

Scientific/Technical Research Expertise and Facilities at East Tennessee State University

Table of Contents

University Wide Facilities

East Tennessee State University Computational Research Facility

Division of Laboratory Animal Resource

Expertise, Department of Biological Sciences

Expertise, Department of Biostatistics and Epidemiology

Expertise, The Center of Excellence in Early Childhood Learning and Development, Claudius G. Clemmer College of Education

Expertise, Center for Excellence for Inflammation, Infectious Disease and Immunology

Expertise, Center for Experiential Learning

Expertise, Department of Chemistry

Core Facilities, Department of Chemistry

Expertise, Department of Computing

Expertise, Department of Environmental Health

Expertise, Department of Engineering, Technology, Surveying and Digital Media

Expertise, Department of Geosciences

Expertise Department of Health Sciences

Expertise Department of Health Services, Management and Policy

Expertise Department of Kinesiology, Sport and Recreation Management

Expertise Department of Mathematics and Statistics

Expertise, Gatton College of Pharmacy

Core Facilities, Gatton College of Pharmacy

Expertise Department of Physics and Astronomy

Expertise Department of Psychology

Quillen College of Medicine

Cardiovascular and Metabolic Diseases

Infectious Diseases and Immunology

Neuroscience

Genetics and Molecular Medicine

General Medical Science

College of Medicine Core Facilities

Expertise Department of Sociology and Anthropology

University-Wide Facilities

East Tennessee State University Computational Research Facility

High-Performance Computing Center at ETSU provides computational and storage resources to researchers across the campus. HPC resources are specialized hardware/software components that enable the execution of compute-intensive and data-intensive applications which are prevalent in scientific research. ETSU HPC Center currently houses two separate cluster systems, each better suited for different types of applications. Combined, two clusters have around 800 processor cores that theoretically allow hundreds of times quicker results than a standard computer. Some of the recent research activities conducted on our HPC Center span a wide range of fields from nanoscience to protein modeling. For more detailed information about ETSU HPC Center resources and activities, please refer to <http://www.etsu.edu/hpcc>.

Division of Laboratory Animal Resources

The Division of Laboratory Animal Resources (DLAR) maintains an AAALAC accredited laboratory animal facility and program. Two laboratory animal facilities are supervised by the DLAR staff and currently provide adequate space for housing and maintaining large (dogs and pigs) and small animals (guinea pigs, hamsters, mice and rats). All full-time DLAR technicians are certified by the American Association for Laboratory Animal Science. DLAR staff provides training in handling of animals, administration of anesthetics, post-surgical maintenance of animals, bleeding techniques, euthanasia and other standard procedures. DLAR staff also will assist in restraint of animals, induction and maintenance of anesthesia, experimental surgery, pre- and postoperative care, blood and tissue collection and injections. A sterile surgery suite is available and can be scheduled through the department.

Website:

<http://www.etsu.edu/com/dlar/>

Expertise, Department of Biological Sciences

The Department of Biological Sciences has expertise in cell and molecular biology, biochemistry, basic and applied ecology, behavior, genetics, physiology, organismal biology, evolutionary biology, and quantitative biology. Our collaborative links with the Quillen College of Medicine, the Computation and Research in Data Science (CARDS) Institute, and the Center of Excellence in Paleontology further expand the department's research capacity.

Website: <http://www.etsu.edu/cas/biology>

Representative specific areas of expertise include the following:

Education

- Development of assessment tools to measure college student learning in sciences
- Application of social science research methods to teaching and learning of biology

Plant Biochemistry and plant physiology

- Plant hormone signaling
- Lipid biosynthesis and signaling
- Pathogen defense signaling in plants
- Biosynthesis of flavonoids

Enzymology

- Molecular modulation of ATP Synthase
- Transcriptional control of gene expression
- Antibiotic Resistance and Population Trends in a Bacterial Pathogen

Basic and Applied Ecology

- Human impacts on terrestrial and aquatic habitats
- Community Ecology
- Control of circadian rhythms
- Physiological ecology of ectotherms
- Functional significance of pollen characters
- Ethnobotany
- Plant ecology
- Theoretical ecology
- Population ecology
- Neurobiology
- Behavioral aspect of organismal interactions

Genetics

- Organelle Population Genetics
- Amino acid substitutions and hereditary disease
- Differential gene expression in development

Animal Behavior

- Sociobiology
- Organization of work in insect societies
- Neurobiology
- Control of circadian rhythms

Quantitative Biology and Modeling

- Theoretical biology and modeling

Organismal Biology

- Morphology, physiology, and development of plants and animals
- Taxonomy of vascular plants

Evolutionary Biology

- Plant evolution (living and fossil plants)
- Evolutionary developmental biology of amphibians & reptiles
- Impact of life history strategies on development

Expertise, Department of Biostatistics and Epidemiology

The Department of Biostatistics and Epidemiology has experts in research study design and statistical analyses with focus on chronic and infectious diseases and population health with emerging expertise on environmental and behavioral risk factors. Faculty members in the department play a key role in research proposal development, project execution, data collection and management, and analysis and interpretation of results. Faculty in the department have expertise in the leading data analytic software programs including SAS, SPSS, Stata, mPlus, EpiInfo and others.

Website: http://www.etsu.edu/cph/biostat_epidemiology/

Representative areas of expertise in epidemiology include the following:

Genetic epidemiology

Chronic disease epidemiology

Focus areas: cancer, cardiovascular disease, obesity, diabetes

Epidemiology of multiple risk factors for adult chronic disease

Clustering of health risk behaviors among youth and adults
Environmental epidemiology
Pediatric epidemiology
Population health
Reproductive epidemiology
 Focus area: endocrine disrupters
Health Behavior theory
Global health
Health disparities
Translational research, including clinical trials and community-based interventions

Representative areas of expertise in biostatistics includes the following:

Genome-wide association studies
Population genetics
Quantitative genetics
Bayesian statistics
Repeated measures statistics
Latent variable models
Multi-level models
Covariance models
Design and analysis of clinical trials
Dealing with missing data
Statistical methods for studies in chronic disease in particular
Statistical distribution theory
Longitudinal data analysis
Categorical data analysis
Multivariate statistics
Model selection
Survival analysis
Sample size and power calculations

Expertise, The Center of Excellence in Early Childhood Learning and Development, Claudius G. Clemmer College of Education

Overview

The Center of Excellence in Early Childhood Learning and Development at East Tennessee State University is a state, national, and international program influencing policy and services that directly impact the lives of young children and their families. The Center was established in 1985 and, in 1988, was recognized by the Tennessee Board of Regents and Tennessee Higher Education Commission as an "Accomplished Center". The Center's mission is to provide and support exemplary training, research, and service for young children, birth through 10 years of age, their families, and the people who work with them.

Research Focal Areas

The Center's faculty and staff maintain research and applied expertise in the areas of child development and learning, positive behavior supports and applied behavior analysis, autism spectrum disorder, childcare, family and professional partnerships, teacher training and capacity building through professional development.

Research Activities

The Center's faculty and staff plan, develop, and implement applied research studies, program evaluations and other empirical activities relating to the development and learning of all young children including those children with developmental delays and or disabilities and their families.

Website: <http://www.etsu.edu/coe/child/>

Expertise, Center for Excellence for Inflammation, Infectious Disease and Immunology

The mission of the Center will be to coordinate efforts and facilitate interactions amongst members of the ETSU biomedical research community in order to advance education, research and clinical applications in inflammation, immune and infectious diseases.

The Center will serve as an integrated and synergistic environment for basic, applied and translational research that is focused on the development of new and novel approaches to understanding, diagnosis and treatment of human diseases.

The Center will offer a sense of community for a critical mass of investigators that are focused on clinically relevant problems in modern medicine.

A major objective of the Center is to create an intellectual and scholarly environment that increases our competitiveness for extramural funding including investigator initiated grants, program projects, center grants, contracts and training grants.

Website: <http://www.etsu.edu/com/ciidi/>

Expertise, Center for Experiential Learning

The Center for Experiential Learning serves to foster learning and academic achievement for all health care professionals. Through simulation, the Center serves the university and greater health care community by providing an experience that is grounded in educational theory, scientific discovery, and in sustaining the ultimate goal of superior patient care.

Website: <http://www.etsu.edu/com/simlab/>

Expertise, Department of Chemistry

The Department of Chemistry faculty have the expertise and the department has the instrumentation to provide analytical services to industry in our community. It can manage short and long term projects. Both inorganic and organic compounds can be analyzed and characterized by experienced personnel in consultation with the highly recognized faculty members in the chemistry department at ETSU.

Website: <http://www.etsu.edu/cas/chemistry/>

Specific expertise in research of the faculty in the department includes the following.

- Synthetic organic chemistry
 - Medicinal chemistry
 - Catalytic studies of Rh_2L_4 (L = acetamide, acetate)
 - Organic material chemistry for PEM Fuel Cell

- Focus on using organic chemistry to solve biological problems. Research covers
 - Enzymology
 - Drug discovery
 - Chemical biology
 - Biochemistry
 - Molecular biology
 - Nucleic acids research
 - Protein chemistry and engineering
 - Signal transduction and regulation
 - Polymer nanocomposite materials

- Inorganic chemistry of the transition metals
 - Binuclear mixed-valence complexes of the transition metals
 - The role of metal ions in biological systems, the mechanism of iron uptake and storage by ferritin, and the synthesis and characterization of copper complexes as models for copper-containing proteins.
 - X-ray structural determination of small molecules
 - Synthesis and characterization of Rh_2L_4 (L = acetamide or acetate) complexes

- Focus on luminescence phenomena and their applications in analysis.
- Interest in monitoring local environmental heavy metals pollution via vegetative probes and atomic spectroscopy
- Molecular recognition
- Nucleic acids structure and reactions
- Nuclease enzyme models metal complexes
- Catalysis

- *Ab initio* quantum chemistry calculations of small molecules particularly inorganic clusters
- Raman and infrared spectroscopy.
- Reactions of small molecules on microporous surfaces
- Chemical education focused on undergraduate science education

The following core facilities are available to the faculty in the Department of Chemistry, as well as other faculty at ETSU and for fee-for-service and collaborative research.

The **Department of Chemistry** at ETSU offers expertise in all major areas of chemistry including computational chemistry. It also provides analytical services to other departments at ETSU as well as to the industry in our community. The analytical instruments in the department enable us to analyze a wide range of chemical compounds in different matrices such as water, gasoline, agricultural crops, etc. The instruments in the department include Atomic Absorption spectrometer, FTIR, HPLC, GPC, GC/MS, GC/FID, UV-VIS, 400 MHz NMR spectrometer with multinuclear capabilities, porosimetry (surface area pore size), and a single crystal X-ray diffractometer. We are able to handle short and long term projects. The cost of analysis varies with the request. For long term projects there will be a flat charge depending on the analysis type. Inorganic Compounds: chloride, fluoride, nitrite/nitrate, antimony, calcium, potassium, sodium, tin, lead, magnesium, copper, nickel, manganese, iron, zinc. Organic Compounds: ascorbic acid, phenol, methyl tert-butyl ether (MTBE), pesticides residue analysis.

Expertise, Department of Computing

The faculty members of the Department of Computer and Information Sciences have a broad range of expertise. Many of the faculty members also have significant experience in industry.

Website: <http://www-cs.etsu.edu/>

The areas of research expertise that can be drawn upon include the following categories.

Software Development and Web Management

- Software engineering and development including risk analysis, project management, design metrics and testing
- Web engineering, programming, design, and web services
 - Team-based Web planning, design, and construction
- Code refactoring (changes to code that improves its readability or simplifies its structure without changing its results)
- Object Oriented Programming and Design
- Database systems and Database-oriented programming languages

- Building web-supportive information handling processes into organizational systems
- Algorithm development
- Integer programming
- Software Verification and Validation
- Test Driven Development
- Real-time computer graphics
- Robotics algorithms
- Android and IOS development

Hardware/Software Systems

- High Performance Computing
- Embedded system hardware design
- BIOS theory and design
- Device driver theory and design
- Control and automation theory
- Evaluation of different embedded processors including processors implementing Java Byte Code
- User interface development for embedded systems
- Embedded O/S comparisons and evaluations
- Distributed system design including function allocation
- Network Security, Penetration testing, and Intrusion detection
- Wireless networks and Sensor Networks
- Security and Privacy in Cloud and Healthcare IT

Business Applications Including E-business

- Requirements Analysis and Design, particularly how to get requirements from users in quickly, accurately, and in a cost-efficient manner.
- e-Business and e-Commerce:
 - Usability and design of commerce and non-commerce business sites
 - Applicability of historic physical retail merchandising and design techniques in the online environment
 - Effective e-business models and supporting practices
 - Usability and Human Computer Interaction research and statistical analysis
 - Application of Software Engineering principles to Web development
- Enterprise Information Systems and ERP
 - SAP ERP, including system configuration, ABAP development, and SAP Mobile App development
 - Tableau and other business intelligence tools
 - Business processes

- Use of technology in support of business
 - Developing a technology plan for creating competitive advantage in business
- Human Computer Interaction
- Web Application Security and internet security

Ethical and Professional Issues in Computing

- Internet, computer law, and licensing
- Codes of ethics

Expertise, Department of Environmental Health

Research in the **Department of Environmental Health** includes factors affecting water quality and human health, remediation of contaminated soil and ground water, factors affecting the quality of indoor and outdoor air, factors affecting food safety, and human health risk assessment in the workplace. The academic and research programs also focus on the biotic integrity of land, air, and water resources. In addition, faculty members in the **Departments of Biology, Health Sciences, Biomedical Sciences, Pharmaceutical Sciences, and Geosciences** have over-lapping interests and expertise.

Specific faculty expertise in the Department of Environmental Health includes the following.

Evaluation and remediation of contamination of soil and water

- Alternative indicators to identify source of fecal pollution.
- Modelling of surface water quality and fecal contamination.
- *In situ* remediation of contaminated soil and ground water systems.
- Development of TMDLs, implementation plans, and BMPs in 303d listed waters.
- Monitoring and evaluation of stream restoration programs.
- Identification and evaluation of contaminants and ambient toxicity in river ecosystems.
- Ecotoxicology of selenium in wetland and freshwater systems.

Air Quality

- Gas-phase filtration in indoor air quality applications.
- Reactions of ozone and volatile organic compounds in indoor air.
- Impact of ambient air pollution on food safety.

Human health risk assessment.

- Community- and labor-oriented approaches to public health concerns through the prism of public history.
- Establishing relationships between ecosystem health and human health.
- Historical exposure assessment at Department of Energy facilities.
- Ethical, legal, social and policy implications of biomarkers.
- Popular education in occupational and environmental health for workers and health care providers.

This work is supported by the **Environmental Health Sciences Laboratory (EHSL) housed in the Department of Environmental Health**. The EHSL provides routine biological and chemical water, soil and air analyses for individuals, industries and local governments. **The EHSL is available to other faculty at ETSU and for fee-for-service and collaborative research with industry.**

Environmental Health Sciences Lab

The Environmental Health Sciences Laboratory (EHSL) is a section of the Department of Environmental Health in the College of Public Health. EHSL was established to conduct research in the fields of environmental microbiology, environmental chemistry and environmental toxicology. EHSL is utilized by faculty and graduate students working on their Master of Science in Environmental Health (MSEH) and PhD in Environmental Health. Additionally, undergraduates work in the lab on special research projects. The lab is also utilized for contract work involving water, wastewater and certain sediment analyses. We have carried out work for government agencies including Tennessee Valley Authority (TVA), Tennessee Department of Transport (TDOT), Tennessee Department of Environment and Conservation (TDEC), and cities in east Tennessee and southwest Virginia. Private companies and homeowners also employ our services.

Website: <http://www.etsu.edu/cph/eh/>

Expertise, Department of Engineering, Technology, Surveying and Digital Media

Website: <http://www.etsu.edu/cbat/applieddesign/>

Digital Media Center

Website: ETSUDigitalMedia.com

The 7 faculty members of the Digital Media work at the convergence of design and technology. Most have significant experience in the private sector before joining ETSU. They are housed in the Scott Niswonger Digital Media Center and their areas of expertise include:

- Digital video production
- Visual effects
- 3D Animation and visualization
- Interactive design
- Interface design
- Game design and development
- Digital publishing

This is supported by 3 advanced computer labs with:

- 70 workstations (8core, 32Gb ram, Quadro 5000 video cards)
- Cintiq graphic workstation monitors
- 60 seat render farm
- Organic Motion capture system
- Green screen
- Current software for animation, game and design production

Engineering Technology

The division of Engineering Technology consists of Biomedical Engineering Technology, Construction Engineering Technology, Electrical Engineering Technology, Industrial Technology, Manufacturing Engineering Technology and Product Development. In addition to the technical/engineering knowledge in their specific fields, many of the faculty members have advanced expertise in manufacturing processes including 6-sigma and lean manufacturing that take products from concept to market. The program also has the equipment necessary to support these activities. Specific areas of expertise include:

- Product concept development
- Computer aided design and drafting (CADD)/CAM/CNC
- Product prototyping
- Material testing (including construction)

- Medical simulations
- Systems and Automation
- Applied materials science
- Robotics and mechanical engineering
- Electrical engineering
- Metrology, including inspection, performance testing and calibration of equipment
- Industrial systems design
- Application of acceptable Industry Standards and ethical judgments to identify, evaluate and economically solve complex problems.

This work is supported by the Department of Technology's communication and instrumentation laboratory. This lab is set up to support class experiments and local industry. Some of the equipment used in the lab consist of the following: Fluke 199C(x2) 2.5 Giga-samples/sec color DSO, Avcom 0-6GHz spectrum analyzer, Ramsey RSG-1000B RF Generator 0-10GHz (variable modulation, 0.1 PPM time base), Fluke PM6304 RCL meter, Berkley Nucleonics arbitrary waveform generator (0.1 PPM ref.), Keithly 2701 (x3) high precision (10 μ V) data acquisition system (Ethernet/Webactive) 750 channel capacity, Fluke 744 documenting process calibrator, several Fluke 700 series laboratory pressure sensor reference standards, RN Electronics comb generator 0-1GHz. Recent equipment added to the lab includes three Fluke 8846A Precision DMM with a resolution of 1 μ V, two Fluke DSP-FOM, Fiber Optic test sets for use at 1350 and 850 nM, a Stanford Research System SR785 Dynamic Signal Analyzer and an SRS SR650 precision amplifier / filter have been added as well. The Lab has also added five Benchmark model OFT Optical Fiber Training Centers. A Marconi Instruments model MI-701 AM/FM Modulation tester has also been added. The lab also contains instrumentation for combustion analysis, thermal IR signatures and various other small instrumentation sets for force, vibration, and other physical parameters. Much of this equipment is portable and can be used off site to support program activities.

The Department also has a Dimension printing rapid prototyper capable of taking 3D computer generated models and turning them into ABS plastic prototypes. The maximum model size is 8" by 8" by 12" with a resolution of 0.010 inches. A recent addition along with the Dimension is a Minolta 3D, model Vivid 9l scanner capable of scanning resolutions to 5 mm. This scanner will help extend the rapid prototyping and 3D design / development programs. Several CNC machines are also available to support product development. As an example the department has an XYZ automation CNC table with a working area of 4' by 10' by 10" with an overall accuracy of 0.008 inches. An Instron 50 kNewton tension and compression tester model 5569 and two Denso six axis robot capable of 2mm resolution have been added to the department. The Denso robots and the associated work cells are now part of robotics lab. **The facilities are available to other faculty at ETSU and for fee-for-service and collaborative research with industry.**

Expertise, Department of Geosciences

Geospatial Analysis

ETSU has a well-equipped GIS facility. The faculty expertise in GIS is concentrated in the **Department of Geosciences**, but also includes faculty in the Geomatics component of the **Department of Technology and Geomatics**. Faculty members in this area have sophisticated knowledge of specific applications of capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the Earth that result in creation of interactive queries (user created searches), analysis of spatial information, editing of spatial data such as maps, and presentation of the results of all these operations. Generally this expertise can be used for scientific investigations, resource management, asset management, environmental impact assessment, urban planning, cartography, marketing, and logistics.

Website: <http://www.etsu.edu/cas/geosciences/>

Specific areas of current expertise and research include the following.

General

- Integration of GIS, shallow-earth geophysics and remote sensing techniques
- Digital image processing

Culture and Society

- Natural hazards and society: Relationship between hazards and people and development at risk.
- Remote sensing and photometry as tools in surveying for cultural applications

Environment

- Biogeography/landscape ecology monitoring of model environmental changes
- Land Cover change detection
- Environment change modeling
- Using geospatial analysis techniques to examine the effects of weather and geology on environment and society

Geology

Faculty in the division of geology study the Earth, the materials of which it is made, the structure of those materials, the processes acting upon them and the organisms which inhabit it. One area of faculty expertise in the division is in the study of the processes acting upon the Earth cause hazards such as tsunamis, landslides, and earthquakes, what land areas are most likely to be affected and how humans can best prepare to minimize the damage caused by natural disasters. Additionally, the faculty members have expertise in areas such as prediction of mineral deposits, stratification of rocks, oil

and natural gas deposits, ground water flow and cave formation and hazards. The specific areas of expertise include the following:

- Stratigraphy
- Mineral and rock identification
- Identification of natural hazards and risk associated with them
 - Hazard warning systems: Public understanding of, and response to hazard warnings
 - Modeling preparedness for natural hazards
- Environmental consulting/geology and geotechnical engineering
- Soil, surface water, and ground water assessments
- Monitoring and remediation of solid waste and low level radioactive waste landfills
- Review of environmental impact of commercial industrial complexes
- Modeling and management of sinkhole hazards and karst features
- Investigation of groundwater flow, water quality, groundwater contamination, and surface water and groundwater interaction.
- Investigation of Cenozoic climatic and environmental changes using speleothem-based records in caves and faunal records from cave and open-air localities

The research capabilities of faculty in the Department of Geosciences is supported by the following equipment resources: GIS software, including ArcGIS (a complete software system for authoring, serving, and using geographic information) and ARCVIEW (desktop for mapping and GIS), global positioning (GPS) software, ground water modeling software (GMS), are available for use.

Hardware including a Dell® Precision 380, x64-Bit, Intel Pentium 4 CPU, 3.00GHz, 2.99 Ghz, 2 GB RAM, a Dell® Optiplex GL520, x32-Bit, Intel Pentium 4 CPU, 3.00GHz, 2.99 Ghz, 1GB RAM and a Dell® Latitude D610, x32-Bit, Intel Pentium M CPU, 2.00GHz, 242 MHz, 1GB RAM support the software. In addition faculty in the department use the ETSU high performance **Computational Research Facility** for solving complex problems.

Equipment supporting GIS and geological research includes an ASD Spectroradiometer (ASD FieldSpec Pro JR), and AccuPAR Ceptometer (AccuPAR LP-80). a Nikon Optiphot 2 Petrographic microscope, field surveying equipment (Brunton and Sylva compasses, levels, penetrometers); soil sampling equipment, E285 shear-vane tester, a Shimadzu RF5300 spectrofluorophotometer which can run water samples with 6 different dyes simultaneously, and an ISCO automatic water sampler, data loggers, and water testing kits. There is a fully equipped sedimentology lab with sieves, sieve shaker, scales, drying ovens, differential velocity settling tubes, magnetic separator and sediment splitters. Equipment for mineral and rock identification include Nikon research level Petrographic and Binocular Microscopes with digital imaging capability, rock and mineral reference collections, 24" and 10" rock slab saws a petrographic thin-section trim saw and grinder, a rock crusher and a rock polisher. There is a fully equipped soil

properties lab to support soil engineering studies. This facility allows measurement of soil density (specific gravity), consolidation (compaction and soil loading), failure property analysis, slake durability, direct Shear, the Atterberg limit test (soil water-content and plasticity) and grain size analysis (sieves and sieve shaker). **The facilities are available to other faculty at ETSU and for fee-for-service and collaborative research with industry.**

Expertise, Department of Health Sciences

The research expertise in the Department of Health Sciences ranges widely from microbial physiology, pathogenesis, drug discovery, gastrointestinal & neuro physiology, obesity to gravitational biology. Faculty have expertise especially in the techniques of Molecular genetics, Drug discovery, small molecule & protein purification, receptor ligand interactions, lipid physiology and space & gravitational Biology. Several faculty in the department of Health sciences have collaborative projects with the faculty from the Quillen College of Medicine, College of Public Health and the Department of Biological Sciences.

Specific expertise of the faculty in the Department of Health Sciences includes the following:

- Bacterial Iron transport Systems
- Molecular mechanism of Siderophore mediated iron transport in gram negative bacteria
- Novel siderophores from Rhizobia
- Siderophore mediated iron transport in community and clinical isolates of Methicillin resistant *Staphylococcus aureus* (MRSA).
- Effects of ruthenium compounds on human cancer cell lines.
- Gravitational biology focusing on the effects of microgravity on reproductive tissues
- Secondary metabolism in a soil bacterium called Rhodococcus.
- Siderophore or potential antibiotics produced by Rhodococcus that are of growing importance to the chemical and biotech industries.
- The reverse transcriptases of bacteria. An emerging group of enzymes important in genetics.
- Influence of environmental factors (dietary and otherwise) on the protective gastrointestinal mucus lining.
- The molecular mechanisms and signaling pathways in the etiology of obesity syndrome
- Identification of brain sites and neuroendocrine pathways for leptin action in modulating energy and body weight homeostasis
- The Hypothalamus and the control of appetite and reproduction
- CTRP family of proteins as novel regulators of glucose and lipid metabolism
- Molecular Mechanisms of CTRP3 Reduction on Lipid Accumulation in the Liver
- Characterization of the CTRP family of proteins in lean compared with obese persons, feasibility of using CTRP's as clinical biomarkers.
- Bacterial Pathogenesis of *Pseudomonas aeruginosa* and *Mycobacterium* species, Bacterial Signal Transduction

Website: <http://www.etsu.edu/cph/hs/>

Expertise, Department of Health Services, Management and Policy

The Department of Health Services Management and Policy has expertise in the organization, financing, and delivery of health services, including public health and health care services. Within the public health arena, faculty have expertise in public health policy and practice, including public health systems and services research (PHSSR) and public health workforce development. Within the health care field, faculty members have expertise in access, quality, and cost of care issues, health disparities, women's health, and long-term care administration. Additionally, faculty have expertise in health program evaluation and extensive experience in both quantitative and qualitative research methods.

See the department webpage for detailed information: <http://www.etsu.edu/cph/hsmp/>
Specific research expertise of the department faculty includes:

- Health policy analysis and evaluation
- Tobacco policy research (<http://www.etsu.edu/cph/hsmp/tobaccopolicy/>)
 - Statewide smoke-free policies
 - School (college and university) based tobacco free policy
 - Global tobacco control
- Public health policy and practice (see website of the Center for Public Health Policy and Practice http://www.etsu.edu/cph/center_php/)
 - Public health systems and services research
 - Public health accreditation
 - Academic health departments
 - Public health – hospital collaboration
- Public health workforce development (see website of LIFE PATH, Tennessee's Public Health Training Center <https://www.etsu.edu/cph/tnphtc.php>)
- Evaluation studies of health programs
 - Formative evaluation
 - Process evaluation
 - Impact/effectiveness evaluation
- Quantitative/Survey research methods
 - Study design
 - Questionnaire development and pilot testing
 - Data collection
 - Data analysis and interpretation
- Qualitative research methods – Case studies, focus groups, in-depth semi-structured interviews

- Study design
- Protocol and discussion guide development and pilot testing
- Data collection
- Qualitative data analysis and interpretation using N-Vivo and other qualitative software
- Mixed method research designs, integrating quantitative and qualitative research components
- Health services policy and research
 - Access to care, particularly for underserved populations
 - Cost of care
 - Quality of care
 - Health reform
 - Health disparities
- Women's health issues
 - Women's health policy
 - Women's health services research
 - Breast cancer control
 - Screening mammography

Expertise, Department of Kinesiology, Sport and Recreation Management

The Department of Kinesiology, Sport and Recreation Management faculty have diverse research expertise. Departmental faculty has expertise in the areas of Physical Education/Teacher Education, Sport Management, and Recreation Management. The department and faculty have a history of relationships and partnerships with area schools, city recreation programs, state parks, and a variety of sport programs and venues. These relationships and partnerships provide a conduit for excellent research opportunities and service to the community.

Expertise in the department includes:

Physical Education

- Physical Education/Teacher Education
- Wellness and Wellness Education
- Coordinated School Health
- Physical Activity in Schools

Recreation Management

- Municipal Recreation
- Recreation Resource Management
- Leisure Behavior
- Environmental Responsibility
- Green Initiatives

Sport Management

- Venue and Event Management
- Risk Management
- Sport and Social Media
- Sport Marketing
- Volunteerism in Sport
- Intercollegiate Sport
- NASCAR

Website: <http://www.etsu.edu/coe/ksrm/>

Expertise, Department of Mathematics and Statistics

The Department of Mathematics and Statistics faculty have diverse interests and expertise in a number of areas in mathematics and statistics. The department's faculty collaborates on research, data analysis, and development projects with faculty and students from other departments. Further, research is strengthened by collaborations through the Institute for Quantitative Biology.

Website: <http://www.etsu.edu/cas/math/>

Specific expertise in research includes the following.

Mathematical Biology

- Computational Biology and Bioinformatics
- Stochastic Modeling of Biological Systems

Computational Biology*

- Computational biomolecular modeling
- Computational neuroscience
- Computational genomics

* The Department of Mathematics and Statistics offers a graduate certificate called *Mathematical Modeling in Bioscience*.

Applied Mathematics

- Predictive modeling and data mining
- Complex Dynamical Systems
- Graph-theoretic modeling
- Ordinary, Stochastic, and Partial Differential Equations
- Inverse Problems

Discrete Mathematics

- Combinatorics
- Graph theory

Analysis and Topology

- Real analysis
- Complex analysis
- Knot Theory

Probability and Statistics

- Applied statistics
- Asymptotic statistical theory
- Bayesian data analysis
- Discrete probability
- Distribution theory
- Estimation
- Multivariate Analysis
- Time Series

Mathematics Education

- Teaching of mathematics at the elementary level
- Teaching of mathematics at the high school level

Expertise, College of Nursing

Faculty members in the College of Nursing have a range of expertise across a broad spectrum of nursing and health care. Their studies are clustered around three central themes which include reducing health disparities in rural and underserved populations, health services and systems, and nursing education and professional role. Many studies are interdisciplinary in nature, with partners from psychology, environmental health, medicine, foreign language, nutrition, pharmacy and others. A Center for Nursing Research supports research and grant-writing needs of faculty, students, and nurse researchers in the community.

Specific faculty expertise in the College of Nursing is as follows.

Reducing Health Disparities in Rural and Underserved Populations

- Health of rural family caregivers
- Promotion of elder health in public housing
- Management of Type II Diabetes Mellitus in rural and low income populations
- Improving health in migrant and non-migrant Hispanic families
- Promotion of rural and underserved women's health
 - Cardiovascular health
 - Polycystic Ovary Syndrome
 - Improving women's screening practices
- Improving infection control in long term care facilities
- Smoking cessation in pregnancy
- Psychological experiences of high-conflict divorce

Health Services and Systems

- Improvement of clinical practice guidelines for antipsychotic drug therapy
- Integration of behavioral health services into primary care
- Provision of in-home elder care by advanced practice nurses
- Health care delivery in nurse-managed primary care centers
- Nurses' role as leaders in the health care delivery system
- Effectiveness of rural health care delivery systems
- Development of evidence-based practice protocols for nursing care

Nursing Education and Professional Role

- Simulation in nursing education
- Evaluation of effectiveness of inter-professional education
- Improving well-being and success of nursing students
- Effectiveness of on-line learning
- Lived experiences of accelerated second degree undergraduate nursing students
- History of nursing in Appalachia

Website: <http://www.etsu.edu/nursing/>

Expertise, Gatton College of Pharmacy

The Department of Pharmaceutical Sciences

Website: http://www.etsu.edu/pharmacy/departments/pharmaceutical_sciences/pharmaceutical_sciences.php

The current faculty members of the Department of Pharmaceutical Sciences have research expertise in the areas: neuroscience, cancer biology, medicinal chemistry and pharmaceuticals, including therapeutic protein engineering. Interactions have been formed with researchers in the Quillen College of Medicine, the ETSU Cancer Center, the Department of Physical Therapy, the Department of Biological Sciences and the Department of Psychology. Strong interdepartmental bridges are also being developed with the clinical faculty within the College of Pharmacy based on activities centered in the area of drug and chemical analysis.

Departmental faculty members have expertise in the area of Pharmaceuticals and Pharmacokinetics, and in Analytic Medicinal Chemistry. These areas address the traditional areas of physical properties of drugs, drug formulations for optimal effect, drug distribution in biological systems, bioavailability and bioequivalence, drug stability and host of issues related to isolation and characterization of known and novel compounds. Emerging expertise is focused in these areas: the creation of novel therapeutic fusion proteins; extraction, analysis and testing of novel phytochemicals; and in vivo imaging of gene expression. Gatton College of Pharmacy faculty members possess expertise in pharmacodynamic/pharmacokinetic modeling and analysis as well as detailed knowledge of drug solubility and dissolution characteristics. Much of the research is “product oriented” and translational because so much of the field of pharmacy focuses on the application and distribution of drug products.

Specific ongoing research projects include: study of cancer ontogenesis due to malfunctioning signaling; selective transcriptional control of pituitary growth hormone expression; alteration of neurotransmitter levels due to environmental, behavioral and dietary cues; formulation of selective pharmacologic targets; novel location-specific delivery methods and drug stability control; and the creation of novel proteins targeting specific disease states.

Expertise in the Department includes:

- Drug analysis and solubility assurance, including HPLC-UV/ECD, GC/LC-MS with microsampling Physical pharmacy, drug stability, compatibility and dissolution properties
- Drug formulation for bioavailability and bioequivalence
- Drug distribution and metabolism kinetics
- Pharmacodynamic/pharmacokinetic modeling
- RNA localization methods including real-time quantitative PCR, in situ hybridization, RNAase protection and Northern analysis

- Signal transduction evaluation including cellular distribution of activated and non-activated transmembrane receptors;
- Neurotransmitter localization by immunofluorescence and immunocytochemistry;
- Neurotransmitter detection and quantification by HPLC with electrochemical detection
- Neurotransmitter release via suprafusion
- Use of Fluorescence resonance energy transfer (FRET) technology for protein interaction.
- Site-directed mutagenesis
- Protein/glycoprotein expression analysis and quantification
- Confocal microscopy
- Intracellular protein localization and translocation
- Medicinal chemistry analysis for dissolution and pharmacokinetics of related pharmaceuticals, including compounding alternatives;
- Small animal handling, surgery and drug dosing and kinetics

The following core facilities support the work done by the GCOP faculty and are available for fee-for-service and collaborative research work.

A Shimadzu LCMS IT-TOF system is housed in the Department of Pharmaceutical Sciences, Gattton College of Pharmacy. This HPLC component can accommodate modern UPLC (ultra-high pressure) sub-2 micron particle size columns and detection can be accomplished with the mass spectrometer or via a fixed-wavelength UV detector. The MS component is equipped with electrospray (ESI) and atmospheric-pressure chemical ionization (APCI) sources, capable of operating in positive and negative ion mode. LCMS analysis can also be amplified to include MSⁿ fragmentation for structure elucidation. This system is best equipped to measure analytes in the 100-1500Da mass range, and is routinely utilized to measure drug and metabolite levels in drug products and biological matrices.

An ESA Coulochem III HPLC system is housed in the **Department of Pharmaceutical Sciences, Gattton College of Pharmacy**. The Coulochem III detector relies upon the electroactive nature of molecules: a molecule's ability to be oxidized or reduced. Both fluorescence and UV detection can readily measure many of these compounds, but liquid chromatography combined with electrochemical detection provides a more-sensitive and selective alternative. ESA's Coulochem III is the detector of choice. The Coulocomb system quantifies picogram to femtogram levels of oxidizable or reducible compounds in a sample and is considered the **industry standard for the analysis of multiple species of neurotransmitters**.

Expertise, Department of Physics and Astronomy

The Department of Physics and Astronomy at East Tennessee State University (ETSU) has expertise in computational physics, biophysics, astronomy, and astrophysics. The Department has a large collection of high-speed desktop computers and workstations, some running *MS Windows* and others running *Linux*, which faculty and students use for their research programs. In addition to these computers, there is also a *Parallel Quantum Solutions QuantumCube* computer cluster housed in the Department that is used by some of the faculty and their students. ETSU is part of the Southeastern Association for Research in Astronomy (SARA), which operates a 36-inch telescope at Kitt Peak National Observatory in Arizona (SARA-North) and a 24-inch telescope at the Cerro Tololo Inter-American Observatory in Chile (SARA-South). ETSU also has a state-of-the-art campus observatory (the Harry D. Powell Observatory) with its 14-inch telescope. Physics students with an interest in astronomy gain observational experience at all of these observatories. ETSU astronomers have also used some of the NASA space-based telescopes, such as the *Hubble Space Telescope*, the *Spitzer Space Telescope*, and the *Chandra X-ray Observatory*.

Website: <http://www.etsu.edu/cas/physics/>

Representative specific areas of expertise include the following categories.

Computational Physics:

- Computational treatment of finite systems, ranging from atoms and molecules to complex nanostructures
- Molecular orbital calculations
- Interacting galaxy modeling
- Non-local thermodynamic equilibrium radiative transfer in stellar atmospheres
- Data analysis

Biophysics:

- Electron Paramagnetic Resonance spectrometry
- Radiation biophysics
- DNA constituents
- DNA radiation damage
- ESR/ENDOR spectroscopy
- X-ray diffraction
- Ultraviolet and visual absorption and emission spectrometry

Astronomy:

- Variable star visual and infrared photometry
- Variable star polarimetry
- Stellar spectroscopy at X-ray, ultraviolet, visual, and infrared wavelengths
- Multi-wavelength observational astronomy

Astrophysics:

- Interstellar medium and star formation in external galaxies
- Asymptotic giant branch stars including Mira variable stars and carbon stars
- Stellar atmospheres and winds (hot stars and cool giant stars)
- Thermodynamics and hydrodynamics of variable stars
- Gravitational lenses
- Thermodynamics of the intergalactic medium and quasar absorption line systems
- Cosmogony and large-scale structure of the Universe
- Quasar absorption spectra
- Theory of galaxy formation

Expertise, Department of Psychology

The Department of Psychology faculty has the expertise, equipment and software to provide consultation to the campus and community in numerous areas, including behavioral science, statistics, intervention design and implementation, and program evaluation.

Website: <http://www.etsu.edu/cas/psychology/>

Representative areas of psychological expertise of faculty are noted below:

Subfields of Psychology Represented by Faculty:

Behavioral Neuroscience
Clinical Psychology
Child Clinical Psychology
Child and Developmental Psychology
Cognitive Neuroscience
Educational Psychology
Experimental Psychology
Forensic Psychology
Health Psychology
Quantitative Psychology
Social Psychology

Areas of Psychological Expertise:

Aggression and Anger Management
Appalachian Mental Health (Child and Adult)
Behavioral Medicine
Behavioral Pediatrics
Behavioral Pharmacology
Brain-Computer Interface
Brain Plasticity

Child Development and Mental Health
Clinical Forensic Psychology
Cognitive Development
Community-Based Participatory Research
Developmental Cognitive Neuroscience
Drug Self-Administration
Event Related Potentials
Forensic Consultation and Expert Testimony
Forgiveness
Gifted Child Identification and Education
Health Disparities
Higher Education Policy and Planning
HPA-Axis Functioning
Infant Eye Tracking
Infant Indicators of Cognitive Risk
Infant Visual Attention and Perception
Integrated Health Care
Interpersonal Relationships
Intimate Partner Violence
Language Development
Mind-Body Relationships
Neuromuscular Disability
Organizational and Systems Consultation
Pediatric Obesity Prevention and Intervention
Pediatric Psychology
Positive Psychology
Prenatal Stress
Pre-term Infants
Primary Care Psychology
Psychopharmacology
Reasons for Living
Religion, Spirituality and Health
Rodent Behavioral Models of Impulsiveness, Memory, and Learning
Rural Caregiver Stress
Rural Health
Rural Women's Health and Access to Mental Health Services
Serious and Persistent Mental Illness
Social Development in Infants and Toddlers
Stigma
Stress and Anxiety Reduction
Substance Use, Abuse and Dependence
Suicide Prevention
Telehealth and Telemental Health
Temperament
Traffic Safety
Visual and Auditory Working Memory

Advanced Training and Skills:

Biological and Biobehavioral:

Behavioral Testing
Blood Analysis (Finger Prick; Cholesterol & Glucose)
Cortisol Assessment and Saliva Collection
Classical (Pavlovian) and Operant conditioning
ELISA assay
General Histology
High Performance Liquid Chromatography (HPLC)
Intracranial, Intravenous, Intraperitoneal and Subcutaneous Injections in Rodents
Intravenous Catheters and Implantation and Maintenance of Chronic, Indwelling Catheters
Microdialysis
Microscopy
Preclinical Surgical Techniques

Research Design and Analysis:

Factor Analysis
Hierarchical Linear Modeling
Linear Modeling
Longitudinal Data Analysis
Measurement and Test Development
Multiple Regression
Moderation and Mediation
Power Analysis
Program Evaluation
Psychometrics
Statistical Simulation
Structural Equation Modeling
Survey Research Methods

Assessment and Therapy:

Acceptance and Commitment Therapy
Applied Behavior Analysis
Cognitive Behavioral Therapy
Couples and Family Therapy
Dialectical Behavior Therapy
Infant Visual Assessment and Coding
Intellectual and Psychological Assessment
Interpersonal Therapy
Motivational Interviewing

Sex Offender Assessment and Therapy
Rational Emotive Behavior Therapy
Risk Assessment
Suicide Prevention Gatekeeper Training
Time-Limited Dynamic Psychotherapy

Department of Psychology Programming and Software Capabilities:

Software:

Any Maze (Behavioral Scanning Software)
E-Prime
ESQ
MATLAB
MPLUS
NVIVO
SPSS/PASW
STATA
VISIO

Programming:

C#
HTML5
Javascript
Pascal
Python
R Programming
SAS Programming
VisualBasic
WYSIWYG HTML Coding

Department of Psychology Equipment Capabilities:

Biological and Biobehavioral:

Autoclaves for Sterilization of Surgical Instruments
Biosignal Amplifiers (16-Channel x 8 units)
Brain Tissue Storage Freezer (-80)
Chemical Fume Hood
Elevated Plus Maze
Intracranial Infusion Equipment and Pumps
Light/Dark Box
Mettler/Toledo Analytical Balance
Morris Water Maze
Open Field Motor Activity Chambers

Operant Conditioning Modular Chambers (x10), Equipped for Intravenous Drug Self-Administration
Place Conditioning Chambers
Stereotaxic Surgical Station with Isoflurane Anesthesia
Visual Spectrum Plate Reader

Health and Psychological Functioning:

Driving Simulator
Stadiometers
Tanita Weight Scales
Telehealth Substations (x2; Desktop and Cart-Based)
Tobii T60 Eye Tracker
Tobii TX300 Remote Eye-Tracker

Educational and Research Design Functioning:

Apperson DataLink 1200 Optical Scanner {Scantron}
Hewlett Packard DesignJet 500-42 Technical Document Printer
SONA Systems – Online Research System

Quillen College of Medicine

CARDIOVASCULAR AND METABOLIC DISEASES

Field: Cardiovascular disease

Investigator: Alok Agrawal (agrawal@etsu.edu)

Area of study: Functions of C-reactive protein in preventing atherosclerosis

Methodological expertise: Biochemical, molecular biological and immunological techniques

Field: Neuroscience/Neurocardiology

Investigator: Eric Beaumont, (beaumont@etsu.edu)

Area of study: Function and plasticity of the autonomic nervous system in heart disease.

Methodological expertise: Characterization of the autonomic nervous system in heart disease in rats, electrophysiology (intracellular recording *in-vitro*, multi-array electrode recording *in-vivo*), western blotting, immunostaining.

Field: Pharmacology, neurocardiology, autonomic neuroscience
Investigator: Donald B. Hoover (hoover@etsu.edu)

Area of study: Autonomic regulation of the heart; remodeling of sympathetic and intrinsic cardiac ganglia in cardiovascular disease; cholinergic anti-inflammatory mechanisms; neuroimmunology of sepsis.

Methodological expertise: Isolated tissue concentration-response techniques, ECG recording and analysis in murine models, histology and immunohistochemistry, quantitative image analysis, standard and confocal microscopy techniques, cell culture (immune cells, dissociated neurons and organotypic), PCR and quantitative PCR, Western blot analysis, transgenic murine models, developmental biology.

Field: Cardiovascular/Microcirculation
Investigator: tba

Area of study: Cardiovascular pathophysiology, myocardial ischemia and necrosis/fibrosis, microvascular inflammation and injury, obesity

Methodological expertise: Microvascular observation, fluorescence microscopy in isolated/perfused microvessels and in cell cultures, protein analysis and identification, culture techniques for cardio-microvascular cells, in situ measurements in physiological preparations.

Field: Innate and inflammatory responses in cardiovascular disease
Investigator: Chuanfu Li (li@etsu.edu)

Areas of study: Pathophysiologic mechanisms of cardiovascular dysfunction in myocardial ischemia/reperfusion injury, cerebral ischemia/reperfusion injury, and sepsis

Methodological expertise: Animal models of ischemia/reperfusion injury and sepsis, In vitro models of hypoxia/reoxygenation in cardiac myocytes, myoblasts and endothelial cells, pattern recognition receptors, Intracellular signaling, molecular biology, qPCR, cloning, gene transfection, gene expression, cell and cell communication.

Field: Molecular Cardiology
Investigator: Krishna Singh, Ph.D. (singhk@etsu.edu)

Area of study: Molecular and cellular basis of heart failure.

Methodological expertise: Measurement of structure and function of heart using echocardiography in mice, performance of myocardial infarction and ischemia/reperfusion in mice, infusion of drugs in mice using mini-osmotic pumps, isolation and culture of adult cardiac myocytes, microvascular endothelial cells and fibroblasts, and use of various molecular, cellular and biochemical techniques.

Field: Molecular Biology / Vascular wall biology

Investigator: Douglas P. Thewke (thewke@etsu.edu)

Area of study: Cellular and molecular mechanisms modulating atherosclerosis.

Methodological expertise: Characterization and quantitation of atherosclerotic lesions in mice, cell culture, apoptosis assays, osteogenic differentiation analysis, Western blotting, immunostaining, PCR and standard molecular cloning.

Field: Cardiac/Mitochondrial Metabolism

Investigator: Gary Wright (wrightgj@etsu.edu)

Area of study: The pathobiological basis of ischemic heart disease. Mitochondrial Biogenesis and metabolism

Methodological expertise: Respirometry measurements (Seahorse XF-24), live cell imaging, Langendorff perfused heart and common molecular techniques

INFECTIOUS DISEASE AND IMMUNOLOGY

Field: Infectious Disease

Investigator: Alok Agrawal (agrawal@etsu.edu)

Area of study: Functions of the molecules of the innate immune system in pneumococcal infection; Development of a strategy to treat microbial infections

Methodological expertise: Biochemical, molecular biological and immunological techniques

Field: Immunology/Infectious Disease

Investigator: Mohamed Elgazzar (elgazzar@etsu.edu)

Area of study: Immunobiology of sepsis, bacterial pathogenesis, innate immunity cell reprogramming

Methodological expertise: Animal model of sepsis/cecal ligation and puncture, mammalian tissue culture, bone marrow cell isolation and fractionation, immunostaining, flow cytometry, cell transfection, DNA and RNA isolation/amplification, standard PCR, real time PCR, Western blotting, Northern blotting, epigenetic- and microRNA-based investigations.

Field: Microbiology/ Bacterial Pathogenesis

Investigator: Jennifer Hall (halljl1@etsu.edu)

Area of Study: The interactions between genital tract epithelial cells and the intracellular pathogen, *Chlamydia trachomatis*, and the influences of sex hormones on chlamydial pathogenesis.

Methodological expertise: Western blotting, DNA/RNA isolation, real-time PCR, RT-PCR, siRNA/shRNA gene knockdown, mammalian cell tissue culture, Herpes Simplex Virus propagation, *C. trachomatis* propagation, immunostaining, immunoprecipitation, ELISA, mouse genital infections, mouse ovariectomy, light and electron microscopy

Field: Microbial Pathogenesis

Investigator: J. Russell Hayman (Hayman@etsu.edu)

Area of study: The mechanisms of adherence and infection, and the effects of infection on host cells of the obligate intracellular pathogen microsporidia.

Methodological expertise: Mammalian tissue culture, immunofluorescence assays, fluorescent microscopy, standard molecular biology techniques, Southern and Western blotting, SDS-PAGE, RT-PCR, heterologous recombinant protein expression in *E. coli*, standard molecular cloning.

Field: Microbiology/Medical Mycology

Investigator: Michael D. Kruppa (kruppa@etsu.edu)

Area of study: Genetics behind cell-cell communication between *Candida albicans* and bacterial species with emphasis on novel targets for antifungal development, characterization of fungal cell wall carbohydrates as targets for diagnostic development.

Methodological expertise: Standard recombinant DNA methodologies including Southern blotting, Western blotting, cloning, mutant construction, PCR, RT-PCR, fungal and bacterial cultivation, chemical isolation of cell wall carbohydrates from fungi,

Field: Immunology of Hepatitis C Infections; HIV/HCV Coinfection; Tropical Infections

Investigator: Jonathan Moorman, M.D., Ph.D., FACP (moorman@etsu.edu)

Area of study: Mechanisms of immune evasion by chronic viral infection, role of hepatitis C core protein on immune signaling pathways, and co-infection of hepatitis B and hepatitis C.

Field: Pathogenesis of HCV/HIV, innate and adaptive cellular immunity
Investigator: Guangyu Li (Liq001@etsu.edu)

Area of study: Virus-host interactions; molecular and cellular mechanisms involved in immune control of HCV/HIV infection.

Methodological expertise: Virus-cell culture systems and various biochemical and molecular approaches including real-time PCR; gene transfection and expression, human immune cells purification; flow cytometry, protein-protein interactions; immunological networks; functional immunologic and virologic assays.

Field: Infectious Disease
Investigator: Shunbin Ning (nings1@etsu.edu)

Area of study: Host-pathogen interaction between the oncogenic virus Epstein - Barr virus (EBV) and host innate immune system. HIV/Viral Oncology, Innate immunity, IFN Signaling, miRNA

Methodological expertise: Standard methods in Immunology, Molecular Biology, and Virology, including Promoter analysis, lentiviral packing and transfection, RNA interference, protein-protein and protein-DNA interaction, Chromatin Immunoprecipitation, immunoblotting and immunostaining, protein expression and purification in mammalian, yeast and insect cells, real-time PCR, cell culture, etc. Contemporary “state-of-the-art” high throughput strategies such as phosphoproteomics, ubiquitinomics, Tandem Affinity Purification, Gene Expression Profiling.

Field: Innate immunity and Sepsis
Investigator: Tammy R. Ozment (ozmentsk@etsu.edu)

Area of study: The innate immune receptors and molecules that propagate and promote or prevent systemic inflammatory response syndrome and sepsis.

Methodological expertise: animal models of sepsis, *in vitro* models of inflammation, receptor binding and internalization studies, flow cytometry, immunocytochemical staining, and confocal microscopy.

Field: Microbial Pathogenesis
Investigator: Robert Schoborg (schoborg@etsu.edu)

Area of study: The pathobiological consequences of chlamydial genital tract infection, co-infections by genital pathogens, and host DNA damage by microorganisms.

Methodological expertise: RNA isolation/amplification, RT-PCR, real time PCR, end-point PCR, SDS-PAGE, Western blotting, immunostaining, mouse genital infections, chlamydial propagation, mammalian tissue culture, electron and light microscopy, molecular cloning, and protein expression.

Field: Inflammation, immunology and infectious disease

Investigator: David L. Williams (williamd@etsu.edu)

Areas of study: Pathophysiology of sepsis and septic shock, cardiovascular dysfunction in sepsis and shock, innate immune recognition of pathogens, fungal pathogen associated molecular patterns

Methodological expertise: Animal models of infection, *in vitro* models of inflammation and infection, intracellular signaling, receptor binding methods, high performance gel permeation chromatography, chemical extraction of pathogen associated molecular patterns, chemical analysis of complex carbohydrates

Field: Viral (HCV/HIV) Immunology

Investigator: Zhi Q. Yao (YAO@etsu.edu)

Area of study: Cellular (DCs, NKs, T cells) and molecular (negative signaling molecules, including PD-1/SOCS-Tim-3/KLRG1/miRNA) mechanisms for persistent viral infection.

Methodological expertise: Translational purification and characterization of human immune cells from chronically viral infected individuals, RNA isolation/amplification, real-time PCR, siRNA/miRNA, Flow Cytometry, Western blotting, protein-protein interactions, receptor binding methods.

Field: Neuroimmunology

Investigator: Deling Yin (yin@etsu.edu)

Area of study: Cellular and molecular mechanisms of drug abuse and Toll-like receptors mediated signaling pathways.

Methodological expertise: gene transfection, RT-PCR, real-time PCR, expression profiling, transgenic mice, knockout mice, RNA interference and microRNAs in animal models.

NEUROSCIENCE

Fields: Developmental Psychology; Primary Care

Investigator: Beth Bailey, PhD (nordstro@etsu.edu)

Areas of Study: Pregnancy health behaviors and impact on child health and development; smoking and other substance use; intimate partner violence; vitamin D

Methodological expertise: Biostatistics; Clinical research design; Program evaluation; Infant and toddler assessment; Community-based provider training; Clinical interventions

Field: Neuroscience/Neurocardiology

Investigator: Eric Beaumont, (beaumont@etsu.edu).

Area of study: Function and plasticity of the autonomic nervous system in heart disease.

Methodological expertise: Characterization of the autonomic nervous system in heart disease in rats, electrophysiology (intracellular recording *in-vitro*, multi-array electrode recording *in-vivo*), Western blotting, immunostaining.

Field: Neuroscience

Investigator: Theo Hagg (haggt1@etsu.edu)

Area of study: Neuroprotection and repair after stroke and spinal cord injury.

Methodological expertise: in vivo models of stroke and spinal cord injury, microsurgical techniques, stereotaxic surgery, behavioral analyses, pharmacological treatments (systemic, intrathecal, intracerebral), tissue culture; RNA isolation/amplification, quantitative real time PCR, Western blotting, immunostaining, image analyses, intravital microvascular labeling techniques.

Field: Neuroscience

Investigator: Theresa A. Harrison (harrisot@etsu.edu)

Area of study: Sensory systems; central pathways of taste; turnover of peripheral taste receptors; taste epithelium stem cells

Methodological expertise: Functional neuroanatomy; electrophysiology; mouse genetic models; lineage analysis; immunohistochemistry, confocal microscopy

Field: Neuroscience

Investigator: Richard M. Kostrzewa (kostrzew@etsu.edu)

Area of study: dopamine receptor supersensitivity and neurotoxicological mechanisms relating to Parkinson's disease and ADHD

Methodological expertise: in vivo microdialysis, monoamine and reactive oxygen species analysis, behavioral methodological assessments

Field: Psychiatry

Investigator: Norman C. Moore MD (mooren@etsu.edu)

Area of interest: Psychopharmacology, Alzheimer's disease, Brain Imaging, PET, EEG, Evoked Potentials, Cognition, Fibromyalgia, TMS

Methodological expertise: EEG, Evoked Potentials, Neuropsychology, TMS

Field: Molecular Genetic Pathology; Molecular Biology of Disease

Investigator: Jerald E. Mullersman, MD, PhD, MPH (mullersm@etsu.edu)

Areas of study: Genetic epidemiology; pharmacoepidemiology; biochemistry of transcriptional inhibitor alpha-amanitin and related peptides

Methodological expertise: nucleic acids methods, bioinformatics and biostatistics, micro scale organic synthesis, chromatography, enzyme kinetics

Field: Psychiatric neuroscience

Investigator: Gregory A. Ordway (ordway@etsu.edu)

Area of study: The pathobiological basis of clinical depression and autism; molecular mechanisms of antidepressant drugs.

Methodological expertise: Molecular brain pathology, RNA isolation/amplification, RT-PCR, real time PCR, end-point PCR, RNA-Seq, laser capture microdissection, Western blotting, immunostaining, human brain collection, receptor binding methods

Field: Neuroimmunology

Investigator: Deling Yin (yin@etsu.edu)

Area of study: Cellular and molecular mechanisms of drug abuse and Toll-like receptors mediated signaling pathways.

Methodological expertise: gene transfection, RT-PCR, real-time PCR, expression profiling, transgenic mice, knockout mice, RNA interference and microRNAs in animal models.

Field: Neuroscience

Investigator: Meng-Yang Zhu (zhum@etsu.edu)

Area of study: Gene regulation of the central noradrenergic system in stress and Parkinson's disease animal models..

Methodological expertise: animal models of stress and Parkinson's disease, stereotaxic microinjection, molecule construction of lentiviral vector cassette, behavioral analyses, cell culture (cell line and primary); real time PCR, *in situ* hybridization, western blotting, immunostaining, image analyses, shRNA and microRNA *in vitro* and *in vivo*.

GENETICS AND MOLECULAR MEDICINE

Field: Biochemistry and Molecular Biology

Investigator: David A. Johnson, Ph.D. (davidj@etsu.edu)

Area of study: Human proteinases and their inhibitors; Mast cell and neutrophil granule proteases and blood plasma proteinase inhibitors; particularly alpha-1 antitrypsin and secretory leukocyte proteinase inhibitor

Methodological expertise: Protein molecular modeling, protein structure and function, molecular cloning, protein expression in *Pichia pastoris*, a yeast, protein purification, enzyme kinetics, electrophoresis.

Field: Molecular Genetic Pathology; Molecular Biology of Disease

Investigator: Jerald E. Mullersman, MD, PhD, MPH (mullersm@etsu.edu)

Areas of study: Genetic epidemiology; pharmacoepidemiology; biochemistry of transcriptional inhibitor alpha-amanitin and related peptides

Methodological expertise: nucleic acids methods, bioinformatics and biostatistics, micro scale organic synthesis, chromatography, enzyme kinetics

Field: Cancer and Premature Aging

Investigator: Yue Zou (zouy@etsu.edu)

Area of Study: Cancer etiology; molecular mechanisms of DNA damage responses including DNA damage, DNA repair, and programmed cell death; molecular basis of Hutchinson-Gilford progeria syndrome

Methodological expertise: Molecular biology, biochemistry, and cell biology such as Western blotting, chromatin immunoprecipitation assay (ChIP), immunofluorescence microscopy, PCR, RT-PCR, fluorescence spectroscopy, DNA repair assays, Radio-labeling, site-directed mutagenesis, mass spectrometry-based structural characterization methods, and flow cytometry-based assays.

GENERAL MEDICAL SCIENCE

Fields: Developmental Psychology; Primary Care

Investigator: Beth Bailey, PhD (nordstro@etsu.edu)

Areas of Study: Pregnancy health behaviors and impact on child health and development; smoking and other substance use; intimate partner violence; vitamin D

Methodological expertise: Biostatistics; Clinical research design; Program evaluation; Infant and toddler assessment; Community-based provider training; Clinical interventions

Field: Biochemistry and Molecular Biology

Investigator: Sharon E. Campbell (campbese@etsu.edu)

Areas of Study: 1. The effects of dietary constituents on diseases such as cancer, depression and diabetes; disease prevention through dietary intake, 2. Carcinogenic mechanisms, etiology, and progression, 3. The effects of oxidative stress on diseases such as cancer, depression and diabetes. 4. Comorbidity between disease states cancer, depression, and diabetes. 5. Fatty acids, their metabolites, and their influence on inflammation and disease.

Methodical expertise: Mammalian tissue culture, sterile technique, molecular cloning, recombinant DNA technology, RT-PCR, QPCR, nucleic acid isolation and electrophoresis methods, western blotting, ELISA, transient transfection, fluorescent and luminescent based reporter assays, gel imaging techniques, animal models of colon and prostate cancer, HPLC with UV detection, stereotaxic surgery, spectrophotometric methods: Ultra violet and Visible spectroscopy, fluorescence spectroscopy, infra-red spectroscopy, and identification of organic compounds.

Field: Cell and Developmental Biology

Investigator: Dennis M. Defoe (defoe@etsu.edu)

Area of study: Growth of ocular tissues; control of cell size and shape, stem cell self-renewal and fate

Methodological expertise: genetically-induced fate mapping, lineage analysis, immunostaining, confocal microscopy, stem cell culture

Field: Environmental Science

Investigator: Anthony J. DeLucia (delucia@mail.etsu.edu)

Area of study: Climate change

Methodological expertise: BenMAP, BenMAP Community Edition, mapping of secondary and primary data (ArcGIS)

Field: Molecular Pharmacology

Investigator: Michelle M. Duffourc (Duffourc@etsu.edu)

Area of study: Director of the ETSU Molecular Biology Core Facility; regulation of neurotropic factor expression in the CNS

Methodological expertise: Next generation sequencing, targeted RNA expression profiling, Sanger sequencing, STR profiling, mouse genotyping, nucleic acid isolation/QC, RT-PCR, real time PCR, end-point PCR, DNA cloning, Western blotting, gel imaging technologies, laboratory automation, transient transfection, gel

electrophoresis, microfluidic electrophoresis, fluorescence/luminescence based reporter assays.

Field: Toxicology/Pharmacology (Forensic)

Investigator: Kenneth E. Ferslew, Ph.D., DABFT (ferslew@etsu.edu)

Areas of study: Clinical and Forensic Toxicology; Drugs of Abuse; Pharmacokinetics/toxicokinetics and pharmacodynamics

Methodological expertise: Qualitative and quantitative analyses for a variety of compounds in blood, urine and other tissues using high performance liquid chromatography (HPLC), gas chromatography (GC), gas chromatography/mass spectrometry (GCMS), immunoassay techniques (EMIT and ELISA), and thin layer chromatography (TLC) as well as spectral analyses (fluorescence, visible and ultraviolet).

Field: Pulmonary

Investigator: Mehta, Jay B. (mehtaj@etsu.edu)

Area of study: gamma interferon (IGRA) in diagnosis and treatment of TB

Methodological expertise: Monitoring PPD Vs Gamma Interferon study as part of clinic quality assessment work.

Area of study: changing epidemiology of Extrapulmonary TB

Methodological expertise: Reviewing National and State of TN data on Extrapulmonary TB

Fields- Ob/Gyn, Medical Education, Medical Simulation

Investigator- Martin Olsen MD (olsen@etsu.edu)

Areas of Study- Use of medical simulation to enhance the medical education of Ob/Gyn residents and Medical Students

Methodological Expertise- Patented co-inventor of the Surgical Chloe simulation device, google GLASS explorer

Field: Proteomics/Pediatrics

Investigator: William L. Stone (stone@etsu.edu)

Area of study: Proteomics, pediatric research, oxidative stress, cancer therapeutics

Methodological expertise: Proteomics with nanospray LC-MS/MS, cell culture, protein structure prediction, protein-ligand docking, in silico drug design, HPLC with UV/VIS or electrochemical detection.

Field: Internal Medicine

Investigator: Jeffrey A. Summers, MD FACP (summersj@etsu.edu)

Area of interest: Mathematical modeling, decision analysis

Methodological expertise: Computer applications (including custom applications) for the above

Field: Cellular Physiology

Investigator: Robert Wondergem (wonderge@etsu.edu)

Area of study: Regulation of intracellular Ca²⁺ in regard to deleterious effect of endotoxin on the function of cardiomyocytes. Regulation of intracellular Ca²⁺ during cell motility and during cell migration/metastases of tumor cells.

Methodological expertise: cell culture; electrophysiology-patch clamp and conventional microelectrodes; calcium fluorescent imaging.

COLLEGE OF MEDICINE CORE FACILITIES

ETSU Clinical Labs

ETSU's Clinical Labs provides laboratory testing on a daily basis. A variety of assays can be performed for you by this laboratory. Please click the link for a list of assays.

Contact: Dr. Kevin Breuel (Email : breuel@etsu.edu)

Flow Cytometer

A Flow Cytometer is available in the Room 3-38 in Building 119. This Becton Dickinson FACSCalibur instrument is a dual laser, four color, fully integrated multiparameter system that is specifically designed for a wide range of biomedical applications.

Contact: Dr. David Williams (Email: WILLIAMD@etsu.edu)

Microscopy Core

The **Microscopy Core** is operated by the Department of Biomedical Sciences and located in Building 119 on the VA Campus. The Core comprises facilities for transmission electron microscopy (Room 119, 439-6785) and laser scanning confocal microscopy (Room 150, 439-6208). Both facilities are available to intramural and extramural clients on a "fee-for-service" basis. The confocal microscope is a Leica TCS SP II laser powered single-point scanning system capable of producing publication quality high-resolution images of fluorescently labeled tissues and cells. Differential Interference Contrast light microscopy is also possible using the Leica system. Confocal microscopy allows the user to obtain data and images from very thin tissue sections as well as sections up to 100 microns in thickness. Three different colors of fluorescence

can be visualized concurrently using a single scan or a compilation of multiple scans through the sequential scanning capabilities of the system. 3D rendering of scanned images is also made possible with the Leica system software. The electron microscopy laboratory is available for ultrastructural studies and includes a Philips Tecnai 10 transmission electron microscope with computer driven microscope operation and digital image recording capability, two ultramicrotomes, and facilities for sample preparation.

Contact: Dr. Don Hoover (Email: Hoover@etsu.edu) or Judy Whittimore (Email: whittimo@etsu.edu)

Molecular Biology Core

The Molecular Biology Core Facility at the James H. Quillen College of Medicine is a state of the art facility dedicated to furthering the research and educational needs of ETSU and the surrounding community. We currently offer DNA sequencing, phosphorimaging, microcapillary electrophoresis (Agilent) and real-time PCR technologies.

We are located in Building 119, Room 2-22 on the VA campus.

In addition, other services exist to support the scientific needs of the community, including:

- An on-site stockroom and discounted rates for commonly used molecular reagents.
- Specialized classes/workshops.
- Outreach to the educational community in the form of lectures and DNA-activity based classes.
- Guidance for sample preparation to obtain optimal sequencing results
- Assistance in interpreting sequence results.
- Consultation for the design of molecular biology projects.
- Primer design for PCR, DNA sequencing, and Q-PCR
- Robotic automation for setting up sample plates.

Contact: Dr. Michelle Duffourc (Email : DUFFOURC@ETSU.EDU)

Proteomic and Mass Spectrometry Facility

The term "proteomics" was first defined by Marc Wilkins in 1996 (Wilkins et al., 1996, *Nature Biotechnology* 14: 61-65) as an analogy with genomics, the study of genes. Proteomics is the large-scale study of proteins, particularly their structures and functions. Proteins are vital parts of living organisms and are the main components of the physiological metabolic pathways of cells. The proteome is the entire complement of proteins including their modifications produced by an organism or system. The proteome of a cell will vary with time and distinct requirements or stresses.

Our Mission: Our mission is to provide all scientists interested in proteomic research with affordable, reliable and relatively fast mass spectrometry-based proteomic services. We welcome collaborative research.

Our Facility: Our core instrumentation is the ProteomeX Station, which includes a Finnigan **LTQ XL** Linear Ion Trap Mass Spectrometer and integrated LC system (ThermoFisher).

Contact: Dr. William Stone (Email: STONE@etsu.edu)

ETSU Toxicology Laboratory

The ETSU Toxicology Laboratory is an integral part of the Section of Toxicology in the Department of Biomedical Sciences. The ETSU Toxicology Laboratory maintains the following licenses and certifications: federal license HHS-CLIA #44D0659142, Tennessee license #2048, and Medicare and Medicaid provider #44-8087. It also maintains proficiency testing with the American Association of Bioanalysts and the College of American Pathologists. The laboratory is equipped to do qualitative and quantitative analyses for a variety of compounds in blood, urine and other tissues using high performance liquid chromatography (HPLC), gas chromatography (GC), gas chromatography/mass spectrometry (GCMS), immunoassay techniques (EMIT and ELISA), and thin layer chromatography (TLC) as well as spectral analyses (fluorescence, visible and ultraviolet). The laboratory is affiliated with and housed in the William L. Jenkins Forensic Center on the James H. Quillen Veterans' Administration Medical Center campus in Building 6, Magnolia Avenue and Fifth Street, Mountain Home, Tennessee 37684. Our staff performs toxicological services for numerous area hospitals and clinics associated with the Quillen College of Medicine, plus supports our forensic pathologists and medical examiners with toxicological services on over 350 forensic autopsy cases performed in our center

Contact: Dr. Kenneth Ferslew (Email: ferslew@etsu.edu)

Expertise, Department of Sociology and Anthropology

Sociology and anthropology are social science disciplines that focus on the study of humans, social institutions and culture. Representative areas of expertise of faculty include:

Anthropology

- Ethnographic fieldwork
- Medical anthropology
- Race and human variation
- Visual anthropology
- Religion and pilgrimage

- Environmental anthropology
- Applied anthropology
- Native American culture
- Southern Appalachia
- South America
- Mesoamerica
- Physical anthropology
- Bioarchaeology
- Prehistory of the Southeast U.S.
- Highland/Cave archaeology
- Archaeology in France
- Paleolithic archaeology

Sociology

- Quantitative methods
- Applied sociology
- Survey research
- Medical sociology
- Religion
- Deviance
- Gender
- Family and social organization
- Socioeconomic class and inequality
- Politics, the military and war
- Terrorism

For more detailed information, see our website: <http://www.etsu.edu/cas/sociology/>

In addition to faculty areas of specialty, the department houses three new research/teaching initiatives. These include the Applied Social Research Laboratory (ASRL), the Valleybrook Archaeological Education and Curation Center and the program in Culture and Health.

Applied Social Research Laboratory (ASRL)

The Applied Social Research Laboratory (ASRL) is the newest initiative of the department's Center for Community Outreach and Applied Research. The ASRL has two primary functions: 1) to carry out telephone, web, or in-person surveys as well as focus group sessions for local or regional organizations and companies that desire high quality, accurate and representative research on citizens/consumers; and 2) to assist in the development of grant and contract programs that involve research or the evaluation of programs and services promulgated by government or non-profit organizations. Part of what makes the ASRL unique is that it is fully integrated with the Masters of Sociology program at ETSU. This benefits ETSU students in that they get hands on experience planning and conducting research, assisting with data analysis, and working

with ASRL faculty on report writing and presentations. Faculty have extensive experience in community based research, evaluation research, government and non-profit work, public opinion polling, and community health research. For specific information on each faculty and staff member's interests and experiences as well as their contact information, see below. Dr. Kelly Foster serves as the Director of the ASRL. For more information, see the website:

<http://www.etsu.edu/research/communityoutreach/programs/asrl.aspx>

Valleybrook Archaeological Education and Curation Center

The ETSU Valleybrook Archaeological Education and Curation Center is a facility on ETSU's Vallebrook campus that houses archaeological collections from selected Tennessee Department of Transportation (TDOT). The collections are available for examination and study by interested students (from ETSU and other institutions) and scholars. Associated with the center is the Stanley A. Ahler Archaeological Library which holds several hundred archaeological volumes and technical reports are housed in the library to aid research. We are also home to extensive comparative and type collections, including stone tools, toolstone raw material, and prehistoric pottery. Dr. Jay Franklin serves as the Curator of the Center. For more information, see the website:

<http://faculty.etsu.edu/franklij/valleybrook/valleybrook.htm>

Culture and Health

The department recently developed an interdisciplinary minor, Culture and Health, aimed to train students in the cross-cultural diversity of experiences surrounding health, illness, and treatment. The minor will increase cultural competency of future health care providers, give them firsthand experience engaging health and disease in nontraditional settings, and provide them with tangible skills designed to help them have success in professional training all while helping them work closely with faculty mentors along the way. In addition to targeting pre-health and pre-med students, the minor will offer students in the social sciences a focused track to pursue careers in community health research, advocacy, and development work in the government and nonprofit sectors. The minor will integrate a variety of experiential and competency-based learning opportunities into the curriculum. These may include collaborative research between students and professors, internships, field schools, and practicum courses. These experiences will focus on the close mentoring of students, the development of practical skills in research and/or applied settings, and cross-cultural and international exposure. The minor will begin fall 2015, pending final TBR approval. For more information, contact Melissa Schrift (schrift@etsu.edu) or William Duncan (duncanwn@etsu.edu).