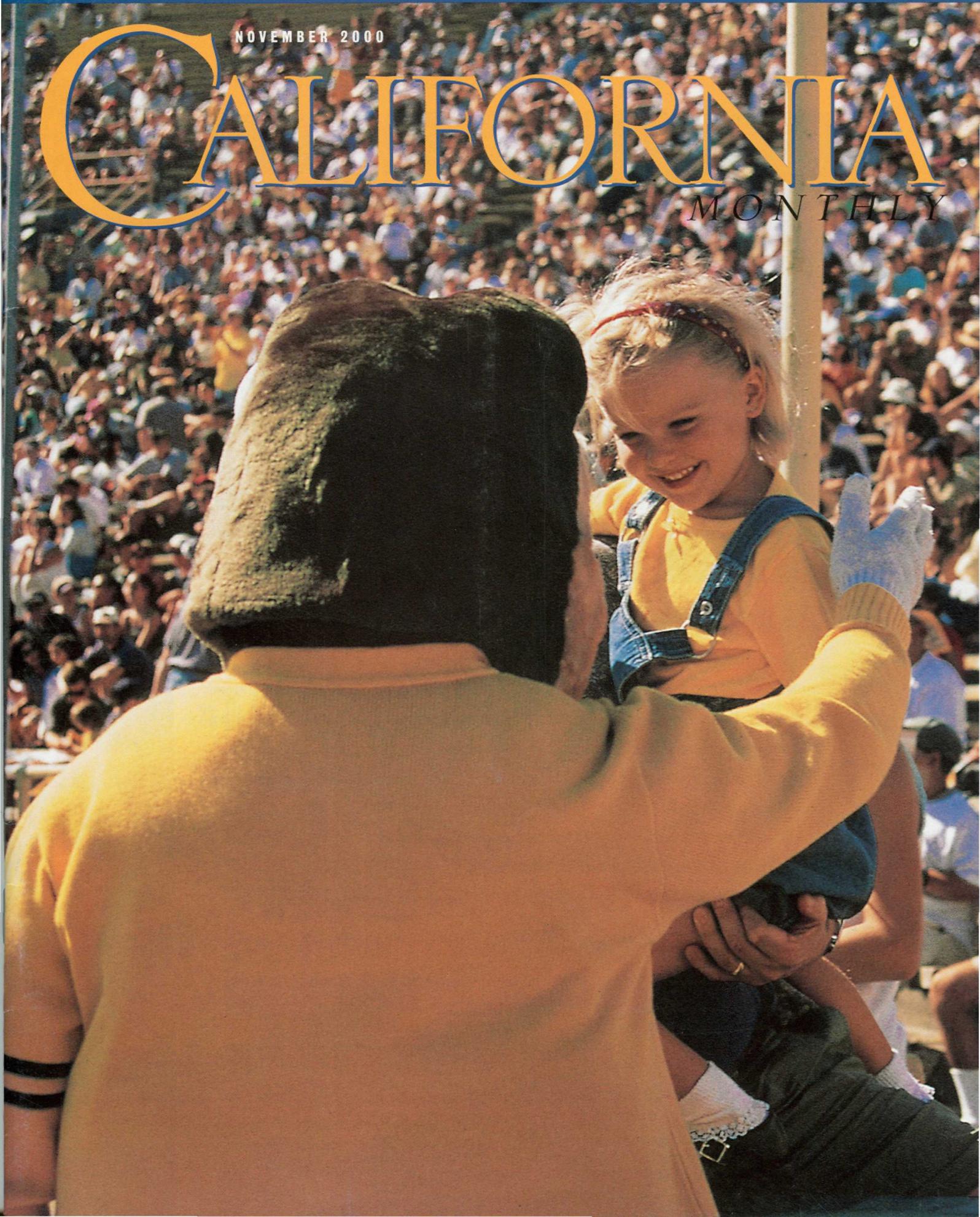


The nature of beauty | Building the Big C | The robot in the garden

NOVEMBER 2000

CALIFORNIA

MONTHLY



CONTENTS

NOVEMBER 2000
VOL. III, NO. 2

California Monthly

The magazine
of the
California Alumni
Association



Chiura Obata's *Lake Basin in the High Sierra*, ca. 1930 (see page 26)

- 18 Building the Big C** BY STEVEN FINACOM
That letter on the hill was not constructed without some spirited debate on campus and between town and gown.
- 20 Bygone Berkeley** BY JOE ESKENAZI '98
A recent book explores the town of Berkeley in 1900, while another tells tales from the Elmwood.
- 23 Planting seeds of doubt** BY AYALA OCHERT
Mixing art and technology, associate professor Ken Goldberg wants to facilitate the resumption of disbelief.
- 26 The nature of beauty** BY PATRICIA CAMBRON
A retrospective look at the life and work of artist and influential Cal teacher Chiura Obata.
- 28 Q&A: A Conversation with Laura Nader** BY RUSSELL SCHOCH
An anthropologist urges us to challenge the assumptions that guide our lives. For her, it's a family tradition.

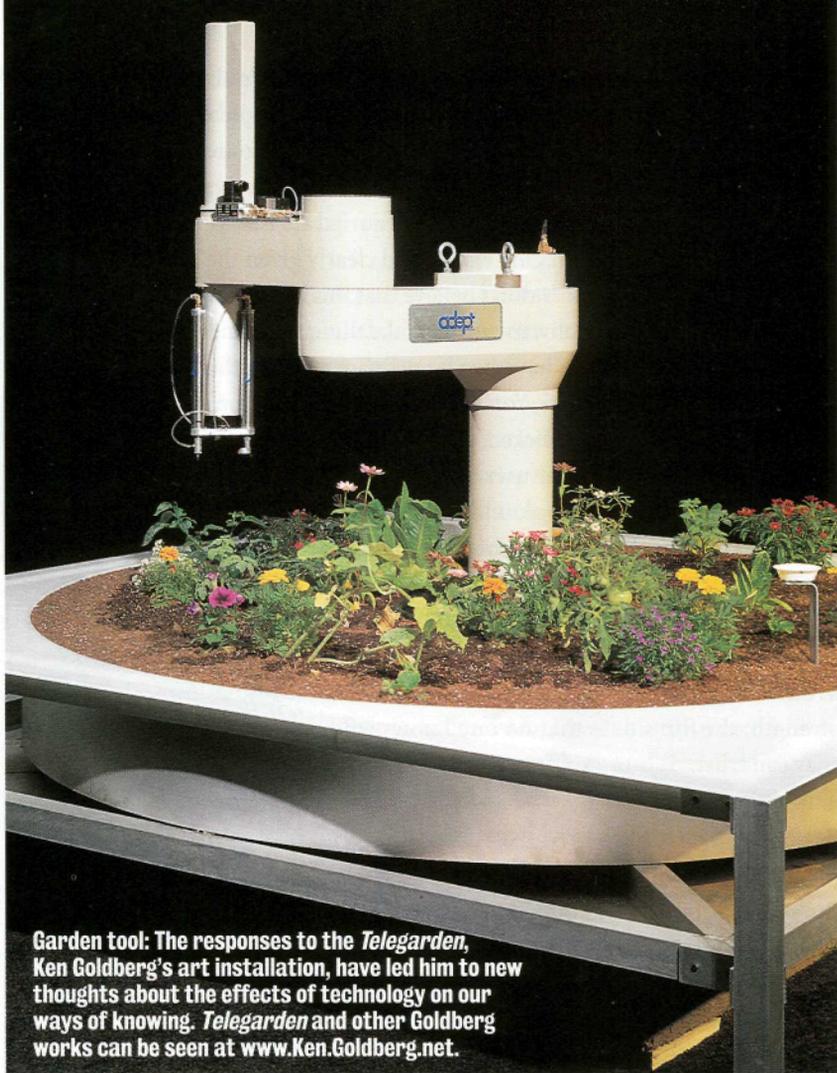
Departments

Letters	4
Twisted Titles	7
A Personal Essay	11
Talk of the Gown	12
Alumni Almanac	34
Recalling Cal	36
Calendar	37
Keeping in Touch	38
In Memoriam	52
CalZone	56

Cover photograph by
Diane Wondolowski '86

FIVE YEARS AGO, Ken Goldberg placed a webcam mounted on an industrial robot arm in the middle of a small plot of earth. He invited people to connect via the Internet, using the robot arm to dig, plant seeds, water seedlings, or just look around. He was trying to be ironic. "A garden is meant to be a refuge from technology. Robots are meant to go into places that are dangerous—places we don't want to be. So sending a robot into a garden is probably the most absurd application of telerobotics," says Goldberg, a Berkeley associate professor of engineering who is best known off campus for his telerobotic art. The *Telegarden*, says Goldberg, is a metaphor for the deepening intrusiveness of technology, in particular the Internet.

So he was surprised and perhaps a little chagrined when visitors to the *Telegarden* apparently missed the irony. Most visitors seemed to relish the idea of tending a garden thousands of miles away. And art critics were fascinated by the virtual community of gardeners that sprouted up around the *Telegarden*, now physically located in the Ars Electronica Center, a museum in Lenz, Austria. Goldberg had included a "chat" facility on the website so that members could communicate about how to manage the garden, and laid down a few simple operating rules. Individual members were limited to planting three seeds in any one season, and were respectfully asked not to place their seeds too close to other plants, and also to take care not to trample the garden with over-enthusiastic movements of the robotic arm. Soon, a self-governing community developed which came to be seen by many as a model society, an exemplar of sustainable, ecological living. One critic called it "a subtle rumination on the nature of the commons." Another felt that the *Telegarden* offered "a search for the soul of gardening...it engenders a Zen-like appreciation for the fundamental act of growing."



Garden tool: The responses to the *Telegarden*, Ken Goldberg's art installation, have led him to new thoughts about the effects of technology on our ways of knowing. *Telegarden* and other Goldberg works can be seen at www.Ken.Goldberg.net.

But this almost universally positive reception wasn't the only surprise to Goldberg. In place of the critique of the uses of technology that he had hoped for, a new and unexpected kind of skepticism emerged. Some visitors to the garden began to question whether what they were seeing was indeed real. After all, how could they be sure that there really was a robot, really was a camera, really was a garden? They began to speculate that the whole thing was just an elaborate hoax. One visitor wrote: "I get it now. This is an intelligence test. How long can people be fooled by computer simulations? How long will they keep pushing a button to pretend-water a pretend plant?" And then, gleefully: "I pass [the test]. Do I win something?"

PLANTING SEEDS OF DOUBT

The ROBOT in the GARDEN

BY AYALA OCHERT

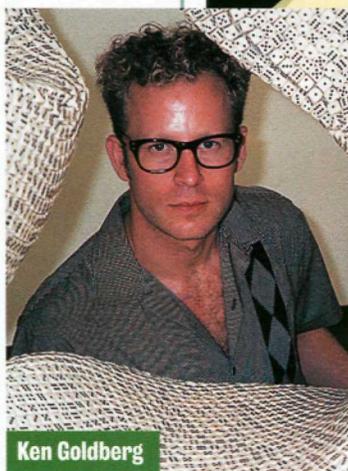
This wasn't the first time that people had expressed doubt over the authenticity of Goldberg's art. A year earlier, he completed the *Mercury Project*, which included the first robot ever to be controlled over the Internet. Visitors to the installation directed the robot to dig in a box of sand in search of "buried treasure," but a handful were unconvinced. One visitor had clearly given the matter a great deal of thought: "I don't believe that this is real. It would be easy, at least conceptually, to entirely fake this site. What I suspect is going on is that you have two large images, one of the dirty site, and one of the clean site. You only transmit the portion of the image near where the user clicked, and you alternately return portions of the clean image if the user has blown air in the vicinity."

Such concerns were not groundless. Of the thousands of webcams that have proliferated on the Internet in recent years, many have turned out to be hoaxes. "You don't need a broadcast license to set up a webcam," Goldberg points out, noting that while a lack of institutional authority on the Internet may be its greatest strength, the flip side is that no one knows who they can trust.

WHILE HE HAD PLANNED TO USE HIS ART TO GET people to question technology, Goldberg instead found himself forced to question the very basis for knowledge itself. After the *Telegarden*, he embarked on his own personal exploration of skeptical doubt, and an inquiry into "telepistemology"—his own term for the study of knowledge acquired at a distance, especially through telerobots. "I realized that the questions I was interested in have a long history in philosophy," says Goldberg, who presents the insights that he and others have so far gleaned in his new book *The Robot in the Garden* (MIT Press).

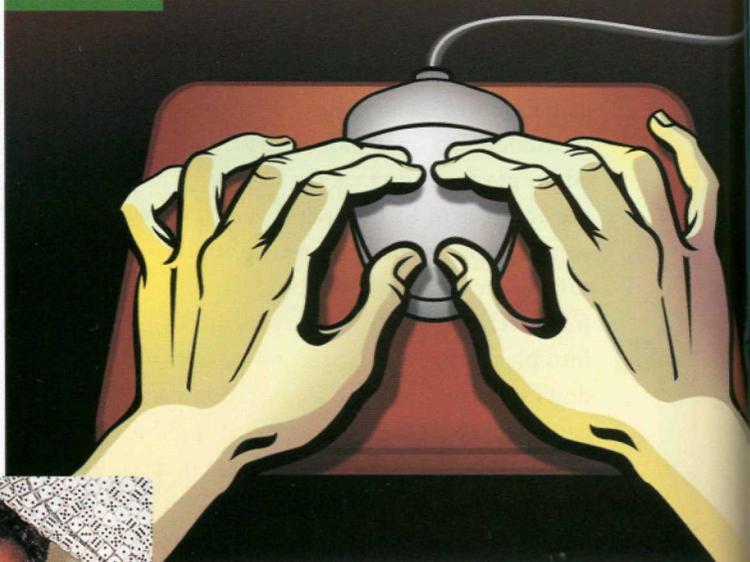
Goldberg's day job is associate professor of industrial engineering and operations research, where he specializes in the design and manufacture of industrial robots. He's always been an artist, he says, but a decade ago his two worlds were brought closer together. "I realized that the natural tool for me to work with in my art was the robot," recalls Goldberg, and so began his robotic installations. But frustration soon set in. Despite months of hard work on each installation, only a few dozen people ever got to see them. That's when he decided to put his art online. "It seemed like the perfect solution. Rather than bring Mohammed to the mountain, I would bring the mountain to Mohammed," he explains.

The strategy paid off. In the five years it has been running, more than 20,000 members have signed up to play in the *Telegarden*. And Goldberg's telerobotic art has won critical acclaim. Earlier this year, Goldberg's latest work, *Ouija 2000*, was included in the pres-



Ken Goldberg

OUIJA 2000



tigious New York Whitney Biennial, a showcase for the country's best new art. Originally commissioned by the Berkeley Art Museum, *Ouija 2000* is a playful attempt to make people confront their beliefs about technology.

A webcam is placed over a traditional Ouija board, and a planchette (pointer) is mounted on a robot arm. Frivolous questions are chosen randomly by a computer, such as, "Will [player's name] achieve great wealth in 2000?," and the players "follow" the movement of the planchette until it finally rests on the Yes or No. Because the robot averages the movements of all the players, the planchette appears to have a mind of its own, as if moved by a spirit force—the "ghost in the machine," as Goldberg likes to call it.

In *Ouija 2000*, Goldberg's art and his engineering have never been so close. But while his art has evolved, one theme has remained constant—the critique of public perceptions of technology. "Media technology generally facilitates the suspension of disbelief," he claims. "I'm trying to facilitate the resumption of disbelief."

This foray into telepistemology has served to broaden Goldberg's definition of skepticism. The question is not just whether a technology is good or bad for society, but how we can trust that we are not being deceived, and the more philosophical concern over whether instruments reliably represent the world. Observing that the most skeptical in his audience also turned out to be the most engaged with his art, Goldberg decided to turn this latent skepticism to his advantage, toying with it in his *Dislocation of Intimacy* (1998). Gallery visitors to this installation see only a large, black, steel box. But Internet visitors are shown—purportedly—the inside of that box. They are given the choice of turning on or off any combination of five light

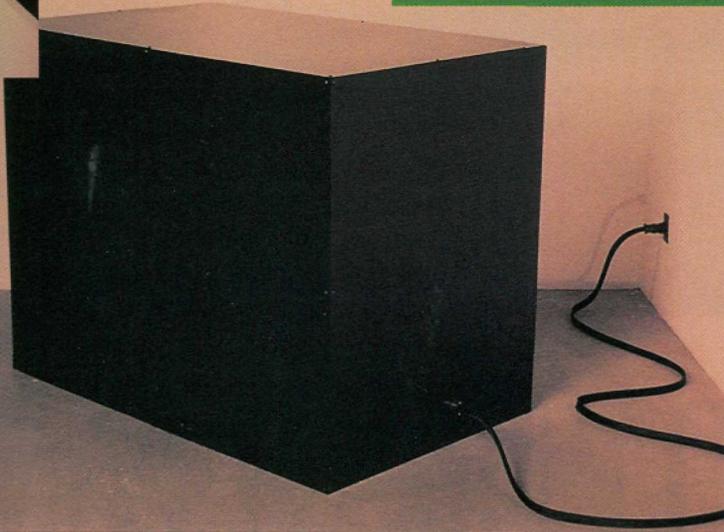
'Media technology generally facilitates the suspension of di

sources placed strategically around the box's interior, and are rewarded with a snapshot of its contents.

A murky image created out of fuzzy shadows and diffuse light deliberately goads the viewer into questioning its authenticity. In the process, Goldberg hopes that *Dislocation of Intimacy* will provoke skeptical doubt in his audience and cause them to ponder, as he has, questions of epistemology—how we can know anything, especially on the Internet, where our perception is so heavily mediated by intervening technology.

His own ponderings on these questions led him to the writings of 17th-century philosopher René Descartes. In his pursuit of “certain knowledge,” Descartes argued that visual perception could not be trusted, since we could never be sure that we weren't

DISLOCATION OF INTIMACY



dreaming or experiencing an illusion. Taking his argument to its logical extreme, Descartes concluded that he had no way of knowing that he was not a “brain in a vat,” the entire external world fed to him by some evil demon. “The only thing that I can be sure of,” he famously determined, is: “I think, therefore I am.”

Such radical doubt has rarely been matched since, but for 300 years philosophers were preoccupied by skepticism. In the 20th century, epistemology fell out of favor, but Goldberg is unperturbed by its unfashionable status. Not only has Descartes become something of a hero for him, he hopes to see a revival of epistemology. Goldberg was especially thrilled to discover that Descartes's own doubts were prompted by the introduction of the telescope; Goldberg immediately saw the analogy with his own tele-technologies.

“The telescope caused this fairly radical sense of skepticism that led Descartes to question things much more broadly. That kind of doubt and skepticism has had a tremendous influence on our modern culture. You might argue that the whole scientific method

grows out of that impulse,” argues Goldberg. “So what I was really excited about was that technology is introducing a new set of experiences that might reinvigorate that kind of skepticism. Now anyone with an Internet connection can experience something akin to what Descartes experienced,” he enthuses.

EARLY ON IN HIS INQUIRY INTO TELEPISTEMOLOGY, GOLDBERG WENT to his shelf and pulled down a book that had sat there for more than a decade. The book, *What Computers Can't Do*, written by philosopher Hubert Dreyfus in 1979, strongly shaped Goldberg's thinking. When he turned to the dustjacket and discovered that its author was a professor at Berkeley, he says he nearly fell off his chair. He was doubly surprised to learn that the author was the brother of Stuart Dreyfus, a colleague in his own department, and well known to him. The next day, Goldberg tracked Hubert down, and the three of them went to lunch.

Goldberg reverently refers to Dreyfus, a world-renowned scholar of Heidegger, as “one of the greatest minds on campus.” In turn impressed by Goldberg's enthusiasm, Dreyfus encouraged him to produce his new book on telepistemology and telerobotics, *The Robot in the Garden*. “Berkeley is a great environment for letting you explore. It fosters experimentation and crossing over boundaries,” says Goldberg of the experience. “The fact that I can walk in and sit down with one of the greatest scholars in the world, Hubert Dreyfus, and he'll listen—that's what I like about Berkeley.”

Goldberg's knack for rallying support and assistance, so crucial to his art, was also invaluable in putting his book together. His ideas have captured the attention of scholars from engineering, philosophy, and art who, like Dreyfus, contributed articles to the book. Among the book's contributors are Martin Jay, chair of Berkeley's history department, and Goldberg's colleagues in the engineering department, professor John Canny and graduate student Eric Paulos.

These last two are developing telerobots that will make online communication more natural by simulating non-verbal communication cues, such as gaze, gesture, and physical proximity, which are lost in cyberspace. As such technologies take hold, ordinary people will find themselves interacting with the world ever more through high-tech instruments. “Technology is going to penetrate much further than it has before,” Goldberg says. “We are in danger, as we get more and more complicated instruments, of believing the products of these instruments without question.”

If the *Telegarden* is anything to go by, the danger is very real. The vast majority of its visitors don't question the ironic placement of a robot in the garden; those who do question this intrusion go to the opposite extreme—they suspect they are being manipulated. Those unexpected reactions have led Goldberg to propose a better response: the skeptical detachment of the scientist. ☹

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