

University of Pittsburgh

Research Development Report

Reporting Period:

July 1, 2010 - June 30, 2011

Commercial Development of Research

The Office of Technology Management (OTM), along with its affiliate Office of Enterprise Development (OED), serves as the hub of all innovation commercialization activities at the University of Pittsburgh. Together OTM and OED facilitate the development of products and processes from University technology for the benefit of the University, its faculty and staff, and the community. At the same time, OTM fosters long-term relationships with industry in sponsored research, innovation development, technology licensing, and the formation of start-up companies.

To manage the University's fast-growing commercialization activities, OTM employs intellectual property protection experts, specialized licensing managers, business development and technology marketing professionals, education and outreach teams, and reporting and compliance personnel.

OTM services to Pitt innovators include:

- Assistance with preparing and submitting invention disclosure forms for commercial consideration
- Facilitation of the protection of intellectual property at the University via patents and copyrights
- Strategic planning for the successful transfer of innovations to the marketplace
- Negotiation of licenses and options for Pitt innovations to commercial interests
- Management of post-licensing reporting, revenue collection, and royalty distribution
- Educational opportunities in technology commercialization and "academic entrepreneurship"
- Unique opportunities for targeted interaction between Pitt innovators and industry, investors, and the community
- Facilitated brainstorming to assist Pitt innovators in developing marketable commercial applications
- Annual recognition for faculty, staff, and students who participate in the commercialization process

Pitt's total research expenditures (both direct and indirect costs) were approximately \$737 million in fiscal year 2010 (the latest year for which data are available). According to preliminary calculations for FY11, research activity generated 250 invention disclosures, which are evaluated by OTM in conjunction with the University Technology Transfer Committee for technical merit, patentability, and market potential. During FY11, OTM executed 105

technology licenses and options to industry, including two new Pitt-originated start-up companies (licenses/options include 62 regular licenses/options, two sublicenses, 40 deals in which other universities shared in ownership of the technologies and led in the facilitation of the licenses, and three amendments). In FY11, the United States Patent and Trademark Office issued 36 patents to the University of Pittsburgh. Since 2001, the University and its innovators have been issued 332 patents. OTM actively develops commercialization strategies for these and other Pitt-developed technologies.

The Association of University Technology Managers (AUTM), in its 2008 survey of U.S. universities (the latest survey data available), ranked the University of Pittsburgh 18th in sponsored research expenditures, with \$641.6 million in total funding. AUTM also ranked Pitt 19th in number of invention disclosures, with 244 disclosures that year. In addition, the University completed 58 technology licenses and options, placing it in a tie for 26th in the AUTM ranking. The number of issued patents totaled 36 in FY08, placing the University 23rd in ranking.

OTM and the University depend on the dedication of the University's multidisciplinary community of researchers to succeed in commercializing innovations for the benefit of humankind. Therefore, OTM's ongoing challenges are to: (1) engage more faculty, staff, and student innovators in the commercialization process; and (2) improve the commercial merits of the innovations that are submitted via invention disclosures to OTM for commercial consideration.

Among the key initiatives created to reach those goals is OTM's Pitt Innovator Initiative, which continues to support the office's core mission by building and nurturing a growing community of "Pitt Innovators." Pitt Innovators represent those who have submitted invention disclosures and, therefore, are participating in the innovation commercialization process at Pitt. Several of OTM's ongoing outreach and education programs continue to encourage more Pitt faculty, staff, and students to become Pitt Innovators, thus engaging in the innovation development and commercialization process, and to recognize those who do. As a result of such efforts, invention disclosures over the past several years have totaled well over 200 per year. In fact, in FY2011 the number climbed to 250 invention disclosures (an 11.1 percent increase).

In FY11, OTM/OED worked closely with a diverse group of academic disciplines, as well as with a number of student interns, to develop the business cases for more Pitt innovations. OTM/OED hosted a number of networking and innovation showcase receptions, including "speed-dating" sessions between Pitt faculty and industry representatives, and hosted yet another meeting of their new Commercialization Advisory Committee, whose members represent entrepreneurs, investors, and economic development professionals, among others.

To celebrate the accomplishments of Pitt Innovators, OTM and the Office of the Provost continue to host an annual Celebration of Innovation. Invitations to the event are limited to those who filed invention disclosures during the previous fiscal year, those whose innovations were licensed to industry or start-ups in the past year, senior administrators from across campus, and the local economic development community. Those whose innovations were licensed are awarded Pitt Innovator Awards for their achievement. The sixth annual event, held on October 5,

2010, drew more than 150 attendees. More than 70 faculty, staff, and student innovators received awards.

In spring 2011, OTM/OED launched a new Executive in Residence program, which is just beginning to take shape and build results. Two serial entrepreneurs—one in computer software and the other in medical device development—were hired to generate more technology commercialization and start-up activities in those areas of research. OTM/OED also are integrally involved in the development of a medical innovation center in the Swanson School of Engineering, which will identify problems in the medical realm that can be solved through innovation development and then put together teams of faculty and students who can systematically solve those problems. Entrepreneurial education, including technology commercialization, will become an important component of the program.

Finally, OTM/OED are in the process of developing a new Web site in which education and assistance are key components. The Web site is being designed largely as a repository of information to help Pitt Innovators and potential commercial partners navigate the challenges of technology commercialization while also driving users to viable innovation licensing and sponsored research partnerships.

Research Licensing Agreements

The University of Pittsburgh has developed the following standard licensing agreements for use in the licensing of research results related to medical devices, drugs, and other research discoveries:

- Biomaterials license agreement
- Inter-institutional agreement
- License agreement—exclusive
- License agreement—non-exclusive patented
- Option Agreement

Training Students and Health Professionals

The School of Medicine's Summer Premedical Academic Enrichment Program-Level I (SPAEP-I) is a seven-week program designed to be a preliminary education program for 12 minority and/or disadvantaged students who are graduating high school seniors or college freshmen or sophomores. The program reinforces science coursework, broadens competency in written and oral communication skills, and introduces health disparities issues. Participants for this institutionally funded program are selected from a national pool. However, preference is given to students from the University of Pittsburgh, Pittsburgh residents, and students from historically black colleges and universities (HBCUs).

The institutionally funded Summer Premedical Academic Enrichment and Research Program (SPAERP) Level II curriculum places six to eight underrepresented or disadvantaged upper level college students in laboratories for seven weeks to participate in research mentored by School of Medicine faculty. Each Friday afternoon, the students are engaged in medical school application skills seminars taught by the Office of Admissions, as well as study skills strategy sessions.

They attend Medical College Admissions Test (MCAT) preparation workshops each Saturday morning during the program. Program participants spend one or two afternoons shadowing clinicians and attending weekly brown bag lunch seminars given by School of Medicine faculty, residents, fellows, and community physicians. They also participate in mentoring and networking activities held in conjunction with other summer programs. Each student has a “mock interview” with a School of Medicine faculty member and receives feedback on his/her performance. Participants also complete an application timeline based on when they are planning to apply to medical school. The program’s capstone experience is a presentation of the student’s research with mentors and peers in attendance. Participants for this institutionally funded program are selected from a national pool; however, preference is given to students from Pennsylvania, the University of Pittsburgh, Pittsburgh residents, and students from historically HBCUs.

The Center for Public Health Practice (CPHP), established in 1995 with an appropriation from the Commonwealth of Pennsylvania, is a catalyst for engaged scholarship in public health through applied research, practice-based teaching, and professional service. Numerous activities interface with all departments at the Graduate School of Public Health (GSPH), the Dean’s Office, and the Multidisciplinary Master of Public Health (MMPH) program, utilizing and sharing expertise throughout the school. CPHP’s goals are to:

- Develop innovative resources and practical solutions for public health problems at the local, state, and national levels
- Provide education and training for students, practitioners, and leaders in public health and other professions
- Create partnerships for mutual learning between academic institutions and public health agencies
- Apply principles of quality assurance and quality improvement to continuously improve performance in scholarship, professionalism, and management

CPHP houses several subsidiaries, including the Pennsylvania Public Health Training Center and the Public Health Adaptive Systems Studies.

The Pennsylvania Public Health Training Center (PAPHTC) is one of 33 public health training centers across the United States funded by the Health Resources and Services Administration (HRSA). Additional funding from HRSA in 2010 enabled the training center to increase the depth and breadth of its programs. As a result, a new partnership was established with GSPH, Drexel University School of Public Health, the University of Pittsburgh at Bradford Center for Rural Health Practice, and the public health workforce across the Commonwealth. The aim of PAPHTC is to strengthen the competencies and improve the performance of public health workers through dynamic, innovative, and effective training and educational opportunities. PAPHTC offered 24 different training titles to more than 600 public health professionals during the most recent reporting period. Example training titles show the variety of programs offered:

- *Creating a More Productive Workplace - 2011 Management Institute*
- *Interfacing with Special Populations: Autism*
- *Grant Writing Basics*
- *Listening between the Lines*

Public Health Adaptive Systems Studies (PHASYS) is one of nine Preparedness and Emergency Response Research Centers funded through a five-year grant from the Centers for Disease Control and Prevention. A central assumption within PHASYS is that the public health system (PHS) must *adapt* from its routine functioning in order to be effective in an emergency. The research focus takes two parallel approaches to understanding this adaptive response: (1) to develop criteria and generate indicators to measure the effectiveness and efficiency of preparedness planning and emergency response within the PHS and (2) to conduct agent-based systems modeling. The resulting research evidence will have applications for both evidence-based preparedness planning and information-based emergency response decision making. During the third year of the study, PHASYS:

- Has used data from various public health departments to develop a draft tool to measure local PHS emergency response burden
- Developed draft adaptive system indicators to study PHS response
- Worked closely with a National Advisory Group to ensure the national application of research findings
- Conducted six focus groups with representatives of local PHSs across the country to identify the legal and ethical issues affecting local PHSs' ability to build emergency preparedness capacity within vulnerable populations they serve
- Completed data collection and coding of all statutes directing emergency preparedness and response activities in three states, including Pennsylvania (legal network and other statistical analysis of these data is currently underway)
- Developed two agent-based models of preparedness and response, currently in refinement (one local, one national)
- Designed and developed an electronic decision-support dashboard, currently in the prototype stage, for hospitals to monitor and display the status of multiple interdependent engineering systems
- Is studying dynamic relationships among the hospital, public health, and emergency medical services in 13 local counties and, having already extensively studied Allegheny County, is moving on to others

In fall 2009, through collaboration with CPHP, the University of Pittsburgh School of Medicine created a Public Health Area of Concentration (AOC). The AOC is designed to supplement and complement the required medical curriculum and offers medical students an opportunity to pursue in-depth experiences in public health research and practice. In 2010, more than 200 students participated in a variety of activities, including lunch talks, journal clubs, summer research opportunities and leadership training.

CPHP hosts the School-Based Research and Practice Network, whose mission is to help investigators create well designed, school-based research and to connect them to partner schools. As of June 2011, network activities linked 11 research projects to 30 different school districts and 162 public, private, charter, and parochial schools in the region. Settings include rural, suburban, and urban populations as well as a mixture of demographic and socio-economic statuses. Research projects cover a spectrum from medical to public health to educational to social programs, including environmental asthma, depression, friendship, anxiety, learning fractions, and autism. More than 1,300 children, and in some cases parents and teachers, have

been screened for participation with nearly 700 enrolled in studies. In addition, 124 investigators attended network seminars to increase their understanding of best practices in conducting research with schools to improve their ability to design and place research projects in school settings.

The Public Health Preparedness Law Program serves as a resource for preparedness law information to individuals with responsibility for public health preparedness and response. The highlights of program activities during 2011 include: the delivery of a two-day seminar for the judiciary in multiple states, the delivery of emergency preparedness law lectures in several courses across the University community, and the delivery of an online two-credit Emergency Preparedness Law and Ethics Course.

- The Graduate Certificate Program in Public Health Preparedness and Disaster Response, co-sponsored by the GSPH Departments of Behavioral and Community Health Sciences and Environmental and Occupational Health, offered four required and one elective academic preparedness courses in 2010–11, reaching 62 students.
- CPHP continues to support the Student Public Health Epidemic Response Effort (SPHERE), founded by GSPH graduate students. SPHERE provides essential assistance to local and state agencies and enables public health students interested in epidemic response, community preparedness, and hands-on experience to participate in outbreak or disaster response activities and community health events and promotions. This year SPHERE coordinated a series of activities including:
 - Student staffing for the Allegheny County Health Department influenza clinic
 - Training 16 GSPH students in epidemiology for outbreaks and emergency response
 - Bringing more than 30 new GSPH students to the Allegheny County Health Department as part of the “Plunge into Pittsburgh” orientation
 - Distributing first aid kits to volunteers
 - Conducting a speaker’s series that qualified for GSPH Dean’s Grand Rounds credit, with experts speaking on topics including Marburg virus outbreaks, FEMA Incident Command, immunizations and pertussis outbreaks, and rabies in Pennsylvania; more than 150 students attended these lectures over the course of the year

Commercial Research Development Training

During this reporting period, OTM/OED engaged in a series of activities to provide training opportunities to faculty, staff, postdoctoral fellows, and graduate students related to the commercialization of research. These activities included the following:

- In fall 2010, OTM and the Office of the Provost once again hosted a seven-week course for faculty and their research students, titled “Academic Entrepreneurship: The Business of Innovation Commercialization.” The course focuses on the early stages of commercial innovation development and teaches participants how to transform their ideas and research into commercially viable business opportunities. This year, the course attracted 35 faculty, staff, and students.

- In February 2011, OED hosted its own 10-week commercialization course, titled “From Benchtop to Bedside: What Every Scientist Needs to Know.” The course, which attracted more than 30 faculty, staff, and student participants, focuses on the innovation development/commercialization process, with particular emphasis on life sciences-related technologies, regulatory issues, and topics such as business models based on insurance reimbursement.
- OTM/OED conducted at least six introductory presentations in various departments and student classes, reaching an estimated 100-plus faculty, staff, and students in fiscal year 2011. All such outreach efforts are designed to generate a new awareness of Pitt’s commercialization endeavors and to encourage greater collaboration both internally and externally. Moreover, each attendee received additional commercialization education materials developed by OTM/OED.
- OTM distributed its “Pitt Innovator’s Guide to... Technology Commercialization at the University of Pittsburgh” throughout the year to faculty, staff, and students, including an estimated 70 new faculty at the Office of the Provost’s annual new faculty orientation program in August 2010.
- OTM/OED have been working closely with the Swanson School of Engineering for the past year in the development of a new medical innovation center. The center will bring students and faculty together as teams to develop and commercialize innovations. OTM/OED has been working to educate the development team and prepare them to educate students who will join the innovation development teams.
- OTM/OED have continued to provide a comprehensive internship program that teaches students with both business and science educational backgrounds about technology commercialization. In fiscal year 2011, at least eight students from the Joseph M. Katz Graduate School of Business, School of Law, and Department of Bioengineering participated in the program. The students provided market research, competitive analysis, and industry contact development services for both offices.
- One OTM staff member maintains board of director ties with the Massachusetts Institute of Technology (MIT) Enterprise Forum of Pittsburgh, a regional entrepreneurial education and networking organization that emphasizes technology-based entrepreneurship. As part of OTM’s affiliation, which includes sponsorship, staff members proactively encourage faculty, staff, and students to attend the forums for educational and entrepreneurial networking benefits. Another OTM staff member serves on the board of The Indus Entrepreneurs (TiE) organization, which promotes entrepreneurship.
- OTM/OED continued to distribute “Commercialization Coaching Cards” to Pitt Innovators throughout fiscal year 2011 at all OTM/OED-oriented events. The cards provide tips on how to convey innovative ideas to potential outside partners, including research collaborators, investors, and entrepreneurs.
- In October 2010, OTM hosted its sixth annual “Celebration of Innovation” before an audience of more than 150 innovators, as well as both University and external supporters.
- OED hosted several lecture programs in fiscal year 2011, including a well-attended program that featured Robert Langer, ScD, a famous technology-based innovator and entrepreneur from MIT, who discussed how he has turned his unique innovations into successful companies. An estimated 300 people, mostly consisting of faculty and students, attended the lecture.

- OED hosted its annual meeting with its commercialization advisory committee, comprising local entrepreneurs, investors, and University of Pittsburgh alumni who are successful business leaders. The committee meets with a select group of Pitt Innovators who present innovations with start-up potential. The committee then critiques each innovation and presentation to help the innovators move their ideas forward toward market.

Outreach to Businesses Regarding Recent Research Developments

- Database marketing—OTM continued to post its portfolio of available innovations on searchable online databases, including TechFinder, which is accessible by industry, investors, and other outside parties through the OTM Web site (www.otm.pitt.edu). Included with each case listed are the title, non-confidential abstract, available patent link information, inventor Web site links, and technology licensing manager contact information. OTM also continues to participate in i-Bridge, a nonprofit, online marketing network that posts technologies from universities across the country. The network provides ongoing leads from interested industry representatives.
- Business development—OTM and OED continued to pursue the development of new long-term relationships with industry for the purposes of sponsored research, clinical trials, and innovation out-licensing. OTM/OED hosted numerous meetings on- and off-campus with industry representatives in fiscal year 2011. Most recently, staff members attended an BIO International Conference in Washington, D.C., and participated in more than 50 partnering meetings with industry. To support the effort, OTM/OED has updated its “Partner with Pitt” brochure and begun to develop a series of “Partner with Pitt in...” capability brochures that showcase Pitt’s multi-disciplinary strengths. This past year, brochures were developed on medical imaging, energy, and vaccine research, with additional documents in the works on cancer research, regenerative medicine, and drug discovery.
- Commercialization advisory committee—OED once again hosted a gathering of its commercialization advisory committee to review and discuss potential start-up opportunities among Pitt innovations. The group is made up of business leaders and successful Pitt alumni.
- Entrepreneurial speed-dating—OED began to test this concept in 2006, bringing together pre-screened faculty and industry representatives for many short, tightly-structured meetings to explore potential common interests. In fiscal year 2011, OED hosted two sessions.
- Technology conferences—OTM and OED representatives attended numerous conferences during this reporting period to meet with specific industry representatives and market specific innovations that are available for licensing and other potential industry partnerships. The effort led to a number of qualified leads, which now are being followed up. Among the conferences OTM/OED attended were the Association of University Technology Managers (AUTM) annual conference in Las Vegas, Nevada; the BIO International Conference in Washington, D.C.; BIO Windover, a bio-partnering conference; and a Bayer-sponsored conference in Germany.
- Community involvement—OTM/OED have continued to reach out to the community and industry via the MIT Enterprise Forum of Pittsburgh, 3 Rivers Venture Fair, Entrepreneur’s Growth Conference, local The Indus Entrepreneurs (TiE) events, OED’s lecture series, the BIO International Conference, AUTM annual conference, the Association for Corporate Growth-Pittsburgh, State Science and Technology Institute (SSTI), the Pittsburgh Technology Council’s Tech 50 awards program, and several other technology-based industry

conferences. OTM/OED sponsored many of those events and managed exhibit booths to share Pitt's technology commercialization activities.

- Technology Showcase—OED worked with the Office of Academic Affairs, Health Sciences, to organize the eighth annual Technology Showcase reception as part of Pitt's annual celebration of science and research, "Science2010." This event provided industry and venture capitalists with the opportunity to view and explore 28 of the latest innovations coming out of Pitt, with a focus on commercialization. The event, which also included industry/community mentors for Pitt Innovators, proved instrumental once again in creating many critical relationships that have resulted in technologies being licensed to new and existing companies.
- Hosting visitors—On several occasions in fiscal year 2010, the Pittsburgh Council for International Visitors included OTM as a target destination for international visitors interested in technology-based economic development. During this reporting period, OTM met with delegations from Russia and Chile.
- Annual report—In September 2010, OTM published its sixth annual report, showcasing Pitt innovators and their commercially viable innovations. The report was distributed to nearly 1,000 companies, economic development agencies, investment firms, foundations, and others to promote commercialization and foster more interaction with industry. The report was also distributed to nearly 500 Pitt faculty, staff, and students.
- Celebration of Innovation—OTM and the Office of the Provost hosted the sixth annual Celebration of Innovation in October 2010 to recognize the involvement of faculty, staff, and students in the commercialization process. Awards were given to those whose innovations were licensed in the last year. To build awareness of Pitt's commercialization efforts, OTM invited dozens of local companies, investors, economic development representatives, and foundations to attend.

Research Development Collaboration

The University's principal partner in research development and commercialization is the University of Pittsburgh Medical Center (UPMC), which directly supports selected research and research infrastructure initiatives, as well as investing in promising intellectual property developed by Pitt faculty members. During a previous reporting period, UPMC and the University of Pittsburgh entered into an agreement with the Italian president, the president of the region of Sicily, and Italy's National Research Council to operate a major new research center in Sicily. (This request complements the successful development by UPMC of a tertiary care hospital in Palermo, which specializes in organ transplantation and other complex procedures; the facility was funded by the Italian government and is managed by UPMC.) The \$400 million Biomedical Research and Biotechnology Center (BRBC) will house programs that build on Pitt's strengths in computational and structural biology, vaccine development, drug discovery, molecular imaging, tissue engineering/regenerative medicine, and neuroscience. Italy will construct the 300,000-square-foot center in the province of Palermo. The facility is expected to open its doors by 2013. In addition, a state-of-the-art cell factory in Palermo is one of the country's most innovative research projects. Developed in collaboration with the University of Pittsburgh McGowan Institute for Regenerative Medicine, the facility processes, stores, and distributes human cells to be used for regenerating damaged organs at transplantation centers throughout Europe.

During the current reporting period, the trilateral partnership among UPMC, the University of Pittsburgh, and the Italian government has continued a fellowship program established three years ago. To date, 24 young Italian researchers have received or are currently receiving research training and experience at the University of Pittsburgh in the fields of structural biology, computational biology, neurosciences, pharmaceutical research, vaccine development, tissue engineering/regenerative medicine, biomedical devices/development of nanotechnologies, molecular imaging, and related areas. The progress of these fellows, who will comprise the vanguard generation of investigators in the BRBC, is reviewed annually by the program's scientific committee, which is headed by Arthur S. Levine, MD, Pitt senior vice chancellor for the health sciences and dean, School of Medicine.

The University of Pittsburgh also works closely with UPMC's International and Commercial Services Division (ICSD), which invests in strategic partnerships, commercial ventures, and clinical operations, joining with industry innovators to form and support businesses focused on developing breakthrough technologies and delivering advanced patient care. A number of the technologies ICSD has advanced have emerged from intellectual property created by Pitt faculty members. For example, the ICSD Office of Strategic Business Initiatives (SBI) has created a new wholly owned subsidiary of UPMC, SimMedical, in collaboration with the University of Pittsburgh's Peter M. Winter Institute for Simulation Education and Research (WISER). SimMedical provides expertise in the creation and management of integrated health-care simulation training programs, featuring curricula and a web-based simulation management system developed by leading health-care and simulation experts. Another innovation developed by University faculty/UPMC physicians is ImPACT, a user-friendly Windows-based testing program designed for the diagnosis and management of sports-related concussions. ImPACT is currently the most widely used computerized concussion treatment program in the world and is used by athletes from grade school to the professional level. Omnyx, a start-up company jointly owned by GE and UPMC, is a digital pathology company based on University- and UPMC derived technologies that aim to transform diagnostic processes that traditionally have relied on outdated manual methodologies.

Through its National Institutes of Health-funded Clinical and Translational Science Institute (CTSI), Pitt is working with UPMC to bolster participation in clinical research trials by developing an institutional registry of potential clinical trial participants. The Research Participant Registry is a database of individuals who are willing to participate in clinical research at the University of Pittsburgh and/or UPMC plus an ongoing list of current studies being conducted by Pitt/UPMC. The goals of the voluntary registry are to provide community members and patients in the UPMC network opportunities to receive educational materials about clinical research and to get their permission to be contacted for study recruitment. Through the UPMC electronic health record, the registry matches patients who express interest in taking part in clinical studies with a list of current trials being conducted through the University and UPMC. The CTSI registry leverages not only UPMC's reach (more than 4.5 million outpatient visits and more than 187,000 inpatient admissions a year) but also its investment of more than \$500 million in an interoperable, long-term electronic health record system. The Research Participant Registry is also available to patients who do not receive their care at a UPMC site, although these sites

cannot provide the same level of electronic matching as UPMC sites. As of July 1 2011, the registry had achieved the milestone of enrolling more than 20,000 people.

The University of Pittsburgh and neighboring Carnegie Mellon University (CMU) have collaborated for many years on the development of research, as well as licensable products from that research. For example, the fundamental value of DNA analysis for the advancement of science was evident long before the full sequencing of the human genome was completed in 2003. Today, so many studies require sophisticated, next-generation sequencing of multiple small RNA or DNA genomes that the University of Pittsburgh is working to streamline data-sharing capabilities through the Pittsburgh Supercomputing Center (PSC). Established by Pitt, CMU, and the Westinghouse Electric Company in 1986, PSC houses some of the most powerful cyberinfrastructure currently available for high-performance computing, communications, data handling, and data storage. At Pitt, next-generation sequencing enables microbiome-based investigations, as well as those involving infectious diseases, congenital heart defects, cancer, and others that require bioinformatics support. Other Pitt-CMU collaborations include the Center for the Neural Basis of Cognition and the National Science Foundation-funded Quality of Life Technology Center, among others.

The University of Pittsburgh also collaborates with CMU in two biomedical education programs. The first is the joint Pitt-CMU program in computational biology. Computational biology uses mathematical models to analyze structure-function relationships to answer important biological questions. With the advancement of next-generation sequencing techniques and high-powered computing, this discipline has seen unprecedented growth in recent years. Pitt's Department of Computational and Systems Biology and CMU's Ray and Stephanie Lane Center for Computational Biology serve as the administrative homes for the program, which allows students to be cross-trained by experts at both institutions. Another joint program is the Molecular Biophysics and Structural Biology (MBSB) Graduate Program, which focuses on an area of research that crosses the boundaries of physics, chemistry, biology, and medicine. MBSB students are mentored by internationally renowned faculty from both institutions and are educated in the use of state-of-the-art technologies, such as high-field solution and solid-state nuclear magnetic resonance (NMR) spectroscopy, X-ray crystallography, cryo-electron microscopy, atomic force microscopy, mass spectrometry, and infrared spectroscopy, and learn to apply these methods to the study of biological interactions.

The RAND-University of Pittsburgh Health Institute (RUPHI) is a formal collaboration between RAND Health, a division of the RAND Corporation, and the University of Pittsburgh Schools of the Health Sciences. RUPHI's primary goal is to build a collaborative, interdisciplinary health services research enterprise focused on addressing important local and national health care problems. The collaboration encompasses shared activities in research, education, and training, with a particular focus on creating and broadening synergies in women's health, behavioral health, type 2 (bedside to practice) translational research, health and health care disparities, patient safety, and global health.

RUPHI staff currently include 92 faculty from the University of Pittsburgh and 38 health researchers and staff from the RAND Pittsburgh office, including one junior faculty member with a joint appointment at the University of Pittsburgh and RAND. To date, RAND and

University of Pittsburgh investigators have conducted 39 collaborative research projects, supported by over \$110,000,000 in external funding.

Beginning in fall 2006, RUPHI instituted a pilot grant program designed to forge productive working relationships among junior and senior investigators at both RAND and the University of Pittsburgh that would lead to more substantial externally funded RUPHI grant applications. To date, RUPHI and its co-sponsors have issued nine pilot grant awards at \$25,000 each in three areas of research: translating research into practice (with Pitt's Clinical and Translational Science Institute), women's health (with Magee-Womens Research Institute), and mental health (with Western Psychiatric Institute and Clinic). Representative projects include:

- Feasibility of a Telehealth Kiosk Intervention for Community-Dwelling Older Adults
- Latina Postpartum Depression: Defining Terms and Treatment
- Investigating Associations between Media Use, Depression, and Anxiety using Ecological Momentary Assessment