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1) FACILITIES & RESOURCES

1.1) Animal Resource Program, University Park

<http://www.research.psu.edu/arp/>

The Animal Resource Program (ARP) is committed to providing PSU faculty, staff and students with high quality, cost-effective research animal resources. In addition to suitable housing facilities and animal husbandry services for animals used in biomedical research, ARP provides veterinary and diagnostic services, personnel training and expertise in laboratory animal, agricultural and wildlife technology and medicine. ARP also provides veterinary oversight of agricultural animal facilities and wildlife used in research and teaching at Penn State.

1.2) Cytometry Facility, University Park

<http://www.huck.psu.edu/facilities/cytometry-up/>

Provides fluorescence services from flow cytometry to confocal/widefield microscopy including:

- Image cytometry using sophisticated fluorescence microscopes
- Flow cytometry using high-speed cytometers and cell sorters
- Training and assistance in sample preparation, use of equipment and interpretation of results. Preliminary analyses are conducted at no cost to assure that methods will work for the protocol and cell type of interest.
- Information to help you in grant and paper preparation, for example, literature searches and reference materials, preliminary data collection, help with experimental design.
- Access to Buffalo confocal and Purdue cytometry newsnets for help with difficult problems.
- Workshops and facility tours

1.3) Cytometry Core Facility, Hershey

<http://www.pennstatehershey.org/web/core/flow-cytometry>

As a clinically certified facility, the Cell Science/Flow Cytometry Core Facility, located in room C3603, performs clinical analyses of patient samples on a regular basis. In addition, the six flow cytometers, including two 3-color FACScan instruments, two 4-color FACSCalibur instruments, a 6-color FACSCanto instrument, and a 6-color MoFlo High

Performance cell sorter, are available for use by investigators at the College of Medicine on an hourly rate basis. The services of this core are indispensable for investigators in the field of immunology. In addition, many other cell biology projects use the flow cytometers.

1.4) DNA Microarray Facility, University Park

<http://www.huck.psu.edu/facilities/dna-microarray-up>

The facility performs microarray experiments, including sample labeling, hybridization, scanning, data acquisition, and assessment of sample purity/quality. Also available: robots for high-throughput bacterial colony picking/gridding, and high-throughput liquid handling.

1.5) Electron Microscopy Facility, University Park

<http://www.huck.psu.edu/facilities/electron-microscopy-up>

The facility provides conventional transmission- and scanning electron microscopy, cryo-SEM, digitized imaging, microtomy, cryogenic sample preparation, high resolution imaging, elemental analysis, immunogold labeling, freeze-substitution, histology and immunohistochemistry.

1.6) Electron Microscopy, Histology and Confocal/Deconvolution Imaging, Hershey

<http://www.pennstatehershey.org/web/core/microscopy-histology>

The Histology Laboratory, Confocal/Deconvolution Imaging Core Facility and Electron Microscopy Laboratory provide an assortment of microscopy services.

1.7) Functional Genomics Core Facility, Hershey

<http://www.pennstatehershey.org/web/core/gene-expression-analysis>

The Functional Genomics Core Facility offers gene expression analysis (microarray analysis and interpretation, quantitative real-time PCR analysis), TaqMan SNP analysis, laser capture microdissection.

Specific services include:

- * Consultations on Experimental Design & Data Validation
- * RNA, DNA, Protein Quality Control
- * MicroArray and Analysis
- * Data Analysis
- * Quantitative Real-time PCR Analysis (RNA, DNA, SNP)
- * Access to Laser Capture Microdissection

1.8) Human Electrophysiology Facility, University Park

<http://www.cyfc.psu.edu/hef/>

The Human Electrophysiology Facility (HEF) supports Penn State researchers in the acquisition, analysis, and modeling of electroencephalography (EEG) data. Through use of equipment found in the HEF, Penn State researchers may extend their research programs to include methods of behavioral and cognitive neuroscience, consistent with the emphases placed on neuroscience and translational research by major funding sources (the National Institutes of Health, in particular).

1.9) Macromolecular Core Facility, Hershey

<http://www.pennstatehershey.org/web/core/macromolecular-synthesis>

The Macromolecular Core Facility was established in 1987-88, with primary grant support from the National Science Foundation as well as College of Medicine funds. This facility subsequently received grant support from the NIH and the State of Pennsylvania via the Ben Franklin Partnership, and matching funds from the College of Medicine. Services include:

1.9.1) Protein Sequencing

<http://www.pennstatehershey.org/web/core/proteins-mass-spectrometry>

An Applied Biosystems Procise 491 was acquired in May, 2001 for sequence analysis. We have the capability to sequence from blots and can routinely sequence 5-20 pmol of non-blocked peptide. Cost is \$15/residue sequenced, with a 5-residue/\$75 minimum charge.

1.9.2) Peptide Synthesis

<http://www.pennstatehershey.org/web/core/proteinsmassspectrometry/peptide-protein-sequencing>

A Milligen 9050 Fmoc peptide synthesizer has been our workhorse for peptide synthesis, and we have recently acquired a second synthesizer (Perseptive 9050 Plus) through a generous donation from the du Pont Nemours Company in Wilmington, DE and an ABI 331 A recuperated from Geisinger Weiss Research Center. A standard synthesis on either of these machines delivers between 50-80 mg of peptide, at a cost of \$20 per residue (0.1 mmol scale), or \$30 per residue (0.2 mmol scale). Custom syntheses are also possible (e.g., phosphopeptides, biotinylated peptides), with the additional cost being determined by the reagents used.

1.9.3) Oligonucleotide Synthesis

<http://www.pennstatehershey.org/web/core/macromolecular/oligo-synthesis>

One Polygen synthesizer is used to generate oligonucleotides. The cost is 33¢ per base, with no set-up charge. Many users choose to have their oligonucleotides purified, which is done with Nensorb columns (\$15 per purification). Custom syntheses such as modified bases and phosphorothioate chemistries are also available, as are larger-scale syntheses.

1.9.4). Image analysis and Gel Band Quantitation

<http://www.pennstatehershey.org/web/core/macromolecular/gel-imaging>

(Instrumentation purchased with Tobacco Settlement Funds)

A) Phosphorimager Gel/Blot Analysis (1D and 2D)

For direct quantitation of radioactive bands in dried gels or blots, a BioRad Molecular Imager FX Pro Plus PhosphorImager is available, with a linear range of detected density of 5 orders of magnitude. Price is \$2 per scan.

B) Fluorimager Gel/Blot Analysis (1D and 2D)

The FX Pro Plus also has a 3-laser Fluorimager (488, 532, & 635 nm lasers) which enable band and spot detection from a large variety of fluors. After image acquisition, Quantity One 1D or PDQuest 2D analysis software can be used to perform calculations of band densities, background corrections, etc. The PDQuest software can also compare spot densities on different gel images to select protein spots whose levels change between different experimental conditions, and a spot cut list can be exported to our LEAP/BioMachines 2DiDx gel spot cutter. The imaging charge is \$2 per scan, and the instrument is available on a sign-up basis to individual trained users.

C) Gel/Film Densitometry Analysis (1D and 2D)

For quantitation of exposed film (radioactive or chemiluminescent detection), a BioRad GS800 Calibrated Densitometer is available to digitize film images. The densitometric image obtained can then be analyzed using Quantity One software to analyze 1D gels or slot/dot blot images, or PDQuest software to analyze two-dimensional gel images. The rate for Densitometry is \$5/hr, and the instrument is available to trained users on a sign-up basis.

D) DIGE Gel Analysis (2D)

For quantitation of differences in protein amount between different samples, equal amounts of each sample can be labeled with different fluors, usually a combination of Cy2, Cy3, and Cy5, then mixed together before 2D gel separation. Fluorescent imaging and quantitation of the resulting 2D gels can be done with our Typhoon Imager, and spot-cut lists can be exported for automated gel spot excision using our Ettan Spot Picker.

1.10) Molecular Genetics and DNA Sequencing Core Lab, Hershey

<http://www.pennstatehershey.org/web/core/molecular-genetics-services>

The Molecular Genetics Core Facility (MGCF), provides automated DNA sequencing centered around an ABI 3130XL Capillary sequencer. Additional equipment housed by the facility include a gel based ABI 377 DNA Sequencer, an MJ Research thermocycler, a PE Applied Biosystems GeneAmp PCR System 9700 thermocycler, and a NanoDrop ND-1000 Full-spectrum UV/Vis Spectrophotometer. The MGCF also provides Genotyping and SNPlex services. Our methodology is based around the Applied Biosystems SNPlex Genotyping System, and is used in conjunction with ABI 3130XL instrumentation. This combination allows for the rapid analysis of up to 48 separate SNPs per individual sample. 9,000-11,000 independent sequencing reactions are performed per year at a cost of \$9.50 per template sequenced.

Under normal conditions sequencing data from a template submitted before noon on day one, will arrive by email by the end of day two; however, the service is first-come, first-serve, so there may be occasions where resulting samples

may take slightly longer. The ABI 3130 capillary sequencer allows us greater flexibility in running samples, thus minimizing turn-around times.

Individual investigators provide the purified plasmid or PCR template in water, as well as the primer, unless a standard primer (T3, T7, M13, etc.) stocked by the Core Facility is requested (View the list of available primers). Avoid placing samples in TE buffer, as EDTA chelates metal ions needed during the PCR reaction. The sequencing reactions are performed by cycle sequencing using fluorescent dye-labeled dideoxy terminators (ddNTPs) and a modified Taq polymerase. Resolution of the sequencing products is achieved by running the spin column-purified samples on a 16 set cap. Special care must be taken by customers to provide as clean a DNA product as possible. Quality, as well as quantity of your DNA sample is of the utmost importance. Electrokinetic injection of the DNA product puts investigator DNA in direct competition with any salts, RNA, or other charged particles which may be present in the sample. Detection of the fluorescently-labeled fragments is done as the bands migrate past the CCD camera under illumination of an argon-ion laser.

Version 5.2 Sequencing Analysis software, using optimized basecalling and sizecalling algorithms, is used to generate sequencing data. Turnaround times are quick, and researchers are rapidly provided with their sequence data via email. Color-print electropherograms showing the fluorescence peak traces that represent the actual dye-labeled fragments as they leave the caps can be provided; however, it is more cost- and time-efficient to simply send you the chromatogram as an attachment to the emailed sequence file, and we encourage investigators to use this option, which provides a permanent electronic record which can either be viewed on-screen or printed at a later date. We recommend ABI's Sequence Scanner Software v1.0 as this is the trace viewer utilized by the core facility for printing chromatograms. Since the ABI program only runs in the Windows environment, Finch TV is an alternative trace viewer available for Windows, MacOSX or UNIX.

1.11) Magnetic Resonance Center, University Park

<http://www.bioe.psu.edu/NMR/>

The center offers magnetic resonance imaging, high resolution spectroscopy, diffuse optical tomography, RF coil fabrication and electrical characterization. Available equipment includes: 2 magnetic resonance systems; a multi-source, multi-detector near infrared spectrophotometer; network analyzers; oscilloscopes; frequency synthesizers; and software. The Huck Institute Magnetic Resonance Centre was established in late 2005 and consists of a Varian 7 tesla horizontal magnet for small animal imaging and a Varian 14.1 tesla vertical magnet for NMR microimaging. The center is involved in many research areas of magnetic resonance imaging and diffuse optical tomography.

1.12) Magnetic Resonance Imaging/NMR Facilities, Hershey

<http://www.pennstatehershey.org/web/nmrlab/home>

The Department of Radiology provides the Center for NMR Research with 6,500 sq. ft. of laboratory space, which includes: a biochemical suite, an electronic suite, a surgical suite, and a fully equipped machine shop.

These two MRI systems are dedicated for research activities.

- 3.0 Tesla 90 cm bore whole body MR spectrometer/imager (Bruker S-300).
- 7.0 Tesla 20 cm bore small animal imaging system (Bruker Biospec 70/20as).
- This system is reserved one day per week for research activities.

- 3.0 Tesla MRI Philips Intera Imagers with seven receiver channels for state-of-the-art SENSE technology are located in the main hospital complex.

1.13) Micro CT Scanner, Hershey

<http://www.pennstatehershey.org/web/core/micro-ct-scanner>

The Penn State College of Medicine research core facility has a Scanco vivaCT 40, in vivo microCT scanner. The scanner is located in the Department of Comparative Medicine, and is operated under oversight provided by the Department of Orthopaedics

Scanco vivaCT 40 Specifications:

- X-Ray: Microfocus X-Ray-source; 5 or 7 μm spot size; 30-70 kVp / 20-50 keV (160 μA); No shielding required
- Detector: 2048x252 elements, 26 μm pitch
- Resolution: 10-72 μm nominal isotropic, 16 μm (10% MTF)
- Image matrix 512x512, 1024x1024 or 2048x2048 Pixels
- Specimen Size: FOV 20 to 38 mm max. Scan length 145 mm
- Scan Time:
 - 1k x 1k, 3 sec/section (6 min/110 sections)
 - 2k x 2k, 3 sec/section (12 min/220 sections)
- Reconstr. Time:
 - 3 sec/section for 1k x 1k, 0.72° angular increment
 - 24 sec/section for 2k x 2k, 0.36° angular increment
 - 48 sec/section for 2k x 2k, 0.18° angular increment

Services and Scheduling:

- | | |
|---------------------------|--------------|
| • Hourly Use | \$75.00 |
| • Unlimited Yearly Rate | \$4,500.00 |
| • Scientific Consultation | \$50.00/hour |

1.14) Mouse Metabolic Phenotyping Center, Hershey

The Penn State MMPC is designed to provide the scientific community with unique, state-of-the-art, and standardized experimental tools for the purpose of investigating transgenic mouse models potentially useful for understanding obesity, diabetes and its complications. The MMPC is composed of a multidisciplinary group of investigators at the Penn State College of Medicine and consists of the following Phenotyping Cores:

- 1) In Vivo Metabolism Core performs various non-invasive and invasive procedures to measure whole body adiposity, glucose/lipid/protein metabolism, in individual organs, physical activity, energy expenditure, and pancreatic β -cell function in awake mice.
- 2) In Vitro Metabolism and Clinical Chemistry Core conducts specialized experiments to measure glucose/lipid/protein metabolism and mitochondrial/islet function in isolated organs and applies biochemical

techniques to provide standardized measurement of serum/urine/tissue factors obtained from mouse models of diabetes and its complications.

3) Complications Core consisting of Cardiovascular Pathophysiology, Retinopathy, Nephropathy, and Sleep & Behavior Sub-Cores applies echocardiography, telemetry, EEG, and other in vivo and in vitro techniques to assess cardiovascular, retinal, renal, and sleep/behavior functions pertinent to diabetic complications.

4) Functional Genomics and Proteomics Core will apply PCR, whole genome microarray, 2D electrophoresis, and other state-of-the-art methods to measure the expression of proteins and genes associated with obesity, diabetes and its complications.

1.15) Nucleic Acid Facility, University Park

<http://www.huck.psu.edu/facilities/nucleic-acid-up/>

Services provided include:

1) DNA sequencing

Regular sequencing: standard plasmid and PCR products as well as large DNA services (including genomic). High-throughput sequencing (96-well plate submissions).

2) DNA synthesis

Oligos with lengths of 10 to 150 bases can be prepared. Crude oligos are usually available within 24-48 hours.

3) Quantitative Real-Time PCR

The ABI 7300 Sequence Detection System allows fewer than 10 copies to over 10,000,000 copies to be quantitated accurately after less than 2 hours of thermocycling and a few minutes of analysis. Researchers can set up their own samples. » more

4) Genotyping

Genemapper Fragment Analysis provides genotyping by microsatellite analysis, AFLPs and loss of heterogeneity. The 5-color system allows the researcher to use 4 fluorescent-labeled primers to multiplex several genomes in the same well. At minimum, 4 genotypes can be determined per sample in less than an hour for about \$120 (96 samples in a 96-well plate). Multiplexing different products with the same color can double or even quadruple the number of genotypes per sample (due to resolution of different-sized products with one base resolution).

5) DNA extraction and storage

Extraction and storage protocols have been adopted from the Institute of Psychiatry in London. We have also adopted their LIMS system to track samples through all stages of purification, storage and testing.

1.16) Proteomics and Mass Spectrometry Core Facility, University Park

<http://www.huck.psu.edu/facilities/proteomics-mass-spectrometry-up/>

Offers nominal and accurate mass spectrometry analysis of synthetic compounds, polymers and biomolecules (such as proteins, peptides, oligosaccharides and oligonucleotides or their conjugates). Provides identification and quantitation

of metabolites by LC-MS/MS and GC-MS, protein sample preparation for mass spectrometry analysis and subsequent identification by MALDI-TOF MS (peptide mass fingerprinting) or nanoflow LC ESI tandem mass spectrometry (nano LC-MS/MS). Assists in data interpretation.

1.17) Proteomics and Mass Spectrometry Core Facility, Hershey

<http://www.pennstatehershey.org/web/core/proteinsmassspectrometry/instrumentation>

Offers protein, peptide, oligonucleotide and small molecule analyses, as well as large-scale proteomic analyses.

Major Equipment:

- ABI/MDS Sciex 4800 MALDI TOF mass spec
- ABI 4700 Proteomics Analyzer MALDI TOF-TOF mass spec
- MDS Sciex 4000 QTrap hybrid ion trap mass spec
- ABI Voyager DE-PRO Reflectron MALDI TOF mass spec
- Bioinformatics: ProteinPilot and Phenix advanced protein-MS ID software; GPS Explorer and Mascot software, Analyst software
- HPLC and Gel Separation Systems:
 - Tempo LC-MALDI nanoflow separation & MALDI spotting system
 - Eksigent 2D nanoLC liquid chromatography system
 - LC Packings/Dionex ProBot MALDI spotting robot
 - Agilent 1100, Shimadzu LC-AS10, Waters 600E HPLC systems
 - Beckman-Coulter PF 2D Whole Protein separation system
 - 12-gel casting and running apparatus for 2D gels (Ettan IPGPhor II and Dalt 12)
- Gel Imaging and analysis
 - BioRad FX Pro Plus phosphorimager, fluorimager (3 laser), and Densitometer with QuantityOne and PDQuest software
 - GE/Amersham Typhoon DIGE gel reader with DeCyder software
 - Spot-cutting and robotics
- LEAP Technologies/BioMachines 2DiDx Spot-cutting/digestion/spotting robot
- GE/Amersham Ettan Spot Picker
- Tecan Robotics platform
 - Shimadzu CHiP printer
 - Wyatt DAWN HELEOS light-scattering detection system for protein sizing
- Services Offered:
 - Mass Spectrometry analyses and identification of proteins, peptides, oligonucleotides, carbohydrates, small molecules
 - 2D LC separations of complex protein and/or peptide mixtures for Proteomics
 - Protein Expression analysis using ICAT & iTRAQ methodology
 - Protein Expression analysis using 2D Gel-image analysis
 - Automated spot-cutting, proteolytic digestion, and sample deposition from gels
 - Shared equipment for analyzing whole protein sizes and multimeric state

1.18) Software Research Resources, Hershey

<http://www.huck.psu.edu/facilities/software-hershey/>

Software for macromolecular modeling and graphics; DNA, RNA, and protein sequence analysis; gel imaging and analysis.

1.19) Reagent Stock Program, Hershey

<http://www.hmc.psu.edu/core/reagent/vendors/sigma.htm>

Competitively-priced reagents for purchase. Rapid restocking.

1.20) Tissue Bank, Hershey

<http://www.pennstatehershey.org/web/cancer/research/facilities/tissue-bank>

Tissue (tumor tissue and normal tissue), associated blood, buccal cell swabs and epidemiological data are available.

1.21) Transgenic Core Facility,

[Hershey http://www.pennstatehershey.org/web/core/animals-transgenics-phenotyping-imaging](http://www.pennstatehershey.org/web/core/animals-transgenics-phenotyping-imaging)

Production of transgenic mice, knockout mice, rederivation of mice and whole-animal luminescent imaging.

1.22) Transgenic Mouse Facility, University Park

<http://www.huck.psu.edu/facilities/transgenic-up/>

Produces transgenic and gene-targeted (knockout) mice for the Penn State research community.

Services

- Transgenic mouse production
- Gene-targeted (knockout) mouse production
- Other services
 - Consulting: project design, construct design, screening assays, protocols, positive and negative selection schemes, any aspect of a project (no fee)
 - Special projects: inducible promoters, Cre recombinase- LoxP2
 - Special mouse strains may be considered
 - Isolation of DNA from mouse tail clips (minimum 10/procedure)
 - Isolation of DNA from embryonic stem cell clones (minimum 50/procedure)
 - Breeding of PI selected chimera or transgenic founders
 - Expansion of embryonic stem cell line(s) and arrangements for MAP testing
 - In vivo embryo rederivation (live male).
 - In vivo embryo rederivation (cryopreserved embryos).
 - Technical training (hourly rate)

1.23) X-ray Crystallography Facility, University Park

<http://www.huck.psu.edu/facilities/xray-crystallography-up/>

Training, assistance and expertise in crystallizing and determining the 3D atomic structures of proteins and other biological macromolecules. » more

Crystallization

- You provide the sample (native gel electrophoresis should be performed to demonstrate purity)
- Screens are performed (eleven 48-conditions, seven 24-conditions, three 96-conditions from Hampton; six 96-condition suites from Nextal)
- Case-specific optimization grids are used to obtain diffraction-quality crystals from initial screens
- Crystal screening for X-ray diffraction
- Crystals are screened on X-ray machines to determine diffraction limit, mosaicity and optimization of freezing conditions
- Crystals are characterized; unit cell dimensions and space group are determined
- X-ray data collection
- For crystals that have been screened successfully, X-ray data acquisition is attempted.
- In cases where the diffraction is of low resolution, data collection using the “mail-in” facility at a synchrotron can be explored.
- In special cases a data collection trip is planned to collect data at one of the national synchrotron facilities in person.
- 3D structure determination and analysis
 - X-ray structure determination, display and analysis of macromolecular structure are done using a variety of software.
- Access to Protein Data Bank
 - The Protein Data Bank is the single worldwide repository for the processing and distribution of 3-D structure data of large molecules of proteins and nucleic acids. We can visualize and analyze structures deposited in this database using a range of software.
- Dynamic light scattering
 - Analysis of variables such as aggregation, folding and conformation as a function of time and/or treatment.
- Manuscript and grant preparation
 - We will assist investigators with manuscript and preparation (including figures) for projects that involve 3D structure determination by X-ray crystallography at the facility.

1.24) X-ray Crystallography Core Facility, Hershey

<http://www.pennstatehershey.org/web/core/xray-crystallography>

The Protein X-ray Crystallography Core Facility is hosted by the Department of Biochemistry and Molecular Biology. The purpose of the Facility is to provide equipment, training, assistance, and technological innovation for determining 3D atomic structures of proteins and other macromolecules. Services provided by the Facility include: aid in crystallization,

x-ray characterization of crystals, x-ray data collection, processing and quality analysis of data, and structure determination and display.

The X-ray Crystallography Core Facility is located on the east side of the 5th floor of the Crescent (Room C5722). It contains a crystallization room, an x-ray enclosure, and a computational area for data collection, data processing, and structure determination. The Crystallization room houses a Douglas Instruments Oryx6 crystallization robot for microbatch crystallization experiments and equipment for more traditional crystallization. Eleven 48-condition, seven 24-condition, three 96-condition Hampton Screens, and six 96-condition Nextal Suites are available. Three vibration free chambers, maintained at 15 °C, 10 °C and room temperature are available for storage of trays. An Olympus SZ-61 microscopes for inspecting crystal trays is also housed here. The x-ray enclosure houses an R-Axis IV++ mounted on a Rigaku Micromax-007 x-ray generator. The x-ray beam is focused by Confocal Blue mirrors. An Xstream 2000 cryostat is also maintained. This Facility is kept at 25 °C by two independent air conditioning systems. The computing area contains two Dell Dimension PCs (Pentium IV, CPU 3.00GHz) used for data collection and data processing, and a Silicon Graphics Octane workstation for structure determination, visualization and refinement. Standard crystallographic software is freely accessible for use in this facility. An SGI Altix 350 Server is based on 64-bit Linux operating system. It consists of 8 x 1.5 Ghz Intel Itanium 2 processors sharing 8 GB of memory.

2) INSTITUTES AND CENTERS

2.1) The Huck Institute of the Life Sciences at Penn State

<http://www.huck.psu.edu/>

The Huck Institute provides an infrastructure for the establishment and support of interdisciplinary endeavors by coordinating many of the shared resources described above and many of the centers and institutes listed below. In addition, the institute supports the education and research missions of the University by serving as the umbrella for University-wide centers and institutes that support the life sciences. The Huck also supports several interdisciplinary education programs.

Education

Degree programs and professional training prepare graduates for productive and successful scientific careers. Students have the opportunity to explore concepts linking different fields, engage in active group learning experiences and explore potential career opportunities before graduation. Graduate programs are supported in the fields of;

- Cell and Developmental Biology
- Ecology
- Genetics
- IBIOS: Bioinformatics and Genomics
- IBIOS: Chemical Biology
- Immunology and Infectious Diseases
- Molecular Toxicology
- Molecular Medicine
- Neuroscience
- Physiology

- Plant Biology
- Master of Biotechnology

2.2) Center for Cellular Dynamics

<http://www.huck.psu.edu/institutes-and-centers/ccd/>

A group of labs at Penn State with shared interests in: cytoskeleton and intracellular transport; cellular changes during development and disease; cell-cell communication and interactions; live imaging. CCD labs have our homes in different departments at Penn State (Biology, Biochemistry and Molecular Biology, Chemistry, and Bioengineering). CCD members participate in departmental graduate programs, as well as interdisciplinary graduate programs organized through the Huck Institutes of the Life Sciences.

2.3) Center for Chemical Ecology

<http://chemicalecology.psu.edu/>

In 2005, Penn State researchers and facilities united as a center of excellence to promote collaborative research and graduate education in chemical and molecular ecology. The Penn State Center for Chemical Ecology (CCE) brings together researchers in complementary disciplines (biology, crop and soil sciences, entomology, horticulture, forestry, plant pathology, biochemistry and molecular biology) to explore the role chemistry plays in predator–prey, parasite–host, herbivore–plant, virus–vector, and intraspecific interactions. The center offers education and training to graduate students and postdoctoral scholars through PSU courses, international short courses, and seminars by chemical ecology experts.

2.4) Center for Comparative Genomics and Bioinformatics

<http://www.bx.psu.edu/>

The center brings together laboratories applying bioinformatic and experimental approaches to find functional sequences within genomic DNA, and to assign function to proteins.

2.5) Center for Computational Genomics

<http://www.huck.psu.edu/facilities/center-for-computational-genomics/>

The center offers a full range of bioinformatics services from consultation and data analysis to database and tool development.

2.6) Institute for Diabetes and Obesity

<http://www.pennstatehershey.org/web/diabetesandobesity/home>

The Penn State Hershey Institute for Diabetes and Obesity is a collaboration of scientists, health care providers, patients and friends whose continued goal is to increase the scientific and medical knowledge needed to eradicate diabetes and help those with diabetes to live better lives. We are committed to improving health through world-class patient care, research and education to prevent or successfully manage diabetes, obesity and related disorders.

2.7) Center for Eukaryotic Gene Regulation

<http://www.huck.psu.edu/institutes-and-centers/cgr/>

The Center seeks to foster collaborative, interdisciplinary research into fundamental gene regulation processes and their impact on cellular and developmental biology.

2.8) General Clinical Research Center at Penn State

<http://www.gcrc.psu.edu/>

The primary mission of The General Clinical Research Center at Penn State is to provide research infrastructure for investigators who conduct research with human subjects. Investigations carried out can include studies of normal and abnormal human function and studies of cause, prevention, progression, and cure of diseases. The GCRC at University Park, together with its partner GCRC at the Hershey Medical Center, are part of a national network of similar centers funded by the National Institute of Health through the National Center for Research Resources. We are administered through and additionally supported by the College of Health and Human Development, but are a resource for all of Penn State.

2.9) Penn State Institute for Computational Sciences

<http://www.research.psu.edu/ics/index.html>

ICS@PSU coordinates the computational infrastructure and instrumentation for simulation, data management and visualization, sponsorship of graduate and undergraduate training, and strategic targeting of funds to support research groups tasked with developing multiple large-scale high-impact research proposals.

The mission of ICS@PSU is to advance the science of discovery through computational modeling and simulation and multi-modal data integration analysis. ICS@PSU was developed to enhance Penn State's national and international presence and stature in computational science by growing its foundational core and advancing its frontiers in the Environmental, Life, Materials, Social Sciences. ICS@PSU will develop and coordinate activities that engage the Penn State community toward:

- Promoting foundations - meeting the need for an authoritative source for fundamental principles and practices of modeling, computation and information analysis, and verification and validation, underlying simulation based discovery across disciplines.
- Expanding frontiers - including new and emerging directions of broad scientific and societal impact such as predictive modeling of infectious disease dynamics, Internet security, clean energy, and tailored materials.
- Growing participation - reaching out to the community of students, faculty, and industrial affiliates through increased support for travel, training and internships.
- Enhancing visibility - developing new venues for dissemination of Penn State computational science research, including developing science gateways on the NSF national TeraGrid cyberinfrastructure, linking with international e-science systems, and co-organizing workshops and symposia with other Penn State institutes and professional societies.

2.10) Institute for Genomics, Proteomics and Bioinformatics

<http://www.huck.psu.edu/institutes-and-centers/genomics-proteomics-bioinformatics/>

This institute brings together researchers from across Penn State in the areas of bioinformatics, computational genomics, evolutionary genomics, functional genomics, and proteomics. The primary aim is to catalyze collaborations between researchers in the fields of:

- Genomics: the study of organisms' whole genomes (i.e. all the genetic material in an organism: DNA and RNA), including identification of the sequence of bases that make up the genetic material, and elucidation of the (physical, functional and evolutionary) relationships between different parts of the genome.
- Proteomics: the study of proteins' structure and function (including interactions between proteins).
- Bioinformatics: management and analysis of the vast amounts of data generated by genomic and proteomic studies, using advanced information science and computing techniques.
- The Institute includes:
 - The Center for Comparative Genomics and Bioinformatics (CCGB) brings together laboratories applying bioinformatic and experimental approaches to find functional sequences within genomic DNA and to assign function to proteins.
 - The Bioinformatics and Genomics option of the Integrative Biosciences graduate program provides training and experience to students in the areas of computational genomics, evolutionary genomics and functional genomics.

2.11) Center for Infectious Disease Dynamics (CIDDD)

<http://www.ciddd.psu.edu/about/index.html>

CIDDD is a "virtual" center bringing together theoreticians and empirical scientists in a wide variety of disciplines to collaborate and innovate in the area of infectious disease research. CIDDD integrates genetic, immunological, ecological and other studies to understand how disease processes work, and how they inter-relate across scales: from the sub-cellular to the meta-population level from ecological to evolutionary timescales

CIDDD research ranges from investigating development of disease agents within hosts, to characterizing and predicting their spread through populations in time and space. The diversity of expertise in CIDDD and the close working relationships that are fostered, result in the sharing information and ideas in innovative and productive ways. CIDDD research addresses issues of fundamental importance in biology. For instance, many disease agents have a sufficiently short generation time that ecological and evolutionary dynamics operate on similar timescales. Consequently, host-parasite relationships provide a tractable system for investigating key questions in population and evolutionary biology. Though their interactions with host immunity are complex, some disease agents have small enough genomes that we can begin to dissect the molecular basis of important large-scale phenomena such as species barriers to transmission and herd immunity. CIDDD research has considerable relevance to management and control of pressing disease issues such as disease emergence, bio- and agro-terrorism and epidemic control strategies.

2.12) Center for Molecular Immunology and Infectious Disease

<http://cmiid.psu.edu/>

Current events including threats of bioterrorism, Severe Acute Respiratory Syndrome (SARS) and recent influenza outbreaks demonstrate how vulnerable we are to bioactive compounds and emerging diseases. Strong basic research programs focusing on mechanisms of disease and immunity will be required to effectively manage these threats as well as other viral and bacterial diseases, autoimmunity and cancers. Recent growth in the areas of infectious disease and immunology has positioned Penn State to be a leader in elucidating mechanisms that contribute to disease, developing novel therapeutic strategies and educating the next generation of scientists that will battle future emerging diseases. In order to facilitate interactions amongst researchers interested in immunology and infectious diseases within and outside the Penn State community, we have formed a center of excellence in Molecular Immunology and Infectious Disease (CMIID).

The Center of Molecular Immunology and Infectious Diseases (CMIID) includes a group of investigators with an established track record of collaborative research that are strongly committed to developing a dynamic training and research environment. The overlapping interests but unique research skills each investigator brings to the CMIID guarantees an interdisciplinary approach to current topics in immunology and infectious disease. The overall mission of CMIID is, through education and basic research, to develop at Penn State, a collaborative and multidisciplinary group that will be a recognized leader in immunology and infectious diseases.

2.13) Center for Molecular Toxicology and Carcinogenesis

<http://www.cmtc.psu.edu/>

The Center was formed in 1997 to develop and expand programs in toxicology and carcinogenesis at Penn State University. Over the past ten years the Center has fostered the development of graduate and undergraduate programs in toxicology. This was accomplished by the hiring of outstanding faculty, post-doctoral fellows, coupled with the recruitment of highly qualified students. In 2004 we moved into a new state-of-the-art research building with modern core facilities, including; Bioinformatics Consulting Center, Center for Computational Genomics, Center for Quantitative Cell Analysis (flow cytometry, confocal microscopy, etc), DNA Microarray Facility and Transgenic Mouse Facility. Support for the CMTC is provided from a variety of sources including Penn State Institutes for Energy and the Environment, grants from industry and the National Institutes of Health.

2.14) Neuroscience Institute

<http://www.huck.psu.edu/institutes-and-centers/neuroscience/>

The Penn State Neuroscience Institute spans both the Hershey and University Park campuses and provides oversight and coordination for neuroscience-related activities in education, research, patient care and outreach.

2.15) Penn State Social Science Research Institute

<http://www.ssri.psu.edu/>

The mission of the Social Science Research Institute (SSRI) at The Pennsylvania State University is to promote research encompassing the wide range of skills and perspectives that are needed to solve complex social problems. SSRI fosters communication and collaboration across the full range of social science disciplines and provides a shared infrastructure for social science research that enables faculty to conduct high-quality studies. Created by the Colleges of Agricultural Sciences, Education, Health and Human Development, and The Liberal Arts, SSRI is open to all social scientists at Penn State. Uniting outstanding social science faculty across the university, SSRI encourages and supports:

- Research of individual investigators from diverse fields
- Research collaborations across disciplinary lines, across colleges and research centers, and across universities
- Programs to support multidisciplinary graduate training
- Multidisciplinary centers of activity within SSRI that focus on different areas of social concern

In addition to the overall institute, SSRI includes a number of research centers focusing on specific issues in the social sciences. The Population Research Institute (PRI) is one of the foremost research and training programs in the population sciences in the United States. The Children, Youth, and Families Consortium was created to encourage and develop faculty expertise and to promote the kind of interdisciplinary collaboration that could place Penn State in a position of national and international leadership, demonstrating the role a land-grant university could and should play in addressing critical social issues and serving community needs. SSRI also houses the Survey Research Center (SRC), which advances research and training in survey methods and meets the need for state-of-the-art and comprehensive survey services to support social science research.

SSRI offers a range of high quality services to all Penn State social scientists regardless of college or research unit. These include:

- Computing
- Data management and statistical programming
- Survey design and data collection through the SRC
- Geographic Information Systems approaches to social science research questions
- Methodological Consulting

For suggestions or comments about the Penn State Hershey Core Research Facilities website, please email Dr. Bruce A. Stanley at <mailto:bstanley@psu.edu>, or fill in an anonymous Feedback Form.