This resource listing is intended as a source of information that can be selectively cut, pasted and edited into Facilities and Other Resources sections of grant submissions.

BROWN ENVIRONMENT AND RESOURCES (QUICK SECTION LINKS)

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Brown Research Buildings

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RHODE ISLAND STATEWIDE COLLABORATIVE PROGRAMS
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RI NSF Established Program to Stimulate Competitive Research (EPSCoR)
Brown University: Brown was founded in 1764 — the third college in New England and the seventh in Colonial America. Brown was the first Ivy League school to accept students from all religious affiliations, a testament to the spirit of openness that still typifies Brown today. Originally located in Warren, Rhode Island, and called the College of Rhode Island, Brown moved to its current spot on College Hill overlooking Providence in 1770 and was renamed in 1804 in recognition of a $5,000 gift from Nicholas Brown, a prominent Providence businessman and alumnus, Class of 1786.

Women were first admitted to Brown in 1891. The Women’s College was later renamed Pembroke College in Brown University before merging with Brown College, the men’s undergraduate school, in 1971. The northern section of campus where the women’s school was situated is known today as the Pembroke Campus. The first master’s degrees were granted in 1888 and the first doctorates in 1889. The first medical degrees of the modern era were presented in 1975 to a graduating class of 58 students. Today, Brown awards approximately 100 MD degrees annually from the Warren Alpert Medical School.

Undergraduate education changed dramatically in 1970 with the introduction of what has become known as the Open Curriculum. The idea for this change came from a report written by undergraduates Ira Magaziner, of the undergraduate Class of 1969, and Elliot E. Maxwell, of the undergraduate Class of 1968, as part of a GISP (Group Independent Study Project) that examined education at Brown. The new curriculum eliminated core requirements shared by all Brown undergraduates and created specific departmental concentration requirements. This approach has defined the undergraduate academic experience at Brown ever since, demanding that students serve as the architects of their courses of study.

Constant change defines Brown’s past and future, though the University’s culture is rich in tradition. Brown’s first building, for example, the red-bricked University Hall, was built in 1770 and still stands on the College Green. Today, the University consists of nearly 230 buildings on approximately 150 acres, and includes undergraduate and graduate programs, plus the Warren Alpert Medical School, School of Public Health, School of Engineering, Industrial Engineering Brown Executive MBA, and executive masters of healthcare leadership, science and technology leadership, and cybersecurity.

In 2013, President Christina H. Paxson, Brown’s 19th president, charted the course for the University’s future with her strategic plan, Building on Distinction: A New Plan for Brown. The plan was launched in 2014, the 250th anniversary of Brown’s founding. It provides a vision to achieve higher levels of distinction as a university that unites innovative education and outstanding research to benefit the community, the nation and the world. It calls for targeted investments to attract and support the most talented and diverse faculty, students and staff, and to support rigorous inquiry and discovery across the disciplines to address the world’s most complex challenges. The plan highlights the need to keep a Brown education affordable for talented students from all economic backgrounds and to sustain a community with the diversity of thought and experience required for excellence.

Brown University: Located in historic Providence, Rhode Island and founded in 1764, Brown University is the seventh-oldest college in the United States. Brown is an independent, coeducational Ivy League institution comprising undergraduate and graduate programs, plus the Alpert Medical School, School of Public Health, School of Engineering, and the School of Professional Studies. With its talented and motivated student body and accomplished faculty, Brown is a leading research university that maintains a particular commitment to exceptional undergraduate instruction. Brown’s vibrant, diverse community consists of about 6,580 undergraduates, 2,255 graduate students, 545 medical school students, more than 6,000 summer, visiting, and online students, and more than 700 faculty members. Brown students come from all 50 states and more than 115 countries. Undergraduates pursue bachelor’s degrees in 81 concentrations, ranging from Egyptology to cognitive neuroscience. Anything is possible at Brown—the university’s commitment to undergraduate freedom
means students must take responsibility as architects of their courses of study. Brown University has 51 doctoral programs and 32 master’s programs. The broad scope of options vary from interdisciplinary opportunities in molecular pharmacology and physiology to a master’s program in acting and directing through the Brown/Trinity Repertory Consortium. Additional programs include the Undergraduate Summer Session and Pre-College Programs for high school students — on campus, online, and abroad. Brown is frequently recognized for its global reach, many cultural events, numerous campus groups and activities, active community service programs, highly competitive athletics, and beautiful facilities located in a richly historic urban setting.

University of Rhode Island (URI)
https://www.uri.edu/

The University of Rhode Island (URI) had humble beginnings as the state’s agricultural school chartered in 1888. Today URI is a nationally recognized Land, Sea and Urban Grant public research institution, and the only public institution in Rhode Island offering undergraduate, graduate, and professional students. URI maintains a large focus on Allied Health programs including the College of Pharmacy, Nursing, and the new College of Health Sciences (2016). This Academic Health Collaborative brings together the previously individual schools of communicative disorders, health studies, human development and family studies, kinesiology, nutrition and food science, physical therapy, and psychology. Together the Allied Health expertise at URI in partnership with Brown’s Alpert Warren Medical School, and School of Public Health, round out the health education and research expertise in the state.

URI has a long-standing collaboration with Brown University’s Medical School, Lifespan, Care New England, the Providence Veterans Affairs Hospital and other hospital providers in the state. URI has more than 16,000 undergraduate and graduate students who work side-by-side with more than 721 full-time, tenure-track teaching faculty, as well as with hundreds of dedicated lecturers, researchers, and adjunct faculty. URI has over 120,000 alumni globally. The main campus is in the historic, rural town of Kingston, just 30 miles south of the metropolitan city Providence and Brown University. There is also a Providence Campus that is home to biomedical sciences and the Centers of Biomedical Research Excellence (COBRE) for Immunology and Infectious Diseases near the Jewelry District and the Brown Alpert Medical School.

ACADEMIC HEALTH CENTERS

Lifespan Health System
https://www.lifespan.org/about-lifespan

Lifespan Hospitals: Lifespan, Rhode Island’s first healthcare system, was founded in 1994 by Rhode Island Hospital and The Miriam Hospital. A comprehensive, integrated, academic health system affiliated with the Warren Alpert Medical School of Brown University, Lifespan’s present partners also include Rhode Island Hospital’s pediatric division, Hasbro Children’s Hospital; Bradley Hospital; Newport Hospital and Gateway Mental Health Services. A not-for-profit organization, Lifespan is overseen by a board of volunteer community leaders who are guided by its mission: Delivering Health with Care.

Rhode Island Hospital: Rhode Island Hospital, with 750 beds, is the state’s largest hospital and the third largest hospital in New England. It is designated as the Level 1 Trauma Center for southeastern New England, providing expert staff and equipment in emergency situations 24 hours a day. Rhode Island Hospital provides comprehensive diagnostic and therapeutic services to inpatients and outpatients, with particular expertise in cardiology, oncology, neurosciences and orthopedics, as well as pediatrics at its Hasbro Children’s Hospital. Rhode Island Hospital is home to a Comprehensive Cancer Center. Its pediatric division, Hasbro Children's Hospital, opened in 1994 and cares for some 7,000 inpatients and 60,000 outpatients annually. Two distinct emergency departments exist on the RIH campus: the Andrew F. Anderson Emergency Center and Hasbro Children’s Hospital ED’s. The annual patient volume of these facilities is over 130,000 patient visits per year. Both ED’s also house the American College of Surgeons approved Level 1 trauma center. The new Anderson Emergency Center was constructed in 2005 and encounters > 80,000 adult visits per year and is the tertiary care referral site for all of southeastern New England. Both ED’s sponsor highly regarded PGY1-4 residency programs in emergency medicine with 48 residents in training and a pediatric emergency medicine fellowship. There are over 3000 new cancer cases diagnosed each year at RIH. The hospital has a new, state-of-the-art,
cancer center integrating radiation oncology and medical oncology within three adjacent floors of the Ambulatory Patient Care (APC) building of Rhode Island Hospital. Full imaging facilities, including CT scan, MRI, PET scan, and other diagnostic imaging is directly connected to the cancer center via a walkway to the main patient building. There is a dedicated inpatient oncology floor on the fourth floor building. There is a dedicated hematology/oncology ward team who follows the inpatient service. This includes a hematology oncology attending, fellow, two medical residents, a pharmacist and 1-2 Brown Medical students. RIH participates in cooperative group, pharmaceutical and investigator-initiated studies. The oncology research office has 17 full-time employees. The IRB meets twice a month.

Hasbro Children's Hospital: Hasbro Children’s Hospital is deeply committed to advancing medical knowledge and improving patient care for children through the latest research. It currently has 53 principal investigators conducting more than 160 research initiatives, which are coordinated across Hasbro Children's Hospital, Bradley Hospital and Women & Infants Hospital and the Warren Alpert Medical School of Brown University. Hasbro researchers have made significant findings in cancer, liver disease, diabetes and asthma, and our research has appeared in more than 500 publications over the past five years. Pediatric cancer research is led by members of the Children’s Oncology Group.

The Miriam Hospital: The Miriam Hospital is a 247-bed facility that provides a broad range of primary, secondary and tertiary medical and surgical services to adolescents and adults in 31 medical and surgical specialties and sub-specialties. The hospital provides a broad range of primary, secondary, and tertiary medical and surgical services. Miriam Hospital is noted for its specialty services in AIDS at the Samuel and Esther Chester Immunology Center and in cardiac care. The Women's Cardiac Center at The Miriam Hospital offers complete diagnostic and clinical cardiology services, cardiovascular surgery and cardiac rehabilitation to women. The Miriam Hospital is a major teaching hospital affiliated with Brown University. The hospital is home to (1) The Immunology Center, (2) the Sexually Transmitted Disease (STD) Clinic, (3) the Pre-Exposure Prophylaxis (PrEP) Program, (4) the Centers for AIDS Research (CFAR), (5) The Immunology Center Research Laboratory, and (6) the Centers for Behavioral and Preventive Medicine.

Emma Pendleton Bradley Hospital: The Emma Pendleton Bradley Hospital, founded in 1931, is the nation’s first psychiatric hospital devoted to children and adolescents. It is the nation’s only free-standing child/adolescent psychiatric hospital. Bradley services include a 60-bed acute inpatient program for children and adolescents with emotional, behavioral, and developmental disorders and outpatient services (including a dialectical behavior therapy [DBT] program), day treatment, and five fully certified special education schools across RI for youth with psychiatric disorders.

Care New England (CNE) Health System
http://www.carenewengland.org/about/

Care New England Health System is a trusted organization that fuels the latest advances in medical research, attracts the nation’s top specialty-trained doctors, hones renowned services and innovative programs, and engages in the important discussions people need to have about their health and end-of-life wishes. Care New England is helping to transform the future of health care, providing a leading voice in the ongoing effort to ensure the health of the individuals and communities we serve. Backed by a broad range of services—primary care, surgery, cardiovascular care, oncology, psychiatry, behavioral health, newborn pediatrics and the full spectrum of women’s health services—CNE is reinventing the way health care is delivered, partnering with our patients to provide the best care possible while working to create a community of healthier people.

Our Partners
Butler Hospital
Care New England
Care New England Wellness Center
Kent Hospital
The Providence Center
VNA of Care New England
Women & Infants Hospital
Women & Infants' Hospital of Rhode Island: Women & Infants Hospital, a Care New England hospital, is one of the nation’s leading specialty hospitals for women and newborns. Women & Infants is the eighth largest stand-alone obstetrical service in the country with nearly 9000 deliveries per year. In 2009, Women & Infants opened the country’s largest, single-family room neonatal intensive care unit. Women and Infants Hospital is a major teaching affiliate of the Warren Alpert Medical School of Brown University for obstetrics, gynecology and newborn pediatrics, as well as a number of specialized programs in women's medicine. Known as one of the nation’s largest and most prestigious research facilities in high-risk and normal obstetrics, gynecology and newborn pediatrics, it is home to two National Institutes of Health (NIH) Centers of Biomedical Research Excellence for Perinatal Biology and Reproductive Health, respectively. Women and Infants is a member of NRG Oncology, a National Cancer Institute funded, multi-institutional, cooperative research group with a major focus on gynecologic and breast cancer treatment. It is also a member of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Maternal Fetal Medicine Units Network, a consortium of 12 premier clinical centers across the U.S. whose charge is to investigate problems in clinical obstetrics. Women and Infants is a member of the 18-center NICHD Neonatal Research Network, conducting multi-centered trials studying pelvic floor disorders. In 2015, the NICHD awarded Women & Infants Hospital and Brown University an additional five years of grant funding to support the Women’s Reproductive Health Research (WRHR) Career Development Program. With just seven active sites throughout the country, this highly competitive program provides a tailored research and career development plan to enable junior faculty obstetrician/gynecologists to develop into leaders in women’s health research.

Butler Hospital: Butler Hospital is the only private, nonprofit psychiatric and substance abuse hospital serving adults, adolescents, and children in Rhode Island and southeastern New England. Founded in 1844, it was the first hospital in Rhode Island, and has earned a reputation as the leading provider of innovative psychiatric treatments in the region. Affiliated with the Warren Alpert Medical School of Brown University, Butler Hospital’s clinical research trials provide valuable information on brain-based diseases. Through research, new treatments are being discovered for diseases including depression and anxiety, obsessive-compulsive disorder (OCD), Alzheimer’s disease, Movement Disorders, such as Parkinson’s disease, and addictions. Butler Hospital is affiliated with the Norman Prince Neurosciences Institute, dedicated to advancing the neurosciences and reducing human suffering from disorders of the nervous system through world-class research, outstanding clinical care and advanced education. Butler's research activities have helped bring about groundbreaking treatments, including Transcranial Magnetic Stimulation (TMS), a treatment for depression recently approved by the U.S. Food and Drug Administration (FDA), and Deep Brain Stimulation, a "pace-maker for the brain" that is used to treat severe obsessive-compulsive disorder and depression.

Kent Hospital: Kent Hospital, a Care New England Hospital, is a 359-bed, acute care hospital. It is Rhode Island’s second largest hospital, serving approximately 300,000 residents of central Rhode Island. A teaching affiliate of The University of New England College of Osteopathic Medicine, Kent offers programs in Emergency Medicine, Family Medicine, Internal Medicine and an Undersea and Hyperbaric Medicine Fellowship. Kent’s redesigned Emergency Department (ED) sees approximately 70,000 patients a year and ranks Kent’s ED volume among the top 10-percent nationally. It was the first hospital in the state to eliminate the practice of ambulance diversion. The Kent Medical Staff represents more than 30 specialty areas. The hospital's care team includes more than 2,300 nurses, technical professionals and support staff. Kent Hospital is fully accredited by The Joint Commission.

Providence VA Medical Center (PVAMC)
https://www.providence.va.gov/

The Providence Veterans Affairs Medical Center (PVAMC) is a major teaching hospital and research affiliate of the Warren Alpert Medical School of Brown University and delivers a broad range of services in medicine, surgery, and behavioral sciences. Providence VA Medical Center is a 75-bed facility providing acute inpatient and ambulatory care in medicine, surgery, psychiatry and neurology. The hospital admits approximately 5,000 veterans annually and provides over 150,000 outpatient visits in 41 clinics. It is a VA regional center for treatment of post-traumatic stress disorder. The hospital also provides special medical services in the areas of dialysis, substance abuse treatment, rehabilitative medicine, and prosthetics. The medical center and its five community-
based outpatient clinics in Rhode Island and southern Massachusetts serve as a primary care resource and a regional referral network for a variety of inpatient and outpatient programs. The PVAMC participates in the medicine, surgery, neurology, psychiatry and orthopaedic residency programs at Brown Medical School. The PVAMC has four buildings dedicated to providing research investigators with opportunity to collaborate on basic, animal and clinical research. PVAMC research resources are listed under Clinical Research Units.

ACADEMIC SCHOOLS, COLLEGES, DEPARTMENTS, CENTERS, INSTITUTES AND PROGRAMS

Center - Advance-CTR: Comprehensive
https://www.brown.edu/initiatives/translational-research/home

ADVANCE CLINICAL AND TRANSLATIONAL RESEARCH (Advance-CTR):

The IDeA-CTR Program, provides support for forging partnerships and collaborations within and across IDeA states, the development of infrastructure and human resources required to conduct clinical and translational research in IDeA-eligible states, enhancing the ability of IDeA institutions and investigators to develop competitive clinical and translational research programs, and fostering and sustaining collaboration and coordination of clinical and translational activities within and across IDeA institutions and organizations. Advance-CTSA partners were awarded an IDeA-CTR grant by NIGMS in 2016 [(U54GM115677) RI-Center for Clinical and Translational Science (Advance-CTR)], PI James Padbury, Brown University]. The foundational progress of Advance-CTR places Advance-CTSA in an ideal position for immediate implementation and rapid progress. Upon funding of Advance-CTSA, we will relinquish IDeA Advance-CTR funding.

Advance-CTR serves to support and educate clinical and translational researchers in Rhode Island. The goal of Advance-CTR is to enhance collaboration and coordination of translational research in order to accelerate cross-disciplinary discoveries that improve health. Advance-CTR aims to: 1) Foster coordination between translational researchers at partner institutions, 2) Bring together the diverse clinical research resources to provide a home that facilitates new collaborations, 3) Eliminate obstacles that may prevent researchers from pursuing clinical research initiatives, 4) Educate, mentor and encourage young investigators in clinical research professional development, 5) Facilitate research to gather preliminary data necessary for developing competitive research proposals and 6) Sustain a clinical translational research environment by providing the necessary management and coordination of resources.

Advance-CTR is comprised of an Administrative Core; two Award Cores, the Pilot Projects Program and Professional Development; and three Service Cores, Clinical Research Design, Epidemiology and Biostatistics, Clinical Research Resources and Facilities, and Biomedical Informatics and Cyberinfrastructure Enhancement.

Administrative Core: The Administrative Core serves as the central operations hub for Advance-CTR. It includes two Project Managers, a Communication Manager, and one Assistant who report to the Advance-CTR Administrative Director. These individuals support the PD/PI; Program Coordinator; Strategic Planning Coordinator, the Internal and External Advisory Committees, the Steering Committee; and the six Cores. The academic homes of the Core Leads are based out of the Advance-CTR partnering institutions and the Administrative Core support is centralized. The Administrative Core included an Administrative Director and Clinical Managers for the Award Cores, Service Cores, Communication, Administrative Support and the Tracking and Evaluation Core. The Administrative Core’s roles and responsibilities are to support each of the key component activities. This includes organization of meetings, preparation of agendas, preparation of notes, organization of funding announcements, organization of the steering committee supporting each of the Cores and organization of the review and award process. The direct participation in each of these activities by managers of both Pilot awards and Career Development Cores and Service Core Directors has allowed an exemplary degree of integration, cross-fertilization and adherence to best practices.

Administrative Core personnel assist the Core Leads in program management and planning, tracking and evaluation, budget development, allocation of resources, reporting and development of educational initiatives.

Biostatistics Epidemiology and Research Design (BERD) Core has accounted for more than 50% of the Advance-CTR consultative activity. This reflects the results of the Needs Assessment Survey that demonstrated
that support for study design and data analysis was desired across our partnering institutions. The Core has
developed storefront drop-in sessions, located at partner institutions across Rhode Island, for initial biostatistical
and data analysis consultations. In response to recognized need, the Core also provides consultation and
support for qualitative data analysis. The Biostatistics Core has also been instrumental in providing education
and workshops including regularly scheduled training sessions for computer-based learning on how to use
REDCap software with more than 125 individuals trained. Most recently, more than 70 participants attended the
first BERD Statistical Methods in Translational Science Symposium. This was a half-day symposium with topics
focused on causal mediation analysis, estimating effects of health and medical interventions using imputation
and transporting results of clinical trials to target population. The Symposium was organized with the support of
the Administrative Core following their successful experiences with the Needs Assessment Retreat and the
annual statewide IDEa Symposium.

Clinical Research Support Core: The Clinical Research Resources and Facilities Core is based at the Lifespan
Clinical Research Center. Clinical Research Support is offered to Rhode Island investigators by highly trained
research staff including clinical research coordinators, registered nurses, a medical technologist, and a
phlebotomist. Investigators seeking Advance-CTR services have access to regulatory support, subject
recruitment, space and support for the conduct for study visits, specimen collection and biobanking. The
Advance-CTR Clinical Research Core has sponsored workshops in good clinical practice (GCP), Public
Responsibility in Medicine and Research (PRIM&R), and Society for Clinical Research Associates (SOCRA). A
Clinical Research Center Direct Program which provides on demand resources and service support for young
faculty negotiating the human subjects’ submission process has been created. Workflows are in place to
streamline the process for participation of human subjects’ submission of Institutional Review Board applications
and support for inter-institutional awards. The Administration Core of Advance-CTR has taken responsibility for
organization of the Rhode Island IRB Administrator Network (IRBAN). This includes support for the regular
meetings, minutes and provision of professional development opportunities to IRBAN members. We have
facilitated participant institution’s use of SMART IRB for institutional Reliance Agreements. Institutional partners
now include Brown University, University of Rhode Island (URI), Lifespan and Care New England.

The Biomedical Informatics and Cyberinfrastructure Enhancement Core aims to: (1) develop and support
the cyberinfrastructure needed to enable effective collaborative clinical and translational research, (2) promote
and advance professional development in biomedical informatics through workshops and online resources in
Rhode Island and across the IDEa network, and (3) support the implementation and maintenance of Advance-
CTR’s administrative tools to monitor the use and impact of resources. The long-term goal is to transform the
environment for clinical and translational research in Rhode Island by enabling integrated access to electronic
health data, providing core informatics support, and instructing researchers on implementing and applying newly
developed resources for studies. Faculty and staff in the Core offer experience in applying the breadth of
informatics and data science approaches across the full spectrum of biomedicine (translational bioinformatics,
clinical research informatics, clinical informatics, consumer health informatics, and public health informatics).
Specific areas of expertise include: biological sequence analysis, data capture and management, data
integration, knowledge representation and discovery, natural language processing, machine learning,
evaluation, and decision support. A signature effort of the Advance-CTR Biomedical Informatics Core is the
Unified Research Data Sharing and Access (URSA) Initiative for making data accessible and usable for research
purposes by the Advance-CTR community. This includes data from Electronic Health Record systems (Lifespan,
Care New England, and Providence VA Medical Center), statewide Health Information Exchange (Rhode Island
Quality Institute), and All-Payer Claims Database (Rhode Island Department of Health).

Pilot Projects Program: The Pilot Projects Program awards four investigators per year with one-year grants of
$75,000 each in direct costs for clinical and translational research. Awarded proposals must be interdisciplinary
with a focus on clinical, translational or community research. Priority is given to proposals that address statewide
health priorities set forth by the Rhode Island Department of Health. Awardees gain the opportunity to experience
planning and preparing research applications in an NIH format, respond to reviews and learn grant management
skills in a collaborative, cross-disciplinary environment. Finally, awardees may take advantage of Advance-
CTR’s research services in both the pre-proposal and post-award stages of their projects. To date the Pilot
Project Program has awarded 36 Pilot Awards to 61 unique investigators across all five of our partner institutions.
These included single investigator Pilot Awards and larger multi-PI investigator awards. We have made awards
for projects devoted to using biomedical Big Data as a central element to their proposal. We have made awards
to projects emphasizing community engagement. We have made awards for grant resubmission for proposals that were close to the funding line at large federal foundations and would have received support were it not for the current funding climate.

Professional Development Core: The Professional Development Core provides educational and mentoring opportunities to both junior and senior investigators. The Core includes the Mentored Research Awards program (MRAs), which is geared toward early-career stage investigators, especially those who identify as underrepresented minority individuals in STEM. The MRAs are given annually to three investigators from Brown University and the University of Rhode Island. They are two-year awards that cover 75% salary up to $90,000 in direct costs. An additional $25,000 is also provided to cover research-related expenses or tuition (a Master's degree in Clinical and Translational Research from the Brown University School of Public Health is encouraged). Finally, the awards provide a structured mentoring program and training in clinical and translational research. Awardees are encouraged to take advantage of Advance-CTR's research services in both the pre-proposal and post-award stages of their projects. To date five Mentored Research Awards have been awarded.

Tracking and Evaluation Core: The Advance-CTR Tracking and Evaluation Core, with support of the Administration Core, convened a statewide symposium/retreat to support programmatic planning and to assess the needs and obstacles to clinical and translational research of the participating institutions. Almost 100 clinical translational research from each of the institutional stakeholders, including institutional leaders, came together and drafted a needs assessment survey using program facilitators and workgroups. The product of that first retreat was refined into a formal Needs Assessment Survey that was sent to all of the Clinical and Translational researchers at each of the stakeholder institutions. The survey, which solicited anonymous responses, was launched in the spring of 2017. The sampling frame included faculty, postdoctoral fellows, administrators, clinical professions from all six of our institutional stakeholders. Following collation of over 171 responses, the survey demonstrated that only 18% of researchers were very or extremely satisfied with support for clinical and translational research whereas 63% were somewhat satisfied and nearly 20% were not at all satisfied with institutional support for clinical and translational research. The major unmet needs for research support that poses barriers to translational research productivity included Pilot Project funding, protected time for research, support for proposal development. Additionally, lack of integration of Institutional Review Board oversight for protection of human subjects was a significant barrier to the efficiency of research as stated by the majority of participants. Support for study participant recruitment and access to biostatistics and data analytical support for large datasets were also very substantial and met needs. These results were considered seriously by the leadership at Advance-CTR and the partner organizations and formed the basis for new initiatives and improvements.

Dedicated Space: A total of 6,946 square feet is dedicated to Advance-CTR across all partner institutions in Rhode Island. Central offices are located in downtown Providence, Rhode Island, adjacent to the Warren Alpert Medical School of Brown University and less than a mile from the Brown University School of Public Health, Lifespan and Care New England hospital systems. Other partners, including the Providence VA Medical Center and the Rhode Island Quality Institute are less than three miles away from the Administrative Core offices. This includes 2,281 square feet of space for the Administrative Core, the Pilot Project Program and the Biomedical Informatics Core. Shared building-wide resources include a small 209 square-foot conference room with capacity of 8 people and a larger 365 square-foot conference room with a capacity of 16 people. The building is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco).

Center - Advance-CTR: Comprehensive Alternative
https://www.brown.edu/initiatives/translational-research/facilities-and-resources-grant-proposals

Advance Clinical and Translational Research (Advance-CTR) serves to support and educate clinical and translational researchers in Rhode Island. The goal of Advance-CTR is to enhance collaboration and coordination of translational research in order to accelerate cross-disciplinary discoveries that improve health. Advance-CTR aims to: 1) Foster coordination between translational researchers at our partner institutions, 2) Bring together the diverse clinical research resources to provide a home that facilitates new collaborations, 3) Eliminate obstacles that may prevent researchers from pursuing clinical research initiatives, 4) Educate, mentor and encourage young investigators in clinical research professional development, 5) Facilitate research to gather
preliminary data necessary for developing competitive research proposals and 6) Sustain a clinical translational research environment by providing the necessary management and coordination of resources.

Advance-CTR is comprised of an Administrative Core; two Award Cores, the Pilot Projects Program and Professional Development; and three Service Cores, Clinical Research Design, Epidemiology and Biostatistics, Clinical Research Resources and Facilities, and Biomedical Informatics and Cyberinfrastructure Enhancement.

**Administrative Core:** The Administrative Core serves as the central operations hub for Advance-CTR. It includes two Project Managers, a Communication Manager, and one Assistant who report to the Advance-CTR Administrative Director. These individuals support the PD/PI; Program Coordinator; Strategic Planning Coordinator, the IAC, EAC and Steering Committees; and the six Cores. Administrative Core personnel assist the Core Leads in program management and planning, tracking and evaluation, budget development, allocation of resources, reporting and development of educational initiatives.

Pilot Projects Program: The Pilot Projects Program awards four investigators per year with one-year grants of $75,000 each in direct costs for clinical and translational research. Awarded proposals must be interdisciplinary with a focus on clinical, translational or community research. Priority is given to proposals that address statewide health priorities set forth by the Rhode Island Department of Health. Awardees gain the opportunity to experience planning and preparing research applications in an NIH format, respond to reviews and learn grant management skills in a collaborative, cross-disciplinary environment. Finally, awardees may take advantage of Advance-CTR's research services in both the pre-proposal and post-award stages of their projects.

**Professional Development Core:** The Professional Development Core provides educational and mentoring opportunities to both junior and senior investigators. The Core includes the Mentored Research Awards program (MRAs), which is geared toward early-career stage investigators, especially those who identify as underrepresented minority individuals in STEM. The MRAs are given annually to three investigators from Brown University and the University of Rhode Island. They are two-year awards that cover 75% salary up to $90,000 in direct costs. An additional $25,000 is also provided to cover research-related expenses or tuition (a Master's degree in Clinical and Translational Research from the Brown University School of Public Health is encouraged). Finally, the awards provide a structured mentoring program and training in clinical and translational research. Awardees are encouraged to take advantage of Advance-CTR's research services in both the pre-proposal and post-award stages of their projects.

**Biostatistics Core:** The Clinical Research Design, Epidemiology and Biostatistics Core provides a central location for Rhode Island investigators seeking quantitative and qualitative research design and analysis support through Advance-CTR. The Biostatistics Core links investigators with multidisciplinary faculty members and experts in various methodological techniques including biostatistics, epidemiology, qualitative data techniques and measurement and evaluation in health-related research.

**Clinical Research Support Core:** The Clinical Research Resources and Facilities Core is based at the Lifespan Clinical Research Core. Clinical Research Support is offered to Rhode Island investigators by highly trained research staff including clinical research coordinators, registered nurses, a medical technologist, and a phlebotomist. Investigators seeking Advance-CTR services have access to regulatory support, subject recruitment, space and support for the conduct for study visits, specimen collection and biobanking.

**Biomedical Informatics Core:** The Biomedical Informatics and Cyberinfrastructure Enhancement Core employs a team of data scientists to support research endeavors across the full spectrum of biomedicine. The Core offers investigators specific expertise in biological sequence analysis, data capture and management, biomedical data integration, knowledge representation and discovery, natural language processing and decision support.

**Dedicated Space:** A total of 6,946 square feet is dedicated to Advance-CTR across all partner institutions in Rhode Island. Central offices are located in downtown Providence, Rhode Island, adjacent to the Warren Alpert Medical School of Brown University and less than a mile from the Brown University School of Public Health, Lifespan and Care New England hospital systems. Other partners, including the Providence VA Medical Center and the Rhode Island Quality Institute are less than three miles away from the Administrative Core offices. This
includes 2,281 square feet of space for the Administrative Core, the Pilot Project Program and the Biomedical Informatics Core. Shared building-wide resources include a small 209 square-foot conference room with capacity of 8 people and a larger 365 square-foot conference room with a capacity of 16 people. The building is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco).

**Center - Advance-CTR: Summary**
https://www.brown.edu/initiatives/translational-research/home

Advance Clinical and Translational Research (Advance-CTR): Advance-CTSA partners were awarded an IDeA-CTR grant by NIGMS in 2016 (Advance-CTR, U54GM115677). The foundational progress of Advance-CTR places Advance-CTSA in an ideal position for immediate implementation and rapid progress. Biomedical Informatics is part of Advance-CTR. Upon funding of Advance-CTSA, we will relinquish IDeA Advance-CTR funding.

Advance-CTR serves to support and educate clinical and translational researchers in Rhode Island. The goal of Advance-CTR is to enhance collaboration and coordination of translational research in order to accelerate cross-disciplinary discoveries that improve health. Advance-CTR aims to: 1) Foster coordination between translational researchers at partner institutions, 2) Bring together the diverse clinical research resources to provide a home that facilitates new collaborations, 3) Eliminate obstacles that may prevent researchers from pursuing clinical research initiatives, 4) Educate, mentor and encourage young investigators in clinical research professional development, 5) Facilitate research to gather preliminary data necessary for developing competitive research proposals and 6) Sustain a clinical translational research environment by providing the necessary management and coordination of resources. Advance-CTR is comprised of an Administrative Core; two Award Cores, the Pilot Projects Program and Professional Development; and three Service Cores, Clinical Research Design, Epidemiology and Biostatistics, Clinical Research Resources and Facilities, and Biomedical Informatics and Cyberinfrastructure Enhancement.

A total of 6,946 square feet is dedicated to Advance-CTR across all partner institutions in Rhode Island. Central offices are located in downtown Providence, Rhode Island, adjacent to the Warren Alpert Medical School of Brown University and less than a mile from the Brown University School of Public Health, Lifespan and Care New England hospital systems. Other partners, including the Providence VA Medical Center and the Rhode Island Quality Institute are less than three miles away from the Administrative Core offices. This includes 2,281 square feet of space for the Administrative Core, the Pilot Project Program and the Biomedical Informatics Core. Shared building-wide resources include a small 209 square-foot conference room with capacity of 8 people and a larger 365 square-foot conference room with a capacity of 16 people. The building is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco).

**Center – Advance Predictive Biology**
https://www.brown.edu/research/projects/center-to-advance-predictive-biology/about-us

Center to Advance Predictive Biology: The Center is modernizing toxicity and drug testing by measuring and integrating the biologic responses of miniaturized human tissues. There is a large and growing number of potential toxicants and drugs whose concentration-dependent effects are unknown. Current animal and simple 2D cell culture models do not rapidly and effectively identify human health risks. Needed are new, cost-effective, and predictive assays that can assess adverse effects through an integration of biology and engineering, we have devised simple, high-throughput 3D microtissues as predictive biology platforms that reflect human physiology and disease, solving fundamental questions of adverse biological response. We use quantitative confocal imaging of 3D human microtissues to identify pathologic responses to chemical and drug exposures.

The Center to Advance Predictive Biology provides a scholarly environment for research and teaching in the development and use of state-of-the-art humane approaches to understanding the fundamental characteristics of health and disease, including identifying alternatives to animal testing for screen of environmental toxicants and new drugs. The Center is interested in collaborating with industry to accelerate the Center's mission and research and development programs. Types of support include general support for the Center, sponsored research, and collaboration around areas of mutual interest. The Center's strategy is to optimize and validate in vitro assays using human 3D microtissues visualized by high-throughput/high-content imaging. These novel
platforms for predictive biology are designed to address the unmet need for screening and safety assessment of large numbers of environmental chemicals and emerging toxicants, thus protecting human health and the environment.

Center - Alcohol and Addiction Studies (CAAS)
https://www.brown.edu/academics/public-health/research/alcohol-addiction-studies/

Center for Alcohol and Addiction Studies (CAAS): The Brown University Center for Alcohol and Addiction Studies in the School of Public Health is an internationally renowned research center in alcohol research. The mission is twofold: to conduct collaborative research that will lead to more effective treatment for alcohol and drug abuse, and to create a nationwide program in substance abuse, education and training for psychologists, physicians, medical students, and health care professionals. CAAS faculty conduct empirical research in a variety of areas of alcohol abuse/dependence, drug abuse/dependence and tobacco use, ranging from laboratory investigations of mechanisms through treatment or early intervention to policy. Funding comes from the federal government and a variety of foundations.

Comprehensive training is provided in how to conduct excellent research to predoctoral and postdoctoral research fellows. Faculty conduct clinical training seminars for practitioners at national and regional conferences. Faculty are involved in developing training curricula for medical schools and addiction training for clinicians as part of the Addiction Technology Transfer Center (ATTC). The CAAS houses the largest library of material on Alcoholics Anonymous, in conjunction with the Brown University Library system. Faculty are involved in Physicians and Lawyers for National Drug Policy to align policy, practice, and public understanding with the scientific evidence that addiction is a preventable and treatable disease; to support the use of evidence-based, cost-effective approaches toward prevention and treatment; and to enable lawyers and physicians to provide effective and sustained leadership in this effort.

Center - Biology of Aging
https://www.brown.edu/research/projects/biology-aging/

Center on the Biology of Aging: The mission of the Center is to promote at Brown University and at its affiliated hospitals research and education programs on the causes and treatment of aging. The Center complements already existing strengths such as clinical care and health services research by providing a focal point whose primary function is basic research on the biology of aging. The ultimate goal is to catalyze activity that will improve human health span. The Center for Aging Initiative seeks to: 1) identify biological mechanisms that can extend healthy life, 2) develop interventions to ameliorate the negative aspects of aging. By assembling a core group of experienced scientists the Initiative is increasing the interactions among investigators interested in aging, attracting talented students to their laboratories, and promoting growth by recruiting top-ranked new faculty. In addition to escalating research activity, the Initiative also strives to inform and educate the Brown community and the public. The Center also runs a monthly Providence Area Aging Research Forum, an extramural Aging Seminar Series, and the annual Colloquium on the Biology of Human Aging.

Center - Brown Center for Biomedical Informatics (BCBI)
https://www.brown.edu/academics/medical/about-us/research/centers-institutes-and-programs/biomedical-informatics/

Brown Center for Biomedical Informatics (BCBI): BCBI was established in July 2015 with a three-fold mission to: (1) innovate how electronic biomedical and health data are used, (2) implement solutions for improving biomedical research and healthcare delivery, and (3) inspire the next generation of biomedical researchers and clinicians in partnership with collaborators in existing areas of excellence at Brown, its healthcare affiliates, and statewide healthcare organizations. BCBI consists of six faculty members, two administrative staff, six data scientists and developer/analysts (who are also part of the centralized Data Science Practice at Brown), and students at various levels. BCBI is centrally located in office space in a building adjacent to the Warren Alpert Medical School of Brown University. This office suite space has 2,281 net assignable square feet and includes five administrative support workstations and eight offices. Shared building-wide resources include a 209 square-foot conference room with capacity of eight people and a larger 365 square-foot conference room with a capacity
of 16 people. This area is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco). Computers are available for basic programming and productivity tasks. Dedicated servers for BCBI research and educational activities are maintained by Computing and Information Services. BCBI leads the Advance-CTR Biomedical Informatics Core and works closely with the Center for Computational Molecular Biology, COBRE Center for Computational Biology of Human Disease, Data Science Initiative, and Hassenfeld Child Health Innovation Institute.

Center - Brown Center for the Study of Children at Risk
https://www.brown.edu/research/projects/children-at-risk/

Brown Center for the Study of Children at Risk (The Center) at the Alpert Medical School of Brown University and Women & Infants Hospital (WIH). The Center occupies 14,100 square feet of space and houses a 60 member staff. The laboratory and offices are located at 50 Holden Street, Providence, 2.28 miles from the WIH campus. The mission of the Center is: (1) to advance theories of the developmental pathways from fetal and infancy periods in at-risk children, (2) to enhance synergy between research and clinical practice that advances child development research, intervention programs and social policy, (3) to train scientists and practitioners in interdisciplinary methods from the field of child development. The Center's functions are: 1) fundamental research on mechanisms that explain long-term developmental outcome with emphasis on at-risk children, 2) applied research on interventions for children and their families, 3) education and training of students, scientists, and practitioners, and 4) services for populations of children of interest for fundamental and applied research.

Clinical: The Center is supported by WIH and is a Division of the Department of Pediatrics at WIH. WIH is located at 101 Dudley Street. The Holden St. facility provides office space and work stations for the 60 members of the Center including 12 Brown Medical School faculty, a reception/waiting area for research subjects and patients, four dedicated laboratories/evaluation rooms for research on fetal function and behavior, kinematic motor lab for children ages 3-5 years; eye tracking lab for high-risk children including those with autism spectrum disorder; medical examination room. 12 research and clinical testing and evaluation rooms with five one way observation rooms, physiological and videotape recording facilities, and a data center that includes biostatistical and technical support, and five video coding stations. The Center has two conference rooms for colloquia, seminars presentations and work group meetings. Both rooms are equipped with audio-video equipment. Five work stations are also available with coding systems to extract data for data analyses.

Computer: All members of the Center, including trainees, have personal computers equipped for word processing, data analysis, and graphics. All Investigators and trainees have access to color laser printers and digital scanners. All computers have access to the internet, Email, library information and database searches via connection to Brown University. Further, the Center has an internal network and dual servers that interface with the WIH network. The Center technical engineer is the network administrator with back up from WIH information services. The facility is site licensed for all statistical software proposed in this project (SPSS, MPLUS, SAS). The hospital main campus and the Brown Center are connected on the same system-wide secure network.

Other: The kinematics lab is designed to test visual-motor and fine motor control in young children when reaching and grasping a series of pegs. The Vicon Motus software was installed on the specialized computer that guided the procedure. The setup includes two cameras with infrared illuminator rings that recorded the procedure from different angles. Prior to the assessment, the reaching space was calibrated by a 12 by 12 frame with 16 markers by the two infrared cameras. With calibrated space, the software is able to determine the moving position of the child’s hand.

Equipment: The biomarkers lab provides information on how children with autism spectrum disorder engage and respond to interesting stimuli. Visual attention is used (eye tracking measures of social attention) and tests of autonomic regulation (sympathetic and parasympathetic functioning) as a potential battery of biomarkers. The equipment required includes: REDn Eye Tracking System (system laptop, eye tracking hardware, and system software); MindWare Physiological Data Analysis Software (2 license keys); 2 Actiwave Cardio ECG Waveform Data Recorders; Dell Latitude Laptop; three Dell OptiPlex 9020 Computers (1 is refurbished); 2 E4 EDA recording wristbands; 2 Q-sensor EDA recording wristbands (on loan from Northeastern University); CIP Pupilometer with Laptop (on loan from Simons Foundation); 1 Macbook Air; Dell 24 Monitor. Eye tracking measures of visual attention to people and social stimuli indicate social attention and information processing. Autonomic nervous
system (ANS) activation has bottom up influences on attentional and emotional responses, and ANS responses are influenced by top down higher-order processing of experiences. Activation of the sympathetic and parasympathetic branches of the ANS measure emotion regulation and social responsiveness. Skin conductance is one measure of sympathetic activity, whereas heart rate variability is a measure of parasympathetic activity. Together, emotion regulation, social responsiveness, and attention to social information can be expected to correlate with dysfunctions seen in ASD.

Center - Center for Biomedical Engineering (CBME)
https://www.brown.edu/academics/biomedical-engineering/home

Center for Biomedical Engineering (CBME): This center is the only joint academic program of the School of Engineering and the Division of Biology and Medicine. CBME’s research improves human health through cross-disciplinary studies and educational activities that integrate the engineering, physical sciences, life sciences, and clinical practice. CBME also oversees and administers degree programs in Biomedical Engineering for undergraduates, masters students, and PhD students.

CBME faculty are drawn from across the campus academic departments as well as the School of Engineering and the clinical departments of the Division of Biology and Medicine. Their dual status as CBME faculty and members of academic departments makes them well poised to bring the very latest in their disciplines to bear on the complex and multidisciplinary problems of biomedical engineering. Many CBME researchers bridge the gap between clinical and basic research through interaction with Brown's affiliated hospitals including Rhode Island Hospital, Providence Veterans Affairs Medical Center, and Miriam Hospital.

The research, teaching, and service activities of the CBME community are diverse. However, much of the Center’s fundamental capability can be captured in four topics of nationally recognized excellence: Mechanobiology, Regenerative Engineering, Neuroengineering, and Biomaterials and Sensing.

Center - COBRE Center for Computational Biology of Human Disease (CBHD)

COBRE Center for Computational Biology of Human Disease (CBHD): The COBRE CBHD embraces the age of genomics medicine from an explicitly data-driven, computational perspective. By building a collaborative Center of empirical and computational scientists, this COBRE advances new discoveries, algorithms, and genomic screening approaches with direct relevance to several human diseases. This is consistent with NIH's mission of supporting bioinformatics and computational biology to advance all areas of biomedicine. This Center provides a centralized service to assist researchers in computational, bioinformatic, and data management challenges of analyzing large data sets made available by modern 'omics' technologies. In addition, this funding will support the research activities of junior investigators to ensure their transition to stand-alone extramurally funded research scientists. The COBRE CBHD uses an innovative joint mentoring process, where each junior faculty member is advised by both computational and biological or clinical senior faculty members. In addition, staff data scientists in the Computational Biology Core will be active members of each of these laboratory groups to better integrate all phases of the research activities.

Center - COBRE for Central Nervous System Function
https://www.brown.edu/research/projects/central-nervous-system-function/

COBRE for Central Nervous System Function: Purposeful human behavior requires attention, decisions and construction and production of abstract sequences, all basic functions mediated by brain networks primarily located in the neocortex, but modulated and shaped by sub-cortical processing. In a general and even a specific sense, attention, decision making and production of abstract sequences are key components of human mental activities. Deficits in these functions are common in both neurological and psychiatric disorders and can result in a wide range of higher-order behavioral deficits, including anxiety. We propose to continue, for at least another five years, the COBRE Center for Central Nervous System Function at Brown University that will investigate the mechanisms of higher-brain function focusing on decision making, abstract sequence construction and attention, while developing statistically valid tools to reveal brain connectivity pattern. This COBRE consists of four research projects. A Design and Analysis Core and a Behavior and Neuroimaging Core will facilitate the research goals of these projects and benefit the broader Brown community by developing new tools and optimizing existing
ones to image brain structure and function with MRI and EEG, while insuring proper experimental design and analysis procedures across the projects. Project Leaders will have senior faculty mentors who will provide support and guidance on research, publication, grant preparation, and career development. An Administrative Core will oversee the operations of this COBRE Center. The COBRE Center for Central Nervous System Function will fall under the auspices of the Brown Institute for Brain Science. The COBRE Center will leverage the administrative resources available through the Brown Institute for Brain Science to ensure efficient operation and coordinate with other brain science research activities at Brown.

Center - Computation and Visualization (CCV)
https://ccv.brown.edu/

Center for Computation and Visualization (CCV): The mission of CCV is to provide the scientific and technical computing expertise required to advance computational research and support Brown’s academic mission. The accelerated transformation of the pace and impact of computational approaches led to Brown University’s recognition of the importance of high performance computing across all of its disciplines. As a result, Brown and IBM developed in 2009 a $4M investment in a high performance computing platform, known as Oscar, that is available statewide to researchers. Through grant funding and University investment, this platform has undergone continual hardware enhancement, and now includes Intel Scalable Processors and NVIDIA GPUs of the Pascal and Volta architectures, as well as 100Gb/s EDR Infiniband. The equipment is maintained and operated by the staff of the Center for Computation and Visualization (CCV), who have extensive experience in operating shared computational clusters. CCV staff are responsible for scheduled maintenance, access control as needed, and integration with research specific hardware as required by NIH-funded researchers. CCV staff also take care of all financial aspects of operating and maintaining the facility.

The high performance computing resources at CCV equip the Brown research community to undertake complex numerical simulation, modeling, and data analysis. Oscar is the primary research computing cluster with several hundred multi-core nodes sharing a high performance interconnect and file system. Applications can be run interactively or scheduled as batch jobs. Several large memory nodes provide substantially more memory than is available on typical workstations and laptops. A large collection of software is available on CCV systems, including: python, perl, R, Matlab, Mathematica, Maple, optimized math and science libraries, and domain-specific applications. CCV staff can help acquire and install most applications upon request. The technical specifications of Oscar are:

- Two login nodes provide access for application development, debugging and batch job management
- About 400 compute nodes up to current specs of dual multi-core processors and 128 GB of memory and a total of more than 8,000 cores
- Specialized nodes containing GPU processors or 512 GB of memory
- High-bandwidth/low-latency Infiniband interconnects
- All nodes are diskless with I/O provided by an IBM GPFS parallel file system
- 1 PB of usable disk space
- RHEL 7.3 Linux operating system
- SLURM workload manager

CCV provides storage for large research files connected to the high performance computing (HPC) system. A default allocation of 256 GB (also called RData) is given to all faculty members at Brown, on a per request basis, with the option of purchasing additional storage as needed. Long-term storage and backups are available on a fee basis. Storage can be purchased in increments of terabytes for periods of up to 6 years. The cost for backups is included when storage is purchased. Data is incrementally backed up to tape on a daily basis. In addition, snapshots for the last 7 days are available online for quick restores. Long-term archiving of files to tape (one or two copies) can be purchased as needed. Tape libraries are housed at two separate locations to enable disaster/recovery scenarios. In addition, a disaster recovery copy of the non-ephemeral data is kept on a lower-performance filesystem to permit immediate recovery and limited production computing in the unlikely event of the loss of the primary filesystem. These research storage allocations can be easily mounted to desktops or other computer systems to allow for easy access and sharing files. Details of HPC file storage at CCV:

- Rdata is accessible from all CCV systems (/gpfs/data)
• Can be mounted to all desktops on Brown's campus network
• Is backed up on a daily incremental basis
• Rdata allocations can be increased by purchasing additional storage
• Home directory on Oscar: All users will have access to a home (/gpfs/home) allocation of 10 GB. This allocation is backed up on a daily basis
• Group storage: Premium accounts will be entitled to an additional allocation of 256 Gb that may be merged with RData (for primary PI). Likewise, group premium accounts will be entitled to additional 25 GB per user
• Snapshots: Daily snapshots are available for both RData and Home file systems for seven consecutive days
• Scratch: Space for temporary files is available as (/gpfs/scratch). These files are not backed up and scratch space is strictly for temporary files. Files may be purged after 30 days or as the file system is being utilized. This allocation will be managed by an application called xdisk (time versus space) (work in progress)
• Sharing data: Sharing files that are too big to be sent via email. There is a 10 GB quota and a limit of 2 GB per file
• Users can access RData from the CIFS share. This can be mapped as a drive in Windows and mounted in Mac OS X and Linux from any campus system (off-campus use requires a VPN connection to campus). Users can also access files by using a file transfer tool like Secure Copy (SCP), Secure FTP (SFTP), or rsync

A key benefit of using these computing resources is that CCV installs and maintains a large collection of computational research software. CCV can install most software packages upon request. A full range of statistical and other scientific software is available on the CSS system, including standard statistical packages (including SAS, Stata, Splus), specialized statistical software (such as DBMSCopy, ROCKIT, nQuery, East), scientific programming languages and software (such as Fortran, C++, Matlab) and office software. All data stored on the CSS network is secure: access to the system from outside our network requires the use of a software client that employs a point-to-point encryption. The UNIX operating system also provides the mechanism to limit access of specific directory trees to specific groups of users. CSS will supplement the funded Administrative Coordinator for the Core with a modest amount of in-kind administrative support in the form of existing clerical and secretarial help, assistance with grant and subcontract preparation, access to conference rooms and office equipment. The Core will pay a nominal fee to CSS to offset the cost of maintaining multiple-user site licenses for statistical software and for maintaining updated operating systems, having full access to the computing network (including associated software and dedicated hardware), and software and systems support for core personnel.

Center - Computational Molecular Biology (CCMB)
https://www.brown.edu/academics/computational-molecular-biology/

Center for Computational Molecular Biology (CCMB): CCMB was founded in September 2003 with the aim of establishing a world-class center for research and scholarship in this new discipline. CCMB's central mission is to make breakthrough discoveries in the life sciences at the molecular and cellular level through the creative application of existing data analytic methods, and the development of novel computational, mathematical, and statistical technologies required exploit the opportunities emerging from advances in genomics and proteomics. It is a research center that unites existing faculty research programs and does not support service staff for computation or bioinformatics. CCMB occupies ~3000 square feet of space in the Watson Center for Information Technology (CIT) at 115 Waterman Street. This includes office space for graduate students, postdoctoral fellows, research staff and visitors, and a faculty member. In addition, there is a state-of-the-art seminar room with dual projectors, a smart board and a floor-to-ceiling white board along one entire wall, and is used for the weekly Computational Biology seminar series and research group meetings. CCMB has a full-time administrative staff member for grant preparation and other administrative duties. CCMB has 72 dedicated cores on the Oscar super computer. Center for Computational Biology of Human Disease (CCMB): The prime intellectual mission of Brown University's Center for Computational Molecular Biology (CCMB) is to promote the development, implementation and application of analytical and computational methods to foundational questions in the biological and medical sciences. The research programs of the Core Faculty in CCMB lie fundamentally at the intersection of computer science, evolutionary biology, mathematics, and molecular and cellular biology.
Biological questions that currently unite the CCMB Core and Associate Faculty are: How do genotypes and genes interact to produce phenotypes, and how does this happen from womb to tomb? What drives the formation, maintenance and evolutionary transformations of communities of organisms over time? Quantitative questions that currently unite the CCMB faculty are as follows. How can we design powerful algorithms to make sense of the sea of data produced in the genomic era? What principles are required for a theoretical framework to completely model cellular systems?

The research challenges at the heart of CCMB are a rich source of mathematical problems motivated by the complex nature of genomes, disease processes and evolutionary relationships. These challenges are both multi-scale (with units of interest ranging from molecules to communities of organisms) and large-scale (data-intensive, due to advances in sequencing technologies). Thus, CCMB rounds out the broader landscape of research in methodological development at Brown University by partnering with and complementing the Data Science Initiative and the Brown Center for Biomedical Informatics.

In addition to these research interests, CCMB Faculty members are actively involved in the operation of Brown's NIH-funded COBRE Center for the Computational Biology of Human Disease, and administer both an undergraduate concentration and an interdisciplinary doctoral program in Computational Biology.

Center - Evidence Synthesis in Health (CEHS)
https://www.brown.edu/public-health/cesh/home

Center for Evidence Synthesis in Health (CEHS) conducts multidisciplinary research and teaches principles in research synthesis (by means of systematic review, meta-analysis) and evidence contextualization (by means of decision or economic modeling) with a focus on comparing the effectiveness of interventions, tests and processes in clinical medicine. It seeks to optimize the processes of research synthesis in healthcare and beyond by developing new and extending existing methods and tools. It maintains extensive research collaborations with Brown Medical School and its affiliated hospitals. Through a K12 award (Joseph Lau, PI), it trains postdoctoral fellows and junior faculty in comparative effectiveness research (CER) and patient-centered outcomes research (PCOR) with an emphasis on systematic review. It also has an R25 grant from the Agency for Healthcare Research and Quality (AHRQ) (Christopher Schmid, PI) to establish a nationwide training, peer-to-peer network and mentorship program in CER and PCOR for mid-career professionals (Evidence Synthesis Academy, see below). CESH is developing three software products for systematic review that will benefit users of Advance-CTSA BERD and others. The Systematic Review Data Repository (SRDR) is an open collaborative Web-based repository of systematic review data housed at srdr.ahrq.gov. It serves as both a central archive and data extraction tool, shared among and freely accessible to organizations producing systematic reviews worldwide. Abstrakr is free, open-source software for semi-automated screening of abstracts using machine learning techniques. Open Meta-Analyst is cross-platform, open-source software for performing meta-analyses of binary, continuous, or diagnostic data. Pooling can be done using a variety fixed and random-effects methods, including Bayesian and maximum likelihood analysis. The software enables you to a variety of subgroup and sensitivity analyses.

The Evidence Synthesis Academy seeks to promote an understanding and appreciation of evidence synthesis and to increase utilization of proper methods for its implementation. The Academy provides training in methods and technologies that can improve the quality and efficiency of conducting systematic reviews, as well as advanced methods to maximize the use of available clinical data. The Academy strives to engage audiences who rarely receive this kind of training but who have an enormous impact on policies and on the public's understanding of, and access to, new medical knowledge. In addition to clinicians and methodologists, the Academy welcomes healthcare administrative professionals (health payers); patients and advocacy groups; industry and consultancy professionals; federal and state government researchers, policy makers and legislative staff; librarians; journalists; research funders.

Center - Gerontology and Healthcare Research
https://www.brown.edu/academics/public-health/cqhr/home
Center for Gerontology and Healthcare Research: The Center for Gerontology and Healthcare Research in the School of Public Health is a nationally prominent research center that studies the diverse health and social service needs of elderly and other persons with chronic illnesses. Since the early 1980's, center faculty members have had substantial success in securing funding from the National Institutes of Health, the Agency for Healthcare Research and Quality, and the Health Care Financing Administration, as well as from numerous philanthropic foundations. The research findings of center faculty have, as intended, figured prominently over the years as valuable guides for government agencies making decisions regarding policy aimed at improving health and health care for aging and disabled populations. Initiating new lines of research on previously unstudied or understudied populations is a hallmark of the center work. The Center for Gerontology and Healthcare Research is located on the campus of Brown University in the city of Providence, Rhode Island and is the administrative home of the Center for Long-Term Care Quality & Innovation.

Center - Plant Environmental Center

Plant Environmental Center: The Plant Environmental Center at Brown University consists of six environmentally controlled research greenhouses, a conservatory, two laboratories and a classroom. The facility is comprised of six computer controlled research greenhouses totaling approximately 5,000 square feet. These greenhouses are used for research experiments, as well as various plant collections used to support biological science classes. In addition, this roof top space includes an 1800 square-foot conservatory open year round. The collection in the conservatory includes many plant families, including a diverse collection of Cycads, Orchids, Aroids, and many plants from the Amazon region. Many of these plants have medicinal and ceremonial uses and are part of our Ethnobotanical collection.

The greenhouse facility also consists of a head house for potting and other prep work, classroom, and plant growth chamber laboratory. The plant growth laboratory consists of eight E7/2 Conviron Plant growth chamber units, as well as two eighty square-foot walk-in chambers and one 80 square-foot cold room. These units are primarily used by graduate students and faculty performing research with very specific cultural requirements that cannot be maintained in the greenhouses.

Center - Primary Care and Prevention (CPCP)
http://med.brown.edu/CPCP/

Center for Primary Care and Prevention (CPCP): The Brown University Center for Primary Care and Prevention was established in 1997 to improve the health of individuals and communities by promoting research, enriching knowledge, and improving practice in primary care and prevention. The missions of the Center are to promote interdisciplinary research in community, public health, and clinical aspects of primary care medicine; to stimulate innovations in the primary care education for medical students, residents and fellows; and to provide technical assistance to private foundations, state and federal agencies on matters of health policy, and to international organizations on matters regarding the development of primary care systems in other countries.

The Center is home to an interdisciplinary team of scientists, physicians and educators, each of whom has an interest in improving the delivery and practice of primary care and prevention. The CPCP is a collaborative effort between Brown University and the former Memorial Hospital of Rhode Island, where the Primary Care Center, serves as a base of operation for faculty and staff. The Center serves Brown University faculty members with appointments in the University Departments of Medicine, Family Medicine, Epidemiology, Social and Behavioral Science, Psychiatry and Human Behavior, Obstetrics and Gynecology, and Pediatrics. Faculty are based at Brown-affiliated hospitals, on campus, and in various private and public organizations. The Center has been involved in several outreach activities with community organizations including meetings with Progresso Latino, Hope Street Ministries, Rhode Island Free Clinic, Clinica Esperanza, Latino Cancer Control Task Force in an attempt to find common ground to create community academic partnerships surrounding mutually agreed upon research agendas.

The Clinical Studies Center has processed over 25,000 individuals in multiple randomized clinical trials. We have investigative expertise in Dietary Counseling, Cardiovascular testing including flow mediated dilation, heart rate variability, and carotid IMT, Body composition analysis (DXA scans), Physical strength measures including
Physical Activity Recall and Accelerometer technology, Cognitive testing, Fat biopsy sampling. The center occupies 1570 square feet of clinical research space, consisting of a separate waiting room with snacks and refrigerator for after fasting blood-drawing refreshments, a large phlebotomy unit, four dedicated examining rooms for ongoing research studies, a reception area, medication storage area, Clinic Director and data entry space, two handicap accessible bathrooms and a radiology suite with mammography, fluoro unit, DEXA scanner and two X-ray units. Additional exam rooms are available for research staff to accommodate higher clinic volume as needed. The center employs a clinic manager, two research RNs, one research assistant, receptionist, lab processor and data entry clerk who are involved in a cadre of epidemiologic studies and clinical trials.

**Center - Sheridan Center for Advanced Teaching and Learning**

[https://www.brown.edu/sheridan/sheridan-center](https://www.brown.edu/sheridan/sheridan-center)

Sheridan Center for Advanced Teaching and Learning, directed by Dr. Mary Wright, is a place where faculty, graduate students and postdocs come together from across the disciplines to inquire about, explore, and reflect upon teaching and learning as ongoing and collaborative processes. Sheridan Center programs, services and resources are available to all members of the Brown community, including full-time and part-time faculty, postdoctoral fellows, teaching fellows, and teaching assistants. The Sheridan Center provides practical advice about teaching and professional development and promotes best practices and promising new practices in teaching. Programs offered include Teaching – orientations, workshops, and lectures; Course Development Grants – support to develop experimental modules or new courses that pursue creative approaches to teaching and learning; Certificate Programs – five year-long certificate programs on teaching practice and preparation for professional careers; Confidential Consulting Services – course and syllabus consultations, classroom observations, student evaluation consultations, practice teaching sessions; Support for Research – effective presentations, educational components of grants, program evaluations, scholarship on teaching and learning; Career Planning – programs and resources to help launch and develop professional careers; Teaching and Learning Resources – publications and online resources addressing a wide range of topics; Community – programs and initiatives bringing together faculty, graduate students, and postdocs from across the disciplines. Advanced T32 students use this center to work toward various teaching certificates. Graduate students can move through to Certificate IV which is the teaching consultant program. There is a graduate student liaison to the Teaching Center. The Sheridan Center resources are especially valuable to students interested in future careers that involve college level teaching.

**Center - Statistical Sciences (CSS)**

[http://www.stat.brown.edu/Faculty.aspx](http://www.stat.brown.edu/Faculty.aspx)

Center for Statistical Sciences (CSS): The Center for Statistical Sciences was founded in 1995 as a unit of Brown Medical School, funded by research projects. Over the years, CSS has developed a robust research enterprise and provided the academic strength and infrastructure for the formation of the Department of Biostatistics. The Center organizes the Brown Statistics Seminar, which is and held throughout the academic year and features talks on current developments in statistical methodology from invited external speakers. In addition, Center faculty host regular working groups in which topics of current research are discussed. Presenters in these informal seminars include Brown graduate students and faculty as well as other campus- and hospital-based researchers. The Center’s work is focused on methodologic research in biostatistics and interdisciplinary research across the spectrum of medicine, public health, biology, and health-related topics in the social sciences, with local, national, and international collaborations. It houses several interdisciplinary research groups listed below.

Biostatistics Core for Lifespan/Tufts/Brown Center for AIDS Research (CFAR). The Outcomes and Biostatistics Core of the Lifespan/Tufts/Brown CFAR is a major collaborative activity between CSS biostatisticians and HIV scientists and has been successfully sustained since 1999. The Core’s personnel include three faculty, one staff biostatistician, graduate research assistants, and informatics and administrative support staff. Core faculty and staff collaborate with CFAR investigators in the development and conduct of studies in HIV/AIDS, including studies of the progression of HIV in women, behavioral interventions to increase compliance with antiretroviral therapy (ART), policy interventions and substance abuse, antiviral therapy adherence, and international studies of HIV drug resistance. The collaboration has also led to productivity in statistical methods work motivated directly by problems in HIV and AIDS, including published work on methods for informative dropout, causal inference
and associated sensitivity analyses, and modeling HIV disease parameters and progression. Core faculty serve as mentors and consultants for a number of K award recipients who are junior faculty at Lifespan and/or Brown.

Biostatistics Core for AMPATH Consortium. The Academic Model for Providing Access to Healthcare (AMPATH) Consortium is collaboration between Moi University in Eldoret, Kenya and 18 universities in North America. A core subgroup of these universities is involved in research using data from over 100,000 individuals with HIV in western Kenya. Dr Hogan oversees a staff of seven faculty and masters-level statisticians at Brown, Indiana University, and Moi University in the Biostatistics Program of AMPATH. He is involved in both research and statistical training with Kenyan and American investigators.

Eastern Cooperative Oncology Group/American College of Radiology Imaging Network (ECOG/ACRIN) is a cooperative group funded by the Cancer Imaging Program of the National Cancer Institute to conduct multi-center, interdisciplinary clinical evaluations of diagnostic imaging in cancer. CSS is home to the network’s Biostatistics Center for which Dr. Gatsonis is Director. The current research portfolio of ACRIN includes 9 trials with active participant accrual or follow-up, eight trials with ongoing analysis of primary or secondary endpoints, and eight trials in development. ACRIN’s research program includes imaging in cancer, early detection, diagnosis and staging, disease management and image guided treatment. ACRIN is now expanding its research portfolio with studies of imaging for cardiovascular and neurologic diseases; it conducted the Digital Mammography Screening Trial (DMIST), which enrolled 49,500 women and compared the diagnostic accuracy of digital and film mammography, the National CT Colonography Trial evaluating the accuracy of CT Colonography for colon cancer screening, and the ongoing National Lung Screening Trial (NLST) which enrolled more than 50,000 participants at high risk for lung cancer and randomized them to annual screening with helical CT or X-ray. More than 100 centers across the U.S., Canada and other countries participate in ACRIN studies. The Biostatistics Center of ACRIN provides methodologic leadership and support to ACRIN investigators in the design, implementation, and analysis of network studies. Center personnel includes five faculty, ten professional biostatisticians, graduate research assistants, and administrative and informatics support staff.

ACRIN Outcomes and Economics Assessment Unit (OEAU) was formed to support the operations of the ACRIN Outcomes and Economics Committee and to perform the collection of patient reported outcome data in ACRIN studies. The Assessment Unit has extensive experience with the instruments used to collect patient reported outcomes and cost data, and is responsible for the collection of quality of life data for the National Lung Screening Trial and data on screening-associated costs and test preferences for the National CT Colonography Trial.

Center - Swearer Center
https://www.brown.edu/academics/college/swearer/

The Swearer Center: The Howard R. Swearer Center of Brown University works with more than 1,200 Brown students, through and with 100+ community partners -- more than half of which are in the greater Providence area. In its 30-year history, the center has developed and nurtured many deep — and deeply rewarding — relationships with individuals and organizations in Providence. The center connects students, faculty and community partners through community engagement, engaged scholarship and social innovation -- three key perspectives that are the foundations of its work. Swearer Center programs and fellowships provide students with community engaged, cohort-based experiential learning opportunities. Through programs and fellowships, students link their passion for social justice and community engagement with their academic and career goals. The Swearer Center partners with a wide range of organizations (nonprofit, LEAs, state and local government agencies etc.) that wish to access the resources of the Swearer Center or the university to advance their mission and work. Partnering organizations work with Swearer Center and university staff as co-educators, co-developers and co-creators of knowledge in our community engagement and engaged scholarship work.

Swearer Center partnership practices are centered around the values of Community Agency and Reciprocity. Community-based organizations are best situated to design, create and deliver programs and services in their own communities and therefore our work is that of capacity building partner, technical assistance, and conduit to access other university resources like community-based research. We work to ensure that both partners realize the desired benefits of the partnership. The Swearer Center offers partner organizations a variety of supports, resources, scholarship, student time and effort, funding for social innovation projects and membership in the Community Partner Network. In turn, partner organizations provide essential learning and engagement
opportunities for students, as well knowledge and expertise to Swearer Center and institutional staff as we seek
to understand and better inform the field of higher education and community engagement.

**Center - Writing Center**
https://it.brown.edu/services/type/lynda

The Writing Center is an academic support service, staffed by graduate students from a variety of academic
disciplines, available for all members of the Brown Community. Writing Center staff members are experienced
writers and teachers who participate in ongoing training in composition theory and practice. Along with holding
one-on-one conferences, Associates in the Writing Center offer various workshops on writing for interested
groups. Writing Center conferences generally last an hour. Writing Center Associates are prepared to discuss
all stages of the writing process, from finding a topic up through revision and editing strategies. Associates can help writers deal with writer's block, audience awareness, argumentation, organization, grammar, research skills, and the conventions of academic writing

**Department - Behavioral and Social Sciences**
https://www.brown.edu/academics/public-health/bss/home

School of Public Health (SPH) Department of Behavioral and Social Sciences (BSS) is a multidisciplinary
academic department in the Brown University School of Public Health. Over 50 BSS faculty members are actively
engaged in research and teaching to understand the behavioral and social determinants of public health
problems and to develop interventions to change behaviors and improve social contexts related to public health.
BSS faculty conduct collaborative research with a substantive focus on behavioral health issues such as alcohol
and other drug abuse; smoking and tobacco use; obesity, nutrition, and physical activity; HIV and sexually
transmitted infections; and health disparities and culture. The Department of Behavioral and Social Sciences
offers courses of study leading to Master of Science (ScM) and Doctor of Philosophy (PhD) degrees in Behavioral
and Social Health Sciences. BSS faculty also teach and advise Brown undergraduates and train and mentor
postdoctoral research fellows.

**Department - Biostatistics**
https://www.brown.edu/academics/public-health/biostats/home

School of Public Health (SPH) Department of Biostatistics: The mission of the Department of Biostatistics at
Brown is to conduct fundamental research that generates new discoveries in theory and methods of statistics
and data science; to provide expertise and leadership and to promote interdisciplinary research in domain areas
related to human health and the life sciences; to develop future researchers and professionals in the field of
biostatistics through a graduate program that combines rigorous training in theory and methods with meaningful
engagement in interdisciplinary research; to provide high-quality courses and mentoring in biostatistics and data
science for the broader community of students and researchers at Brown; and to serve the academic community
at Brown and the scientific community at-large by providing intellectual and organizational leadership and
collaboration on programs in the statistical and data sciences.

**Department - Chemistry**
https://www.brown.edu/academics/chemistry/about

Chemistry: The Chemistry Department at Brown engages scientific problem-solving that advances our
understanding of chemistry from the most fundamental level and addresses the needs of today's society.
Chemists at Brown advance knowledge and discovery in theoretical, physical, inorganic, organic, materials, and
biological chemistry. Innovative research areas include sustainability and green chemistry, chemistry and
medicine, design and application of new materials, and novel methods of understanding molecular dynamics
and reactions. Brown Chemistry research groups, in collaboration with other Brown schools and departments,
as well as national laboratories, prepare students to succeed in a complex and changing world.

The department offers academic programming that includes introductory and advanced courses, a doctoral
program, and three undergraduate concentrations: Chemistry, Biochemistry, and Chemical Physics. To complement academic programs, the department's weekly colloquium series and other seminars and events
connect Brown with faculty and industry leaders throughout the world—including departmental alumni—to enrich students' learning as they engage and develop their intellectual independence.

**Department - Computer Science**
https://cs.brown.edu/

Department of Computer Science: Since its inception in 1979, the Computer Science Department at Brown has forged a path of innovative information technology research and teaching at both the undergraduate and graduate levels. From modest beginnings as an interest group within the Divisions of Applied Mathematics and Engineering in the 1960s to its current stature as one of the nation's leading computer science programs, the Computer Science Department has continuously produced prominent contributors in the field, at both the undergraduate and graduate levels. The Department is a diverse community of scholars engaged in all aspects of research, teaching and mentoring in computer science and its related interdisciplinary disciplines. Realizing the importance of computing and algorithmic thinking in so many scientific, social and technological endeavors, the faculty collaborate extensively with colleagues in archaeology, applied mathematics, biology, cognitive and linguistic sciences, economics, engineering, mathematics, medicine, physics and neuroscience.

Computer Science undergraduate offerings reflect the department's multidisciplinary orientations, with joint concentrations in mathematics, applied mathematics, computational biology and economics. There are strong undergraduate research groups in graphics, neuroscience and robotics as well as a long history of involving undergraduates in projects that span disciplinary boundaries. Graduate students find it easy to tailor their education to meet the challenges of multidisciplinary research and commonly have advisors in two or more departments.

Computer Science graduate students find it easy to tailor their education to meet the challenges of multidisciplinary research and commonly have advisors in two or more departments. Research in the department crosses traditional boundaries and projects spring from shared interests more than from established groups. Faculty work with postdoctoral students, graduate students and undergraduates with ideas and expertise are drawn from other disciplines and departments at the University. A long tradition of combining theory and practice is as strong and relevant today as it ever was. Research areas the department participates in include: algorithms; cloud computing; computational biology; computational geometry; computational neuroscience; computational photography; computer graphics; computer networks; computer vision; cryptography; data management; distributed systems; educational technology; electronic commerce; information visualization; intelligent agents; machine learning; mobile and ubiquitous computing; nanocomputing; natural language processing; operating systems; optimization; parallel computing; programming languages; robotics; scientific visualization and modeling; security and privacy; sensor networks; software engineering; user interfaces; theory of computation; verification and reliable systems; virtual reality.

**Department - Department of Ecology and Evolutionary Biology (EEB)**
https://www.brown.edu/academics/ecology-and-evolutionary-biology/

Ecology and Evolutionary Biology (EEB): Research and instruction in the Department is directed toward understanding biological systems at the individual, population, and community levels of organization utilizing both plant, animal, and microbial systems. Major research areas pursued by faculty and students include functional morphology, foraging ecology, the adaptive significance of animal behavior, sexual selection in plants and animals, insect mating behavior, plant population genetics, molecular population genetics and evolution, marine community ecology, theoretical population and community ecology, and ecosystem ecology. Graduate study in ecology and evolutionary biology at Brown University leads to the PhD degree. A core of faculty and postdoctoral researchers engaged in cutting edge research guides students. Students further benefit from the Department’s academic collaborations across University and Alpert Medical School departments and programs. Faculty and students are also active prominently in the Environmental Change Initiative, a multidisciplinary center at Brown tackling the complex issues undergirding environmental change.

**Department - Department of Molecular Biology, Cell Biology and Biochemistry (MCB)**
https://www.brown.edu/academics/biomed/molecular-cell-biochemistry/
Molecular Biology, Cell Biology and Biochemistry (MCB): The Department of Molecular Biology, Cell Biology and Biochemistry is a basic science department within the Brown University Division of Biology and Medicine. Its core areas of scholarship are broad and encompass biochemistry, cell biology, developmental biology, and genetics. The department supports undergraduate, graduate, and medical education in these fields, offering a large variety of courses from introductory to highly specialized levels. The department currently houses 28 primary faculty whose research programs cover a wide array of biological questions, model systems, and methodological approaches. The biological phenomena under investigation range from embryonic and neuronal development, reproduction and genetics of behavior to neurodegeneration and aging. The biological mechanisms being addressed include DNA replication, recombination and transcription, RNA processing and transport, protein translation, protein folding and turnover, vesicular transport, and numerous aspects of molecular signaling. Model systems range from prokaryotic, through plant and several metazoan species to mammals including humans. Classical biochemical and genetic approaches are used alongside innovative technologies including genomics, proteomics, X-ray crystallography, and mouse transgenics. The department is also the centerpiece of an interdisciplinary and interdepartmental graduate program in Molecular Biology, Cell Biology and Biochemistry leading to the PhD degree.

Department - Department of Neuroscience (Neuro)
https://www.brown.edu/academics/neuroscience/

Neuroscience: The mission of the Department of Neuroscience is to do excellent teaching and research on the basic functions and diseases of the nervous system. Areas of interest include neural plasticity, information processing, and neuronal and synaptic functions, particularly as they relate to development, sensory perception, motor behavior, and cognition. The 20 campus-based neuroscience faculty train undergraduate, graduate, postdoctoral, and medical students in molecular, cellular, developmental, systems, cognitive, and theoretical neuroscience. There are currently 42 doctoral students in the Neuroscience Graduate Program and the innovative Brown-NIH Graduate Program Partnership, and 122 undergraduate students are enrolled in the neuroscience concentration. Members of the Department also participate in the MRI Research Facility, the Center for Vision Research, and several NIH and NIMH training grants for graduate and postdoctoral fellows studying neuroscience and vision sciences. The Department is also a cornerstone of Brown's Institute for Brain Science, a multidisciplinary consortium of about 90 faculty from 11 departments that promotes collaborative theoretical and experimental studies of the brain, and the Norman Prince Neurosciences Institute at Rhode Island Hospital.

Department - Earth, Environmental, and Planetary Sciences
https://www.brown.edu/academics/earth-environmental-planetary-sciences/

Department of Earth, Environmental, and Planetary Sciences (DEEPS): With its unique interdisciplinary research opportunities and collegial atmosphere, DEEPS is rated among the top programs in the world. Our internationally known faculty engage in externally supported research in the following research fields: geochemistry, mineral physics, igneous petrology; geophysics, structural geology, tectonophysics; environmental science, hydrology; paleoceanography, paleoclimatology, sedimentology; and planetary geosciences. Emphasis in these different areas varies, but includes experimental, theoretical, and observational approaches as well as applications to field problems. Field studies of specific problems are encouraged rather than field mapping for its own sake. Interdisciplinary study with other departments and divisions is encouraged.

Students in DEEPS develop a comprehensive grasp of principles as well as an ability to think critically and creatively. Formal instruction places an emphasis on fundamental principles, processes, and recent developments, using lecture, seminar, laboratory, colloquium, and field trip formats. Undergraduates as well as graduate students have opportunities to carry out research in current fields of interest.

Department - Epidemiology
https://www.brown.edu/academics/public-health/epi/home

School of Public Health (SPH) Department of Epidemiology: The primary mission of the Department of Epidemiology is to provide excellence in teaching and training in the field of epidemiology. The graduate program offers master’s and doctoral degrees to prepare students for careers in research or professions in public health
which require knowledge of advanced epidemiologic methods. The department excels in research, education, and service covering the entire life-course for health outcomes in diverse populations, particularly focusing on critical windows of development (i.e., during and after pregnancy and during childhood and young adulthood). There are 19 primary faculty and more than 25 additional faculty associated with the Department of Epidemiology at the Brown School of Public Health. The faculty are world-renowned researchers whose expertise include cancer, environmental health, global health, mental health, infectious disease, maternal and child health, molecular, health disparities, obesity, substance use, mindfulness, and epidemiologic methods. The Department also collaborates with faculty in social sciences, basic biomedical sciences, and clinical departments at Alpert Medical School and its affiliated hospitals (e.g., Cardiology, Endocrinology, Obstetrics/Gynecology, Pediatrics, and Psychiatry). The department includes faculty engaged full-time in research and teaching, as well as importantly clinical faculty and faculty members jointly appointed with Brown University and the Rhode Island Health Department.

Department - Health Services, Policy & Practice (HSPP)
https://www.brown.edu/academics/public-health/hspp/home

School of Public Health (SPH) Department of Health Services, Policy & Practice (HSPP) includes 25 full-time faculty based at 121 South Main Street in Providence, 73 faculty from other Brown University departments that have secondary appointments and other affiliated faculty. The Department’s mission is to develop and disseminate new knowledge that helps to deliver effective, efficient, continuously improving and just public health and health care services. This is accomplished through innovative research, engaged teaching, creative training and mentoring and collaborative engagement with policy makers and service providers. The Department values innovation, creativity, promotion of diversity, multidisciplinary collaboration, community engagement, and excellence. The long-term goal is to catalyze the delivery of higher quality and more cost-effective public health and health care services.

The Department has developed relationships with a wide variety of partners and collaborators. Within Brown University these include the Departments of Medicine, Surgery, Psychiatry and OB/Gyn at the Medical School, and the Departments of Economics, Sociology and Computer Science on campus. The Department has a strong and long-standing relationship with the Providence Veteran’s Administration (VA) Hospital. In addition, the department has relationships with a number of important Rhode Island state agencies including the Department of Health, the Executive Office of Health and Human Services (EOHHS) and the RI Medicaid Program. These and other partners and collaborators allow faculty and trainees to participate in multidisciplinary collaboration in a variety of academic and policy setting.

Department - Mathematics
https://www.brown.edu/academics/math/

Department of Mathematics: The Department of Mathematics enjoys a rich historical tradition of research and education in many fields of pure mathematics, with particular strengths in algebra and number theory, geometry and topology, probability, and analysis. The Department, which counts many internationally recognized researchers among its faculty ranks, nurtures an informal environment for students that emphasizes creative models for scholarship and learning. As data science challenges require increasingly complex methodologies and algorithms, the Department’s expertise in tools from cryptography, harmonic analysis, probability, and even topology has become central to developing our understanding of data science’s foundational questions, and the Department’s courses in these areas serve as a theoretical foundation to the methodological research and curricular offerings in data science.

The undergraduate program in mathematics at Brown is designed to present students with challenging courses that will train them for any future they desire be it in the economy, in government, or in academe. It is also quite flexible in placing students, the goal being to discover a students level of competence and then offering a stimulating course. The department supports approximately 40 to 50 graduate students in a PhD program whose graduates populate top mathematics departments and prominent positions in industry. Joint graduate courses and seminars with the adjacent Division of Applied Mathematics add to the breadth of offerings available to our graduate students.
The Mathematics Department at Brown balances a lively interest in students and teaching with a distinguished research reputation. Several strong research groups, Analysis, Algebraic Geometry, Geometry and Topology, and Number Theory, all have active weekly seminars that draw speakers ranging from the local to the international.

Department - Molecular Microbiology and Immunology (MMI)
https://www.brown.edu/academics/medical/molecular-microbiology-and-immunology/

Molecular Microbiology and Immunology (MMI): The MMI Department supports undergraduate, graduate, and postdoctoral education by providing an interdisciplinary structure for training programs. The department's overall mission is to maintain an active and integrated research program for studying the interactions between pathogenic microbes and their hosts that influence the outcome of infections. MMI fosters collaborative studies within the department as well as with faculty in other departments, both on campus and hospital-based. MMI provides instruction and a nurturing environment for undergraduate, graduate, and medical students in the areas of microbiology and immunology. MMI's instruction includes lecture courses, seminar courses, and laboratory research (undergraduate independent study and graduate thesis).

Department - Molecular Pharmacology, Physiology and Biotechnology (MPPB)
https://www.brown.edu/academics/molecular-pharmacology-physiology-and-biotechnology/

Molecular Pharmacology, Physiology and Biotechnology (MPPB): Guided by a mission to apply insight gained from scientific inquiry to advance the treatment of illness and injury, faculty research interests within MPPB are diverse and include molecular and structural pharmacology; the molecular and cellular basis for drug addiction; cellular and intracellular signaling in cancer and neurodegeneration; macromolecular structure; cellular, comparative, and organ systems physiology; biomaterials; organ replacement, tissue engineering, gene therapy, and regenerative medicine. Research objectives are translated into innovation by faculty with extensive experience in the biotechnology and biomedical device industry. The Department's 14 faculty members support graduate, medical, and postdoctoral education within an interdisciplinary framework of training programs in classical theory and newly emerging areas of biomedical sciences. Doctoral degree programs are offered in three programmatic tracks.

Department - Pathology and Laboratory Medicine
https://www.brown.edu/academics/biomed/departments/pathology/home

Department of Pathology and Laboratory Medicine forms a bridge between the basic sciences and clinical medicine, bringing the newest scientific concepts to enhance understanding of the biologic basis of disease. Basic science research in pathobiology addresses how a sequence of biologic events leads to a disease state. Translational and clinical research bridges basic mechanistic research to advances in clinical diagnosis and treatment of human disease. Diagnostic testing in Pathology and Laboratory Medicine at Warren Alpert Medical School of Brown University is performed at the hospital affiliates; a total of 90 faculty are located at Brown University, Rhode Island Hospital, The Miriam Hospital, Women & Infants' Hospital, and the Office of the Medical Examiner at the Rhode Island Department of Health. All campus and hospital-based faculty participate in teaching and advising undergraduates, graduate students, medical students, residents, and postdoctoral and clinical fellows. These trainees work together in multidisciplinary teams involving pathologists, biomedical scientists, clinicians, chemists, and engineers on basic and applied research projects related to human disease.

Department - Physics
https://www.brown.edu/academics/physics/welcome

Department of Physics: Physics has been in the Brown curriculum since 1772; today, Brown University has a vibrant Physics department with 27 faculty members and 12 joint and affiliated faculty members, all pursuing the frontiers of physics. Some members are developing advanced theories to explain phenomena as grand as the origin of our universe and the nature of matter. Others are pushing the limits of physics to detect new fundamental particles and dark matter, as well as building incredibly sensitive devices based on quantum physics. The Department has multiple strong research clusters spanning the discipline of physics, including high energy, cosmology/astrophysics, condensed matter, and biophysics. The Department boasts two Nobel Laureates (Leon
N. Cooper and J. Michael Kosterlitz, the co-discoverer of the Higgs mechanism and Higgs boson (Gerald Stanford Guralnik), and the 2011 Fritz London Memorial Prize winner (Humphrey J. Maris).

Graduate students and postdoctoral researchers are trained to become next generation physicists and future leaders in academia, government, NGOs, or the private sector. Physics graduate students receive the most comprehensive education in scientific and mathematical methods, as well as the problem-solving process. Students have full access to the most advanced research facilities and our world-renowned faculty, who care very much about them. Students also benefit from strong links to the School of Engineering, Chemistry, and Earth, Environmental and Planetary Sciences departments, and, with this application, the Biological Data Science community.

**Division - Applied Mathematics**
https://www.brown.edu/academics/applied-mathematics/

Division of Applied Mathematics: The Division of Applied Mathematics is one of the most prominent departments at Brown, and one of the oldest and strongest of its type in the entire country. The Division had its origin in the program of Advanced Instruction and Research in Mechanics, established in 1941 on the recommendation of a committee of the National Research Council. This early program focused on solid and fluid mechanics, electromagnetic theory, mathematical methods in applied physics, numerical analysis and probability theory— the principal interests of the faculty for many years. Since then the interests of the faculty have expanded and diversified, as the Division has maintained a leading role in the development of applied mathematics both in the United States and throughout the world. In 1964, for example, the Center for Dynamical Systems was established to coordinate the research of a large group of people working in ordinary and partial differential equations and their applications. More recently, programs at the forefront of research in scientific computing and in applied probability and statistics have been established.

The Division’s mission rests in research, education, and scholarship. The faculty engages in research in a range of areas from applied and algorithmic problems to the study of fundamental mathematical questions. By its nature, the Division’s work is and always has been inter- and multidisciplinary. Among the research areas represented in the Division are dynamical systems and partial differential equations, control theory, probability and stochastic processes, numerical analysis and scientific computing, fluid mechanics, computational molecular biology, statistics, and pattern theory. The graduate program in applied mathematics includes around 50 Ph.D. students, with many of them working on interdisciplinary projects. Applied Math offers undergraduate degrees in Applied Mathematics, Applied Math–Biology, Applied Math–Computer Science, and Applied Math–Economics. The faculty actively involve undergraduates in summer research projects and offer many independent studies every year.

The Applied Math graduate program provides training and research activities in a broad spectrum of applied mathematics. The principal areas of research activities represented in the Division of Applied Mathematics are ordinary, functional, and partial differential equations; probability, statistics and stochastic systems theory; neuroscience, pattern theory, and computational/mathematical biology; numerical analysis and scientific computation. The effort in virtually all the research areas ranges from applied and algorithmic problems to the study of fundamental mathematical questions; many of our faculty are engaged in interdisciplinary research collaborations with colleagues here at Brown or elsewhere. This breadth is one of the great strengths of the program and is further reflected in the courses we offer. Brown guarantees financial support for five years, including summer support for 2.5 months, and generous health benefits. The Applied Math graduate program focuses on doctoral training.

**Division - Biology and Medicine**
https://www.brown.edu/academics/biomed/about-division-biology-and-medicine

Division of Biology and Medicine: Comprising the Program in Biology and the Warren Alpert Medical School (AMS), the Division is home to five biology departments offering undergraduate and graduate courses, 14 clinical departments, and one hybrid department (with both clinical and campus-based faculty). The Division of Biology and Medicine (BioMed) is the administrative home for faculty whose primary roles are in research, education, or clinical care in the domains of biology and medical science. This organizational structure encourages
multidisciplinary instruction and research, a hallmark of education at Brown and unites the departments into a cohesive unit with a common mission: to understand the underpinnings of human life and the study, prevention, and treatment of disease.

**Initiative - Data Science Initiative (DSI)**
[https://www.brown.edu/initiatives/data-science/home](https://www.brown.edu/initiatives/data-science/home)

Data Science Initiative (DSI): The DSI is a new collaboration at Brown between Applied Mathematics, Biostatistics, Computer Science, and Mathematics, that seeks to develop research and training around methodologies in Data Science and applications to domains. The DSI leverages established academic strength to build a campus hub for research and education in foundational methodologies of data science, maintaining an outward focus on application areas and critical engagement with questions of the impact of the data revolution on society, culture, and social justice. Academic and professional programs are offered for a rigorous, distinctive, and innovative approach to learning and collaboration for anyone building a career in data-enabled fields. Building on Brown’s strength in the computational, mathematical, and statistical sciences, the DSI reaches out to support and connect with data-driven work across the campus, driving research in an increasingly interconnected University. Brown’s DSI has been awarded $1.5M to establish a Data Science Research Institute. The award is one of 12 nationwide Transdisciplinary Research in Principles of Data Science (TRIPODS) grants recently announced by the National Science Foundation. The DSI focuses on the foundations of model-driven discovery from massive data. It supports broad engagement with the campus community through public lectures, panel discussions, boot camps, and other projects, and explores the challenges in translating data into knowledge and in understanding its impact. DSI industrial partners give students and faculty the opportunity to work hands-on, addressing problems arising in industrial settings, while giving partners the chance to leverage cutting edge research and student creativity in their domains.

**Initiative - Unified Research Data Sharing and Access (URSA) Initiative**
[https://www.brown.edu/initiatives/translational-research/biomedical-informatics-services](https://www.brown.edu/initiatives/translational-research/biomedical-informatics-services)

Unified Research Data Sharing and Access (URSA) Initiative: The overall goal of the Unified Research Data Sharing and Access (URSA) Initiative is to make data accessible and usable for research purposes by the clinical and translational research community through establishment of a shared technical infrastructure and common processes. This initiative is coordinated by the Brown Center for Biomedical Informatics (BCBI) that operates the Advance-CTR Biomedical Informatics Core in close collaboration with information services, compliance programs, and research offices at Brown and health data partners: Lifespan, Care New England, Providence VA Medical Center, Rhode Island Quality Institute, and Rhode Island Department of Health. For sensitive data, URSA utilizes the Stronghold server system at Brown (URSA Stronghold), which offers a secure computing environment for storing and analyzing data.

**Institute - Brown for Environment & Society (IBES)**
[https://www.brown.edu/academics/institute-environment-society/](https://www.brown.edu/academics/institute-environment-society/)

Institute at Brown for Environment & Society (IBES): The Institute at Brown for Environment & Society (IBES) supports research to understand the interactions between natural, human and social systems. IBES teaching programs prepare future leaders to envision and build a just and sustainable world. The Institute’s engagement programs take research from the lab to the statehouse, the hospital, and the public sphere. The Institute has five strong disciplinary areas: Conservation Science, Land Change Science, Climate Science, Environmental Health, and Institutions and Human Behavior.

**Institute - Carney Institute for Brain Science**
[https://www.brown.edu/carney/node/1](https://www.brown.edu/carney/node/1)

Carney Institute for Brain Science: The Carney Institute for Brain Science (formerly the Brown Institute for Brain Science –BIBS) advances multidisciplinary research, technology development, and training in the brain sciences and works to establish Brown University as an internationally recognized leader in brain research. The Institute unites more than 100 faculty from a diverse group of departments at Brown, spanning basic and clinical departments, and physical and biological sciences. The Carney Institute provides a mechanism to advance
interdisciplinary research efforts among this broad group and provides essential support to obtain and administer multi-investigator grants for research, infrastructure, and training. The Institute actively seeks new training funds to support interdisciplinary education that transcends that available in individual academic departments.

The Carney Institute community is united under the common theme of understanding how brain circuits generate and control complex behavior. Carney Institute faculty members have pioneered research to give paralyzed individuals the ability to move prosthetic limbs, move their own limbs, and to control devices through brain-computer interfaces; to develop new non-invasive tools to visualize and control brain function; to reveal the reward mechanisms in the brain that govern motivation and choice; to study and suppress diseases including ALS, spinal muscular atrophy, drug addiction, and epilepsy; to discover cells behind the retina in the eye that control the body's internal clock; and to discover mutations in genes that cause neurodevelopmental disorders including Christianson Syndrome. Carney Institute faculty are using computational and machine learning approaches for the diagnosis, assessment, and treatment of neurologic and psychiatric disorders including Parkinson's Disease, depression, chronic pain, and autism. Ongoing projects range from a single laboratory to multiple institutions, and from early stage, high-risk high-reward projects to well-established research efforts.

Institute - Hassenfeld Child Health Innovation Institute (HCHII)
https://www.brown.edu/hassenfeld/Hassenfeld

Hassenfeld Child Health Innovation Institute (HCHII): The Hassenfeld Institute seeks to integrate research, clinical practice, public health efforts, and educational programs to achieve the following four goals: 1) Improve the health of children, making the communities we serve among the world’s healthiest places for children and their families, 2) Address the issue of poverty and how it impacts child health, 3) Serve as a national and international model for what can be achieved in child health and 4) Train the next generation of child health leaders. The Institute aims to make a transformative impact on the lives of children and their families in Rhode Island, as well as around the world. Made stronger by its deep and far reaching collaborations, the Hassenfeld Institute is led by and partners with key organizations throughout Rhode Island. Its core leadership resides under the following four institutions: Brown University’s School of Public Health, Hasbro Children’s Hospital, the Warren Alpert Medical School of Brown University, and Women & Infants Hospital of Rhode Island. Researchers and child health professionals from other institutions, such as Bradley Hospital, The Miriam Hospital, and its community partners are also intricately involved.

The work of the Institute employs multidisciplinary research methods to address a broad range of child health issues. The Core Research and Evaluation Unit of the Hassenfeld Institute is tasked with providing the necessary research and evaluation infrastructure to support work on a broad range of health initiatives within the Institute as well as with the Institute partners. This includes extensive analysis and mapping of health data in Rhode Island, as well as launching a birth cohort study with long-term follow-up. Along with the work carried out by the Core Research and Evaluation Unit, the Hassenfeld Institute has assembled teams of experts to implement and assess innovative new approaches to address important child health issues. These teams will form the foundation of the Hassenfeld Initiatives. The Institute’s three initial initiatives are: 1) Healthy weight, nutrition and physical fitness, 2) Autism (a precision medicine approach) and 3) Childhood asthma research innovation.

Institute - Institute for Computational and Experimental Research in Mathematics (ICERM)
https://icerm.brown.edu/

Institute for Computational and Experimental Research in Mathematics (ICERM): The Institute for Computational and Experimental Research in Mathematics (ICERM) was founded in 2010 through a major grant to Brown University from the National Science Foundation, Division of Mathematical Sciences. The mission of ICERM is to support and broaden the relationship between mathematics and computation: specifically, to expand the use of computational and experimental methods in mathematics, to support theoretical advances related to computation, and address problems posed by the existence and use of the computer through mathematical tools, research and innovation. ICERM supports its mission by developing and hosting research programs and activities that 1) Encourage the creation of new computational methods to advance mathematical understanding, 2) Foster a deeper understanding of algorithms and computational tools, 3) Expose program participants to the use of simulation, visualization, experiments, or computer-assisted proofs, 4) Catalyze new directions of mathematical research through synergistic collaborations across disciplinary areas and research communities.
5) Advance the training and mentoring of graduate students and early-career postdoctoral researchers through exposure to new mathematical areas and computational methods. The Institute benefits from its strong ties to the mathematical sciences departments at Brown, and from the vibrant educational community of colleges and universities across New England.

Institute - Molecular and Nanoscale Innovation Research Facilities (IMNI)
https://www.brown.edu/research/institute-molecular-nanoscale-innovation/

Institute for Molecular and Nanoscale Innovation Research Facilities (IMNI): The Institute for Molecular and Nanoscale Innovation (IMNI) fosters interdisciplinary, multi-investigator research and education. A state-of-the-art equipment infrastructure is essential to enable research topics of intellectual and technological importance and allow researchers the ability to engage in research problems of broad scope and complexity that can not be addressed by a single investigator, rather requiring the advantage of a larger infrastructure and interdisciplinary expertise provided by a campus-based research center. The IMNI Core Research Facilities provide access to advanced instrumentation and various services as well as involvement in developing new technology or new applications of existing techniques. The IMNI Core Research Facilities are administered by IMNI and are available to researchers from any and all university departments, as well as outside users from local industry and academic institutions on a usage fee basis to recover operating costs. IMNI administers the Electron Microscopy, Microelectronics and NanoTools Facility.

Program - Biology
http://biology.brown.edu/

Program in Biology: This Program promotes basic scientific research aimed at discovery of fundamental insights into living systems at all levels of complexity with a major emphasis on relevance to human health and disease mitigation. Faculty of the Program in Biology conduct research on all levels of biological organization: molecular, cellular, organismal and population, and concentration programs with varying degrees of multidisciplinary or specialty foci. The close administrative relationship with the Warren Alpert Medical School offers additional opportunities for blending fundamental biology and clinical sciences in research projects across the institutions. These multidisciplinary research opportunities are a hallmark of Brown University’s biomedical programs. Campus-based faculty (127), with primary appointments in the life and biological sciences, collaborate regularly with hospital-based academic faculty members (626) pursuing research at area hospitals.

Program - MD, PhD
https://www.brown.edu/academics/biomed/md-phd-program/

The MD, PhD Program was founded in 1979 by the inaugural Chair of the Department of Pathology, Dr. Nelson Fausto and is currently led by Jonathan Kurtis, MD/PhD and Thomas Bartnikas, MD/PhD. Since its inception, the program has graduated over 60 MD/PhD students with the majority remaining in academic and research careers.

A distinguishing feature of the Brown MD/PhD program is its focus on translational research. Because translational research requires fluency across basic science and clinical medicine boundaries, a defining feature of Brown’s program is its heavy integration across the MD and PhD transitions. Traditional MD/PhD programs are structured with two years of medical school followed by 4-5 years of graduate school, culminating with the final two years of medical school. Typically, there is little to no integration across these transitions.

At Brown, the curriculum is designed to inculcate scientific thinking into the MD years, while maintaining clinical perspective and skills during the PhD years. Specifically, MD/PhD students spend the summer after their first and second years of medical school with a research mentor. The students have the opportunity to select research mentors across the graduate programs within the Division of Biology and Medicine with the potential to explore programs within the School of Public Health in certain circumstances. The goal of this research integration during medical school is to enhance scientific thinking while simultaneously streamlining the process of selecting the best research environment for each student. After students matriculate into graduate school and complete their course requirements, they begin a longitudinal clinical clerkship in family medicine, seeing patients one afternoon.
every 2 weeks. This clinical experience serves to maintain student’s clinical skills and confidence while encouraging them to apply their burgeoning scientific skills to clinical problems.

The Brown MD/PhD program has trained many physician scientists who occupy leadership positions in translational medicine oriented departments throughout the country. Notable accomplishments of our graduates include developing highly successful NIH-funded research programs, promotion to Chairs of several national medical school departments, as well as founding disease specific, research oriented philanthropic foundations.

The mission and goals of Brown’s MD/PhD program were significantly enhanced in 2017 with a 22 million dollar endowment which will allow a marked increase the number of training slots, enhance the programmatic offerings with a particular focus on career trajectories, and, most importantly, matriculate the strongest students.

Programs - Medical Education
https://www.brown.edu/academics/medical/education-programs

Medical Education:. The Warren Alpert Medical School has always reflected the ethos of Brown University, epitomizing the university’s goal of training its graduates to lead lives of usefulness and reputation. While the Warren Alpert Medical School is traditionally thought of as a training ground for leaders in primary care, its graduates have gone on to roles across the spectrum, from small town doctors to deans of medical schools to physician scientists to leaders at the National Institutes of Health. Each year, our graduates match to top-ranked residency programs in both primary care and a wide variety of specialties. This innovation in medical education is evidenced by hallmark initiatives such as:

-The Program in Liberal Medical Education, the eight-year combined undergraduate and medical degree program that allows undergraduates to pursue the breadth and depth of a liberal arts education before entering the Warren Alpert Medical School.

- The Scholarly Concentrations Program, which enables students to focus on individual areas of interest, engaging in intellectual pursuits beyond their core medical studies through intensive, cross-disciplinary research projects. The result is a scholarly product, typically one or more publications in a peer-reviewed journal.

- The Primary Care-Population Medicine Program that leads to both the MD degree and a master’s in population medicine, preparing students for careers in medicine while providing comprehensive, longitudinal training in population-level health care. The program was selected as one of the American Medical Association’s first 11 Accelerating Change in Medical Education initiatives, which provided a $1 million grant for its launch.

- The two-year Doctoring course that provides students with patient contact within the first two months of medical school. Students work once a week in a community clinical setting with a physician-mentor who provides intensive grounding in medical ethics and professionalism as students master communication and cultural competencies and learn to take patient histories and other clinical skills.

School - Engineering
https://www.brown.edu/academics/engineering/

School of Engineering: Brown Engineering is a unique place, which emphasizes the power of interdisciplinary thought and recognizes that engineering is intertwined with every aspect of human lives. The School is organized without the traditional departments or boundaries found at most schools; the School’s model is focused on making unique connections between the various engineering disciplines. Along with associations with the other scholarly disciplines – biology, medicine, physics, chemistry, computer science, the humanities and the social sciences – Engineering’s co-operations bring unique solutions to challenging problems. The School focuses on unique and innovative clustering of faculty; in terms of research groups, engineers of all types team together with non-engineers to tackle some of the biggest problems facing engineering and science today. The School’s talents and expertise lie in the interdisciplinary domain where the seemingly diverse disciplines converge. Because of a unique structure and approach to engineering, for example, the lack of formal boundaries between engineering disciplines, research is highly interdisciplinary and often includes connections to other departments on campus outside of the School. In keeping with an interdisciplinary nature, the School of Engineering has no
traditional departments and Brown does not award degrees based by specific research area. Areas of study in engineering include: Biomedical Engineering; Chemical and Biochemical Engineering; Electrical Sciences and Computer Engineering; Fluids and Thermal Sciences; Materials Science; Mechanics of Solids; Program in Innovation Management and Entrepreneurship (PRIME) (Master's only) and Executive Master in Science and Technology Leadership (EMSTL).

School - Professional Studies
https://professional.brown.edu/

School of Professional Studies: The School of Professional Studies advances Brown University’s commitment to executive education and its mission to develop reflective leaders, to effect change in the world, and to improve human welfare. The School offers outstanding educational programs for executives and professionals who are ready for the challenge.

IE Brown Executive MBA – The focus is for students to learn to lead in the complex, global business environment by integrating core business studies with social sciences and humanities.

Executive Master of Healthcare Leadership – The focus is for students to prepare to transform healthcare policy and delivery with clinicians, executives, advocates, payers and other professionals who will design and implement innovative, sustainable solutions across healthcare.

Executive Master in Cybersecurity – The goal is for students to become transformative cybersecurity leaders in this rapidly evolving field by understanding and applying technical, legal, policy and human factors essential for resilient, secure organizations.

Executive Master in Science and Technology Leadership – The focus is for students to build on existing technical expertise and develop leadership and communication skills with leading professors and accomplished practitioners from science, technology and engineering.

School - Public Health
https://www.brown.edu/academics/public-health/home

School of Public Health (SPH): In 2014, the University Corporation (governing body) approved the establishment of the School of Public Health and the Director of that Program, the Associate Dean for Public Health and Public Policy arrived in late 2000. The new School builds upon a strong and mature research base, comprised of 11 affiliated research centers, including the Center for Gerontology and Health Care Research. In addition to conducting nationally recognized public health relevant research, these centers provide fellows: (1) opportunities to participate in large-scale population-based research and public health intervention studies; (2) access to data sets available from ongoing funded grants; (3) technical assistance and mentoring in research methods, (4) access to research tools such as Computer-Assisted Telephone Interview equipment and ongoing surveys, and (5) consultation in the use of cutting edge statistical methods and software. Moreover, Centers have large and well trained staff who serve as resources to students. The School of Public Health, led by Dean Bess Marcus, provides the administrative umbrella for both the affiliated research centers and the four departments. The academic and teaching programs are led by academic departments traditionally included in Schools of Public Health; Biostatistics, Epidemiology, Behavioral and Social Sciences and Health Services, Policy & Practice. Department faculty teach undergraduates, MPH students, master’s students in Biostatistics, Epidemiology and Behavioral and Social Sciences as well as doctoral students in all four departments. Altogether, each year the Public Health Program has over 400 undergraduates, 200 MPH and master’s students, 60 predoctoral students in addition to over 20 different postdoctoral fellows.

School - Warren Alpert Medical School
https://www.brown.edu/academics/medical/

Warren Alpert Medical School: Established in the early 1970s, the Warren Alpert Medical School of Brown University is the State of Rhode Island’s only school of medicine. It was established with the goal of training new physicians who stay and practice in the state, and attracting leaders in research and clinical medicine who would
care for citizens. Though it is among the nation’s youngest medical schools, the Warren Alpert Medical School has developed into a robust research powerhouse and leader in innovative medical education, and is consistently ranked in the top quartile of medical schools in the U.S. News & World Report rankings.

Mission: To support and promote the health of individuals and communities through innovative medical education programs, research initiatives, and clinical excellence in service to society and to improve the health and wellness of all.

Vision: We envision attracting, training, and sustaining diverse individuals who will work together to lead locally, nationally and internationally renowned transformative and socially responsible medical education, research, clinical care, and advocacy. We will inspire and cultivate physician scholars and leaders who positively impact the health of people and society.

Values

• Humanism and compassion
• Integrity, accountability, and collaboration
• Creativity, innovation, and discovery
• Inclusiveness, diversity, and equity
• Dedication to anti-racism
• Social responsibility, both locally and globally
• Community engagement and service
• Commitment to professional development

School - Warren Alpert Medical School – Alternative
https://www.brown.edu/academics/medical/about-us

Warren Alpert Medical School: Founded as the Brown University School of Medicine in 1972, it is ranked in the top quartile of medical schools nationally. The Division’s six basic biological science departments are closely integrated with other science departments and are actively involved in the academic and research activities of the University. Fourteen clinical departments are housed at Brown’s eight affiliated hospital partners in the greater Providence area. In 2007, a $100 million gift from the foundation named the Warren Alpert Medical School of Brown University. That investment continues to provide financial support for medical students, faculty members and research programs and played a major role in helping the school construct its flagship building. In 2011, Brown opened a 63,000sq. ft. renovated building in Providence’s Jewelry District as the new home of the Warren Alpert Medical School. The building now anchors what has become a diversified, vibrant “knowledge district”.

School and Affiliates - Warren Alpert Medical School and Affiliated Hospitals
https://www.brown.edu/academics/medical/about/hospitals

Warren Alpert Medical School Affiliated Hospitals: The Alpert Medical School is affiliated with the Lifespan and Care New England Healthcare Systems and the Providence VA Medical Center. The Care New England Healthcare System is comprised of Women and Infants Hospital, Butler Hospital and Kent Hospital. The Lifespan Healthcare System is comprised of Rhode Island Hospital, Hasbro Children’s Hospital, The Miriam Hospital and Emma Pendleton Bradley Hospital.

CLINICAL RESEARCH SUPPORT

BioMed - BrUOG
https://www.brown.edu/academics/medical/about-us/research/centers-institutes-and-programs/oncology/

Brown University Oncology Group (BrUOG) will support the Regulatory and Knowledge Support team. BrUOG was created in 1994 to coordinate clinical cancer research for Brown’s affiliated hospitals and Alpert Medical School faculty. BrUOG’s main mission is to improve cancer care through the implementation of innovative, multidisciplinary cancer clinical trials. BrUOG provides the infrastructure for the efficient development and
implementation of these trials, which are created by Brown University faculty. Before BrUOG was founded, there was no unifying body for such research and no infrastructure through which Brown’s myriad scientists and physicians could share, advance, and garner support for their ideas on the treatment of cancer. The founding hospitals of BrUOG were Rhode Island Hospital, The Miriam Hospital, Roger Williams Medical Center, the former Memorial Hospital, and Women & Infants Hospital, which administer care to the majority of trial patients today. BrUOG, however, is the engine: its administrators and physicians provide support for the initial study concept and validation of trial design, and are responsible for trial administration, safety monitoring, data analysis, and the presentation and publication of findings.

The trials sponsored by BrUOG investigate novel, cutting edge applications of chemotherapy, biologic agents and other cancer treatments. They study anticancer agents in early development, and as such are Phase I trials (which determine the optimally tolerated dose of an anticancer treatment regimen) or Phase II trials (which assesses the potential therapeutic effectiveness). These trials provide essential preliminary data for definitive Phase III trials, often conducted under the auspices of the National Cancer Institute. BrUOG trials are unique because they are investigator-initiated—conceptualized by practicing physicians, not by pharmaceutical companies. As such, these trials represent an incredibly important sector of cancer research. Because medical, radiation and surgical oncologists are deeply familiar with both the latest research and stark realities of cancer, they are an unrivaled source of ideas for novel approaches to treatments.

The BrUOG is the principle mechanism for oncology clinical trials at the Alpert Medical School. This regional consortium of Brown-affiliated hospitals allows hematologists, oncologists, surgeons, radiation oncologists, pathologists, and others to develop investigator-initiated clinical trials. These studies are conceived and designed by faculty at member institutions. They provide cutting edge applications of chemotherapeutic agents, biologic agents, and other treatment modalities. Such innovative studies lay the groundwork for larger nationwide studies under the auspices of cooperative clinical trials groups. Clinical trials are available for a broad range of disorders in hematology/oncology and these include treatment for cancers of the breast, brain, lung, gastrointestinal tract, skin, and prostate as well as trials in leukemia and lymphoma. Many of these trials utilize novel therapeutic agents or new combinations of treatments in an effort to improve treatment. BrUOG is one of the foremost clinical oncology research groups in the country. Accomplishments include:

- Non-Small Cell Lung Cancer (NSCLC): BrUOG performed the sentinel Phase I and Phase II studies of paclitaxel/carboplatin/radiation therapy in NSCLC, which has formed the basis for the standard of care throughout the world for treatment of Stage 3 lung cancer. BrUOG is the leader in developing stereotactic radiation, a highly focused form of radiation for lung cancer.
- Esophageal Cancer: BrUOG has led the development of targeted agents in adenocarcinoma of the esophagus. Two current Phase III studies of the National Cancer Institute—investigating trastuzumab and cetuximab—were each based on BrUOG Phase I/II trials.
- Rectal Cancer: BrUOG is leading the development of chemotherapy and radiation before surgery to prevent local recurrence and to reduce the need for colostomy.
- Breast Cancer: BrUOG has concentrated on two important areas in breast cancer. For patients with metastatic breast cancer, BrUOG is developing more effective, less toxic and more convenient regimens. BrUOG has also been a leader in the development of neoadjuvant chemotherapy treatment given prior to definitive breast surgery to reduce recurrence and the need for mastectomy.
- Pancreatic Cancer: BrUOG has developed more influential Phase I and II pancreatic cancer studies leading directly to Phase II and III cooperative group trials than any other cancer group in the world.
- Brain tumors: BrUOG is leading the development of new radiation sensitizers to treat glioblastoma, the most lethal primary brain tumor.

Education: BrUOG teaches the fundamental of clinical cancer research and provides outstanding research opportunities for physicians in training. In addition to protocols coordinated by BrUOG, patients at the affiliated hospitals also have access to a large variety of other clinical trials through national cooperative groups such as Cancer and Leukemia Group B (CALGB), the National Surgical Adjuvant Breast and Bowel Project (NSABP) and the Radiation Treatment Oncology Group (RTOG). Only through the resources of such large organizations can such randomized trials of cancer therapy take place. Pharmaceutical industry-sponsored trials of novel agents are also available.
Sponsorship for clinical trials is derived from the National Cancer Institute and from numerous pharmaceutical industry sponsors.

COLLABORATING INSTITUTIONS

Rhode Island Department of Health (RIDOH)

Rhode Island Department of Health (RIDOH): Rhode Island is unusual in having a single Department of Health for the entire state rather than one for each county or city. With the primary mission to prevent disease and to protect and promote the health and safety of the people of Rhode Island, RIDOH oversees the licensure, certification, registration, and discipline of more than 72,000 individuals in 65 health occupations and 2,600 facilities. RIDOH also oversees the administrative and regulatory functions of 35 licensing boards whose 325 members represent the various professions and consumers. These responsibilities give RIDOH unique access to licensed health professionals, facilities, and other health-related resources in the state – a function that recently took the form of a department-wide Public Health Directory. RIDOH also operates more than 180 different programs and services through its seven divisions. In addition to regulatory functions, many of these programs include funding and operational links with numerous health care providers, employers, and community-based organizations. Each of these relationships provides a potential linkage for the translation of clinical best practices into various components of the Rhode Island community. While communicable disease control, vital records, environmental health and other units carry out the traditional health department functions, newer and equally important functions include minority health, chronic disease prevention, health promotion, injury control, and public information. RIDOH also collects and manages large data sets used for surveillance and intervention research.

The Rhode Island Department of Health has established a population health framework, which includes three leading priorities, five strategies, and 23 population health goals. The framework is used as a road map for improving Rhode Island’s health. Through the State Innovation Model (SIM) and its culture of collaboration, other state agencies are also looking at their goals and activities within this same framework. The leading priorities are 1) Address the Social and Environmental Determinants Health, 2) Eliminate the Disparities of Health and Promote Health Equity and 3) Ensure Access to Quality Health Services, Including Vulnerable Populations.

RIDOH Academic Center: The RIDOH Academic Center was created in 2015 to enhance RIDOH’s capacity to integrate scholarly activities into public health policy and practice by establishing and facilitating collaborations with academic and research colleagues across the state, and building upon internal and external partnerships and synergy to establish the RIDOH Culture of Learning at the department. The RIDOH Academic Center supports two areas of engagement to achieve these goals: the Public Health Education and Research Academy (PHERA), and the Workforce and Career Development Network (WCDN).

Public Health Education and Research Academy: Through the work of the RIDOH Academic Center, RIDOH has become an Academic Health Department that looks forward to having formal affiliations with all of Rhode Island’s colleges and universities. Formal affiliations currently exist with Brown University School of Public Health, University of Rhode Island, Rhode Island College, Community College of Rhode Island, Roger Williams University, and Johnson & Wales University. Collaboration between RIDOH programs and academic faculty is encouraged based on RIDOH’s public health policy and practice, and similar research and teaching interests of academic faculty. These partnerships drive development of collaborative research ideas that create experiential learning opportunities for RIDOH Public Health Scholars, who are undergraduate, graduate, professional or clinical students currently enrolled in courses of study that relate to public health. RIDOH’s utilization of a health equity lens for public health program planning and policy development provides multidisciplinary opportunities for collaboration with faculty and students in programs of study such as public health, healthcare, communications, graphic design, technology, housing, finance, law, urban planning, architecture, etc. The RIDOH Academic Center’s PHERA also facilitates forums for collaborative state-academic partnerships to enhance statewide research and outcomes in public health-related topic areas. These research-based groups include multiple researchers from various academic institutions as well as state agencies and community partners.
Workforce and Career Development Network: The Workforce and Career Development Network works to enhance the knowledge, skills and abilities of RIDOH staff and healthcare and health-related professionals across Rhode Island through assessment of career planning and continuing education needs, development of initiatives, and utilization of collaborative and innovative methods to address Rhode Island’s health workforce needs.

RIDOH Health Equity Zones: The Centers for Disease Control and Prevention and the Rhode Island Department of Health are collaborating with 10 Health Equity Zones (HEZs) throughout Rhode Island to support innovative approaches to prevent chronic diseases, improve birth outcomes, and improve the social and environmental conditions of neighborhoods across five counties statewide. Health Equity Zones are geographic areas designed to achieve health equity by eliminating health disparities using place-based strategies to promote healthy communities. Healthy communities are places where people live, work, play, and learn. These are neighborhoods consisting of social and physical environments that support healthy choices and safe living. All HEZs grantees conducted community needs assessments in year one. HEZ work plans, based on the needs identified and prioritized in year one, focus on the residents in neighborhoods that each Health Equity Zone serves. The HEZ work plans present ideas and approaches to invest in local communities and improve population health. Community engagement is a priority in reaching these public health goals.

HealthFacts RI, Rhode Island’s All-Payer Claims Database, is a new and powerful dataset that can be used to examine the use, quality, and cost of healthcare provided to Rhode Islanders. HealthFacts RI is jointly managed by the Executive Office of Health and Human Services, the Department of Health, the Office of the Health Insurance Commissioner, and HealthSource RI. The mission of HealthFacts RI is to provide actionable data to support the study and comparison of healthcare data, to identify opportunities to improve healthcare quality and health outcomes, and reduce healthcare costs; and to help Rhode Islanders make informed decisions about their healthcare. HealthFacts RI:

- Sparks innovation across the healthcare system to improve patient care and health outcomes, and lower costs
- Collects data to support the study and comparison of healthcare utilization, cost, and trends for people living in Rhode Island insured by major health insurance companies
- Requires health insurers with more than 3000 members to submit enrollment and provider data, and medical and pharmacy claims for claims dating back to 2011
- Informs people about the costs for certain healthcare procedures
- Identifies opportunities to improve healthcare quality in Rhode Island
- Ensures patient privacy by removing identifying information (names, addresses and other personal information) from patient data.
- Protects the integrity and security of the database and all data transactions
- Oversees access to the data while rigorously protecting patient privacy
- Measures progress on important healthcare benchmarks
- Advances clinical improvement strategies and academic research

Rhode Island Quality Institute (RIQI)
https://www.riqi.org/

Rhode Island Quality Institute (RIQI): Founded in 2001, Rhode Island Quality Institute (RIQI) is a 501(c)(3) nonprofit center of collaborative innovation with a mission to significantly improve the quality, safety, and value of healthcare. RIQI exists to save lives at the speed of data, and capitalizes on Rhode Island’s small size as “living laboratory” for ideation, development, testing, and scaling of innovative products and services. Few places in the nation can rival RIQI’s leveraging of Rhode Island as a petri dish for rapid prototyping, discovery, and bringing innovative healthcare products and services into to being and facilitating research drawn from the rich database.

RIQI’s unique value is created by aligning partnerships and leading-edge improvement strategies with needs and opportunities in healthcare, addressing problems that can’t be solved by single entities acting alone—no matter how large or powerful. By maintaining strong partnerships with healthcare leaders, government/industry organizations, leading researchers and academe, and forward-thinking community groups, RIQI facilitates consensus around innovative solutions to healthcare’s challenges. As a catalyst for change, RIQI levers deep
expertise in health information exchange that enables clinical, person-supplied, and social determinates of health data to be collected, persisted, analyzed, and accessed in real-time where it’s needed and by whom it’s needed. RIQI applies skill in quality improvement science and analytics to drive system transformation and accelerate healthcare’s transition to value-based payment models. RIQI facilitate improvements in health and healthcare through initiatives that improve care coordination; reduce medical errors and waste; lever research, big data and machine learning; and engage with consumers, patients, and families to empower them for self-management.

RIQI operates CurrentCare, RI’s statewide Health Information Exchange (HIE), a centralized data repository that collects, aggregates, normalizes, stores, and makes accessible data on more than 75% of Rhode Island residents from such entities hospitals and health systems, laboratories, pharmacies, long-term/post-acute care facilities, mental health and substance abuse treatment centers, community health centers, retail care delivery sites such as CVS Minute Clinic, community-based primary care and multispecialty care practices, the VA, and consumers statewide. CurrentCare is a secure electronic network that allows doctors and other care givers immediate access to a patient’s up-to-date health information in order to provide the best possible and most comprehensive care. CurrentCare helps providers succeed in the transition to value-based payment systems, providing caregivers with clinical decision support tools, and opportunities to avoid unnecessary and expensive care, such as duplicate tests and avoidable ER and hospital admissions. RIQI’s robust analytics capability supports HIT-enabled quality, cost and efficiency improvements, as well as population health improvements across RI. It offers providers feedback on their clinical outcomes compared to their peers, and enables quality reporting and sophisticated analytics to improve the outcomes of care. The system is a boon to researchers, given that Rhode Island is a microcosm of the nation, the population is extremely stable, and the database is quite unique as a result of very high levels of cooperation in the state.

Rhode Island Public Health Institute (RIPHI)
https://riphi.org/

Rhode Island Public Health Institute (RIPHI): RIPHI’s mission is to promote community health and to eliminate health disparities in Rhode Island and beyond. RIPHI partners with Brown University and the Rhode Island Department of Health to develop innovative public health programs, conduct translational and policy research, and train students and public health practitioners. RIPHI’s work is grounded in five key activities that advance public health and draw on the core competencies of Brown University and the Rhode Island Department of Public Health.

1. Public Health Programs and Community Service: Improving public health requires outreach to communities that have limited access to health services and those most heavily impacted by preventable and treatable diseases. RIPHI sponsors high-impact public health programs in community and clinical settings with a focus on community services and translating research into practice.

2. Community Engagement in Programs and Research: RIPHI is committed to engaging local stakeholders in dialogue about improving public health in their communities. We work with policymakers, scholars, activists, and community residents to engage communities in our programmatic and research activities.

3. Educational Training in Public Health: RIPHI provides community service and educational opportunities for students, professionals, and community members. RIPHI offers training for students and public health professionals in didactic and community settings, with a focus on public health and community service.

4. Translational Research: RIPHI's research is diverse in scope and focuses on translating research into practice, reducing disparities, and promoting health equity. Much of our research focuses on evaluating the programs we develop to advance our goal of promoting public health.

5. Public Policy and Dissemination of Best Public Health Practices: Improving public health requires policy change. We make every effort to ensure that our research and programs have maximum impact on public policy. Policymakers are involved from the onset of each of our projects and throughout their duration. RIPHI makes every effort to disseminate lessons learned from our work in peer-reviewed articles, policy memos, community forums, and in the popular media.
RIPHI runs the Food on the Move mobile produce market. Food on the Move started as an NIH-funded clinical research trial has become one of the largest mobile markets in the U.S., with over 35 mobile markets per month. Our mobile markets provide a testing ground for innovative models to improve food access and affordability, and serve as a national model. The year-round mobile markets bring fresh, healthy produce to the people and places that need it most. Healthy food is made more accessible by bringing markets to senior housing sites and community locations, and more affordable by doubling the value of Supplemental Nutrition Assistance Program (SNAP) dollars spent on fruits and vegetables. Published research shows that Food on the Move works – people who regularly shop at our markets significantly increase the amount of fruits and vegetables they eat, and research shows that eating ample fruits and vegetables is linked to a lower risk of obesity and chronic health conditions such as diabetes and heart disease. As a data-driven organization with a policy focus, RHPHI uses data to advance state and federal policies that make healthy foods accessible and affordable to everyone.

COMMUNITY ENGAGEMENT ORGANIZATIONS

Swearer Center
https://www.brown.edu/academics/college/swearer/

The Swearer Center: The Howard R. Swearer Center of Brown University works with more than 1,200 Brown students, through and with 100+ community partners -- more than half of which are in the greater Providence area. In its 30-year history, the center has developed and nurtured many deep — and deeply rewarding — relationships with individuals and organizations in Providence. The center connects students, faculty and community partners through community engagement, engaged scholarship and social innovation -- three key perspectives that are the foundations of its work. Swearer Center programs and fellowships provide students with community engaged, cohort-based experiential learning opportunities. Through programs and fellowships, students link their passion for social justice and community engagement with their academic and career goals. The Swearer Center partners with a wide range of organizations (nonprofit, LEAs, state and local government agencies etc.) that wish to access the resources of the Swearer Center or the university to advance their mission and work. Partnering organizations work with Swearer Center and university staff as co-educators, co-developers and co-creators of knowledge in our community engagement and engaged scholarship work.

Swearer Center partnership practices are centered around the values of Community Agency and Reciprocity. Community-based organizations are best situated to design, create and deliver programs and services in their own communities and therefore our work is that of capacity building partner, technical assistance, and conduit to access other university resources like community-based research. We work to ensure that both partners realize the desired benefits of the partnership. The Swearer Center offers partner organizations a variety of supports, resources, scholarship, student time and effort, funding for social innovation projects and membership in the Community Partner Network. In turn, partner organizations provide essential learning and engagement opportunities for students, as well knowledge and expertise to Swearer Center and institutional staff as we seek to understand and better inform the field of higher education and community engagement.

Center for Prisoner Health and Human Rights
http://www.prisonerhealth.org/

Center for Prisoner Health and Human Rights: The Center for Prisoner Health and Human Rights was established in 2005 to act as a hub for the innovative correctional health research and programming occurring at The Miriam Hospital and other research hospitals in RI and around the country. The Center’s mission is to improve the health and human rights of justice-involved populations through education, advocacy, and research. Today, the Center’s work falls into three core areas: 1) raising awareness at the national and state levels about the healthcare challenges of incarcerated and other justice-involved populations; 2) providing education and training opportunities for college, graduate, and medical students, and encouraging student engagement and leadership in justice issues; and 3) collaborating with local justice system stakeholders to identify and support projects that respond to the intersection of incarceration, recidivism, and public health in the State of Rhode Island.
Rhode Island Foundation
https://www.rifoundation.org/

Rhode Island Foundation: Founded in 1916, the Rhode Island Foundation is one of the nation's oldest and largest community foundations. Rhode Island Foundation is Rhode Island's only community foundation and the largest funder of Rhode Island's nonprofit sector. The Foundation is a proactive community and philanthropic leader dedicated to meeting the needs of the people of Rhode Island. The Rhode Island Foundation works with many partners to (1) Actively inspire philanthropy and increase permanent resources for the State of Rhode Island, (2) Invest in important community programs through grants, and (3) Provide leadership and a forum for dialogue on critical community issues. In 2017, the Foundation award $43M in grants to more than 1,700 nonprofit organizations, and we continued our commitment to address the state's most pressing issues and needs of diverse communities.

COMPUTING AND INFORMATION SERVICES

Computing and Information Services (CIS), Brief
https://it.brown.edu/

Computing and Information Services (CIS): Brown University’s network infrastructure is comprised of a state-of-the-art fiber optic backbone connecting a majority of buildings on campus. Support is available through Computing and Information Services (CIS), a centralized computing department at Brown. CIS supports a secure computing environment (referred to as Stronghold) for sensitive and protected data that adopts HIPAA security measures. CIS also provides a high performance computing platform through the Center for Computation and Visualization. The computing platform comprises a 8,000+ core computing cluster with 266 GPU's for accelerated computing. A GPFS parallel filesystem provides roughly 1 petabyte of disk storage, and 56/100 Gb/s Infiniband connectivity is used for all parallel applications messaging and I/O. The storage system is integrated with a 10 Petabyte Tivoli TSM backup/archival system. Redundant Internet connectivity provides high availability to the internet and 12 research sites. Brown University utilizes Cisco networking equipment configured for high availability. An equipment renewal process is managed by the CIS organization to regularly refresh and upgrade network technology.

Computing and Information Services (CIS), Comprehensive
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Data Science and Business Intelligence: The Data Science group collaborates with researchers on complex projects. It is a centralized group of data scientists within CIS that consolidates big data expertise to help researchers across campus apply new methods and derive insights from their data. By embedding these staff in research labs and groups and forming close partnerships with faculty, postdocs, and students, and supports data-intensive projects across the physical, life and social sciences, and the humanities. The Business Intelligence team provides data and decision support to administrators. It builds analytic solutions with Brown's institutional data and supports data-driven decision making by senior administrators. Currently made up of 13 full-time staff, this group has expertise in machine learning, informatics, data exploration and visualization,
databases, data management and software databases. Facilities include ~2,000 square feet of offices and conference rooms in CIS offices at 3 Davol Square.

**Stronghold Research Environment for Data Compliance:** Stronghold is a secure computing and storage environment that enables Brown researchers to analyze sensitive data, while complying with regulatory or contractual requirements. Stronghold is currently self-certified to meet the security requirements and controls for HIPAA (Health Insurance Portability and Accountability Act) and is undergoing the certification process for FISMA (Federal Information Security Management Act) and CJIS (Criminal Justice Information Security). This service is customized to the needs of individual users and their data use agreements. Each Principal Investigator (PI) is given a dedicated environment for their project to support their researchers, students, and collaborators. Access to the internet is restricted except for required locations for data imports or necessary software downloads. Import and export controls are in place to limit who can perform data migration, where sensitive data can come from and where desensitized or anonymized data can be moved to. Sensitive data are subject to file system auditing, and real-time alerting is available at the request of the PI.

**Center for Computation and Visualization (CCV):** The mission of CCV is to provide the scientific and technical computing expertise required to advance computational research and support Brown’s academic mission. The accelerated transformation of the pace and impact of computational approaches led to Brown University’s recognition of the importance of high performance computing across all of its disciplines. As a result, Brown and IBM developed in 2009 a $4M investment in a high performance computing platform, known as Oscar, that is available statewide to researchers. Through grant funding and University investment, this platform has undergone continual hardware enhancement, and now includes Intel Scalable Processors and nVIDIA GPUs of the Pascal and Volta architectures, as well as 100Gb/s EDR Infiniband. The equipment is maintained and operated by the staff of the Center for Computation and Visualization (CCV), who have extensive experience in operating shared computational clusters. CCV staff are responsible for scheduled maintenance, access control as needed, and integration with research specific hardware as required by NIH-funded researchers. CCV staff also take care of all financial aspects of operating and maintaining the facility.

The high performance computing resources at CCV equip the Brown research community to undertake complex numerical simulation, modeling, and data analysis. Oscar is the primary research computing cluster with several hundred multi-core nodes sharing a high performance interconnect and file system. Applications can be run interactively or scheduled as batch jobs. Several large memory nodes provide substantially more memory than is available on typical workstations and laptops. A large collection of software is available on CCV systems, including: python, perl, R, Matlab, Mathematica, Maple, optimized math and science libraries, and domain-specific applications. CCV staff can help acquire and install most applications upon request. The technical specifications of Oscar are:

- Two login nodes provide access for application development, debugging and batch job management
- About 400 compute nodes up to current specs of dual multi-core processors and 128 GB of memory and a total of more than 8,000 cores
- Specialized nodes containing GPU processors or 512 GB of memory
- High-bandwidth/low-latency Infiniband interconnects
- All nodes are diskless with I/O provided by an IBM GPFS parallel file system.
- 1 PB of usable disk space
- RHEL 7.3 Linux operating system
- SLURM workload manager

CCV provides storage for large research files connected to the HPC system. A default allocation of 256 GB (also called RData) is given to all faculty members at Brown, on a per request basis, with the option of purchasing additional storage as needed. Long-term storage and backups are available on a fee basis. Storage can be purchased in increments of terabytes for periods of up to 6 years. The cost for backups is included when storage is purchased. Data is incrementally backed up to tape on a daily basis. In addition, snapshots for the last 7 days are available online for quick restores. Long-term archiving of files to tape (one or two copies) can be purchased as needed. Tape libraries are housed at two separate locations to enable disaster/recovery scenarios. In addition, a disaster recovery copy of the non-ephemeral data is kept on a lower-performance filesystem to permit immediate recovery and limited production computing in the unlikely event of the loss of the primary filesystem.
These research storage allocations can be easily mounted to desktops or other computer systems to allow for easy access and sharing files. Details of HPC file storage at CCV:

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A key benefit of using these computing resources is that CCV installs and maintains a large collection of computational research software. CCV can install most software packages upon request. A full range of statistical and other scientific software is available on the CSS system, including standard statistical packages (including SAS, Stata, Splus), specialized statistical software (such as DBMSCopy, ROCKIT, nQuery, East), scientific programming languages and software (such as Fortran, C++, Matlab) and office software. All data stored on the CSS network is secure: access to the system from outside our network requires the use of a software client that employs a point-to-point encryption. The UNIX operating system also provides the mechanism to limit access of specific directory trees to specific groups of users. CSS will supplement the funded Administrative Coordinator for the Core with a modest amount of in-kind administrative support in the form of existing clerical and secretarial help, assistance with grant and subcontract preparation, access to conference rooms and office equipment. The Core will pay a nominal fee to CSS to offset the cost of maintaining multiple-user site licenses for statistical software and for maintaining updated operating systems, having full access to the computing network (including associated software and dedicated hardware), and software and systems support for core personnel.

Cybersecurity Program: The cybersecurity program at Brown University is a collaborative initiative comprised of several internal teams brought together for the purpose of proactively managing security exposures or vulnerabilities, and reactively handling incidents that may arise in Brown’s computing environment. The purpose of the cybersecurity program is to develop, coordinate, drive, and maintain the cross-functional efforts necessary for Brown University to effectively manage security exposures, critical vulnerabilities, or cybersecurity incidents that span Brown’s various technology platforms. The program also aims to maintain capabilities in several procedural areas, including security awareness, readiness, detection, communication, remediation, incident root cause analysis, education, and process improvement. The program includes management and procedural guidelines, policies, and training and awareness opportunities to assist staff in recognizing, identifying, and coordinating an appropriate response to attacks on Brown University information assets. Documentation and procedures are also an integral piece of the program, designed to reduce overall security event exposure for Brown University, initiate a more effective and efficient incident response, decrease total time to incident resolution, outline basic regulatory responsibilities, and promote the ethical obligations surrounding the handling of sensitive data or personal information. It is the mission of the Cybersecurity Incident Response Team (CIRT), a keystone of the program, to provide for the coordination of the response to, and investigation of, attacks on Brown University information assets. The CIRT also provides guidance on detecting, containing, and recovering from computer security incidents. Coordinated by the Information Security Group, the CIRT is responsible for managing responses to computer security events throughout the Brown infrastructure, including
third-party-hosted systems. The degree of involvement of CIRT personnel in an event is dependent upon the event's severity or potential impact to University operations.

**Security Awareness:** Any major enterprise that relies on heavy use of technology must stay aware of the vulnerabilities and emerging threats associated with those technologies. Protective techniques and safeguards must be consistently reviewed and updated using outside sources, vendors, partners, and other alliances that provide information about new technology threats.

**Readiness:** Whether one's responsibilities are technological, operational, or professional, staff must understand clearly the security concerns that may exist within their realm of responsibility. Staff should be familiar with University policy, Computing and Information Services (CIS) and Information Security Group (ISG) policy, and the inherent security risks or responsibilities that exist within their job role. People, systems, policies, and processes need to remain organized to make the University computing environment suitable for effective management of threats.

Detection: As a major computing enterprise, CIS must operate an array of monitoring systems suitable for the environment. Intrusion detection, monitoring of standard configurations, and early warnings of abnormal activity must be properly maintained to ensure that adverse events can be acted upon quickly.

**Communication:** Effective communication among technology staff, professional staff, academic departments, strategic vendors, and sometimes the external community is critical when handling security incidents. Information must be communicated clearly and accurately to affected areas about any developing security crisis and the active management of an ongoing incident. Sound communications plans allow for the expedient gathering of resources when emergency efforts are needed. It is also imperative that internal Brown technical and professional teams work together when wider communications to the University community is necessary.

**Remediation, Mitigation, Eradication, Containment and Control:** In the event of a cybersecurity incident, prompt remediation of the situation includes one or more of the following actions: stopping the attack, applying vendor software patches, implementing creative solutions to eliminate the risk, or containing and controlling a propagation-based malware threat. Whatever the situation, plans and scenarios need to be discussed to ensure that short-term effective strategies can be implemented quickly to contain a problem.

**Root Cause Analysis:** Identification of a problem's root cause is essential to making sure the same incident does not recur. Root cause analysis is also important for regulatory reporting requirements which may be necessary in some cases. Whatever exercises are necessary, teams must work to facilitate the analysis necessary to determine problem causes. Such exercises include forensic investigations where appropriate.

**Education and Process Improvement:** Teams must study the root causes of incidents and how they are handled. Process improvement and implementation of lessons learned is essential to grow cybersecurity defense capabilities. After studying incidents and the effectiveness of response to them, team must work to implement new processes as necessary to ensure better protection in the future.

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**Data Science Practice (DSP):** The Data Science Practice (DSP) is a centralized group of data scientists within CIS that consolidates big data expertise to help researchers across campus apply new methods and derive insights from their data. By embedding these staff in research labs and groups and forming close partnerships with faculty, postdocs, and students, the DSP supports data-intensive projects across the physical, life and social sciences, and the humanities. In addition, the DSP builds analytic solutions with Brown's institutional data and supports data-driven decision making by senior administrators. Currently made up of 13 full-time staff (with three more positions recently opened), the team’s expertise spans machine learning, informatics, data exploration and visualization, databases and data management, and software engineering. Facilities include ~2,000 square feet of offices and conference rooms in CIS offices at 3 Davol Square.

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CCV - Cave  
http://graphics.cs.brown.edu/research/cave/home.html

Cave: The Brown University Center for Computation and Visualization's (CCV) original fully immersive display system, called the Cave, is an 8' cube with projected images on the front, left and right walls, as well as the floor. CrystalEyes LCD-shutter glasses provide stereo depth-perception, and a variety of Intersense and Polhemus tracking devices allow software to track the position of a user's hand, head, wand, etc. The Cave also has a multi-speaker sound system that provides positional audio. Some existing software that can be used in the
system currently include volume visualization, molecular visualization, and simple 3D model manipulation. New projects can be initiated through consultation with CCV visualization staff.

**CCV - YURT**
https://web1.ccv.brown.edu/viz-yurt

YURT: The Center for Computation and Visualization's (CCV's) state-of-the-art virtual reality theater displays over 100 million stereo pixels and consists of 69 full HD projectors driven by 20 nodes of the CCV HPC cluster. The projectors display onto 145 mirrors covering a 360-degree surface including overhead and underfoot. At normal viewing distances, the pixels are smaller than are resolvable by the human retina. The screen consists of translucent polycarbonate. The front wall is 25 feet long and 8 feet high and spans 180 degrees of view. The screens are suspended, along with half of the projectors, from an aluminum superstructure, with a catwalk for maintenance. The blending and warping that create one image from many projectors is proprietary, from the Scalable Display company, but this library has been licensed to be incorporated into many different applications and software libraries. Many of the applications that run in the YURT use vrg3d, a virtual reality graphics package developed and maintained in the Computer Science Department. Other scientific and analysis packages have already been successfully incorporated into the YURT, including Blender, a popular open-source 3D modeling game engine, and Paraview, a widely-used scientific graphics and analysis package.

**Center - Brown Center for Biomedical Informatics (BCBI)**
https://www.brown.edu/academics/medical/about-us/research/centers-institutes-and-programs/biomedical-informatics/

Brown Center for Biomedical Informatics (BCBI): BCBI was established in July 2015 with a three-fold mission to: (1) innovate how electronic biomedical and health data are used, (2) implement solutions for improving biomedical research and healthcare delivery, and (3) inspire the next generation of biomedical researchers and clinicians in partnership with collaborators in existing areas of excellence at Brown, its healthcare affiliates, and statewide healthcare organizations. BCBI consists of six faculty members, two administrative staff, six data scientists and developer/analysts (who are also part of the centralized Data Science Practice at Brown), and students at various levels. BCBI is centrally located in office space in a building adjacent to the Warren Alpert Medical School of Brown University. This office suite space has 2,281 net assignable square feet and includes five administrative support workstations and eight offices. Shared building-wide resources include a 209 square-foot conference room with capacity of eight people and a larger 365 square-foot conference room with a capacity of 16 people. This area is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco). Computers are available for basic programming and productivity tasks. Dedicated servers for BCBI research and educational activities are maintained by Computing and Information Services. BCBI leads the Advance-CTR Biomedical Informatics Core and works closely with the Center for Computational Molecular Biology, COBRE Center for Computational Biology of Human Disease, Data Science Initiative, and Hassenfeld Child Health Innovation Institute.

**Center - CCV- Computation and Visualization (CCV): Comprehensive**
https://web1.ccv.brown.edu/

Center for Computation and Visualization (CCV): The mission of CCV is to provide the scientific and technical computing expertise required to advance computational research and support Brown’s academic mission. The accelerated transformation of the pace and impact of computational approaches led to Brown University’s recognition of the importance of high performance computing across all of its disciplines. As a result, Brown and IBM developed in 2009 a $4M investment in a high performance computing platform, known as Oscar, that is available statewide to researchers. Through grant funding and University investment, this platform has undergone continual hardware enhancement, and now includes Intel Scalable Processors and nVIDIA GPUs of the Pascal and Volta architectures, as well as 100Gb/s EDR Infiniband. The equipment is maintained and operated by the staff of the Center for Computation and Visualization (CCV), who have extensive experience in operating shared computational clusters. CCV staff are responsible for scheduled maintenance, access control as needed, and integration with research specific hardware as required by NIH-funded researchers. CCV staff also take care of all financial aspects of operating and maintaining the facility.
The high performance computing resources at CCV equip the Brown research community to undertake complex
textual analysis. Oscar is the primary research computing cluster with several
multi-core nodes sharing a high performance interconnect and file system. Applications can be run
interactively or scheduled as batch jobs. Several large memory nodes provide substantially more memory than
is available on typical workstations and laptops. A large collection of software is available on CCV systems,
including: python, perl, R, Matlab, Mathematica, Maple, optimized math and science libraries, and domain-
specific applications. CCV staff can help acquire and install most applications upon request. The technical
specifications of Oscar are:

- Two login nodes provide access for application development, debugging and batch job management
- About 400 compute nodes up to current specs of dual multi-core processors and 128 GB of memory and a
total of more than 8,000 cores
- Specialized nodes containing GPU processors or 512 GB of memory
- High-bandwidth/low-latency Infiniband interconnects
- All nodes are diskless with I/O provided by an IBM GPFS parallel file system
- 1 PB of usable disk space
- RHEL 7.3 Linux operating system
- SLURM workload manager

CCV provides storage for large research files connected to the HPC system. A default allocation of 256 GB (also
called RData) is given to all faculty members at Brown, on a per request basis, with the option of purchasing
additional storage as needed. Long-term storage and backups are available on a fee basis. Storage can be
purchased in increments of terabytes for periods of up to 6 years. The cost for backups is included when storage
is purchased. Data is incrementally backed up to tape on a daily basis. In addition, snapshots for the last 7 days
are available online for quick restores. Long-term archiving of files to tape (one or two copies) can be purchased
as needed. Tape libraries are housed at two separate locations to enable disaster/recovery scenarios. In
addition, a disaster recovery copy of the non-ephemeral data is kept on a lower-performance filesystem to permit
immediate recovery and limited production computing in the unlikely event of the loss of the primary filesystem.
These research storage allocations can be easily mounted to desktops or other computer systems to allow for
easy access and sharing files. Details of HPC file storage at CCV:

- Rdata is accessible from all CCV systems (/gpfs/data)
- Can be mounted to all desktops on Brown's campus network
- Is backed up on a daily incremental basis
- Rdata allocations can be increased by purchasing additional storage
- Home directory on Oscar: All users will have access to a home (/gpfs/home) allocation of 10 GB. This
allocation is backed up on a daily basis.
- Group storage: Premium accounts will be entitled to an additional allocation of 256 GB that may be merged
with RData (for primary PI).
- Likewise, group premium accounts will be entitled to additional 25 GB per user.
- Snapshots: Daily snapshots are available for both RData and Home file systems for seven consecutive days.
- Scratch: Space for temporary files is available as (/gpfs/scratch). These files are not backed up and scratch
space is strictly for temporary files. Files may be purged after 30 days or as the file system is being utilized.
This allocation will be managed by an application called xdisk (time versus space) (work in progress).
- Sharing data: Sharing files that are too big to be sent via email. There is a 10 GB quota and a limit of 2 GB
per file.
- Users can access RData from the CIFS share. This can be mapped as a drive in Windows and mounted in
Mac OS X and Linux from any campus system (off-campus use requires a VPN connection to campus).
Users can also access files by using a file transfer tool like Secure Copy (SCP), Secure FTP (SFTP), or
rsync.

A key benefit of using these computing resources is that CCV installs and maintains a large collection of
computational research software. CCV can install most software packages upon request. A full range of
statistical and other scientific software is available on the CSS system, including standard statistical packages
(including SAS, Stata, Splus), specialized statistical software (such as DBMScopy, ROCKIT, nQuery, East),
scientific programming languages and software (such as Fortran, C++, Matlab) and office software. All data
stored on the CSS network is secure: access to the system from outside our network requires the use of a software client that employs a point-to-point encryption. The UNIX operating system also provides the mechanism to limit access of specific directory trees to specific groups of users. CSS will supplement the funded Administrative Coordinator for the Core with a modest amount of in-kind administrative support in the form of existing clerical and secretarial help, assistance with grant and subcontract preparation, access to conference rooms and office equipment. The Core will pay a nominal fee to CSS to offset the cost of maintaining multiple-user site licenses for statistical software and for maintaining updated operating systems, having full access to the computing network (including associated software and dedicated hardware), and software and systems support for core personnel.

CIS - Business Intelligence (BI) Team
https://brown.edu/cis/data-science/

Business Intelligence Team: The CIS Business Intelligence Team provides data and decision support to administrators.

This team of BI professionals makes data available in a user-friendly environment, using our primary business intelligence tools Cognos Analytics and Tableau; educates and supports a wide range of Brown administrators in their use of tools for reporting and analysis; architect sand promotes new reporting and analytical capabilities; collaborates with data stew ards on data management and governance to ensure the ongoing quality, consistency, and availability of institutional data.

CIS - Data Science Practice (DSP)
https://brown.edu/cis/data-science/

Data Science Practice (DSP): The Data Science Practice collaborates with researchers on complex data projects. This team of data scientists helps researchers apply new methods and derive insights from their data; have expertise in machine learning, informatics, data exploration and visualization, databases and data management, and software engineering; works with faculty, postdocs, and graduate students in all areas of research, including the physical, life, and social sciences and the humanities; builds analytics solutions with Brown's institutional data and support data-driven decision making by senior administrators.

High Bandwidth Fiber Connectivity

High Bandwidth Optical Fiber Connectivity: An NSF-EPSCoR Infrastructure Improvement Award to Brown University (Dr. Edward Hawrot, PI) now provides 10Gbps per lambda (laser light wavelength) connection between Brown’s Laboratory for Molecular Medicine at 70 Ship Street, the new Medical School building located in the heart of Providence’s historic Jewelry District and the core campus. Similar high bandwidth connectivity is provided to a nearby university branch building on the edge of the Jewelry District that is home for Statistical Sciences and the School in Public Health. Other nodes provide connection to the core Brown network on campus, the OSHEAN network terminus in the Foundry building located in downtown Providence, the University of Rhode Island Providence campus at 80 Washington Street where the URI's Providence Biotechnology Center is located. The lambda connection now connects us to other EPSCoR institutions in New England. OSHEAN access from the Foundry node provides 10 Gbps per lambda connectivity to Boston and New York and beyond.

Initiative - Unified Research Data Sharing and Access (URSA) Initiative
https://www.brown.edu/initiatives/translational-research/biomedical-informatics-services

Unified Research Data Sharing and Access (URSA) Initiative: The overall goal of the Unified Research Data Sharing and Access (URSA) Initiative is to make data accessible and usable for research purposes by the clinical and translational research community through establishment of a shared technical infrastructure and common processes. This initiative is coordinated by the Brown Center for Biomedical Informatics (BCBI) that operates the Advance-CTR Biomedical Informatics Core in close collaboration with information services, compliance programs, and research offices at Brown and health data partners: Lifespan, Care New England, Providence VA Medical Center, Rhode Island Quality Institute, and Rhode Island Department of Health. For sensitive data,
URSA utilizes the Stronghold server system at Brown (URSA Stronghold), which offers a secure computing environment for storing and analyzing data.

**Program - Cybersecurity**
https://it.brown.edu/services/group/security

Cybersecurity Program: The cybersecurity program at Brown University is a collaborative initiative comprised of several internal teams brought together for the purpose of proactively managing security exposures or vulnerabilities, and reactively handling incidents that may arise in Brown's computing environment. The purpose of the cybersecurity program is to develop, coordinate, drive, and maintain the cross-functional efforts necessary for Brown University to effectively manage security exposures, critical vulnerabilities, or cybersecurity incidents that span Brown's various technology platforms. The program also aims to maintain capabilities in several procedural areas, including security awareness, readiness, detection, communication, remediation, incident root cause analysis, education, and process improvement. The program includes management and procedural guidelines, policies, and training and awareness opportunities to assist staff in recognizing, identifying, and coordinating an appropriate response to attacks on Brown University information assets.

Documentation and procedures are also an integral piece of the program, designed to reduce overall security event exposure for Brown University, initiate a more effective and efficient incident response, decrease total time to incident resolution, outline basic regulatory responsibilities, and promote the ethical obligations surrounding the handling of sensitive data or personal information. It is the mission of the Cybersecurity Incident Response Team (CIRT), a keystone of the program, to provide for the coordination of the response to, and investigation of, attacks on Brown University information assets. The CIRT also provides guidance on detecting, containing, and recovering from computer security incidents. Coordinated by the Information Security Group, the CIRT is responsible for managing responses to computer security events throughout the Brown infrastructure, including third-party-hosted systems. The degree of involvement of CIRT personnel in an event is dependent upon the event's severity or potential impact to University operations.

**Security Awareness:** Any major enterprise that relies on heavy use of technology must stay aware of the vulnerabilities and emerging threats associated with those technologies. Protective techniques and safeguards must be consistently reviewed and updated using outside sources, vendors, partners, and other alliances that provide information about new technology threats.

**Readiness:** Whether one's responsibilities are technological, operational, or professional, staff must understand clearly the security concerns that may exist within their realm of responsibility. Staff should be familiar with University policy, Computing and Information Services (CIS) and Information Security Group (ISG) policy, and the inherent security risks or responsibilities that exist within their job role. People, systems, policies, and processes need to remain organized to make the University computing environment suitable for effective management of threats.

**Detection:** As a major computing enterprise, CIS must operate an array of monitoring systems suitable for the environment. Intrusion detection, monitoring of standard configurations, and early warnings of abnormal activity must be properly maintained to ensure that adverse events can be acted upon quickly.

**Communication:** Effective communication among technology staff, professional staff, academic departments, strategic vendors, and sometimes the external community is critical when handling security incidents. Information must be communicated clearly and accurately to affected areas about any developing security crisis and the active management of an ongoing incident. Sound communications plans allow for the expedient gathering of resources when emergency efforts are needed. It is also imperative that internal Brown technical and professional teams work together when wider communications to the University community is necessary.

**Remediation, Mitigation, Eradication, Containment and Control:** In the event of a cybersecurity incident, prompt remediation of the situation includes one or more of the following actions: stopping the attack, applying vendor software patches, implementing creative solutions to eliminate the risk, or containing and controlling a propagation-based malware threat. Whatever the situation, plans and scenarios need to be discussed to ensure that short-term effective strategies can be implemented quickly to contain a problem.
**Root Cause Analysis:** Identification of a problem’s root cause is essential to making sure the same incident does not recur. Root cause analysis is also important for regulatory reporting requirements which may be necessary in some cases. Whatever exercises are necessary, teams must work to facilitate the analysis necessary to determine problem causes. Such exercises include forensic investigations where appropriate.

**Education and Process Improvement:** Teams must study the root causes of incidents and how they are handled. Process improvement and implementation of lessons learned is essential to grow cybersecurity defense capabilities. After studying incidents and the effectiveness of response to them, team must work to implement new processes as necessary to ensure better protection in the future.

**Stronghold Research Environment for Data Compliance**
https://it.brown.edu/services/type/stronghold-research-environment-data-compliance

Stronghold Research Environment for Data Compliance: Stronghold is a secure computing and storage environment that enables Brown researchers to analyze sensitive data, while complying with regulatory or contractual requirements. Stronghold is currently self-certified to meet the security requirements and controls for HIPAA (Health Insurance Portability and Accountability Act) and is undergoing the certification process for FISMA (Federal Information Security Management Act) and CJIS (Criminal Justice Information Security). This service is customized to the needs of individual users and their data use agreements. Each Principal Investigator (PI) is given a dedicated environment for their project to support their researchers, students, and collaborators. Access to the internet is restricted except for required locations for data imports or necessary software downloads. Import and export controls are in place to limit who can perform data migration, where sensitive data can come from and where desensitized or anonymized data can be moved to. Sensitive data are subject to file system auditing, and real-time alerting is available at the request of the PI.

**CORE AND SHARED RESEARCH FACILITIES**

**BioMed Core Research Facilities**
http://www.coresri.org

BioMed Core Research Facilities. Graduate student education and research training at Brown University benefits from a wide range of cutting edge facilities, instrumentation, and other resources to support these endeavors. Brown University’s Shared Technology Resource (Core) Facilities function at the level of service, research, and teaching. Serving as centers of intellectual exchange and collaboration, each technology-focused core provides a broad spectrum of investigators access to cutting edge instrumentation, current technologies, and expert consultation. The facilities are financed by a mixed funding model that includes grant awards, user fees, and institutional support. Additional cost effectiveness and efficiency are achieved by decreased equipment duplication, economy of scale savings, improved quality control, and rapid turnaround times. Advanced technology platforms of similar scale and productivity would not be financially feasible for any individual lab to purchase, upgrade, and maintain. Each facility is staffed by highly trained personnel that provide exceptional customer service and resource management. Faculty oversight and facility user committees advise the core directors. A PhD, MBA-level Director of Research Operations provides assistance with facility operations and fiscal management and serves as a liaison between the core directors and research administration. The timely acquisition of new instrumentation in the core facilities and the frequent implementation of new technologies facilitate faculty recruitment, education, and training of students, and support research funding.

**BioMed - Animal Care Facility (ACF)**
https://www.brown.edu/research/facilities/animal-care

Animal Care Facility: Brown University shares a mission with other institutions of higher learning in the responsibility to advance the understanding of living organisms through studies of the behavioral and biological processes upon which their survival and well-being depends. Research involving laboratory animals has an essential role in this process. There are approximately 70 Brown-based or Brown-affiliated investigators who use vertebrate animals in their research and approximately 115 active IACUC protocols in a given year.
The program of animal care and use at Brown University is accredited by the Association for the Assessment and Accreditation of Laboratory Animal Care, International, (AAALAC), and is registered with and inspected by the U.S Department of Agriculture (USDA). Brown’s Assurance of compliance with the Public Health Service Policy on Humane Care and Use of Laboratory Animals has been reviewed and accepted by the Office of Laboratory Animal Welfare (OLAW) of the National Institutes of Health (NIH). All animals are maintained in accordance with the National Research Council Guide for the Care and Use of Laboratory Animals. The animal care program is directed by attending veterinarian Lara Helwig, D.V.M., a diplomate of the American College of Laboratory Animal Medicine, (DACLAM). The facility is staffed by three full-time veterinarians, all ACLAM diplomates. The veterinary staff provides veterinary services to research investigators at three of the area hospitals affiliated with the Warren Alpert Medical School. They are responsible for the health care of all animals in the facilities, the review of all IACUC-approved animal care and use protocols, appropriate training/procedural oversight for investigators, and assisting investigators in any animal related queries. The veterinary staff is on site and a clinical veterinarian is available at all times. Animal care staff provides daily feeding, watering and cleaning to all species. Veterinary technicians provide health surveillance and technical assistance. Brown’s animal facilities include specialized housing and equipment for a wide variety of species. Dedicated surgical suites are available as well as dedicated procedural areas. A radiological suite is available and an ethylene oxide (ETO) sterilization machine for items which cannot withstand pressures and or temperatures of steam autoclaving.

BioMed - Bioimaging Facility Leduc
https://www.brown.edu/research/facilities/bioimaging

Bioimaging Facility: The Leduc Bioimaging Facility has two locations: the Laboratories for Molecular Medicine, 70 Ship St and Sidney Frank Hall of Life Sciences, 185 Meeting St. The facility has a PhD-level director and MS-level microscopist manager. These facilities provide equipment and instruction dedicated to high resolution imaging for life science research. Facility instrumentation includes an Apreo SEM serial block-face scanning electron microscope, Philips 410 transmission electron microscope, with goniometer stage, low-dose imaging equipment, an ATM digital imaging system, and a Hitachi 2700 scanning electron microscope equipped with a backscatter detector, lanthanum hexaboride gun, and a Quartz PCI digital imaging system. The facility also houses an Olympus multiphoton laser scanning microscope, an Olympus FV3000, Zeiss LSM800, LSM710, and LSM 510 confocal laser scanning microscopes, two Zeiss Axiolab 200M fluorescence microscopes with DIC, phase contrast, and a stage heater for live imaging, and a Zeiss Lumara fluorescence stereomicroscope. MetaMorph software is available for image analysis. Training in microscopy, image analysis, and ultrathin sectioning is provided at both sites. This facility receives partial support from the Division of Biology and Medicine, the Provost’s Office and the Brown Institute for Brain Science, Brown University.

BioMed - Drosophila Media Facility
https://www.brown.edu/research/facilities/drosophila-media-prep/contact-location

Drosophila Media Facility. Biomedical Center, 171 Meeting St. This facility is directed by a PhD-level investigator and staffed by a media prep assistant. The Brown Fly Facility is dedicated to providing investigators with high-quality media for Drosophila research. In the centralized kitchen, a standard cornmeal, sucrose, yeast medium is prepared and dispensed into different sized culture vessels. Media is prepared in a steam-jacketed food kettle and pumped into trays of glass vials (10ml), plastic vials (10ml) or into plastic bottles (30ml) depending on research needs. Media is prepared according to a strict protocol that ensures consistency in diet and the absence of any bacterial, fungal or insect contamination. Researchers using glass vials return them to the facility where they are autoclaved, washed, and filled again. The media kitchen is equipped with a food service quality steam kettle fitted with stirring unit, a Steris autoclave and a Lancer Washer fitted with custom racks for glass vials. Media is dispensed using Filamatic and Materflex/ Digistatic pumps. This facility has received partial support from the Division of Biology and Medicine, the Provost’s Office and the Brown Institute for Brain Science, Brown University.

BioMed - Flow Cytometry and Sorting
https://www.brown.edu/research/facilities/flow-cytometry-and-sorting/
Flow Cytometry and Sorting: Biomedical Center, 171 Meeting St. The facility is directed by a PhD-level investigator and managed by a research technician who performs the flow cytometry based analysis and cell sorting. The primary facility instrument is a Becton Dickinson FACSARia III, a 4-laser, 19-parameter instrument for flow and sorting application including DNA cell cycle analyses, bead based immunoassays, and sort capabilities of four populations. Each laser (Blue 488, Yellow/Green 561, Red 633, and Violet 407) is listed on the core website with all available corresponding detectors. Users may find it helpful to be able to pick and choose from the lists of the most common dyes on the market. The FACSARia III is capable of rapid sorting of cells, bacteria, yeast, tagged targets, and other small particles based on multiple parameter characteristics into highly pure populations. Its advanced fluidics and optics design offers increased research capabilities across a variety of scientific disciplines. A fixed-alignment cuvette flow cell provides superior fluorescence sensitivity. A dedicated computer workstation with FlowJo data analysis software is provided for the facility users. This facility was supported in part by NCRR equipment grant 1S10RR021051, the Division of Biology and Medicine and the Provost’s Office, Brown University.

BioMed - Genomics
https://www.brown.edu/research/facilities/genomics

Genomics: Laboratories for Molecular Medicine, 70 Ship Street. The Genomics Facility is directed by a PhD-level director and is staffed by a junior research technician. This facility provides investigators ready access to a wide variety of advanced instrumentation, genomic technologies, data analytical services, and training. DNA sequencing services are provided through a Genomics Facility pricing agreement with GENEWIZ. Other facility instrumentation includes microarray analysis using the Affymetrix Gene Chip Workstation, an ABI ViiA™ 7 Real-Time PCR System, a BIO-RAD QX200 Droplet Digital PCR, an ABI 7900 Real-Time PCR machine, an Advanced Analytical Fragment Analyzer, a Covaris S220 Ultra-Sonicator, an Agilent 2100 Bioanalyzer, a Molecular Dynamics Typhoon 9410 Variable Mode Imager, a Spectra Max M5 Scanner, a LI-COR Odyssey Infrared Imaging System, an AXON GenePix 4000B Scanner, a Beckman Optima Max Ultracentrifuge, a Nanodrop ND 1000, and a Becton Dickinson FACSCalibur Flow Cytometer. This facility was partially supported by the National Institutes of Health (NCRR Grant Nos. P30RR031153, P20RR018728 and S10RR027634), the National Science Foundation (EPSCoR Grant Nos. 0554548 and 1004057), Lifespan-Rhode Island Hospital and the Division of Biology and Medicine and the Provost’s Office, Brown University.

BioMed - Herbarium
https://www.brown.edu/research/projects/herbarium/

Herbarium: The Brown University Herbarium was founded in 1869 when the University acquired the collections of Stephen Thayer Olney. The collection includes around 100,000 plant specimens and is an important repository of Rhode Island and New England collections. We also have specimens from all 50 U.S. state (plus the District of Columbia) and the collection is rich in western and southern North American plants including sets of historically valuable specimens from 19th and early 20th century western U.S. expeditions. Among other important collections, the Herbarium also includes a set of Charles Wright’s Cuban plants (1856-1867), Cyrus Pringles’s plants of Mexico (1885-1909) and a unique and classic collection of Carex assembled by Stephen Olney. The Herbarium continues to be active and over the past few years we have added around 2,000 specimens to the collection. These include new collections made by faculty and students at Brown in addition to gifts from other herbaria.

BioMed - Informatics
https://www.brown.edu/academics/medical/about-us/research/centers-institutes-and-programs/biomedical-informatics/research

Informatics: Informatics services are provided by the Brown Institute for Biomedical Informatics (BCBI) and COBRE for Computational Biology of Human Disease (CBHD) and accessed through the Advance-CTR service portal. BCBI reviews the request for assistance and assigns it to the appropriate informatics or data analyst. The overarching research goals of BCBI are to develop, deploy, and evaluate computational and data science approaches to best use biomedical and health data for improving patient care. To this end, our research activities are a major application area for programs such as those within Brown’s Data Science Initiative. Specific areas of core service are:
Computational Biology: The Computational Biology Service provides help for experimental design and data processing pipelines for high-throughput datasets generated in individual projects, particularly for DNA/RNA sequencing data. Our services are broadly categorized into:

__Development: R/Python Packages – The Core will provide help with packaging R, Python and Julia code and work with computational biologists to convert their code to make it easily shareable. The Core will help with the implementation and maintenance of web apps using the latest technologies for projects requiring web enabled interfaces.

__Consulting – A team of experienced computational biologists and biostatisticians are on-hand to help investigators design experiments.

__Data Analysis: The core provides assistance in experimental design and data processing pipelines for high-throughput datasets generated in individual projects, particularly for DNA/RNA sequencing data. Our assistance falls broadly into the categories outlined below.

Translational Bioinformatics: There is significant need for analytic approaches to advance understanding of the molecular underpinnings of disease and enable such insights to be used within clinical contexts. BCBI is developing translational bioinformatics approaches for incorporating deep biological knowledge into clinical practice. These efforts aim to complement synergistic research programs at Brown, including those being led by the Center for Computational Molecular Biology (CCMB).

Clinical Informatics: Concomitant with the widespread adoption of electronic health record (EHR) systems within the healthcare data ecosystem, there is an opportunity to transform the practice of medicine through effective use of digital data. Within BCBI, the Clinical Informatics Research and Discovery (CIRD) Laboratory is studying and using EHR data from clinical partners (focusing initially on partnerships with Care New England and Lifespan Health System, with plans to also partner with the Providence VA Medical Center) for supporting clinical practice as well as research programs.

Public Health Informatics: The emergence of health information exchanges and population-level monitoring systems presents an unprecedented opportunity to develop computational approaches for studying healthcare delivery and quantifying the impact of healthcare reform initiatives. In partnership with the Brown University School of Public Health, Rhode Island Quality Institute (RIQI), and Rhode Island Department of Health (RIDOH), informatics approaches are being developed to support research motivated by state needs.

**BioMed - Magnetic Resonance Imaging**
https://www.brown.edu/carney/mri/

Magnetic Resonance Imaging: Sidney Frank Hall of Life Sciences, 185 Meeting St. This facility is directed by a PhD-level investigator, managed by two PhD-level Associate Directors, and staffed by a registered radiography technologist specialized in magnetic resonance imaging. The centerpiece of the facility is a state-of-the-art research dedicated Siemens 3 Tesla TIM Trio. The scanner is equipped with 32 receiver channels for significant gains in signal-to-noise ratio and acquisition speed and a high performance gradient insert for small animal imaging and small animal coils are available. Experiments involving visual or auditory stimulus presentation, physiological monitoring, participant monitoring, and eye tracking can be conducted. An MRI simulator and MRI-compatible EEG are available and data is collected on a high performance computer cluster. The MRI Research Facility provides infrastructure and support to facilitate research and educational activities using magnetic resonance imaging technology. Ongoing research includes studies of brain structure and function in normal and clinical populations as well as studies of other body systems, non-invasive animal imaging and materials science. This facility has received partial support from the National Science Foundation, the U.S. Department of Defense, Dr. Ralph and Marian Falk Medical Research Trust, Butler Hospital, the Provost’s Office and the Carney Institute for Brain Science (formerly the Brown Institute for Brain Science) at Brown University.

**BioMed - Molecular Pathology Core Research Laboratory**
https://www.brown.edu/research/facilities/molecular-pathology-core/
Molecular Pathology Core Research Laboratory: Laboratories for Molecular Medicine, 70 Ship St. This facility is directed by a PhD-level research investigator and managed by a histotechnologist. The research laboratory, which is open to graduate students, faculty, and staff, provides histopathological, immunohistochemical and immunocyto logical technologies. Processing, embedding, sectioning, and staining of specimens is provided along with educational and hands-on training. The facility instruments include a ScanScope CS digital slide scanning system from Aperio Technologies for image analysis, a Fujix Bas 1000 phosphor imager, a Nikon Eclipse TS100 inverted fluorescence microscope, a Nikon E800 microscope with a digital camera, a Vibratome for soft tissue sectioning, and an Arcturus PixCell II laser capture microdissection system. This facility has received partial support from the National Institutes of Health (NIEHS Grant No. P42ES013660).

**BioMed - Mouse Transgenics and Gene Targeting**  
https://www.brown.edu/research/facilities/transgenic-and-gene-targeting/

Mouse Transgenics and Gene Targeting. Laboratories for Molecular Medicine, 70 Ship St. This facility is directed by a PhD-level research investigator and employs a full-time facility manager and research technician to perform the technical work. Services provided include pronuclear injection of DNA into fertilized eggs, injection of gene targeted embryonic stem cells into blastocysts, and embryo cryopreservation. The individual investigators are responsible for genotyping, husbandry, and breeding of generated mouse strains. Facility instrumentation includes a Nikon SMZ1500 dissection microscope, a Nikon Eclipse TE200 inverted microscope, equipped with Eppendorf Transf erman NK2 micromanipulators and an Eppendorf FemtoJet microinjector, a Nikon Eclipse TS100 inverted microscope for cell culture use, a Nikon SMZ800 surgical microscope, and a CBS V1500AB isothermal liquid nitrogen storage system. This facility has received partial support from the National Institutes of Health (NIGMS Grant No. 8P30GM103410) and the Division of Biology and Medicine and the Provost’s Office, Brown University.

**BioMed - Proteomics**  
https://www.brown.edu/research/facilities/proteomics/

Proteomics: Laboratories for Molecular Medicine, 70 Ship Street. The proteomics facility is directed and staffed by a PhD-level scientist with technical know-how of numerous instrumentation platforms and bioinformatics analytical tools. Mass spectrometry and protein analysis using the Thermo Scientific QExactive or the Thermo LTQ Orbitrap Velos instruments is the central focus of this facility. Other facility instrumentation includes a Jasco J-815 Circular Dichroism Spectropolarimeter, Microcal VP Differential Scanning Calorimeter, a Microcal Isothermal Titration Calorimetry (ITC) 200, HORIBA Jobin Yvon FluoroMax-4 Spectrofluorometer, a GE Healthcare AktaPrime Plus Protein Purifier, an Eksigent 2D+ ultra-high-pressure liquid chromatography system (UHPLC), an Agilent 1200 HPLC, a GE Healthcare Biosciences Biacore X 100 and a Minifors fermenter. Proteomic analysis software tools include Matrix Science Mascot, Bioinformatics Solutions PEAKS Studio, Thermo Scientific Proteome Discoverer and ProSight PC, NuSep ProteolIQ, and Proteome Software Scaffold Q+S. This facility has received partial support from the National Science Foundation (EPSCoR Grants Nos. 0554548 and 1004057), the National Institutes of Health (NCRR Grant No. S10RR020923), a Rhode Island Science and Technology Advisory Council grant, and the Division of Biology and Medicine and the Provost’s Office, Brown University.

**BioMed - Rodent Behavioral Phenotyping**  
http://rndb.clps.brown.edu/

Rodent Behavioral Phenotyping: Biomedical Center, 171 Meeting St. This facility is a fully-automated high-throughput rodent behavioral testing facility. It is unique in that it integrates high-level computer vision, computer learning, and custom built hardware solutions with behavioral testing to automate tracking, cataloging, and analysis of both home cage behavior and standard rodent testing paradigms to characterize preclinical models of disorders, test novel pharmacological and genetic rescue strategies in rodent models, and conduct basic scientific research. The core is composed of a workroom with four workstations which are connected to four testing rooms. Each workstation is equipped with Noldus Ethovision tracking software, and each testing rooms contains a high-definition digital video camera, independent ventilation, data links, and power outlets. These rooms can be readily linked to the in house behavioral monitoring system. This facility also has independent
housing rooms dedicated for mice undergoing behavioral testing, which are located adjacent to the testing rooms. In the housing corridor there are two housing bays dedicated to the chronic monitoring of rodent homecage behavior (up to 40 cages). Located adjacent to homecage monitoring rooms are server rooms, which contain servers that transmit data to CCV for processing. This system is maintained on independent power with battery and backup and it provides a buffering system to store videos in the event of down time or loss of connection with CCV. This approach allows for continuous monitoring of mice even in the event of loss of power or connection to CCV for a period of ~140 hours. Finally, the facility has access to a barrier facility to house and maintain large numbers of breeders, the offspring of which will be transferred to the behavior core 5-7 days prior to beginning testing.

BioMed - Water Flume
http://breuerlab.engin.brown.edu/wordpress/?page_id=239

Water Flume: The Department of Ecology and Evolutionary Biology was awarded a grant from the NSF to establish a core research facility for a 3,500-gallon water flume. Measuring 80 cm in width, 60 cm in height, and 440 cm in length, the flume is based on a recirculating design with the flow loop arranged in a horizontal configuration. With its ability to regulate flow rate patterns up to 1 m/s, the flume offers researchers a wide array of simulated conditions. Principal investigators use the flume to replicate situations normally found in the field.

BioMed - X-ray Reconstruction of Moving Morphology
http://www.xromm.org/

X-ray Reconstruction of Moving Morphology: Biomedical Center, 171 Meeting St. X-ray Reconstruction of Moving Morphology (XROMM) is a 3D imaging technology for visualizing rapid skeletal movement in vivo. XROMM combines 3D models of bone morphology with movement data from biplanar X-ray video to create highly accurate re-animations of the 3D bones moving in 3D space. Rapid bone motion, such as during bird flight, frog jumping and human running, can be visualized and quantified with XROMM. The facility is directed by a PhD-level scientist and staffed by a technician. Facility instrumentation includes mobile C-arm OEC 9400 Fluoroscopes and a biplanar X-ray room containing two Varian model G-1086 X-ray tubes, 2 EMD Technologies model EPS 45-80 pulsed X-ray generators, two Dunlee model TH9447QQXH590 image intensifiers (16 diameter), and 2 Phantom v10 high-speed digital video cameras. The facility also has a veterinary Animage Fidex CT Scanner, a CT scanner designed for animals in the size range from rats to dogs. In vivo scanning of anesthetized animals is possible. This facility has received partial support from The W.M. Keck Foundation for the development of biplanar videoradiography hardware and for support of the interdisciplinary collaborative development of XROMM software, the Rhode Island Hospital Orthopaedic Foundation, the Bushnell Research and Graduate Education Fund, the Instrument Development for Biological Sciences Program at the U.S. National Science Foundation and the Division of Biology and Medicine, the Office of the Vice President for Research at Brown University and the Provost’s Office, Brown University.

BioMed- Structural Biology
https://www.brown.edu/research/facilities/structural-biology/

Structural Biology: Laboratories for Molecular Medicine, 70 Ship Street. Structural Biology: Laboratories for Molecular Medicine, 70 Ship Street. The Structural Biology Facility is directed by two PhD-level scientists and managed by a PhD-level scientist and houses instruments for NMR spectroscopy and X-ray crystallography. The NMR instrumentation includes Bruker 500 MHz AVANCE II Ultrasound, Avance III HD 600 MHz NMR, and 850 MHz AVANCE III ASCEND spectrometers equipped with TCI HCN Z-gradient cryoprobes. The 850 MHz magnet additionally has a Nitrogen Liquefier extension and SampleMAIL automated delivery system for maximum ease of use. TXI HCN room-temperature probes are also available. Both spectrometers are operated by Linux workstations running TopSpin 3.1. For crystallographic research, the facility includes a Rigaku FR-E+ Superbright rotating anode X-ray generator. One side of the instrument is set up for single-crystal diffraction with a Saturn 944 HG CCD and an ACTOR robotic mounting system to allow for automatic screening of up to 80 crystals in a single run. The other side of the instrument includes a state-of-the-art BioSAXS-1000 system for collecting small-angle X-ray scattering data using a Pilatus detector. Linux workstations are available for crystallographic data reduction and structure determination (available programs include HKL-3000, CCP4,
CNS). This facility has received support from the Division of Biology and Medicine and the Provost's Office, Brown University.

**Chemistry - Electronics Shop**
https://www.brown.edu/academics/chemistry/about/facilities-services/electronics-shop

Chemistry Electronics Shop: The Electronics Workshop is utilized for repairing small electronic equipment and for custom design related to the department's research instrumentation.

**Chemistry - Machine Shop**
https://www.brown.edu/academics/chemistry/about/facilities-services/machine-shop

Chemistry Machine Shop: The Department of Chemistry offers a full-service fabrication Machine Shop in which two full-time machinists—with a combined industrial and academic experience of more than 60 years—fabricate specialized tools and equipment that support the department's cutting edge chemistry research. Utilizing the latest in computer aided design and precision manufacturing, staff work side-by-side with faculty and students to develop prototypes and custom-made parts. In addition to the fabrication of new equipment, the Machine Shop repairs and maintains scientific research equipment. There are over 15 machines available; for milling: one Birmingham 4-axis CNC bed mill, two Bridgeport 42 2-axis knee mills, and one Acra 55 2-axis knee mill. For lathing: one Clausing 17 swing, one Clark 14 swing, one Hendey 13 swing, one Clausing 11 swing. For grinding: one Okamoto surface grinder. For cutting: one Doall cutoff saw and one Doall 13 bandsaw. For drilling: one Deltra drill press. For welding: one Heliwelder 251 Tig welder, one Millermatic 212 Mig welder, and one Acetylene torch for brazing.

**Chemistry - Mass Spectrometry Facility**
https://www.brown.edu/academics/chemistry/about/facilities-services/mass-spectrometry-facility

Chemistry Mass Spectrometry Facility: The Mass Spectrometry Facility in the Chemistry Department provides support for the analysis of a wide range of molecules using mass spectrometry based techniques, including a suite of modern instrumentation. The facility maintains two GC-MS (Agilent 5973N and Agilent 5977A), three LC-MS (Agilent 6530, Thermo LCQ Deca XP Max, Thermo LXQ linear ion trap), Bruker autoflex MALDI-TOF Bruker autoflex MALDI-TOF, and a stand-alone HPLC system (Agilent 1260 Infinite LC). The mass spectrometers offer electron impact (EI), electrospray (ESI), atmospheric chemical ionization (APCI), and matrix assisted laser desorption ionization (MALDI) ionization modes that cover a variety of analytes of interest. Available software resources include instrument control and data analysis programs Xcalibur, MassHunter, ChemStation, SpectrumMill, Bioworks/Sequest. Routine mass spectrometric measurements performed in the facility include HRMS molecular formula confirmation, structural elucidation by MSn tandem mass spectrometry, qualitative as well as quantitative analysis of small molecules: synthetic intermediates, natural products, metabolites, and organometallics. For macromolecules, we offer mass analysis of synthetic polymers, peptides and purified intact recombinant proteins and synthetic oligonucleotides.

**Chemistry - NMR Facility**
https://www.brown.edu/academics/chemistry/about/facilities-services/nmr-facility

Chemistry NMR Facility: The Chemistry NMR facility has two locations: the GeoChem Building, 156 George St, and the MacMillan Building, 167 Thayer St. These two locations contain four Bruker high field NMR spectrometers and two Bruker data processing stations: a ZEUS GC410 - 400 MHz with z-BBO probe; an ARTEMIS GC410 - 400 MHz with z-BBFO probe; a CRONUS GC410 - 600 MHz with z-BBFO probe; an ARIES MM315 - 300 MHz with z-BBi probe; a HELIOS GC410 Processing Station; and a Caerus GC410 Processing Station. In addition, a 10ul Capillary NMR Probe and a 5mm z-TXI are available for the 400MHz spectrometers and can be installed upon request. A 600 MHz z-BBO that can lock on 19F on the 1H channel, and observe 2H on the BB channel, as well as a z-TXI probe are available for the 600 MHz Spectrometer.

**Chemistry - Research Facilities**
https://www.brown.edu/academics/chemistry/about/facilities-services
Chemistry Research Facilities: The Chemistry Department is located in the Geology-Chemistry Research Building (GeoChem), housing both the Departments of Chemistry and Earth, Environmental, and Planetary Sciences. The Chemistry Department facilities include fully equipped research laboratories, dedicated laboratories for NMR and Mass Spectrometry, radioisotope use, fully staffed chemistry stockroom, machine shop, and an electronics workshop, as well as classrooms and office space. W. Duncan MacMillan Hall, directly attached to the GeoChem research facility, houses state-of-the-art teaching labs for chemistry, geology, and environmental sciences, as well as two lecture auditoriums.

DEEPS - Climate& Environmental Facilities

DEEPS Climate & Environment Facilities: Analytical facilities of the Climate & Environment group include top-notch facilities for mass spectrometry, organic and inorganic geochemistry, and sedimentology. Instrumentation and facilities include: Mass Spectrometry, field and laboratory equipment for lake sediment and soil sampling, coring and analysis; Brown Global Foraminifer and North American pollen databases; gas isotope ratio mass spectrometers for carbonate and organic samples; gas chromatograph-mass spectrometers; accelerated solvent extractors for organic samples; CHNS analyzers; X-ray fluorescence analysis facility; Jobin ICP-ES; particle size counter, estuarine oceanography equipment. Planetary studies: RELAB spectroscopy database of spectra of lunar and meteoritic materials; visible to mid-IR spectroscopy (multiuser facility supported by NASA); NASA Planetary Data Center, including image data from all major planetary missions; image-processing laboratories. Data and Software include the Arand Software Package, Brown Foraminiferal Database, Match 2.3.1 - Dynamic Programming Software, Bermuda Foram Data, Modern Analog Technique (MAT) package, NEMPID database James W. Bradley, editor, version 1.1, April, 2001), fr: Newby et al., QSR 24 (2005).

DEEPS - Geochemistry/Mineralogy/Petrology Facilities
https://www.brown.edu/academics/earth-environmental-planetary-sciences/research-areas/geochemistrymineralogypetrology-gmp/gmp-facilities

DEEPS Geochemistry/Mineralogy/Petrology (GMP) Facilities: The geochemistry laboratories are well equipped for the application of chemical and particularly isotopic techniques to the solution of geologic problems. Equipment includes: automated mass spectrometers capable of analyzing both light and heavy elements, including O, C, Rb-Sr, Sm-Nd and U-Th-Pb, and all the necessary chemical and vacuum equipment to support mass spectrometer operations; a clean laboratory for the preparation of samples for isotopic analysis, including bombs and abraders for U-Pb zircon, monazite and sphene analyses; pressure vessels for experimental research, capable of operating continuously up to 1200°C and 3000 bars pressure; modern petrographic and binocular microscopes with conventional and digital photographic attachments; the usual ancillary gear used in mineral separation and sample preparation.

The thermal ionization mass spectrometer is an automated Finnigan-MAT 261 multicollector with 6 Faraday cups and an axial secondary electron multiplier (SEM), permitting simultaneous SEM/Faraday analysis of radiogenic Pb. There is also ready access to a Cameca electron microprobe and an XRF spectrometer for major and minor element analysis, both housed in the Department, and Cameca IMS-3f and Cameca 1270 ion microprobe microanalyzers housed at the Woods Hole Oceanographic Institution.

The facilities used by the experimental petrology/volcanology group include two experimental laboratories with numerous hydrothermal pressure vessels (Cold seal Rene and TZM), a 14 kb internally heated pressure vessel, two piston-cylinder vessels, and sample preparation equipment. Analytical facilities include a CAMECA SX-100 electron microprobe, an XRF spectrometer for analysis of major and trace elements. There is a new FTIR spectrometer in the Department.

DEEPS - Geophysics Facilities
https://www.brown.edu/academics/earth-environmental-planetary-sciences/research-areas/solid-earth-dynamics-research/solid-earth-dynamics-facilities
DEEPS Geophysics Facilities: Brown is well equipped for experimental studies. The high-pressure, high-temperature experimental rock deformation laboratory has three Griggs-type piston-cylinder apparatus designed for conducting experiments at temperatures up to 1200°C, pressures up to 1500 MPa, and time durations up to several months. This allows study of the deformation mechanisms and rheology of rock samples at conditions including those of the entire crust and upper mantle.

The lab also has a unique high-pressure rotary-shear apparatus capable of doing rock friction experiments to arbitrarily high displacements and torsion of solid samples to arbitrarily high shear strains. This machine uses gas as the confining medium, has a flow-through pore-pressure system, features internal measurement of displacement, torque, and axial load, and is interfaced to a UNIX computer for digital data acquisition and control. Consequently it can measure the mechanical properties of rocks and minerals with unusually high precision. The laboratory also has facilities for coring, sawing and grinding of experimental samples and for petrographic examination of the deformed samples. The Department has a thin-section lab and technician, a machine shop and machinist. A nearby central facility houses modern scanning and transmission electron microscopes.

Brown is also well equipped for theoretical and field studies. Computer facilities include many high-end work stations, a departmental parallel computing facility, a variety of printers and access to the powerful campus parallel computing and visualization resources. All the computers are networked for high-speed communication as well as internet connection with supercomputer centers across the country. Equipment for field studies includes surveying equipment and both a portable rock saw with diamond blade and a portable diamond core drill.

**DEEPS - Mass Spectrometer Analytical Facility**
[https://www.brown.edu/research/facilities/mass-spectrometer/](https://www.brown.edu/research/facilities/mass-spectrometer/)

Mass Spectrometer Analytical Facility: The Mass Spectrometer Analytical Facility is a part of the Department of Earth, Environmental and Planetary Sciences, Brown University and is located in GeoChem building room GC-040 and GC-015. The facility houses a Thermo Scientific Neptune Plus multicollector ICP-MS, a Thermo Scientific X-series-2 ICP-MS, a Photon-Machines Analyte G2 laser ablation, a trace-metal free clean lab built by Pico Trace, and a Cameca SX-100 electron microprobe. This state-of-the-art facility invites users from around the globe who have diverse research interests. The mission of this facility is to help scientists with their cutting edge research. Our goal is to provide most precise and accurate isotopic compositions and trace element abundances for geological, biological, environmental and material research, as well as other related research fields. This facility could be available to establish and develop new analytical method as well as routine analysis through possible collaboration.

**IMNI - Electron Microscopy**

Electron Microscopy Facility: The Electron Microscopy Facility occupies more than 3,000 square feet of space and was designed to house a suite of electron microscopes and, as such, each room has the power, cooling water supply, and HVAC necessary to run a modern microscope. These rooms have been mapped for stray fields and, being in the basement, are well isolated from vibration. The laboratory currently consists of five instruments. The FEI CM20 is available for applications that require high tilt, moderate resolution (0.23 nm). The FEI Helios - FIB is fully equipped for (near) simultaneous ion/electron beam imaging and patterning of specimens. The JSM-845 is a tungsten filament SEM, with a specimen chamber that can accept larger samples and is capable of 4.0 nm resolution at 25 kV. The 2100F is a 200 kV, field emission source, high resolution/analytical S(TEM) capable of 0.10 nm lattice resolution. The LEO 1530 VP ultra-high resolution field emitter SEM that allows for a resolution of 1 nm at a voltage of 20 kV in high vacuum and 2 nm at 30 kV in the variable pressure mode.

**IMNI - Microelectronics Facility**
[https://www.brown.edu/research/institute-molecular-nanoscale-innovation/CoreFacilities/MicroelectronicsFacility](https://www.brown.edu/research/institute-molecular-nanoscale-innovation/CoreFacilities/MicroelectronicsFacility)
Microelectronics Facility: The Microelectronics Core Facility is housed in approximately 1000 square feet of Class 100 cleanroom with an additional Class 100 cleanroom for photolithography, and it provides the necessary fabrication and characterization resources for research into modern device technologies, including electronics, microfluidics, and photonics. Run on a user fee basis, it provides the primary fabrication support for faculty and students in Engineering and Physics studying nanostructures and advanced devices, as well as technological services to colleagues in other departments at Brown, to local industry and to researchers from other academic institutions. The laboratory currently consists of over 16 instruments. Lithography equipment: Karl Suss MJB-3 Mask Aligner, Newport-Oriel flexible Mylar-Mask Lithography System, Photoresist Spinner, Wet Chemistry Hoods. Thin Film Deposition equipment: Electron Beam Evaporator, Atomic Layer Deposition System, Lesker Lab 18, LPCVD Tool, PlasmaTherm. Plasma Etching equipment: Trion Technology Minilock II, PlasmaTherm, SPTS LPX (Inductively Coupled Plasma RIE System). Furnaces: Dopant, LPCVD Si Deposition Furnaces for 2 Substrates, Wet Oxide and Dry Oxide. Characterization tools: Dektak Profilometer, Rudolph Ellipsometer. Other tools: Wet Chemistry Workbenches, Wire Bonder.

IMNI - NanoTools Facility
https://www.brown.edu/research/institute-molecular-nanoscale-innovation/CoreFacilities/nanotools-facility

NanoTools Facility: The NanoTools Facility comprises sophisticated characterization instrumentation, and it serves the research and teaching needs of faculty, researchers, and students in the physical and biological sciences at Brown University. It is also available for use by outside academic and industry users. The current NanoTools laboratory currently features six state-of-the-art instruments. Bruker D8 Discovery 2D X-ray Diffractometer, with Vantec 500 2D area detector and LinxEye (0D, 1D) detectors for analysis; Bruker D8 Discovery High resolution X-ray Diffractometer, which includes a line source configuration system with a LinxEye (0D, 1D) detector and a Scintillator detector; Asylum MFP-3D Origin Atomic Force Microscope; Witec Alpha 300 Confocal Raman Microscope with additional Ray Shield coupler; Bruker EMX Premium-X Electron Paramagnetic Resonance (EPR) Spectrometer; Park Scientific XE-Bio Atomic Force Microscopy (AFM) and Scanning Ion Conductance Microscopy (SICM).

Physics - Ladd Observatory
http://www.brown.edu/Departments/Physics/Ladd/

Ladd Observatory: The historic Ladd Observatory opened in 1891 under the direction of Professor Winslow Upton, and a regular program of transit observations and timekeeping was started in 1893. The Observatory is open to the public for telescope viewing on Tuesday evenings, weather permitting. The Ladd Observatory houses a 12 refracting telescope with a lens made by John A. Brashear of Pittsburgh following the lens design of Prof. Charles S. Hastings of Yale University. The equatorial mounting and mechanical clock drive were made by George N. Saejmüller of Washington D.C. The telescope is equipped with a filar micrometer, spectroscope, and other attachments. There are also transit telescopes, precision pendulum clocks, chronometers, and various minor instruments with historic value located at the Observatory. Today, in addition to the main telescope, the Observatory features a Boltek StormTracker, a Unihedron SQM-LE Sky Brightness Meter, and a nighttime Sky Camera. The Sky Camera camera system used at the Ladd Observatory was manufactured by Santa Barbara Instrument Group. It includes a weatherproof housing with a window that is heated to prevent condensation. The window is an optical filter that transmits light from 630 - 1000 nm (red to near infrared) and is used to block light pollution. Inside is an ST-402ME digital imaging camera which uses a monochrome 16 bit per pixel Kodak KAF-0402ME CCD chip with 9 micron pixel size. The camera body is mated to a Computar fisheye lens that gives a wide-angle view of the sky. It has a 2.6mm focal length and a 1.6 focal ratio. The field of view is about 140 x 90 degrees.

DIVERSITY PROGRAMS

Brown Graduate School Diversity Commitment
https://www.brown.edu/academics/gradschool/diversity-0

Graduate School Diversity Commitment: The Graduate School is committed to fostering a welcoming and inclusive academic community and educating and training a distinguished and diverse cohort of master’s and doctoral students, as well as postdoctoral researchers. Exposure to a broad range of perspectives, views, and
outlooks is key to fostering both breadth and depth in intellectual knowledge. At Brown, the term diversity is used in the broadest sense to encompass many things such as race, color, religion, age, national and ethnicity origin, disability, status as a veteran, language, socio-economic background, sex, sexual orientation, gender identity, gender expression, political ideology, theoretical approach, and the list can go on. It is through the interaction among individuals from a diverse set of experiences, histories, and backgrounds that true intellectual diversity is achieved. The University’s Office of Institutional Diversity and Inclusion provides leadership for the formulation and oversight of University policies related to pluralism and equity, and initiates programs and practices that promote diversity, inclusion, and fair treatment of all members of the community. The University designates officers who are responsible for issues of compliance and who are available to answer questions and provide advice.

Diversity Fellowships were created in early 2017, as part of the University and Graduate School Diversity and Inclusion Action Plans (DIAPs), for admission beginning in 2017-18. These fellowships are intended to diversify doctoral programs, with priority given to students from historically underrepresented groups. Diversity Fellowships are for top admitted doctoral candidates from across the disciplines, who receive enhanced stipends for three years and a one-time $1,000 research account.

The Graduate School works closely with the Leadership Alliance to identify potential graduate program applicants among the pool of undergraduate students who are conducting research at Brown for eight weeks during the summer. Similarly, the Graduate School works in close partnership with students from Tougaloo College who spend time at Brown throughout the year while participating in various aspects of Brown-Tougaloo Partnership programming. The Graduate School also recruits at various annual meetings and conferences around the country.

Recruiting and Admission: The Graduate School actively recruits students who are and have been traditionally underrepresented in graduate education, including but not limited to underrepresented racial and ethnic minorities, women, and people with disabilities. The associate dean for diversity initiatives works in partnership with individual departments and programs at Brown and cultivates relationships with Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions (MSIs). The Graduate School works closely with the Leadership Alliance to identify potential graduate program applicants among the pool of undergraduate students who are conducting research at Brown for eight weeks during the summer. Similarly, the Graduate School works in close partnership with students from Tougaloo College who spend time at Brown throughout the year while participating in various aspects of Brown-Tougaloo Partnership programming. The Graduate School also recruits at various annual meetings and conferences around the country.

Every spring, the Graduate School invites newly admitted underrepresented minority students to attend a one-day campus visit called Super Monday. Throughout the day, students are exposed to various aspects of graduate student life at Brown through interaction with faculty, staff and students from their prospective departments, deans of the Graduate School, and representatives from various centers and offices on campus. The day ends with a reception and dinner, which is attended by matriculating graduate students, faculty, and staff of color from across the campus. The Graduate School covers the costs associated with prospective students’ transportation to and from Providence and overnight accommodations for this event.

Retention and Advancement: The Graduate School sponsors Multicultural Graduate Student (MGS) events for underrepresented minority students, including dinners with invited guest speakers, academic achievement and cultural celebrations, and social-networking activities. The Graduate School provides assistance to a variety of student associations and clubs that represent Brown’s diverse graduate student population. In addition, the University offers individual and group support to students who identify as Lesbian, Gay, Bisexual, Transgender, and Queer/Questioning (LGBTQ).

Program Review: Diversity is one of several criteria used by the Graduate School to assess the performance of graduate programs.

Brown Pathways to Diversity and Inclusion: An Action Plan (DIAP)
https://www.brown.edu/about/administration/institutional-diversity/pathways
Brown Pathways to Diversity and Inclusion: An Action Plan (DIAP). Brown University is engaged in the work of creating a more diverse and inclusive academic community, as evidenced by Pathways to Diversity and Inclusion: An Action Plan for Brown University . This plan formalizes and expands upon diversity and inclusion efforts articulated in Brown’s Building on Distinction strategic plan. The Graduate School is represented on the Diversity and Inclusion Action Plan (DIAP) Implementation Working Group.

**Initiative to Maximize Student Development (IMSD)**
https://www.brown.edu/initiatives/maximize-student-development/

Initiative to Maximize Student Development (IMSD): Brown University is dedicated to ensuring a diverse and inclusive scholarly community. Brown’s IMSD is a research training initiative funded by a grant R25GM083270 from the National Institute of General Medical Sciences of the National Institutes of Health from April 2008 – March 2022. The program has significantly increased the diversity of doctoral students in the life sciences and supported enhanced academic achievement among the students it serves. This recently renewed $3.3 million award will extend IMSD’s reach to the physical sciences, engineering and mathematics departments. The program will now support up to 20 doctoral students a year in 21 programs instead of just eight students in the Division of Biology and Medicine and the School of Public Health. The goal of the IMSD is to increase the number of underrepresented students who complete PhD degrees in biomedical research. Participants are identified from matriculants in the PhD programs. Participants receive a generous 12-month stipend and benefits, full tuition, health insurance and health fee. In addition, trainees are eligible to receive travel funding support to present their research at scientific meetings.

The program strives for Excellence, Community and Collaboration. IMSD provides a personalized, multi-dimensional training experience that features 1) Continuous-to-degree advising, 2) Cutting edge research experience 3) Skill-based training modules to complement curriculum 4) Strong peer network and mentoring 5) Professional development and career planning. IMSD Workshop topics include: Demystifying the PhD Experience: Strategies for Academic & Personal Success in Graduate School ; Reading Scientific Publications ; Managing and Sharing Your Research Data ; Essential Laboratory Calculations ; Navigating a Successful Graduate Career: Professionalism & Etiquette ; Professionalism & Career Development: Preparing for the Postdoc Experience Graphic Presentation of Scientific Data ; Beyond the Hypothesis: Experimental Design and Critical Analysis, Designing and Delivering Scientific Presentations; Defending Your Research Proposal and Critiquing Those of Others ; Resources, Tools and Basic Techniques in Molecular Biology ; Scientific Writing: Key Principles ; and Introduction to Statistical Analysis of Data

**Office - Institutional Diversity and Inclusion (OIDI)**
https://www.brown.edu/about/administration/institutional-diversity/about

The Office of Institutional Diversity and Inclusion (OIDI): The Office of Institutional Diversity and Inclusion (OIDI) serves as a critical leader, resource and support in promoting and sustaining more inclusive and diverse learning and working environments at all levels at Brown. OIDI supports Brown’s goals related to equal opportunity, diversity and inclusion through:

Compliance: OIDI oversees compliance with University policies and procedures and with federal, state and local laws related to discrimination and harassment (Title VI), sexual and gender-based harassment and violence (Title IX), equal employment opportunity and affirmative action (EEO/AA), and disabilities resources and accommodations (ADA).

Accountability: OIDI monitors and measures progress of Brown University’s Diversity and Inclusion Action Plan (DIAP) and the Departmental DIAPs, produces an Annual Report for the DIAP, and supports the activities of the Diversity and Inclusion Oversight Board and the President’s Advisory Council on Diversity.

Fostering Academic Diversity: OIDI supports academic and administrative units with their efforts to recruit a diverse faculty and staff by providing training and assistance to search committees as they develop diverse pools of candidates. OIDI also supports the development, implementation and assessment of professional development and mentoring initiatives for faculty, staff and students from historically underrepresented groups.
Promoting Diversity and Inclusion: OIDI collaborates with offices across Brown to design, implement and promote programs and events related to diversity and inclusion.

**Student Groups**
[https://www.brown.edu/life-brown/student-organizations](https://www.brown.edu/life-brown/student-organizations)

With more than 400 student organizations, Brown lets students discover new passions and find people who share interests.

**EDUCATION AND MENTORING RESOURCES**

*BioMed Faculty Administration (BMFA)*
[https://www.brown.edu/about/administration/biomed/faculty-affairs/](https://www.brown.edu/about/administration/biomed/faculty-affairs/)

BioMed Faculty Administration supports more than 2,000 faculty in the Division of Biology and Medicine in their teaching, research, clinical, and administrative roles. BMFA facilitates the recruitment, appointment, retention, and promotion of faculty members across 6 campus-based departments and 14 clinical departments in 7 hospitals. BMFA sponsors educational and mentoring programs such as grant writing, promotion, and peer mentoring workshops. BMFA manages faculty data and provides reporting to both internal partners and external organizations and works collaboratively to insure that BioMed's policies and practices are consistent with University goals.

CareerLAB assists graduate students with their professional development, including career exploration as well as job search skills, CV and resume development, cover letter development and interview preparation. Confidential career advising sessions are available with trained advisors familiar with graduate student career issues in both academic and non-academic career fields.

CareerLAB works in collaboration with departments across campus to connect students with Brown’s rich array of career resources. CareerLAB helps students identify their skills, interests and values; explore a wide range of career options; and articulate their unique experiences to employers and graduate or professional programs. Through CareerLAB students can connect with knowledgeable advisors to develop personal career search plans; develop skills and knowledge necessary for successful job and internship searches; meet alumni and find internships through the BrownConnect program; access hundreds of high-quality job and internship opportunities; and apply for internship funding.

**Leadership Alliance**
[https://www.brown.edu/initiatives/summer-research-early-identification-program/](https://www.brown.edu/initiatives/summer-research-early-identification-program/)

Leadership Alliance: The Brown Leadership Alliance Summer Research Early Identification Program (SR-EIP) offers up to 35 undergraduates each summer a paid research internship with a faculty mentor. Research opportunities are available in the following areas: life sciences, physical sciences, humanities and social sciences, engineering, computer science, and applied mathematics. Immersed in an intellectually stimulating and challenging environment, students work closely with a faculty advisor on the university’s main campus or in one of the hospitals affiliated with the Warren Alpert Medical School at Brown University. In addition to this one-on-one collaboration, all participants present their research at the annual Leadership Alliance National
Symposium and learn about the graduate school experience through conversations with Brown graduate students, postdocs and the Graduate School deans. Participants in the Brown SR-EIP receive a competitive stipend, a single room in an apartment in a Brown residence hall, and reimbursement for round-trip travel to Brown. There is a common kitchen in the residence hall. All Brown SR-EIP students live together in a building within a short walking distance of the main campus green, and easily accessible to shopping and transportation services.

LinkedIn Learning
https://it.brown.edu/services/type/lynda

LinkedIn Learning (formerly Lynda.com) provides thousands of self-paced courses on technology, software, and business topics. Employees have access to full course content and example files, and you can track your progress and print completion certificates. Pairing with a LinkedIn account is an optional step with the benefit of personalized recommendations.

RCR - BioMed Responsible Conduct of Research
https://www.brown.edu/about/administration/biomed/graduate-postdoctoral-studies/responsible-conduct-research-rcr

Training for Predoctoral and Postdoctoral Trainees
The Ethics of Responsible Conduct in Research: All first-year graduate students in the Division are required to successfully complete The Ethics of Responsible Conduct in Research. It is also recommended that newly hired postdoctoral trainees participate in this training.

This seven-week introduction to the scope and complexity of ethical situations that confront modern biologists is led by the Division's Associate Dean for Graduate & Postdoctoral Studies and taught by BioMed Division faculty. This training covers multiple topics including: i) the context and history of ethical research practices within scholarship; ii) the peer review process and its purpose; iii) data acquisition, storage, and privacy; iv) legal and ethical considerations in animal research; v) publication practices and responsible authorship; vi) practical and ethical issues in human-subjects research; vii) the mentoring relationship and associated responsibilities of mentors and trainees; viii) recognizing and navigating conflicts of interest and research misconduct; ix) electronic data management issues; x) copyright and intellectual property issues; xi) individual development plans (IDP); and xii) rigor and reproducibility of data. Discussion of the ethics of diversity is incorporated throughout to convey an appreciation for the fact that differences of race, culture, age, gender, (dis)ability, and religion can affect the conduct and interpretation of research.

The training includes presentations, short illustrative films specific to biomedical research issues, and small group discussion of hypothetical and real scenarios drawn from current literature, Office of Research Integrity (ORI) updates, and news media. Division faculty and University staff participate as presenters and discussants along with students. The emphasis is on dialog and the contextualization of ethical decision making in the biological sciences.

RCR training is conducted at the start of the academic year so that students and postdoctoral trainees are able to incorporate this important information into their coursework and early research experiences. To successfully complete the course, students must participate in all sessions, complete homework assignments, and score 75% or better on the final examination. Students and postdoctoral trainees receive certificates of completion and their Graduate Program Directors or primary mentor are notified, respectively. Students or postdoctoral trainees who do not successfully complete training must fulfill additional RCR assignments given by the Associate Dean for Graduate & Postdoctoral Studies. Students or postdoctoral trainees who miss a substantial portion of the classes, are required to re-take the course the following fall. This required introductory Division-wide training is a starting point for ongoing instruction by individual graduate programs, departments and faculty mentors, who are urged to stimulate dialogue regarding ethical conduct in science as relevant situations arise in research projects or the laboratory.

Research Integrity Series for Junior Faculty: Co-sponsored by the Advance-CTR the BioMed Office of Graduate and Postdoctoral Studies is rolling out a Research Integrity Series as part of Brown's Responsible Conduct of
Research (RCR) training available to all junior faculty. The goal of this series is to provide attendees with the opportunity to review and discuss the most current and pressing matters related to research integrity and scientific misconduct with senior faculty and experts in the field. Sessions will be held monthly from 3:30 - 5 pm covering topics such as Rigor & Reproducibility, Mentorship, Data, Collaborations, Policy and Running a Lab. Sessions will alternate between Brown's main campus and Rhode Island Hospital. Registration to receive more information can be found here.

RCR Refresher Training: The Office of Graduate and Postdoctoral Studies offers refresher training for postdoctoral researchers and fourth-year predoctoral students in the Division of Biology and Medicine that satisfies the National Institutes of Health (NIH) and National Science Foundation (NSF) requirements for the Responsible Conduct of Research. The course comprises three in-person sessions lasting 3h each and is offered twice per academic year, once during the fall semester and once during the spring semester. To complete refresher training, trainees may attend all three sessions of a cycle OR participate in two sessions AND complete online Collaborative Institutional Training Initiative (CITI) training.

RCR - Brown Ethics and Responsible Conduct of Research (BEARCORE)
https://www.brown.edu/about/administration/biomed/graduate-postdoctoral-studies/responsible-conduct-research-rcr

The Brown Ethics And Responsible Conduct Of REsearch (BEARCORE) program is designed to educate early-career researchers and trainees from a variety of academic fields on how to conduct their scientific investigations responsibly and with integrity. BEARCORE is an in-person training program that may be supplemented by online instruction through the Collaborative Institutional Training Initiative (CITI). It is held each spring and fulfills NIH and NSF requirements.

Classes are taught by faculty members and Office of the Vice President for Research (OVPR) subject matter experts. Topics include:

- scientific rigor and reproducibility
- conflicts of interest and bias
- human-subjects and animal research
- mentor/mentee responsibilities and relationships
- collaborative research & export controls
- peer review
- data acquisition and laboratory tools
- research misconduct
- responsible authorship and publication
- the scientist as a responsible member of society
- fiscal responsibility in sponsored research

While BEARCORE is used primarily by trainees and new researchers to fulfill NIH and NSF RCR requirements, it is open to anyone in the Brown community. In sessions where spaces are limited, enrollment preference will be given to NIH/NSF trainees. Course requirements for researchers and trainees with NIH and NSF grants include attendance of all in-person sessions/lectures, participation in class discussions, and completion of pre-work and homework assignments. If you have questions about BEARCORE, please email Rebecca Haworth.

BEARCORE Refresher Course: The NIH requires that RCR training be completed at least once during each career stage (i.e., undergraduate, graduate, postdoctoral, and faculty levels), and at a frequency of no less than once every four years. NSF defers to each institution to determine the frequency of RCR training for its NSF-supported trainees, and Brown encourages NSF trainees to follow the same training frequency requirements as those enforced by NIH. Once you complete the in-person course of instruction to satisfy the initial RCR training requirement, you may then complete refresher courses to comply with the career stage requirement and/or the requirement to complete re-training no less than once every four years. To complete the BEARCORE Refresher Course, you must attend a minimum of 8 hours of in-person BEARCORE sessions of your choosing during the course offering.
EDUCATION PROGRAMS

Graduate Programs - Biology and Medicine
https://www.brown.edu/graduateprograms/biomed-biology-phd

Biology and Medicine Graduate Programs: Graduate study at Brown comprises more than 15 degree programs and varied opportunities in postdoctoral scholarship. Programs offer comprehensive course work leading to the Master of Science (ScM) and doctor of philosophy (PhD) degrees. There is also a joint MD/PhD program offered in conjunction with Alpert Medical School.

Master's Programs
- Biomedical Engineering
- Biotechnology
- Fifth-Year Master's Program - for current Brown undergrads.
- Pfizer Program

Doctoral Programs
- Biology
- Biomedical Engineering
- Biotechnology
- Computational Biology
- Ecology and Evolutionary Biology
- Molecular Biology, Cell Biology, and Biochemistry
- Molecular Pharmacology and Physiology
- Neuroscience
- Pathobiology

Academic Support Services for Graduate Students in the Division of Biology and Medicine: Training faculty in general have primary appointments in the Division of Biology and Medicine, in the University at-large, and in clinical departments. The Division’s Graduate Program is administered by the Associate Dean of Graduate and Postdoctoral Studies. All predoctoral students offered admission to graduate programs are guaranteed five years of financial support contingent upon making satisfactory progress toward the PhD degree. This support includes stipend, health insurance, and remission of tuition and fees. Support comes from a combination of resources including Division Fellowships, BIBS fellowships, Predoctoral Training Grants, Research Grants, Institutional Startup Funds, Teaching Assistantships and Individual Fellowships. About 25% of PhD students currently receive support from faculty generated research grants. A criteria of eligibility for more senior faculty to serve as a research mentor is available or pending external research funding.

Office of Graduate and Postdoctoral Studies within the Division of Biology and Medicine: Created in January 2006, the office focuses on and enhancing the training environment for the ~250 graduate students and 100 postdocs within the Division of Biology and Medicine. In creating this office, the Dean of Medicine and Biological Sciences committed to growth in the overall number of trainees and to increase the diversity of this group while enriching trainee preparation as scholars within the university setting and in their future career paths. The Associate Dean for Graduate and Postdoctoral Studies oversees admissions, recruitment, tracking, support, and professional development for students in all graduate programs. Graduate Programs within the Division of Biology and Medicine are primarily interdepartmental in structure. Predoctoral students benefit from this multidisciplinary training environment and strong extramural research funding base. Each Division Graduate Program has its own administrative offices, support staff, and dedicated space for students along with computer and internet access nearby faculty research laboratories. There are further student computer clusters and associated hardware (printers and scanners) and fully supported software at the Libraries and Computing and Information Services (CIS) center. Each student is assigned office space or desk space.

Graduate Programs - Brown University
https://www.brown.edu/academics/gradschool/about

7/31/2019
Graduate School offers 51 doctoral programs and 33 master’s programs, including those of the School of Engineering, the School of Public Health, and the School of Professional Studies.

Brown has a friendly scale and collaborative culture. With 2,600 graduate students and more than 700 full-time faculty members, Brown offers excellent academic training and mentoring within a supportive environment. The University is committed to creating a more diverse and inclusive academic community.

Graduate students may choose from a range of development opportunities, including:
1. Open Graduate Education program, providing flexibility for select doctoral students to define their academic journey and earn a secondary master’s degree of their choosing.
2. Doctoral certificates as well as Sheridan Center for Teaching and Learning certificates.
3. Global Mobility grants and Graduate School travel research funds, supporting graduate student scholarship.
4. Deans’ Faculty Fellowship Program, enabling advanced doctoral students to strengthen their teaching portfolios.
5. Interdisciplinary Opportunities for advanced doctoral students, allowing engagement in scholarly life at participating Centers and Institutes.
6. Both the Brown-Wheaton Faculty Fellowships and the Brown-Tougaloo Faculty Fellowships provide advanced teaching opportunities at a liberal arts and a rural college, respectively.
7. Brown Executive Scholars Training Program, preparing advanced master’s students and doctoral candidates for careers in higher education administration.
8. Effective Performance workshops, improving capacity as communicators for research and teaching

Graduate Programs - Public Health
https://www.brown.edu/academics/public-health/academics

Graduate Programs in Public Health

Master's Degrees
- Behavioral and Social Health Sciences
- Biostatistics
- Clinical and Translational Research
- Epidemiology
- Global Public Health

Doctoral Programs
- Behavioral and Social Health Sciences
- Biostatistics
- Epidemiology
- Health Services Research

Program - Biological Sciences
https://www.brown.edu/academics/biology/undergraduate-education/

Brown’s program in Undergraduate Biology arms students with the knowledge, skills, and collaborative spirit required to tackle some of society’s more pressing issues – from disease prevention to preserving Earth’s natural heritage.

Undergraduates in the Biological Sciences can choose from more than nine concentrations. Biology students take courses and pursue research with faculty spanning six departments within the Division of Biology and Medicine. Partnerships with departments outside of the Division support interdisciplinary concentrations in Applied Mathematics-Biology, Computational Biology, Biochemistry, Biophysics, and Biomedical Engineering.

The Program in Biology strives to place students in the role of the scientist. A growing number of first-year and sophomore seminars, lab-based, and field courses in Biology allow students to engage with learning material in innovative ways that promote independent thinking.
With support from the Howard Hughes Medical Institute, Biology is working with other programs on campus to use well-established teaching methods that broaden participation and increase retention in science, technology, engineering and math disciplines. Our goals are to bring authentic research projects into STEM courses, facilitate collaborative problem-solving in large introductory courses such as Genetics, and build learning communities within courses. Learn more about the Brown-HHMI Gateway STEM Course Initiative here.

More than half of students in Biology pursue independent research. Over one-third complete a senior thesis and graduate with honors. Many students study abroad, pursue internships off-campus, and work with clinical faculty in the Medical School. Over 50 percent of students in Biology pursue careers in the health sciences and work with Health Careers Advising to meet their goals. More than 20 percent of students in Biology pursue graduate studies, and others go into business, education, government and nonprofit sectors.

**Program - Liberal Medical Education**
[https://www.brown.edu/academics/medical/plme/prospective-students/prospective-students](https://www.brown.edu/academics/medical/plme/prospective-students/prospective-students)

Program in Liberal Medical Education: For approximately 50 strongly motivated freshmen, the Program in Liberal Medical Education (PLME) offers a unique opportunity to combine undergraduate education and professional studies in medicine into an eight-year program.

The PLME is an application of the Open Curriculum concept that has been so successful at the undergraduate level at Brown. It encourages students of medicine to pursue their varied interests (in humanities, social sciences, or natural sciences) in-depth even as they prepare for careers as physicians or medical scholars.

As undergraduates, PLME students may choose to work toward an AB or ScB degree in the sciences, or toward an AB in the humanities, social sciences or behavioral sciences. PLME students may choose any one of the nearly 100 departmental and interdepartmental concentration programs offered at the university.

Undergraduate years: The undergraduate experience is designed to best prepare students for the last four years of the program, which constitute the Medical School years and culminate in the MD degree.

During the undergraduate portion of the program, the summer period is free but may be used for independent study, elective coursework, or laboratory research. During the Medical School years, students may pursue, in parallel with the MD degree, an advanced degree in their area of interest (e.g., MPH, MD/PhD) or other professional development such as a Scholarly Concentration (See Advanced Scholarship).

The expected duration of the PLME is eight years. However, students may choose to take advantage of the Flex Plan and extend their program by one or two years. The Flex Plan offers undergraduates the option to defer their entry to the Medical School while they pursue opportunities in other fields such as education, research, public service, government, health care, and business.

**Program - Program in Innovation, Management and Entrepreneurship (PRIME)**
[https://www.brown.edu/academics/engineering/prime/](https://www.brown.edu/academics/engineering/prime/)

Program in Innovation, Management and Entrepreneurship (PRIME). PRIME students learn to use emerging science and technology as a basis for the creation of commercial value and new ventures. The program offers students a strong grounding in how to start and grow a technology-based business in a dynamic, competitive marketplace. PRIME students earn an ScM degree, a Masters of Science. Students from other PhD programs at Brown can earn a PRIME Master's degree alongside their program's PhD.

**Programs - Computational Biology**
[https://www.brown.edu/academics/computational-molecular-biology/courses-study](https://www.brown.edu/academics/computational-molecular-biology/courses-study)

Computational biology involves the analysis and discovery of biological phenomena using computational tools, and the algorithmic design and analysis of such tools. The field is widely defined and includes foundations in computer science, applied mathematics, statistics, biochemistry, molecular biology, genetics, ecology, evolution, anatomy, neuroscience, and visualization.
The Ph.D. program is interdepartmental and the result of a collaboration between the four academic units that comprise the CCMB: Applied Mathematics, Computer Science, Ecology & Evolutionary Biology, and Molecular Biology, Cell Biology & Biochemistry.

The Undergraduate program offers three possible specializations in Computational Biology: Computer Sciences, Biological Sciences, and Applied Mathematics & Statistics. The program requires a senior capstone experience that pairs students and faculty in creative research collaborations.

EDUCATION TECHNOLOGY RESOURCES

Center - Digital Scholarship
https://library.brown.edu/create/cds/

The Center for Digital Scholarship (CDS) performs and promotes the use of digital technology in a scholarly context. Their areas of expertise consist of the following: data management planning, data visualization, digital publishing, archiving, and preservation, digital research project consulting, design and implementation, GIS and mapping, textual and quantitative analysis, visual design and user-interface development, digital spaces in the library.

CIS Academic Technology
https://it.brown.edu/services/type/academic-technology-training-workshops

Brown University’s CIS Academic Technology Group is comprised of several units including the Instructional Technology Group, Media Services, and the Multimedia Labs. These groups provide support and expertise for media production, classroom design & technology, and digital tools for teaching & learning.

Digital Scholarship Lab (DSL)
https://library.brown.edu/dsl/

Scholarship Lab (DSL). The DSL is a digital space in the Brown Rockefeller Library, designed specifically for collaboration, flexibility, and ease of use for scholars working on data-rich and visually-mediated research. It offers a collaborative, flexible, and easy-to-use space for digital projects and allows access to large LED display with multiple inputs for presenting data-rich and visually-mediated research. The lab features:

A 7×16-foot display wall: One side of the lab is occupied by a beautiful large-scale, high resolution video wall comprised of twelve 55-inch high resolution LED screens. The total size is 7,680 pixels across by 3,240 pixels down for a total of over 24 million pixels. This display is perfect for viewing high resolution images in detail, or viewing many images side-by-side for comparison.

Multiple video inputs: There are 14 video inputs throughout the room. Anywhere between one and 12 of those inputs can be displayed on the wall simultaneously, in a variety of configurations. Being able to easily change the layout of the wall means that the room is conducive to a variety of presentation styles, and that one can seamlessly move between modes of use: from a single input for presenting one person’s work to an audience, to 2 inputs for visual comparison, or many more inputs to collectively and collaboratively look at a team's work.

Portable touch-enabled 50-inch monitors: two large portable monitors on carts that can be moved around the room. The portable monitors allow for small group breakouts.

Videoconferencing: The lab contains two high-definition wall-mounted cameras that can be panned and zoomed by remote control. The DSL has full videoconferencing capabilities for bringing in remote speakers or teleconferencing.

Completely reconfigurable furniture: The lab is equipped with seating and tables, and all furniture is on wheels. Table seating accommodates up to 20, with additional seating for up to 45. The DSL can be converted from a lecture hall to a team project room to a seminar room within minutes.
Digital Teaching and Learning
https://www.brown.edu/academics/digital-teaching-learning/

Digital Teaching and Learning: Brown University has made significant strides in expanding its reach into the realms of digitally enabled and supported teaching and learning. Guidance and support for current and future experimentation by faculty in new modes of education come from the Dean of the College, Sheridan Center, School of Professional Studies, Computing and Information Services, University Library, Office of the Provost, and faculty members. Representatives from these offices comprise the Provost’s Steering Committee for Digital Teaching and Learning, charged to assist the Provost in articulating an overarching vision and putting into action a progressive plan for supporting digital education at Brown, and ensuring that the associated efforts align with the University’s mission, values, and operational requirements.

Instructional Technology Group (ITG)
https://blogs.brown.edu/itg/

The Instructional Technology Group’s Teaching Lab allows instructors to investigate new technologies and teaching strategies with reconfigurable space, writable walls, wireless projectors, class recording and help from ITG. It is designed to investigate how instructional space and new technologies interact with teaching and learning strategies. The space offers dry-erase wall surfaces, multiple wireless projectors, touch-screen tablet computers for instructors, and class recording/web conferencing capabilities. Both wireless projectors display directly onto writable walls so the instructor can annotate digital presentations with dry-erase markers. Wireless digital annotation of presentations is also supported. The Instructional Technology Group supports teaching and learning through researching and promoting new technologies and providing consultations on effective pedagogical practices.

Library - Teaching and Research
https://library.brown.edu/

The Brown University Library provides teaching and research-related services and develops library collections in your research and teaching specialties. Workshops in a variety of areas such as personal information databases, citation, copyright, plagiarism, finding and using images, social science data and tools, and working with data are designed to support your research and teaching, as well as student learning. Additionally to support student research skills, the Library develops customized disciplinary and course resource guides, manages the course reserve system (OCRA), and provides class and one-on-one research skills instruction.

Multimedia Labs
https://it.brown.edu/services/type/multimedia-labs

Multimedia Labs. The Multimedia Labs are multi-computer teaching facilities dedicated to integrating creative technology with teaching and learning, featuring animation stations, scanners, MIDI keyboards, and pen-tablet displays. They provide software, equipment and support to produce web, software development, graphics, video, animation, 3D fabrication and sound.

Online Learning and Innovation Team
https://brown.edu/academics/professional/onlinelearning/

Online Instructional Design Resources: The Online Team at Brown’s School of Professional Studies (SPS) is responsible for the design, development, delivery, and facilitation of online and blended courses within three program areas at SPS: Executive and Professional, Undergraduate, and Pre-College. The team also collaborates with colleagues across Brown’s campus and at other peer institutions to advance online teaching and learning initiatives.

Rockefeller Digital Studio
https://library.brown.edu/create/digitalstudio/
Rockefeller Digital Studio: The Sidney E. Frank Digital Studio provides a unique and exciting intellectual hub for digitally enhanced scholarship at Brown University. The Digital Studio facilitates both short-term and extended engagements with academic questions that benefit from the infusion of technology and new methodologies in research and learning. This 4,500-square-foot space in the Rockefeller Library welcomes scholars at all levels into conversations and result-driven actions, whether they have come to consult on the content and design of digital projects, model or analyze data, create prototyped or finished multimedia presentations, learn a new tool, or explore the integration of traditional resources into novel forms of research and scholarship. Expert staff from Center for Digital Scholarship and around the Library assist students and researchers across the disciplines in digital imaging, iterative project design and implementation, copyright and fair use, data curation and management, archiving and repository services, digital scholarship methodologies and practices, as well as the delivery and dissemination of digital content.

LIBRARY RESOURCES

Library - Brown Comprehensive
https://library.brown.edu/

Brown University Library: The Brown Library is located in five separate facilities, contains over 3.8 million items and adds 60,000 more each year. The Library subscribes to well over 500,000 electronic books in many subjects. Most are available in large collections that can be searched through the publisher's interface; all are individually cataloged. In addition to the collections to which the Library subscribes, several publically available e-book collections are listed. The Sciences Library contains biological and medical serials. The Library is a member of the Center for Research Libraries and the Research Libraries Group, which provides free interlibrary loan services, photocopying of articles, and access to cooperating research libraries. Each of the participating hospitals within the Department of Medicine maintains a specialized library.

Licensed Electronic Resources: The Library subscribes to hundreds of online databases and tens of thousands of e-journals, online newspapers, and e-books. These resources are available to current members of the Brown community from anywhere in the world. Brown authentication is required. See: off-campus access.

Special Collections: The Library holds more than 250 named collections with rich research potential. These collections are not fully cataloged in Josiah, but are described in Collections A-Z. Most of the listed collections are located in the John Hay Library. The Library's Center for Digital Scholarship conducts a systematic program to digitize the Library's renowned signature collections.

Researchers at Brown (VIVO): The Library, along with colleagues in Computing and Information Services (CIS) and the offices of the Dean of the Faculty and the Vice President for Research, launched a new, campus-wide service that offers Brown faculty an online platform for sharing their research, publications, and professional work with the Brown community and the world at-large. The service, called Researchers@Brown, is derived from VIVO software, which was developed in recent years by Cornell University, the University of Florida, and a number of other academic partners. VIVO is based on semantic web technology, which provides capabilities for linking concepts, subjects, people, and organizations across institutional boundaries. While Brown's VIVO implementation is in its early days, it positions the work of Brown researchers to be discoverable and accessible in a variety of new ways and helps highlight the unique expertise of Brown faculty in the broader academic landscape. Researchers@Brown profiles have been created for all regular faculty at the University. Their profiles include biographies, research interests, educational background, publications, and professional activity. Faculty members can manage their own profiles or can assign a delegate to update them. On a rolling basis throughout 2014 and beyond, the Library will continue to enhance and refine the system by structuring bibliographic data to enhance the discoverability of faculty publication data and by offering more automated tools for harvesting faculty publications from resources such as PubMed and Web of Science. The potential of Researchers@Brown to highlight and share Brown's intellectual productivity will be most effectively realized by linking researchers' profiles to related resources on the web. To help with that, the Library has subscribed to ORCID (Open Researcher and Contributor ID). ORCID allows researchers to create unique, personal semantic web identifiers that they can embed within their journal submissions, web sites, and social media profiles as well as within the
Researchers@Brown system. By establishing links between these outlets, Researchers@Brown can offer a more comprehensive view of a researcher’s work and can leverage the power of the web to enhance Brown’s visibility and impact. Peers and other institutions are rolling out VIVO and pursuing similar semantic web initiatives that bring their work into conversation with the broader web of data. By being part of this movement, Brown is poised to have a significant impact on the way learners, researchers, and institutions discover and disseminate scholarship.

**Scientific Data Management:** A Scientific Data Management Specialist is available to work with students and faculty researchers in the sciences interested in writing and carrying out data management and sharing plans for sponsored research. The Specialist can serve as a partner to plan for the management and curation of the data throughout the research lifecycle, including for the long-term retention and sharing of data post-project.

**The Library's Data Management Services** include consultation on data management issues, depositing data and supplementary files in a repository, and citing and publishing research data. The Library’s Brown Digital Repository (BDR) is available for the long-term retention, preservation, and dissemination of research data sets associated with sponsored research as well as a data repository Data for Publications (https://repository.library.brown.edu/studio/collections/id_671/) for the preservation and sharing of data sets underlying scientific publications. The Library has a doi and data license consultation service to promote the citation of shared and published data by researchers in their publications and appropriate use and attribution by the public. Lastly, The Division of Biology and the Library make available the electronic laboratory notebook software LabArchives to Brown and affiliated researchers (https://library.brown.edu/info/labarchives) to aid researchers in the documentation, organization, and preservation of their data as well as their collaboration within their team and with other research teams.

**Health Sciences Library Resources:** The Health Science Librarian can assist researchers in research planning, conducting research, publishing research and sharing data. Services include assistance with finding funding, writing a data management plan, sourcing data, conducting a literature review, organizing citations, analyzing and visualizing data, compliance with funders' public access policies, depositing research products into a repository, obtaining a Digital Object Identifier (DOI) and measuring the impact of the research. Regularly scheduled workshops are offered on citing and publishing research data, using data tools, building a better poster, and understanding public access policies and the NIH public access policy.

**Library - Brown University: Brief**
https://library.brown.edu/

University Library: The Brown University Library is located in five separate facilities, contains over 3.8 million items and adds 60,000 more each year. The Library subscribes to well over 500,000 electronic books in many subjects. Most are available in large collections that can be searched through the publisher's interface; all are individually cataloged. In addition to the collections to which the Library subscribes, several publicly available e-book collections are listed. The Sciences Library contains biological and medical serials. The Library is a member of the Center for Research Libraries and the Research Libraries Group, which provides free interlibrary loan services, photocopying of articles, and access to cooperating research libraries. Each of the participating hospitals within the Department of Medicine maintains a specialized library.

**Researchers at Brown (VIVO)**
https://vivo.brown.edu/about

Researchers at Brown (VIVO): The Library, along with colleagues in Computing and Information Services (CIS) and the offices of the Dean of the Faculty and the Vice President for Research, launched a new, campus-wide service that offers Brown faculty an online platform for sharing their research, publications, and professional work with the Brown community and the world at-large. The service, called Researchers@Brown, is derived from VIVO software, which was developed in recent years by Cornell University, the University of Florida, and a number of other academic partners. VIVO is based on semantic web technology, which provides capabilities for linking concepts, subjects, people, and organizations across institutional boundaries. While Brown’s VIVO implementation is in its early days, it positions the work of Brown researchers to be discoverable and accessible in a variety of new ways and helps highlight the unique expertise of Brown faculty in the broader academic.
landscape. Researchers@Brown profiles have been created for all regular faculty at the University. Their profiles include biographies, research interests, educational background, publications, and professional activity. Faculty members can manage their own profiles or can assign a delegate to update them. On a rolling basis throughout 2014 and beyond, the Library will continue to enhance and refine the system by structuring bibliographic data to enhance the discoverability of faculty publication data and by offering more automated tools for harvesting faculty publications from resources such as PubMed and Web of Science. The potential of Researchers@Brown to highlight and share Brown’s intellectual productivity will be most effectively realized by linking researchers’ profiles to related resources on the web. To help with that, the Library has subscribed to ORCID (Open Researcher and Contributor ID). ORCID allows researchers to create unique, personal semantic web identifiers that they can embed within their journal submissions, web sites, and social media profiles as well as within the Researchers@Brown system. By establishing links between these outlets, Researchers@Brown can offer a more comprehensive view of a researcher’s work and can leverage the power of the web to enhance Brown’s visibility and impact. Peers and other institutions are rolling out VIVO and pursuing similar semantic web initiatives that bring their work into conversation with the broader web of data. By being part of this movement, Brown is poised to have a significant impact on the way learners, researchers, and institutions discover and disseminate scholarship.

Scientific Data Management
https://library.brown.edu/create/cds/activities/data-management-planning/

Scientific Data Management: A Scientific Data Management Specialist is available to work with students and faculty researchers in the sciences interested in writing and carrying out data management and sharing plans for sponsored research. The Specialist can serve as a partner to plan for the management and curation of the data throughout the research lifecycle, including for the long-term retention and sharing of data post-project. The Library’s Data Management Services (https://library.brown.edu/info/data_management) include consultation on data management issues, depositing data and supplementary files in a repository, and citing and publishing research data. The Library’s Brown Digital Repository (BDR) is available for the long-term retention, preservation, and dissemination of research data sets associated with sponsored research as well as a data repository Data for Publications (https://repository.library.brown.edu/studio/collections/id_671/) for the preservation and sharing of data sets underlying scientific publications. The Library has a doi and data license consultation service to promote the citation of shared and published data by researchers in their publications and appropriate use and attribution by the public. Lastly, The Division of Biology and the Library make available the electronic laboratory notebook software LabArchives to Brown and affiliated researchers (https://library.brown.edu/info/labarchives) to aid researchers in the documentation, organization, and preservation of their data as well as their collaboration within their team and with other research teams.

MULTISPECIALTY PRACTICE GROUPS

Brown Physicians Inc. (BPI)
https://brownphysicians.org/

Brown Physicians Inc. (BPI): Brown Physicians Inc. is a nonprofit federation of six physician practice foundations formed in partnership with the Warren Alpert Medical School of Brown University. BPI is composed of six foundations, which include Brown Dermatology, Brown Emergency Medicine, Brown Medicine, Brown Neurology, Brown Urology, and University Surgical Associates. All are dedicated to fueling advances in health care in the state and the region. Together, the six foundations employ more than 500 doctors, all of whom are also members of the Warren Alpert Medical School faculty, and many of whom work side-by-side in local hospitals with physicians and other health care providers employed by the hospitals. By working closely together, the physicians, the medical school and the hospitals are better equipped to collaborate on educational initiatives and opportunities, to pool resources to support research and to coordinate clinical care and administrative functions. BPI patients can opt-in to be informed about potential clinical trials.

RESEARCH ADMINISTRATION

Office - Vice President for Research
https://www.brown.edu/research/conducting-research-brown
The Office of the Vice President for Research (OVPR) fosters an environment conducive to research and the creation of knowledge by developing and supporting major research programs; providing effective infrastructure for research and development, research administration, and dissemination of research results; and collaborating with outside organizations. We provide assistance for faculty at every stage of research proposal development and implementation - Finding Funding Opportunities, Preparing a Proposal, Research Compliance, Managing an Award, Commercializing Technology, and maintaining and managing Research Information Systems for Brown.

**BioMed - Research Administration (BMRA)**
https://www.brown.edu/academics/biomed/offices-and-services/research-administration/

The BioMed Research Administration office serves as a central resource to faculty, staff, and students in the Division of Biology and Medicine in their pursuit of research, training, and other scholarly activities while insuring compliance with University, federal, and private sponsor regulations, terms, and conditions. BMRA directly contributes to the academic mission of the Division of Biology and Medicine by providing support for obtaining sponsored research funds and managing sponsored research activity. The BMRA office is comprehensive in its scope and mission, handling both pre-award and post-award services.

**BioMed - Translational Development: Brown Biomedical Innovations to Impact (BBII)**
https://www.brown.edu/research/conducting-research-brown/industry-engagement-and-commercial-venturing-iecv/translational-development-bbii

Brown Biomedical Innovations to Impact (BBII): The office of Industry Engagement and Commercial Venturing (IECV) provides and manages translational development capabilities to help solidify proof of technical feasibility and of commercial relevance, both of which can de-risk an idea or discovery and turn it into more concrete product opportunities that are attractive to potential industry partners or startup creators. The Division of Biology and Medicine, in collaboration with IECV, has launched a translational commercial development program, Brown Biomedical Innovations to Impact (BBII). BBII manages an academic accelerator fund dedicated to supporting academic biomedical technologies—with potential for high impact—to become well-defined product opportunities that are attractive to industry partners and investors. BBII achieves its goals by:

- Funding translational research projects - up to five proposals per annual cycle ~$100,000 for 12 months (with possibility of renewal). Projects are focused on validation of technical feasibility and commercial relevance.
- Advising/coaching – by an independent panel of advisors with broad expertise in evaluation, investment and commercialization of biomedical technologies.
- Partnering/managing – BBII will identify and retain consultants and contract research organizations to leverage development expertise and provide project management support to ensure focus and timely delivery on project milestones.
- Exploring commercial development opportunities – As opportunities progress, BBII and IECV will work through established relationships with industry, venture capital, and entrepreneurial startup resources to find the best path for further development.
- BBII awards are intended to develop and add value to biomedical technologies to increase the probability for licensing and commercialization. It is expected that many projects will require the use of consultants and/or contract research organizations (CROs). BBII will identify and retain consultants and contract research organizations to leverage development expertise and provide project management support to ensure focus and timely delivery on project milestones.

BBII awards may be used to fund projects such as:
- Identification and/or chemical optimization of small molecule drug candidates
- Development of therapeutic or diagnostic antibodies or other biologics
- Evaluation of therapeutic lead candidates in cell based and/or animal models of disease
- Identification and validation of a biomarker for efficacy or profiling
- Development and/or testing of a diagnostic or device prototype
- Other advanced pre-commercial research
Office - Industry Engagement and Commercial Venturing (IECV)
https://www.brown.edu/research/conducting-research-brown/commercializing-technology

Industry Engagement and Commercial Venturing (IECV): The mission of IECV is to unleash the impact of Brown research by encouraging and facilitating the evolution of Brown's discoveries and inventions into know-how, products and services with societal and economic value. IECV supports this mission through its three programmatic pillars: (1) Commercial Venturing: partnering with Brown researchers to ascertain the market relevance of their discoveries, then forge the best strategy for transitioning from idea to impact and protecting intellectual property as appropriate in support of lab-to-market development plans; (2) Industry Engagement: building strategic relationships with industry centered around research collaborations aimed at spawning innovations of commercial interest to our company partners - while also connecting the companies to Brown faculty and researchers, students, entrepreneurs, and executive education programs; and (3) Translational Development: providing and managing translational development capabilities to help solidify proof of technical feasibility and of commercial relevance, both of which can de-risk an idea or discovery and turn it into more concrete product opportunities that are attractive to potential industry partners or startup creators.

Office - Research Administration Information Services (RAIS)
https://www.brown.edu/research/conducting-research-brown/research-administration-information-systems

Research Administration Information Systems & Reporting Services (RAIS): The RAIS team provides services to the research community for all electronic systems and data overseen by OVPR and Workday Grants. This includes: proposal creation in Brown's electronic grants management system (Coeus) and external electronic systems such as eRA Commons, Research.gov, and Grants.gov; Conflict of Interest disclosures and IACUC protocol development in InfoEd; as well as IRB protocol management in Coeus.

RAIS delivers in-depth business intelligence solutions to the Brown community through reporting, visualizations, and workflow notifications for departments and senior management. In addition, this group is leading the development and implementation of a new integrated electronic system managing grant development, submission and management and IRB protocol development and management. We currently support two systems Coeus and InfoEd, and Sponsored Reporting.

Office - Research Development (RD)
https://www.brown.edu/research/conducting-research-brown/research-development

The Research Development office identifies and disseminates funding opportunities, supports development of research teams and submission of large proposals, manages internal research funding programs and limited submission opportunities, and supports smaller departments on pre- and post-award financial management.

Office - Research Integrity (ORI)
https://www.brown.edu/research/ori

The Office of Research Integrity supports the Brown University research community by providing guidance, education and resources to facilitate the conduct of ethical research in accordance with governing federal and state regulations and University policies. The ORI’s multidisciplinary team:

- Provides administrative support and regulatory advisement to the University's Institutional Review Board (IRB), Institutional Animal Care and Use Committee (IACUC), Conflict of Interest Review Board, and Embryonic Stem Cell Research Oversight (ESCR O) Committee;
- Assists researchers with adhering to requirements associated with international research collaborations, including running the University’s Export Control Compliance Program;
• Manages the intake, review and approval of Data Use Agreements for research;
• Promotes integrity in research by providing training in the ethical and responsible conduct of research;
• Handles allegations of research misconduct;
• Through its Quality Assurance / Quality Improvement program, conducts outreach and education to researchers and staff regarding best practices to facilitate regulatory compliance and required institutional approvals, and performs post-approval monitoring and investigations of potential research-related non-compliance.

Office - Research Integrity and IRB
https://www.brown.edu/research/ori

Office of Research Integrity and IRB: Reporting to the Associate Vice President for Research, the Office of Research Integrity (ORI) supports the Brown University research community by providing guidance, education and resources to facilitate the conduct of ethical research in accordance with governing federal and state regulations and University policies. The ORI’s multidisciplinary team:

• Provides administrative support and regulatory advisement to the University's Institutional Review Board (IRB), Institutional Animal Care and Use Committee (IACUC), Conflict of Interest Review Board, Institutional Biosafety Committee (IBC), and Embryonic Stem Cell Research Oversight (ESCRo) Committee;
• Assists researchers with adhering to requirements associated with international research collaborations, including running the University’s Export Control Compliance Program;
• Promotes integrity in research by providing training in the ethical and responsible conduct of research;
• Handles allegations of research misconduct; and
• Through its Quality Assurance / Quality Improvement program, conducts outreach and education to researchers and staff regarding best practices to facilitate regulatory compliance and required institutional approvals, and performs post-approval monitoring and investigations of potential research-related non-compliance.

Brown IRB: The Brown IRB reviews a diverse portfolio of human-subjects research protocols, including social, behavioral, and educational research, FDA-regulated research involving drugs and devices, research involving vulnerable populations, and clinical trials. The Brown IRB meets once per month and is currently comprised of 17 primary members and ten alternate members, including three physician/clinician members, two prisoner representatives and unaffiliated members, among others. Two staff members of the ORI’s Human Research Protection Program (HRPP) are appointed as full IRB members to facilitate expeditious review and approval of expedited protocols. There is a high-level of commitment to continuing education for the Brown IRB and HRPP staff members that extends well beyond CITI certification. HRPP staff are expected and financially supported to achieve professional CIP certification and attend Public Responsibility in Medicine and Research (PRIM&R) and other professional conferences and webinars. IRB members are provided continued education via timely presentations pertaining to regulatory changes and the ethical conduct of research, including presentations provided by external subject matter experts. The HRPP team has one person fully dedicated to managing processes for single IRB review and clinical trial registration and results reporting. Brown is also a participating member of SMART IRB and leverages the Online Reliance System to request, track and document reliance arrangements on a study-by-study basis.

Brown’s HRPP demonstrates its continuous commitment to exceptional quality and excellence through its internal Quality Assurance / Quality Improvement program (QA/QI program), completion of the Office of Human Research Protection (OHRP) QA Self-Assessment Tool, routine reviews by internal auditing services, and solicitation of expert, independent consulting reviews by subject matter experts. Brown’s QA/QI program (i) routinely conducts outreach and education visits to research labs engaged in human-subjects research to enhance understanding of relevant regulations and ensure compliance with IRB-approved protocols; (ii) assesses the HRPP’s and IRB’s compliance with applicable laws, regulations, codes and guidance; (iii) assesses the quality, effectiveness and efficiency of the HRPP; and (iv) assures the integrity of processes and procedures pertaining to identifying, managing, minimizing and/or eliminating financial

Office - Sponsored Projects (OSP)
https://www.brown.edu/research/conducting-research-brown/sponsored-projects-osp
The Office of Sponsored Projects (OSP) supports Brown University faculty and staff in the acquisition, performance, and administration of projects and programs funded from external sources. The office services include: compliance with governmental and private funding agency standards; review and submission of proposals for administrative and regulatory compliance; award negotiation and acceptance on behalf of Brown University; dissemination of research policy information to campus; establishment of subaward agreements and conduct of subrecipient monitoring; oversight and advising on financial management of sponsored projects, including financial reporting, cash management, effort reporting, and monitoring of cost-share arrangements; addressing financial and administrative issues that arise during the life of a sponsored project; coordination of award close-out process; and providing education and professional development opportunities in research administration for the campus community.

RESEARCH BUILDINGS

Brown Research Buildings
https://www.brown.edu/academics/biomed/campus

University Research Buildings

121 South Main St: The School of Public Health research and training is located in this building. The facility includes 64,040 square feet of usable space devoted to research, administration and instruction, and houses the Center for Statistical Sciences, as well as nine other nationally renowned public health research centers. The academic and research goals for the Public Health Program are focused in the Department of Community Health. Offering multidisciplinary, comprehensive programs in population-based medicine and health, the department's educational mission encompasses undergraduate, graduate, and medical education, and fellowship training. Education and research activities are structured into four sections: Behavioral and Social Sciences, Biostatistics, Epidemiology, and Health Services, Policy and Practice.

Applied Mathematics Building: Opened in the fall of 2015, this three-story, 13,000-square-foot structure, provides office space for applied mathematics faculty, graduate students, postdoctoral researchers, and visitors, as well as meeting and seminar rooms. The building is equipped with flexible office space, open spaces with blackboard-painted walls to stimulate informal discussions, meeting space for research groups, and a large seminar room that can be used for presentations but will also serve as a common room for students and faculty alike at 170 Hope St.

Barus and Holley: located at 184 Hope St., is a seven-story, 187,035 sq. ft. building that was constructed in 1965. This building serves as the location for the faculty of the Institute for Molecular Nanoscale Innovation, the Physics Department and the School of Engineering and includes laboratories, classrooms, lecture rooms, and offices.

Watson Center for Information Technology, located at 115 Waterman St., is one of the premier University computing facilities in the world. The 110,559 sq. ft. facility is used for computer research labs, classrooms and offices and is the location of the Center for Computational Molecular Biology (CCMB), Computer Science and Computer and Information Services (CIS).

Biomedical Center (BMC): This seven-story complex of offices, labs, and classrooms is used by departments across the Division of Biology and Medicine. Located at 171 Meeting St, this seven-story building consists of 67,118 square feet of usable space, 37% of which is devoted to research. It is part of the BioMed Complex, housing a total of 47,107 square feet of research space. The building is also located immediately adjacent to the Sidney Frank Life Sciences Building. This building houses research laboratories and the Flow Cytometry Facility. Faculty in Microbiology and Immunology, Ecology and Evolutionary Biology, and Molecular Pharmacology, Physiology and Biotechnology Departments are located in the Biomedical Center.

Department of Molecular Microbiology and Immunology
Department of Molecular Biology, Cell Biology and Biochemistry
Department of Molecular Pharmacology, Physiology, and Biotechnology
Building for Environmental Research and Teaching (BERT): The newly renovated BERT is a center of research and education in environmental science and the School of Engineering. Its rooftop is home to the Plant Environmental Center (PEC), a state-of-the-art facility that includes a greenhouse, classroom laboratories, and a 2,000 square-foot public conservatory - all maintained by the Department of Ecology and Evolutionary Biology.

Plant Environmental Center: Located at 91 Waterman St, the Plant Environmental Center, supported by the Department of Ecology and Evolutionary Biology, is a growing facility devoted to plant biology research. Spread out over three research greenhouses encompassing 5,000 square feet, the space includes a teaching plant collection, a classroom laboratory, and research facilities. There is also a 2,000 square-foot Conservatory, housing many different plant families. In addition to this space there are five E7/2 conviron plant growth chambers, and a 180-sq-ft. walk-in growth chamber, used by grad students and faculty.

Sidney E. Frank Hall for Life Sciences: The Sidney E. Frank Hall is a five-story, 169,000-square-foot facility is home to 60 laboratories and provides access to the Biomedical Center - forming a hub of life sciences research and teaching on College Hill. It houses:

Department of Neuroscience
Department of Molecular Biology, Cell Biology, and Biochemistry
Leduc Bioimaging Facility
Magnetic Resonance Imaging Facility

Buildings in the Jewelry District of Providence

Warren Alpert Medical School: The Medical School's home at 222 Richmond Street features the latest innovations in medical education, including exam rooms where students can practice realistic patient interactions; a fully equipped anatomy lab; and a digital medical library.

The Warren Alpert Medical School of Brown University
Champlin Memorial Library

Laboratories for Molecular Medicine (LMM): The LMM is a focal point of interdisciplinary research activity and expertise for the Division. It supports core facilities that provide state-of-the-art research equipment and training to life sciences researchers at Brown and at partner institutions across Rhode Island. Located at 70 Ship St, this building has 69,002 square feet of usable space, 63% of which is devoted to research in genetics, genomics, proteomics, structural biology, pharmacology, and pathology. The open floor plan of the facility promotes collaboration among scientists and benefits trainees. These partnerships provide the context in which biomedical research will ultimately translate into the tools for clinical care. The facility is within a few blocks of the Warren Alpert Medical School building, as well as the major research buildings of Woman & Infants Hospital and Rhode Island Hospital, which house other Brown faculty and research centers affiliated with the Division. This building houses the Genomics, Transgenics, Proteomics, Bioimaging, and Molecular Pathology Core Facilities. Faculty in Molecular Pathology and Laboratory Medicine, Molecular and Cellular Biology, and Molecular Pharmacology, Physiology and Biotechnology Departments are located in the Laboratories for Molecular Medicine.

Department of Molecular Biology, Cell Biology, and Biochemistry
233 Richmond Street
Just across from the Medical School, 233 Richmond Street houses administrative offices as well as two key research centers:

Brown Center for Biomedical Informatics
Advance-Center for Clinical and Translational Research
BioMed Faculty Affairs

RHODE ISLAND & RESEARCH ENVIRONMENT

State of Rhode Island and the Providence Plantations (RI) has a population just over 1 million. The state demographics are 81.4% white, 5.7% Black or African American, 2.9% Asian, 0.6% Native American, 0.1% Hawaiian or Pacific Islander. Approximately 12.8% of the state’s population is Hispanic or Latino in origin and 13.3% of the population are immigrants. Rhode Island covers 1214 sq. miles and is 37 miles wide by 48 miles long.

Rhode Island Clinical Environment: The clinical environment within Rhode Island is highly conducive to further development of clinical research. Factors supporting clinical and epidemiological research in Rhode Island include: 1) One medical school training physicians who stay and serve the entire region; 2) one dominant adult medical-surgical hospital system with 80% of the medical school faculty; 3) one pediatric hospital with 95% of statewide pediatric hospitalizations; 4) one level 1 trauma center with adult and pediatric capabilities, the Nation’s 5th busiest; 5) one large women’s hospital with 75% of births in the state and 90% of the deliveries in Providence; 6) one large inpatient, academic psychiatry facility; 7) one academic VA hospital; 8) Outstanding colleges of Pharmacy and Nursing at the State’s single land grant University; 9) one Department of Health serving the entire state with oversight over multiple datasets; and 10) CurrentCare, Rhode Island’s official statewide health information exchange, which includes comprehensive, longitudinal records on 50% of the state’s population, growing monthly. Combined, these factors make Rhode Island an ideal location to initiate population-based health programs, to advance clinical and epidemiological research, and to quickly implement improvements in clinical practice.

Large cohorts of patients can be assembled and our highly regionalized, non-duplicative clinical environment, with very low egress from the state, allows robust, population-based studies. As a reflection of the veracity of our current clinical, demographic and epidemiologic environment, Brown University was awarded two National Children’s Study Vanguard sites. One was in Providence County and the other was in Bristol County Massachusetts. Women and Infants Hospital has a significant community base for clinical activities and well-established patterns of referral for regionalized high-risk perinatal obstetrical and neonatal services. A similar situation prevails in other specialties. Rhode Island Hospital and The Miriam Hospital host large postgraduate medical training programs in all the specialties and provide the bulk of inpatient adult medical and surgical care. Butler hospital is a large psychiatric hospital with a robust academic infrastructure. Hasbro Children’s Hospital provides 95% of all inpatient pediatric care.

Rhode Island Collaborative Culture: Rhode Island research groups have formed a strong, collaborative clinical and translational network. The Universities, Hospitals and Community Organizations in Rhode Island have a rich culture of collaboration that is enhanced by having a single Medical School; an integrated academic medical center and health system composed of seven hospitals, closely affiliated with the Medical School; little program duplication and long-standing cooperation between the hospitals; a single children’s hospital with the majority of inpatient pediatric care; a single birthing hospital where ~75% of births in the state take place; one Department of Health for the entire state. This ‘Culture’ is further evidenced by the success of the NIH and NSF funded BRIN, COBRE, CTR, EPSCoR and INBRE, and collaborative programs in RI. These inter-institutional programs share common goals to positively impact biomedical research by catalyzing activity, expanding capacity, augmenting capabilities, enhancing faculty development, strengthening infrastructure, disseminating knowledge, promoting community outreach, and facilitating regional collaborations among diverse stakeholders. The administrative
cooperation and scientific progress made through these cross-institutional awards is a strong indicator for collaborative success of future programs.

CoresRI and ClinicalResearchRI: Rhode Island universities, colleges and academic medical centers across the state collaborated to develop the CoresRI.org website (www.CoresRI.org); a directory of core research facilities, services and instrumentation in Rhode Island. Development of CoresRI grew out of a need to maximize awareness and optimize utilization of these important core facility resources within the state. Besides encouraging equipment sharing and reducing duplication of services, CoresRI.org fosters collaborations and enables investigators to better assess future shared equipment needs. The CoresRI directory catalogues instruments (specific makes, models, and uses), services, resources, locations, and contact personnel. Researchers can easily search for instruments by typing the name of the instrument or service desired in the “All Instruments” search field or by selecting from one of the four drop down fields. Each facility in CoresRI has its own page listing all of the instruments and services available within that facility and providing a direct link to the facility’s website. The site currently lists over 824 instruments, services or resources located within 107 facilities at 18 institutions and 50 centers. The ClinicalResearchRI section of CoresRI.org contains 66 clinical research resources and services in 41 clinical research units in a searchable database. The directory is updated as needed and at least annually. Many of the instruments, services and resources listed in CoresRI were funded by the NIH Centers of Biomedical Research Excellence (COBREs), NIH IDeA Network of Biomedical Research Excellence (INBRE), Institutional Development Award (IDeA) Program Infrastructure for Clinical and Translational Research (IDeA-CTR), or NSF Experimental Program to Stimulate Competitive Research (EPSCoR). The CoresRI participating institutions include Brown University, Lifespan Health System, Care New England Health System, Providence VA Medical Center, University of Rhode Island, State of Rhode Island, Rhode Island School of Design, Bryant University, Rhode Island College, Providence College, Roger Williams University, Salve Regina University and Roger Williams Medical Center.

RHODE ISLAND STATEWIDE COLLABORATIVE PROGRAMS

Rhode Island Statewide Collaborative Programs

Rhode Island Academic and Healthcare institutions have a long history of collaborating on funded research programs. Most of these collaboratives are funded by the NIH Institutional Development (IDeA) Program. The IDeA Program builds research capacities in states that historically have had low levels of NIH funding by supporting basic, clinical and translational research; faculty development, and infrastructure improvements. Rhode Island qualifies as an IDeA state. Rhode Island’s actively funded IDeA programs include one IDeA Network for Excellence in Biomedical Research Excellence (COBRE), and one Program Infrastructure for Clinical and Translational Research (IDeA-CTR) and two Environmental Child Health Outcomes (ECHO) programs.

Advance Clinical and Translational Research (Advance-CTR):
https://www.brown.edu/initiatives/translational-research/home

The IDeA-CTR Program, provides support for forging partnerships and collaborations within and across IDeA states, the development of infrastructure and human resources required to conduct clinical and translational research in IDeA-eligible states, enhancing the ability of IDeA institutions and investigators to develop competitive clinical and translational research programs, and fostering and sustaining collaboration and coordination of clinical and translational activities within and across IDeA institutions and organizations. Advance-CTSA partners were awarded an IDeA-CTR grant by NIGMS in 2016 [(U54GM115677) RI-Center for Clinical and Translational Science (Advance-CTR)], PI James Padbury, Brown University]. The foundational progress of Advance-CTR places Advance-CTSA in an ideal position for immediate implementation and rapid progress. Upon funding of Advance-CTSA, we will relinquish IDeA Advance-CTR funding.

Advance-CTR serves to support and educate clinical and translational researchers in Rhode Island. The goal of Advance-CTR is to enhance collaboration and coordination of translational research in order to accelerate cross-disciplinary discoveries that improve health. Advance-CTR aims to: 1) Foster coordination between translational researchers at partner institutions, 2) Bring together the diverse clinical research resources to provide a home that facilitates new collaborations, 3) Eliminate obstacles that may prevent researchers from pursuing clinical
research initiatives, 4) Educate, mentor and encourage young investigators in clinical research professional
development, 5) Facilitate research to gather preliminary data necessary for developing competitive research
proposals and 6) Sustain a clinical translational research environment by providing the necessary management
and coordination of resources.

Advance-CTR is comprised of an Administrative Core; two Award Cores, the Pilot Projects Program and
Professional Development; and three Service Cores, Clinical Research Design, Epidemiology and Biostatistics,
Clinical Research Resources and Facilities, and Biomedical Informatics and Cyberinfrastructure Enhancement.

**Administrative Core:** The Administrative Core serves as the central operations hub for Advance-CTR. It
includes two Project Managers, a Communication Manager, and one Assistant who report to the Advance-CTR
Administrative Director. These individuals support the PD/PI; Program Coordinator; Strategic Planning
Coordinator, the Internal and External Advisory Committees, the Steering Committee; and the six Cores. The
academic homes of the Core Leads are based out of the Advance-CTR partnering institutions and the
Administrative Core support is centralized. The Administrative Core included an Administrative Director and
Clinical Managers for the Award Cores, Service Cores, Communication, Administrative Support and the Tracking
and Evaluation Core. The Administrative Core’s roles and responsibilities are to support each of the key
component activities. This includes organization of meetings, preparation of agendas, preparation of notes,
organization of funding announcements, organization of the steering committee supporting each of the Cores
and organization of the review and award process. The direct participation in each of these activities by managers
of both Pilot awards and Career Development Cores and Service Core Directors has allowed an exemplary
degree of integration, cross-fertilization and adherence to best practices.

Administrative Core personnel assist the Core Leads in program management and planning, tracking and
evaluation, budget development, allocation of resources, reporting and development of educational initiatives.

**Biostatistics Epidemiology and Research Design (BERD)** Core has accounted for more than 50% of the
Advance-CTR consultative activity. This reflects the results of the Needs Assessment Survey that demonstrated
that support for study design and data analysis was desired across our partnering institutions. The Core has
developed storefront drop-in sessions, located at partner institutions across Rhode Island, for initial biostatistical
and data analysis consultations. In response to recognized need, the Core also provides consultation and
support for qualitative data analysis. The Biostatistics Core has also been instrumental in providing education
and workshops including regularly scheduled training sessions for computer-based learning on how to use
REDCap software with more than 125 individuals trained. Most recently, more than 70 participants attended the
first BERD Statistical Methods in Translational Science Symposium. This was a half-day symposium with topics
focused on causal mediation analysis, estimating effects of health and medical interventions using imputation
and transporting results of clinical trials to target population. The Symposium was organized with the support of
the Administrative Core following their successful experiences with the Needs Assessment Retreat and the
annual statewide IDeA Symposium.

**Clinical Research Support Core:** The Clinical Research Resources and Facilities Core is based at the Lifespan
Clinical Research Center. Clinical Research Support is offered to Rhode Island investigators by highly trained
research staff including clinical research coordinators, registered nurses, a medical technologist, and a
phlebotomist. Investigators seeking Advance-CTR services have access to regulatory support, subject
recruitment, space and support for the conduct for study visits, specimen collection and biobanking. The
Advance-CTR Clinical Research Core has sponsored workshops in good clinical practice (GCP), Public
Responsibility in Medicine and Research (PRIM&R), and Society for Clinical Research Associates (SOCRA). A
Clinical Research Center Direct Program which provides on demand resources and service support for young
faculty negotiating the human subjects’ submission process has been created. Workflows are in place to
streamline the process for participation of human subjects’ submission of Institutional Review Board applications
and support for inter-institutional awards. The Administration Core of Advance-CTR has taken responsibility for
organization of the Rhode Island IRB Administrator Network (IRBAN). This includes support for the regular
meetings, minutes and provision of professional development opportunities to IRBAN members. We have
facilitated participant institution’s use of SMART IRB for institutional Reliance Agreements. Institutional partners
now include Brown University, University of Rhode Island (URI), Lifespan and Care New England.
The Biomedical Informatics and Cyberinfrastructure Enhancement Core aims to: (1) develop and support the cyberinfrastructure needed to enable effective collaborative clinical and translational research, (2) promote and advance professional development in biomedical informatics through workshops and online resources in Rhode Island and across the IDEa network, and (3) support the implementation and maintenance of Advance-CTR’s administrative tools to monitor the use and impact of resources. The long-term goal is to transform the environment for clinical and translational research in Rhode Island by enabling integrated access to electronic health data, providing core informatics support, and instructing researchers on implementing and applying newly developed resources for studies. Faculty and staff in the Core offer experience in applying the breadth of informatics and data science approaches across the full spectrum of biomedicine (translational bioinformatics, clinical research informatics, clinical informatics, consumer health informatics, and public health informatics). Specific areas of expertise include: biological sequence analysis, data capture and management, data integration, knowledge representation and discovery, natural language processing, machine learning, evaluation, and decision support. A signature effort of the Advance-CTR Biomedical Informatics Core is the Unified Research Data Sharing and Access (URSA) Initiative for making data accessible and usable for research purposes by the Advance-CTR community. This includes data from Electronic Health Record systems (Lifespan, Care New England, and Providence VA Medical Center), statewide Health Information Exchange (Rhode Island Quality Institute), and All-Payer Claims Database (Rhode Island Department of Health).

Pilot Projects Program: The Pilot Projects Program awards four investigators per year with one-year grants of $75,000 each in direct costs for clinical and translational research. Awarded proposals must be interdisciplinary with a focus on clinical, translational or community research. Priority is given to proposals that address statewide health priorities set forth by the Rhode Island Department of Health. Awardees gain the opportunity to experience planning and preparing research applications in an NIH format, respond to reviews and learn grant management skills in a collaborative, cross-disciplinary environment. Finally, awardees may take advantage of Advance-CTR’s research services in both the pre-proposal and post-award stages of their projects. To date the Pilot Project Program has awarded 36 Pilot Awards to 61 unique investigators across all five of our partner institutions. These included single investigator Pilot Awards and larger multi-PI investigator awards. We have made awards for projects devoted to using biomedical Big Data as a central element to their proposal. We have made awards to projects emphasizing community engagement. We have made awards for grants resubmission for proposals that were close to the funding line at large federal foundations and would have received support were it not for the current funding climate.

Professional Development Core: The Professional Development Core provides educational and mentoring opportunities to both junior and senior investigators. The Core includes the Mentored Research Awards program (MRAs), which is geared toward early-career stage investigators, especially those who identify as underrepresented minority individuals in STEM. The MRAs are given annually to three investigators from Brown University and the University of Rhode Island. They are two-year awards that cover 75% salary up to $90,000 in direct costs. An additional $25,000 is also provided to cover research-related expenses or tuition (a Master's degree in Clinical and Translational Research from the Brown University School of Public Health is encouraged). Finally, the awards provide a structured mentoring program and training in clinical and translational research. Awardees are encouraged to take advantage of Advance-CTR’s research services in both the pre-proposal and post-award stages of their projects. To date five Mentored Research Awards have been awarded.

Tracking and Evaluation Core: The Advance-CTR Tracking and Evaluation Core, with support of the Administration Core, convened a statewide symposium/retreat to support programmatic planning and to assess the needs and obstacles to clinical and translational research of the participating institutions. Almost 100 clinical translational research from each of the institutional stakeholders, including institutional leaders, came together and drafted a needs assessment survey using program facilitators and workgroups. The product of that first retreat was refined into a formal Needs Assessment Survey that was sent to all of the Clinical and Translational researchers at each of the stakeholder institutions. The survey, which solicited anonymous responses, was launched in the spring of 2017. The sampling frame included faculty, postdoctoral fellows, administrators, clinical professions from all six of our institutional stakeholders. Following collation of over 171 responses, the survey demonstrated that only 18% of researchers were very or extremely satisfied with support for clinical and translational research whereas 63% were somewhat satisfied and nearly 20% were not at all satisfied with institutional support for clinical and translational research. The major unmet needs for research support that poses barriers to translational research productivity included Pilot Project funding, protected time for research,
support for proposal development. Additionally, lack of integration of Institutional Review Board oversight for protection of human subjects was a significant barrier to the efficiency of research as stated by the majority of participants. Support for study participant recruitment and access to biostatistics and data analytical support for large datasets were also very substantial and met needs. These results were considered seriously by the leadership at Advance-CTR and the partner organizations and formed the basis for new initiatives and improvements.

**Dedicated Space:** A total of 6,946 square feet is dedicated to Advance-CTR across all partner institutions in Rhode Island. Central offices are located in downtown Providence, Rhode Island, adjacent to the Warren Alpert Medical School of Brown University and less than a mile from the Brown University School of Public Health, Lifespan and Care New England hospital systems. Other partners, including the Providence VA Medical Center and the Rhode Island Quality Institute are less than three miles away from the Administrative Core offices. This includes 2,281 square feet of space for the Administrative Core, the Pilot Project Program and the Biomedical Informatics Core. Shared building-wide resources include a small 209 square-foot conference room with capacity of 8 people and a larger 365 square-foot conference room with a capacity of 16 people. The building is serviced by a 10 Gigabits per second (Gbps) optical network (Cisco).

**Centers of Biomedical Research Excellence (COBRE) Programs in Rhode Island**

The COBRE programs support thematic, multidisciplinary centers that augment and strengthen institutional biomedical research capacity. This is accomplished by expanding and developing biomedical faculty research capability and enhancing research infrastructure, including the establishment of core facilities needed to carry out the objectives of a multidisciplinary, collaborative program. COBRE support comes in three sequential 5-year phases: Phase I focuses on developing research infrastructure and providing junior investigators with formal mentoring and research project funding to help them acquire preliminary data and successfully compete for independent research grant support; Phase II seeks to strengthen each center through further improvements in research infrastructure and continuing development and support of a critical mass of investigators with shared scientific interests, Phase III transitional centers provide support for maintaining COBRE research cores developed during Phases I and II, and sustain a collaborative, multidisciplinary research environment with pilot project programs and mentoring and training components.

1. P20GM130414 - Phase 1 COBRE Center for Addiction and Disease Risk Exacerbation (CADRE), PI Peter Monti, School of Public Health, Brown University
2. P20GM125507 - Phase 1 COBRE Center on Opioids and Overdose, PI Josiah Rich, Rhode Island Hospital
3. P20 (newly awarded) - Phase 1 COBRE Center for Antimicrobial Resistance and Therapeutic Discovery (CARTD), PI Eleftherios Mylonakis, The Miriam Hospital
4. P20GM104317 - Phase 1 Immune-Based Interventions Against Infectious Diseases, PI Alan Rothman, University of Rhode Island
5. 1P20GM121298 - Phase 1 COBRE for Reproductive Health, PI Surendra Sharma, Women and Infants Hospital
6. P20 GM109035 - Phase 1 COBRE: Center for Computational Biology of Human Disease, PI: David Rand, Brown University
7. P20GM103652 - Phase 2 Endothelial Injury and Repair: Cardiopulmonary Vascular Biology COBRE, PI Sharon Rounds, Ocean State Research Institute
8. P20GM103645 - Phase 2 COBRE Center for Central Nervous System Function, PI: Jerome Sanes, Brown University
9. P20GM119943 - Phase 2 COBRE for Stem Cells and Aging, PI: Peter Quesenberry, Rhode Island Hospital
10. P20GM104937 - Phase 3 COBRE for Skeletal Health and Repair, PI Qian Chen, Rhode Island Hospital
11. P30GM110759 - Phase 3 COBRE Center for Cancer Research Development, PI Bharat Ramratnam, Rhode Island Hospital
12. P30GM114750 - Phase 3 COBRE for Perinatal Biology, PI Sunil Shaw, Women and Infants Hospital
Clinical and Translational Research (IDeA-CTR)

Clinical and Translational Research Program (IDeA-CTR): Another activity is the IDeA Program Infrastructure for Clinical and Translational Research (IDeA-CTR) initiative. The IDeA-CTR encourages consortium applications from IDeA states to develop regional infrastructure and capacity to conduct clinical and translational research on diseases that affect medically underserved populations and/or diseases prevalent in IDeA states. IDeA-CTR awards support mentoring and career development activities in clinical and translational research and facilitate collaboration with clinical researchers in non-IDeA states.

Environmental Influences On Child Health Outcomes (ECHO) Program

Environmental Influences on Child Health Outcomes (ECHO) Program: The ECHO program at Hasbro Children’s Hospital, the pediatric division of Rhode Island Hospital, is part of a national research project to study the effects of environmental exposures on the health and development of children. The Hasbro Children’s Hospital research project is led by Phyllis Dennery, MD, pediatrician-in-chief at Hasbro Children’s Hospital. Dennery along with Thomas Chun, MD, a pediatric emergency medicine physician at Hasbro Children’s Hospital, and Abbot Laptook, MD, medical director of the Neonatal Intensive Care Unit at Women & Infants Hospital. The Hasbro Hospital-based ECHO program will focus on four key pediatric outcomes: upper and lower airway; obesity; pre, peri and postnatal outcomes; and neurodevelopment. The funding will allow Rhode Island Hospital to build an IDeA States Pediatric Clinical Trials Network (ISPCTN), which will support a four-year project entitled “Rhode Island Child Clinical Trials Collaborative” (RICCTC), enabling Hasbro Children’s Hospital, Women and Infants Hospital, and Brown University to develop a pediatric clinical trials network as well as participate in the national NIH network.

IDeA Network for Excellence in Biomedical Research (INBRE)

IDeA Network for Excellence in Biomedical Research (INBRE) Program: The INBRE Program promotes the development, coordination and sharing of research resources and expertise that will expand the research opportunities and increase the number of competitive investigators in the IDeA-eligible states. INBRE grants are intended to enhance the caliber of scientific faculty at research institutions and undergraduate schools, thereby attracting more promising students to these organizations. Since 2001, URI has received a total of approximately $61 million in grants from the Institutional Development Award (IDeA) program, which is run by the National Institutes of Health, to support the Rhode Island IDeA Network of Biomedical Research Excellence (RI-INBRE, previously BRIN) [P20GM103430 Rhode Island IDeA Network for Excellence in Biomedical Research, PI Zahir Shaikh, University of Rhode Island, Kingston].

RI NSF Established Program to Stimulate Competitive Research (EPSCoR)

RI NSF Established Program to Stimulate Competitive Research (EPSCoR): Funded by a $19 million National Science Foundation grant and a $3.8 million state match, RI Coastal Ecology, Assessment, Innovation and Modeling (C-AIM) is a collaboration of engineers, scientists, designers and communicators from eight higher education institutions across R. RI C-AIM is developing new approaches to assess, predict and respond to the effects of climate change on coastal ecosystems. Working together with government, industry and communities, RI C-AIM is positioning Rhode Island as a ‘center of excellence’ for research on Narragansett Bay and beyond.