requires ethical care. "We're dealing with things affecting thought, emotion, behaviour — what people hold valuable as the essence of the self," he says.

Neuroethicists are noticing challenges beyond the medical system, too, particularly in the courtroom. Judy Illes, a neurology researcher at the University of British Columbia in Vancouver, Canada, and co-founder of the International Neuroethics Society, says that brain imaging could affect the criminal-justice system by changing definitions of personal responsibility. Patterns of brain activity have already been used in some courtrooms to assess the mental fitness of the accused. Some ethicists worry that an advanced ability to map human brain function might be used to measure an individual's propensity for violent or aberrant behaviour — or even, one day, to predict it.

At next week's meeting, the presidential commission will hear from each of the US agencies involved in the BRAIN Initiative — DARPA, the National Institutes of Health and the National Science Foundation — about preliminary scientific plans and anticipated ethical issues. Lisa Lee, the commission's executive director, says that the group plans to discuss broad ethical concerns for human and animal participants in neuroscience research, and also the societal implications of discoveries that could arise from the BRAIN Initiative. Although no specific timeline has been set, the commission typically holds three to four meetings over a period of up to 18 months, culminating in recommendations to the President.

As neuroethicists wade into the issues, they may look to the precedent set by the Human Genome Project's Ethical, Legal and Social Implications (ELSI) research programme, which has provided about US$300 million in study support over 23 years. The programme raised the profile of genetic privacy issues and laid the foundations for the Genetic Information Nondiscrimination Act of 2008, which prohibits discrimination by employers and health insurers on the basis of genetic information.

Thomas Murray, one of the architects of ELSI and president emeritus of the Hastings Center, a bioethics research institute in Garrison, New York, is among the speakers invited to the commission meeting. He considers the BRAIN Initiative a timely opportunity to develop an ELSI programme for neuroscience. "There will be wonderful questions about human responsibility, human agency," he says. "It's never too soon to begin." ■

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The Skolkovo Institute of Science and Technology will open near Moscow next year (artist's impression).

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INNOVATION

Russia pins hopes on science city

But sceptics question prospects for Skolkovo commercial park.

BY DECLAN BUTLER

A Russian revolution in scientific innovation — or a white elephant? Bulldozers are rumbling near Moscow, at work on the Skolkovo Innovation Centre, an ambitious, multibillion-dollar scheme to boost Russia's moribund innovation system.

Scientists have high hopes for the project's first goal: to build a world-class technology university from scratch in a few years. However, they are more sceptical about the prospects of a planned commercial science park at the site, and some have baulked at the high price — a reported US$300 million — paid to a US institution to jump-start the university. Meanwhile, allegations of corruption at the innovation centre's umbrella body, the Skolkovo Foundation, risk throwing a cloud over the entire enterprise.

Launched by the Russian government in 2010 with 85 billion roubles (US$2.6 billion) in state funding until the end of 2014, the Skolkovo supercampus will rise on a 400-hectare site just west of the Moscow ring road. On 1 August, the government announced that it intends to put a further 135.6 billion roubles into the venture by 2020. Focusing on five areas — information technology, nuclear technology, energy efficiency, biomedical innovation, and space and telecommunications — Skolkovo is the boldest of Russia's efforts to spur high-tech innovation and reduce the country's economic dependence on exports of oil, gas and minerals.

The intellectual lynchpin of the enterprise is the Skolkovo Institute of Science and Technology (Skoltech), an elite, English-language, graduate and research university being created in partnership with the Massachusetts Institute of Technology (MIT) in Cambridge. It aims to foster a new generation — and breed — of

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YOURI KAZATCHKOFF

top-notch Russian researchers and engineers trained in translational research and entrepreneurship as well as basic science, to fuel an ecosystem of innovation that the country sorely lacks. It plans to recruit 200 full-time faculty, 300 postdocs and 1,200 students by 2020.

Coaxing leading scientists to Russia is a challenge, so Skoltech is offering compensation packages that exceed those available in the West "by a wide margin", says Konstantin Severinov, a molecular biologist and Skoltech associate dean of faculty. Skoltech hopes to have 30–35 faculty members by the end of this year, and then to add 30 or so annually until it reaches its goal.

The most immediate difficulty is practical: Skoltech's first buildings will become available only next year. For now, MIT and other partners are teaching the first students, who started studies last September, and faculty members are working elsewhere. The challenge, says Raj Rajagopalan, a chemical engineer and Skoltech's dean of faculty, is "how to create an academic community when most people are not here".

It was a deliberate choice to start Skoltech's activities in parallel with construction, says Duane Boning, an electrical engineer and MIT's faculty lead on Skoltech. The plan will shave years off the time needed to get the university up and running, he says. It has allowed Skoltech to put its administrative, curriculum and research strategies in place quickly, adds Severinov, who has recruited three postdocs, a programmer and one PhD student for his lab, with more to come soon. But "we really need those buildings here ASAP", he adds.

The terms of MIT's four-year contact with Skoltech, which ends in 2015, are confidential, but those familiar with the project say that Russia is paying MIT at least $300 million for its services. Several members of the Skolkovo Foundation's scientific advisory board originally objected to that price tag, say sources. Some argued that more services could be had for less, or from another partner — and others felt that Russian institutions should have been given a greater role in the project.

Alexei Sitnikov, vice-president of institutional and resource development at Skoltech, confirms that some board members expressed reservations, but he defends the deal. "The benefits which we get exceed, by far, the costs that we pay," he says. Several scientists involved say that, although the price can be debated, MIT has been effective in developing the elements needed for the institute to get going: curricula, research programmes, administrative and recruitment structures, and mechanisms for entrepreneurship and innovation. MIT has also run Skoltech's international calls for proposals for research centres of excellence (15 are planned). "Sometimes you can pay a lot for a brand name," adds Rajagopalan. After its contract ends, MIT will shift to a collaborator role and Russian institutions will be more involved in Skoltech, adds Sitnikov.

Building Skoltech "is exactly the right thing to do", says Leonid Levitov, a Russian physicist at MIT who is not directly involved in Skoltech's creation. At first, he doubted that MIT should take a role, given the political complexity, bureaucracy and corruption that exist in Russia. But he is impressed at how Skoltech, and MIT's contributions to it, are shaping up. Historically, much of the country's most innovative research was linked to government labs, including those run by the military, but most have collapsed since the fall of Soviet communism. These days, there are few graduate opportunities. Many of the best students leave Russia, and even more switch to non-research careers, he says. Skoltech could be a place for them to train in research at home.

"We really need those buildings here ASAP."
Konstantin Severinov

The institute's ultimate impact will depend heavily on reforms elsewhere in Russian science, as well as on the success of the Skolkovo science park. Without it, there will be few meaningful career opportunities for the elite researchers that Skoltech will produce, and the institute could end up as "a completely crazy brain-draining scheme", says Severinov, with Russia training first-rate people who then leave.

The park offers companies incentives including tax breaks and visa help. Twenty-eight ▶

major partners, including Siemens, IBM, Intel and Microsoft, have pledged to invest a total of $500 million, which will be used, in part, to establish corporate research and development centres at Skolkovo. More than 960 start-up companies have signed on to set up shop there, and around 60 venture-capital firms, more than one-third of them from other countries, have pledged a total of $600 million, says Leonid Gankin, a spokesman for Skolkovo.

But with construction still under way, start-ups will not be able to begin moving to Skolkovo until 2014. Only one corporate centre has been built: that of Cisco Systems, a networking-equipment firm based in San Jose, California, which opened its Skolkovo facility in June. A report from the European Bank for Reconstruction and Development in London last December warned that although Skolkovo offers benefits, initiatives in which states try to pick winning industries have a chequered history.

Skolkovo's reputation took a hit this year, with allegations of corruption at the Skolkovo Foundation. In February, the Investigative Committee of the Russian Federation, the country's main criminal-investigation authority, launched enquiries into the alleged embezzlement of 24 million roubles by Skolkovo officials. Investigators raided the foundation's Moscow offices on 18 April.

Levitov and other Russian scientists warn against jumping to conclusions before the charges are substantiated, arguing that in Russia, criminal allegations can often mask political intrigues and power struggles. Still, Rajagopalan worries that some prospective faculty members might ask themselves whether they really want to take the risk of decamping there. "Perceptions count," he says. ■

PHYSICS

Europe sets sights on lasers

Three eastern European countries are gearing up to host powerful light sources.

BY DEVIN POWELL

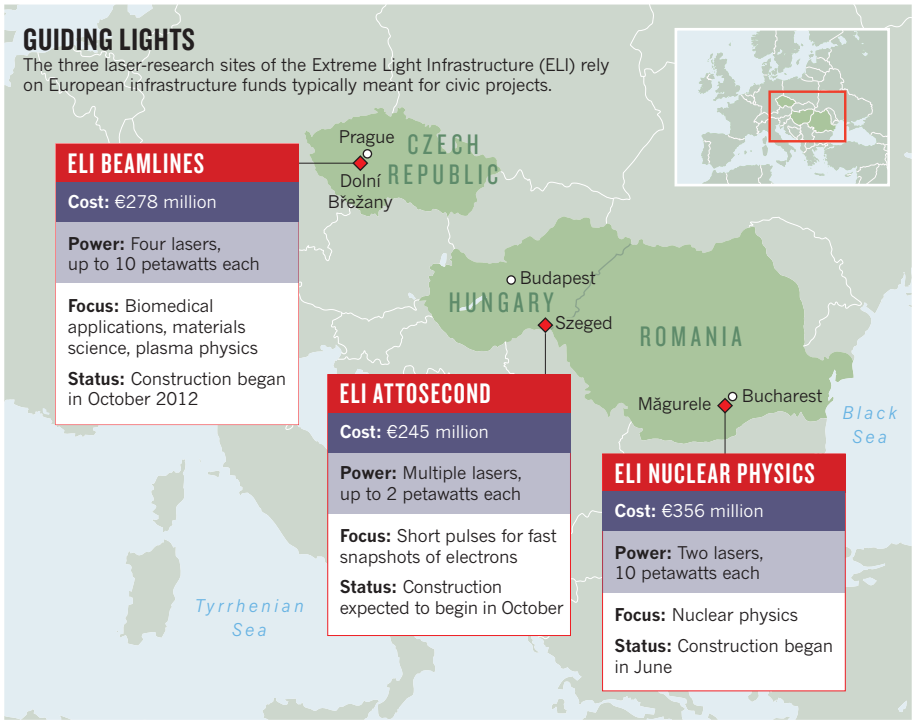
Last month, a large European nation placed an order for a pair of titanium–sapphire lasers. With an output of 10 petawatts, each would be about nine times more powerful than the strongest laser in existence today — capable of exploding the nuclei of heavy elements.

Nearly as special as the lasers is the place where they will be delivered: Măgurele, Romania, a town of 11,000 people that was once home to a Soviet-era research reactor. In June, workers broke ground at the construction site for a new research centre to house the twin lasers.

It would not be possible for the former Eastern bloc nation to afford the project's €356-million (US$475-million) cost: expenditures on research and development in Romania are among the lowest in Europe. Instead, the European Union (EU) is expected to pick up most of the tab, as it plans to for two other facilities, in Hungary and the Czech Republic. The three projects, along with a fourth still on the drawing board, will make up the Extreme Light Infrastructure (ELI) — an experiment in using EU structural funds to advance research.

"With ELI, we enter a new era, pioneering the use of structural funds for an international research infrastructure," says Wolfgang Sandner, who heads a consortium set up by the three countries and Italy to manage ELI.

Structural funds, which make up more than one-third of the EU budget, are aimed at reducing economic disparities across Europe. They typically pay for local projects such as road repair, construction of power lines or clean-up of industrial waste — not super-powerful lasers. And although any member state can apply for these infrastructure funds, most of the money goes to the poorest countries.



SOURCE: EUROPEAN COMMISSION/ELI

ELI, by contrast, is an international research institute that will encourage scientists to do laser experiments at higher energies, intensities and speeds. Both France and the United Kingdom wanted to host the project, marked as a priority in a 2006 road map for European research. But structural funds provided the Czech Republic, Romania and Hungary with a way to pay for it. Advocates for using the money in this way touted the potential of ELI to stimulate economic growth. Romania hopes to attract technology companies and establish Măgurele as a 'laser valley'; the region is also planning to build a smaller laser facility to train its scientists to participate in ELI.

But the structural funds come with strings attached. For starters, the money must be spent by 2015, and meeting that deadline is proving difficult. After Romania was selected for ELI in 2009, it took two years to decide how to shift structural funds away from other projects, delaying the start of construction. And Hungary submitted a formal funding proposal only in May. That request has yet to be approved.

Using structural funds to buy high-end