INSTITUTIONAL ACADEMIC, EDUCATIONAL, AND CLINICAL RESOURCES

The **University of Pittsburgh**, founded in 1787, is one of the oldest institutes of higher education in the United States. The University’s five campuses include 17 undergraduate, graduate, and professional schools, which collectively offer 482 distinct bachelor’s, master’s, doctoral, and professional degree programs. Enrollment in 2019 was nearly 34,000 students. The University employs approximately 5,600 faculty, 709 research/ post-doctoral associates, and over 8,100 staff, and the main campus is in a metropolitan area with a population over 2.3 million.

The University of Pittsburgh is consistently recognized for scholarly excellence, ranking in the top 9 percent among the leading 1,250 research-intensive universities in the world according to the 2019 *Times Higher Education* World University Rankings. *U.S. News & World Report* places Pitt among the top 4 percent of universities worldwide in its “Best Global Universities” list, which ranks 1,500 leading universities in 81 countries based on schools’ academic research and reputation.

Pitt ranks 9th nationally in federal science and engineering funding, according to a report from the National Science Foundation, and ranks 5th among U.S. universities in competitive grants awarded to faculty members by the National Institutes of Health.

Since its founding in 1996, Pitt’s Office of Technology Management now the Innovation Institute, has spun out 183 companies that were dependent upon the licensing of technology developed at the University of Pittsburgh; a majority of them were in the life sciences.

The U.S. Patent and Trademark Office has issued 91 patents to University of Pittsburgh faculty and students in fiscal year 2019. Pitt also rose in the rankings of worldwide university patent issuances to 21st, up from 35th in 2015 and 27th in 2016. Because of Pitt’s relationship with UPMC, growth in the University’s patents is predominantly due to life sciences-related inventions.

*Source: University of Pittsburgh Accelerating Impact, 2018 fiscal year in review, and website of Innovation Institute*

The six **Schools of the Health Sciences** include the Graduate School of Public Health, and the Schools of Dental Medicine, Health and Rehabilitation Sciences, Medicine, Nursing, and Pharmacy. Funding from the NIH is considered the benchmark of overall stature among research-intensive academic health centers. The research community within the schools of the health sciences, led by the School of Medicine, receives more than 90 percent of all funds provided to the University by NIH. Since the late 1990s, the University has been among the top ten recipients of NIH funding and has steadily climbed upward in terms of the amount of grants and contracts received, currently numbering 1,127**. In fiscal year 2018, the University received $536** million in grants alone from NIH, placing Pitt among **the five top universities nationwide in terms of total NIH funding**. NIH currently supports 56 Ruth L. Kirschstein National Research Service Award (NRSA) Institutional Research Training Grants (T32) at the University of Pittsburgh, the vast majority awarded within the six Schools of the Health Sciences. *(does not include MWRI)*

[alternatively] In an analysis of National Institutes of Health FFY18 funding, the Faculty of the University of Pittsburgh rank fifth in total grants awarded, with more than $577* million in total funding. The faculty of the medical and public health schools also rank fifth with total funding of more than $461 million. *(includes MWRI)*

As a result of its success, Pitt has invested significantly in new research infrastructure in developmental, cellular, structural, and computational biology (all within the UPSOM) and recruitment of outstanding new faculty. Overall, the Schools of the Health Sciences currently occupy approximately 4.2 million square feet of research, academic, and administrative space in various buildings.

**University of Pittsburgh Medical Center (UPMC)** is affiliated with each of the University of Pittsburgh’s six schools of the health sciences and is dedicated to providing exemplary patient care, educating the next generation of health care professionals, and advancing biomedical research. As an integrated global health enterprise and one of the nation’s leading academic health care systems, with $21 billion in revenues, UPMC is the largest non-governmental employer in Pennsylvania with nearly 89,000 employees; more than 6,000 affiliated physicians, including more than 4,900 employed by the health system and 1,465 who are also full-
time faculty of the School of Medicine; more than 40 tertiary care, specialty, and community hospitals; as well as specialized outpatient facilities, cancer centers, rehabilitation facilities, retirement and long-term care facilities, imaging services, doctors’ offices, and a health insurance plan covering more than 3.7 million members.

[alternatively: from UPMC.com/about/facts] A $21 billion health care provider and insurer, Pittsburgh-based UPMC is inventing new models of patient-centered, cost-effective, accountable care. The largest nongovernmental employer in Pennsylvania, UPMC integrates 89,000 employees, 40 hospitals, 700 doctors’ offices and outpatient sites, and a more than 3.7 million-member Insurance Services Division, the largest medical insurer in western Pennsylvania. In the most recent fiscal year, UPMC contributed $1.2 billion in benefits to its communities, including more care to the region’s most vulnerable citizens than any other health care institution, and paid $587 million in federal, state and local taxes. Working in close collaboration with the University of Pittsburgh Schools of the Health Sciences, UPMC shares its clinical, managerial and technological skills worldwide through its innovation and commercialization arm, UPMC Enterprises, and through UPMC International. U.S. News & World Report consistently ranks UPMC Presbyterian Shadyside on its annual Honor Roll of America’s Best Hospitals and ranks UPMC Children’s Hospital of Pittsburgh on its Honor Roll of America’s Best Children’s Hospitals.

As of August 2019, the UPMC Medical Education Program has nearly 1,254 medical residents and 425 clinical fellows in programs approved by the Accreditation Council for Graduate Medical Education plus three clinical fellows in other programs. Internationally renowned programs include transplantation, cancer, neurosurgery, pediatrics, emergency, and family medicine, among others. UPMC is an ideal partner in patient care, education and advancement of new medical breakthroughs and technologies.

The School of Medicine includes the following 31 departments: Anesthesiology; Biomedical Informatics; Cardiothoracic Surgery; Cell Biology; Computational and Systems Biology; Critical Care Medicine; Dermatology; Developmental Biology; Emergency Medicine; Family Medicine; Immunology; Medicine; Microbiology and Molecular Genetics; Neurobiology; Neurological Surgery; Neurology; Obstetrics, Gynecology, and Reproductive Sciences; Ophthalmology; Orthopaedic Surgery; Otolaryngology; Pathology; Pediatrics; Pharmacology and Chemical Biology; Physical Medicine and Rehabilitation; Plastic Surgery; Psychiatry; Radiation Oncology; Radiology; Structural Biology; Surgery; and Urology. The two newest of these departments —Plastic Surgery and Cardiothoracic Surgery — reflect the School of Medicine's position at the leading edge of medical education and clinical practice, as well as the recent and rapid evolution of surgical subspecialties as independent disciplines. Similar departments are still novel in American medical schools, and the same can be said of our departments of Computational and Systems Biology, Critical Care Medicine, Developmental Biology, and Structural Biology.

Within the School of Medicine, areas of research emphasis and strength include the biology of aging; neuroscience; vision and vision restoration; comparative effectiveness research; genome stability and tumorigenesis; regenerative medicine and biomedical device development; vascular, developmental, structural, computational, and systems biology; immunology, including immunological approaches to cancer; cancer virology; and clinical research/clinical trials, among others.

The School of Medicine is ranked 5th in fiscal year FY 2018 NIH funding, with 1,157 grants awarded, totaling more than $577 million in funds.

Medical and graduate education

For 2019, the School of Medicine has 2,450 regular plus 2,218 volunteer faculty members. Of these, 81 are current members of the Academy of Master Educators, an organization that recognizes and rewards excellence in medical education. For the Class of 2022, the medical school received 6,874 applications for the 162 available positions.

As of the 2018-2019 academic year, the School of Medicine has 579 MD students (315 women, 54%; 264 men, 46%), 17% of whom are from groups that are underrepresented within the medical profession.

The medical school also has 308 graduate students in PhD programs (including students in the University of Pittsburgh/Carnegie Mellon University combined MD/PhD Medical Scientist Training Program), 134 students in Master’s programs, and 29 students in certificate programs. The graduating class of 2018 achieved 49 fellowships, grants or other national awards; 80 School of Medicine awards; co-authorship on 258 peer-reviewed articles; and 360 national presentations and abstracts. The MD/PhD Program of The University of
Pittsburgh and Carnegie Mellon University was established in 1983 and is currently funded primarily by NIH MSTP. The spirit of interdisciplinary, inter-institutional collaboration that pervades The University of Pittsburgh and Carnegie Mellon University creates a dynamic environment for promising students to launch research careers that integrate medicine and the basic sciences. Exceptional investigators at both universities serve as potential mentors for 83 MD/PhD students. Carnegie Mellon University exists adjacent to, and within easy walking distance of the University of Pittsburgh. The Program in Microbiology and Immunology (PhD) aims to train highly motivated graduate students as self-reliant scholars in an environment with ready access to the breadth of expertise, approaches, and sub disciplines that constitute the diverse fields of microbiology and immunology. Finally, the Interdisciplinary Biomedical Graduate Program provides the opportunity to earn a PhD in the following areas: Cell Biology & Molecular Physiology, Cellular and Molecular Pathology, Molecular Genetics and Developmental Biology, or Molecular Pharmacology, while other PhD programs for Neurobiology/Neuroscience, Computational Biology, Molecular Biophysics & Structural Biology, Clinical and Translational Science, Integrative Systems Biology, and Biomedical Informatics are also very competitive.

The Clinical Translational Science Institute (CTSI) is one of twelve initial recipients of a Clinical and Translational Science Award (CTSA), funded by the NIH Roadmap Initiative. The CTSI serves as the integrative academic home for clinical and translational scientists across the University's six health science schools, Carnegie Mellon University, and UPMC. The CTSI's primary focus is to develop, nurture, and support cadres of clinical and translational scientists by building on the University's existing clinical research training programs and supporting new comprehensive training programs. The CTSI also supports multidisciplinary translational research by providing resources and opportunities that will facilitate the translation of research findings from the bench to the bedside to the community.

CTSI-supported programs and resources extend to all six of Pitt’s schools of the health sciences and, through community engagement efforts, to the Pittsburgh region. UPMC is an active partner in this initiative, providing important access to extensive clinical resources and potential research participants. CTSI also has established collaborative relationships with other Pittsburgh-area institutions, including the Urban League of Greater Pittsburgh, Carnegie Mellon University, and RAND Corporation. Through the establishment of 12 Cores, CTSI is building institutional infrastructure, including educational, programmatic, facility, and equipment resources, to support a wide range of clinical and translational research:

- Biomedical Modeling
- Biostatistics, Epidemiology, and Research Design (BERD)
- Biomedical Informatics
- Community PARTners (Partnering to Assist Research and Translation)
- Innovation
- Participant and Clinical Interactions (PCI)
- Pilot Funding
- Recruitment Innovation Unit
- Regulatory Knowledge and Support
- Special Populations
- Team Science and Workforce Development
- Trial Innovation

Research Participant Registry

The Research Participant Registry (Pitt+Me, www.pittplusme.org) is a component of the CTSI in partnership with UPMC. Pitt+Me is a voluntary database of individuals who have consented to be contacted for potential participation in adult and pediatric research studies. Novel software uses Pitt+Me registry participants’ diagnosis codes, demographics, and/or health preferences to match the participant with studies that may interest them. Regular e-mails and mailings alert participants when a study is available, and participants are pre-screened online or through the call center. Potentially eligible participants are referred to study teams through an online portal. To date, the Registry has had more than 200,000 people sign up to hear more about
research and health topics. Researchers seeking participants for their research studies can use the CTSI Research Participant Registry as a recruitment source.

**Precision Medicine Initiative**

The Pitt CTSI and UPMC have launched the *All of Us Pennsylvania Research Program*, a research participant enrollment effort that is part of the Precision Medicine Initiative. This program is a part of the national *All of Us Research Program*, a long-term health research effort that aims to enroll 1 million or more research participants across the United States. Thanks to the extensive existing research infrastructure available through Pitt's CTSI, *All of Us PA Research Program* was selected by the NIH to be the first of several sites to launch. The program enrolled the first volunteer research participant in the nation last year. Since then, PA Cares for Us has surpassed the 1,300-enrollee milestone and is responsible for more than 40 percent of the enrollment in the nation to date.

The *Health Sciences Library System (HSLS)* supports the educational, research, clinical, and service activities of the health sciences community of the University of Pittsburgh with a wide-ranging collection of biomedical and health-related journals and monographs as well as a specialized collection of rare and historical materials. Library users have access to more than 8,200 electronic journals in the health sciences, as well as 3,940 e-books and 117 databases or publisher collections of full-text information. Our current collection is almost completely electronic: in FY16, less than one percent of our collections budget was spent on essential print materials that were unavailable electronically. In FY16, we added over 930 new e-resources, including more than 450 new ebooks. New resources include JAMA Cardiology, Nature Microbiology, and Nature Review Disease Primers. One area where HSLS is clearly “head and shoulders” above other academic health sciences libraries is our Molecular Biology Information Service (MBIS). The MBIS runs a four-faceted service with the following goals: (1) identify, procure and implement commercially licensed bioinformatics software, (2) teach hands-on workshops using bioinformatics tools to solve research questions, (3) provide in-person and email consultations on software/databases and (4) maintain a web portal providing overall guidance on the access and use of bioinformatics resources and MBIS-created webtools. ([https://doi.org/10.1093/bib/bbz035](https://doi.org/10.1093/bib/bbz035)) HSLS licenses 15 molecular biology software packages for Pitt’s research community. We now have a total of 3,424 registered users, an increase of 1545 (45%) over the previous year.

**Graduate School of Public Health (GSPH)**

Established in 1948 and fully accredited by the Council on Education for Public Health, the GSPH is world-renowned for contributions that have influenced public health practices and medical care for millions of people. The School is the only fully accredited school of public health in the Commonwealth of Pennsylvania, and is one of the top-ranked schools of public health in the United States. The GSPH boasts the third largest endowment among schools of public health, and is ranked 6th nationally for NIH funding.

The School is considered a leader in the field of women’s health research and is one of the original sites for the Women’s Health Initiative, the largest research study in the world to focus exclusively on women's health. It is also the site of broad-based research programs to better understand and treat HIV infection: the Pitt Men’s Study is part of the longest-running national study of the natural history of AIDS. In the area of human genetics, the GSPH is attempting to identify the links between genes and disease through initiatives ranging from basic laboratory research to clinical applications.

The GSPH consists of seven departments that address today’s most critical public health issues, each with faculty who have made national and international contributions to public health. These departments include Behavioral and Community Health Sciences, Biostatistics, Environmental and Occupational Health, Epidemiology, Health Policy and Management, Human Genetics, and Infectious Diseases and Microbiology. Research centers and institutes within the school, such as the Center for Minority Health and the Center for Public Health Practice, provide resources to the community and link scholarly activity with practical application.

**UPMC CHILDREN’S HOSPITAL OF PITTSBURGH/LAWRENCEVILLE CAMPUS**

**Scientific Environment**

The UPMC Children’s Hospital of Pittsburgh is among the nation’s leading children’s hospitals providing state-of-the-art clinical care and basic science. In 2020-2021, it ranked 9th on the *U.S. News & World Report’s* Honor Roll of America’s Best Children's Hospitals. It is also recognized for achieving four pediatric
subspecialties in the national top 10, including: Cardiology and Heart Surgery (2\textsuperscript{nd}), Diabetes and Endocrinology (7\textsuperscript{th}), Gastroenterology and GI Surgery (9\textsuperscript{th}), and Pulmonology (10\textsuperscript{th}).

\textit{Laboratory}

The Rangos Research Center, located on the 10-acre hospital campus, is comprised of 10 floors and 300,000 square feet of open laboratories with seven floors dedicated to biomedical research activities. The facility supports biomedical research, including pediatric cancer, diabetes, heart disease, liver failure, childhood infection and inflammatory disease, genomics, immunology and neuroscience, among other fields.

Utilizing an open laboratory concept, the center is designed for optimal collaboration between researchers and shared use of resources, which is vitally important in supporting major research advances in the 21\textsuperscript{st} century. Each laboratory bay consists of 900 sq. ft. including tissue, fume and equipment alcoves as well as program rooms, dark rooms, environmental rooms, equipment corridor, faculty offices, and state of the art conference facilities designed for optimal collaboration between researchers and shared use of resources. The flexible laboratory space can accommodate 70 principal investigators.

\textit{Core facilities} within Rangos include 2 flow cores, 2 confocal/microscopy cores, histology core, metabolic core, gnotobiotic animal core (main campus), animal imaging (CT and MRI), and sequencing/bioinformatics cores.

\textit{Clinical}

The BioMS Center is a campus-wide shared facility dedicated to advancing the use and application of mass spectrometry in basic, translational, and clinical research. The center combines state-of-the-art high resolution mass spectrometry with classical biochemical approaches to identify and quantify biologically relevant proteins.

The \textbf{Center for Medicine and the Microbiome (CMM)} was established to foster innovative basic, translational, and clinical research in the microbiome. The Center, led by Alison Morris and Barbara Methe, is comprised of MD and PhD researchers in multiple disciplines who will work together to understand the role of the microbiome in health and disease and to apply this knowledge to develop novel diagnostic and therapeutic strategies. Such a center is important given that microbiome research is a rapidly expanding field that will impact multiple areas of human health and radically alter our understanding of many disease processes. The Center will benefit the University of Pittsburgh specifically by providing a home for interdisciplinary studies of the microbiome and integrating work of basic and clinical scientists with access to large clinical cohorts in order to efficiently test new ideas and rapidly disseminate pioneering treatments.

The \textbf{Center for Research Computing (CRC)} is focused on increasing the productivity of Pitt researchers through the application of advanced computing. In addition to supporting research in fields such as engineering, chemistry and genomics, Pitt CRC—a resource for the entire University community—adds value to work in biostatistics, economics, and linguistics, among many other areas. The CRC offers access to cutting-edge computer hardware and software, workshops, and consultation on refining projects at the code level—such as stronger algorithms to take advantage of parallel processing—and at the level of improving the
user experience for researchers who begin taking advantage of high performance computing using a familiar graphic user interface.

The Center for Vaccine Research (CVR) is housed in the Biomedical Science Tower 3 (BST3), which is located on the main campus of the University of Pittsburgh. The CVR is composed of two components — the Vaccine Research Laboratory (VRL) and the Regional Biocontainment Laboratory (RBL) — and has 18,000 square feet of laboratory and office space. Building on the University’s existing strengths in the study of virology and immunology with an emphasis on emerging infections and HIV, the CVR engages a cross-section of scientists from an array of disciplines in infectious disease research. Under the leadership of Director Paul Duprex, PhD, the CVR is expanding its footprint in the area of vaccine research and development by expanding its team of world-class investigators. The CVR activities span basic research on molecular mechanisms of infectious diseases to the development of diagnostics, therapeutics, and vaccines. Moreover, the CVR supports interdisciplinary research efforts across the University and UPMC focused on emerging infections that threaten human health. A balance of basic, translational, and clinical research; emphasis on collegiate interaction; visionary leadership; and a synergistic environment are among the unique features that contribute to the unparalleled potential of this world-class research center.

The Genomics Analysis Core provides bioinformatics analysis for most types of genomic data including gene expression, copy number and methylation microarrays and next generation sequencing (NGS) data from whole genome, whole exome, targeted exome and RNA Seq.

The Genomics Research Core is equipped with state-of-the-art instrumentation and provides a variety of standard as well as customized genomic analyses to University researchers. The services include Sanger DNA sequencing, Next Generation sequencing of DNA and RNA, RNA/DNA extraction, purification and QC services, gene expression microarrays, whole transcriptome human and mouse microarrays, miRNA microarrays, TaqMan real-time PCR and Nanostring digital expression profiling for mRNA and miRNA, candidate gene and whole genome SNP array genotyping and NanoString CNV analysis.

The Health Sciences Metabolomics and Lipidomics Core is a located in the Department of Pharmacology & Chemical Biology. The core provides assistance with projects that range in size from isolated experiments to major collaborations involving global analyses related to metabolites and lipids, and metabolic flux studies. The core has working relationships with C3M, CMM and the Small Molecule Biomarker Core in order to facilitate highly collaborative research involving endocrinology and metabolism, the microbiome and quantitative biomarker analysis.

The Health Sciences Sequencing Core at CHP provides central support for Illumina next generation sequencing for RNA, DNA, FFPE and low input applications to the University of Pittsburgh research community. The core was established by a cooperative agreement between the University of Pittsburgh Schools of Health Sciences and the UPMC Children’s Hospital of Pittsburgh.

Imaging Resources

Pitt has a variety of imaging cores using varied technologies. A partial listing includes:

- Biological Sciences Microscopy and Imaging Facility
- In Vivo Imaging Facility (IVIF) - Preclinical PET and PET-CT (Hillman Cancer Center)
- In Vivo Imaging Facility (IVIF) – Preclinical MRI (Hillman Cancer Center)
- In Vivo Imaging Facility (IVIF) – Preclinical Optical Imaging (Hillman Cancer Center)
- In Vivo Imaging Facility (IVIF) – Preclinical Ultrasound Imaging (Hillman Cancer Center)
- Center for Biological Imaging (CBI)
- Center for Ultrasound Molecular Imaging and Therapeutics
- Department of Neurobiology Microscopes
- Cryo-electron Microscopy (CryoEM) Facility
- Division of Laboratory Animals Research (DLAR) Imaging
- High Content Screening (HCS) Imaging Resources
The **Innovative Technologies Development (ITD) Core** provides cutting edge gene targeting strategies using various methods, including CRISPR-Cas9 gene targeting in mice, classical transgenesis using transgenic vectors, and gene editing in cell lines using CRISPR.

The **Peptide and Peptoid Synthesis Core** provides standard and custom services for peptide & peptoid synthesis, purification and characterization including certified peptides for clinical trials.

The **Pitt Biospecimen Core (PBC)** provides Pitt researchers with excess tissue materials obtained from clinical procedures performed at UPMC hospitals. The main purposes of the PBC are to provide a mechanism to simplify and streamline the process of research tissue accrual, storage and disbursement and to provide efficient research pathology support services. Services provided by PBC include human tissue and biological specimen procurement, honest broker services, research histology, annotation of clinical data, and tissue microarray services. The PBC contains a variety of solid tissues, cell aspirates, blood, peripheral blood mononuclear cells, as well as other clinical samples. Solid tissues are available from various disease states from sources including the gastrointestinal tract, liver, and lung.

The **Pittsburgh Supercomputing Center (PSC)** is a joint effort of Carnegie Mellon University and the University of Pittsburgh. Established in 1986, PSC is supported by several federal agencies, the Commonwealth of Pennsylvania and private industry and is a leading partner in XSEDE (Extreme Science and Engineering Discovery Environment), the National Science Foundation cyberinfrastructure program. PSC provides university, government and industrial researchers with access to several of the most powerful systems for high-performance computing, communications and data storage available to scientists and engineers nationwide for unclassified research. PSC advances the state of the art in high-performance computing, communications and data analytics and offers a flexible environment for solving the largest and most challenging problems in computational science.

The **Small Molecule Biomarker Core** uses state-of-the-art instrumentation to provide quantitative analysis of specific analytes in clinical samples and method development for analytes where a method does not currently exist. The highly sensitive and specific techniques employed by the Core provide accurate quantitation for multiple biomarkers from the same sample, which maximizes the ability to link basic science with clinical outcomes.

The **Transgenic and Gene Targeting Core** provides a broad, comprehensive range of services to Pitt investigators, including generation of gene edited mice, transgenic mice, ES cell microinjection into blastocysts to create germline competent chimera, cryopreservation and long-term storage of mouse sperm/embryos, recovery of mouse lines from cryopreserved germplasm, in vitro fertilization for mouse line rescue and re-derivation of pathogen free mouse strains.

The **Unified Flow Core** manages flow cytometry equipment and cores at each Pitt campus (Oakland, Bridgeside Point II, Children’s Rangos Research building, and Hillman Cancer Center) and provides state-of-the-art flow cytometry and cell sorting services to the entire University of Pittsburgh research community as well as researchers at neighboring institutions. A skilled staff provides help with instrument setup, data
analysis, and consultation for experiment design. Training is available to enable investigators and their staff to run the analytical cytometers themselves.

**ANIMAL RESOURCES**

University of Pittsburgh Institutional Animal Care and Use Committee (IACUC)

The University of Pittsburgh (Unit #000496) is Fully Accredited (updated March 2020) by the Association for the Assessment and Accreditation of Laboratory Animal Care International (AAALAC), affirmed via AAALAC’s website [http://www.aaalac.org/](http://www.aaalac.org/). The day-to-day care of animals is managed through the Division of Laboratory Animal Resources (DLAR) and overseen by the Institutional Animal Care and Use Committee (IACUC).

The DLAR provides education, training, veterinary and animal husbandry care, and associated administrative services to support the institution’s animal-based research programs conducted within the Schools of the Health Sciences at the University and veterinary support to animal-based research programs conducted within the School of Arts and Sciences.