SPOTLIGHT

Wrestling with the Real:
the Art of Ken Goldberg

By Joe Ferguson
Contributor

Traditionally, philosophers wrestled with profound questions of existence, while scientists seemed content to measure, test, and calculate. As the domains of science and technology grew, however, questions about the fabric of what we perceive as reality expanded beyond the linguistic inquiries of philosophy and landed in the hands of scientists, mathematicians, and engineers. With the development of the Internet, the conundrum of what is real increased exponentially—a fact made irrevocably clear in 1995 with a landmark piece of interactive Internet art by engineer and artist Ken Goldberg.

In *Telegarden,* thousands of users logged on through dial-up modems to employ a telerobotic arm to plant and water seeds in a seemingly real but distant physical space. With this piece, the Internet became more than just a communication technology or voyeuristic pursuit—participants could interact with technology in ways that affected the real world. An issue with projected virtual environments, however, is that they lack proof of their existence. In other words, the viewer is left to wonder, "Is this real?" When viewers confronted Goldberg about the existence of his artwork, he realized a fusion of science and philosophy was needed to answer their questions. He ended up coining the term 'telepistemology' and then editing a book on the subject.

Goldberg remains fascinated with the essential epistemological question of reality, and has addressed it in other works such as *Bloom*, *Mori*, and the upcoming *Wow* and *Flutter*. In these works he employs telepresence—the idea that something is happening live in one place, but is visualized in another. Seismic data from the Hayward fault line is converted to animations that can be viewed in a gallery, museum, or online. Though viewers are told the animations represent live data, they are left with no real proof that the data is live or that it exists at all. These works raise important questions about the veracity of mediated information in the Internet age.

Goldberg's most recent work is a departure from his high–tech legacy. In *Body–in–White* he invokes ancient


Ken Goldberg. Photo credit: Eric Rorer.

Mori (1999-ongoing). Internet-based earthwork. By Ken Goldberg, Randall Packer, Gregory Kuhn, and Wojciech Matusik. Image courtesy of the artist. Photo: Jared Charney

The Telegarden (1995-2004). Networked art installation at Ars Electronica Museum, Austria. Co-directors: Ken Goldberg and Joseph Santarromana. Project team: George Bekey, Steven Gentner, Rosemary Morris Carl Sutter, Jeff Wiegley, & Erich Berger. Photo credit: Robert Wedemeyer

Body-in-White A & B (2015). By Ken Goldberg and Stephen Antonson. Images courtesy of the artist.
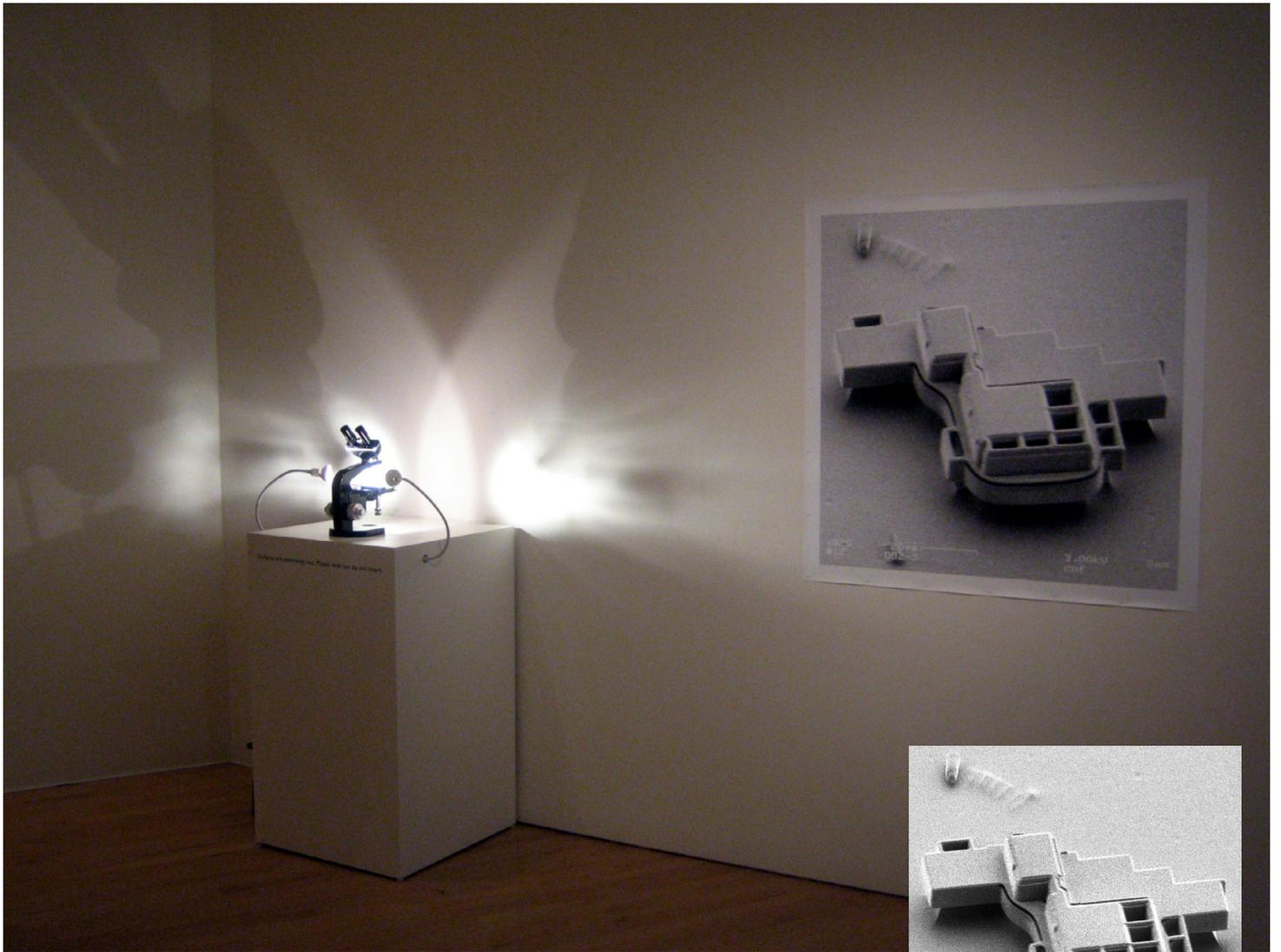
(above and right): flw by Ken Goldberg and Karl Bohringer. A 1/1 millionth scale model of Frank Lloyd Wright's Fallingwater, fabricated from silicon using ultra high precision lithography. Installed at San Jose Museum of Art, 2006. Image courtesy of the artist.

Greek statuary; but instead of anthropomorphizing heavenly deities, he presents us with a classical-looking robot arm. This piece is a sculpture in plaster of Paris of the PUMA—Programmable Universal Machine for Assembly—which was developed in the 1970s and used by General Motors. The work not only addresses the pervasive history of robotics in American consciousness, but also raises ideological questions about technology's invasive role in contemporary culture and presages a possible future in which society believes the generous hand of benevolence comes not from above, but from the outstretched arms of our own creations.

Technology, science, and art are no longer separate domains—they are contributors to a culture as a whole. Historically, artists attempted to interpret cultural happenings in ways that raised questions about technology's seemingly heedless progress. Now, however, we are in the age of the scientist-artist—artistic interpretations are coming from within the technology and scientific sectors. Ken Goldberg is a formative figure in that development. Though he travels frequently to discuss art, robotics, and technology, he sat down with us in his University of California, Berkeley office to answer some questions.

Joe Ferguson: *You're an engineer. What drew you to the arts?*

Ken Goldberg: My first love was art, but my family didn't think that was practical. My mother said, "You can be an artist after you're an engineer." I took her advice and it gave me a valuable perspective on making art.

Art is as deep and as disciplined a field as engineering or science. I have a very strong respect for art's complexities and nuances. To make a contribution in art requires an enormous amount of hard work—experimentation, problem solving, awareness of prior work. All the things

that are involved in doing good research in the sciences are also needed to make good art.

JF: *Is there something the arts bring to the sciences?*

KG: Artists don't like playing by the rules. As an artist, I can challenge conventional wisdom.

JF: *This is the 20th anniversary of* Telegarden—*a landmark work for Internet, interactive art. How did this piece come about?*

KG: I was doing scientific research based on manufacturing—grasping, geometry, and control for robotics—and we had a few robots in the lab for experiments. I was using robots to paint—essentially exploring their weaknesses. I was told by a colleague that art was not going to be taken seriously and that it was not a good use of my time. So I went underground and stopped talking about it. When the World Wide Web came out in about '93, I realized it could be used to make an art installation for a very large audience. I was really interested in the idea that you could put something online and people could experience it from anywhere in the world.

At the time, you could look at images and text online, but you couldn't interact with the physical world. There were some webcams and things like that, but they were all passive. Then we—my colleagues and I—started thinking: "We have a lab, and we have these robots… could we combine these with the web?" That's when we came up with the garden.

We built the planter with soil and irrigation, and then we built the robot and user interface for the web. I believe this was the first web–based system where you could actually do something versus just looking. People would have to actively tend their plants. They could act on this world and see the results.

JF: *Why do you think there was so much enthusiasm? Why do you think 100,000 people logged on? Was it novelty or something else?*

KG: It was somewhat the novelty, but more significantly I think it was the contrast between a very natural kind of environment and a digital one. We humans have very fundamental relationships with plants. A garden is interesting because it is something that is controlled as opposed to the wilderness.

There was also a social aspect of *Telegarden* that was unique at the time. The majority of people would go and just sort of look around, but there was also a smaller number that would actually spend significant time on the site. My sense from reading the logs—there was an early form of a chat room there—was that there was a kind of very sociable, supportive interaction taking place. It became a community garden.

JF: Telegarden *was based in telerobotics. What is telerobotics?*

KG: It's the ability to control a machine, a device, or a robot over a distance. In one sense, something like a radio–controlled car is an example of a telerobot. It's important to make the distinction between a robot—which in its purest form is operating autonomously, there is no human in the loop—versus a telerobot where a human is essentially driving. Telerobotics has been used for a long time in areas and situations where there is danger, like handling nuclear materials or defusing bombs, undersea exploration, and in space. With *Telegarden*, I believe we were the first to develop a telerobot that the public could operate.

JF: *Is there something collaborative occurring between the person and the telerobot?*

KG: I don't think of the robot as a collaborator, not creatively. Sometimes you see an article that states that a robot has written a piece of music or a poem. When you dig into that, it generally means that someone has programmed a bunch of rules and patterns—some fugue style, for instance, and the robot's generated a composition that sounds like a fugue.

I think of the robot as the subject. Machines are the focus of my art, but I don't think of them as having any volition or any consciousness. As an engineer and artist, I feel a responsibility to be a critic of the exaggeration and hype around technology.

JF: *Your early works dealt with telerobotics, but you've also made works that address telepresence—the idea that something is happening live in one place, but is being related somewhere else. Was there something that led you in that direction?*

KG: There was an issue that came out of *Telegarden* in which a student asked whether the garden was real. This caught me completely off guard. To some degree this is an ancient question, "How do we know that we're not all dreaming?"

I started having regular meetings with Hubert Dreyfus, a philosophy professor here at UC Berkeley. We developed what we call 'telepistemology', or the study of knowledge at a distance. Some might argue all epistemology is telepistemology, because there is always some distance between you and the real world.

I spent a lot of time thinking about the nature of knowledge at a distance. I wrestled with the question of how things may appear one way—especially when they're mediated—and how you navigate that and how you establish confidence and trust. These are issues that I think are very relevant today. I eventually edited a book on the subject titled *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*.

JF: *And these ideas were the impetus for* Mori *and* Bloom?

KG: Exactly. I started with *Mori*, and then *Bloom*, and now I'm working on a new version called *Wow* and *Flutter*.
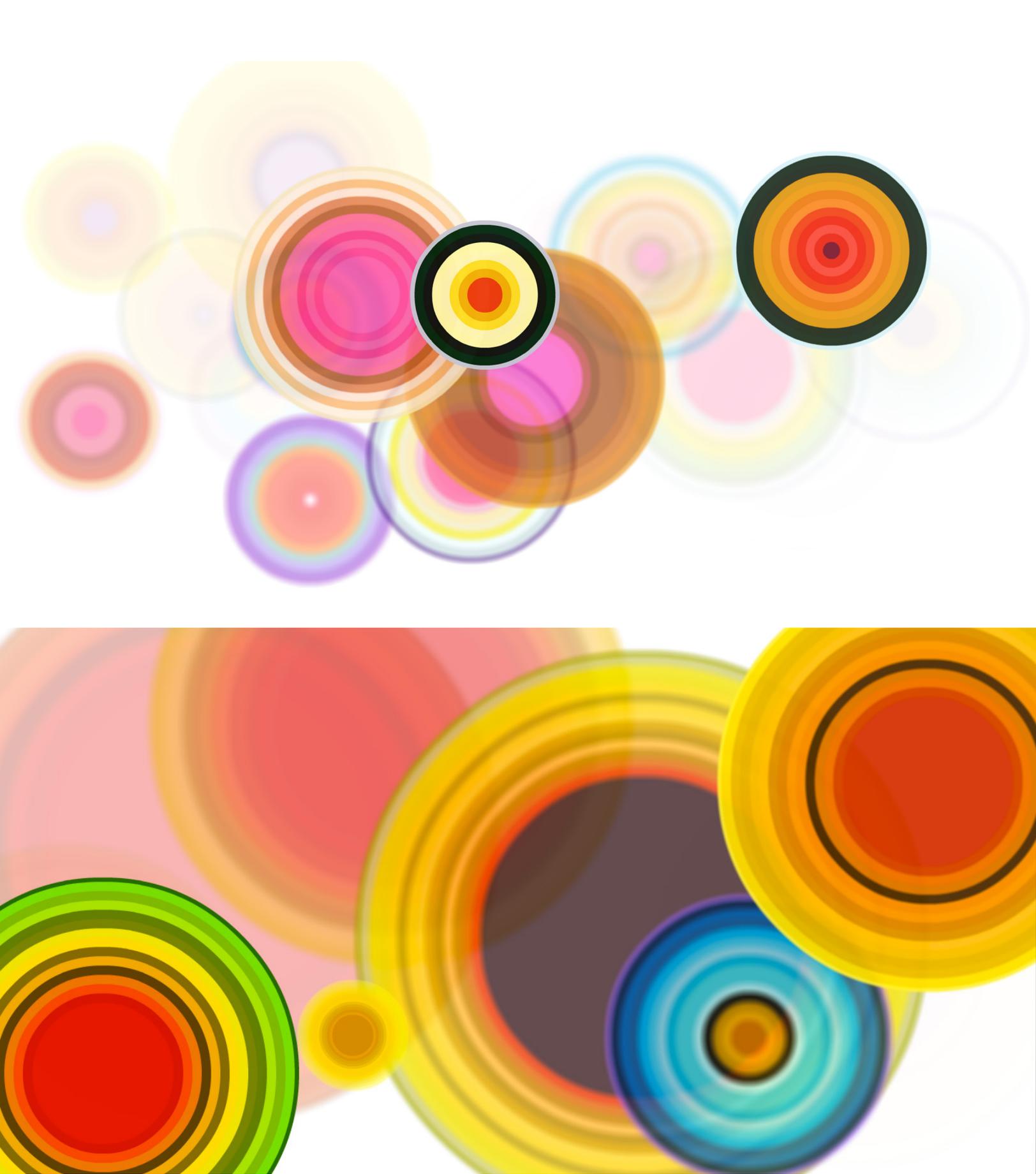
Bloom *by Ken Goldberg, Sanjay Krishnan, Fernanda Viegas, and Martin Wattenberg. Screen captures. Images courtesy of the artist*

The idea was to take a live signal of seismic data from the Hayward Fault and use it to create a live immersive visual or acoustic experience. In *Wow* and *Flutter* we're working to evoke droplets of water.

These works ask an existential question: "Could this be a recording...am I just looking at a loop?" It's the same with *Telegarden*. The difference between fiction and reality is what I'm trying to challenge.

JF: *Interactivity is an increasingly popular aspect of tech art. What are your thoughts on that?*

KG: I think there is a danger of easy interaction. The fact that you just move and something responds to you gets old very quickly, it felt like a gimmick in the early stages. It was enabled by computing and sensing technology, but it got played out too much.

Interactivity is a tricky word. For instance, when you walk into a room and see a painting that you've never seen, you sit down and study it and when you walk out it's a different painting to you. That's an interaction, too—you've interacted with the painting visually. It doesn't have to actively move and respond to your body moving.

It requires a fair amount of discipline and dedication to understand a piece of art. You can't just expect to walk in and get it instantly. You have to know its history, what it's referring to, and that takes a bunch of speculation and creativity on your part. You have to figure it out. Whether it's a piece of interesting engineering or art, you have to work at it.

JF: *There is a long lineage of aesthetic critique for traditional forms of art like painting or sculpture. Without that history, is it more difficult for viewers to relate to tech art?*

KG: When it was all brand new, perhaps it was more difficult to understand. My sense is that this form of art and the standards for evaluating it are evolving. There are writings and books that are developing a critical vocabulary for media and digital art.

It's like mathematics—it's a language, but you have to spend time with it in order to learn how to read it. This is also true for art, whether it's classical painting or aboriginal art or abstract expressionism. If you just walk up and see a painting, it can be difficult to figure out why it is hanging in this gallery or museum. You have to spend time looking at it and a lot of other paintings to figure out why this one is important. It's analogous with tech art.

What I'm always looking for is what can a work of art express that couldn't be expressed before. That's the fundamental question that applies to any work of art, classical or new media. When I look at something new I have to ask myself, "what is it trying to reveal that I've never seen before?"

JF: *Are the objectives of tech art different than those of traditional art?*

KG: If you think about Warhol or the Happenings or Fluxus, there was a real attempt to jar people out of their comfort zones. That wasn't the focus of most classical paintings.

What I'm interested in is creating something that disrupts the viewer's expectations. That's my goal as an artist—I want people to rethink their relationships with technology.

JF: *One of your newer pieces bridges the divide between classical and tech art. Tell us about* Body-in-White.

KG: I'm very excited about that piece. It's a collaboration with Stephen Antonson. It's a life–sized sculpture of a classical robot arm. It doesn't move—it's not interactive in that sense. It is based on the Pygmalion myth—the Greek sculptor who fell in love with a statue he had carved. Stories from *The Golem* to *Frankenstein* to *Ex Machina*—they're really the Pygmalion myth in different ways. The piece captures that this idea is rooted in a history that goes back long before robots.

Body-in-White is an experiment. Many times these things turn out differently than what I anticipated. It's somewhat true of research, too. You don't know what's going to make an impact. It's really hard to recognize that at the time.

JF: *As someone rooted in the two seemingly disparate camps of science and art, how would you recommend people from these two disciplines approach each other's work?*

KG: The divide between the two cultures—science and the humanities—is still very wide. It's not surprising if you consider the roots of the words science and art. Science comes from the Latin word *scindere*, which means to cut, so it's about cutting things up in order to understand them. That's the reductionist model. Art, on the other hand, comes from the word *ars*, which means to join, so it's about putting things together. Art and science are duals of each other. I think the attempt to say they are the same is erroneous. They are really two fundamentally different ways of looking at the world. There's a lot to be gained, however, by the friction that results when you put those two into opposition.

It's important that the art world not view scientists as ruthless agents trying to build the next scary machine. Most scientists are very concerned about morals, ethics, and humanity.

And scientists could develop a deeper respect for art and its nuances. You can't judge what you first encounter by what you see on the surface. It takes a very different mindset and a lot of time to understand the products of artistic creativity. My impression is that as digital technology becomes easier to use, a new generation of students is emerging that are comfortable crossing that divide. ◐