MIT Skoltech Initiative

In the 2013–2014 academic year, MIT solidified and streamlined its continuing project to help build the Skolkovo Institute of Science and Technology (Skoltech), at the western edge of Moscow, Russia. The MIT Skoltech Initiative ended the academic year with approximately 20 staff, led by 12 core faculty and located in Building E70. More than 70 additional faculty, together with senior administrators from Technology Licensing, Sponsored Programs, Campus Planning and Design, and many other offices and departments across MIT, participate in the collaboration to build a unique, world-class research university in Russia.

A key influence on MIT's activities during the academic year was a range of discussions and exchanges of documents between Skoltech and MIT regarding strategic priorities and approaches for the continued development of Skoltech, and MIT's role therein, for 2014 and beyond. The process was led at MIT by professor emeritus Gerald Wilson, senior advisor to the MIT Skoltech Initiative and former dean of the School of Engineering, and discussions began in the fourth quarter of 2013 and continued into the first quarter of 2014. The result of these efforts has been a more focused group of staff working on a more narrowly defined set of tangible goals that will directly build infrastructure and capacity at Skoltech through February 28, 2016, the new end date for the first four-year phase of the collaboration.

Administration and Governance

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

Staffing

At Skoltech, collaboration activities were enriched by a series of senior hires. Working with Skoltech's senior administration and board, MIT advised and assisted on successful searches for a provost and a chief information officer (CIO), with these hires beginning in Moscow in early 2014 and late 2013, respectively. The position of provost strengthened leadership of academic and research activities, while the hiring of a CIO provided the nucleus for the creation of a vital area central to nearly all aspects of a successful graduate research university. At the MIT Skoltech Initiative, there was a change in faculty leadership with the appointment of a new faculty lead (professor of biological engineering and computer science Bruce Tidor) and deputy director (mechanical engineering principal research scientist Brian Anthony) as of January 1, 2014.

Campus and Infrastructure

Senior staff members from MIT Campus Planning and Environmental Health and Safety worked with their counterparts at Skoltech to ensure that campus facilities will function to enable world-class research and education at Skoltech. By the beginning of 2014, the focus of MIT activity had shifted to supporting the detailed programming and design of the Skoltech research facilities, both interim and permanent, including working

closely with a local architectural team to develop detailed lab programs and designs using labs at MIT as benchmarks. MIT also worked closely with Skoltech's incoming CIO to map campus needs, establish faculty advisory structures, and develop and implement a forward-looking information technology (IT) strategy. Given anticipated research computing needs and current bandwidth limitations in the Moscow region, development of relevant infrastructure is critical.

Administrative Capacity Enhancement Program

The Administrative Capacity Enhancement Program continued to serve as a mechanism for introducing Skoltech staff to counterparts and best practices at MIT over the course of targeted visits to Cambridge. Thirty-six visits had taken place through June 2014, ranging from resource development, IT, 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 IT, finance, human resources, fundraising, administration, and communications/events.

Governance

The Collaboration Steering Committee met three times—October 2013 in Cambridge, January 2014 in Moscow, and April 2014 in Cambridge—to conduct reviews of collaboration activities. As scheduled, the MIT Skoltech Initiative submitted interim and annual financial and program reports detailing the impact of activities. In addition, an internal oversight committee from MIT's senior administration met monthly throughout the year to provide high-level guidance and input regarding strategic directions as well as operational issues and challenges facing the collaboration.

Skoltech Capacity Building

MIT also assisted in several other areas to build core administrative and operational capacity at Skoltech. In IT, the MIT Skoltech Initiative provided valuable assistance to the new Skoltech CIO, including offering onboarding help and transferring several online operational tools/applications (e.g., a proposal management system and a faculty/postdoctoral portal). In the area of resource development, MIT's senior consultant continued efforts throughout the year to lay the groundwork for a modern university resource development program, guiding the Skoltech development staff as they organized the office, learned their respective roles, and developed their strategic and operational plans. In human resources, the MIT team supported Skoltech in several domains—compensation and benefits, faculty and postdoctoral associate contracts and information resources, employee and organizational development, performance management, and visitor services—as well as leading the development and implementation of the Skoltech policy development process and planning, scheduling, and facilitating Policy Review Committee meetings.

Outreach/International Relations

In collaboration with the Skolkovo Foundation, Skoltech, and the Russian Ministry of Education and Science, the MIT Skoltech Initiative organized an international conference, "Russian Universities, International Best Practices, and World Rankings

Workshop," at MIT in May 2014. The overall goal of the workshop was to provide a platform for discussing best practices regarding the development of a university strategic vision that would be beneficial for the participants in the "5 into 100" project (a high-priority Russian government project to increase the international competitiveness of Russian universities). Senior leaders from MIT, Tufts University, Northeastern University, and Boston University were invited to discuss leadership strategies relevant to the development and international competitiveness of Russian universities. The workshop was designed as a forum for presenting a variety of best practices in research, education, and innovation from a range of Boston-area universities differing in ranking and reputation, as well as unique perspectives on the development of academic reputation, institution building, and engaging with the international scientific community.

Educational Impact

Faculty and staff in the education and student tracks focused intensively on several tasks: participating in the development, implementation, and transfer of Skoltech educational programs; advising Skoltech on the use of online educational systems; addressing student attraction/selection; supporting Skoltech students at MIT; and supporting the MIT-Russia Program.

Educational Program Development and Implementation

To assist in the development of educational programs, instructional designers and developers, collaborating with faculty, reviewed, developed, modified, transferred, and assessed courses and other curricular elements (such as innovation and research project guidelines). This included the development of master's programs in IT, energy, biomedicine, and space. Also developed was the structure of a doctoral degree program and associated guidelines and procedures such as research requirements, credit-hour requirements, doctoral committee guidelines, and examination scheduling and requirements. In terms of implementation of educational programs, the MIT education team and MIT faculty conducted assessments, identified and strengthened operational mechanisms and processes, and taught and advised Skoltech students (remotely and in person).

In the first fall term (2013), six courses at Skoltech—all of which had been previously piloted at MIT—were taught and supported by a combination of 11 MIT professors/lecturers, one postdoc, seven teaching assistants, and two staff members. Teaching assistance at this level was not envisioned in the original collaboration agreement but was necessary given Skoltech's limited faculty size. In spring 2014, three additional courses were taught (through in-person, remote, and combined formats) by six MIT faculty and lecturers. Per the amended collaboration agreement and the goals outlined therein, MIT is responsible for developing, modifying, and transferring to Skoltech 13 to 24 courses by the end of 2014. Throughout the first half of 2014, the MIT team of instructional designers continued to collaborate with MIT faculty to develop or modify courses and curricular elements and then prepare them for transfer.

Starting in fall 2013, MIT played a crucial role in establishing a system at Skoltech for educational assessment that included the summer Innovation Workshop and all taught

courses. Included in the assessment exercises are the methods used and outcomes collected in the assessment of six courses; the use of "self-efficacy" pre- and postactivity measures to show that selected courses, including the Innovation Workshop, have increased the likelihood that students will pursue careers involving entrepreneurship and innovation; and ongoing activities to establish benchmarks that can be used to measure the career motivation of Skoltech students when they complete their master's degrees. In the first half of 2014, the central assessment activity was the gradual transition of responsibility for course assessment from the MIT Skoltech Initiative to Skoltech, although MIT continued to lead the design and analysis of assessments of summer industry immersion placements and the Innovation Workshop (offered for the first time at Skoltech in August 2014).

MIT's education team engaged on multiple other fronts to support Skoltech in building and strengthening the operational mechanisms and processes of its educational programs; for example, the team developed innovative learning and teaching pedagogies for the Skoltech community by way of the Independent Studies Period, a three-week term in January that is modeled on MIT's Independent Activities Period; constructed guidelines and procedures relating to how students apply for, participate in, conduct, and evaluate their graduate project learning experiences; drafted a thesis guide focusing on how students' thesis research is proposed, approved, conducted, and evaluated; and created guidelines for degree path planning to help students plan the courses/curricular elements, research and innovation projects, and other learning experiences they will complete to fulfill Skoltech requirements and pursue their various career goals and plans.

Online Educational Systems

Skoltech is working to develop a strategy and operations for outreach and online education that align with the institute's short- and long-term growth plans. It is critical that Skoltech's strategic and tactical approaches to online courses and edX (the premier online learning platform, founded by MIT and Harvard) are aligned with both internal (e.g., educating its students) and external (e.g., outreach to other Russian universities and potential students) needs. The MIT Skoltech Initiative team worked closely to advise Skoltech on an appropriate model of collaborating with and using edX that is fully aligned with the growth and outreach needs of the university and consistent with its internal education needs.

Student Attraction/Selection

In support of Skoltech's goal of admitting a combined total of 270 master's and PhD students by the end of 2014, the MIT student team conducted recruiting and outreach sessions, engaged in social media efforts, and conducted email campaigns during fall 2013 in connection with Skoltech opening its online admissions process for the 2014–2015 academic year. In addition, MIT continued to assist in the student selection process through participation in the spring and summer Student Selection Weekends, which included challenges, seminars, and individual interviews. In 2014, MIT representation included seven faculty members, two staff members, and one PhD graduate student.

Student Support

In AY2014, MIT hosted 10 Skoltech master's students for their pilot "year zero" experience. Five of the students participated in courses as part of the inaugural cohort of the biomedical science and technology stream, and five were at MIT to pilot a one-year program in product realization. All 10 students were at MIT not only to take courses but also to immerse themselves in the Institute's culture of entrepreneurship and innovation so that they can help drive participation in and implementation of best practices at Skoltech during the 2014–2015 academic year.

In late 2013 and early 2014, MIT developed the "flex program, an extension and amplification of the "year zero" cohort program aimed primarily at second-year Skoltech students who may need coursework that is directly applicable to their degree path but is not yet available at the institute. The program also targets Skoltech students who are interested in working on a research project with an MIT faculty member. Through the end of June 2014, 20 Skoltech students had applied to take MIT coursework and eight students had applied to work on various research projects with MIT faculty starting in fall 2014.

MIT-Russia Program

As part of MIT's commitment to develop student and postdoc exchange and internship programs at and for Skoltech, the MIT-Russia Program (part of the MIT International Science and Technology Initiatives) was established in 2011 to facilitate collaborations among MIT students, faculty, and research scientists and industry/research leaders in Russia. In AY2014, the MIT-Russia Program maintained its portfolio of key activities: summer internships for MIT students in Russia; a lecture series on topics related to Russian science, culture, and politics; and Russian-language instruction at MIT. During summer 2014, the program sent 15 students for internships to Russia, a significant increase relative to previous years (10 in year 1 and five in year 2). The number of host companies now totals nine, including private- and public-sector entities in both industry and academia. To date, 125 MIT students have taken Russian-language classes at the Institute, and the number of such students grew from 14 in fall 2012 to 30 in spring 2014.

MIT and Skoltech Faculty Engagement

The MIT-Skoltech collaboration has received substantial support from MIT faculty, who have engaged as search committee members, mentors, curriculum contributors, 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, with two primary areas of effort: an application-based process, generally for junior (assistant professor) and midlevel (associate professor) positions, and a targeted process for more senior positions (full professors and research center directors). Twenty-seven MIT faculty members serve on specialized faculty search committees. In 2014, efforts were expanded to create a larger applicant pool targeted toward the research areas of direct interest to Skoltech through a combination of center director–based outreach initiated by MIT and a Skoltech-initiated effort to reach out to

key MIT faculty members with the support of the MIT Skoltech Initiative. By the middle of 2014, the search committees had (cumulatively) reviewed nearly 1,100 applications for Moscow positions and recommended 60 candidates for hire by Skoltech (of whom 18 have been hired), and MIT faculty had hosted 113 associated research seminars presented by candidates. Faculty and staff also served as liaisons with several external firms involved in senior-level searches.

Faculty Development Program

Over the course of the year, MIT further developed and implemented the pioneering faculty development program (FDP) for Skoltech junior faculty that was designed and launched in 2012. Under the program, newly hired Skoltech faculty receive an appointment as a visiting scholar/professor 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. MIT hosted four Skoltech faculty members in AY2014.

Over the past year, key FDP developments included the debut of a new education curriculum in January, with redesigned offerings intended to provide a more personalized, one-on-one experience for faculty members centered around use of active learning techniques, the Skoltech educational framework, and transfer of course material from MIT to Skoltech; presentations and activities in the areas of entrepreneurship and innovation and leadership and development; and initiation of conversations with Skoltech regarding the packaging and eventual transfer of FDP materials and procedures for use at the institute.

Skolkovo Foundation Professorships

In 2014, six MIT faculty members from across the Institute were recognized 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 MIT vice president Claude Canizares. The 2014 recipients were Jacob White, Cecil H. Green professor of electrical engineering and computer science; Peter So, professor of mechanical engineering and biological engineering; James Kirtley, professor of electrical engineering and computer science; Douglas Hart, professor of mechanical engineering; Stephen Graves, Abraham Siegel professor of management; and Dick K.P. Yue, Philip J. Solondz professor of engineering.

New Research Opportunities

Research is one of the core elements of Skoltech's multidisciplinary Centers for Research, Education, and Innovation (CREIs). CREIs represent the building blocks of Skoltech's integrated approach to combining research, education, and innovation activities organized along five core thematic areas—biomedicine, IT, space, nuclear science, and energy—as well as in cross-cutting areas of research. In addition to supporting the process of CREI selection and establishment, the MIT research team supported and

enabled the build-up of Skoltech's research organization and administration, which strengthens Skoltech's faculty research and ensures integrated management of CREIs. In parallel to the establishment of the CREIs, strategic development projects (SDPs) continued to forge MIT/Russian/Skoltech research links, foster development of strong CREIs, and provide capacity building. The activities of the joint research team addressed Skoltech's priorities in several key task areas, as described below.

Centers for Research, Education, and Innovation and Industry Programs

In support of the Skoltech-defined key performance indicator of establishing 10 (cumulative) Skoltech CREIs by the end of 2014, the MIT research team guided and assisted the institute in CREI negotiations, establishment, and rollout of operations. In addition, the MIT team provided input on facilities, lab establishment, and processes and policies for operationalizing CREIs and research at Skoltech. As part of the effort to operationalize and establish biomedical CREIs, the MIT Skoltech Initiative supported a kick-off conference that attracted several hundred participants. The conference, "Towards Therapies of the Future," took place in May 2014 in Skolkovo and featured two Nobel Prize–winning keynote speakers and a roundtable discussion with Russian government representatives.

Additional operational support, training, and advice was provided on policies and design and laboratory operations for the biomedical CREIs, in particular for the establishment of the appropriate biosafety standards for laboratories, procedures, and policies for animal facilities as an integral part of campus establishment and development. The MIT research team also supported the establishment and operationalization of the Skoltech Center for Electrochemical Energy Storage and worked closely with Moscow State University faculty and administrators at the electrochemical CREI kickoff and planning meeting in March 2014.

Research with a consideration-of-use approach and industry engagements are central to Skoltech's unique approach as a university. Since 2013, the MIT research team has been providing advice and recommendations regarding industry outreach and partnering models. Moreover, the team has actively supported the industrial immersion program for students at Skoltech with the goal of creating strong links between industry and Skoltech. MIT's contributions included organizing and coordinating the industrial immersion training at MIT for the Skoltech station managers and the immersion director in late 2013.

Strategic Development Projects

Strategic development projects, launched in 2012, involve teams of MIT and Russian researchers who received awards from the initiative to conduct joint research with the goal of seeding a network for research and capacity building for Skoltech across all five thematic areas (biomedicine, energy, IT, space, and nuclear science). Researchers in Russia represent such leading institutions as Moscow State University, the Institute of Physics RAS, the New Economic School, and the Moscow Institute of Physics and Technology. Continuing in 2013–2014, the SDPs have enabled MIT faculty to engage with MIT/Skoltech institution-building efforts and to forge MIT/Russian research links and foster development of strong CREIs. By the end of 2013, 11 SDPs with MIT

participation had been approved jointly by Skoltech and MIT, with the SDP teams providing valuable contributions to building capacity for Skoltech, including serving on faculty search committees and assisting in the design and implementation of educational programs. The funding of six of the 11 SDPs ended in May 2014. Four of the remaining five SDPs are scheduled to end by December 31, 2014, and the last SDP will end by May 31, 2015. The MIT Skoltech Initiative office encouraged accelerated collaboration between the Russian and MIT SDP partners and facilitated discussions between Skoltech and the MIT SDPs. SDP programs were actively involved in the creation of corresponding CREIs, several of which are scheduled to start later in 2014 or in early 2015.

Skoltech Research Management and Operations

Building the Skoltech research administration and organization has been another central activity of the research team, to ensure that Skoltech research can effectively support CREI establishment and operations, faculty, and student research. In 2013, the research team started developing, refining, and rolling out the most critical research functions, including the Grants and Contracts Office and the Office of Research Alliances. The ongoing establishment of these offices was further supported in 2014. In addition, the research team rolled out the first version of Skoltech's research operations manual in June 2014. The manual is designed to guide new CREI directors through CREI establishment, management, and research operations and facilitate faculty and student research at Skoltech in general. MIT also provided advice and guidance on the development and implementation of critical policies, procedures, grant submissions, and industrial contracts. Training sessions were offered by MIT in the areas of sponsored research administration, regulatory compliance, animal use in research, and export control.

Building an Innovation Ecosystem

In AY2014, the MIT Center for Entrepreneurship and Innovation (CEI) team continued to help build capacity and further transitioned future innovation capacity building to Skoltech, enabled in part by the MIT-designed foundational educational and administrative programs invested in, and built out, in 2012 and 2013. Skoltech's student team estimated in June 2014 that 40% of Skoltech master's students are involved in one or more innovation projects, a byproduct of the growing innovation and entrepreneurship culture taking root at the institute. Activity highlights during this period included the following.

CEI Education

MIT developed three new credit-bearing activities:

- The Skoltech Innovation Workshop, developed by chemical engineering research scientist Luis Perez-Breva, is a compulsory, multiweek, hands-on course for all entering Skoltech master's students that teaches and demonstrates the connections among innovation, impact, research, and education central to Skoltech's mission.

- Venture financing, an immersive, action-oriented course developed by Sloan School of Management senior lecturer Shari Loessberg, explains the principles of early-stage venture financing opportunities through the use of simulated term-sheet negotiations with real corporate lawyers and venture capitalists.

- Innovation assistantships are being developed by Dr. Perez-Breva and Dr. Ilia Dubinsky (Skoltech) to provide students a pathway to hone their entrepreneurial and innovation skills by creating a new venture within an academic framework.

CEI Research

To "fill" the pipeline of entrepreneurship and innovation research suitable for symposia, and as a means of providing advice/guidance in terms of the development of Skoltech, MIT faculty engaged in applied research in four topical areas: Skoltech stakeholders, entrepreneurial scale-up and operation, accelerators and regional development, and commoditizing innovation. This research, conducted at MIT with fieldwork in the Russian Federation, frames and attempts to answer a core set of Skoltech innovation strategic challenges and interests. Highlights in 2013–2014 included the conclusion of the stakeholder analysis conducted by Deborah Nightingale, professor of the practice of engineering systems and aeronautics and astronautics, and issuance of the *Skoltech Stakeholder Analysis Study Report*, as well as reports of project findings at the 2014 Skoltech Innovation Symposium by associate dean of innovation and William Porter (1967) professor of entrepreneurship Fiona Murray ("Accelerators and Regional Development"), Robert T. Haslam professor of chemical engineering Charles Cooney ("Bridging the Innovation Gap with Proof of Concept Funding"), Chrysler Leaders for Manufacturing professor Charles Fine ("Entrepreneurial Scale-up and Operation"), and Dr. Perez-Breva ("Commoditizing Innovation").

Also seeing completion this year was "Creating University-Based Entrepreneurial Ecosystems: Evidence From Emerging World Leaders," a project conducted by consultant Ruth Graham under the supervision of Professor Cooney and José Estabil that describes the distinguishing building blocks of, and likely development paths for, an entrepreneurial university.

In addition, MIT supported the 2014 Skoltech Innovation Symposium, the third of three workshop-based conferences devoted to the creation of an international community with a common interest in building entrepreneurial universities, and coauthored the symposium's proceedings.

Knowledge Exchange

MIT helped review grant proposals and sourced US-based mentors for the Skoltech Innovation Program (SIP), which provides proof-of-concept research grants. The four 2013 pilot grants and the six SIP project teams selected are still on board and executing their respective project plans. In addition, MIT supported the development of, and attended, the SIP Catalyst Workshop kick-off meeting in June 2014 as part of the 2014 Startup Village event organized by the Skolkovo Foundation.

The MIT Technology Licensing Office continued to support the professional and operational capabilities of the Skoltech Knowledge Transfer Office (KTO) team in such areas as Skoltech intellectual property (IP) ownership, invention assignment, conflicts of interest, equity ownership, and background IP policies. The office also assisted with the live release of the KTO website and Skoltech faculty/student FAQ, the development of an invention evaluation and licensing guidelines document, and the creation of an IP training program for Skoltech students.

A Multiyear Collaboration

The formal collaboration agreement of October 2011 established a three-year relationship among 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 United States and Russia. As the collaboration has grown across multiple dimensions, the MIT Skoltech Initiative has further accelerated the university's development.

Bruce Tidor
Faculty Lead