

For friends and supporters
of the Harvard Stem Cell Institute
Fall-Winter/2007



Stem Cell Lines

October 2007 Stem Cell Summit in Boston

Cosponsored by HSCI, the Stem Cell Summit took place October 2–3 at the Hynes Auditorium in Boston. Cosponsors included the Genetics Policy Institute and the



THE STEM CELL SUMMIT
GENETICS POLICY INSTITUTE
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Burrill Life Sciences Media Group. In addition to formal presentations, breakfast and luncheon roundtable discussions as well as poster sessions and exhibits by organizations in the field extended the breadth and depth of information available. The audience included advocates and patients, private-sector companies, scientists, and professionals.

Almost 100 speakers, many of them HSCI-affiliated investigators as well as experts from around the world, presented on topics such as the future of stem cell research, philanthropic giving, and collaboration from the vantage point of research hospitals. Panel presentations provided an array of perspectives including representatives from venture capital firms, biotechnology and legal professionals. Attendees could opt for breakout sessions in six disease areas. To achieve a holistic view of a disease area, each discussion included a scientist, a clinician, a disease foundation representative, and a patient advocate. The highlights from two discussions follow.

Summit Breakout Session – Spinal Cord Injury and Paralysis

At a roundtable discussion on spinal cord injury and paralysis, the center aisle was nearly filled with people in wheelchairs. On the dais, about a dozen bottles of pills sat on the table in front of activist Danny Heumann, who was paralyzed from the waist down in a car accident 22 years ago. He related how he depends on the contents of those bottles. He delivered a message to doctors and researchers that was deeply personal: “My goal is to get sensation back.”

All agreed that even that seemingly simple goal will be difficult. Moderator Jeffrey Macklis, MD, PhD, who studies nervous system development and directs HSCI’s Nervous System Diseases program,

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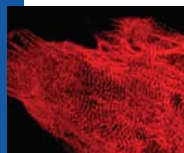
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HSCI Grant Programs Support Early-Stage Research

HSCI's unique grant programs provide early-stage funding for scientists in diverse areas of stem cell research that are aligned with HSCI's mission. Seed grants support both junior and senior investigators who have difficulty in obtaining funding to support new ideas. Such grants are, by definition, high risk, but in HSCI's experience several have proved critical in advancing the field. More importantly, these grants would not be possible without generous philanthropic support.

Sternlicht Director's Fund Awards Given to Graduate Students in Diabetes Stem Cell Research

This HSCI special grant program was initiated by a generous gift from **Mimi Reichert Sternlicht and Barry S. Sternlicht, MBA '86**. After a rigorous application process, grants are awarded to promising graduate students conducting stem cell research on diabetes. To be considered, students must have two to four years remaining in their program, be nominated by a faculty member and have financial need. The program provides grants of up to \$85,000 each year toward the recipients' graduate program costs (tuition, fees and stipend). Awardees present their research in an annual meeting with the Sternlicht family. The 2007 Sternlicht Fellows, announced on November 1, are Richard Sherwood, Catia Verbeke and Christopher "Kit" Rodolpha. (For more information on the grant award winners, visit www.hsci.harvard.edu.)

Farkas Family Steps Forward

Andrew (AB '82) and Sandi Farkas posed a startlingly simple question to Doug Melton, coscientific director of HSCI and a member of the HSCI Executive Committee. It was: "What do you need?" Melton's answer was also simple; he pointed to the need to support junior faculty. The couple responded by making a generous gift to fund the work of young scientists who show promise as future Harvard faculty members. Made in honor of Andrew

Farkas's 25th Reunion Class, the gift was matched in part by Harvard's Professorship Challenge, a university-wide faculty support initiative. Those who know the couple say their enthusiasm for HSCI can be attributed to their awareness of how stem cell research could revolutionize the scope and pace of science research and health care. The Farkas family, like others, is eager to help advance this work.

Millipore Foundation Supports HSCI Grant Program

Established more than 20 years ago by the Millipore Corporation (Billerica, Mass.), the Millipore Foundation furthers innovation and research in the life sciences industry. This past September, Millipore made a gift to HSCI as part of a scientific collaboration with Harvard to fulfill the promise of stem cell biology. In alignment with Millipore's corporate mission, this funding will support HSCI's Seed Grant Program that focuses on early-stage, high-risk research projects at the cutting edge of the stem cell field. Millipore is a life sciences company that provides technologies and tools and services for the bioscience research and biopharmaceutical manufacturing industry.



HSCI's first corporate donor puts emphasis on early stage research.

Volume 2
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Stem Cell **Lines**

Harvard Stem Cell Institute

Executive Director

Brock C. Reeve, MPhil, MBA

Scientific Directors

Douglas A. Melton, PhD

David T. Scadden, MD

The Harvard Stem Cell Institute (HSCI) is a scientific collaborative established in 2004 to fulfill the promise of stem cell biology as the basis for the cure and treatment of a wide range of chronic diseases and medical conditions. HSCI's unique effort unites experts across the disciplines, schools and departments of Harvard University and all its affiliated research hospitals.

HSCI also sponsors public education programs concerning scientific, legal, and ethical implications of stem cell research, conducts a summer research program for college students, and helps educate area high school teachers about stem cell science. HSCI depends on the vision and generosity of private individuals, and foundation and corporate donors to carry on its work, due to current U.S. restrictions on federal funding of embryonic stem cell research.

Stem Cell Lines is published three times each year for friends and supporters of HSCI. Inquiries from the public are encouraged; e-mail brock_reeve@harvard.edu.

Stem Cell Lines and extensive information concerning HSCI scientific research and programs can be found at www.hsci.harvard.edu.

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A class gift is used to support young investigators and is matched by Harvard's Professorship Challenge.

Bill Bowes Fills Stem Cell Science Funding Gap

Bill Bowes, MBA '52, has a keen eye for untapped excellence. A successful entrepreneur and venture capitalist, he was a pioneer in the promotion of biotechnology advances by forming Amgen, now a company with \$15 billion in revenue.



HBS's Bill Bowes provides support to accelerate the pace of research.

Bowes recognizes that scientists have to answer new questions and is highly aware of the funding gap that exists for new ideas, especially in stem cell science. To help fill that gap, Bowes gave a gift to Harvard this past summer to establish the Bowes Acceleration Fund at HSCI to provide critical funding that will enable important projects to advance to their next stage or key milestone. His gift honored Harvard Business School and was recognized as part of his class's 55th reunion.

Sandy Kurtzig gave a gift for a two-year project to support the creation and study of human embryonic stem cells with a diabetic genotype, a step along the road of developing cellular therapies for type I diabetes. In addition to funding this highly complex project, Kurtzig's gift will also support the Diabetes Think Tank, an international gathering of experts to brainstorm on key issues in the field and discuss research milestones and progress. Kurtzig is a graduate of the Harvard Business School Owner/President Management Program.

BD Biosciences (San Jose, Calif.) is the sponsor of the 2007–08 HSCI Seminar Series. Based at the MGH Center for Regenerative Medicine, the seminar series brings outside speakers to the HSCI community to foster learning and collaboration. BD Biosciences is a major producer of tools for life sciences researchers that include flow cytometers, cell imaging systems, monoclonal antibodies, research reagents, diagnostic assays, and tools to help grow tissues and cells.

Close to 20 talks are planned this year. Some of the leaders in the field who will be coming to HSCI include Mahendra Rao, Invitrogen Corporation (Carlsbad, Calif.); Arnold Kaplan, Case Western Reserve University; Eric Olson, University of Texas Southwestern; Thomas Zwaka, Baylor College; Rick Young, MIT; and Tony DeTomaso, Stanford University.



Ethan Bickford

MicroRNA study may yield clues to healthy cell self-renewal

Recipient of a 2007 Singer Family Foundation seed grant, **Richard Gregory, PhD**, is an investigator at Children's Hospital Boston, an HSCI principal faculty member and an assistant professor at Harvard Medical School. Gregory's research interests include working to understand the regulation of stem cell self-renewal at the RNA level, in particular the role of microRNAs (miRNAs) in this process. He will use his grant to pursue a screening strategy to look for compounds that prevent production of miRNAs by embryonic stem (ES) cells, keeping these cells in a pluripotent state, i.e., self-renewal state.

The miRNAs are single-stranded RNAs and do not encode proteins but instead target the destruction of other RNAs. Since miRNAs can influence which RNAs are present in a cell, they may play an important role in determining a cell's fate. Several studies have suggested miRNAs are not necessary for self-renewal in ES cells but do promote differentiation of these cells into mature cells. Gregory will examine which miRNAs drive differentiation to identify targets that, when blocked, could promote the process of self-renewal instead.

Gregory's current work has implications in cancer and cellular therapeutics. Since data from previous cancer studies show that patients with certain cancers have a deletion or down-regulation of particular miRNAs, this dysfunction may block normal cell development, allowing tumor cells to continue to divide and grow. Gregory's exploration of a compound to promote self-renewal could lead to a mechanism for generating large quantities of the same-type cell. This would provide an excellent foundation for building cellular therapies.

Nuclear transfer is essential building block for diabetes cellular therapy

Dieter Egli, PhD, is a postdoctoral fellow in the laboratory of HSCI principal faculty member Kevin Eggan. He is an HSCI-affiliated faculty member and HSCI's second Singer seed grant recipient. Egli will use his grant to support his work with fertilized human egg and cleavage stage embryos, obtained from couples whose reproductive treatment is complete. Central to his work is the transfer of the genetic material from a mature (donor) cell into an egg whose own genetic information has been removed. This mature cell's genetic information is then reprogrammed into an embryonic cell state. Normal and diabetic donor cells have been obtained from patients in collaboration with Columbia University; each donor has given consent for these experiments.

Egli's research goals include generating normal human embryonic stem cells from a mature adult cell and, in collaboration with Alice Chen, a postdoctoral fellow in Harvard's Department of Molecular and Cellular Biology, and Doug Melton, HSCI codirector, creating human ES cells specific for a diabetes patient. In work recently published in *Nature*, Egli has proved that this technique works in mice. He has now started to establish an equivalent technique using human fertilized eggs. The ability to closely examine the function of diabetes stem cells could be a key step on the journey to developing effective therapeutics.



Keck Award to Amy Wagers, HSCI Executive Committee Member and Investigator at Joslin Diabetes Center

Amy Wagers, PhD, is the recipient of the W.M. Keck Foundation award under its Distinguished Young Scholars in Medical Research Program. Wagers is assistant professor of pathology at Harvard Medical School and Joslin Diabetes Center. She will receive up to \$1 million in research funding over the next five years to expand her work on using stem cells to better understand and eventually treat diseases such as cancer, immune deficiency, and muscle dysfunction.

Wagers is interested in, among other topics, the mechanisms that regulate function of blood-forming and muscle-forming stem cells. Her work has identified particular gene regulators that appear to coordinate stem cell migration and expansion,

potentially leading to ways to increase the efficacy of bone marrow transplantation and to better understand the events that contribute to the development of leukemia. Like many investigators, she is working with both ES cells and adult stem cells in mouse and human models.

In the muscle, Wagers recently isolated a unique population of cells from adult mouse skeletal muscle that has tissue-specific stem cell properties and has been found to generate many new muscle fibers after transplantation. For diseases such as muscular dystrophy, this work may



Michael Maloney

provide a feasible approach to stimulating therapeutic muscle repair in humans. Wagers, as a result of a Jain Foundation grant, is examining the decline in regenerative capacity of skeletal muscle that occurs in a rare form of muscular dystrophy called Miyoshi myopathy, with a focus on identifying blood circulating factors that may be harnessed to remedy disease symptoms.

NIH New Innovator Award to Konrad Hochedlinger, HSCI Principal Faculty Member and Investigator at the MGH Center for Regenerative Medicine

Konrad Hochedlinger, PhD, an investigator with the MGH Center for Regenerative Medicine and a principal faculty member at HSCI, was among a number of Harvard researchers awarded special funding by the NIH this past September. Hochedlinger received the New Innovator Award, which provides \$1.5 million to support his research over a five-year period. He will continue his study of nuclear reprogramming to create cells with properties similar to ES cells – notably, the ability to differentiate into any cell type – by reprogramming adult cells.

This past year, Hochedlinger and other HSCI-affiliated researchers, along with scientists at the Whitehead Institute for Biomedical Research and Japan's Kyoto University, published findings concerning innovative ways to reprogram cells to direct their development. Under the NIH

grant, Hochedlinger will continue his work on induced pluripotent stem cells (iPS cells), embryonic stem cell-like cells he and his team have induced from adult fibroblasts in mouse models. He will examine the molecular nature of reprogramming to lay the groundwork that could lead to reprogramming human adult cells into a pluripotent state. In a follow-on step to such studies, scientists expect to be able to create disease-specific cell lines to understand disease development at a more detailed level than currently is possible.

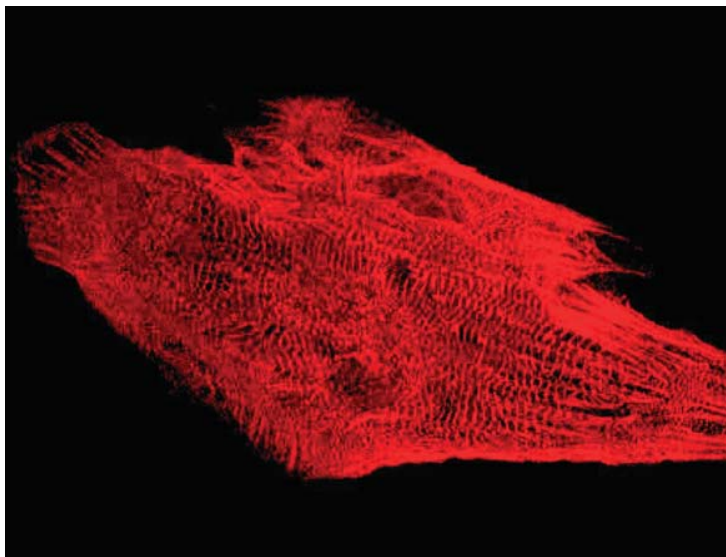


Sam Riley

HSCI Sponsors Radcliffe Institute Fellow

Financial support from HSCI has made it possible for **Christine L. Mummery, PhD**, a professor of developmental biology at the University of Utrecht, Netherlands, to spend this fall on a research sabbatical at the Radcliffe Institute for Advanced Study. The first-ever fellow supported by HSCI, Mummery is a highly regarded heart stem cell expert. Her goal is to better understand the differentiation of heart cells through collaborative work with Ken Chien, MD, PhD, director of the Cardiovascular Research Center at the MGH, and Kit Parker, director of the Disease Biophysics Group at the Harvard School of Engineering and Applied Sciences (SEAS).

Mummery is working to understand how the heart develops by studying the process by which stem cells mature into different types of heart cells. In her lab, viable pumping heart cells grown from stem cells have been implanted into mice. In these models, she observes that these grafted cells produce no apparent long-term improvement in heart function, although in several other groups, she does find short-term



A stained human heart cell shows the sarcomeres, structures that allow the cell to contract.

benefit. Why this occurs is not well understood.

Mummery hypothesizes that transplanted cells may not exert a force equivalent to the same cell type found normally in hearts. She also made the observation that sarcomeres, critical protein complexes in muscle cells, are highly unorganized in these grafted cells unlike those in normal heart-muscle cells.

At Harvard, she is collaborating with Parker's group at SEAS and Chien's at MGH to examine the electrical properties and action potential of various cell shapes to understand

how shape may be related to the force of contraction. The result of her inquiry may help determine whether adult stem cells can be a viable source for transplantation to replace parts of the heart damaged due to heart attack or heart failure.

In addition to her research project, Mummery is an active member of the HSCI community. She has already given a talk to her Radcliffe Institute colleagues, participated on a panel at the Stem Cell Summit and will be giving additional talks to the larger HSCI community.



Christine L. Mummery, PhD

George Daley Named President of the International Society for Stem Cell Research

HSCI contributions to international cooperation in stem cell research are advanced by the recent election of George Daley, MD, PhD, associate director of the Children's Hospital Boston Stem Cell Program, as president of the International Society for Stem Cell Research (ISSCR). The ISSCR is an independent, nonprofit organization, which, since 2002, has worked to foster the dissemination of information and ideas relating to stem cells, to encourage research, and to promote professional and public education in all areas of stem cell research.

Daley is the organization's fourth president, taking over from Paul Simmons, PhD, University of Texas Health Sciences Center at Houston. (Leonard Zon of Children's Hospital Boston and HSCI Executive Committee chair served as its founding president.) Annual meetings of the ISSCR tend to focus on young researchers, fostering communications and support for future leaders. In February 2000, the ISSCR released its

"Guidelines for the Conduct of Human Embryonic Stem Cell Research," intended to encourage responsible, transparent, and uniform practices worldwide. See www.isscr.org.

An important and well-known voice in science and ethics at Harvard and around the world, Daley is an HSCI principal faculty member, member of HSCI's Executive Committee, a hematologist at Children's Hospital Boston, and a laboratory investigator. He has briefed Congress concerning government support of both human embryonic and adult stem cell research. He is expected to encourage ISSCR's continued examination of ethical practices while president. Daley comments, "We seek to remove unnecessary barriers to scientific programs while promoting responsible, uniform research practices worldwide."

Thanks to Children's Hospital Boston for information regarding Daley's appointment.

2007 HSCI Summer Interns Thrive in Science

This past summer, 31 college students, excited by the challenges of stem cell biology, worked as interns in HSCI laboratories at Harvard, Harvard Medical School, and its affiliated research hospitals. The lucky 31 were selected from a pool of almost 200 outstanding applicants vying for spots in this, HSCI's third summer internship program.

A 10-week, intensive hands-on research and educational program in stem cell science and technology, the HSCI summer internship program is entirely funded by the generosity of individuals who believe in the promise of stem cell science. The application process is competitive, with members of a review committee conducting phone interviews with those selected for the final round.

Applicants come from a wide range of backgrounds, and not all have had previous laboratory experience. The program is dedicated to providing undergraduate students who do not have access to stem cell science at their schools with a unique opportunity, and it extends its reach beyond Harvard's borders. This past summer, there were 15 non-Harvard students, including one from the U.K. and one from Egypt.

In addition to working fulltime in the laboratory, all interns attended a weekly seminar series and a Stem Cell Companion Course. The seminar series featured a scientific talk by an HSCI stem cell investigator, along with a career panel that introduced interns to alternative careers in science. The Companion course met weekly and consisted of two components, an outreach project and a journal club.

Interns worked together in groups to develop an outreach presentation aimed at the high school level on a disease area relevant to stem cell research. This project engaged the interns in thinking about stem cell

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HSCI intern Alan Chou conducted lung stem cell research with his mentor, Carla Kim, assistant professor, Children's Hospital Boston.

Sarah Opitz

Student Intern Begins a Science Career in HSCI Laboratories

Anya Kimura's father died of cancer and liver failure shortly before she graduated from high school in Tokyo. She and her mother then moved to the United States, where Kimura enrolled at Harvard College. Soon after, her mother was diagnosed with and succumbed to pancreatic cancer. At a very young age, Kimura, alone in the United States and realizing that her prospects were more promising here than in Japan, dropped out of college to support herself.

Thirsty for knowledge and unafraid of asking questions, Kimura attended free lectures within the Harvard community, where she learned about HSCI. The more HSCI seminars and public forums she attended, the greater her passion grew for stem cell science. Kimura re-enrolled in a bachelor's degree program at the Harvard Extension School,

still maintaining her full-time job, and is expected to graduate in 2008.

This summer, Kimura participated in the HSCI Summer Internship Program with support from a generous gift by Anne and Edward Bliss and their grandchildren, Annie and Elisha Lee; Leland and Page McManus; George, Elizabeth, and Margaret Gregory; and Sarah and Cooper McGrath. She balanced her regular job during the week (supporting investigators with clinical trials) with her responsibilities as a full-time HSCI intern, along with a part-time job on the weekends. Kimura remarked that these opportunities have allowed her to experience both sides of medicine, basic research, and its clinical application. She has extended her research experience and is now working in neuronal stem cell research with Kathy Niakan, a postdoctoral fellow in the laboratory of Kevin

Eggan at Harvard.

Kimura pursues her studies and research with an appetite for learning and hopes ultimately to test her own theories about stem cell function. Deeply curious, she thrives on asking different and broad questions. In a recent conversation, Kimura thought out loud about the complexity of stem cell science, "It's important to use your imagination. If you don't question what is possible, you won't see it. There is really a lot of order and logic to stem cell biology; it's not magical. I think our role as scientists is to use knowledge to its fullest potential."

Open to new experiences and extraordinarily dedicated, Kimura is an inspiration to all those curious about how the world works and who dare to pursue their dreams, no matter what happens.

HSCI/California Junior Faculty Symposium

HSCI's junior faculty started off this academic year with a symposium with their California colleagues to foster idea sharing. Millipore and Cell Press (Cambridge, Mass.) were financial sponsors of this meeting that was convened by HSCI with the purpose of developing collaborations among the leading young scientists in the country. Coordinated by HSCI principal faculty member, Niels Geijsen, the two-day program was jammed with presentations by HSCI investigators as well as 14 scientists associated with the California Institute for Regenerative Medicine (CIRM). Discussion focused on the major scientific questions in topics such

as pluripotency, epigenetics and reprogramming, neural systems, and a variety of special topics. Due to its tremendous value this year, participants are planning a second meeting next year in California.

CIRM was established in early 2005 with the passage of Proposition 71, the California Stem Cell Research and Cures Initiative. California's statewide ballot measure provided \$3 billion in funding for stem cell research at California universities and research institutions. CIRM is the state-level agency that provides grants and loans for stem cell research, research facilities, and other vital research opportunities.

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and John Kessler, MD, director of the Northwestern University Feinberg School of Medicine Stem Cell Institute, outlined how restoring function and sensation following a spinal cord injury is likely to involve repair and regeneration of not only nerve cells but also supporting cells and nonliving extracellular scaffolding. This has the potential to restore an environment that will allow surviving fibers to conduct signals again and transected nerves to grow through the injured area.

Stem cells, embryonic and adult, were seen as important tools in understanding how nervous system cells respond to injury. Kessler cautioned that stem cells, manipulated in culture and then transplanted into patients, were very unlikely to be a “magic bullet” cure that would undo the effects of trauma. “The notoriety of stem cells is actually a problem,” said Peter Kiernan III, chairman of the board of the Christopher and Dana Reeve Foundation, because the hype over stem cells has raised unreasonable expectations.

Faced with these daunting obstacles to complete cures, the concept of a pragmatic cure moved to the fore. “Pragmatic cures are easier,” said John McDonald III, MD, PhD, executive vice president and director of the International Center for Spinal Cord Injury in Baltimore, the world’s first program dedicated to spinal cord injuries in children. He pointed out that if only 20 percent of neurons remain to cross the injury gap, movement or sensation can be preserved. Kiernan reported that the Reeve Foundation is working to find the common denominators of injury, impairment, recovery, and function that are needed to evaluate clinical trials.

Despite the many reasons to be pessimistic about finding near term stem-cell-derived treatments for spinal cord injury and paralysis, the discussion ended more hopefully. The encouraging outcome of football player Kevin Everett’s spinal injury during an NFL game in September demonstrated that when treatments are applied in the right way, at the right time, they can be effective at staving off

paralysis. Panelists urged patients to challenge obsolete assumptions about the unlikelihood of recovery. “You’d better stay in shape,” said Heumann, who bikes and plays tennis. Added Kiernan, “Don’t write yourself off.”

Stem Cell Research and Opportunity from a Hospital Perspective

Leading off the summit’s second day, a panel of Boston-area research hospital CEOs reflected on competition and collaboration, two essential and inevitable features of stem cell science. David Scadden, MD, HSCI codirector, Harvard professor, and a practicing hematologist/oncologist at Massachusetts General Hospital (MGH), moderated a lively dialogue, as he attempted to tease out answers to difficult questions. He began with the theme of collaboration.

MGH CEO Peter Slavin pointed to the upside of collaboration “but also the temptation to defect,” as he put it, to much laughter from the audience. Factors favoring collaboration include federal funding priorities and the recent California ballot initiative (establishing a

To achieve excellence, [Harvard's research] institutions must work hard to create a culture in which teaching programs are viewed as a top priority. Harvard's new interschool Department of Stem Cell and Regenerative Biology is presented with that opportunity.

state-funded stem cell institute). California sent a lightning bolt, as Slavin put it, “threatening the strategic advantage we have had in stem cell [research].” Collaboration also creates positive conditions for recruiting top scientists. He commented that HSCI has been integral to the creation of research programs across Harvard-affiliated institutions, something that has never occurred before. He acknowledged that donors favor multi-institutional collaboration. But, Slavin cautioned, a collaboration can be fragile, as in any type of relationship.

Gary Gottlieb, CEO of Boston-based Brigham and Women’s Hospital, underscored funding needs. “We need visionary donors,” he said. The huge price tag of stem cell science from the bench to the marketplace is evident to all. Gottlieb commented that generous donors want to know “Why Harvard?” He added that HSCI has raised the visibility of the depth and breadth of research across Harvard. He encouraged participation by all parts of the university and affiliated hospitals, remarking that “big” science is the priority for the next decade.

Scadden noted there would obviously be multiple claims on intellectual property emerging from scientific collaboration. He asked panelists to envision a system in which all institutions benefit. All agreed that one conversation, not many conversations, with commercial interests would be an efficiency. Children’s Hospital Boston CEO James Mandell pointed out that each institution needs to maintain its own scientific oversight; Children’s, like other institutions, also has a rigorous separate and internal ethics committee focused on stem cell research. Brock Reeve, HSCI executive director, reminded the panel, “We want to be sure, even if committees need to be separate, that we coordinate so that no one group reinvents. We can achieve economies of learning and economies of scale by doing this.”

Panelists considered the pervasive issue of safety. Edward Benz, CEO of Boston-based Dana Farber Cancer Institute commented, “In cancer, where we have a long history of experience with bone marrow transplant, major immunological issues emerge around grafting. Secondly, we can’t target therapy until we thoroughly understand how the daughters of stem cells are formed. Generally from a safety perspective, the therapeutic benefit ratio to the risk would be narrow for any therapy. One must be sure the trial is addressing the questions that justify the inherent risk in the trial.”

The hospital leaders affirmed the value of educating young investigators but noted the conflicting demands on scholars around promotion as measured by published papers,

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funding, and the translation of new discoveries. To achieve excellence, institutions must work hard to create a culture in which teaching programs are viewed as a top priority. Harvard's new interschool Department of Stem Cell and Regenerative Biology is presented with that opportunity.

Benz pointed out the long road between the lab and the clinic. Institutions must tap and ally with biotechnology companies that have critical resources such as libraries of antibodies and chemical compounds. Mandell pointed out the need for teamwork and for seeking scientists with an entrepreneurial spirit. Slavin termed this being "bilingual in the private business sector and in science."

This theme was subsequently picked up by the summit's concluding commentary by experts on the interplay between global regulation and global research collaboration. The broad and ambitious meeting, with HSCI as a galvanizing force, reflects the maturity of the collaborative enterprise at Harvard University and its schools, research centers, and affiliated hospitals. Built on last year's inaugural summit meeting, the two days of lectures and panel presentations captured some of the new and still-evolving issues at the nexus of policy, stem cell-based treatment of disease, and the patient's perspective.

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science from a disease perspective and provided them with experience in translating complex scientific terms and concepts into language appropriate for a high school audience. In partnership with Boston's Roxbury Latin School, two summer interns presented their projects to a high school class taught by Larry Murphy. (Murphy is director of the Biotechnology Institute at the school.)

The focus of the journal club is to teach and refine skills necessary for critically analyzing scientific and review literature. Each intern gained experience presenting parts of a paper and leading detailed discussions. In addition to the science of stem cell research, interns engaged in lively discussion on the ethical, philosophical, and social implications often associated with this field.

For more information on the summer program, please check HSCI's Web site: www.hsci.harvard.edu.



HSCI's 2007 student interns gather in the courtyard of the Sherman-Fairchild Building at Harvard.