

# The David H. Koch Institute for Integrative Cancer Research at MIT

## Current Goals, Objectives, Priorities

The [David H. Koch Institute for Integrative Cancer Research](#), a National Cancer Institute (NCI)-designated Cancer Center, provides a state-of-the-art research facility and collaborative environment for cancer research on the MIT campus. Completed in 2010, the Koch Institute (KI) building allows for the physical co-localization of faculty members from the Department of Biology (formerly in the MIT Center for Cancer Research) with faculty drawn from a variety of departments in the MIT School of Engineering. This multidisciplinary group of investigators is at the core of the Koch Institute's mission: to combine cancer science and cancer-oriented engineering to develop new insights into cancer as well as new tools and technologies to better treat, diagnose, and prevent the disease.

As a group, our goal is to make the Koch Institute the gold standard in interdisciplinary disease-focused research. The organization is continually expanding a highly effective relationship network that involves other academic and clinical oncology centers, industrial partners, and cancer-focused foundations. As part of an institution of higher education, we are also deeply committed to training the next generation of cancer researchers. As we settle into our new building and develop this new community, many of our efforts this past year have been on refining internal and external communications.

## Accomplishments

In 2012, a series of workshops and other activities have been established (or further improved) aimed at community-building, with the goal of strengthening integration and furthering interactions between scientists and engineers, as well as exposing researchers to the clinical, patient-based side of cancer work.

*KI Oncology Seminar.* The first cancer-specific seminar series at MIT was initiated this year at the KI. Top-level cancer researchers and clinicians were invited to present their work and meet with faculty and researchers. The seminar was well attended and received favorable reviews.

*KI Yearly Fall Retreat.* The purpose of the retreat is to provide an off-campus opportunity for sharing lab research and highlighting new research areas through formal presentations, panel discussions, poster sessions, and casual events.

*Friday Focus.* This internal weekly seminar series has broken down language barriers and become a very successful cross-disciplinary educational and training platform for presenting recent data from and by each of the KI labs.

*Crossfire.* This new in-house lecture series is designed to bring our two communities closer together. Broad-scope lectures explicitly designed to reach across disciplines are given by graduate students and postdoctoral fellows.

Biology lectures cover the basics of key areas of cancer biology while engineers present lectures on the big trends in materials, tissue engineering, and nanoparticles.

*The Doctor Is IN.* Presented by clinical trainees, this event exposes researchers in the building to real clinical issues, including patient case studies and new treatments being tested in the clinic.

*Engineering Genius Bar.* Presented monthly by engineering trainees, this is a drop-in session for biology trainees to get a deeper understanding of engineering solutions or to come with specific problems or questions.

*Committee for Community Life.* Volunteers from the KI (trainees and staff, researchers and administrators) organize community-building events and the seminars and lectures mentioned above. They also discuss other issues of importance to postdocs and graduate students.

*The Cancer Community Newsletter.* This electronic newsletter (started in 2009) sends highlights of newsworthy achievements, awards, and publications of KI members to current and past KI members.

The Koch Institute also focused on outreach beyond our research community. The following are some examples.

*KI Cancer Solutions Newsletter.* This electronic newsletter sends highlights of newsworthy achievements, awards, and publications of KI members to over 2,400 people with an interest in the Koch Institute (up from 2,100 in 2010 and 1,500 in 2009).

*The Koch Institute Public Galleries.* The galleries were established to connect the community in Kendall Square and beyond with fascinating work being done at the cutting edge of cancer research and, more generally, life sciences work at MIT. Within the galleries, visitors can explore current cancer research projects, examine striking biomedical images, hear personal reflections on cancer and cancer research, and investigate the historical, geographical, and scientific contexts out of which the Koch Institute emerged. New exhibits are unveiled regularly, including the annual exhibition of winning biomedical images from the Koch Institute Image Awards. The galleries are free and open to the public from 8 am to 6 pm weekdays.

*With/In/Sight Lecture Series.* Started in September 2011, this public lecture series features the insights that emerge when science meets engineering, clinical practice meets urgent patient need, entrepreneurial drive meets venture capital, and imaging technology meets artistic vision. Five With/In/Sight events were held over the past year with a total attendance exceeding 800.

*Annual KI Symposium.* The 11th annual Summer Symposium, “Epigenetics, Plasticity, and Cancer,” was held on June 14, 2012. The 12th annual symposium, “Cancer Immunology and Immunotherapy” is being planned for June 2013. Attendance was more than 1,000 at the 2012 event.

*School Group Programs.* The Koch Institute is committed to fostering an interest in science and engineering in young people. As part of this mission, we invite groups of middle and high school students (grades 7–12) to visit our facilities,

meet researchers who work every day to solve the cancer problem, and learn interactively about the science and technology of cancer research. Over the past year, we have hosted 11 school groups with 374 students, presenting hands-on demonstrations of the work in the building and making use of the resources in the KI Public Galleries. These events are offered free of charge and can optionally be paired with other activities at MIT, including the LEGO DNA workshops developed by the MIT Center for Environmental Health Sciences.

*Bio Flash Mob.* The KI hosted a Cambridge Science Festival activity on April 26, 2012 that brought together 226 participants for a giant-scale reenactment of targeted drug delivery to a cancer cell.

## **Administrative Initiatives**

The KI's administrative goal is to support and facilitate the work of Koch Institute researchers. This year several initiatives have been implemented or improved on.

*KI Intranet.* This is the development of an intranet system to provide key information to members of the Koch Institute in administrative, event, and scientific areas. The intranet serves as a repository for handbooks, guides, forms, and videos of seminars. Development will continue with input from the community.

## **Advisory Boards**

The Scientific Advisory Board (SAB) provides key scientific input to the KI as an NCI-designated Cancer Center. SAB input played a critical role in the significant increase that we received in NCI funding during the last competitive renewal of our Cancer Center grant.

The KI Leadership Council provides strategic input on outreach and communications of the KI. Members of the council are all successful business people, most with a technical background, and all have a passion to support our research's impact on the lives of cancer patients.

A new newsletter, the SBC Focus Newsletter, shares Swanson Biotechnology Center (SBC) news and showcases donors who support the efforts of the SBC.

## **Finances and Funding**

Funding for research performed within the KI building comes from several sources including federal grants, philanthropic dollars from individual donors, industrial contracts, and foundation support. The total was about \$70 million in 2012. Following are a few highlights of programs and funding.

Given the inter-disciplinary nature of much of the research in the Koch Institute, several faculty members participate in multi-investigator collaborative projects, many of which are funded by grants from the NCI:

- Bridge Project. In order to provide additional opportunities for faculty members to develop research toward clinical and commercial applications, KI has established collaborations with partner organizations in clinical centers and industry. The Bridge Project is a collaboration with the Dana-Farber/Harvard Cancer Center (DF/HCC) designed to foster and support inter-institutional cancer research efforts between faculty at MIT and Harvard. Now in its second year of funding, the Bridge Project has supported six teams of investigators from the two institutions to develop new treatment and diagnostic methods for cancers of the ovary, pancreas, brain, and lung, as well as melanoma. The Bridge Project is funded solely by philanthropic funds, which have been raised in a collaborative fashion between the development organizations of the DF/HCC and the KI. There are also several Bridge Project events every year, including workshops for teams to meet as well as donor events.
- Center for Cancer Nanotechnology Excellence Center
- The Ludwig Center for Molecular Oncology, established in 2006 following a gift from the Ludwig Trust, continues to support several investigators working in metastasis research.
- NCI Cancer Center Support Grant funds
- Physical Science and Oncology Center (PS-OC)
- Transcend—In addition to several smaller-scale sponsored research relationships with companies, the KI has established a larger-scale partnership with the pharmaceutical division of Johnson & Johnson (J&J). The Transcend program is a five-year partnership that includes a minimum of \$25 million of research support from the company. The program is in its third funding cycle, and currently 13 MIT faculty members are receiving support through Transcend, with two new additional faculty getting funds starting in July 2012, for a total of 14 projects (which also include non KI-members). In addition to financial support, Transcend offers the opportunity for visiting scientists from J&J to work in MIT laboratories as well as regular consultation with company scientists. Trainees are invited to two yearly scientific exchange events, one at the KI and one at J&J.
- Tumor Cell Network Center—formerly the Integrated Cancer Biology Program (ICBP)
- Tumor Microenvironment Network (TMEN)
- 43% Increase from '09-'10 in NCI Cancer Center Support Grant (CCSG) funds in recognition of expansion from Center for Cancer Research to the Koch Institute
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## Personnel Information

- Fourteen faculty members from the Department of Biology, with 12 active research programs.
- Nancy Hopkins will retire from the faculty at the end of the 2013 academic year.
- In conjunction with the Department of Biology, the Koch Institute is conducting a search for a new faculty member.
- Twelve faculty members from the School of Engineering.
- 2 KI Clinical Investigators (Scott Floyd started in July 2012).
- The Swanson Biotechnology Center, which includes the core facilities of the KI, is available not only to the faculty within the KI but to the Department of Biology and the whole of MIT. At full capacity, the center will employ about 70 fulltime staff scientists working within 13 distinct core facilities.
- An additional 25 MIT faculty are “extramural members” of the Koch Institute, including the directors of the Whitehead Institute (David Page) and the Broad Institute (Eric Lander). Through their involvement in research on cancer or cancer-related subjects, these individuals participate in a variety of ways in the research activities of the Koch Institute.
- At calendar year-end there were 164 graduate students and 153 postdoctoral fellows or associates with active appointments in the KI building faculty laboratories. Total personnel at the KI exceeds 700 individuals.

## Faculty Honors and Awards

- Angela Belcher—American Academy of Arts and Sciences Fellow
- Jianzhu Chen—American Association for the Advancement of Science Fellow
- Tyler Jacks—American Academy of Arts and Sciences Fellow
- Robert Langer—Priestley Medal, American Chemical Society; National Medal of Technology (National Science & Technology Medals Foundation)
- K. Dane Wittrup—National Academy of Engineering Member

## Publications, Patents, and Companies

Over the past four years, 15 companies have been started by KI faculty as a mechanism for discoveries in new technologies to be brought to the marketplace for clinical applications. For example, BIND Therapeutics, a nanomedicine technology company launched in 2007, treated phase I clinical trial patients last year.

KI intramural researchers produced over 400 publications in 2012, 15% of which have multiple KI faculty as authors. A solid indicator that KI cross-disciplinary collaborations are happening was the increased number of publications from collaborations between biologists and engineers; one third of publications involving multiple KI faculty include both biologists and engineers. This number is expected to rise rapidly over the coming years.

With an intense focus on developing new solutions to the complex challenges of cancer, the KI assembles world-class interdisciplinary researchers in an institute dedicated entirely to cancer research. As a state-of-the-art cancer research and technology facility, the Koch Institute is clearly – and quickly – changing the landscape of cancer research.

**Tyler Jacks**

**Director**

**David H. Koch Professor of Biology**