own. Springs in each joint contract until each finger comes to rest on an object, so some fingertips can curl around, say, a wineglass stem while others grasp the cup. The springs exert a level of pressure gentle enough to hold an egg but strong enough that you can lift a chair.

In 2004, Stark constructed a proof-of-concept from hardware-store supplies and gave it to Vogt to try out. Within an hour, Vogt

caught a ball left-handed for the first time in his life. Since then, he has helped Stark test and improve four more prototypes. Stark designed stronger, compact springs, reengineered the fingers into a few easy-to-manufacture shapes, and set the thumb at a new angle to better replicate a real thumb. He also strengthened the joints in the hand against side impacts after Vogt broke a prosthetic knuckle when he hit something while swinging around on the dance floor.

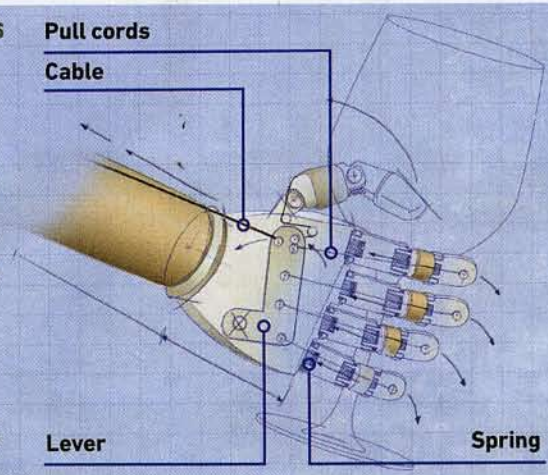
Vogt now wears the hand everywhere except to his job as a machinist, where he has to do heavy lifting for which a hook still works better. A more durable production version, which will use tougher plastics and sleeker parts, could be on the way as early as this winter. Edison Nation, a company that helps inventors develop their ideas, recently selected Stark's hand for commercial development and is now in talks to license it to a major prosthetics manufacturer.

—LAUREN AARONSON



HOW IT WORKS

The prosthetic hand attaches to a cable that runs from a shoulder harness worn by an amputee. A lever on the palm opens all five fingers at once, and separate cables in each finger and springs at each knuckle allow the fingers to close individually and bend around objects with a secure grip.



**THE HAND IS
GENTLE ENOUGH
TO HOLD A
RAW EGG BUT
STRONG ENOUGH
THAT YOU CAN
LIFT A CHAIR.**

IN THE WORKSHOP One of the inspirations for Mark Stark's [below] invention was an artificial hand designed for NASA. "It was a challenge," he says. "I thought, 'I can do better than that.'"

