

## MIT Skoltech Initiative

The 2012–2013 academic year saw a significant expansion of MIT efforts in building the Skolkovo Institute of Science and Technology (Skoltech), at the western edge of Moscow, Russia. The [MIT Skoltech Initiative](#) (formerly SkTech/MIT Initiative) grew to approximately 35 staff, led by 10 faculty, and relocated to renovated space in Building E70. More than 70 additional faculty, together with senior administrators from Technology Licensing, Sponsored Programs, Campus Planning and Design, the Office of the Vice President for Research, the School of Engineering, the Martin Trust Center for MIT Entrepreneurship, and many other offices and departments throughout MIT, participated in the collaboration to build a new, unique, world-class research university in Russia.

In October 2012, MIT entered the second of what had initially been a three-year collaboration agreement and marked the anniversary with a small event in Moscow. By late winter, ongoing discussions between stakeholders led to the extension of the collaboration to a four-year period—scheduled to conclude in October 2015.

### Administration and Governance

Establishing and scaling core administrative functions was a central goal during the first year of collaboration. As structures and personnel were put into place, attention turned to the question of how to scale rapidly.

### Staffing

At both MIT and Skoltech, collaboration activities were enriched by a series of senior hires. Working with Skoltech's president, Edward Crawley, MIT advised on successful searches for an executive vice president and a senior vice president for research and innovation, with both hires beginning in Moscow in fall 2012. The position of executive vice president strengthened leadership of administrative and operational activities, while the senior vice president role attracted a former National Science Foundation director. By December 2012, Skoltech had largely completed its senior leadership team—though with MIT input, a provostial search was launched in spring 2013. At the MIT Skoltech Initiative, new staff positions included directors of research, education, and program management.

### Campus and Infrastructure

Campus Planning officers and Environmental Health and Safety officers worked with counterparts to ensure that campus facilities will function to enable world-class research and education at Skoltech. After a brief pause, the pace of activities resumed in September, requiring resolution of key issues related to space management, equipment and environmental considerations, design, leadership input, and more. At the same time, e-infrastructure planning was designated as a priority. MIT worked with Skoltech's acting chief information officer to map campus needs, establish faculty advisory structures, and begin to develop and implement a forward-looking information technology strategy. Given anticipated research computing needs and current

bandwidth limitations in the Moscow region, development of relevant infrastructure is critical. Faculty-driven information technology councils have been established at both MIT and Skoltech to guide work in this area.

### **Administrative Capacity Enhancement Program**

The Administrative Capacity Enhancement Program (ACEP) was developed as a mechanism for introducing Skoltech staff to counterparts and best practices at MIT over the course of targeted visits to Cambridge. The first ACEP training was conducted in late October 2012. Seventeen subsequent visits took place through June 2013, ranging from resource development, information technology, and student services to faculty affairs and finance. For each visit, a customized agenda was developed and the participation of MIT personnel carefully coordinated. At Skoltech's request, the initiative expanded the program to address a number of additional functions, including finance, human resources, fundraising, and communications/events.

### **Strategic Planning and Policy Development**

By June 2013, MIT staff had assisted Skoltech in drafting more than 39 policies, modeled on successful practice in Cambridge, as well as on benchmarks of other leading universities. Introducing and adapting international best practices in Russia is an important goal for Skoltech, as it seeks to attract staff and serve as a model for the changing higher education sector.

To this end, MIT Skoltech Initiative staff and faculty leads have participated in a series of strategic planning exercises, beginning with a "strategy day," held in September, in Cambridge. Through this and other sessions, MIT provided input on Skoltech research priorities and institutional development. MIT also provided templates for an annual operating plan, a financial model, a resource development strategy, and a staff ramp-up, informed by previous experience with international programs in Singapore and Abu Dhabi. Such processes are helping to establish a sustainable business model at Skoltech.

### **Governance**

The Collaboration Steering Committee met in November (in Cambridge) and May (in Moscow) to conduct biannual reviews of collaboration activities. As scheduled, the MIT Skoltech Initiative submitted interim and annual financial and narrative reports detailing the impact of activities. In April 2013, MIT hosted a small, high-level delegation of governmental and foundation representatives to discuss collaboration priorities.

### **Educational Impact**

Faculty and staff in the educational track focused intensively on two tasks: designing the first two Skoltech graduate programs (energy, and information technology), and laying the foundation for Skoltech student life. The initiative, partnering with the Martin Trust Center for MIT Entrepreneurship, also introduced a new entrepreneurship and innovation-based course for MIT students in spring 2013.

## Curriculum Design

Throughout the fall semester, the MIT faculty co-leads for education (research scientist Brian Anthony, and professors David Hardt and Warren Seering) focused on establishing an architecture for Skoltech master's programs. Through a series of discussions with Skoltech, including an external expert review in Lausanne, Switzerland, in early winter, key learning outcomes were fine-tuned. This activity served as a platform for in-depth design of master's program structure and curricula. Skoltech's academic calendar combines multiple course and "application" periods in the space of a standard term. The innovative approach exposes students to theoretical frameworks and laboratories, followed by shorter experiential projects that enable candidates to integrate and apply new knowledge.

In the spring, focus shifted to planning for the Skoltech classroom experience. Within the information science and technology area, faculty coordinators began to populate specialized tracks on information technology and computational mathematics. Meanwhile, the MIT Energy Initiative oversaw the development of Skoltech energy curricula, with director Robert Armstrong advising on industry relations (all students in Skoltech's energy track will complete an industry project.) On campus, pilot sessions were offered for the courses developed for Skoltech. Additionally, the initiative worked with Academic Media Production Services to capture significant MIT classroom content for future use at Skoltech. Educational leads also recruited Skoltech and MIT faculty to teach in Moscow in fall 2014 and took initial steps to establish a quality assurance system for Skoltech programs.

MIT also agreed to host a small cohort of students enrolling in Skoltech's pilot biomedicine and manufacturing programs during AY2014. Dr. Anthony, director of MIT's master of engineering in manufacturing program, is leading the planning for the manufacturing and product realization program.

## First Student Cohort at MIT

In August 2012, the first group of 20 Skoltech students, along with students from collaborating Asian and European universities, arrived at MIT to participate in an intensive, month-long MIT-Skoltech Innovation Workshop. At the conclusion of the workshop, 12 Skoltech energy and information technology students remained at MIT as special students for the academic year. Termed "year zero," the experience offers a mechanism for Skoltech to benchmark student life and academics at multiple leading entrepreneurial universities. For the MIT cohort, it was an opportunity to absorb the local innovation culture and translate it to Skoltech. Approximately half of the visiting students enrolled in 2.009 Product Engineering Processes, participating in team project presentations in Kresge Auditorium at the end of the semester. Students also enrolled in MIT Sloan School of Management electives and advanced disciplinary studies. Extracurricular meetings, such as those with the Graduate Student Council, provided insight on student governance and impact at MIT. In addition to the master's cohort, Skoltech enrolled its first PhD candidate in spring 2013.

## **Selection of Second Student Cohort**

The application deadline for admission to Skoltech's second class fell in mid-January 2013. In the months leading up to the deadline, the initiative was actively involved in international recruiting activities. In December 2012, faculty and staff conducted a first information session on master's degree programs and fellowships for MIT students. By May 2013, 47 new students representing 13 countries had accepted Skoltech's offer of admission for programs in energy, information technology, biomedicine, and manufacturing. The cohort included the first MIT graduate to enroll at Skoltech.

## **Conceive-Design-Implement-Operate Academy**

In June 2013, the MIT Skoltech Initiative hosted a student academy as part of the 2013 Conceive-Design-Implement-Operate (CDIO) Conference, at Harvard University and MIT. CDIO is a new approach to engineering education, spearheaded in large part by Dr. Crawley, and is quickly gaining traction in institutes around the world. The conference attracted 300 practitioners and leaders in engineering education. Initiative staff designed and led programming for more than 70 student participants. The academy wrapped up with a showcase of student projects, including several developed by Skoltech students from the MIT-based cohort.

## **MIT and Skoltech Faculty Engagement**

The MIT-Skoltech collaboration has received timely support from MIT faculty, who have engaged as committee members, mentors, and principal investigators, while creating new ways for faculty to engage internationally.

## **Faculty Recruitment**

MIT continues to refine and execute strategies for the entire spectrum of faculty recruitment at Skoltech. More than 20 MIT faculty serve on specialized search committees for junior and senior faculty; for research center directors for Skoltech's Centers for Research, Education, and Innovation (CREIs); and for the newly created provost role. Two rounds of tenure-track faculty recruitment generated interest from candidates around the world. By the end of 2012, the MIT committees had reviewed hundreds of applications for Moscow positions, and by the end of June, MIT faculty had hosted 38 associated research seminars. Faculty and staff also serve as liaisons with three external firms involved in senior-level searches.

## **Faculty Development Program**

Over the course of the year, MIT designed and launched a pioneering faculty development program for Skoltech junior faculty. In September, professor Dick Yue convened a workshop at MIT to solicit needs and identify best practices in supporting faculty competences. The workshop surveyed comparative experience at MIT and other international partners.

Under the program, newly hired Skoltech faculty receive an appointment as a visiting faculty or research scientist and are resident at MIT for approximately one year. The intent is to immerse faculty in the MIT community and provide programming that

develops skills related to entrepreneurship and innovation, teaching and learning, research, leadership, and other competencies relevant to long-term success at Skoltech. Participants are expected to conduct joint research with one or more MIT faculty mentors/hosts. As such, MIT faculty play a critical role in supporting the program.

In 2012–2013, MIT hosted two assistant professors and one associate professor from Skoltech. All three co-taught at MIT in spring 2013, helping to deliver 12.S680 Space Physics, Space Environment, and Space Hazards; 16.89 Space Systems Engineering; and 15.S12 Systems Optimization, Models, and Computation.

### **Skolkovo Foundation Professorships**

In April 2013, six MIT faculty members from across the Institute were recognized for one-year terms as Skolkovo Foundation Professors. The MIT-based appointments recognize significant engagement in the collaboration between MIT and Skoltech. Faculty were informed of the appointments by vice president Claude Canizares; terms began on January 1, 2013, and continue through December 2013.

The pilot recipients were Regina Barzilay, Skolkovo Foundation associate professor of computer science and engineering; Duane Boning, Skolkovo Foundation professor of electrical engineering and computer science; David Gamarnik, Skolkovo Foundation professor of operations research; Fiona Murray, Skolkovo Foundation associate professor of entrepreneurship; Bruce Tidor, Skolkovo Foundation professor of computer science and biological engineering; and Forest White, Skolkovo Foundation associate professor of biological engineering.

### **Sabbaticals in Moscow**

This year, the MIT Skoltech Initiative announced sabbatical and leave opportunities to enable participation of MIT faculty and research staff on the ground at Skoltech during its crucial formative stages. Opportunities are particularly targeted to individuals wishing to explore the function of universities, the creation of new research programs, the design of advanced educational environments and programs, and the interactions between universities and industry that drive innovation. Support is designed for faculty eligible for sabbaticals and/or cases where the impact of leaves is manageable.

### **New Research Opportunities**

Multi-institutional collaborations are at the center of Skoltech's research development, and MIT has been deeply involved in building research expertise, identifying state-of-the-art infrastructure, engaging industry, adapting contracts and templates, and ensuring integration between research, education, and innovation activities at Skoltech.

The creation of Skoltech's research strategy in fall 2012, developed in consultation with MIT faculty, provided a roadmap for near-term investments. The strategy builds on Skoltech's five priority areas and identifies important cross-cutting research themes, such as advanced materials, computational and data-intensive science and engineering, and human engineering and cognition.

The following sections describe two major areas of research activity.



## **Skoltech Centers for Research, Education, and Innovation**

In October 2012, Skoltech announced the launch of negotiations with finalists from the first call for proposals for Centers for Research, Education, and Innovation (CREIs). Each center will bring together leading institutions focused on a shared strategic problem or research area important to Russia. Two of the three centers under discussion are coled by investigators from MIT addressing electro-chemical energy storage, and RNA therapeutics and infectious disease. While negotiations continue on these centers, Skoltech formally launched a center for stem cell research in April 2013. Led by the Vavilov Institute of General Genetics and the University Medical Centre Groningen, the center includes participation from researchers from the Whitehead Institute for Biomedical Research. This is the first of 15 planned CREIs at Skoltech.

As the first round advanced, Skoltech and MIT launched a second call for proposals, with a deadline in November 2012. This call generated 143 white paper submissions from 381 institutions worldwide. Following the same international peer review process as round one, and based on Skoltech priority themes, 15 finalists were invited to submit full proposals. MIT and Skoltech hosted teams in Boston in May for final presentations, after which recommendations were submitted to the Skoltech board of trustees. Recipients will be announced at the close of negotiations.

## **Strategic Development Projects**

Over 2012–2013, 11 teams of MIT and Russian researchers received awards from the initiative to conduct joint research. The goal is to seed a network for research and capacity building for Skoltech across all five thematic areas (biomedicine, energy, information technology, space, and nuclear science). Researchers in Russia represent such leading institutions as Moscow State University, the Institute of Physics of the Russian Academy of Sciences, the New Economic School, and the Moscow Institute of Physics and Technology.

## **Building an Innovation Ecosystem**

A full year of innovation programming began in July 2012 with a design workshop, cohosted by professor Charles Cooney, in Moscow. Results included an outline for an entrepreneurship and innovation minor at Skoltech and an aggressive outreach plan. As the year continued, MIT advised on the launch of translational research programs, curriculum design, research directions, organizational structure, internet protocol templates, and conflict of interest policies.

At MIT, faculty involvement expanded, with Professor Hardt and Dr. Anthony advising on manufacturing efforts, and Luis Perez-Breva, lecturer and research scientist, supporting educational development. Program staff similarly grew, with a focus on commercialization activities and grant management.

## **Benchmarking Study**

A study was launched under Professor Cooney's direction to benchmark the world's most highly regarded university-based technology innovation ecosystems and evaluate the role of the host university in their success. The benchmark focused on two distinct

types of institution: (1) universities that have nurtured/supported the world's leading ecosystems, and (2) universities that have nurtured/supported thriving ecosystems despite limited support from their local and regional environment. Through a series of conversations and a literature review, the initial phase of the study elicited expert views on the leading international university-based ecosystems, identified varying approaches to technology transfer, suggested preliminary indicators to measure university efficacy, and yielded a set of institutions for further study. The study continued into 2013 in a second phase.

### **Network Building and Outreach**

In March 2013, the joint innovation teams hosted the Building Entrepreneurial Universities Workshop, at MIT. The goal was to create an international community of entrepreneurial universities. The workshop, the first in a planned series, convened thought leaders in the field of entrepreneurship and innovation to identify opportunities for enhancing entrepreneurship and innovation in curricular and extracurricular activities. Over the course of several days, small teams of participants proposed a variety of collaborative activities and ways to facilitate interaction between university, industry, and government.

In addition to MIT- and Skoltech-hosted events, entrepreneurship and innovation leaders within the MIT Skoltech Initiative have been invited to engage in a number of international events to discuss collaboration with Skoltech. The two institutions presented three joint panels: in October, at the Open Innovations Forum, in Moscow; in March, at the Global Technologies Symposium, in California; and in May, at the Startup Village conference, in Skolkovo. All three events explored mechanisms for moving university research from the laboratory to the marketplace.

### **Focus on Manufacturing and Complex Systems**

At the request of Skoltech's president, MIT is advising on the formation of a program on manufacturing and complex systems. Integrated with Skoltech's Center for Entrepreneurship and Innovation, the new disciplinary focus complements industry interests and creates a platform for applied research and engagement. An early educational pilot was conducted in Moscow, in January 2013, under the auspices of the MIT International Science and Technology Initiatives Russia program, where Dr. Anthony led a short course titled Innovation and Entrepreneurship in Networks for 12 MIT students and Russian participants from leading Moscow universities.

### **Teaching Innovation**

Skoltech was founded on the belief that core innovation skills can be taught. MIT faculty and researchers have been actively involved in developing pedagogies that provide students with the confidence to become innovators. During the 2012–2013 academic year, two specialized courses were developed, which will be transferred to Skoltech as part of the core curriculum.

In August 2012, MIT hosted the pioneering MIT-Skoltech Innovation Workshop, designed by Dr. Perez-Breva. The four-week, intensive course brought a 40-student international cohort to MIT, with participants including 20 pilot Skoltech students, students from other Russian universities (the Moscow Institute of Physics and Technology; Bauman Moscow State Technical University; St. Petersburg National Research University of Information Technologies, Mechanics, and Optics; and the National Research Tomsk Polytechnic University), two Russian visiting faculty (from Tomsk Polytechnic University and Bauman Moscow State Technical University), students from Asian (Hong Kong University of Science and Technology) and European universities (Imperial College London and Eidgenössische Technische Hochschule Zürich), and four students from MIT. Faculty introduced the concept of prototyping innovation and empowered students through hands-on technology experience. The content of the workshop fused for the first time different approaches to technology innovation from across the MIT campus. Lectures and laboratories were highly multidisciplinary, ranging from technical explorations of energy, robotics, and power electronics to relational and strategic themes in business, writing, innovation prototyping, advocacy, and leadership. More than 62 contributors from the MIT ecosystem, including faculty, guest lecturers, mentors, and advisors, contributed to the delivery of the workshop.

In spring 2013, a four-member faculty team piloted a new half-term course, Ideas to Impact: Foundations for Commercializing Technological Advances. The six-credit, graduate-level course joined MIT students from across the Institute in teams with engineering students from Skoltech to address technical challenges. The course was cotaught by professor Edward Roberts, founder and chair of the Martin Trust Center for MIT Entrepreneurship ; MIT Sloan School of Management visiting professor Rory O'Shea; Dr. Perez-Breva, from the Department of Chemical Engineering; and Violetta Gerasymenko, an assistant professor at the NOVA School of Business and Economics, in Portugal.

### **Partnerships within MIT**

Through its Center for Entrepreneurship and Innovation team, the MIT Skoltech Initiative continues to pursue partnerships with innovation-focused programs across MIT. In spring 2013, the initiative partnered with the Martin Trust Center for MIT Entrepreneurship to support the MIT Global Founders' Skills Accelerator. This effort built upon a pilot held the previous summer, expanding access beyond MIT to international teams. The initiative also provided support for IdeaStream 2013, hosted by the Deshpande Center for Technological Innovation, and for the student-run MIT Global Startup Workshop, in Tallinn, Estonia.

Through the involvement of the center's director, Professor Cooney, strong collaboration has been established with the Deshpande Center, and initiative staff have helped test the applicability of the Deshpande Center's model in the Russian Federation. Skoltech's Innovation Sponsorship Program, launched in 2012, funds select translational research and development projects, aiming to bridge the gap between the laboratory and the marketplace. The program serves as a catalyst for innovation and entrepreneurship in the Russian academic and university research ecosystem by enabling proof-of-concept



research and identification of research and development and commercialization paths. The team also tested the Catalyst model, recruiting five US-based mentors to work with the selected Russian entrepreneurs.

In addition, MIT and Skoltech built linkages with the MIT \$100K Entrepreneurship Competition in order to better understand entrepreneurial student culture. Visiting Skoltech students participated in 2013 events, both on the organizing committee and as competitors. The initiative also sponsored a research study of the Russian competition landscape, conducted by the \$100K Entrepreneurship Competition student codirectors.

### **A Multiyear Collaboration**

The formal collaboration agreement of October 2011 established a three-year relationship between MIT, the Skolkovo Foundation, and Skoltech and outlined the possibility of a two-year extension. In late 2012, after one year of activities, the parties extended the term to a fourth year. The experience to date has been one of new perspectives, rapid development, and expanding stakeholder engagement in both the US and Russia. As the collaboration grows across multiple dimensions, the MIT Skoltech Initiative looks to further accelerate knowledge transfer to Skoltech.

**Duane Boning**  
**Faculty Lead**