Teaching
- Ecohydrology (BEE 313)

Research
Focus on understanding the influence of ecosystems on the hydrologic cycle. When, where, and how are plants using water (transpiration) and how is this altering water resource availability?

Thesis Topic Ideas/Opportunities
- Remote Sensing of the hydrologic Cycle
- Geochemical tracers in hydrology
- Evapotranspiration partitioning
- Role of climate variability
- 3D Vegetation modeling

Stephen Good
Assistant Professor
Biological & Ecological Engineering
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Purpose

Addressing climate change requires new tools for observation and management. The OPEnS Lab combines cutting edge technologies and makes them available to the OSU, the USA, and globally. OPEnS will create Maker lab space at OSU and a synergistic forum for environmental sensing technology.

-3D Printers
-Laser/plasma cutters
-CNC routers
-Arduinos/RasPy/etc.
-Available Workspace
-Professional support
-Online repository

Thesis Topic Ideas/Opportunities

- low cost precision agg sensors
- Novel environmental monitoring
- Improve data logging/processing
Teaching

• BEE 472/572 Intro to Food Engg. Principles
• BEE 473/573 Intro to Food Engg. Design
• BEE 585/586 Metabolic Systems Engg.

Research

• Microbial soil nitrification processes, nitrogen cycling
• Microbial N₂O (Greenhouse Gas) production from agricultural and undisturbed soils
• Microbial community dynamics

Skills: Genome scale constraints-based modeling, bioinformatics, biochemistry, microbiology, programming, wet lab

Thesis Topic Ideas/Opportunities

• Build and validate model of nitrifying archaea (*Nitrososphaera viennensis*). Objective: Develop and test hypotheses regarding role in soil nitrification processes
• Integrate models for *Nitrosomonas europaea*, *Nitrobacter winogradskyi* and *Nitrobacter hamburgensis*; design improved processes for fertilizer application. Objective: Develop strategies for reducing agricultural N₂O emissions.
Bioremediation of Chlorinated Solvents and Emerging Contaminants

Biological Conversion of Methane to Liquid Fuels

Biofilm Processes for Wastewater Treatment

Lewis Semprini
School of Chemical, Biological, and Environmental Engineering
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Kinetics of the Cometabolism of 1,4-Dioxane

Immobilizing Cells for the Biological Treatment of Emerging Contaminants

Reactor Studies to Evaluate the Bioremediation of Chlorinated Solvents

Fate and Transport of Chemicals in the Environment

Groundwater Remediation

ENVE Senior Capstone Design
Thesis Topic Areas

- **Software Development**
  - programming educational technology

- **Student Learning**
  - in Virtual Laboratories through student-faculty interactions, model development, etc.
  - in Concept-based Instruction
  - What can we learn from experts?

- **Organizational Change Strategy**
  - What are ways we can get other people to use evidence-based educational innovations?

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Research – Engineering Education

Integrating technology into effective educational practices and promoting the use of higher-level cognitive skills in engineering problem solving.

Milo D. Koretsky
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Teaching
- CHE 417/517 Instrumentation
- CHE 444/544 Thin Films
- CHE 451/551 Solar Energy Technologies
- CHE 541 Catalysis
- CHE/ECE 611 Electronic Materials Processing

Research
The development of sustainable materials with specific functional properties for technologies ranging from devices, catalysts, sensing, and nanodimensional patterning.

Detailed characterization of materials to obtain a better fundamental understanding of structure/property relationships.

Apply materials and processes to commercially relevant applications to promote technology transfer between OSU and industry.

Thesis Topic Ideas/Opportunities
- Transparent field effect in-situ glucose sensing
- Characterization of amorphous thin film catalysts
- Materials for next generation photoresists

Enabling Moore’s Law
Nanostructure Enhanced Sensing

9 nm (~30 atoms)
• Modeling and Simulation (fiber-reinforced composite, polymer, wood)
• Data Field Visualization (fluid and solid mechanics data)
• Image Processing (extract deformation from a sequence of images)
Teaching

ENGR 201(H) : Electrical Fundamentals
ECE599 : Bioelectronic Sys. and Devices

Research

- Biosensors and bioelectronics
- Portable sensor systems
- Micro- and nanofabrication (MEMS, microfluidics)
- Gas sensing, environmental monitoring
- Protein sensing, medical diagnostics

Thesis Topic Ideas/Opportunities

- Low-cost biology and chemistry tools for the developing world
- Wireless sensors for air quality monitoring
- Wearable medical monitoring tools
- Internal sensors for lithium ion batteries
Teaching
ECE 534 Advanced Electric Machines
ECE 438/538 Hybrid Electric Vehicles
ECE 432/532 Electric Machine Controls

Research
- High power/torque density, high efficiency AC electric machines for road vehicles, aircraft, ships.
- System noise, vibration and harness issues caused by electric machine drive components interaction and mitigation methods applying novel machine design and control strategies.
- Circuit, cooling and packaging design of various types of power converters for vehicle systems.

High voltage: kV
High current: kA
High power: MW

Thesis Topic Ideas
- Electric machine resolver aliasing study (Use finite element method)
- Electric machine winding insulation study
- Characterize GaN based power electronics
- Design of experiments for permanent magnet demagnetization study.
Robotics
Oregon State University
http://robotics.oregonstate.edu/

October 9, 2015

Program Director
Kagan Tumer
kagan.tumer@oregonstate.edu

Co-director
Bill Smart
bill.smart@oregonstate.edu
We’re in the Midst of a New “Industrial Revolution”

• Our robots are

  - Cruising the ocean to collect valuable scientific data
  - Allowing people with disabilities to retain their independence
  - Working in the fruit orchards in the Northwest
  - Improving the supply chain of the US Navy
  - Helping prevent injuries in foundries
  - Improving efficiency of air traffic
Oregon State University: Early Lead in Robotics

• 30+ robotics faculty across OSU
  - Mechanical Engineering
  - Computer Science
  - Electrical Engineering
  - Manufacturing Engineering
  - Oceanography

• Third Ph.D. program in robotics in the US
  - First program in the West
  - One of five in the US
  - 180 applications for 15 positions for Fall 2015

  - 10 Undergrads/year for 3 years
OSU Robotics: Undergraduate involvement

• Building things:
  - Jonathan Hurst, legged robotics
  - Ross Hatton, casting robots
  - Ravi Balasubramanian, tendons for hands
  - Yigit Menguc, soft sensors, actuators
  - Cindy Grimm, bat ears for robots

• Robot-human interaction:
  - Cindy Grimm/Bill Smart, privacy and robots
  - Bill Smart, automatic wheel chair control
  - Kagan Tumer, long term space missions

• Exploring of the world:
  - Geoff Hollinger, underwater and aerial
  - Kagan Tumer, many, many robots
Home of OSU Robotics: Graf Hall
Robotics and Human Control Systems
Ravi Balasubramanian

• Research Interests:
  - Robotic Control and Dynamics
  - Human neuro-biomechanics

• Applications:
  - Mobile Robotics
  - Robotic Hands
  - Robotic Manipulation
  - Biomedical implants
Modeling and Human Computer Interfaces
Cindy Grimm

• Research Interests:
  - Shape analysis for biomedical applications
  - Geometric modeling
  - User interfaces

• Applications:
  - How do heart defects form?
  - How does bat ear shape influence sonar function?
  - How do brains develop?
  - 3D Image Segmentation
  - Sketching 3D shapes
Robotics and Applied Mechanics
Ross Hatton

- **Research Interests:**
  - Robotic control and dynamics
  - Applied geometric mechanics
  - Snake robots and full-body locomotion
  - Casting manipulation (free cables and whip-like objects)
  - Spiders and spider webs
  - Vibration

- **Applications:**
  - Locomotion in novel environments
  - Distributed mechanical sensing
  - Micro air vehicle monitoring and interception
  - Biological understanding
Robotic Decision Making Laboratory
Geoff Hollinger

• Research Interests:
  - Robot motion planning
  - Autonomous robots
  - Machine learning
  - Multi-robot systems

• Applications:
  - Inspection and monitoring
  - Aerial and marine robotics
  - Agricultural robotics
  - Ubiquitous sensing
Legged Robotics and Passive Dynamics
Jonathan Hurst

• Research Interests:
  - Legged Locomotion
  - Legged Control Strategies
  - Emphasis on Robot Prototypes
  - Improving Robotic Actuators

• Applications
  - Dynamic running on rugged terrain
  - Agile field robots
  - Human-assistive “co-robots”
  - Prosthetics
Biologically-Inspired and Soft Robotics
Yiğit Mengüç

• Research Interests:
  - Soft sensors and actuators
  - Gecko-inspired adhesion
  - Wearable soft robotics
  - 3D printing
  - Laser micromachining
  - Material selection in robot design

• Applications:
  - Smart clothing
  - Robotic fabric and rubber prostheses/orthoses
  - Wall-climbing search and rescue robotics
  - Pressure-resistant deep sea robotics
Research Interests:
- Human-robot interaction
- Long-term robot autonomy
- Shared-autonomy human-robot systems
- Open-source software architectures for robotics
- Robots in the theatre
- Machine learning for the control of physical systems
- Advanced user interfaces for robot assistants

Applications:
- Body surrogates for persons with severe motor disabilities
- Robot assistants for industrial tasks
- Biomechanical modeling and optimization
Autonomous Agents and Distributed Intelligence
Kagan Tumer

• Research Interests:
  - Multi-Robot Coordination
  - Autonomous Robots
  - Control of Complex systems
  - Multi-objective Optimization
  - Evolutionary Algorithms

• Applications:
  - Robot navigation
  - Multiple autonomous vehicle coordination
  - Traffic flow optimization
  - UAV traffic management
  - Energy system control
  - Wave energy buoy shape optimization
**David S. Hurwitz**  
Associate Professor  
School of Civil & Construction Engineering  
Director  
OSU Driving & Bicycling Research Lab  
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**Thesis Topic Ideas/Opportunities**

**Traffic Control Devices:**
- *Determine the effectiveness of innovative signs, signals, pavement markings*

**Transportation User Behavior:**
- *Assess glance patterns, perception reaction times, and comprehension of drivers, pedestrians, and cyclists*

**Safety:**
- *Determine the contributing causes of a particular crash type (i.e. right hook crashes at signalized intersections)*

**Engineering Education:**
- *Identify commonly held misconceptions regarding an aspect of transportation engineering (i.e. signalized intersection design)*

**Images:**
- Driving Simulator
- Bicycle Simulator
- Vehicle Trajectory
- Object Rendering
- Eye Tracking in the field and lab
Teaching
- Transportation Engineering
- Transportation System Analysis and Planning
- Traffic Flow Analysis and Control
- Traffic Modeling and Simulation

Research
- The impacts of emerging technologies such as connected vehicle or autonomous vehicle on traffic operation and infrastructure management.
- The Post-disaster Transportation Network Resiliency and Recovery.

Thesis Topic Ideas/Opportunities
- Connected/Automated Vehicles and Their Implications to Future Driving
- Smart Cities and Big Data Initiatives in Transportation
- An Agent-based Modeling and Simulation of Individual or Group Movements in Emergency

Haizhong Wang
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Teaching (this year)

- Statics (ENGR 211)
- Structural Theory II (CE 382)
- Matrix Structural Analysis (CE 585)
- Nonlinear Structural Analysis (CE 537)

Some Current Research

- Simulation of fluid-structure interaction
- Earthquake simulation of highway bridges

Thesis Topic Ideas/Opportunities

- Validate numerical simulation models for tsunami loading on bridges
- Calibrate earthquake simulation models across disparate software packages
- Develop OpenSees/Python educational modules for courses in engineering mechanics and structural analysis
Teaching (this year)
- Seismic design of steel buildings
- Design loads for buildings
- Design of steel structures (intro to design of steel members, connections and systems)

Some Current Research
- Steel slit panel frames for seismic design of steel buildings
- 3D-printed energy dissipation elements and seismic fuses for steel buildings

Thesis Topic
Ideas/Opportunities
- Innovate and optimize steel slit panel geometries for multi-hazard design (e.g., earthquake, windstorm, disproportionate collapse resistance)
- Refine modeling and design tools for steel slit panel frames
- Design 3D-printed energy dissipation elements or seismic fuses for steel buildings
Teaching (this year)
- CE 382 Structural Theory (spring)
- Probabilistic design and analysis of structures
- Performance-based design

Some Current Research
- Computer modeling of building models to multi-hazard loadings (e.g., earthquake, windstorm)
- Design and testing of rocking cross-laminated timber structures
- Design and testing of reinforced concrete columns retrofitted with titanium rebars
- Fiber-reinforced concrete bridge column modeling and testing

Thesis Topic Ideas/Opportunities
- Computer modeling of building models to multi-hazard loadings (e.g., earthquake, windstorm)
- Design and testing of rocking cross-laminated timber structures
- Design and testing of reinforced concrete columns retrofitted with titanium rebars
- Fiber-reinforced concrete bridge column modeling and testing
Teaching
- Introduction to CBEE
- Polymer Science and Engineering
- Transport Phenomena
- UHC Colloquia – Plastics for Poets and Energy IQ

Research
- Anything related to POLYMERS!
- Biomaterials
- Environmental Sustainability
- Engineering Education
- K-12 Outreach

Thesis Topic Ideas/Opportunities
- Plastics Recycling - Building Insulation in Third World Countries and Green Building
- Plastics Recycling – 3D printing filaments
- Equine Synovial Fluid Characterization for treatment of Lameness in Horses (with VetMed)
- Hydrogels for Spinal Disc Replacement
- Biodegradeable agricultural films from waste biomass for organic farming
...or anything that might interest You and Me!

Skip Rochefort
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Teaching

- **CBEE 102: Engineering and Problem Solving Fundamentals**
- **HC 407: Exploring the Magic of Engineering Physics**
- **CHE 525: ChemE Analysis**
- **CHE 514: Fluid Flow**
- **CHE 599: Colloids & Interfaces**

Research

I am a *transport engineer*, who develops both theoretical and experimental methods to study complex fluids, soft solids, miscible fluid interactions, and biological systems. I am interested in multiphase systems and mechanics of materials.

My ultimate goal is to provide detailed insight into the macroscopic characteristics of materials and processes through an in-depth understanding of the fundamental physics found at a molecular level.

Thesis Topic Ideas

- Dilatational interfacial viscosity
- Biofilm characterization
- Magnetic bead microrheology
- Chocolate 3D printer
- Fibrin formation

Travis Walker

**Assistant Professor of CBEE**

**Faculty of Materials Science**

[web.engr.oregonstate.edu/~walkert2](http://web.engr.oregonstate.edu/~walkert2)

[travis.walker@oregonstate.edu](mailto:travis.walker@oregonstate.edu)
Xinhui Zhu
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Dearborn 108
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Thesis Topic Ideas/Opportunities

- Investigate relationships between work-related factors and musculoskeletal injuries/disorders for diverse occupations including surgeons and office workers.
- Evaluate the usability of touch control devices, such as smartphone and laptop.

Research

- Human Factors/Ergonomics in Operating Room
- Work Safety
- Touch Control
- Investigate relationships between work-related factors and musculoskeletal injuries/disorders for diverse occupations including surgeons and office workers.
- Evaluate the usability of touch control devices, such as smartphone and laptop.
Dr. Bryony DuPont  
Assistant Professor  
Mechanical Engineering  
Rogers Hall 216  
bryonydupont.com  
bryony.dupont@oregonstate.edu

Teaching

ME 382  
ME 519  
MIME 101

Research

Computational Optimization & Algorithm Development  
Sustainable Design & Renewable Energy

Thesis Topic Ideas/Opportunities

- Wind Energy Systems  
- Sustainable Products and Systems  
- Sustainable Design Education  
- Computational Sustainable Design Methods  
- Wave Energy Systems  
- Sustainable Design & Renewable Energy

Computational Optimization & Algorithm Development  
Sustainable Design & Renewable Energy
MFGE 336: Production Engineering
General understanding of the production engineering function within industry and process design.

MFGE 437: Comp. Control of Manu. Process
Automated manufacturing system design and operations.

MFGE 599: Precision Motion Generation
- Dynamics and Controls
- Optimization
- Process Machine Interaction

Design of a Automatic Dynamics Identification Software on Matlab/Dspace

Dynamics and Controls
Self Excited Chatter Vibration
Controlled Force Vibration

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Burak Sencer, Ph.D
Assistant Professor
MIME - Advanced Manufacturing Process Control Laboratory
http://research.engr.oregonstate.edu/mpcl/

Design of a Precision Linear Motor Driven Motion Stage
Milling Cutting Process Simulation Software
Teaching

- MIME 101: Intro. to MIME
- ME 331: Intro. Fluid Mechanics

Research

- Combustion modeling
- Computational fluid dynamics
- High performance computing; graphics processing units

Thesis Topic Ideas/Opportunities

- Reduce chemical model for hydrocarbon fuels
- Simulate turbulent flames
- Simulate fluid-structure interaction
Teaching

Introduction to MIME
Thermal-Fluid Sciences
Humanitarian Engineering

→ Developing an interdisciplinary study Abroad course for this summer

Research

Imagine if the only energy you could access was provided by a three-stone fire...

How do we understand the factors and outcomes that dictate how we can sustainably meet basic energy needs?

Nordica MacCarty
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Thesis Topic Ideas

Modeling...
1. Adoption and usability of energy technologies
2. Performance and cost of technologies such as solar water heaters or lighting
3. Fuel harvest renewability and climate impact

→ Work with other disciplines across the university
Hailei Wang
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Teaching

Hailei Wang
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Research

• ME 383 Mechanical Component Design
• Mentor of ME Capstone Projects

Teaching

• Me 383 Mechanical Component Design
• Mentor of ME Capstone Projects

Waste Heat Recovery --- Combustion Engineers Power Plants, and Data Centers (DOD ICE, DOE Supertruck, Facebook)
• Energy Storage/Conversion --- Alternatives to Batteries to Enable Renewables
• Thermal Management and Engine Emission Technology Enhancement

Thesis Topic Ideas/Opportunities
High Performance, Low Cost and Low Impact Heat Exchangers
• Supercooling for Energy Storage/Desalination
• Boiling Enhancement Using Nanofilms
• Dual Functional Catalytic converters
• Hydrogen Storage for Fuel Cell Vehicles
• Solar thermal and PV interactions
Electronics Thermal Management

Air Cooling is the generally accepted form of cooling high performance computing equipment.

Push for Liquid Immersion Cooling as a disruptive technology in the industry.

What do I get to play with?

High Speed Camera

What can I do for you?
Teaching

Winter 2016:
MATS 581 Thermodynamics of Solids

In planning for 2016/17:
Course(s) on transmission electron microscopy theory and practice

Research

Experimental studies on:
• kinetics of phase transformations
• interface science

Transmission electron microscopy techniques play a key role in the research program for characterizing materials from the nano- to the atomic scale.

Thesis Topic Opportunities

• Crystallization kinetics of phase change materials for memory devices
• Characterization of metal-oxide interfaces related to catalysis

Undergraduate projects may focus on processing or characterization techniques complementary to TEM
College of Engineering and UHC Thesis Mixer

Teaching
- Capstone Design
- Solid Mechanics
- Component Design
- Mechanical Mechanisms

John P. Parmigiani
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Research
Computational (e.g. FEA) modeling, typically with experimental validation, of mechanical and material systems. Design, fabrication, and testing of technically interesting and relevant mechanical devices

Current project topics include chainsaw lubrication and safety, characterization of high-performance adhesives, modeling of carbon fiber panels, and cutting mechanics.

Thesis Topic Ideas/Opportunities
- OFF-GRID WATER SYSTEM: Fairfield Farm is a certified organic farm. Currently, water is provided by an electric pump. When the power is out, there is no access to water. This is an opportunity to create a water system using solar, wind, and perhaps even bicycle power.
- CHAINSAW PERFORMANCE: Participate in the development of improved chainsaws
Teaching

- MATS 321 Intro to Materials Science
- MATS 571 Electronic Properties of Materials
- MATS 671 Electronic Properties of Oxides

Research

- Synthesis and electronic properties of ceramic materials
- Focus on the role of crystal structure and point defects on the dielectric and electromechanical properties

Thesis Topic Ideas/Opportunities

- Ceramic materials with electric-field induced phase transitions: Electric cooling/actuator devices
- Development of new oxygen conductors for use as electrolytes
- Development of new ceramic capacitor materials for high power/high temperature applications
Fall Workshops on:
Who What Where Why:
Summer Research Experiences for Undergraduates (REU) (How to find and apply for REU Programs)

Winter Workshop on
REU essays and personal statements

Alicia Lyman-Holt
Director of Undergraduate Research
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Stop by between 9 am -3 pm or make an appointment