THE DEVELOPMENT OF PHYSICIAN-SCIENTISTS
At the University of Pittsburgh, we believe the field of academic medicine is uniquely positioned — and obligated — to ensure the future of leadership and scholarly innovation in biomedicine by helping to develop the next generation of superb physician-scientists. Success in this mission requires a convergence of talented and creative students with excellent faculty mentors and role models, growing together in an environment rich with opportunity — one that promotes investigation, innovation, collaboration, and creativity.

To that end, the University of Pittsburgh School of Medicine has developed an array of programs to cultivate the physician-scientist. Every one of our medical students is exposed to the mechanics of scientific investigation through the completion of a mentored scholarly project. Exceptional students interested in research-based careers have multiple programs to choose from that will provide them with the skills, credentials, and support to achieve their goals.

It is our belief that physicians who understand the structure of thought underlying the practice of medicine are better prepared to practice medicine in the 21st century and that those with the talent and will to lead the field to new heights as physician-scientists must be supported and cultivated. As evidence of our dedication to training the next generation of physician-scientists, we are pleased to share with you this summary of some of our programs and curricular innovations.
A SCHOLARLY PROJECT CURRICULUM

Background
Our mission is to educate the finest clinicians and scientists. We believe accomplishing this goal requires that every student become familiar with the application of the scientific method to medical questions. Our thinking is that physicians schooled in the analytic process are better prepared to retrieve and critically evaluate the information in this week’s JAMA and New England Journal of Medicine—information that can help them determine patient treatments, for instance, or separate advertising hype from established findings in evaluating new drugs.

We contend that physicians schooled in the analytic process will arrive at clinical decisions based on solid evidence, even when the cases do not lend themselves to straightforward conclusions. They are equipped to deal with the rapidly changing developments that have become a hallmark of contemporary medicine. These are physicians who advance the medical profession, rather than simply working in the profession.

Methods
Since 2004, the training of every Pitt medical student has included a curricular requirement to formulate and complete a hypothesis-driven scholarly project. The scholarly project is incorporated longitudinally throughout the curriculum as an indispensable component of medical education and is broadly defined to provide a wide range of possibilities, including laboratory-based, clinical, or outcomes research, as well as less traditional choices.

The intent is to expose students to the mechanics of scientific investigation; teach them how to develop a hypothesis and how to collect, analyze, and interpret data to test it; encourage them to pursue research opportunities; and help them understand the structure of thought underlying the practice of medicine. Among the program’s distinctive elements are thorough preparatory course work designed to foster the skills that students need to successfully conduct scholarly work, an emphasis on developing strong faculty mentors to ensure the program’s ongoing success, and creative use of electronic technology to promote learning and mentorship.
Many students initiate their scholarly project by participating in a summer research program, while others might take a year off to pursue a more in-depth experience. Some students find the work so rewarding that they embark on careers as physician-scientists. The goal in every case, however, is to enhance their ability to think independently, critically, and creatively and, thereby, equip them to practice medicine in the 21st century.

**Results**
The Class of 2010 was the third class to complete the four-year scholarly project experience. Their endeavors resulted in 38 fellowships, grants, or other national awards; 28 School of Medicine awards; co-authorship of 104 peer-reviewed papers; and more than 120 national presentations and abstracts.

**Conclusions**
Students are able to be highly productive on scholarly projects during the four-year medical curriculum. These projects and their outcomes demonstrate the achievability of the scholarly project program goals, including development of in-depth knowledge in a focused area, the ability to synthesize and critically evaluate published work by others, and the generation and completion of new studies that advance the health sciences. The scholarly project represents a novel (and perhaps even prototypical) way to increase the number of medical students who pursue research-based careers or clinical careers grounded in evidence-based medicine. It endows all of our graduates with the confidence needed to be creative and analytical clinicians—and those are the kinds of doctors we want.

*For more information: [www.omed.pitt.edu/curriculum/scholarlyproject.php](http://www.omed.pitt.edu/curriculum/scholarlyproject.php)*

**“THE PEOPLE ON FACULTY ARE VERY APPROACHABLE, AND THAT’S A BIG DEAL. OBVIOUSLY, THERE ARE A LOT OF INSTITUTIONS THAT HAVE TOP RESEARCH PROGRAMS. BUT AT PITT, IT SEEMS THAT THE FACULTY AND POTENTIAL MENTORS ARE REALLY EAGER TO TAKE ON TRAINEES AND STUDENTS. EVERY SINGLE PERSON I HAVE EVER APPROACHED TO DISCUSS POSSIBLY DOING RESEARCH WITH THEM HAS BEEN HAPPY TO DISCUSS OPPORTUNITIES.”**

Jonathan Leeman, PSTP student / Class of 2013
MEDICAL SCIENTIST TRAINING PROGRAM

The Medical Scientist Training Program (MSTP) gives medical students intent on pursuing careers in biomedical research the opportunity to undertake doctoral work at either the University of Pittsburgh or Carnegie Mellon University (CMU) in one of the participating programs in basic science, engineering, or public health. Students in the MD/PhD program, as it is known, complete both degrees in an average of seven years.

Students begin with the first two years of medical school and then move into their PhD work; once that is completed, they finish their medical training. The program provides them with full tuition and a stipend each year. Currently, 92 students are enrolled in the MSTP, which is funded by a grant from the National Institutes of Health, with support from the Office of the Dean. At any time, about half of the students are engaged in the MD segment of the program, while the others are involved in their PhD studies. If they did not enroll from the start, students can apply for transfer into the MSTP during their second year of medical school.

A rising trajectory of research funding, both traditional and non-traditional, is one of Pittsburgh’s most notable achievements in recent years, ensuring a wealth of opportunities for MD/PhD students to explore cutting-edge areas of medicine. Both Pitt and CMU have more than doubled their NIH funding since 1998. The University of Pittsburgh currently ranks fifth in the nation among educational institutions and affiliates in NIH support.

The spirit of interdisciplinary collaboration that pervades the linked campuses of the University of Pittsburgh and Carnegie Mellon University creates an ideal environment for promising students to launch research careers that integrate medicine and the basic and applied sciences. Exceptional investigators in the following programs serve as potential mentors for MSTP students:

“DESPITE THE ECONOMIC PRESSURES FORCING CLINICAL AND SCIENCE CAREERS APART, I BELIEVE THAT THE MSTP TRAINING IS MORE IMPORTANT NOW THAN IT WAS 30 YEARS AGO. THE DESIRE FOR A HEALTHY SOCIETY CREATES THE DEMAND FOR THE COMBINATION OF CLINICAL AND BASIC SCIENCES.”

CLAYTON A. WILEY, MD, PHD / ASSOCIATE DEAN AND DIRECTOR, MSTP
University of Pittsburgh
Biochemistry and Molecular Genetics
Biomedical Informatics
Cell Biology and Molecular Physiology
Cellular and Molecular Pathology
Clinical and Translational Science
Computational and Systems Biology
Immunology
Integrative Molecular Biology
Molecular Genetics and Developmental Biology
Molecular Pharmacology
Molecular Virology and Microbiology
Neuroscience
Epidemiology
Human Genetics
Chemistry
Neuroscience
Bioengineering
Chemical and Petroleum Engineering

Carnegie Mellon University
Biomedical Engineering
Biological Sciences
Robotics

2010 MSTP graduates entered residency programs at the following institutions:
Harvard University—Emergency Medicine
Johns Hopkins University—Internal Medicine and Pathology
UCLA—Psychiatry
University of Chicago—Pediatrics
UPMC—Ophthalmology and Pathology

For more information:
www.MDphD.pitt.edu

PHYSICIAN SCIENTIST TRAINING PROGRAM

The Physician Scientist Training Program (PSTP) is a five-year program for exceptionally talented students who, in addition to the regular curriculum, undertake two summers and a dedicated year of laboratory-based research training, as well as enrichment courses to prepare them for careers in academic medicine.

The primary directive of the PSTP is to create future academic physicians by providing the highest quality of medical training. This program provides formal mentorship and a range of special services and opportunities to facilitate training. In addition to efficiency, the close integration of clinical and basic science training better reflects the future careers of academic physicians.

Those who are selected for the program receive full tuition for the four years of medical school plus a stipend during the two research summers and the research year. The PSTP currently has 22 students. Medical students can also apply as internal candidates in their second year. Over a period of five years, PSTP graduates acquire the knowledge, skills, and experience to begin careers in some of the most exciting areas of academic medicine.

For more information:
www.pstp.pitt.edu

CLINICAL SCIENTIST TRAINING PROGRAM

The Clinical Scientist Training Program (CSTP) is a five-year, dual MD/MS scholarship program designed to prepare outstanding medical students for careers in academic medicine and clinical investigation.

Through the CSTP, students earn a Master of Science (MS) in clinical research. The program requires an additional year (the research year) between the third and fourth years of medical school, plus additional coursework and a thesis. Up to five students matriculate each year, and there are currently 24 students in the program. CSTP students receive a scholarship of $25,000 a year toward medical school tuition for four years, full tuition for the MS, and a stipend during the research year.

“Our greatest concern is breaking the artificial distinction between clinical and scientific training.”

Richard A. Steinman, MD, PhD / PSTP Director

For more information:
www.pstp.pitt.edu

Amar Mehta / Class of 2012
The program has three main components:

**Longitudinal Seminar**
In the first three years, students attend a weekly seminar covering topics such as research ethics, career paths in clinical investigation, the nomenclature of the National Institutes of Health (NIH) application process, and the students’ own research progress.

**Mentored Research**
All students conduct full-time mentored clinical research with a federally funded investigator during the summer between the first and second years and for 12 months after the third year of medical school. The ultimate goals are for students to complete their research, present one or more abstracts at regional or national meetings, and convert these abstracts into manuscripts for publication in peer-reviewed journals.

**Courses in Clinical Research Methods**
Students work with the program director to develop a plan of study to complete 30 credits for an MS. The course work is completed during the research year between the third and fourth years of medical school and during research electives.

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**Doris Duke Clinical Research Fellowship**
Medical students may apply in their third year for a Doris Duke Clinical Research Fellowship, a one-year program leading to a certificate in clinical research. Doris Duke Fellows receive a generous stipend, tuition benefits, and funds for research and travel. Up to seven students are accepted each year. Competitive applicants have an established relationship with a clinical research mentor, a compelling research proposal, and an expressed interest in and aptitude for a career in clinical research.

**For More Information About CSTP:**
www.icre.pitt.edu/cstp-m/
## CURRICULUM OVERVIEW

### Year 1

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<tr>
<th>August</th>
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<tbody>
<tr>
<td>Medical Anatomy</td>
<td>Cell Path Basis of Disease</td>
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<tr>
<td>Fuel Metabolism</td>
<td>Immunol in Health and Disease</td>
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<td>Human Genetics</td>
<td>Medical Microbiology</td>
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<td>Intro to Medical Decision Making</td>
<td>Neuroscience</td>
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<td>Ethics, Law, and Professionalism</td>
<td>Intro to Psych</td>
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<td>Advanced Physical Exam 1 and Clinical Experiences 1</td>
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### Year 2

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<td>Renal</td>
<td>Repro and Develop Biology</td>
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<td>Pulmonary</td>
<td>Integrated Case Studies</td>
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<td>Methods and Logic in Medicine 2</td>
<td>Family Medicine</td>
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<td>Population Health</td>
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### Year 3*

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<tbody>
<tr>
<td>Elective</td>
<td>Surgery and Perioperative Care</td>
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<td>Combined Ambulatory Medicine and Pediatrics</td>
<td>Clinical Neurosciences</td>
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<td>Specialty Care</td>
<td>Adj Clin Skills</td>
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<tr>
<td>Elective</td>
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<td>Geriatrics</td>
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### Year 4*

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<td>Acting Internship</td>
<td>Recess / Interview</td>
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<tr>
<td>Pediatric Inpatient Medicine</td>
<td>Integrated Life Sciences</td>
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<td>Obstetrics and Gynecology</td>
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<td>Elective</td>
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<tr>
<td>Recess / Interview</td>
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* During the combined clinical years students rotate through eight required clerkships in any sequence. Additional requirements are one acting internship, one integrated life sciences selective, nine electives, and three clinical focus courses.