

France were the partners in 2009 and 2010, respectively. The US is supposed to be this year's partner, but Al-Sherbiny says that with the political upheaval, joint activities are in limbo.

Now, with Amr Salama, an engineer, former university president, and previous science minister named interim science minister in a March cabinet reshuffle, Al-Sherbiny says the country's science and technology strategy will be updated. "We want to make the transformation with as little pain as possible, and to create the best future for our youth," he says. "It all comes to money at the end of the day. It will be very important to increase resources." In recent years, he says, Egypt has put from 0.2% to 0.4% of its gross domestic product into research. "We would hope for at least 1%."

"Don't blink an eye"

Not surprisingly, hand in hand with optimism about the future come worries about heading down the right path. For Khalil, one worry is the possibility that the military won't keep its promise to hand back authority to civilians. Talaat notes that things have moved very swiftly, and "it would have been easier to negotiate with a weakened govern-

ment than with the armed forces." For his part, Al-Sherbiny is not worried about the temporary military control of the country. "They are on our side," he says. Rather, he worries about a derailing of the new process due to war erupting somewhere in the region or to "people pointing fingers at each other instead of moving forward."

"There is still a lot of dust in the air," says Talaat. "It's like having someone who has been imprisoned for a long time, and now he is free. But he is not prepared. He cannot answer right away what he wants to do."

El-Baz says he did not see "even a hint of pessimism. My advice is, keep forging ahead, don't blink an eye. Egypt has been like a snail. If they sit on things, corruption will creep back in." He notes that when asked to be on an advisory board, his answer was "Forget it. Don't go back to the generation that made a mess. Ask us questions, but do not depend on us." In 2006 El-Baz, then 68 years old, wrote an article on the Arab world's "generation of failure." He says he is "delighted that this young generation is a different beast. If they do see roadblocks, they do not see why they can't remove them."

Toni Feder

High-energy physics lab seeks discovery-oriented artists for close interactions

A new initiative at CERN aims to tap the shared curiosity of artists and scientists to create mutual understanding, inspire art, and excite people about science.

"We are colliding things even more elusive than particles—human imagination and creativity," says Ariane Koek, a former BBC producer. The force behind a new arts experiment at the Large Hadron Collider at CERN, she says, "I love anything that stretches knowledge and busts boundaries. I am fascinated by everything, and I have a nerdy interest in atomic physics."

"It's an incredible moment for particle physics," says Koek. "CERN has the world's largest machine, and we are at the moment of great discovery. I can't think of a better way of demonstrating fundamental science's relevance to our culture than engaging in an inspirational way." A century ago, she says, science "inspired cubism, the moderns. Now let's inspire even more."

To that end, last December the laboratory's director general, Rolf-Dieter Heuer, adopted a cultural policy for CERN. Called Great Arts for Great Sci-

ence, the policy sets the stage for Koek's initiative through four strategies: Create expert knowledge in the arts through a cultural advisory board, create a point of contact for artists who want to visit CERN, create an arts residency, and access professional advice for in-house arts activities.

The cultural advisory board held its first meeting in February. Coincident with that meeting, a website (<https://arts.web.cern.ch/arts>) went live to showcase significant art projects carried out at CERN or inspired by CERN science and to publicize activities that fall under the new cultural policy. Collide@CERN, a residency program for artists to spend time at the lab, will launch in the next few months—as soon as Koek raises enough money. Other arts-related activities, such as CERN's CinéGlobe short-film festival and the choice of artwork on display at the lab, will come under the umbrella of the



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Great Arts for Great Science framework.

Heuer backs Koek's initiative with strong words but no money, which he says can't come from the lab's coffers. In a New Year's speech he said, "Although we are enjoying unprecedented levels of popular and political support around the world, the trend is still against basic science." He went on to say that CERN must "first of all . . . deliver on our scientific promises. But we also have to show our relevance to society on other levels, and engagement with culture plays an important role." A lot of artists are interested in science at CERN, says Heuer. "People want to do sculpture, films, books, ballets. . . . I wanted to channel it a bit."

Understanding and inspiration

The cultural policy at CERN, says Koek, provides a framework for diverse activities. It says to people at CERN, "You are great scientists, and you deserve to engage with great artists." It also acknowledges "what has been happening anyway." Among the artists who have come "to pay homage to what CERN science is doing for culture," Koek lists the band the Black Eyed Peas, architect Charles Jencks (see photo, above right), photographer Simon Norfolk, and Wales's first national poet, Gwyneth Lewis. The idea of the Great Arts for Great Science initiative is to "show that CERN inspires culture not only in science but in the arts, and to create mutual understanding," says Koek.

"The strongest and best physicists have always had a creative side," says CERN particle physicist Helenka Przysiezniak Frey. "As a theorist, you

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The Garden of Cosmic Speculation near Dumfries, Scotland, was inspired by math and science. The garden's designer, Charles Jencks (hat), physicist Peter Higgs (foreground), CERN director general Rolf-Dieter Heuer (left front), and two others visit red posts that represent the eightfold way, a theory for organizing baryons and mesons. Jencks's plans for a garden at CERN that will tell the history of the universe will be unveiled this spring.

have to play around with theory. Experimentalists are also reading and thinking about theories, so there is quite a lot of freedom, which is also like artists. Both of our jobs are asking questions, doing research."

"I think there is an actual renaissance that is bringing these fields together," says Liz Lerman, a choreographer whose 2010 dance, *The Matter of Origins*, "probes the physics of beginnings and the poetry of the mind" (see <http://blogs.physicstoday.org/singularities/2010/09/big-bang-ballet.html>). Lerman sees "huge interest" from both artists and

scientists in interacting. "Scientists want to reengage with their creativity. Or they know they need public support. It can help with teaching." It can even help with research, she adds. "Some scientists are realizing that if you do embodied modeling instead of computer simulations you make different connections and you see things you wouldn't otherwise see." As for artists, says Lerman, "Any artist who is really wanting to connect and comprehend and know what is going on in this world has to know science." The sense of discovery is part of it, she says, "and the other part is the implications—of the genomic revolution, the origins of the universe. . . . How do we live with this new understanding? That is where art has a huge contribution to make to the science community and the community at large."

Color changes in a sculpture by Japanese video and photographic artist Mariko Mori represent real-time detection of neutrinos by Super-Kamiokande in Japan. The 3-meter-tall sculpture, named Tom Na H-iu for a place where transmigrating souls were believed to rest according to the ancient Celtic religion, is supposed to both reflect the death of stars and signify the rebirth of energy. Mori, a creative patron of CERN's artists-in-residence program, says she hopes that in glimpsing a neutrino, a viewer may feel connected with the universe. Koek says the sculpture "illustrates the quality of work which [CERN's] new cultural policy aims to attract and inspire in the future."



In *The Matter of Origins*, choreographer Liz Lerman refers directly and indirectly to science; in this scene video images from her visit to CERN are used as the backdrop.

GEORGE HAGEGEORGE

"Decorating CERN is not the target," says cultural board member Beatrix Ruf, the director and curator of the Kunsthalle Zürich art center. "Art is very influential. It's not like a political parade. It's micro-influences on how people think about things, how their perceptions and ways of approaching things change." By bringing artists and scientists together, she says, the influence "could snowball."

Toys, tools, and emotions

"Often art turns out to be a pure communication of science, or outreach," says Koek. "Ideas in science are communicated by equations. In art, they are communicated through the senses." Her initiative, she says, "is more about having science and arts on equal platforms, learning about each other." Koek wants to stay away from art as outreach

and focus on established and young, innovative artists who "break boundaries like CERN science does." Although she is steering away from more conventional forms of outreach, Koek does aim to show the world that science has meaning for everyone.

The arts initiative at CERN "is an experiment," says Michael Doser, the lone scientist on the cultural advisory board. "Success depends on the goodwill and interest of both sides." Science can provide understanding, while art can provide meaning to the human enterprise, he says. "The program tries to set up a dialog based on mutual respect." Doser adds that he hopes the initiative "shows that science has an effect not just on the materials plane—better toys, better tools—but on humans. Science has an emotional impact."

Toni Feder

Rankings place technology-courting US states on top

Economic indices highlight research universities' key role in feeding the innovation pipeline.

"Utah is in the ranks of the big boys now," says Ross DeVol, economic research director at the Milken Institute, a California-based nonprofit that periodically evaluates the 50 states on their success at converting R&D into products, companies, and high-paying jobs. Known more for coal mines and oil refineries than for a high-tech business culture, Utah placed near the top in 2010 rankings recently released by the Milken Institute and by the Washington, DC-based Information Technology and Innovation Foundation (ITIF), which independently conducts a similar assessment.

Utah's success is used by both organizations to illustrate a wider trend: States that invest in basic R&D and technology commercialization are more likely than those that don't to create new businesses and jobs over the long haul. "You can explain about two-thirds of a state's economic performance by its innovation activities and its high-tech sector," says DeVol, coauthor of the Milken Institute's State Technology and Science Index, which focuses on such measures as total levels of R&D funding, access to financial capital, and growth rate of high-tech firms. The ITIF State New Economy Index looks at how a state's high-tech economy is affected by globalization and how its public and private sectors embrace information technology. In 2010 Massachusetts took

first place on both indices; the state has held those first-place rankings since the Milken Institute and ITIF indices were first introduced, in 2002 and 1999, respectively.

Planting technology parks

Massachusetts got high marks for its cluster of software, hardware, and biotechnology companies and for its research universities, which generate scientists and intellectual property that often flow to the state's technology companies. The state is also credited for its commitment to long-term R&D projects, including a 10-year, \$1 billion life sciences initiative that will provide \$23.9 million in tax incentives this year for biotechnology companies that pledge to create 1000 jobs in the state.

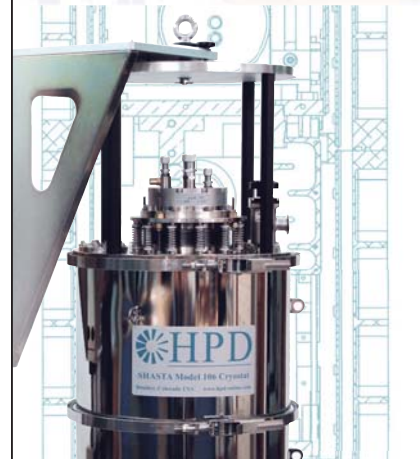
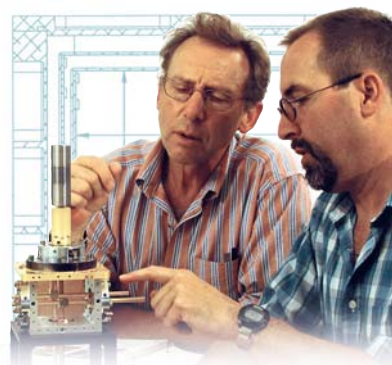
The greatest natural resource that Massachusetts has is its "unrivaled group of terrific research universities where extremely bright people are doing extremely creative things," says physicist Jack Wilson, president of the University of Massachusetts system. In recent years the state has facilitated several public-private partnerships, including the \$95 million Massachusetts Green High Performance Computing Center, a joint initiative of UMass, MIT, Harvard University, Boston University, and Northeastern University. Scheduled to be completed in 2012, the multidisciplinary center also receives funding

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