

# CAREERS

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SEMICONDUCTOR



Joe Gerhardt, one-half of the UK artist duo Semiconductor, explores the archives at CERN with archivist Anita Hollier as part of the COLLIDE initiative.

## ART-SCIENCE COLLABORATIONS

# Change of perspective

*Pick up a lump of clay or stare at a Leonardo water drawing — your science, not just your frame of mind, will benefit from it.*

BY SHEILA MULROONEY ELDRED

After earning her PhD in Earth and planetary sciences, Johanna Kieniewicz found herself in a coveted tenure-track job. But as she dug more deeply into her work, she felt her field of vision narrowing — and not in a good way. Extreme focus left her worried that she was stifling her creative side.

“With the intensity of those sorts of jobs, it becomes all that you do,” she says. “I was in danger of losing the bigger picture.” To re-engage with her artistic side — she had always had a penchant for drawing and making things with her hands — she took a leave of absence and

went to art school. There, she came to realize how skills taught in the art world could influence science. Asking difficult questions about purpose and ethics, or imagining both fantastic and terrifying futures, helps scientists to put their work in perspective, she says. She used her art experience to nab a dream job as head of outreach and engagement at the Institute of Physics in London, where she coordinates with art museums and theatres to pull the public into conversations about science. “Ultimately, both artists and scientists are asking big questions about the world,” Kieniewicz says. “A lot of rich and exciting stuff is happening between them.”

Although Kieniewicz took her affinity for

art to the far end of the spectrum, attending art school is hardly a prerequisite for those who hope to expand their scientific horizons and frame an experiment differently or get past a sticking point. Even a rudimentary interest in art can help to shift a researcher’s perspective. Routes into the realm include creating your own art, collaborating with artists and viewing art that resonates with you.

Making art can be very helpful for scientists when they are failing to make progress. “Sometimes you have to dive in deeply, but sometimes you’re stuck and have to get unstuck,” says Robbert Dijkgraaf, director of the Institute for Advanced Study in Princeton, New Jersey. ►

► He advises his students to engage in some form of art when they encounter seemingly insurmountable obstacles in their research.

Cancer researcher Silvia Balbo relates to that recommendation. She has access to an art studio for precisely that purpose. It's been her escape ever since she took a sculpting class in high school in Turin, Italy. "Whenever I feel like things are stuck, I go back to it," she says. She made use of the studio many times during a particularly gruelling three-year project on how tobacco smoke and alcohol damage DNA and contribute to cancer.

Balbo would often head, exhausted, directly from her lab at the University of Minnesota in Minneapolis to the studio. "I'd be super tired, but I'd get there and then suddenly feel super energized," she says. "On those days where you feel like you haven't accomplished anything, it's nice to get a feel for making something. I picked clay because it's constructive: all of a sudden, I have a piece. That immediate outcome is very rewarding."

Clay modelling also gives her a chance to turn off the structured, analytical part of her brain, she says, and allow intuition and creativity to take over. Often, she leaves the studio with a fresh outlook on a knotty experiment. "I'll get out of there and realize, 'Oh, I had not thought of it in this way before,'" she says.

Over the course of that project, Balbo sculpted, fired and glazed four pieces: nude women in various languid postures drenched in streaks of blue glaze that she now displays in her home. Ultimately, her team had a breakthrough, and published the findings. In addition to unlocking new ideas in the lab, she credits the sculpting with helping her to stay on track. "It's very energizing to have a peek into the art world and recharge your batteries," she says.

### EYE OF THE BEHOLDER

The pay-offs of art involvement need not come just from creation. Simply looking at it can also bring benefits: gazing at other people's creative endeavours can help scientists to find inspiration and come up with new approaches. Chemist Catherine Murphy at the University of Illinois at Urbana-Champaign is drawn to close-ups of natural objects, the bright colours of inorganic compounds and the brilliant hues of gold nanomaterials. She has a copy of artist Georgia O'Keeffe's *Red Poppy No. VI* on her office wall just so that she can stare at the flower's vibrant scarlet petals. She once bought a painting at an art fair that looked to her like proteins seen through an atomic force microscope (not what the artist had in mind, she says). "I thought it was really interesting that the same visual could be perceived in so many different ways," she says. "In science, the more different perspectives you have on the phenomena you're studying, the richer the understanding becomes."

Other ways to stretch scientific thinking are discovered when researchers collaborate with

## RESOURCES

### Up your art quotient

Scientists who have no experience in art can still find ways to engage with their creative side. "If you have any curiosity for art, I'd encourage you to give it a try," says Silvia Balbo, a cancer researcher at the University of Minnesota in Minneapolis.

- Make a friend in the art department of your institution. Go to a thesis presentation and invite an art student to visit your lab.
- Apply for a residency or offer to participate in one. Here are a few: the Massachusetts Institute of Technology Center for Art, Science & Technology in Cambridge ([go.nature.com/2bnppjh](http://go.nature.com/2bnppjh)), Arts@CERN in Geneva, Switzerland ([go.nature.com/2b5b9jb](http://go.nature.com/2b5b9jb)), The Guapamacátero Center for Art and Ecology in Michoacan, Mexico, and the Institute for Advanced Study in Princeton, New Jersey (<http://go.nature.com/2brypgx>).
- Participate in a collaboration such as those organized by the Institute of Physics in London ([go.nature.com/2b9ycel](http://go.nature.com/2b9ycel)).
- Sign up for a drawing or pottery class through community education, audit a class at your university or search for museum-based programmes.
- Search Meetup.com for art-related outings.
- Search Twitter for #sciart. **S.M.E.**

artists. So effective have these partnerships been for stimulating scientific creativity that some research institutions have established programmes to encourage them (see 'Up your art quotient'). Europe's particle-physics laboratory, CERN, for example, established a programme called COLLIDE to foster ingenuity through the exchange of ideas between scientists and artists. The initiative brings world-class artists to the laboratory and campus in Geneva, Switzerland, for a residency of up to three months.

CERN theoretical physicist Luis Álvarez-Gaumé (who moves to Stony Brook University in New York this month), recently worked with two UK artists as part of the initiative. The artists used scientific data and computer-generated animation to probe how scientific instruments and discoveries in particle physics influence the perception of nature. Explaining his work to them for their upcoming piece helped Álvarez-Gaumé to find holes in his own knowledge. "It allows us to really see, to appreciate and understand what we are talking about," he says. Kieniewicz agrees that working with artists helps scientists to reframe their thinking. "The artist will come in from a bit of a tangent, probing areas where scientists wouldn't think to probe," she says. "They are really good at asking 'what if' questions — 'what if we could hear the Higgs boson?'"

Art-science collaborations can produce other benefits, too. Murphy established a programme at her lab in which university art students come in and ask questions of her chemistry pupils. She quickly realized that her students rapidly improved at communicating their work and ideas. "When you're giving a presentation to a totally non-scientific audience, you have to be able to communicate really well," she says.

And scientists are often awestruck by seeing artists portray what they've learned in completely new ways. Artists who have worked alongside Murphy's students, for example, have created everything from a dance interpreting the view through an electron microscope to a computer-sized block of canvas with light bulbs shining through at various levels of brightness, inspired by the gold particles that the artist glimpsed through a microscope. Because the results are usually exhibited to both scientists and artists, they provide an ideal opportunity for interdisciplinary conversations.

The collaborations spawn more than impressive art — they are rich for researchers too, says Martin Kemp, an emeritus art historian at Trinity College in Oxford, UK, who specializes in visualization of science and has written a book called *Structural Intuitions: Seeing Shapes in Art and Science* (Univ. Virginia Press, 2016). He says that perception is deeply embedded in the brain by the end of formal schooling, yet researchers must embrace other ways of thinking and visualizing, and can do so through making or viewing art. He thought he was leaving science forever when he went to do graduate studies at an art institute — until he stumbled across Leonardo da Vinci's water drawings. The detailed sketches depicting patterns and shapes of water, wind and air reflect the theory of hydrodynamics, he says — completely applicable to both art and science. "I felt I'd come home," Kemp says.

Although that sort of leap is practical for very few ("It doesn't help to have art school on your CV to get funded," Balbo says), most of the bright scientists Kemp knows engage in the arts in some form. And some even say it is essential to their careers.

"If I had not gone to art school, I don't believe I would be a scientist today," Dijkgraaf says. ■

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