I. Health Sciences on the FSU Campus

Florida State University does not have a traditional Academic Health Sciences Campus with related colleges, in fact the College of Medicine is one of the youngest Colleges on campus with College of Communication & Information (merged from three existing Colleges in 2009), Nursing (1950), Social Work (1928), Social Sciences and Public Policy (1973), and Human Sciences (renamed in 1989) predating COM by decades.

The FSU College of Medicine [https://med.fsu.edu](https://med.fsu.edu) (COM) welcomed its first 30 students, the Class of 2005, in May 2001. Enrollment steadily increased to the current maximum class size of 120 new medical students a year. The first full class to be admitted, the Class of 2011, arrived in May 2007 as the College continued to grow toward full enrollment of 480. The College was designed as a community-based medical school. The students spend their first two years taking basic science courses on the FSU campus in Tallahassee and are then assigned to one of the regional medical school campuses for their third- and fourth-year clinical training.

Regional campuses originally opened in Orlando, Pensacola, Sarasota and Tallahassee. Additional campuses opened in Sarasota (2005) and Daytona Beach and Fort Pierce (2007) to help accommodate 240 third- and fourth-year students training with a clinical faculty of more than 2,500 physicians throughout the state. In addition, the College in 2007 opened a rural clinical-training site in Immokalee.

Originally housed in Duxbury Hall (administrative offices and student community room), Montgomery Gym (anatomy lab), several science buildings (classrooms) and portable buildings (administrative offices), the College moved into transitional facilities at the former FSU Developmental Research School on the northwest corner of the FSU campus in three phases between December 2001 and April 2002. The College broke ground February 4, 2003, on a 300,000-square-foot complex of buildings to house the first- and second-year educational program, and moved into these buildings in October 2004. The College has continued to invest in laboratories, core facilities and research faculty but is built around non-traditional interdisciplinary departments (Biomedical Sciences, Behavioral Sciences and Social Medicine, Geriatrics, Clinical Sciences, Family Medicine and Rural Health). While there has been robust growth of extramural funding ($49.2 million in new awards FY 2018), it is concentrated in two departments (Biomedical Sciences; Behavioral Sciences and Social Medicine) and the Autism Institute.

The COM buildings are immediately adjacent to Psychology and Biology, and there is no academic healthcare facility affiliated with FSU. There are three shared residency programs with Tallahassee...
Memorial Hospital but only the residency director for each is a FSU COM employee. The highest concentration of faculty actively engaged in research is in two interdisciplinary departments: Biomedical Sciences and Behavioral Sciences and Social Medicine. “Big Data Analytics” relevant faculty include Greg Hajcak (event-related brain potentials fMRI and psychopathology), Mohammad Kabbaj (animal models of stress and drug addiction, Michelle Arbeitman (genetic basis of courtship and reproductive behaviors of the fruit fly), David Meckes (molecular mechanisms of viral oncogenesis), Tim Megraw (functions of centrosomes and cilia in cell division), Sylvie Naar (behavioral health interventions, HIV), Angelina Sutin (personality traits and chronic disease), Heather Flynn (maternal health and depression), and Jeff Harman (health services and policies).

As referenced in the White Paper – COM Bioinformatics Needs (included in the packet) there are a number of core facilities that provide research infrastructure to the University, including Translational Science Laboratory and the Magnetic Resonance Imaging Facility. As detailed in the white paper there is limited bioinformatics support within COM to meet the data analytics needs of faculty engaged in research in the omics, imaging and health data analytics and social policy arenas within COM.

The College of Nursing https://nursing.fsu.edu/ was founded in 1950 and is the first nationally accredited baccalaureate degree program in nursing in the State of Florida. With over 7,000 graduates, the College has a proud history of preparing nurses for professional practice and research in diverse settings. The current Dean (2013), Judith McFetridge-Durdle, PhD, RN, FAAN, is a career scientist and a champion for the role of nursing in healthcare reform. Amongst other investments in research is the recently established Center for Indigenous Nursing Research for Health Equity (INRHE), headed by John Lowe, RN, PhD, FAAN.

The College of Social Work https://csw.fsu.edu/ was established in 1928, the College holds more experience than any other institution in Florida offering social work education and in 2016, was also ranked a top 25 social work program at a public university (U.S. News & World Report). James (Jim) Clark, PhD, an expert on forensic mental health was named dean of the College of Social Work in 2015. Research within the College is focused in the fields of health and behavioral health, child welfare, schools, criminal justice, gerontology, social justice, community development, law, business, and higher education. There are five research centers within the College focused on communities, family and children, that provide an umbrella of research support activities.

College of Communication & Information https://cci.fsu.edu/ includes the Schools of Communication, Information, and Science & Disorders. Lawrence (Larry) C. Dennis has served as dean of the FSU College of Communication & Information since the merger of the separate colleges into one College with three Schools in 2009. The College’s education, research and service facilities include forward-looking research centers and institutes, state-of-the-art information technology to support a distributed academic community, the Goldstein college library, Seminole Productions, and the Schendel Speech and Hearing Clinic.

College of Social Sciences and Public Policy https://coss.fsu.edu/ includes the departments of Public Health, Social Sciences, and Sociology, as well as Political Science, Economics, Urban and Regional Planning, and Public Administration and Policy. The College also is home to several interdisciplinary programs including Public Health. Dr. Tim Chapin, a professor of Urban and Regional Planning at Florida State University, was appointed Dean in 2017 and has been at FSU since
1999. The College hosts a number of centers and institutes that continually contribute to research and academic training, including the Center for Demography and Population Health http://popcenter.fsu.edu/ which coordinates population research across FSU; and the Pepper Institute on Aging and Public Policy which serves as coordinator and facilitator for the multidisciplinary work in aging studies at FSU.

The College of Arts and Sciences https://artsandsciences.fsu.edu/ includes 18 departments; 11 programs and institutes; and about 11,000 students. It awards approximately 2,000 degrees per year. It includes departments directly related to the Big Data needs such as Psychology, Biology, Statistics, Computer Science and Scientific Computing. The Psychology department has an extensive research portfolio and is ranked in the top five Psychology departments nationwide in Total and Federally financed higher education R&D expenditures (R&D NSF). It is home to graduate programs in Neuroscience and in Clinical, Cognitive, Developmental, and Social psychology. The department facilities include 12 neuroscience labs and 37 dry labs. Additionally, the department houses the Florida Center for Reading Research and also the Psychology Clinic. Big Data Analytics relevant faculty include: Neil Charness (design and use of technology by an aging population), Don Compton (Modeling children’s reading skills), Thomas Joiner (suicidal ideation and behavior), Pamela Keel (eating disorders), Wen Li (fMRI, ERPs, and emotion-cognition interactions), Greg Hajcak (utilizing event-related potentials as a brain circuitry detection in psychopathology), and Chris Patrick (mental disorders relate to neurobiological systems).

The Department of Biological Science https://www.bio.fsu.edu/ offers MS and PhD programs in Cell and Molecular Biology, Ecology and Evolution, and Neuroscience. Interdisciplinary research includes integrating molecular biology, development, epigenetics and evolution to better understand the relationship between the genotype and phenotype; the integration of neuroscience and ecology to understand behavior; the integration of genomics, computational biology and phylogenetics to understand the diversity and history of life; and the interaction of physics and chemistry to understand the structure of proteins. Core facilities include Molecular (Hybridoma, NGS library, Sanger Sequencing and Cloning) and Imaging (Confocal, Cryo-EM, TEM). BIO also administers the Center for Genomics and Personalized Medicine and the Center for Anchored Phylogenomics. Big Data Analytics relevant faculty with major genomics efforts include: Peter Fraser and Dave Gilbert (3D genome architecture and function), Henry Bass (Maize genome project), Jonathan Dennis (nucleosome positioning), Kim Hughes (longevity and fecundity in flies), Emily Lemmon (anchored phylogenomics), David Houle (Phenomics), Darin Rokyta (venom genomics), Erdam Bangi and Wu Min Deng (Drosophila models for cancer), Kay Jones (metagenomics of gut microbiome) and Karen McGinnis (plant transgenerational inheritance). Those who routinely use genomics as a tool in their research include: Joe Travis (ecology and evolution), Hengli Tang (Hepatitis C and Zika virus), Brian Chadwick (X-chromosome inactivation), Hongchang Cui (plant stress responses), Jim Fadool (retinal development in Zebrafish), Don Levitan (evolution of gamete recognition proteins) and Tom Miller (metagenomics of aquatic communities). Those with major efforts in imaging (Titan cryo-EM) include: Ken Taylor (cytoskeleton and adhesion), Beth Stroupe (mRNA and Sulphur metabolism) and Qian Yin (innate immunity).

The Department of Statistics https://stat.fsu.edu/ was founded in September 1959, since that time it has been the home at one time or another to many of the pioneers of modern statistics. It has a significant teaching load and a research faculty predominantly focused in theoretical statistics. There
II. Computing Center Establishment and Resources

The FSU Research Computing Center provides the FSU research community with computational resources to enable scientific research. More details are available on their web site.

Supercomputing came to the Florida State University campus through the auspices of the Supercomputer Computations Research Institute (SCRI), which began operation in 1984. It was established by the U.S. Department of Energy in response to a nationwide discussion on the need to advance research in a variety of fields, all of which required large-scale computers. SCRI ushered in a period in which several national supercomputing centers were established and which most research universities invested in high-performance computers.

Over the years, a number of supercomputing configurations came to the Florida State campus, all of which have played a focal role in the use of computers to advance science and engineering and in the development of algorithms and software that take full advantage of these computational resources. In September 2007, the High Performance Computing Cluster was commissioned as a multi-disciplinary, shared, expandable resource for FSU researchers. In 2013, the Shared-HPC became part of Information Technology Services. The number of full-time system support staff increased, and the name changed to Research Computing Center to reflect the new scope of the department. By this time, the RCC was supporting the operations of the HPC, an interactive computing system (“Spear”), a cloud-computing infrastructure (“SKY”), and a high-throughput cluster, Condor.

The RCC Mission is to:
- Support multidisciplinary research.
- Provide a general access computing platform.
- Encourage cost sharing by departments with dedicated computing needs.
- Provide a broad base of support and training opportunities.

The Research Computing Center (RCC) operates within Florida State University as an academic service unit of Information Technology Services (ITS). This unique partnership enables the RCC to leverage university ITS infrastructure and places the RCC in a position to support university-wide research.

The RCC Director oversees the professional staff and students responsible for maintaining core systems and supporting specific research domain projects. The director has an academic affiliation with at least one academic unit and operates at the level of unit head to give this person a vantage over research computing activities taking place at Florida State. The director reports to the Associate Vice President and Chief Information Officer (CIO) and has a permanent position on the IT Governance Council.

To maintain the Center’s focus on research, the activities of the RCC are reviewed annually by an Executive Board composed of the CIO, Vice President of Research, the Dean of the College of Arts and Sciences and RCC Director (Ex Officio). Advisory panels, such as the High Performance Computing (HPC) Advisory Panel, are created at the discretion of the Executive Board to help the RCC director prioritize activities related to research and education.
Key computing and data storage resources include:

- The High Performance computing cluster (708 nodes and 12,490 cores).
- The Spear Cluster providing interactive high-performance computing connected to the Center’s high-performance network and storage systems.
- A cloud virtualization cluster for rapid deployment and management of web, database and other self-managed applications.
- Storage systems includes a parallel data storage system optimized for rapid I/O for HPC and Spear jobs.
- Research Archival Storage for general long-term digital storage for research data.

The Research Computing Center team include ten support staff members plus additional student interns. Our team includes software specialists, systems administrators, and research specialists.

- Paul van der Mark - Director
- Casey McLaughlin - Support Coordinator
- Application Specialists
  - Bin Chen
  - Prasad Maddumage
  - Donny Shrum
- Operations
  - Edson Manners - Operations Manager
  - Mitch Gans - Data Center Manager
  - Brian Gentry - Systems Specialist
  - Cameron Berkley - Systems Specialist
  - Terry Ward - Systems Administrator

The RCC supports research activities of faculty from a wide range of research areas including:

- Dr. Christopher Reenock from the Department of Political Science who is conducting research exploring environmental risk patterns and the implementation of environmental policy in the United States.
- Daniel Tompkins from the College of Music is analyzing thousands of digital music scores to discover new musical insights.
- Dr. Kaitlin Lansford from the School of Communication Science and Disorders, is investigating the effects of perceptual training on subsequent understanding of dysarthric speech.
- Sue Ellen Smith from the College of Business is conducting research in catastrophe risk management.
- Dr. Adrian Barbu from the Department of Statistics creates algorithms and statistical methodologies for large data sets.
- Dr. Kunihiko “Sam” Taira from the Department of Mechanical Engineering is studying fluid flow around a wide variety of objects.
- Dr. Beth Stroupe of the Microbiology Department is using big data to study a microscopic substance: the molecular structure of sulfite reductase, a central enzyme in the sulfur metabolic cycle.
- Dr. Greg Riccardi from the Institute for Digital Information and Scientific Communication (iDigInfo) at the College of Communication and Information has led a number of big data projects in biological diversity.
Dr. Wei Yang from the Department of Chemistry and Biochemistry have used RCC to conduct long-timescale biological simulations.

Dr. Steve Morey from the Center for Ocean and Atmospheric Prediction Studies, Morey has used RCC to generate ocean topography models, study how currents affect fisheries and explore effects of the Deepwater Horizon oil spill.

A complete list of collaborators is on their web site.

III. Cores and Centers Related to Health Sciences Data

There are a number of cores and centers that provide services to members of the FSU community but are housed within Departments to provide infrastructure. The following are listed by department for location only and provide information about the range of services.

- In Biomedical Sciences (College of Medicine)
  - Magnetic Imaging Resonance Facility: [https://mri.fsu.edu/](https://mri.fsu.edu/) The facility is housed within the College of Medicine and is dedicated to cutting-edge multidisciplinary research. The goal is to foster research that encompasses and connects neuroscience, psychology, medicine, and engineering. The MRI center is a research-dedicated space that includes a 3T Siemens Prisma (whole-body) scanner, an MR-compatible Brain Products system for EEG and psychophysiological measures, eye tracker, mock scanner, and a MagPro X100 equipped with Localite TMS Navigator for brain stimulation. Colm Connolly, PhD is Research Faculty I in Biomedical Sciences in the College of Medicine and Operations Director for the MRI facility. Greg Hajcak, PhD is the scientific director with a dual appointment in Biomedical Sciences (COM) and Psychology (Arts and Sciences). The MRI center is funded through the Office of the Vice President of Research, the Office of the Provost, and the College of Medicine.
  - Translational Science Laboratory [https://med.fsu.edu/?page=translationalLab.home](https://med.fsu.edu/?page=translationalLab.home) The TSL provides state-of-the-art proteomic and gene sequencing capabilities as well as high capacity frozen biological sample storage and serves all of FSU, in addition to the department of Biomedical Sciences. Proteomics services can include processing and identification, including post-translational modifications. Proteomics equipment includes a Thermo HF Hybrid Quadrupole-Orbitrap MS, a Thermo LTQ Orbitrap Velos HPLC-nELSI-LIT – Orbitrap, an AB Sciei 5800 MALDI-TOF, two tandem MS and a TOF MS. Sequencing equipment includes a HiSeq 2500 and a Covarix sonicator. Roger Mercer, PhD directs TSL opened and it is staffed with five PhD level research faculty including the Director, who reports directly to the Senior Associate Dean for Research and Graduate Programs.
  - The Confocal Lab [http://med.fsu.edu/index.cfm?page=confocalMicroscopyLab.home](http://med.fsu.edu/index.cfm?page=confocalMicroscopyLab.home) offers training or fee for service with confocal and super-resolution 3D structured illumination (3D-SIMM) microscopy. The facility houses a Zeiss LSM 880, Andor Revolution Spinning Disk Confocal and a DeltaVision OMX.
In Biological Science

- Center for Genomics and Personalized Medicine (CGPM): [http://genomics.fsu.edu/](http://genomics.fsu.edu/)
  
  Executive Director: Peter Fraser (since 2017)
  
  Scientific Director (Staff): Andy Wang (since 2018)
  
  Executive Committee: Weikuan Yu (Computer Science), Jonathan Dennis (Biology), Michelle Arbeitman (College of Medicine), Mohammed Kabbaj (College of Medicine), David Gilbert (Biology), Florian Duclot (College of Medicine)

The CGPM at Florida State University aims to enable research programs by providing consulting, data analysis support, and training opportunities for FSU students, postdocs, and faculty in genomic data analysis. The Center facilitates ongoing genomics research, actively supports new grant applications by helping researchers demonstrate feasibility of genomics aims, and provides a focal point with continuity for a genomics community on campus. The CGPM has collaborated on over 20 grant proposals and projects in the past two years, held 6 workshops, and trained numerous undergraduate and graduate students. Through its collaborations, the Center addresses wide-ranging problems in genomics, such as transcription, chromatin structure, genome structural organization, whole genome sequencing and characterization, and replication timing. The CGPM also serves as a research hub aimed at bringing together diverse faculty in various disciplines to solve large-scale problems in genome biology. The CGPM's services are available to all FSU students and faculty on a fee for service basis at costs with significant savings compared to outsourcing.

We see expansion of the CGPM as an essential component of a Big Data initiative on campus, to provide increased capacity for both training and analysis expertise in genomics/omics. We envision the inclusion of new faculty lines in computational biology and bioinformatics, which specifically earmark researchers interested in providing their expertise in multi-disciplinary collaborative projects. We see this as necessary to continue to build a genomics community at FSU, to fully exploit the powerful technologies employing NGS, to maximize success in obtaining federal grant funding and to train the genomics and Big Data scientists of tomorrow.

More information is available in the CGPM 2017 annual report and renewal proposal (these documents are included in the packet of information).

- Center for Anchored Phylogenomics [http://anchoredphylogeny.com/](http://anchoredphylogeny.com/)

  The aim of the Center for Anchored Phylogenomics is to facilitate data collection for phylogenetics, phylogeography, and population genomics by providing expertise, resources and training to researchers worldwide. The Center uses an approach (“anchored hybrid enrichment”) that captures highly conserved “anchor” regions of genomes (7), which was recently applied to construct the phylogeny of living birds with an unprecedented scale of data (8). The Center has processed more than 25,000 taxa to date and is currently supported by collaborative contracts with more than 24 institutions internationally. The Center has produced 25 publications, with additional manuscripts currently under review (10) or in press (9). The Center for Anchored Phylogenomics is a non-profit entity that operates at cost. Collaborators send their DNA samples to the Center, which enriches the samples for anchor, anonymous, and/or functional loci, sequences the enriched libraries, and performs the bulk of the downstream bioinformatics (including assembly, orthology, alignment, and
preliminary phylogeny estimation). The collaborator performs additional analyses and prepares manuscripts for publication in consultation with the Center. Collaborators benefit from greatly reduced costs that result from the substantial reagent and sequencing discounts that the Center negotiates because of the high volume processed.

- **Analytical Lab and Research Facility** [http://www.bio.fsu.edu/analytical.php](http://www.bio.fsu.edu/analytical.php) incorporates state-of-the-art laboratory equipment for performing biological analyses, developing methods to aid in research, and training faculty and graduate students in equipment operation and research techniques. Includes next generation sequencing (NGS) library preparation and quality control in preparation for submission to the translational lab facility for NGS.

- **The DNA Sequencing Facility** [http://www.bio.fsu.edu/dna_sequencing.php](http://www.bio.fsu.edu/dna_sequencing.php) offers sequencing and fragment analysis services using an Applied Biosystems 3730 Genetic Analyzer with Capillary Electrophoresis. DNA sequencing chemistries are performed using Big-Dye terminator chemistry on double or single stranded DNA and PCR products.

- **NGS Library Facility.** As specialized faculty in the Biology Core, Dr. Amber Brown is involved in and coordinates library preparation for next-generation sequencing with the Illumina MiSeq and NovaSeq platforms. We can do start-to-finish library construction (RNaseq, DNaseq, PCR products) including all QC and pooling, or we can help out with individual steps of the process as needed. The Biology Core has a Biomek 4000 liquid handling system for high-throughput library construction, and Bioanalyzer and KAPA PCR for quality control. Amber coordinates with the Translational lab and other users across campus to plan indexing strategies and help the users submit their libraries for sequencing.

- **The Hybridoma Facility** [http://www.bio.fsu.edu/hybridoma.php](http://www.bio.fsu.edu/hybridoma.php) provides the expertise and assistance necessary for the production of monoclonal antibodies including the immunization of mice, collection and testing of immune sera, hybridoma fusions screening of hybridomas by ELISA, subcloning of selected cell lines, scale up of cells for supernatants or to be sent out for ascites production, long term storage of hybridomas and revival as needed, mycoplasma testing (currently in-house only) and isotyping.

- **The Molecular Cloning Facility** [http://www.bio.fsu.edu/mol_cloning.php](http://www.bio.fsu.edu/mol_cloning.php) provides expertise and assistance in designing and implementing molecular biology techniques including training to support individuals with their research projects, full service production of plasmid clones, mutants, fusions constructs, libraries, etc., qPCR analysis of DNA and RNA samples from a variety of organisms, as Qiagen and Invitrogen reagents.

- **Biological Science Imaging Resource** ([http://bsir.bio.fsu.edu/](http://bsir.bio.fsu.edu/)) is a well-equipped multidisciplinary facility incorporating modern technologies in imaging and analysis. Equipment available to students include at Titan Krios Cryo-EM, CM120 and JEOL 1200EX Transmission EM, Nova 400 Nano-Scanning EM, Vitrobot Mk-4, Gatan Plasma Cleaner, JEOL 1200EX, Olympus BX61 and Zeiss LSM 510 NLO.

Chemistry, Biochemistry and Biophysics

- **Protein Expression Lab** [http://biophysics.fsu.edu/facilities/protein-expression-facility/](http://biophysics.fsu.edu/facilities/protein-expression-facility/) provides training and services for large-scale expression of recombinant proteins in eukaryotic cells.
- **X-ray Crystallography** [http://biophysics.fsu.edu/facilities/x-ray-facility/](http://biophysics.fsu.edu/facilities/x-ray-facility/)

**IV. Doctoral Programs in the Major Participating Units**

- **Biological Science** [http://www.bio.fsu.edu/](http://www.bio.fsu.edu/)

  In 1956, the Department of Biological Science was founded by merging four independent biological units. In contrast to many biology departments at other universities over the last 60 years, it remained a large inclusive, integrated unit encompassing all facets of biological research. The department consists of three relatively autonomous units: Cell and Molecular Biology (CMB), Ecology and Evolution (EE), and Neuroscience (NS). Each unit has developed their own graduate curriculum and evaluation process of their graduate students. However, graduate students have lunch together with the weekly Biological Science Colloquium speaker, and they choose three speakers per year and some faculty are cross-listed in multiple units.

  - **AREA1: Cell and Molecular Biology (CMB)** [http://www.bio.fsu.edu/cmb/index.php](http://www.bio.fsu.edu/cmb/index.php) The CMB Area has gone through an aggressive period of growth over the past fifteen years with the hiring of more than a dozen faculty at all career levels, from Junior faculty to Endowed Chairs Gilbert and Fraser. Faculty have broad interests in the areas of cell structure, motility and development, the genetic control of cellular behavior, the regulation of gene expression, the dynamic maintenance of genetic information and the physiology of organisms. The CMB area also has a concentrated strength in the area of nuclear and chromosomal organization. The CMB PhD Program is tailored to the individual needs and interests of students. CMB students complete a core of two required courses (Advanced Molecular Biology and Advanced Cell Biology) and then select additional course work in consultation with their supervisory committees. First-year students participate in three lab rotations to expose them to diverse research environments and help them select a major professor by the end of the spring semester. Typically, Ph.D. students complete their preliminary written and oral exams near the end of their second year and successfully defend their research proposal near the end of their third year.

  - **AREA2: Evolution and Ecology** [https://www.bio.fsu.edu/ee/index.php](https://www.bio.fsu.edu/ee/index.php) The Ecology and Evolution Group has a long tradition of excellence in research and graduate training, especially in **quantitative approaches to understanding ecological and evolutionary processes**. Faculty members have **broad research interests that link deep natural history with modern quantitative, computational**, and molecular techniques. Graduate students are welcomed as a key component of our intellectual community, forming the circulatory system that promotes exchange among research areas. They are therefore an unusually interactive group, with many students co-advised by multiple faculty, and where collaborative research is highly valued. Externally-funded research relevant to this proposal ranges from viral protein evolution to metagenomics of ecological communities.
**Biomedical Sciences** [http://med.fsu.edu/?page=phdAdmissions.home](http://med.fsu.edu/?page=phdAdmissions.home)

The Department of Biomedical Sciences is the interdisciplinary basic sciences research and teaching department of the College of Medicine, which houses 34 basic research faculty. The Department has six priority research areas: (1) Neuroscience, (2) Genetics and genomics, (3) Molecular structure and function, (4) Cardiovascular and infectious diseases, (5) Cell biology and development and (6) Stem cell and cancer biology. By design the department is interdisciplinary and has a culture of collaboration. The department as a whole has been very successful in obtaining external with an overall increase of Federal and non-Federal research dollars from $11.9 million to $24.5 million during the last six years. A further increase will exist at the end of this fiscal year such that it is projected to more than a doubling of Federal research dollars (NIH, NSF and DOD) since FY 10'-11’. Many faculty use genomic approaches to address fundamental questions about gene regulation, chromatin state, and epigenetic inheritance; as well as intracellular (e.g., centrosomes) and extracellular (e.g., exosomes) communication. The Ph.D. Program (founded in 2005) trains biomedical scientists using modern approaches of genomics, proteomics, bioinformatics, among others, to address questions of developmental, cell, and molecular biology related to human health. There are 47 students, with 7-10 new students per year. New students are required to perform at least two laboratory rotations, meant to provide students with scientific training and opportunities to become familiar with faculty research projects, specific lab environments, and lab personnel. For each rotation, students are required to write a project summary of their experience. Students select their thesis lab after the second rotation. In addition, there are core set of courses the students are required to take including research techniques, advanced molecular biology, bioregulation, advanced cell biology and professional integrity in research.

**Chemistry and Biochemistry** [https://www.chem.fsu.edu/](https://www.chem.fsu.edu/)

Chemistry and Biochemistry is comprised of 26 tenured and 6 and tenure track faculty. In the past five years (2011-2016), awards have totaled over $33 million dollars. Chemistry & Biochemistry faculty members and students continually receive accolades for their efforts. Examples of successes include Dr. Thomas Albrecht-Schmidt’s recent $10 million award for a nuclear research center from the U.S. Department of Energy, Dr. Yan-Yan Hu’s 2017 Marion Milligan Mason Award from the American Association for the Advancement of Science, and a record number of highly competitive Graduate Research Fellowships from the National Science Foundation in 2017. The graduate program is divided into six areas: Analytical, Biochemistry, Inorganic, Materials, Organic, and Physical. The area with IGP participating faculty is Biochemistry (Dr. Hong Li). Biochemistry research is directed towards understanding the molecular basis for cell function and disease. In pursuit of these aims, our researchers use state-of-the-art equipment including instruments at the National High Magnetic Field Laboratory, the Institute of Molecular Biophysics and the Biological Sciences Imaging Resource. The Biochemistry program offers graduate students diverse research training opportunities that span from molecular structure determination to drug design.
Program in Molecular Biophysics (MOB) [http://biophysics.fsu.edu/graduate-program/]

Students and faculty associated with the MOB Graduate Program use the language and tools of physics, biochemistry, mathematics, physical chemistry, and molecular and cellular biology to understand biological phenomena at the molecular level. Structural Biology & Computational Biophysics involves exciting, highly interdisciplinary research, and the graduate training at FSU reflects the best in the areas that comprise biophysics. The MOB Graduate Program is independent from the graduate programs in other departments. Because our faculty is drawn from several departments, MOB students have the opportunity to work with an interdisciplinary group of faculty and access to resources in several departments. Applicants must specify that they are applying to one of the MOB Program tracks: Molecular Biophysics/Structural Biology or Computational Structural Biology. Successful students in our program come from many different scientific backgrounds and our curriculum is designed with the flexibility to meet their individual goals. Our program is small enough that students receive individual attention and yet large enough to offer the students a wealth of research opportunities. Our graduates are employed in academia, industry, and government. We have graduates in patent law and those who have founded their own start-up companies. Our students are a diverse group who come to us from all over the world. Students studying structural biology & computational biophysics at Florida State are a close-knit group and gather once a week during Fall and Spring semesters for research presentations.

Scientific Computing [https://www.sc.fsu.edu/]

The Department of Scientific Computing (SC) is the focal point of computational science activities at FSU. Computational science involves the invention, implementation, testing, and application of algorithms and software used to solve large-scale scientific and engineering problems. Our faculty comes from a wide variety of traditional mathematical and scientific disciplines, such as physics, computer science, biology, material science, and engineering. The scientific diversity of the faculty fosters synergistic collaborations within and outside of the department to advance the nascent discipline of computational science. The department offers an innovative undergraduate and graduate training program in computational science. Students learn merging mathematics, computation, and science at all levels in a truly interdisciplinary environment.

Computer Science [https://www.cs.fsu.edu/]

Computer Science (CS) at FSU offers three Master of Science tracks and Doctoral degrees. Besides core Computer Science areas, our faculty also engage in inter-disciplinary research with other Departments including Mathematics, Statistics, Biology, Engineering, and Medicine. The department includes 27 faculty: 15 tenured, 6 tenure track and 6 teaching/specialist faculty. FSU’s CS department is home to five NSF CAREER Award winners, a US Dept. of Energy Early Career Principal Investigator Award winner, an AFOSR Young Investigator Award winner, three Fulbright Scholar Award winners, an IEEE Fellow, ACM Distinguished Scientists, and a FSU Distinguished Research Professor. CS faculty are among the world’s leaders in Algorithms, Architecture, Databases, Distributed Systems, High-Performance Computing, Networking, Programming Languages and Compilers, Scientific Computing, Security, Software Engineering, and Vision. Research and education programs are cutting edge. The CS department has shown...
steady growth in proposal submissions and in the last year alone has over doubled both their awards both in number and dollar amount.

- Program In Neuroscience [http://neuro.fsu.edu/about/abouthub](http://neuro.fsu.edu/about/abouthub)
  The Program in Neuroscience at Florida State University is an interdisciplinary research and graduate training program, offering a Ph.D. in Neuroscience. The Program is made up of 40+ graduate students working with more than 30 core faculty from 4 departments at FSU. These participating departments, Psychology, Biological Science, Molecular Bio and Biomedical Sciences, have tracks in Neuroscience within their existing graduate programs.

  There are two pre-/post-doctoral training programs at FSU, both hosted by the Department of Psychology. The Chemosensory Training Program (CTP) is focused on chemosensory systems. Maintained by FSU’s program in Neuroscience, the CTP training grant was recently renewed for another five years, extending the award into its 25th year of training predoctoral and postdoctoral candidates at FSU. The Integrated Clinical Neuroscience (ICN) Training Program trains students in several areas of psychopathology characterized by dysregulated behaviors. The proposed program includes 11 core faculty from the 21 faculty members in the Clinical and Neuroscience programs within the Department of Psychology at FSU.

V. University Libraries Data Services

University Libraries provide collections, resources and services to enhance the learning, teaching, research, and service activities of the Florida State University. The Libraries’ collections include nearly 3.75 million titles and the web site offers access to more than 1100 databases and 125,000 electronic journals. University Libraries had about two million visitors in 2016-17. Strozier Library, FSU’s largest library, is open 134 hours each week to provide around-the-clock research assistance and other services like free academic tutoring and a robust range of academic support throughout the day and late into the night. Library faculty offer classes and consultations to teach critical research and thinking skills reaching over 22,000 participants. The FSU Libraries include seven libraries on campus: the Robert Manning Strozier Library, Paul A. M. Dirac Science Library, Mildred and Claude Pepper Library, Warren Allen Music Library, College of Law Legal Research Center, College of Medicine Medical Library, and the College of Engineering Library.

Data-intensive research is an area of growth for academic research libraries and FSU Libraries is on the fast track to becoming a leader in providing these services in a sustainable and innovative way. Our current mission for data services includes providing:

- Research data management consultations and training
- Training in data processing and analysis (i.e., data carpentry)
- Data curation throughout the research lifecycle
- Preservation and access to data collections

By leveraging our faculty’s expertise throughout the research lifecycle, we offer a suite of services focusing on effective research data stewardship, data management, training in data analysis and visualization, and providing the technical infrastructure for curating, preserving, and publishing data.
Current Data Services

- Assist in creating Data Management Plans in compliance with funder mandates
- DigiNole Research Repository for Public Access Data
- Teaching and Training on Data Management Plans and Best Practices in Data Management
- Text and Numerical Data Services
- Interdisciplinary Data Reference
- Government Information and Data Consultations
- Research and Development Spaces
- Data Acquisition
- Data Analysis, Visualization, and Software Training (SPSS, Stata, SAS, R, NVivo, Qualtrics, QGIS, SQL, OpenRefine, Tableau, MatLab)
- Digital Humanities Data Analysis and Interpretation
- Data Discovery and Access
- DATA (Data and Text Analysis) Lab
- Data Services Team with various Subject and Functional Specialists
- Institutional memberships with DMPTool, Open Science Framework, ORCID Id

FSU Libraries is building capacity for providing these services. Our current Data Librarians serve as a foundation upon which to grow as the library and campus grows and changes. Ideally the Libraries “Data Services Team” would have dedicated staff including functional specialists, subject liaisons, repository experts, metadata experts and technology professionals. With more resources our next areas of growth could be the expansion our data services and team to provide data curation throughout the entire research lifecycle, more robust metadata and deposit assistance to researchers, creating interdisciplinary data information literacy materials and trainings, building capacity to enhance technical data infrastructure, and increasing discovery and access strategies for our many data collections.