Smart Materials for Nondestructive Evaluation and Quality Control

Developing vibration-based solutions for material characterization, nondestructive evaluation, and quality control through the integration of smart materials

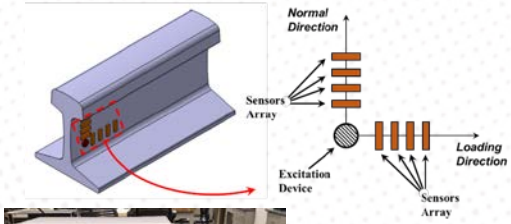
Mohammad Albakri
Mechanical Engineering
malbakri@tntech.edu

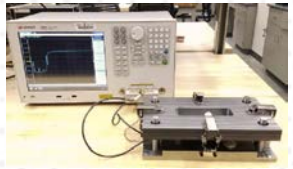
Research/Innovation/Creative Interest Areas

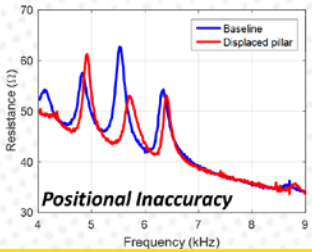
- **Smart Materials and Structures**
- **Structural Health Monitoring and Non-destructive Evaluation**
- **Elastic Meta-structures**
- **Theoretical and Experimental Modal Analysis**

Ongoing Projects

- Cyber-Physical System Integrity and Security with Impedance Signatures
- Reference-free Longitudinal Rail Stress and Neutral Temperature Measurement Utilizing Multidirectional Elastic Waves
- Non-Destructive Evaluation of Additively Manufactured Parts via Electromechanical Impedance Measurements







Dr. Melinda Anderson, PhD, RDN, LDN

Accreditation Standards and Program Evaluation

Research/Innovation/Creative Interest Areas

- **Compliance with Accreditation Standards**
- **Program Evaluation and Review**
- **Best Practices for Online Teaching**

Ongoing Projects

- Tennessee Early Childhood Training Alliance
- Submission of new MS degree in Community Health and Nutrition
- Development of new undergraduate and graduate online courses

School of Human Ecology
manderson@tntech.edu

Mathematics and STEM Education Research

Understanding the best practices for teachers and learners in STEM education, with a focus on mathematics teacher preparation and professional development

Research/Innovation/Creative Interest Areas

- Mathematics Education
- STEM Education
- Teacher Professional Development
- Peer Mentorship Models

APLU MTE-Partnership Mathematics Teacher Education Partnership

Holly Anthony, PhD
Curriculum & Instruction
hanthony@tntech.edu

Ongoing Projects

- Increasing the number of high-quality STEM educators in P–16
- Understanding teachers' perceptions and pedagogical practices in an everchanging educational climate
- Developing mathematics/STEM educators who are innovative and effective
- Studying the impacts of transformative teacher professional development

SMaRT STEM Majors for Rural Teaching

Dynamics of Smart Material Systems

Characterizing the dynamic response of smart materials for sensing, structural health monitoring, energy harvesting, and actuation in order to discover new phenomenon associated with the dynamics of smart material systems.

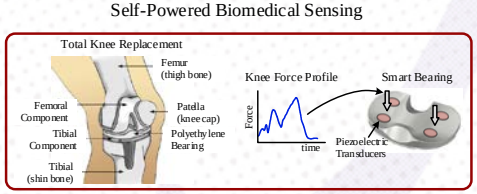
Research/Innovation/Creative Interest Areas

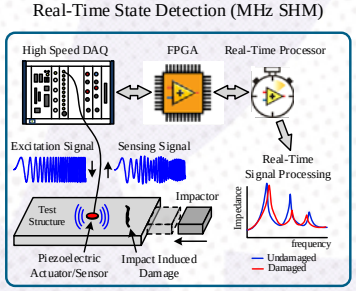
- Structural Health Monitoring (SHM)
- Embedded Energy Harvesting and Sensing in Implantable Biomedical Devices
- Embedded Sensing in Additive Manufacturing
- Piezoelectric Energy Harvesting

Steve Anton
Mechanical Engineering
santon@tntech.edu

Ongoing Projects

- Real-time state detection in highly dynamic environments to enable SHM of structures on the microsecond timescale
- Integrated load and wear sensing in Total Knee Replacements (TKRs) using piezoelectrics for simultaneous sensing and energy harvesting
- Integrated sensors in additive manufacturing to create self-sensing “smart parts”
- Real-time uncertainty quantification and model updating





Technological Innovation for Health Care Applications

Within the Renaissance Engineering Foundry Model, our efforts focus on the development, manufacturing and optimization of Applied Field-Sensitive Technologies for improving health care protocols

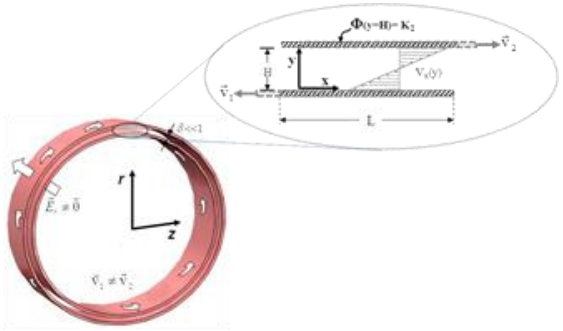
Research Interest Areas

- Biomaterials for health care applications
- Advanced Oxidation to Eliminate Health Care Pollutants from Water
- Electrical-Field Based Separations (Electrophoresis, Electro-chromathography, etc.)
- Innovation-driven Learning
- Transformational Approaches in Academic Environments

Pedro E. Arce, PhD

Ongoing Research Projects (Relevant to this Effort)

- Nanotemplated Hydrogels for Drug Delivery, Clinical Diagnostics and Tissue Scaffolding
- Nanocomposite Hydrogels for Purification of Biomolecules
- Electrokinetics of the Human Kidney-Towards an Artificial Kidney
- Cold Plasma-Membrane Process in Water Purification



Electro-Couette Microseparator

TENNESSEE TECH UNIVERSITY

Hydrogeology/Hydrology

Research involves use of hydrochemistry and environmental isotopes to study hydrological and chemical processes, and to understand questions related to water quantity, quality, dependent ecosystems, and availability of watersheds

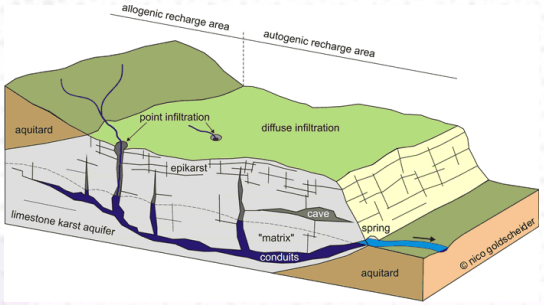
Research Interest Areas

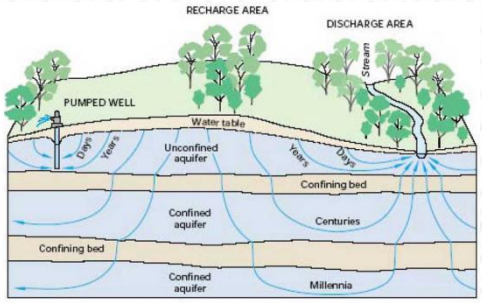
- Hydrogeology of Intermontane basins
- Hydrogeology of mined watershed
- Hydrogeology of Karst watershed
- Effect of aqueous geochemistry on biological processes and solute transport

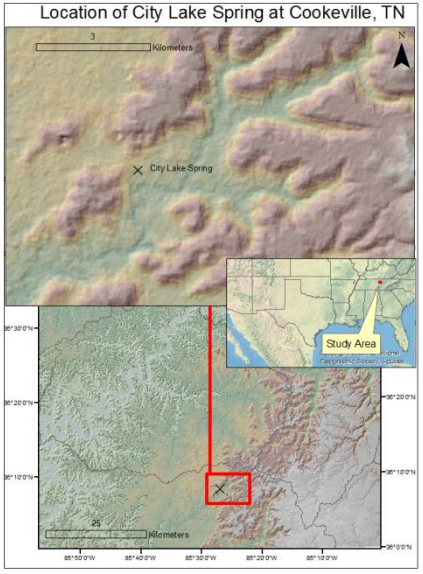
Joseph Asante
Earth Sciences

Ongoing Research Projects

- I am working with undergraduate students in the department of Earth Sciences on developing a new technique for karstic aquifer systems contamination risk assessment







Hydration of Portland cement and related interactions with admixtures and processing environments

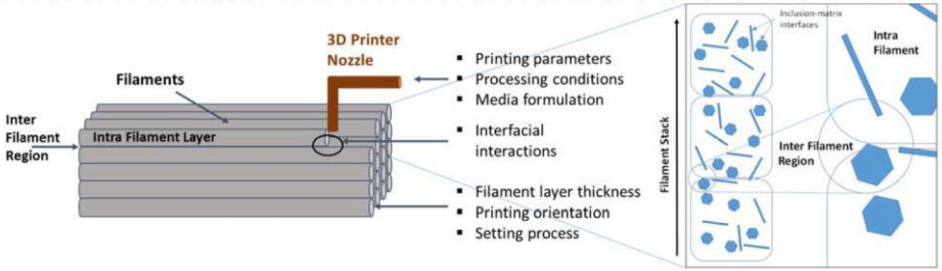
Research/Innovation Interest Areas

- Hydration Modeling
- Microstructure Development
- Design of admixtures and additive manufacturing of cement-based materials

Joe Biernacki
Chemical Engineering

Ongoing Research/Innovation Projects

- Computer Aided Design of Admixtures
  - Molecular Descriptor and a quantitative structure-activity relationship (QSAR)
  - Inverse-QSAR
  - Discovery of novel and highly effective materials – Multiple Molecular Scaffolds and functional groups
  - Shrinkage reducing and strength enhancing admixtures
- Additive Manufacturing of Cement-Based Composites

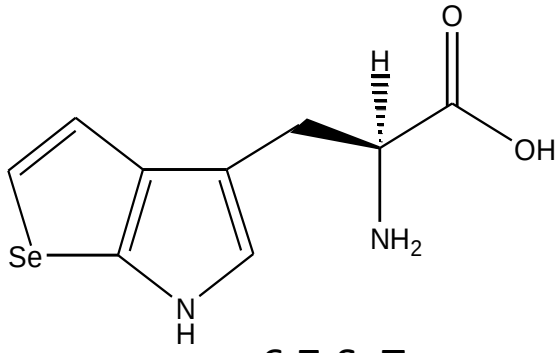


Jeff Boles, Chair of Chemistry

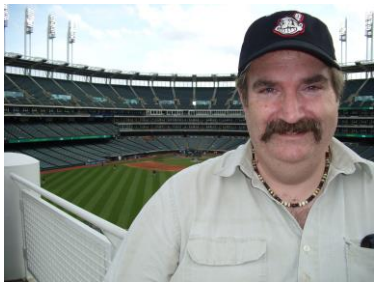
Structural Biochemistry

Research Interest Areas

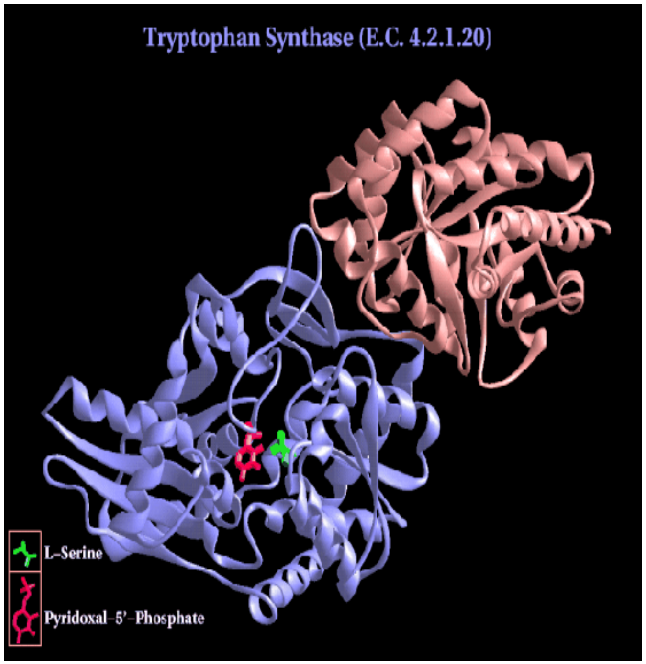
- Advance the field of x-ray crystallography via the improved synthesis and bio-incorporation of the unnatural tryptophyl amino acid Selena-tryptophan as a solution to the phase problem of macromolecular crystallography.
- Conduct experimental studies to evaluate the feasibility of additional Selenium or Tellurium-containing amino acids.
- Conduct experimental studies to enhance incorporation of unnatural tellurium-containing amino acids (TeMet).



6,7-SeTrp



Dr. Jeff Boles
Chemistry



Relevant Expertise

- Incorporation of SeMet as a phase solution for 3D structure determ.
- Crystallography
- Enzyme Kinetics
- Protein Purification
- Binding Analysis (Biacore)

TENNESSEE TECH UNIVERSITY

Use of Powerless Linguistic Cues as Predictors of Speaker Credibility Through Mediation Analysis

Reimagining Speaker Credibility Factors to Identify Deception

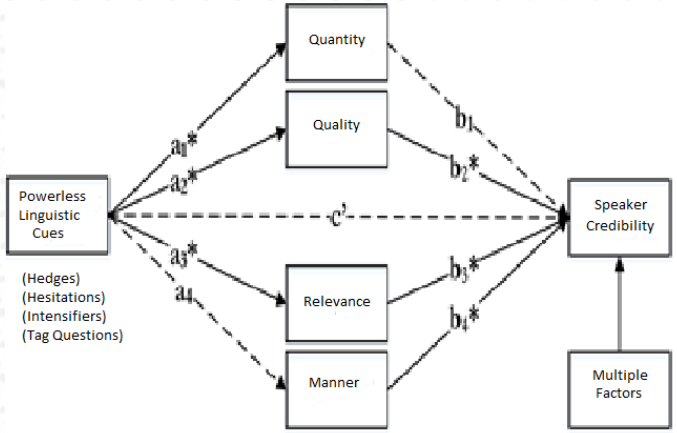
Research/Innovation/Creative Interest Areas

- **Powerless Linguistic Cues and Instructional Development**
- **Intercultural Communication and Cognitive Learning**
- **Social Influence/Persuasion and Deception**
- **CRAFTS: Creating, Recruiting, and Administering Forensics Tournaments and Students**

Kevin Bryant
Communication
kbryant@tntech.edu

Ongoing Projects

- Conditional Process Model – Deception & Speaker Credibility
- Foreign Instructor's Use of Humor
- Undergraduate Innovation Fellowship
  - Faculty Champion
- International Public Debate Association
  - Hosting National Tournament Spring 2020



Limitations of Bankruptcy Prediction Model Usefulness in the Audit Environment

Investigating the sensitivity of traditional models to common materiality thresholds

Sid C. Bundy, PhD
Assistant Professor of Accounting

Research/Innovation/Creative Interest Areas

- Bankruptcy Modeling with AI
- Going Concern Prediction
- Working on the Work (WOW) for authentic student engagement through research and internships

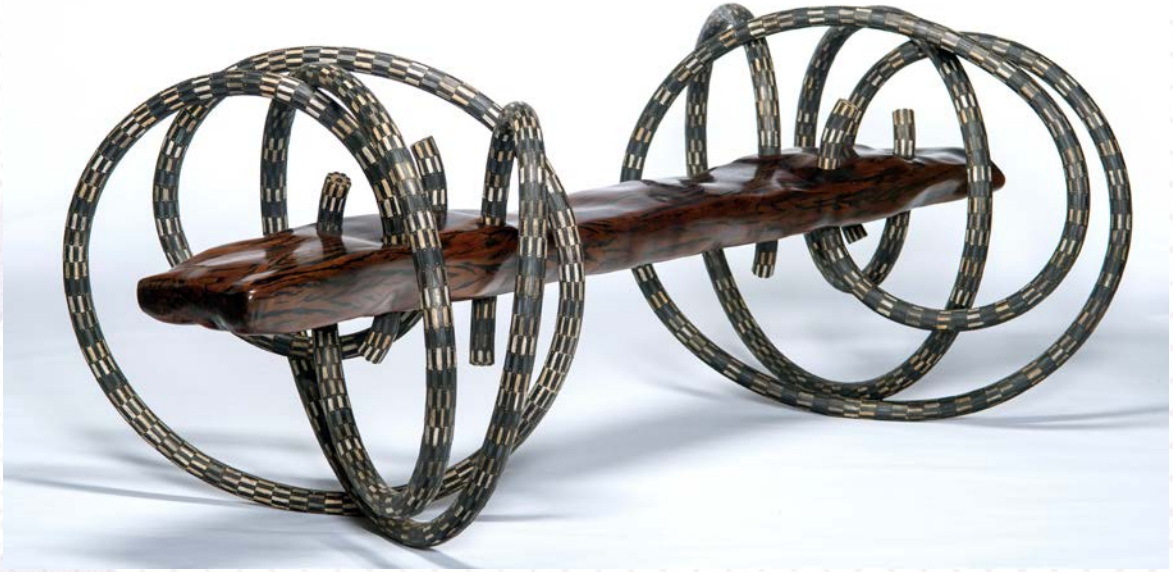
Ongoing Projects

- Simulation of Standard Errors in Bankruptcy Prediction Models at Common Materiality Thresholds
- Increasing Explainability of AI Models in Default Predictions
- WOW: Impact of Including Authentic Student Research in Financial Statement Analysis Classroom
- WOW: Infusing Data Visualizations early in Accounting Program

Furniture and Sculpture; materials, concept, process and structure.

- **Furniture responding to singular briefs that demand equilibrium over contesting design drivers.**
- **Sculpture impelled by cultural collusion, conflict and contamination.**
- **Research and application of pre- digital woodworking practices**

Graham Campbell
School of Art, Craft & Design
gcampbell@tntech.edu



Bench for the Platform at Fashoda Junction

Automation, Robotics and Compliant Machines in Vehicles and Manufacturing

Developing next-generation mobility tools for vehicles and manufacturing

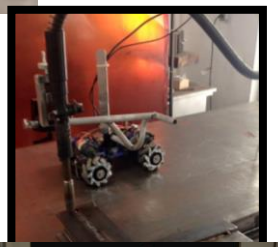
Research Interest Areas

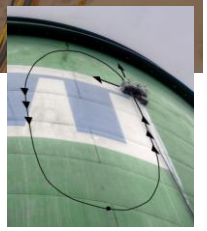
- Design of adaptive suspension systems for high-mobility vehicles
- Kinematics and Dynamics of vehicle systems on planar/non-planar terrain
- Autonomous capabilities in Non-holonomic (wheeled) platforms
- Mobile Manufacturing Robots in unstructured environments,
- Automated Mobile Robotic Welding
- Kinematics and Dynamics of in-space mechanisms
- Design and manufacture of distributed-compliance mechanisms
- Design of novel assistive devices for children with special needs

Ongoing Research Projects

- Developing the Southern Alliance for Advanced Vehicle (SAAV) Manufacturing Center
- Developing the DENSO Intelligent Vehicle Development Cluster (IVDC) at TTU
- Advancing precision manufacturing in non-factory environments with low-cost positioning sensor
- Developing a High Mobility Manufacturing Robot (HMMR) for Ship Compartments
- Development of a Remote Climbing Robot for Automating Welding Processes in the Shipbuilding Industry
- Automating Weld Processes in unstructured environments through a Remote, Climbing Robot
- High-Mobility Robots for Nuclear Fuel Cask inspection

Stephen Canfield
Dept. of Mech Eng.





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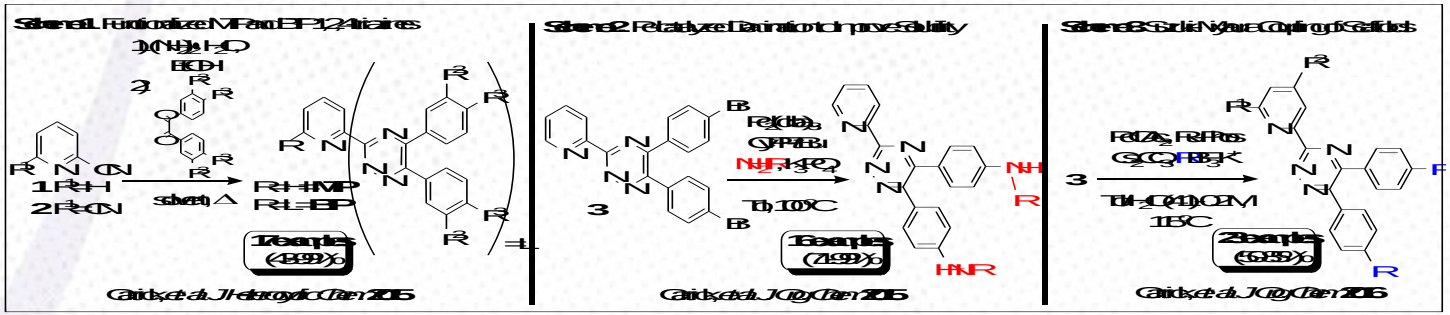
Carrick Group

Synthetic Organic Chemistry

Research Interest Areas

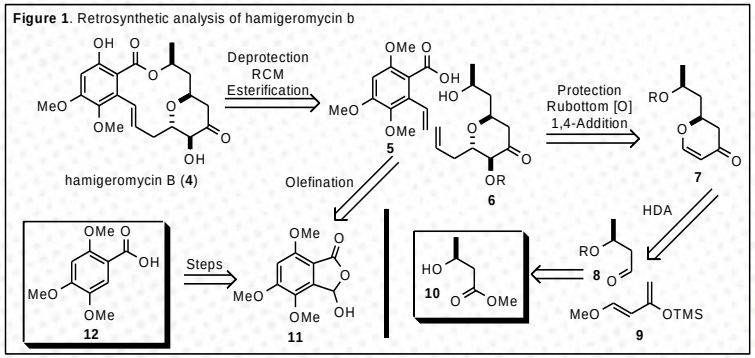
- **Total Synthesis of Biologically Active Natural Products**
- **Heterocycle Synthesis**
- **Development of Novel Synthetic Methods**
- **C-H Functionalization**



Dr. Jesse D. Carrick
Chemistry

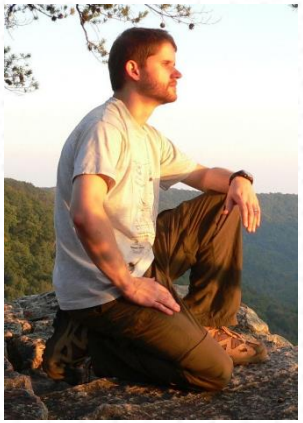
Relevant Professional Experience

- Process Development of APIs
- Project Leadership with Results
- NMR Spectroscopy



Population and Community Ecology of Rare Mammals

Research Examining Habitat, Population, and Community Relationships and the Status of Rare, Threatened, Endangered, and Understudied Mammal Species



Dr. Brian Carver
Dept. of Biology

Research Interest Areas

- Winter Ecology of Bats and Implications for Impacts from White-Nose Syndrome
- Population Status of Understudied Mammal Species
- Management of Rare Mammals
- Ecology of Bats in Eastern North America

Ongoing Research Projects

- Winter Ecology of Threatened Northern Long-eared Bats
- Ecology of Sympatric Southeastern Myotis and Rafinesque's Big-eared Bats
- Distribution and Habitat Associations of Eastern Spotted Skunks in Tennessee
- Small Mammals in Hemlock and Associated Forest Stands

TENNESSEE TECH UNIVERSITY

Derek J. Cashman, Ph.D.

Computational Medicinal Chemistry

Research Interest Areas

- Biomolecular simulations of proteins and nucleic acids.
- Protein-Protein and Protein-Ligand Docking and Scoring.
- Quantitative Structure-Activity Relationships of small molecule ligand binding.
- High Performance Computing (HPC) modeling of large biomolecular complexes.

Derek Cashman
Department of Chemistry

Ongoing Research Projects

- Protein-Protein Docking of Arrestin, JNK3, and receptor in the MAPK signalling pathway.
- Design of inhibitors of the MAPK signaling pathway.
- Computational studies of the bacterial chemotaxis complex in E.coli.
- Protein docking studies of photosystem I with Ferredoxin and cytochrome c6 to elucidate electron transfer mechanisms.

TENNESSEE TECH UNIVERSITY

Membranes for Sustainability at the Water – Energy – Food Nexus

(1) New membrane applications for better resource production and recovery and
(2) Nano-scale design and fabrication of membranes to support these applications

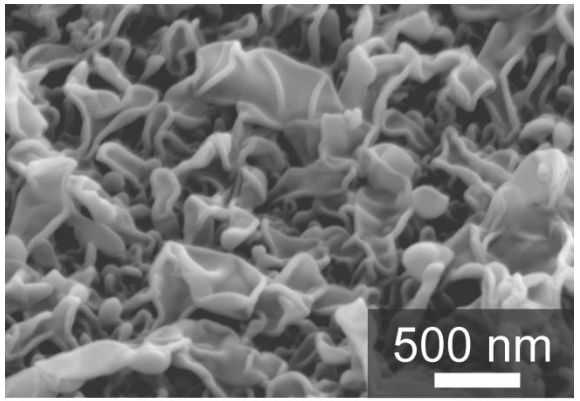
Research Interest Areas

- Forward osmosis and reverse osmosis for lower-impact separations in the water, agricultural, and manufacturing sectors
- Pressure retarded osmosis for clean, renewable energy from salinity gradients (in nature or in anthropogenic waste)
- Novel membrane structures and materials for reduced fouling

Laura H. Arias Chavez
Chemical Engineering

Ongoing Research Projects

- Recovering water and products from wastewater for the oil & gas industry and the food processing industry
- Investigating the role of membrane active layers in fouling
- Removing recalcitrant contaminants in industrial wastewater (*collaboration with P. Arce*)
- Modelling the effect of membrane support layer structure on performance in forward osmosis (*collab. with E. Languri*)



TENNESSEE TECH UNIVERSITY

Dr. Pingen Chen
Assistant Professor, Mechanical Engineering
College of Engineering

pchen@tntech.edu; (931)372-3310

Control and System Diagnostics, Internal Combustion Engine, Advanced Powertrains, Connected Vehicles, Renewable Fuels

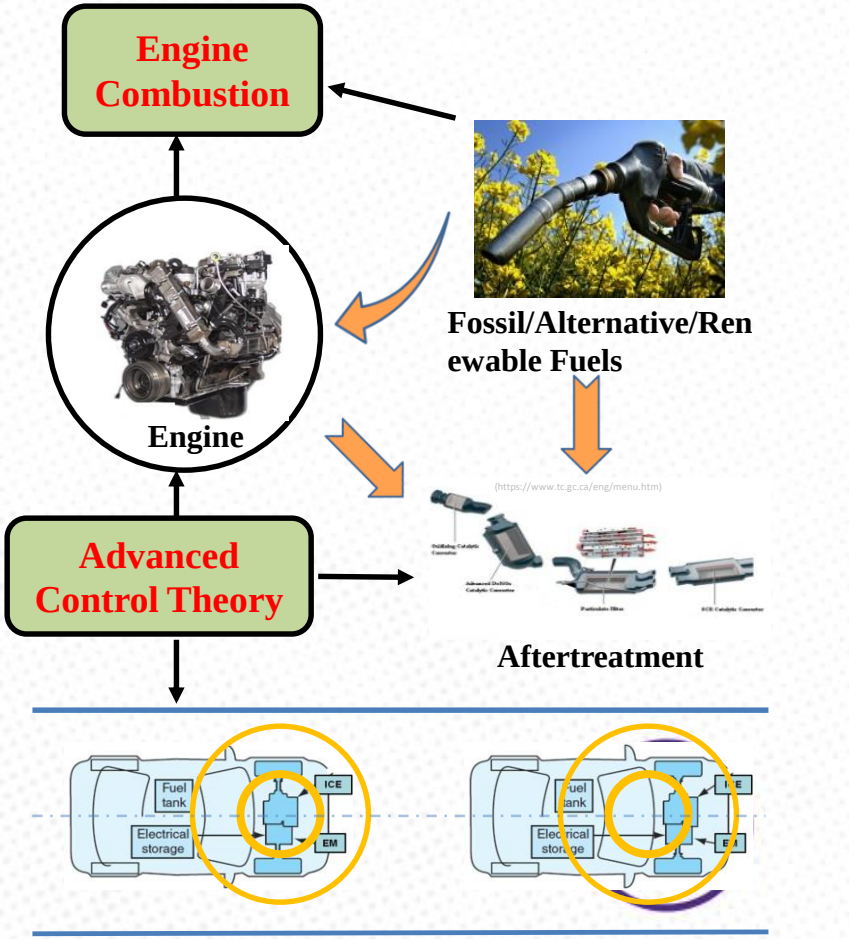
Goal: Clean, Efficient, Sustainable Next-Generation Powertrain

Accomplishments

- Over **10** years of research experience in modeling, diagnostics, and controls of next-generation automotive powertrain systems.
- Over **14** published journal articles, **9** peer-reviewed conference papers, and **1** filed patent (Google Scholar h-index: 9)
- Founding director of **Automotive Powertrain and Emissions Control Laboratory** at Tennessee Tech.

Current Projects

- Modeling, estimation, and control of integrated advanced lean-burn gasoline engine and after treatments
- Integrated advanced multi-mode Diesel engine and aftertreatment control
- Fully synergistic integrated powertrain, fuels, Diesel engine and aftertreatment system control
- Powertrain optimization for connected vehicles



Traditional, Hybrid, and Electric Powertrains, Connected Vehicles

Genetic or self-taught Resilience: Why Bouncing back is Important

When faced with life-changing situations and/or stressful conditions, some people generally adjust well over time while others never recover. What enables some to do well while others get crippled and spiral downhill with no hope in sight?

Rufaro A. Chitiyo
School of Human Ecology
rchitiyo@tntech.edu

Research/Innovation/Creative Interest Areas

- **Child abuse & neglect**
- **Trauma-informed care and resilience**
- **Cultural competence**
- **Self-care for professionals**

Ongoing Projects

- Non-violent discipline for children with histories of trauma
- Fostering cultural competence for Family and Consumer Sciences students
- The importance of being resilient
- Professional resilience and the importance of taking care of self as professional
- Cross disciplinary collaboration among first year Family and Consumer Sciences students

Improving Traffic Operations in Congested Systems

Improving system efficiency and user experience though application of advanced signal timing, signal system timing, and innovative design.

Research/Innovation/Creative Interest Areas

- **Traffic Signal and Signal System Operations**
- **Non-traditional Intersection and Interchange Designs**
- **Traffic Operations in Rural Areas**
- **Traffic Flow Theory**

Ongoing Projects

- When to Retime Traffic Signal Systems: Evaluating the Three Year Myth
- Integrated Implementation of Innovative Designs
- Strategies for Mitigating Congestion in Small Urban and Rural Areas
- TDOT's Traffic Monitoring Program: A Comparative Evaluation with Recommendations for Improvement

Dr. Steven M. Click, PE
Civil & Environmental Engineering
sclick@tntech.edu

Creating Educational Games, Animations, and Experiences for Introductory Chemistry Students

Developing interactive resources to engage students in science learning activities.

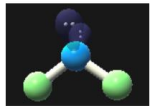
Research/Innovation/Creative Interest Areas

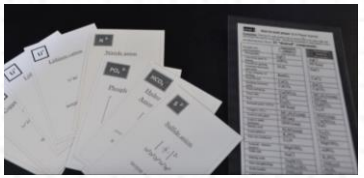
- **Digital & Print Games**
- **Phone Applications**
- **Computer Animations & Videos**
- **Hands-on Science Activities**

Janet Coonce
Chemistry
jcoonce@tntech.edu

Ongoing Projects

- **Serious Solids** (iCUBE): iPhone/Android Game to help general chemistry students predict the product of precipitation reactions.
- **VSEPR3D** (iCUBE): Android/Google Cardboard Application to help students visualize the 3D structure of molecules.
- **Keep Looking** (Carolina Biological): Board Game to help students understand ionic compound nomenclature.
- **Mind Over Matter** (Carolina Biological): Board Game that allows high school students to use deductive reasoning to correctly ID chemical compounds.
- **SAIC/Army Game Studio** (Redstone Arsenal, AL): TestFlight list for beta-testing of chemical education games



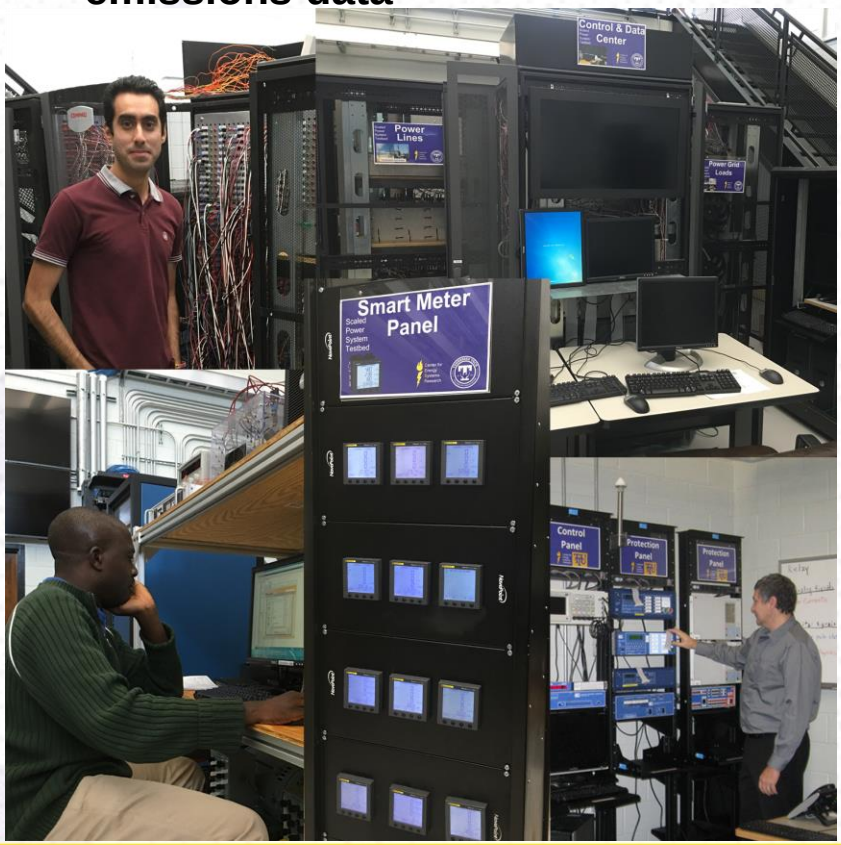


I40 Living Lab

Robert Craven, R&D Engineer
Center for Energy Systems Research
rcraven@tntech.edu

Past Engine, Vehicle, Emissions work

- **DAQ for mobile emissions lab at WVU including dilution tunnel work**
- **Instrumented and logged data on Los Angeles Hybrid Diesel-Electric city bus for an Urban route for Dyno testing**
- **Stiller-Smith Engine design and modelling**
- **Real-time heatrate of coal fired power plants using real-time emissions data**



Research Interests for I40 Living Lab

- Instrumentation and DAQ
- Programming, Modelling, Simulation, Emulation
- Electric Trucks
- Connected and Automated Vehicles (CAVs)

Smart Grid Laboratory

Biological Wastewater Treatment Processes and Environmental Microbiology Research

Understanding the structure and function of microbial communities in engineered systems, with the ultimate goal of improving environmental and public health.

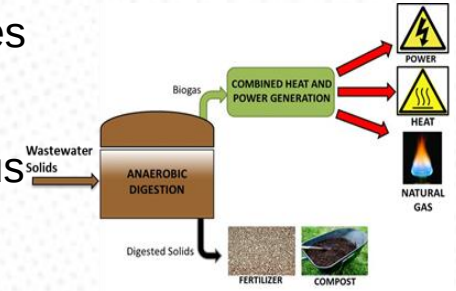
Research/Innovation/Creative Interest Areas

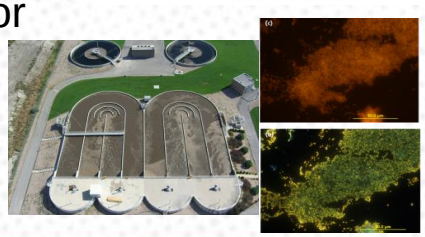
- Biological Nutrient Removal Processes from Wastewater
- Environmental Microbiology
- Bioenergy Production through Anaerobic Processes
- Sustainable Decision-Making
- Water and Sanitation in Developing Countries

Tania Datta
Civil & Environment Engineering
tdatta@tntech.edu

Ongoing Projects

- Linking complex organic feedstock characteristics to microbial metabolism in anaerobic codigester processes
- Understanding the structural and functional diversity of microbial communities involved in biological phosphorus removal process in water reclamation facilities
- Development of a holistic decision-making framework for sustainable solids waste management alternatives





State Tax, Classroom Pedagogy, and Financial Literacy Research

Understanding the impact of federal tax provisions on state tax revenues and decisions, improving classroom experiences and learning in accounting through research, and examining financial literacy in elementary and college students.

Research/Innovation/Creative Interest Areas

- Federal Tax Provisions on State Tax Revenues and Other Economic Measures
- Effective Tax Rate Management
- Classroom Pedagogy in Accounting
- Financial Literacy in Rural America

Ann Boyd Davis, Ph.D., CPA, CGMA
Department of Accounting
anndavis@tntech.edu

Ongoing Projects

- Examining the effect of tax expense management and corporate social responsibility ratings on investor perceptions of firm value.
- Improving classroom performance in Intermediate Accounting through ALEKS, bootcamp, and flipping the classroom
- Understanding the impact of one-credit hour classes on learning using the setting of financial literacy for entrepreneurs

I40 Living Lab

Trucks, Motorsports: Design, Test & Evaluations

- **Formula car design and competition**
- **Commercial Fleet Engine Optimization**
- **Instrumentation and Fleet Analysis**

Mark Davis
Civil & Environment Engineering

Research Interests for I40 Living Lab

- Instrumentation and DAQ – AFLEET
- ATV Instrumentation & Fleet Analysis
- AFV – Buses

TTU Motor Sports Team

History of Medicine and Science:

Study the history of medicine and science in antebellum America and modern Britain

Research/Innovation/Creative Interest Areas

- **History of Science and Medicine**
- **History of Chemistry**
- **History of Modern Britain (British History Since 1688)**
- **History of Nursing/History of Mathematics**

Ongoing Projects

- Manuscript in Review at the *Bulletin of the History of Medicine* about medical chemistry and urology at the turn of the nineteenth century
- Manuscripts in preparation: the history of botany in Tennessee, medical bleeding in early America, and the history of the scientific study of Indian Civilization in Tennessee.
- Developing new classes in the history of nursing and healthcare in America and the history of early mathematics.
- Starting Learning Community Focused on the History of STEM

E. A. (Allen) Driggers
History
edriggers@tntech.edu

Cyber Security and Privacy Preservation for Wireless Network Applications

Preserve privacy for smart grid communications, and machine learning models. Use of Blockchain technology to enhance security in various applications.

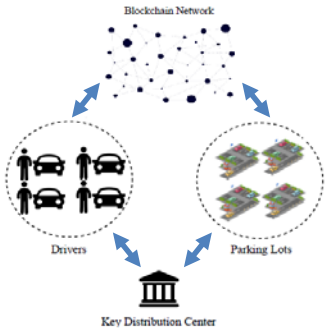
Research/Innovation/Creative Interest Areas

- **Cyber Security**
- **Privacy Preservation**
- **Machine Learning**
- **Blockchain**
- **Smart Grid**

Mostafa Fouda
Electrical & Computer Engineering Department
mfouda@tntech.edu

Ongoing Projects

- Privacy-Preserving Data Collection for Securing Advanced Metering Infrastructure in Smart Grids
- Electricity Theft-Detection for Securing Advanced Metering Infrastructure in Smart Grids
- Privacy-Preserving Smart Parking System Using Blockchain
- Authentication in 5G Networks Using Blockchain



Laboratory Astrochemistry, Atmospheric Chemistry, and Photoelectron Spectroscopy of Interstellar and Biological Anions

Research/Innovation/Creative Interest Areas

- CavityRing Down Spectroscopy
  --How light interacts with aerosols and other reactive species that are important either to our atmosphere or other chemically rich and evolving planetary atmospheres (such as Saturn's moon, Titan) or the interstellar medium
- Photodetachment Studies of Anions Relevant to Biology and Astrochemistry
- How to Learn and Teach "Threshold Concepts" in Chemistry

Dr. Wilson K. Gichuhi
Chemistry
Wgichuhi@tntech.edu
Office: FH 303, FH 320

Ongoing Projects

- Photoelectron Spectroscopy of Interstellar and Biological Anions

J. E. Owen Chair of Excellence

The discovery and validation of new knowledge in the area of technology management for business innovation.

Tor Guimaraes
J.E. Owen Chairholder
tguimaraes@tntech.edu

Research/Innovation/Creative Interest Areas

- Management of Technology for Business Innovation
- Success Factors for Improving Hospital Performance and Quality
- Success Factors for City E-Government
- Improving the Quality of Strategic IT Planning

Ongoing Projects

- Testing the determinants of hospital service quality
- Important factors for IT department performance
- Smart cities' relationship to city quality
- The impact of company innovativeness on performance

Wireless Communication, Data Collection and Analytics

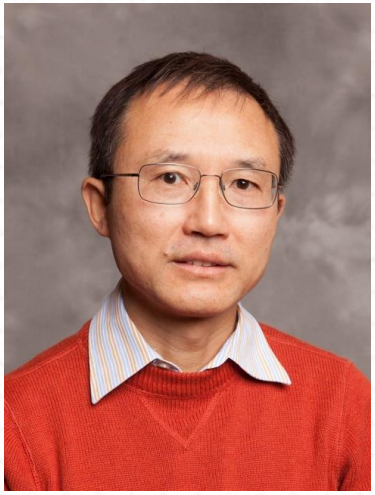
Research and development in wireless communications, RF systems & signal processing. Lead IoT PEER (IoT Platform for Engineering Education and Research) project. Supporting student innovation.

Areas of Research and Development

- **Wireless communications and RF systems**
- **Signal processing, data collection and analytics, and anomaly detection**
- **Industrial Internet of Things (IIoT)—machinery health monitoring and analysis**
- **Wireless physical-layer security and privacy**

Ongoing Projects

- IoT PEER (sponsored by NSF REU, TTU CoE and Microsoft)
- Directing a Capstone Design project iMakerSpace Data Collection and Usage Tracking on IoT Platform
- Cattel tracking
- Wireless physical-layer enhancement of security and privacy (sponsored by NSF SaTC)



Terry Guo, Ph.D.
R&D Engineer
Manufacturing Center
nguo@tntech.edu

Secure Cloud and Edge Assisted Cyber Physical Systems Research

Developing Novel Cybersecurity Solutions for Smart Communities

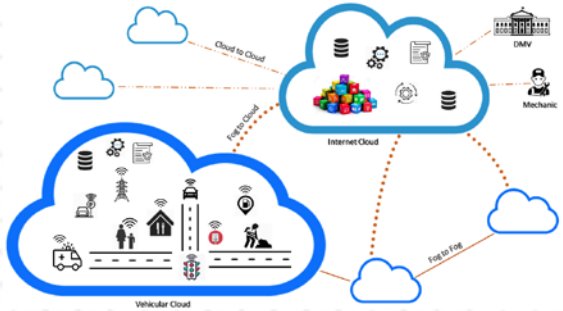
Maanak Gupta
mgupta@tntech.edu

Research/Innovation/Creative Interest Areas

- Smart Connected Systems and Internet of Things
- Social Relationship Centric Security Solutions
- Malware Analysis using Machine Learning
- Cloud (and Edge) Computing and Big Data
- AI and Data Driven Security Solutions

Ongoing Projects

- Secure Cloud Assisted Smart Cars and Fine-Grained Access Control
- Authorization Framework for Cyber Physical Systems
- Contextual Aware Social Relationship Centric IoT Security
- Static and Dynamic Malware Analysis using AI and ML
- Secure and Privacy Aware EV Charging Coordination Schemes



Trumpet Pedagogy and Performance

Exploring the creative arts through teaching and performing trumpet repertoire.

Research/Innovation/Creative Interest Areas

- **Performance – Chamber music, Orchestral Music, Solo Repertoire, Brass Band**
- **Commissioning – Bringing new music to life**
- **Publishing – Recording Reviews, Original Arrangements and Recordings**
- **Pedagogy – Exploring new method books, exercises and etudes for teaching trumpet performance**

Scott Hagarty
School of Music
shagarty@tntech.edu

Ongoing Projects

- Brass Arts Quintet: The TnTech faculty brass quintet rehearses and performs regularly each semester
- Bryan Symphony Orchestra – Working alongside students and colleagues regularly in a local professional orchestra.
- Faculty Recitals – performing solo repertoire for trumpet
- Fanfares for Waterfalls – New commissioning project of trumpet fanfares inspired by local waterfalls

Investigating Security and Reliability of Digital System Design

Modeling Various Digital and Pseudo Digital Systems and studying their security vulnerabilities

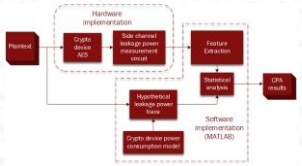
Syed Rafay Hasan
Electrical and Computer Engineering
shasan@tntech.edu

Research/Innovation/Creative Interest Areas

- Modeling security vulnerabilities in cyber physical systems (CPS), using Formal Methods
- Hardware design security and reliability for integrated circuits and embedded systems
- Applications of Formal Verification on industrial control systems and smart grids

Ongoing Projects

- "REU Site: Secure and Privacy Preserving Cyber Physical Systems", Role: Co-PI Budget: $ 359,738, Funding Agency: National Science Foundation (2016 – 2018)
- ICT-Funds (a United Arab Emirates Research funding organization) for the year 2016-2017 (tentative), with the research title "Investigation of Effective Management of Energy Demand in Distribution Management Systems of Smart Grids using Formal Verification Methods", (**Role: PI, Total Amount, approx. $408,000 US**).
- Towards Run-Time Hardware Trojan Detection Using Circuit Behavior Profiling: Leveraging Game Theory and Formal Verification **(Internally Funded/ Summer Faculty Fellowship Program at AFRL (2016))**



Metal Ion and Molecular Separations for Nuclear Waste Remediation and Radionuclide Analysis

Study of f-element and radionuclide pre-concentration, extraction, and separation in liquid-liquid and solid-liquid systems employing complexation, solvation, host-guest chemistry, and ion-exchange in phase transport reactions.

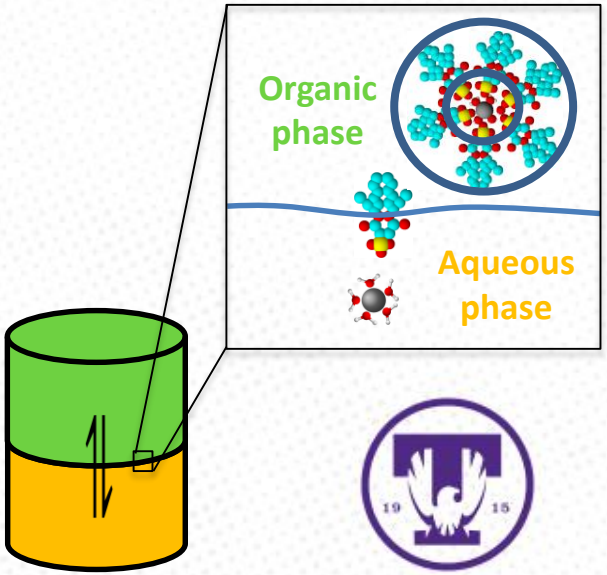
Research/Innovation/Creative Interest Areas

- Solvent extraction, ion-exchange, and complexation chemistry
- Interfacial chemistry and dynamic equilibria
- Actinide/lanthanide solution chemistry
- Ionic liquids and novel ligands/extractants
- Radioanalytical method development

Cory Hawkins
Chemistry, cahawkins@tntech.edu

Ongoing Projects

- Functionalized ionic liquids for selective complexation and separation of *f*-elements
- Studies of Schiff base ligands for metal ion complexation and separation
- Detection and characterization of reverse micelles and their effect on solvent extraction systems by NMR spectroscopy
- Development of low-background radiation detection and measurement laboratory: A collaboration between Physics, Chemistry and Earth Sciences departments.



Applied Wildlife Nutritional Ecology and Management

Understanding the patterns and mechanisms of foraging and other ecological processes in Tennessee's wildlife to improve conservation, management and enjoyment of these resources.

Steven Hayslette
Biology
shayslette@tntech.edu

Research/Innovation/Creative Interest Areas

- Wildlife Ecology and Management
- Diet Selection, Behavior, and Nutritional Ecology of Granivores
- Ecology and Management of Upland Game Birds

Ongoing Projects

- Development and use of physiological indices of habitat quality in northern bobwhites
- Diet selection and competitive interactions of gray squirrels and other non-target species at bird feeders
- Mechanisms of diet selection and foraging patch-use in mourning doves

Earthquake Ground Motion for Structural Analysis

Development of Seismic Loading for the Inelastic Analysis of Structures

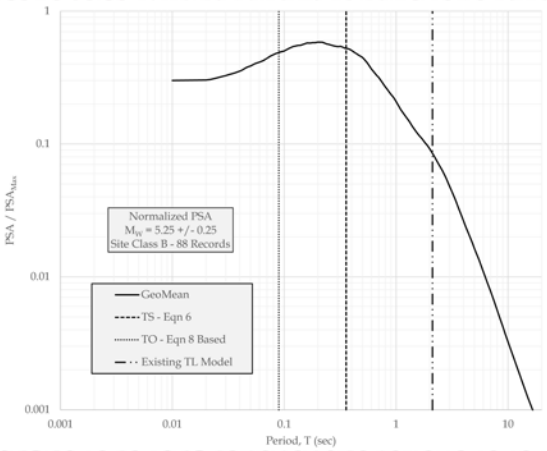
Tim Huff
Civil and Environmental Engineering
thuff@tntech.edu

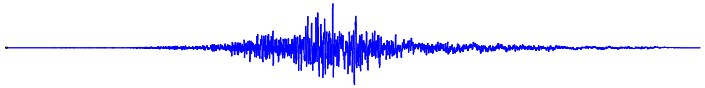
Research/Innovation/Creative Interest Areas

- Ground Motion Selection
- Ground Motion Modification
- Definition of various Target Spectra
- Seismic Spectra Transition Period Models

Ongoing Projects

- Earthquake Ground Motion Suites for Oak Ridge, TN
- Earthquake Ground Motion Suites for Memphis, TN
- The Importance of Target Spectrum Basis in Ground Motion Scaling
- Inelastic vs. Elastic Variability in the Seismic Response of Structures
- Updated Transition Periods for Seismic Spectra based on an Expanded Ground Motion Database





Molecular Approaches to the Assessment and Conservation of Biological Diversity

We are applying sophisticated molecular tools to improve the management strategies for conserving imperiled and endangered aquatic biodiversity,

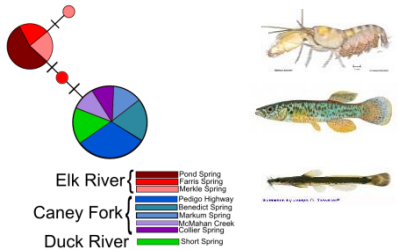
Research Interest Areas

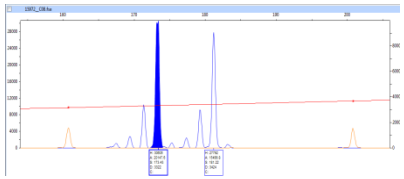
- Assessing levels of biodiversity at the species level.
- Examining patterns of divergence in incipient species.
- Identifying units of conservation and management priorities.
- Developing environmental DNA sampling techniques for defining the distribution of endangered and imperiled aquatic species.

Dr. Carla Hurt
Assistant Professor of Biology

Ongoing Research Projects

- Microsatellite approach for assessing the success of stocking and recruitment in Sauger.
- Next-generation GBS approach to measuring the rate and pattern of DNA substitutions in the nuclear genome.
- Evaluating ESUs and MUs in the imperiled Barrens Topminnow
- Environmental DNA assessment of the distribution of the endangered pygmy madtom





TENNESSEE TECH UNIVERSITY

Community Nutrition and Health

Understanding barriers to health in rural areas, and exploring ways of enhancing the health of this population.

Research/Innovation/Creative Interest Areas

- Barriers to Participation in Public Assistance Programs
- Improving Nutrition Related Aspects of Health in Rural Areas
- Increasing Physical Activity in Rural School Systems

Samantha Hutson
School of Human Ecology
shutson@tntech.edu

Ongoing Projects

- Perceptions of students who participate in interprofessional healthcare simulations
- Nutrition graduate program development and assessment

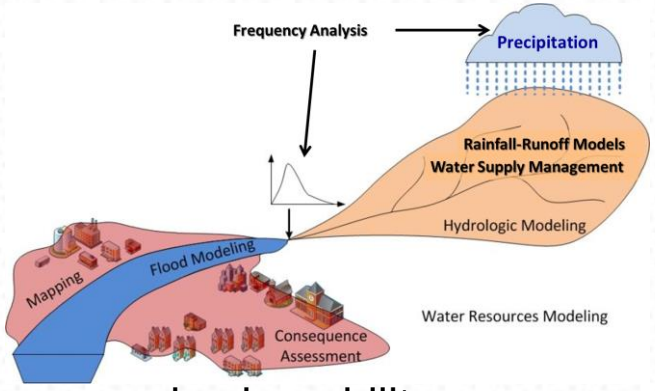
WAter Resources Modeling & Simulation (Tech-WARMS)

Alfred J. Kalyanapu
Civil and Environmental Engineering
http://www.techwarms.org

Our broad research focus aims "***at understanding the complex interplay water resources has with climate, urbanization, energy development, and how that affects infrastructure sustainability & resilience.***"

Research Areas & Interests

- Advanced Scientific Computing
- Flood Modeling and Simulation
- Monte Carlo based Uncertainty Analysis
- Natural Hazards and Extreme Events
- Watershed Hydrology
- Integrated Watershed Management

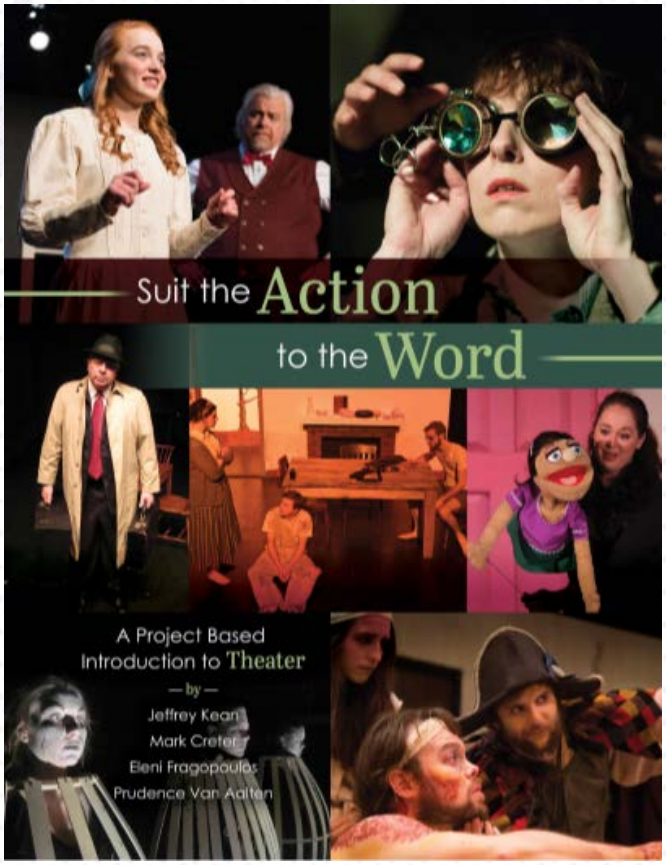


Ongoing & Recent Projects

- Extending projected PMP/PMFs to flood risk consequences and vulnerability assessment (*ORNL Collaboration* - Drs. Shih-Chieh [ESD] and Anantharaj [NCCS])
- Development of Watershed Quality Index for Watershed Management
- River Conveyance Correction for using digital topographic data for flood risk modeling
- Risk and reliability analysis for dam gate optimizations in a Dam network
- Probabilistic framework for dam breach modeling and simulation
- Flood impacts on Agricultural Production in Tennessee and Cumberland River Basins

A Project Based Introduction to the Theatre

The full time and adjunct faculty of the TTU Theatre program have collaborated to create a project-based approach to the THEA1030 Introduction to the Theatre course. Over the course of two years, projects were introduced into the classroom and the results are featured in the recently published e-book-*Suit the Action to the Word-A Project Based Introduction to the Theatre (Kendall Hunt Publisher)*



Jeff Kean
Mark Creter
Elani Fragopoulos
Prudence Van Aalten
English jkean@tntech.edu

Dr. Duckbong Kim
Assistant Professor, Manufacturing and Engineering Technology Dept., College of Engineering

dkim@tntech.edu; (931) 372-3327

Smart Manufacturing, Additive Manufacturing and Data Analytics

Research Experience and Projects

- Assistant professor at Tennessee Tech. Univ., 2016-present
- Guest researcher: National Institute of Standards & Technology (NIST), Oct. 2011- Jul. 2016
  - Systems Integration for Additive Manufacturing Project (2013-2016)
  - Modeling Methodology for Smart Manufacturing Systems (2013–2016)
  - Sustainable Modeling & Optimization Project (2011–2013)
  - Testbed Development for Sustainable Manufacturing (2011–2013)

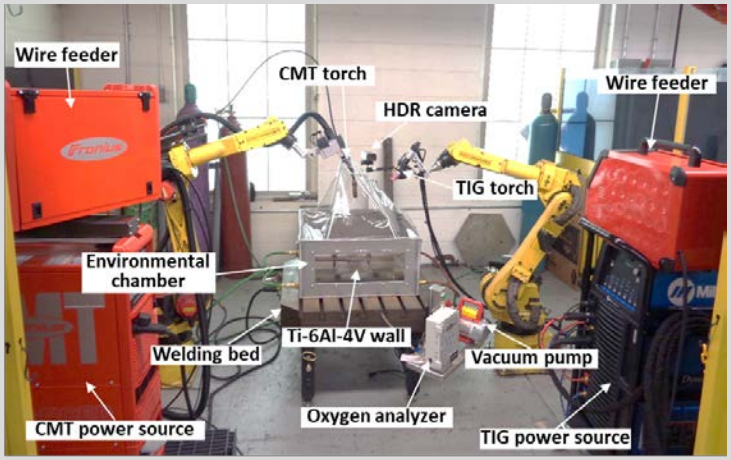
Current Research & Educational Interests

- Wire+arc additive manufacturing (WAAM)
- Hybrid additive and subtractive manufacturing system
- Multi-material WAAM
- Characterization of interfacial layer between dissimilar materials
- Qualification and quality assurance
- Industrial Automation and Robotics

Current Journal Publications

1. Kim, Duck Bong, P. Witherell, R. Lipman, & S. Feng (2015) "Streamlining the additive manufacturing digital spectrum: A systems approach," Additive Manufacturing 5: 20-30.
2. Kim, Duck Bong, P. Witherell, Y. Lu, & S. Feng (2017) “Toward a digital thread and data package for metal additive manufacturing," ASTM smart and sustainable manufacturing systems 1(1), 75.
3. Kim, Duck Bong, (2017) “An approach for composing predictive models from disparate knowledge sources in smart manufacturing environments ,” Journal of Intelligent Manufacturing 1-14.
4. Kim, Duck Bong, P. Denno, & A. Jones (2015) “A model-based approach to refine process parameters in smart manufacturing,” Concurrent Engineering: Research and Applications. 23(4): 365-376.
5. Kim, Duck Bong, S. Shin, G. Shao, & A. Brodsky (2015) "A decision-guidance framework for sustainability performance analysis of manufacturing processes," IJAMT 78(9): 1455-1471.

System Setup



<Wire+Arc Metal Additive Manufacturing>

Clarinet: Pedagogy, Chamber Music & Entrepreneurship

Music Clinician and consultant, orchestral positions, Discography and Media Credits

Wonkak Kim
Music, Clarinet
wkim@tntech.edu
www.Wonkak.com

Research/Innovation/Creative Interest Areas

- Notable solo and chamber recitals and concerto performances
- Commission & premiers
- Competitions

Expected Projects

- High School Clinics
- Adjudication (Universities, Festivals & other venues)
- Master Classes & Guest Teaching

School Counselor Professional Identity Development and Occupational Burnout

Exploring factors that influence school counselors' professional identity development and burnout, as well as linkages between the two phenomena.

Research/Innovation/Creative Interest Areas

- Fostering professional identity development
- Simulated encounters in school counselor training
- Occupational burnout prevention
- School counselor professional advocacy

Kathryn Kozak
Counseling & Psychology
kkozak@tntech.edu

Ongoing Projects

- Intrapersonal and organizational predictors of school counselor burnout
- Association between school counselor burnout and wellness
- Standards and competencies for counseling practice
- Simulated counseling encounters as a mechanism for professional identity development

Plant Systematics and Evolutionary Biology

Understanding the evolution of plants, focusing on morphology, development, and gene expression.

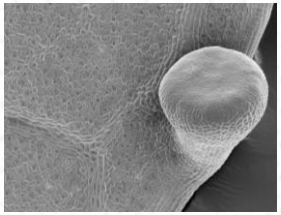
Shawn Krosnick
Department of Biology
skrosnick@tntech.edu

Research/Innovation/Creative Interest Areas

- Pollination and reproductive biology of plants
- Plant systematics and taxonomy
- Evolution of gene expression
- Plant development and anatomy

Ongoing Projects

- Understanding the evolution of andromonoecy in *Passiflora*
- Examining the evolution of self-compatibility
- Reconstructing phylogenetic relationships in *Passiflora* with an emphasis on subgenus *Decaloba*
- Examining comparative transcriptomes in Passifloraceae to identify new candidate genes involved in nectary expression



Geometric properties in Banach Spaces

To understand connecitons between various geometric properties of Banach spaces which have applications in other areas of matheamtics (in appropximation theory, optimization theory and others)

Damian Kubiak
Mathematics Department
dkubiak@tntech.edu

Research/Innovation/Creative Interest Areas

- **Functional Analysis and Operator Theory,**
- **Properties of Musielak-Orlicz and Cesaro spaces**
- **Properties of noncommutative spaces of measurable operators**
- **Non-squarness type geometric properties in Banach spaces**

Ongoing Projects

- Diameter 2 properties in Musielak-Orlicz spaces
- Duality of Cesaro and Lorentz function spaces

Energy Sector's Water Use

A Core Challenge: Interdependence of energy systems and local availability of water often in large quantities

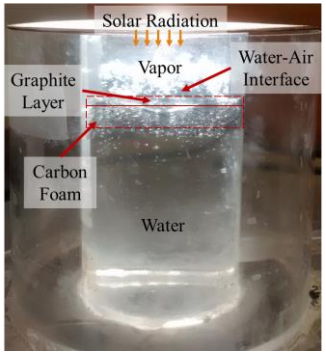
Research Interest Areas

- **Energy System's Cooling Tower**: To improve the cooling tower efficiency to work with no or minimum water loss.
- **Solar Evaporation and Boiling Improvement**: Significantly improved solar evaporation at the water-air interface.
- **Forward Osmosis Water Treatment**: Forward osmosis membrane support layer improvement.

Ehsan Languri, PhD
Mechanical Engineering
elanguri@tntech.edu

Ongoing Research Projects

- Cooling tower efficiency improvement: dynamic modeling, field demonstration and testing (with Dr. Cunningham)
- Solar Heat Localization at Water-Air Interface: experimental and numerical modeling
- Forward Osmosis Water Treatment: numerical modeling on membrane redesign using CFD (with Dr. Chavez)



Enhanced Boiling

Cooling Tower

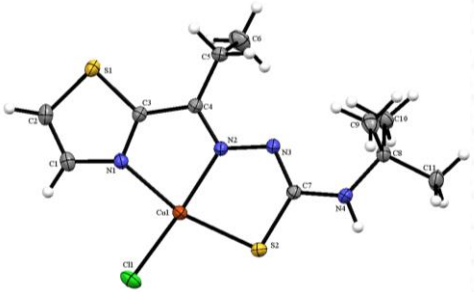
TENNESSEE TECH UNIVERSITY

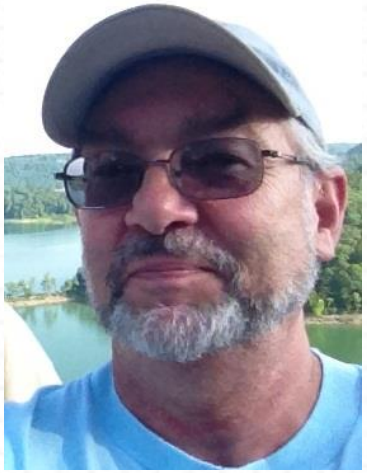
Ed Lisic, Chemistry

Inorganic Chemistry

Research Interest Areas

- **Medicinal Chemistry**
- **Metal complexes as enzyme inhibitors**
- **Nuclear medicine**





Dr. Ed Lisic
Chemistry

My large research group of seventeen undergraduates and one grad student are involved in synthesizing new metal complexes that are potential chemotherapy agents which target specific enzymes such as Topoisomerase and ribonucleotide reductase.

Cu(II) Benzoylpyridine Thiosemicarbazone Complexes: Inhibition of Human Topoisomerase IIα and Activity against Breast Cancer Cells

Jennifer D. Conner[1], Wathsala Medawala[1], Madison T. Stephens[1], William H. Morris[1], Joseph E. Deweese[2,3], Patrick L. Kent[4], Jeffery J. Rice[4], Xiaohua Jiang[1*], Edward C. Lisic[1*]

[1]Department of Chemistry, Tennessee Technological University, Cookeville, TN, USA
[2]Department of Pharmaceutical Sciences, Lipscomb University, Nashville, TN, USA
[3]Department of Biochemistry, Vanderbilt University, Nashville, TN, USA
[4]Department of Chemical Engineering, Tennessee Technological University, Cookeville, TN, USA
Email: edlisic@tntech.edu, xjiang@tntech.edu

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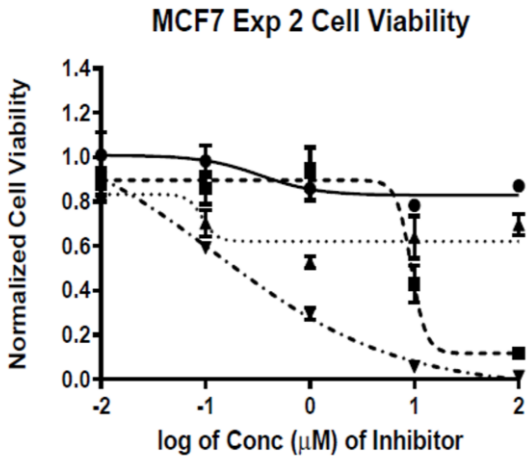
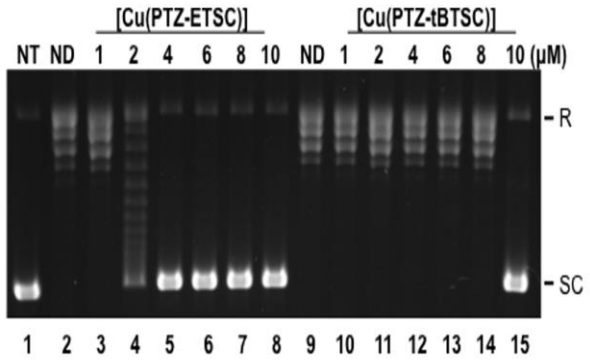
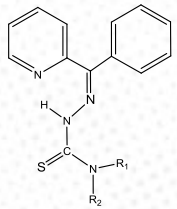
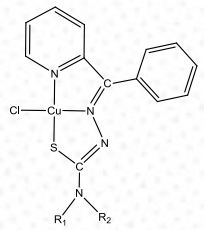








Ligand	R_1	R_2	Copper Complex
BZP-MTSC=	H	methyl	[Cu(BZP-MTSC)Cl]
BZP-ETSC=	H	ethyl	[Cu(BZP-ETSC)Cl]
BZP-tBTSC=	H	tert-butyl	[Cu(BZP-tBTSC)Cl]
BZP-BzTSC=	H	benzyl	[Cu(BZP-BzTSC)Cl]
BZP-PTSC=	H	phenyl	[Cu(BZP-PTSC)Cl]
BZP-dMTSC=	methyl	methyl	[Cu(BZP-dMTSC)Cl]

TENNESSEE TECH UNIVERSITY

Virtual Reality Marketing & Education

Implementing emerging business technologies to assist organizations in marketing critical public policy challenges like environmental stewardship and public safety.

Research Interest Areas

- **Virtual Reality in Education**
- **Opening Minds to Advanced Manufacturing**
- **Traffic Safety Education**
- **Marketing for Public Policy**
- **Conservation Education**

Kevin Liska

Ongoing Research Projects

- Oculus Rift project with TN Aquarium
- Virtual reality education in areas of climate change, water conservation, traffic safety, and fire safety.
- App development for student advising
- MakerMinded.org – ReduceTnCrashes.org

TENNESSEE TECH UNIVERSITY

Best Practices in Literacy Instruction: Increasing Preservice and Inservice Teachers' Pedagogical Knowledge

Exploring research-based, best practices in literacy instruction and disseminating this information to inservice and preservice teachers

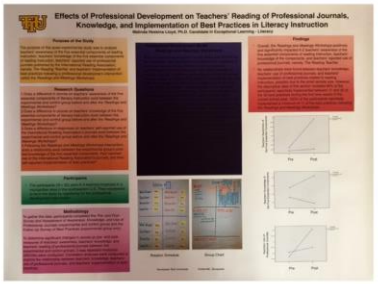
Mindy Lloyd, Ph.D.
Curriculum & Instruction
Mlloyd@tntech.edu

Research/Innovation/Creative Interest Areas

- Research-Based Best Practices in Literacy Instruction
- Transformations in Teacher Education
- Comparison of International Education Systems and Teacher Preparation Programs

Ongoing Projects

- The Value of Pedagogy in a Global Society: A Comparison of Undergraduate Teacher Education Programs Including Ivy League and TTU's 2+2
- Comparison of Teacher Education Programs from the Early 20th Century to Today
- Common Teacher Practices in Exemplary Schools
- Genevieve Anderson Hoyt: Impact and Analysis of a Life in Reading and Social Studies
- Analysis of Levels of Student Engagement in the College of Engineering: Collaboration with the College of Education



Implications of Translational Neuroscience on Counseling, Addictions, & Implicit Bias

Understanding how the neurobiological underpinnings of addiction, implicit bias, and other mental and social health issues can inform interventions.

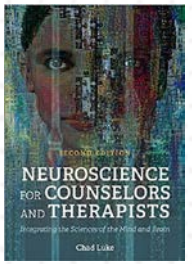
Research/Innovation/Creative Interest Areas

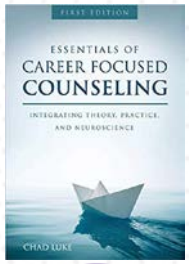
- RI1 Integrating Neuroscience into Counseling
- RI2 Career Development of College Students
- RI3 Translational Neuroscience of Addiction and In-Group Bias
- RI4 Clinical Supervision for Inappropriate Client Sexualized Behaviors

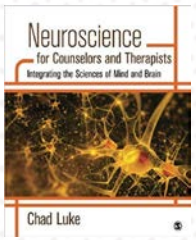
Ongoing Projects

- RP1 *TTU Learning Village Wellness and Resilience Project*
- RP2 *Ethical Concerns with the Integration of Neuroscience in Counseling*
- RP3 From microaggressions to neural-aggressions: A neuro-informed counseling perspective
- RP4 *Addiction, stress, and relational disorder: A neuro-informed approach to intervention*

cluke@tntech.edu







International Financial Instruments and their effects on Income Distributions in Developing Nations

Exploring the effects of IMF, FDI, and sovereign credit loans on monetary and fiscal policies in the global south.

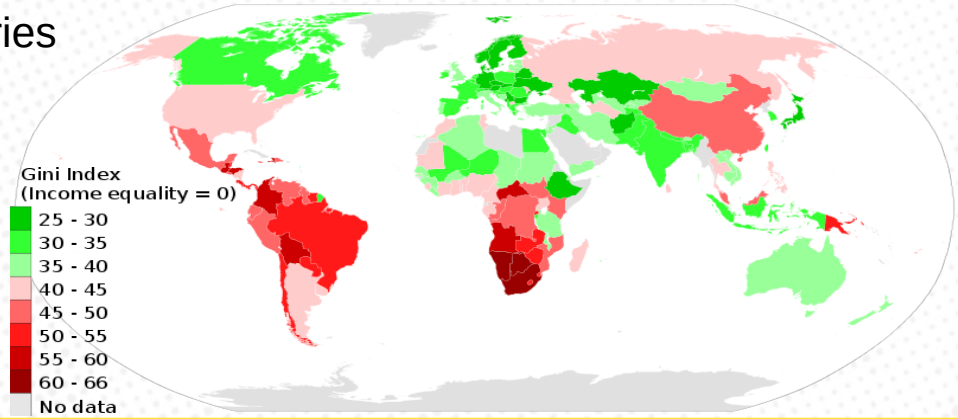
Research/Innovation/Creative Interest Areas

- **Globalizations effect on income distributions in dependent countries**
- **The uneven application of global financial instraments**
- **The effects of 'Washington Consensus' policies on developing economies**

Ronald J.McGauvran
Sociology and Political Science
rmcgauvran@tntech.edu

Ongoing Projects

- Examining the effects of sovereign bonds ratings and economic policies in less developed countries.
- Linking the policy responses to debt forgiveness grants to inequality in less developed countries
- Understanding the policy linkages between IMF loan conditionality and poverty in the global south
- Exploring the economic factors that influence IMF loan conditionality



Self-care in Chronic Illness and Health Policy

Research focus on: Appalachian populations; preventative care; self-care management of chronic illness; underserved populations; health policy; innovation in education

Research/Innovation/Creative Interest Areas

- **Co-Development of Education Rubric (SIM-PLE) for Simulation**
- **Self-Care in Chronic Illness for Heart Failure Patients**
- **Travel/Study Abroad with Nursing to Underserved Populations (Belize)**
- **Health Policy specifically for SDH and Illness prevention**

Ongoing Projects

- Rural Appalachian Primary Care Outreach
- Collaboration with Graphic Design for creative teaching
- “SIM-PLE” Rubric ongoing development and testing
- Promotion of Self-Efficacy in Nursing students
- Motivational Interviewing and Self-Care in Chronic Illness

Jennifer L. Mabry, PhD, FNP-BC, RN
jmabry@tntech.edu
Whitson-Hester School of Nursing
Associate Professor

Vehicle to Grid (V2G) Energy Transfer and Advanced Sensors

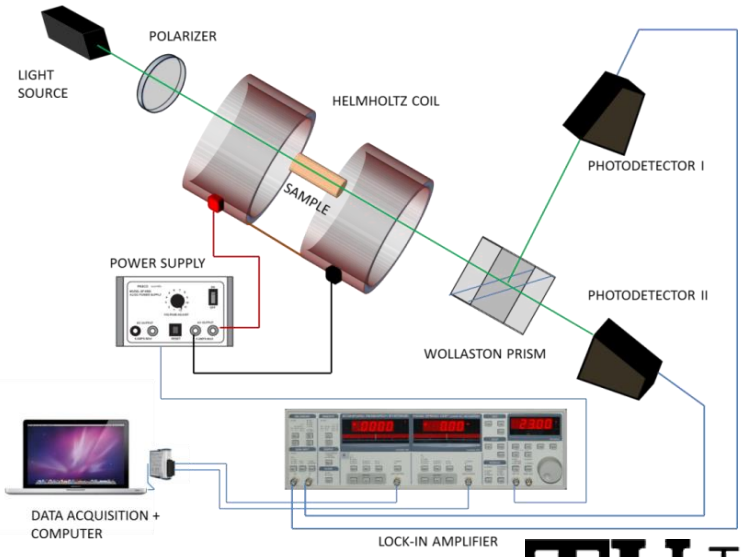
Satish M. Mahajan
Director, Center for Energy Systems Research (CESR)

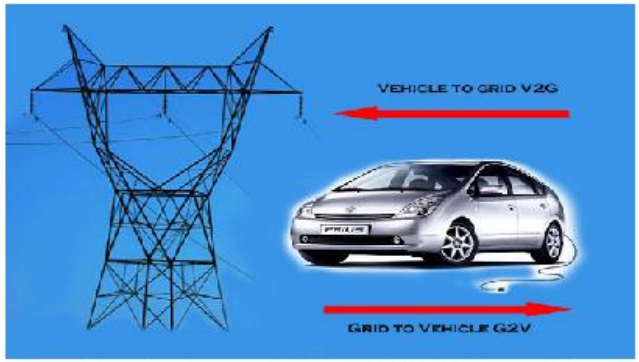
Research Interest Areas

- Integration of Renewables in the Smart Electric Grid
- Advanced Sensors with Real Time Reporting Capabilities
- Solar Charging Stations for Electric Vehicles

Ongoing Research Projects

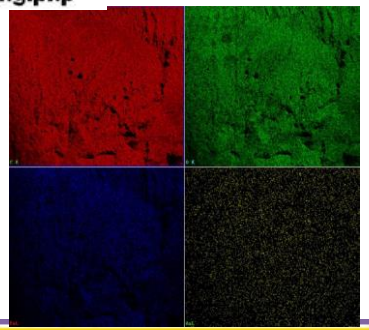
- Vehicle to Grid (V2G) Energy Integration
- High Resolution Magneto-optic and Fiber-optic sensors
- Wind Emulator using DC machines





Source: http://dvice.com/archives/2008/11/7-promising.php

Figure: ESEM of Fe_2O_3:Au PMMA sample magnified 100X.
(a) top left, carbon K energy (b) top right, oxygen K energy (c) bottom left, iron L energy line (d) bottom right, gold L energy line .....



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Secure and Privacy Preserving Communications for Vehicular Ad Hoc networks and Electric Vehicles

Designing secure and privacy preserving protocols

Mohamed Mahmoud

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http://www.cae.tntech.edu/~mmahmoud/

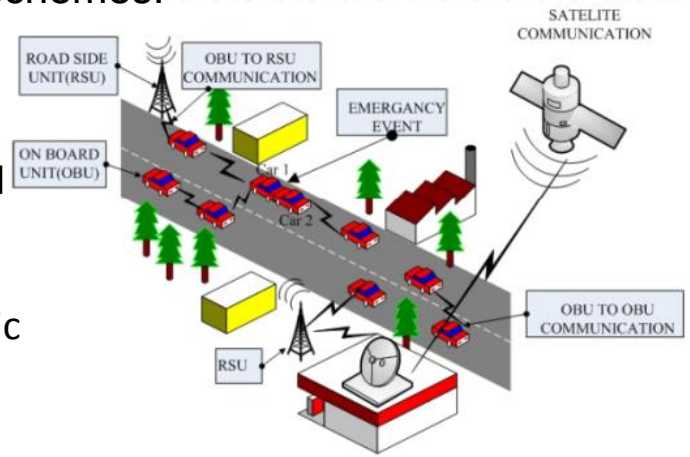
Research Interest Areas

- Security & Privacy in Smart Grid, Vehicular Ad Hoc Network (VANET), Wireless Sensor Network (WSN), LTE-A, Mobile social networks, and eHealth care System.
- Traffic management in VANETs.
- Electric vehicles to grid communications.
- Optimal and privacy preserving electric vehicles' charging schemes.

Research Projects

- iRoad: Internet of Radio-equipped On-road and Vehicles-carried Agile Devices

- Towards Privacy-Preserving Vehicular CPS for Large-Scale Electric Vehicle Charging
- Secure and Privacy-preserving Vehicle-to-Grid Communications via AMI Networks



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Perceptions and Practices of Early Childhood Educators and Pre-Service Teachers

Understand how early childhood educators perceive the influence of their beliefs on their classroom practices in order to prepare future educators to implement developmentally appropriate practices that support all children

Research/Innovation/Creative Interest Areas

- Teacher's Religious and Personal Beliefs and Their Understanding of Tolerance and Values
- Teachers' and Parents' Perceptions on Discipline
- Nature Experiences in Children's Everyday Lives
- Creative Representation in Qualitative Research

Rebekah C. Marcum
Curriculum & Instruction
Rmarcum@tntech.edu

Ongoing Projects

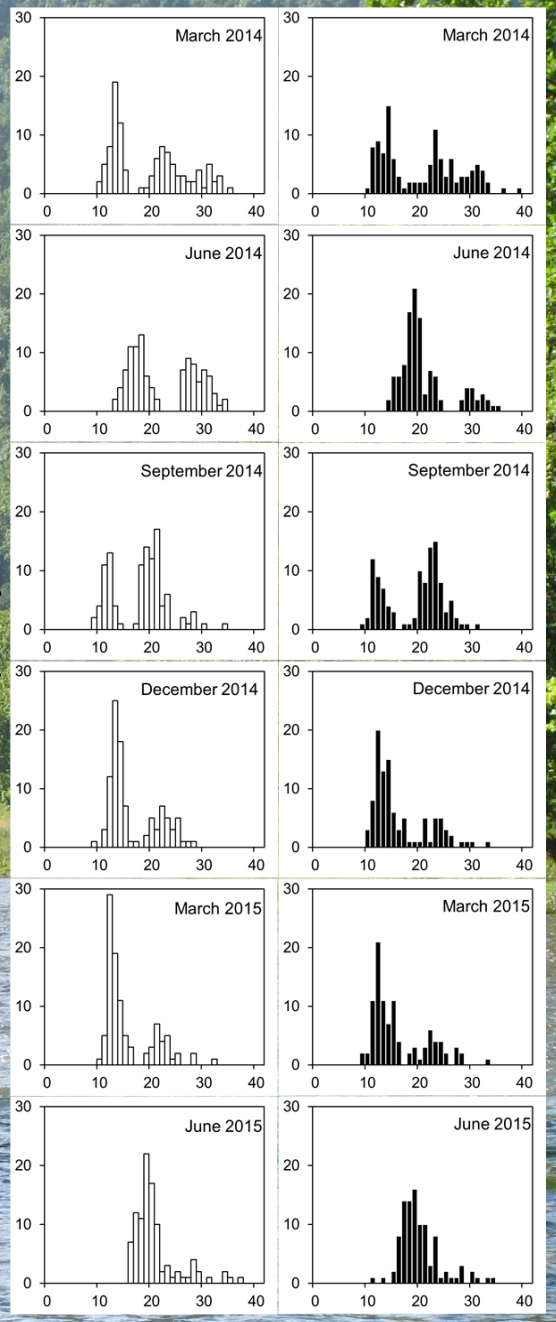
- Develop understanding of religious faith and early childhood educators' classroom practices
- Understanding pre-service teacher's perceptions of the influence of personal beliefs on classroom practices
- Rethinking discipline in a "spare-the-rod" culture
- Combining technology and nature experiences with young children

Hayden Mattingly

Department of Biology
hmattingly@tntech.edu

Research Areas:

- Environmental DNA detection of rare species
- Threat assessments for endangered species at multiple spatial scales
- Life history and ecology of fish and crayfish



Music

Terezin was a holding camp during World War II. In this camp, prisoners were allowed to pursue their artistic interests. Composer Victor Ullmann was incarcerated in this camp. My research is on the camp, the prisoners' artistic endeavors, and the music of Victor Ullmann.

Research/Innovation/Creative Interest Areas

- **RI1: Music of Terezin**
- **RI2: Viktor Ullmann**
- **RI3: Vocal Literature**
- **RI4: Viola**

Ongoing Projects

- RP1: Music of Terezin

Dr. Wendy Mullen
Director,
School of Music
wmullen@tntech.edu

Aquatic Ecology and Biogeochemistry Research

Understanding the structure and function of streams, lakes, and wetlands to improve health and maximize ecosystem services

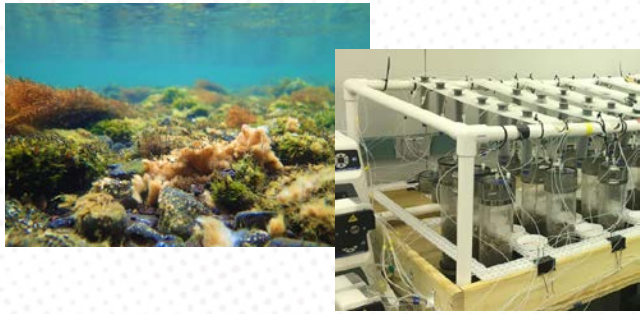
Justin Murdock, Biology
jmurdock@tntech.edu

Research/Innovation/Creative Interest Areas

- **Nutrient cycling in aquatic ecosystems**
- **Linking biodiversity to ecosystem services**
- **Reducing agriculture's impact on the enviroment**
- **Algal ecology**

Ongoing Projects

- Nutrient sequestration potential of floodplain wetlands in agricultural watersheds
- Understanding harmful algal bloom formation and toxin production
- The ecology and management of the invasive alga *Didymosphenia geminata*
- Toxin transfer pathways from streams to terrestrial consumers
- The distribution and ecological importance of microplastics in streams



Spanish Second Language Acquisition and World Languages Teacher Education Research

Understanding the psychocognitive development of Spanish as a second language and the impact of teaching practices on second language acquisition

Research/Innovation/Creative Interest Areas

- Acquisition of Spanish Phonology
- Second Language Attrition
- Spanish Dialectal Variation
- Acquisition of Spanish Object Pronouns
- Instructor Input in World Language Classes
- Standardized Testing for World Languages Teacher Candidates

Ongoing Projects

- Understanding the effects of Animacy on the second language acquisition of Spanish object pronouns in native English speakers and Spanish heritage speakers.
- Development of a “Teacher-Talk” corpus of Spanish language courses for analyzing how instructor input impacts second language acquisition of students.
- Understanding the impacts of the edTPA on world languages teacher candidates during their residency/student teaching experiences.

Michael K. Olsen
Foreign Languages
molsen@tntech.edu

Venkat Padmanabhan, Ph.D.

Understanding the behavior of Soft and Active Matter

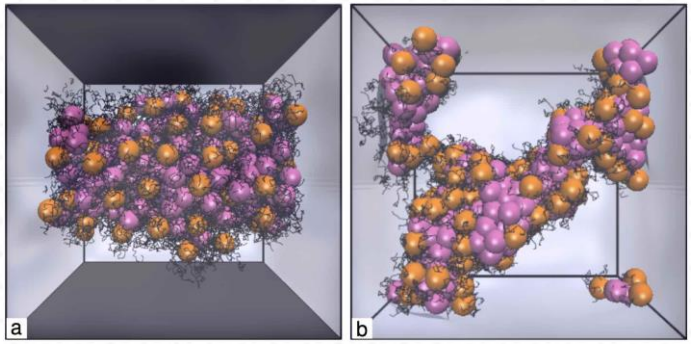
Research Interest Areas

- Self-assembly and phase behavior of nanoparticles in polymer
- Donor-acceptor morphology in polymer-based solar cells
- Carbon-based materials for hydrogen storage
- Structure-property relationship in polymer membranes
- Behavior and bio-mechanics of the nematode, *C. elegans*

Venkat Padmanabhan
Chemical Engineering
vpadmanabhan@tntech.edu

Past Projects (as PI at IIT Kharagpur)

- Self-assembly in polymer nanocomposites
- Morphology of model P3HT-PCBM composites
- Hydrogen storage in single-walled carbon nanotubes
- Locomotion and chemotaxis of C. elegans in complex media



Sports Nutrition Research

Developing education programs, models, and survey instruments to improve nutrition behaviors and outcomes in collegiate student-athletes

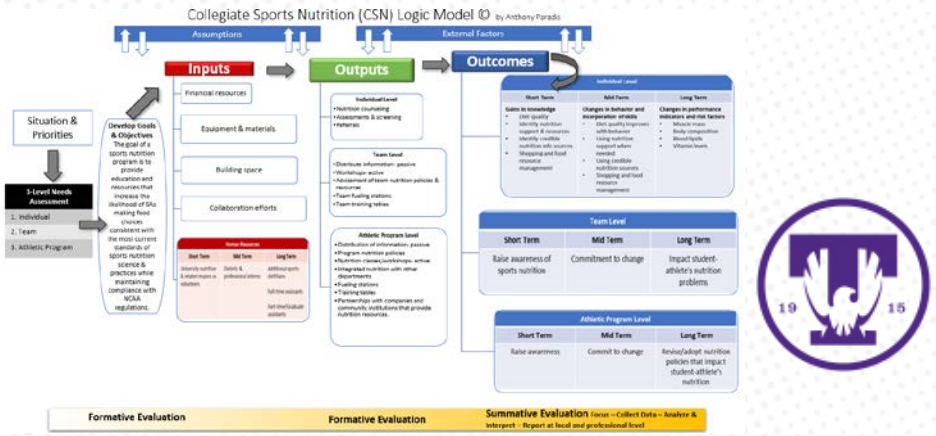
Research/Innovation/Creative Interest Areas

- Nutrition considerations of long-distance backpacking treks
- Food insecurity among student-athletes
- Nutrition education interventions for student-athletes
- Logic model for a collegiate sports nutrition program

Anthony Paradis
Human Ecology
aparadis@tntech.edu

Ongoing Projects

- Development & testing of an online nutrition class to improve nutrition knowledge and habits among student-athletes
- Development of a collegiate sports nutrition logic model



Creative Writing, Innovative Literature, and New Literary Publishing

Creating and Supporting New American Writing in Innovative Traditions as an Author, Critic, and Small Press Legacy Publisher

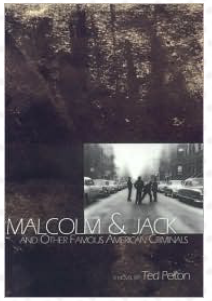
Ted Pelton - English
tpelton@tntech.edu

Research/Innovation/Creative Interest Areas

- **Fiction Writer with More than 50 Magazine Publications**
- **The Beat Generation and its Legacies**
- **Legacy Small Press founder (Starcherone Books, 2000-2015)**
- **Published Novelist**
- **Scholarly Publications in American and African Lit Criticism**

Ongoing Projects

- **Short Fiction** (recently in *BOMB*, *Gargoyle*, and *Western Humanities Review*)
- ***Iris Review*** Advisor
- **Scholar of Teaching** with Creative Inquiry interests
- ***American Book Review*** contributor



High Intensity Exercise on Performance Change and Interventions that Promote Physical Activity

Understanding how HIT is associated with important health and performance benefits, including improved aerobic fitness, insulin sensitivity, blood vessel health, and motivation

Research/Innovation/Creative Interest Areas

- Examining Strength and Physiological Variable Changes in an ECP.
- Christianity and Physical Health.
- Nursing professionals as role models.
- Non-Traditional vs Traditional Weight Training in BIP.

Michael B. Phillips
EXPW
mbphillips@tntech.edu

Ongoing Projects

- Is there a relationship between Religion and Health Behaviors?
- Interventions that promote increased physical activity, fitness, and nutrition.

Professional/Technical Communication and Identity Development, Community Interactions

Researching and developing strategies for more effective academic-to-workplace transitions and interactions with local communities to accomplish social goals

Research/Innovation/Creative Interest Areas

- Effective Team Oral Communication Strategies
- Internships
- Affect and Professional Identity Development
- Rhetoric of Environmental Sustainability

Ongoing Projects

- Students' perceived team roles in oral communication (engineering and business majors) and anticipatory professional identity development
- Incorporating affect into identity development through professional communication internships—intercultural and legal
- Negotiation strategies between the U.S. Army Corps of Engineers and a local community—agency, identity, and social action

Kristin Pickering
English
kpickering@tntech.edu

The Effects of Social Influence on Nurses' Behaviors

Research/Innovation/Creative Interest Areas

- Nurse labor and climate
  - Social Influence
  - Nursing practice
- Infection Control/Sepsis

Ongoing Projects

- Dissertation completion
- Interdisciplinary Projects
- Program Development

Susan Piras
Whitson-Hester School of Nursing
spiras@tntech.edu

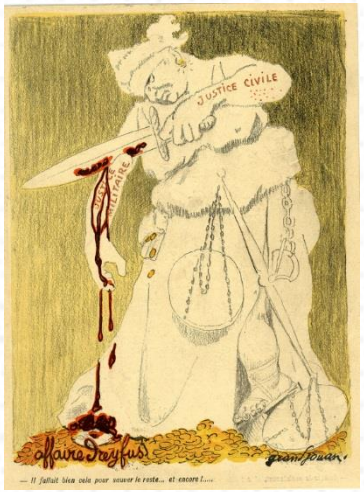
French and European History

Focusing on civil-military relations as a means of studying issues of citizenship, national identity, and the republic as a form of government, with France (1871-1919) as a case study

Research/Innovation/Creative Interest Areas

- **Philosophical discussions of nature, definition and responsibilities of citizenship**
- **Scientific and medical studies regarding the role of education, lifestyle, and biology in determining an individual's competency for citizenship**
- **Societal and military debates regarding the purpose of military service beyond national defense**

Dr. Elizabeth Propes
epropes@tntech.edu



Ongoing Projects

- Sociological and medical debates over whether military service provided a positive influence on national health
- Investigating the contradictions between the rights that citizens have in society and the rights they do or do not have while in military service (military vs. civil justice, for example)
- Studying the relationship between pacifism and national defense. Is there a contradiction between being a citizen and being a pacifist?

Facilitating Secure Software Development with Tools and Practices

Prevent Security Weaknesses and Vulnerabilities in Software by Advancing the Science of Software Security with Data Analytics

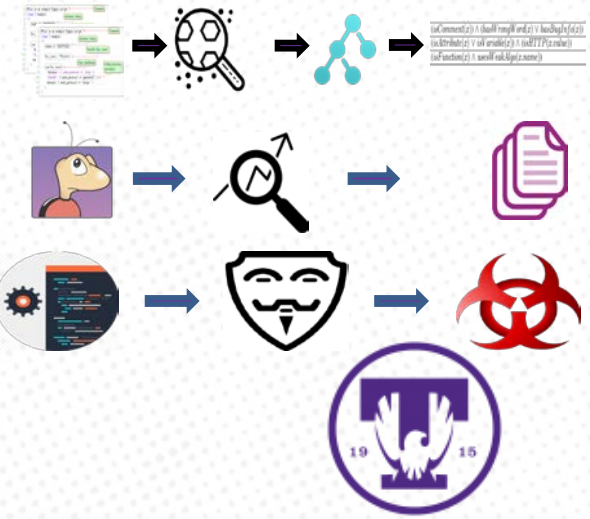
Research/Innovation/Creative Interest Areas

- **DevOps**
- **Scientific Software Devlopment**
- **Software Security**

Department of Computer Science
arahman@tntech.edu

Ongoing Projects

- Security Smells in Infrastructure as Code Scripts
- The Hacker Mindset: Synthesizing Attack Strategies in Open Source Software Development
- Building A Taxonomy for Reported Security Bugs in Scientific Software
- Quantifying the Influence of DevOps Tools on Insecure Coding Pattern Density



Active Defense for Dependable Systems

The vision is to develop automated analytics, both static and dynamic, for secure and dependable management of cyber and cyber-physical systems

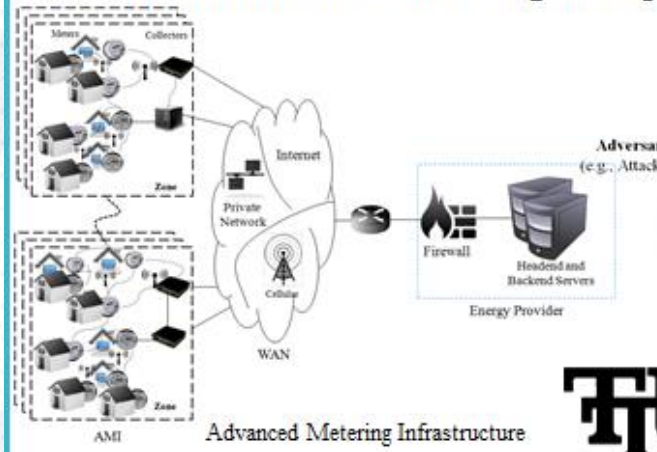
Mohammad Ashiqur Rahman
www.csc.tntech.edu/~marahman/

Research Interest Areas

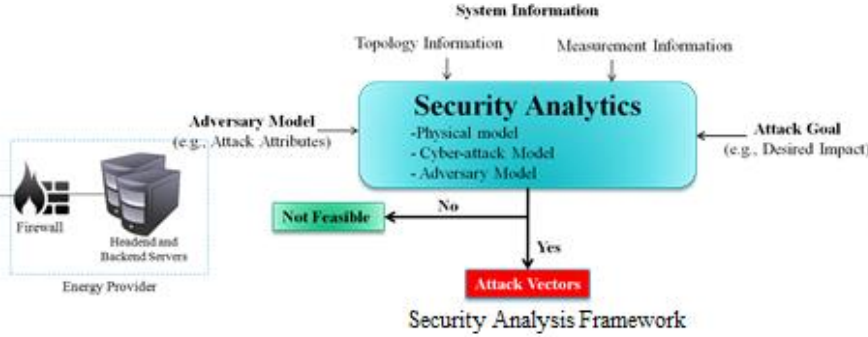
- Network security and information assurance
- Risk analysis, impact assessment, and security hardening
- Secure and dependable resource management
- Distributed and parallel computing

Ongoing Research Projects

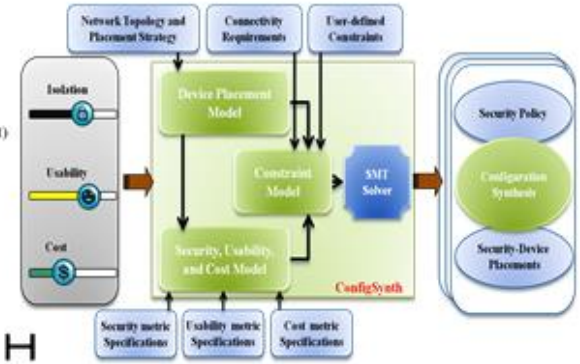
- Formal verification and synthesis of security/resiliency configurations based on security/resiliency requirements for cyber and cyber-physical systems (CPS).
- Dependable resource management for CPS like smart grids and hybrid electric vehicles.
- Game-theoretic modeling for optimal security and resource management.



Advanced Metering Infrastructure



Security Analysis Framework



Security Analysis Tool Design

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Child and Family Sciences

Understanding preventative and mitigating factors that build resilience in families and children to improve educational achievement, economic productivity, responsible citizenship, health, and family relationships.

Research/Innovation/Creative Interest Areas

- **Training and Education of foster parents**
- **Social Health Education in the Public School System**
- **Implementation of Trauma Informed Care in Helping Professions**
- **Mitigation and Prevention of Adverse Childhood Experiences**

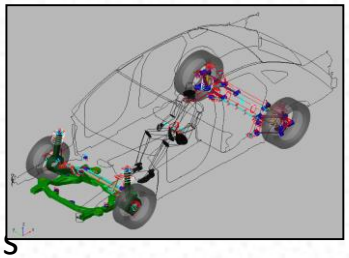
Elizabeth A. Ramsey, PhD, CFLE
Human Ecology
eramsey@tntech.edu

Ongoing Projects

- Training and education of foster parents including foster parents who care for infants with Neonatal Abstinence Syndrome (NAS)
- Discipline and guidance of children who have experienced trauma
- Advocacy Model for Social Health Education in middle school
- Implementation of Trauma Informed Classrooms to build resiliency

Vibrations, Dynamics, and Acoustics of Automotive Systems

Over thirty years of research experience in different areas of vibration, noise control, acoustics, and dynamics with particular applications to automotive, snowmobile, aerospace, construction equipment, and appliance industries.



Mohan D Rao
Professor and Chair of Mechanical Engineering

Research/Innovation Interest Areas

- Multidisciplinary Engineered- Dynamics Systems
- Transportation Noise and Rotating Machinery Analysis
- Dynamics, Vibration, Acoustics, Signal Processing and Controls
- Health Monitoring and Structural Damage Prediction
- Dynamic Characterization of Elastomers, Bushings & Shock Absorbers

Ongoing Research/Innovation Projects

- Powertrain Mount Optimization
- Correlation of Finite Element and Test Models for Thin Metal Structures
- Noise Emission Analysis for Trucks, Excavators and Heavy Machinery
- Non-Destructive Damage Detection Using Vibration Tests
- Industrial and Environmental Noise Emissions and Control
- Modeling and Testing of Engine, Driveline, Intake, Exhaust and other component for optimal NVH performance.
- Baja and Hybrid Baja car Design for Student Competitions

Religiosity and Health Behaviors

Exploring relationships between religiosity and health behaviors to improve quality of life and utilize faith-based organizations to address social determinants of health in underserved populations

Research/Innovation/Creative Interest Areas

- Christianity and Sexual Behaviors
- Health Interventions in Faith-Based Organizations
- Maternal and Child Health, including breastfeeding and early childhood eating patterns
- Christianity and Health Behaviors, including eating patterns and physical activity

Ongoing Projects

- Exploring the relationship between Christianity and health behaviors, including eating patterns and physical activity
- Developing health interventions with faith-based organizations in the local, rural community
- Understanding the role Christianity plays in sexuality and sexual health decision-making

Jessica Richards
Exercise Science, Physical Education, & Wellness
jrichards@tntech.edu

Stephanie J. Richards, PhD
Assistant Professor

Research has centered around student perceptions of violence at school and teacher's perceptions of use of bibliotherapy to reduce bullying in their classrooms

Research/Innovation/Creative Interest Areas

School violence

Readers theatre

Bullying

Poverty

Retention and Recruitment of teachers

Curriculum&Instruction
srichards@tntech.edu

The Biomolecular Medicine Laboratory (The BML)

In the BLM, we utilize a variety of experimental and mathematical approaches towards the development of new therapeutics and diagnostics-based platforms for improved outcomes regarding acquired and inherited diseases of the lungs. The BML is also focused on generating a better understanding of the wound healing process and the development and characterization of new soft gel materials for a variety of applications.

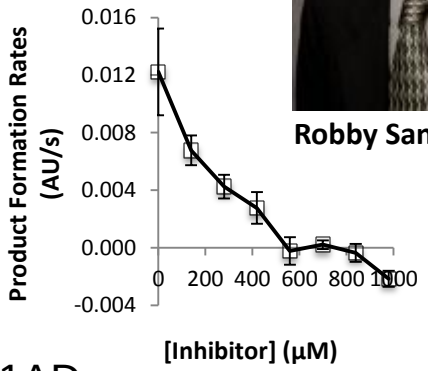
Research (Technical) Interest Areas

- Enzyme Inhibition Kinetics and Assay Development
- Drug Discovery and Delivery
- Wound Healing
- Gene Therapy

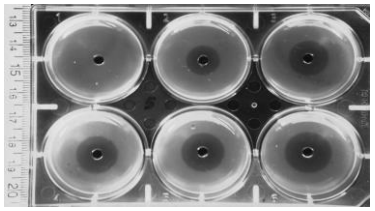
Robby Sanders, PhD

Ongoing Research Projects

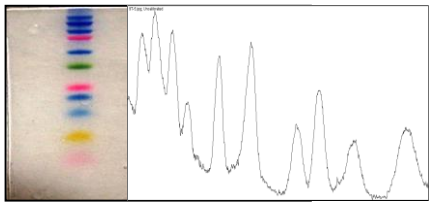
- Development of Low Molecular Weight Inhibitors of Human Neutrophil Elastase for Treatment of Alpha-1 Antitrypsin Deficiency (A1AD)



- Development of New Diagnostic Platforms for Detection of A1AD



- Development of Physical and Mathematical Models of Early Phase Wounds and Facilitated Wound Closure Devices
- Development and Characterization of New Soft Gel Materials for Improved Protein Separations, Drug Delivery, and Endotoxin Testing



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Social Psychology of Self, Identity, & Relationships within an Era of Social Technology

Exploring the structure and dynamics of everyday social life within a technologically saturated social world.

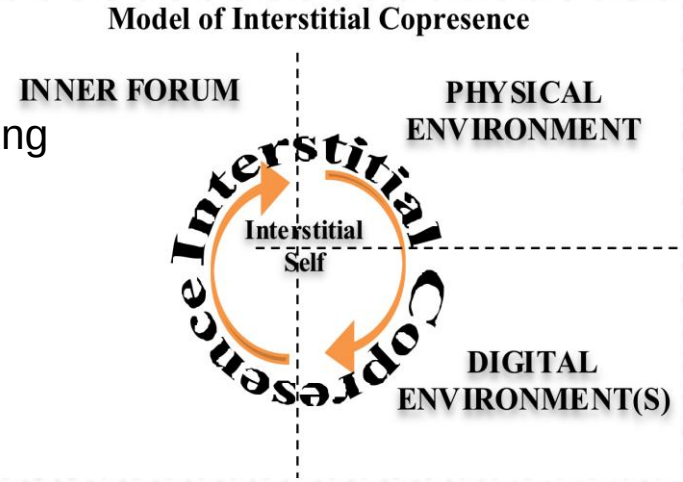
Steven Seiler
Department of Sociology and Political Science
sseiler@tntech.edu

Research/Innovation/Creative Interest Areas

- **Impact of Social Technology on Social Life**
- **Structure & Processes of Selfhood, Identity, & Personal Relationships**
- **Interstitial Copresence via Electronically-Mediated Communication**
- **Social Research Methods & Methodologies**

Ongoing Projects

- Exploring the processes of managing self and personal relationships within perpetual telecopresence.
- Examining social factors increasing the likelihood of texting while driving
- Analyzing dimensions of socially-constructed interstitial copresence



Children in Health Care and Child Life

Learn from children their experiences in health care to inform patient- and family-centered care, foster best pediatric practices, and improve quality of life.

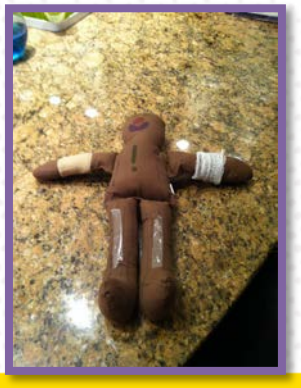
Research/Innovation/Creative Interest Areas

- Children's experiences in health care
- Children with special health care needs and friendship
- Children with disabilities in health care
- Child life specialist psychosocial support and interventions

Ongoing Projects

- Children with Special Healthcare Needs Voices in Healthcare
- Medical Play

Cara Sisk
School of Human Ecology
csisk@tntech.edu



Race and Identity in U.S. History

Examining and illuminating the development and propagation of racialized hierarchies and modes of self and community identification from the colonial period to the present

Troy D. Smith
History
tdsmith@tntech.edu

Research/Innovation/Creative Interest Areas

- Intersections of African American and American Indian contact and identity
- American Indian cultural, political, and legal history
- Racial, regional, and cultural identities in the American South, especially Appalachia
- Racial and ethnic representations in American pop culture

Ongoing Projects

- Examining race and sovereignty in 19th century Indian Territory, especially through the lens of the status of freed slaves and of law enforcement and jurisdictional issues
- Helping develop a virtual reality replica of a colonial Tennessee fort and a Cherokee village at iCube
- Exploring racial/regional identity construction in Appalachia, especially connected to the Civil War
- Exploring racial construction in comic books/graphic novels

Dan Swartling, Chemistry

Medicinal and Green Chemistry

Research Interest Areas

- **Medicinal Chemistry**
- **Green Chemistry**
- **Sustainability**

Dr. Dan Swartling
Chemistry

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Secure Data Container for Data Protection in Transit and at Rest

Providing a privacy-preserving mechanism to protect data in transit and at rest, with capabilities of role-based and attribute-based access control, insider threat detection, integrity guarantees for provenance data and with support of secure decentralized peer-to-peer data communications.

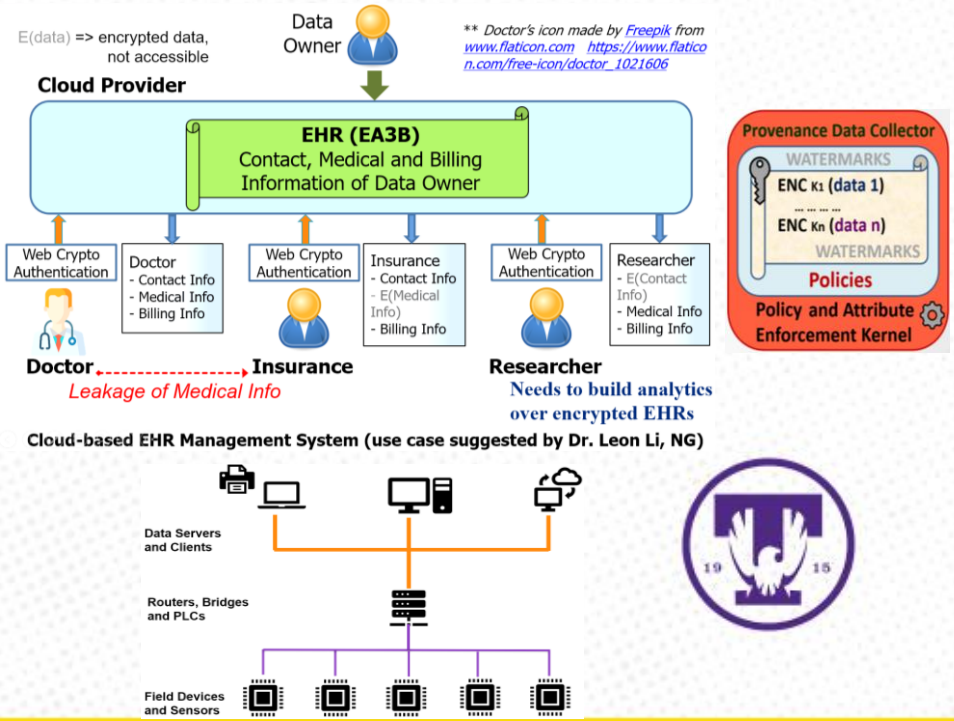
Research/Innovation/Creative Interest Areas

- **Data Privacy and Secure Data Communication**
- **Industrial Control Systems, Smart Grids**
- **Information Retrieval, Data Mining, Machine Learning**
- **Blockchain-based Technologies**

Denis Ulybyshev
Computer Science, CEROC
dulybyshev@tntech.edu

Ongoing Projects

- Secure Electronic Health Records (EHR) Management System
- Secure Data Communication and Sensor Data Anomaly Detection in Industrial Control Systems
- Secure Data Communications in Wireless Power Transfer Systems
- Secure Data Communication in Vehicle-to-Everything Systems
- Machine Learning-based Crack Detection in Metals and Composites



Emotional Labor in Social Media Practices and Family and Consumer Sciences Leadership Research

Exploring the ways leadership affects the family and consumer sciences field, in addition to exploring the function of emotional labor in regard to social media use by entry-level professionals, with the goal of improving education in these areas.

Research/Innovation/Creative Interest Areas

- **Effects of emotional labor in creative industries**
- **Intersection of emotional labor and organizational values**
- **Growth and exploration of leadership characteristics**
- **Sustainability, education, and leadership initiatives**
- **Implications of an internship for merchandising majors**

Hannah Upole
Human Ecology
Merchandising & Design
hupole@tntech.edu

Ongoing Projects

- Program development of the internship experience for senior Merchandising & Design majors
- Investigating the link between leadership characteristics and exposure to leadership training among high school seniors planning to major in Family and Consumer Sciences
- Understanding the implications of dis-alignment in organizational values among entry-level professionals in creative industries

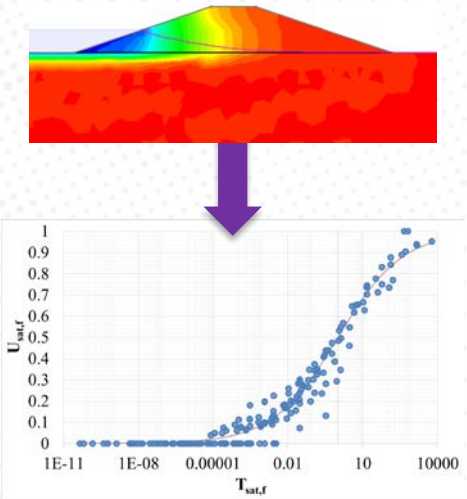
Participating in a strength building activity during Leadership Academy

Resilient and Sustainable Earth Structures

Focusing on improvements to analysis and design methods for earth dams, levees, and embankments – critical components of our nation's aging infrastructure.

Research/Innovation/Creative Interest Areas

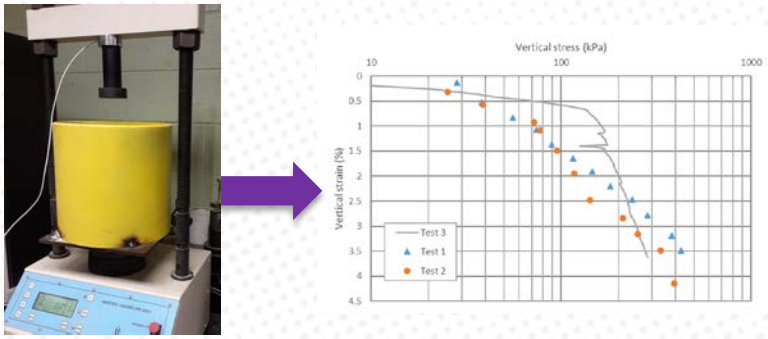
- Rapid drawdown analysis for levees
- Behavior of stiff and compacted clays, especially softening-prone soils
- Fiber optic sensing applications
- Innovative geomaterials
- Geotechnical engineering education



Daniel R. VandenBerge
CEE Department
dvandenberge@tntech.edu

Ongoing Projects

- Revision of US Navy DM 7.01 and DM 7.02
- Compression testing of Foamed Glass Aggregate
- Collaborative Professional Learning – collaboration with TTU College of Education



Stream Fish Ecology

Our research addresses ecologically relevant questions with practical implications for the conservation and management of fishes in Southeastern freshwaters.

Research/Innovation/Creative Interest Areas

- **temporal changes in fish community structure**
- **functional role of migratory freshwater fishes**
- **native fish ecology and conservation**
- **modeling stream fish response to environmental change**

Ongoing Projects

- assessment of aquatic resources at Arnold Air Force Base
- quantifying nutrient inputs from, and ecosystem responses to, fish migrations in Citico Creek
- examining distribution, abundance, and ontogenetic habitat shifts of the striated darter in the Duck River watershed
- using dynamic multistate models to understand stream fish community response to hydrologic variability in the Apalachicola-Chattahoochee-Flint River Basin

Kit Wheeler
Biology
kitwheeler@tntech.edu
www.tntechstreamfishecology.org

Corporate Governance and Management Accounting

Examining issues related to boards of directors and financial managers

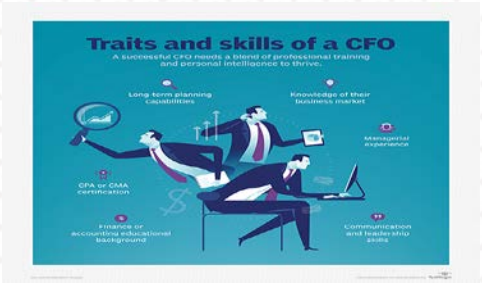
Research/Innovation/Creative Interest Areas

- **Corporate Governance**
- **Audit Committees**
- **Government Accounting**
- **CFO/Corporate Controller Issues**

Ongoing Projects

- **Audit Committee Perceptions of PCAOB Disclosures**
- **The Changing Role of CFOs and Corporate Controllers**
- **Personal and Professional Relationships and Audit Committee Members' Performance**
- **CPAs and Work-Life Balance**

Robert Wilbanks
Accounting
rwilbanks@tntech.edu



Distribution of mineral and energy resources in sedimentary rocks

Understanding modern and ancient sedimentary processes and how they impact geologic development of ores and petroleum systems.

Research/Innovation/Creative Interest Areas

- Sedimentology and Stratigraphy
- Petroleum Exploration and Production, Reservoir Modeling of Channel Systems
- Geophysics, 2D/3D Seismic Analysis
- Mineral and Ore Formation, Migration of Metal-rich Fluids in Sedimentary Rocks

Jeannette Wolak
Dept. Earth Sciences
jwolak@tntech.edu

Ongoing Projects

- Clastic and carbonate rocks of the Mississippian Fort Payne Formation, central Tennessee and Kentucky.
- Magmatic-hydrothermal processes in Precambrian sedimentary rocks of the Idaho Cobalt Belt, Salmon River Mountains, Idaho.
- Paleoshorelines, channel development and ancient sedimentary processes on Mars.

Sphalerite (zinc ore)

US consumers' perceptions of imperfect "ugly" produce

Investigating US consumers' perceptions of imperfect "ugly" produce and their willingness to purchase and consume these foods in their households

Research/Innovation/Creative Interest Areas

- **Food service management**
- **Food Sustainability**
- **Consumer behavior**
- **Small business entrepreneurship**

Sungpo Yi
School of Human Ecology
syi@tntech.edu

Ongoing Projects

- **Development of a community event to improve consumers' perception of imperfect "ugly" produce**

Dr. Matthew Younglove, Assistant Professor of Saxophone

As an academic saxophonist, my creative activity involves the creation and presentation of new music for the saxophone, having an integral role in shaping the future of the saxophone repertoire.

Matthew Younglove
School of Music
myounglove@tntech.edu

Research/Innovation/Creative Interest Areas

- **The Creation of Contemporary Saxophone Solo Music**
- **Saxophone Quartet + Piano**
- **The Saxophone Music of Eric Wubbels**
- ***SPP* by Philippe Leroux, a spectral music composition for soprano saxophone and piano**

Ongoing Projects

- Commission and premiere of new soprano saxophone and piano composition by composer Joel Love
- New commissions and arrangements for saxophone quartet + piano, a new genre and debut album with the Assembly Quartet and pianist I-Chen Yeh
- Journal article dissecting Eric Wubbels *This is this is this is* for alto saxophone(s) and piano
- Presentation of Leroux's *SPP* at the International Saxophone Symposium hosted by US Navy Band in January, 2020.

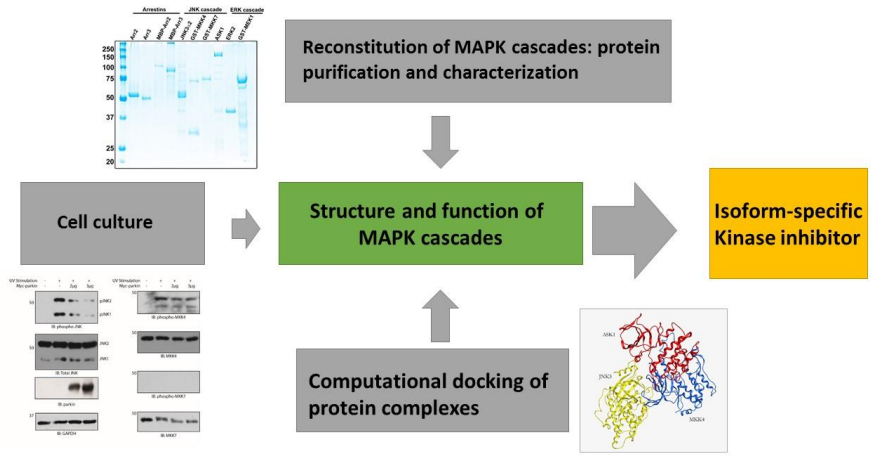
Zhan Group

Protein Science

Research Interest Area

- Catalytic Mechanisms of MAP Kinases;
- Structural basis of MAPK signalosomes;
- Regulation of scaffold protein
- Post-translational modification of protein

Research focuses and expertise of our group



Ongoing Research Proje

- Molecular mechanism of ASK-1 auto-activation
- Structural basis of ASK1-MKK4/7-JNK3 comple
- Isoform-specific inhibitor of JNK3
- Binding induced conformational changes of Arr

Dr. Xuanzhi Zhan
xzhan@tntech.edu

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Structure, Dynamics, and Functional Mechanism of Human β Defensin Type 3

Applying molecular dynamics simulation methods to understand the structure, dynamics and functional mechanism of human β defensin type 3 (hBD-3) interaction with chemokine and cancer receptors

Liqun Zhang
Department of Chemical Engineering
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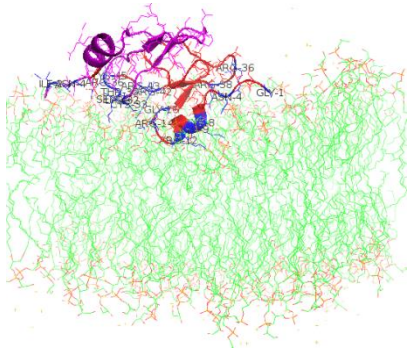
Research Interest Areas

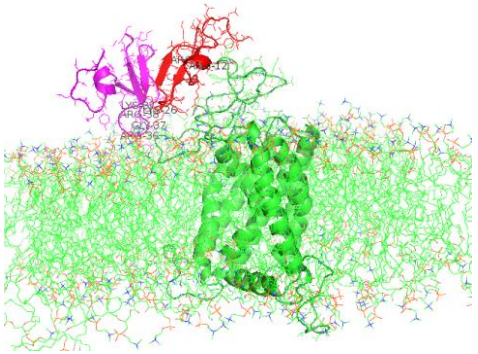
- Protein structure and dynamics
- Protein association and dissociation
- hBD-3 interaction with chemokine and cancer receptors



hBD-3 dimer disrupting lipid bilayer

Ongoing Research Projects

- Oligomerization of hBD-3 at different concentrations, in solvent and around lipid membrane
- Disruption of hBD-3 on cancer cell lipid membrane
- hBD-3 interaction with EphA2 receptor bound with EphrinA1 complex
- Binding of hBD-3 on CCR2b and CXCR4 chemokine receptors



hBD-3 dimer binding with CCR2b receptor

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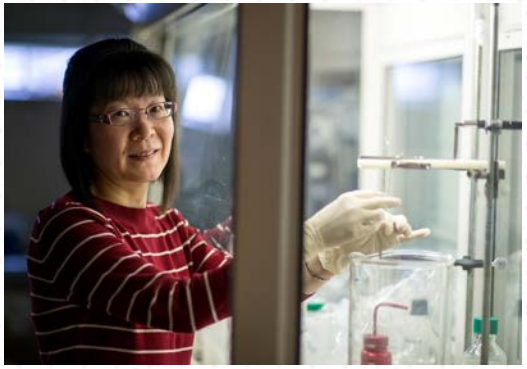
High-Temperature Materials/Coatings

Development of new materials and protective coatings for high-temperature oxidation and corrosion protection

Research/Innovation/Creative Interest Areas

- Manufacturing of novel material/coating systems via vapor deposition and electrolytic processes
- Protective coatings for gas turbine engine and other high temperature applications
- Oxidation/corrosion and erosion



Ying Zhang
Director, Center for Manufacturing Research

Ongoing Projects

- PI, Development of Corrosion- and Erosion-Resistant Coatings for Advanced Ultra-Supercritical Materials, DOE, $1,250,754 Total (DOE Share: $999,999; Cost Share: $250,755), 10/01/2019-03/31/2021.
- PI, High Performance Laboratory-Scale Gas Atomizer for Materials and Coatings Research, Defense University Research Instrumentation Program (DURIP), ONR, $315,000, 06/15/2019-06/14/2020.
- PI, Electro-codeposition of MCrAlY Coatings for Advanced Gas Turbine Applications, AESF Foundation, $75,000, 01/01/2018-12/31/2020.
- PI, Materials Research for DigitalClone Modeling, Private Sector, $19,278, 05/13/2019-11/13/2019.