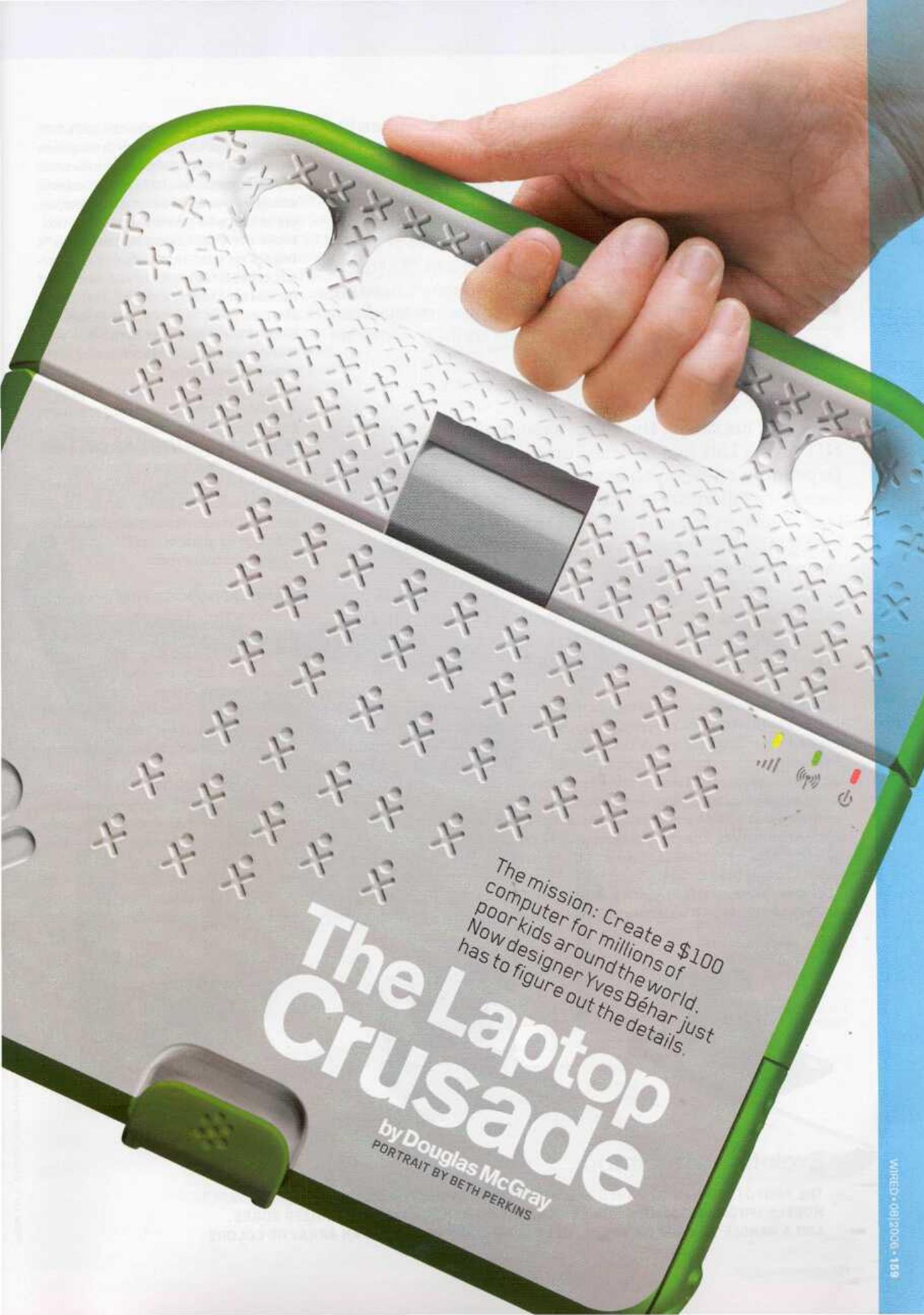




The \$100 laptop, Béhar says, must be small and durable. "It has to go into the field."



The mission: Create a \$100 computer for millions of poor kids around the world. Now designer Yves Béhar just has to figure out the details.

# The Laptop Crusade

by Douglas McGray  
PORTRAIT BY BETH PERKINS

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**YES BÉHAR SITS AT A WIDE** worktable on the lofted second floor of fuseproject, his San Francisco design studio, surrounded by windows and whiteboards and nearly a dozen foam laptops. He is tall and tan, with a surfer's mess of curls and the quiet, easy manner of someone who just woke up from a nap, "There are two types of projects," he says. "There are the stylist projects - the ones you sign with your signature. Then there are the ones that are going to be difficult," He looks at his pile of discarded ideas, none of them much alike, and smiles. For nearly a year, Behar has been at work on the most visible and most controversial project of his career. His client, a nonprofit offshoot of the MIT Media Lab, had dreamed up a radical new computer. Depending on who you asked, it was either soon-to-be-legendary vaporware or a shortcut to modern education for tens of millions of poor kids around the world. The plan called for a garage full of experimental technology: radio antennas that network computers up to 10 miles apart without satellites or towers; a dual-mode display that switches to monochrome in bright light; a power scheme that lets the computer run indefinitely without an electrical outlet. But nothing worked together. Media Lab cofounder Nicholas Negroponte was

looking for someone to puzzle together the technology - someone to make it bright and iconic, rainproof, dustproof, heatproof, drop-proof, spillproof, and intuitive to a Thai or Nigerian child who had never seen modern technology. Negroponte would offer the laptop to governments who would commit to buying at least a million computers each; it promised to outsell every other laptop in the world in just a few years. Oh, and one more thing: The machine would need to cost one-fifth the price of the cheapest laptop at Wal-Mart. The Media Lab dubbed the project One Laptop per Child, but everyone else knew it simply as "the \$100 laptop."

Behar was skeptical at first. And who wasn't? After Negroponte announced the plan at the World Economic Forum in January 2005, the

Negroponte originally hired to create the prototype, Boston-based Design Continuum, had run into some trouble. "We got stuck and could not rethink the basics," Negroponte says. So he turned to Behar: "Yves brought us a fresh look."

Most star designers have a signature style. Whether the product is a motorcycle or a toilet brush, they use a distinctive color palette, curve, material, or texture. "They suffer from an almost obligatory style," Behar explains. "Their work has to be like what they have done before, because that is how the product is marketed."

Behar's work is different. His massive chandelier for Svarovski - a loose tangle of organic curves hanging at JFK airport - hardly seems imagined by the same guy who fashioned Aliph's noise-

critics descended: Most scientists said a \$100 laptop was unbuildable, many development experts said it was out of touch with the needs of poor communities, and a good number of educators wondered about giving computers to kids who go without modern textbooks. Steve Jobs dismissed the idea as "a science project." Intel's chair, Craig Barrett, called it "a gadget." Bill Gates mocked the idea of its battery-charging crank. Behar saw their point. "I grew up as a designer in Silicon Valley," the Swiss-born Behar says, "but I'm not one who sees computing as the remedy for everything."

There was something about the project that appealed to him, though, something that almost sounds like nostalgia. "Computers were supposed to be a democratizing tool. You used to see that boundless optimism from Silicon Valley hardware companies. I'm not sure it's still there," he says. "One Laptop per Child is the first thing I've seen in many years that is in line with the original goal of the PC."

Now it just has to work.

**BEHAR GOT INVOLVED** in the laptop project when a Media Lab alum invited him to present ideas on next-generation computer concepts. He focused on pragmatism over high art. "This is a product that has to go into the field," he says. Meantime, the design firm



## ● Evolution of a Laptop

THE PROTOTYPE WAS DESIGNED AND REDESIGNED OVER A SEVEN-MONTH PERIOD. EARLY MODELS (FROM LEFT) HAD A POWER-GENERATING HAND CRANK, RUBBERIZED EDGES, AND A HANDLE TO PROP UP THE PC. ALL ALONG, THEY'VE COME IN AN ARRAY OF COLORS.

canceling Jawbone headset with its hard metal angles and a line of bouncy rubber clogs for Birkenstock. There is a unity to Behar's work, but it isn't about colors or materials or even genres of design. "He takes minimalism and has fun with it," says Joseph Rosa, architecture and design curator for the Art Institute of Chicago. And often that means subtle, even invisible use of experimental technology. A simple cashmere hoodie for the New York fashion house Lutz & Patmos appears almost undesigned, until you discover that it is water-resistant (Behar had each cashmere fiber coated with Teflon). Or take Behar's Leaflight, which Herman Miller released this summer. The LED bulbs along its bright face remain startlingly cool to the touch, thanks to a novel network of vents and a heat sink that took nearly four years to engineer. All that science means you can direct your light source simply by grabbing

it - an interface that humans mastered a few million years ago.

As soon as they accepted the challenge, Behar and a handful of his 28 staffers began a stretch of late nights at the studio, sketching shapes on tracing paper. They reviewed 20 or 30 models that other designers had proposed at various points in the project. They gave special attention to Design Continuum's original version, a boxy green laptop with a prominent power crank.

"There were too many parts flapping around, too many open places. It wasn't realistic," Behar says. "It should be compact and sealed, like a suitcase. And it should really look and feel different. It shouldn't look like something for business that's been colored for kids." 168>>

*Douglas McGray wrote about bupe, an addiction treatment pill, in issue 13.04. He is a fellow at the New America Foundation.*

## •The Winning Design

THE LATEST VERSION IS ROUGHLY THREE-QUARTERS THE SIZE AND HALF THE WEIGHT OF A TYPICAL LAPTOP. IT WILL SELL FOR ABOUT \$140.



- A Only 512 Mbytes of flash memory, but a mesh-networked server offers 200 Gbytes of storage.
- B Swivels to ebook mode.
- C 802.11b/g antennas have a half-mile range. A mesh network can connect kids 10 miles apart.
- D LEDs replace a fluorescent backlight. A 640x480, 7.5-inch color display switches to 1,200 x 900 monochrome in bright sunlight.
- E Rubberized plastic absorbs shock.
- F A seamless touchpad supports drawing and handwriting.
- G Custom batteries have a five-year lifespan.
- H A 366-MHz processor and 128 Mbytes of RAM run a trimmed-down version of Redhat Linux with ease.
- I The hollow handle holds a shoulder strap.
- J VoIP and Skype are built in.
- K The kid-friendly design and colors (30 initially) protect against theft.

## \$100 laptop

<< 161 (That's more than an aesthetic concern: An unmistakable, childlike design will be the laptop's only real defense against theft and resale.)

"My temptation as a designer was to explore a lot of options," Behar says. He looked into electronic ink displays, which run on very low power and could allow for smaller, lighter batteries. (The laptop must be light, since kids are meant-to carry it everywhere.) He liked the idea of a soft keyboard, connected to the screen with something called a living hinge (think of the way a cap attaches to a shampoo bottle), which would be cheap and practically indestructible. But E Ink technology is not mature enough, and kids who have no desks at school would find a floppy hinge awkward to balance in their laps. Besides, the laptop was supposed to roll off an assembly line at Quanta, the world's largest laptop manufacturer, by the end of 2006. He had to move quickly. "A lot of concept ideas I eliminated pretty early on," Behar says.

One of his first decisions was to stick all of

cover the laptop's naked ports.

"Everything on the laptop serves at least two purposes," he says.

**IN MARCH, BEHAR'S TEAM** presented two models to the One Laptop per Child panel of researchers, engineers, and former Media Labbers. Members of the Design Continuum team also presented two versions. Only one design would survive to a final round of revisions. After Behar showed off his work, he wandered out to the hall for a glass of water. Fifteen minutes later, he walked back into the room and was greeted with a round of applause.

They picked the Blue model, the one with the ergonomic tilt. But its triumph was brief. To get 12 hours of power and a five-year lifespan, the battery had to grow by 50 percent, and it no longer fit under the keyboard. Behar tried using two smaller batteries, even turning the handle into a battery, but nothing worked. A month later, in late spring, Behar ditched the Blue model and went back to work

## Early models were powered by hand crank. Other options: foot pedals and a rope tug.

the computer's guts behind the display, like an iMac, instead of beneath the keyboard. That simplified the wiring (the motherboard and display no longer had to communicate through a fragile hinge) and cut costs, but also made the machine top-heavy. So he came up with two fixes: One model, codenamed Blue, had the battery beneath the keyboard to give the laptop a nice ergonomic tilt and act as a counterweight to the heavy display; another, codenamed Yellow, was propped up by a sturdy handle behind the keyboard.

Figuring out how to protect everything from dust and moisture was harder. Behar replaced the traditional keyboard on Design Continuum's model with a sealed rubber one and built a sensor right into the palm rest to eliminate the seam between it and the trackpad found on a regular laptop. Other problems: The USB ports were exposed to the elements, and a pair of radio antennas had to stay outside the machine. (The Media Lab wanted the antennas to have a half-mile range for building a city- or village-wide mesh network, with each laptop acting as a node.) Solving one problem solved the other: Behar turned the antennas into a pair of playful "ears" that swivel up for reception or down to

on a version of the Yellow one.

Behar's crew also discovered that putting a crank on a laptop - the most distinctive feature of nearly every design so far - was a bad idea. If the user gripped the laptop with one hand and the crank with the other, the whole thing would shake with each whirl, wasting muscle power and putting too much stress on the hardware. Other design firms are working on a foot pedal, a kind of rope tug, and a more efficient crank built onto an AC adapter.

All the while, Negroponte has been relaying feedback from around the world, trading emails with Behar in the middle of the night. "The Brazilians wanted a bigger display, and we did that," Negroponte recalls. "The Thais wanted a taller touch tablet" - big enough so kids could write on it in tall Thai script - "and we did that." And everyone, it turns out, is a decorator. "Color is a time sink in conversations," Negroponte says. "Nigeria has asked for it to be in their national colors."

Negroponte has promised to ship millions of laptops around the world. If it succeeds, Behar's design will become an icon. If it fails, it will be something more like the first English-Esperanto dictionary - an

artifact of ill-fated idealism. The project's transparency, part of Negroponte's insistence on open source development, amplifies the pressure.

"With the Leaf light, we were left in peace for four years," Behar laughs. "If something horrendous had happened or it got canned, nobody would have known." With the laptop, every misstep becomes public.

Behar thinks the laptop project is more pragmatic than his skeptics realize. "There's a criticism that comes up," he says. "I think it's the stupidest argument: Send kids food, send them water." These critics, he says, imagine all the developing world to be a famine-stricken village in Africa. "This is the typical ignorance of the West. There are different conditions in different places," he says. "And there are a lot of places where kids are not starving, where kids want to learn more than anything else."

Then there are the critics who believe the project requires villagers to run a Ti line into the center of town. It doesn't. In fact, many laptops will go to areas with no Internet access. "Our emphasis is peer-to-peer," Negroponte explains - connecting kids with each other over the mesh network, and offering schools a \$100 server packed with 200 gigabytes of educational material. If every textbook resided on a server, a country like Brazil would save roughly \$20 per kid per year (minus the cost of licensing). When fast Internet access becomes more widely available, the laptops will simply become more valuable. "Let's not wait," Negroponte says.

As of early summer, One Laptop per Child was negotiating with many potential buyers - Argentina, Brazil, China, Egypt, India, Mexico, Nigeria, Thailand, and countries in Central America - some of them close collaborators in the design. But none of them have committed to the minimum purchase of 1 million laptops, at a cost of about \$140 each (Negroponte expects the price to drop to \$50 by 2010). Which means the program is a long way from Negroponte's self-imposed minimum of 5 million laptops, expected to ship at the beginning of next year. "What happens if we get only 1 million?" Negroponte says. "We delay launch until we have enough."

But Behar has become a believer - and he's not the only one. Intel is showing off a \$450 education laptop, and Bill Gates has proposed plugging cell phones into televisions as a way to bring computers to the developing world. Competition is a welcome change from the eye rolls of a year or two ago.

"It's like there's this virus of cheap laptops," Behar says, laughing. "That's what happens when you plant an idea."