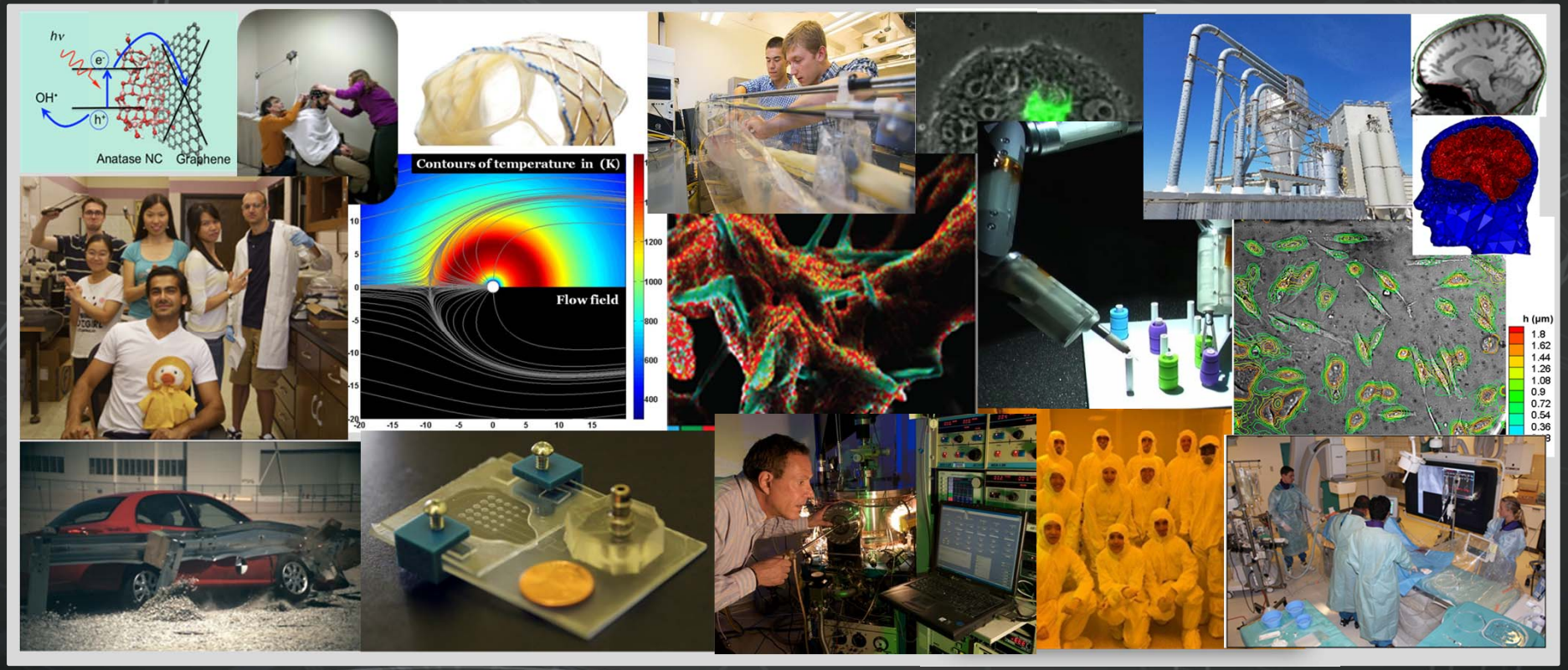
Mechanical and Materials Engineering
University of Nebraska-Lincoln
Jeff Shield, Chair

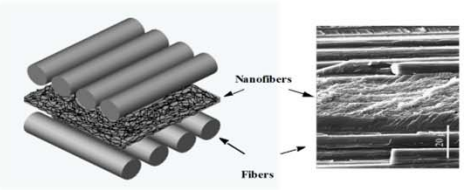


John D. Reid, Associate Chair for Graduate Studies and Research

A Research Program of Excellence

Nebraska Engineering

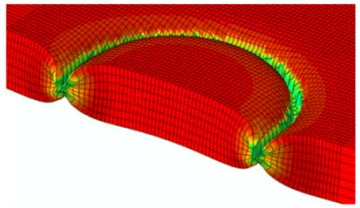
Mechanical and Materials Engineering



Dynamics and Vibration

Solid Mechanics

Fluid Mechanics



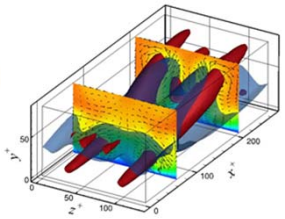
Thermal Sciences

Materials Science

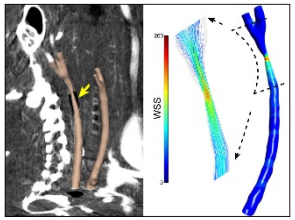
MME

Manufacturing

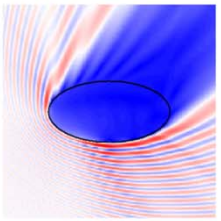
Computational Methods



Biomedical Engineering



Systems, Design, and Controls



Mechanical and Materials Engineering


Shane Farritor

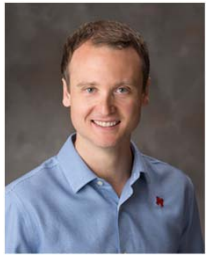

Prahalada Rao


Mehrdad Negahban


Linxia Gu (Area Chair)


Kevin Cole


Tim Wei


Ryan Pedrigi

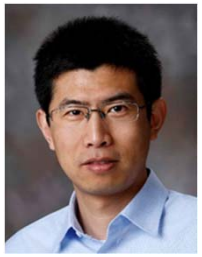

Michael Sealy


Florin Bobaru

Biomedical Engineering


Yuris Dzenis


Joseph Turner


Ruiguo Yang


Eveline Baesu


Jung Yul Lim

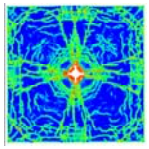

Benjamin Terry


Sangjin Ryu


Ali Tamayol


Carl Nelson

Mechanical and Materials Engineering




William Charlton

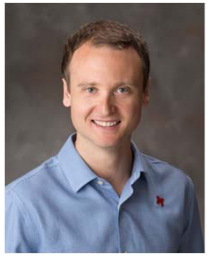

George Gogos


Florin Bobaru (Area Chair)


Jae Sung Park


John Reid


Jian Wang


Ryan Pedrigi

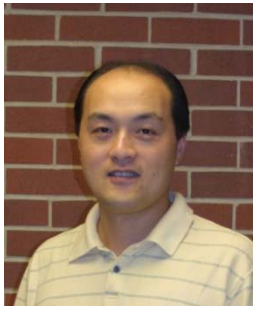
Computational Methods


Kevin Cole


Carl Nelson


Mehrdad Negahban


Linxia Gu

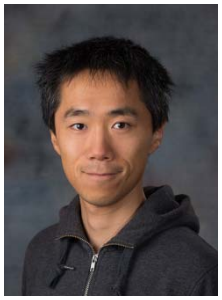

Zhaoyan Zhang


Yuris Dzenis


Ruqiang Feng


Michael Sealy

Mechanical and Materials Engineering

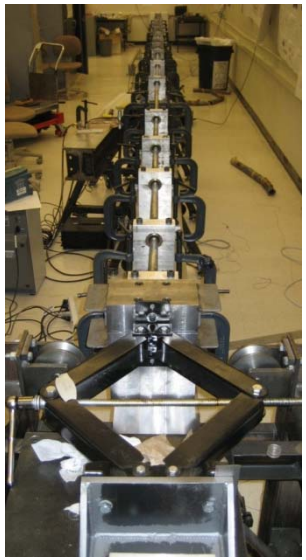


Qin Zhou

Mehrdad Negahban

Joseph Turner (Area Chair)

Cody Stolle



Dynamics and Vibration

John Reid

Carl Nelson

Eveline Baesu

Benjamin Terry

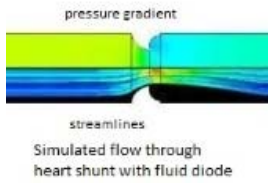
Mechanical and Materials Engineering

Tim Wei

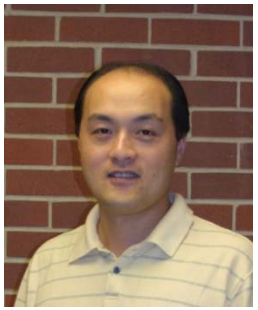
George Gogos

Sangjin Ryu
(Area Chair)

Kevin Cole



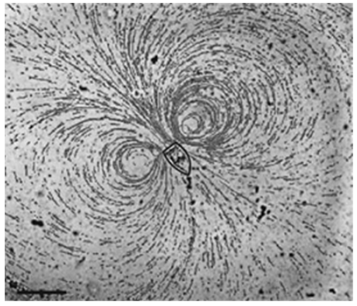
Simulated flow through heart shunt with fluid diode



Zhaoyan Zhang

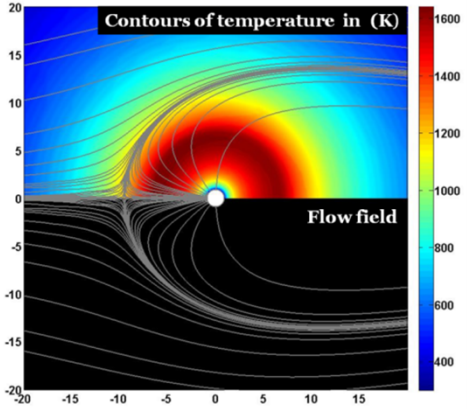
Ali Tamayol

Fluid Mechanics



Yuris Dzenis

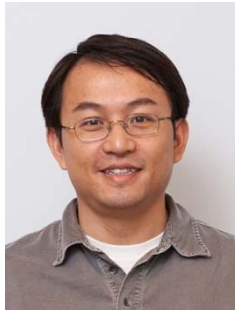
Jae Sung Park



Sidy Ndao

Mechanical and Materials Engineering

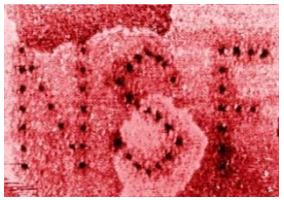
Michael Sealy

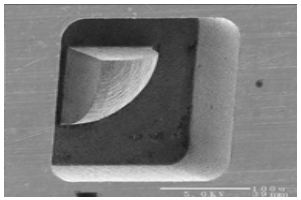


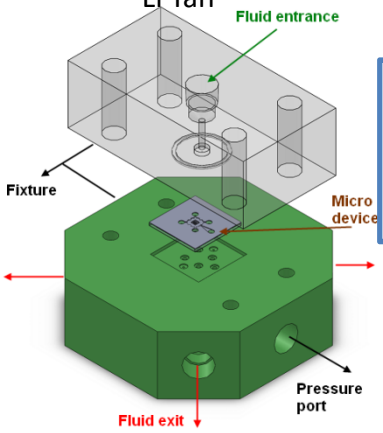
Li Tan

Robert Williams (Area Chair)

Kamlakar Rajurkar

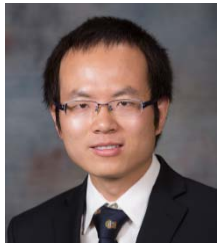






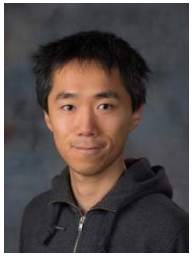
Manufacturing

Yuris Dzenis



Bai Cui

Sidy Ndao



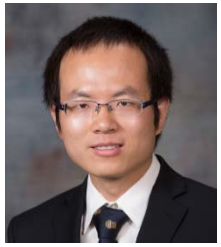
Qin Zhou

Prahalada Rao

Ali Tamayol

Jian Wang

Mechanical and Materials Engineering


Bai Cui


Eli Sutter


Jeff Shield (Area Chair)


Yuris Dzenis

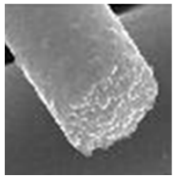

Michael Sealy


Joseph Turner


Florin Bobaru


Mehrdad Negahban

Materials Science

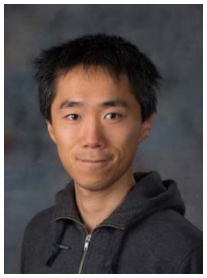



Michael Nastasi


Li Tan


Jung Yul Lim

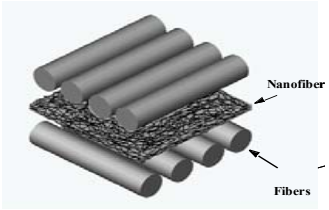

Jian Wang


Qin Zhou


William Charlton


Lucia Fernandez-Ballester

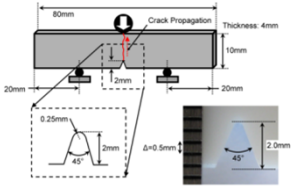
Mechanical and Materials Engineering



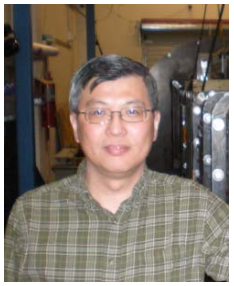
Mehrdad Negahban

Eveline Baesu (Area Chair)

Yuris Dzenis



Joseph Turner



Ruqiang Feng

Jian Wang

Solid Mechanics

Michael Sealy

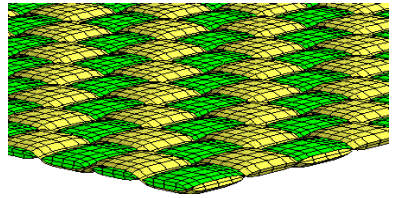
Ryan Pedrigi

Jiashi Yang

Florin Bobaru

Linxia Gu

Benjamin Terry



Mechanical and Materials Engineering


William Charlton


Shane Farritor

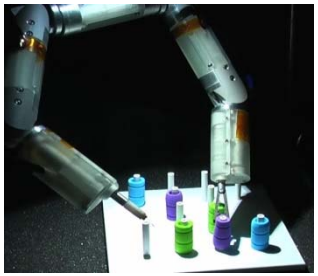

Carl Nelson
(Area Chair)


John Reid


Kamlakar Rajurkar

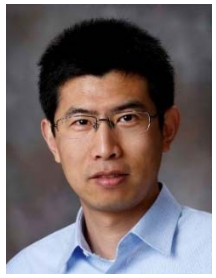

Florin Bobaru

Systems, Design, and Controls



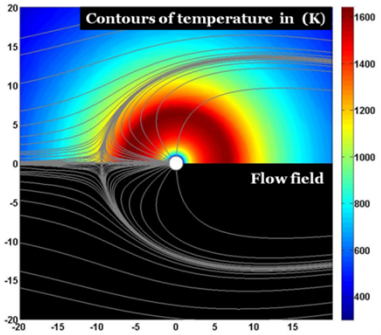

Robert Williams


Benjamin Terry


Ruiguo Yang


Prahalada Rao

Mechanical and Materials Engineering



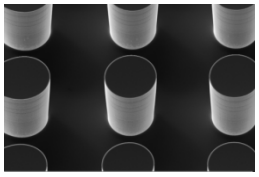
Florin Bobaru

George Gogos (Area Chair)

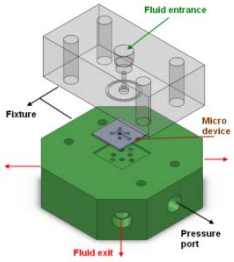
Kevin Cole

Zhaoyan Zhang

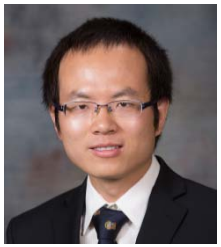
Sangjin Ryu



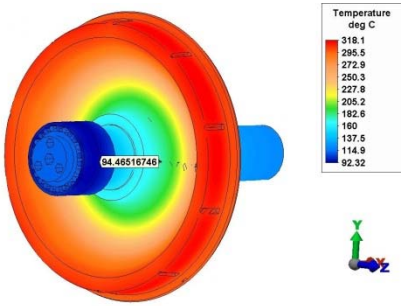
Thermal Sciences



Sidy Ndao



Bai Cui

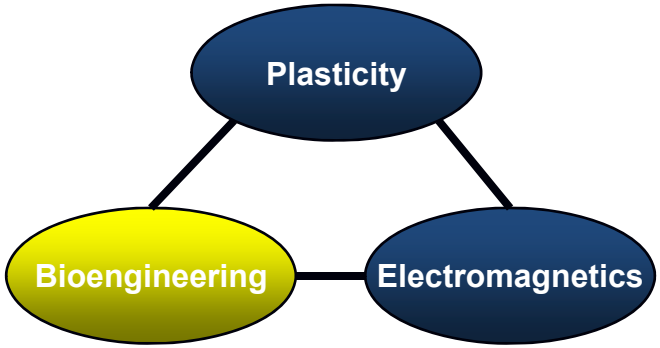


Ali Tamayol

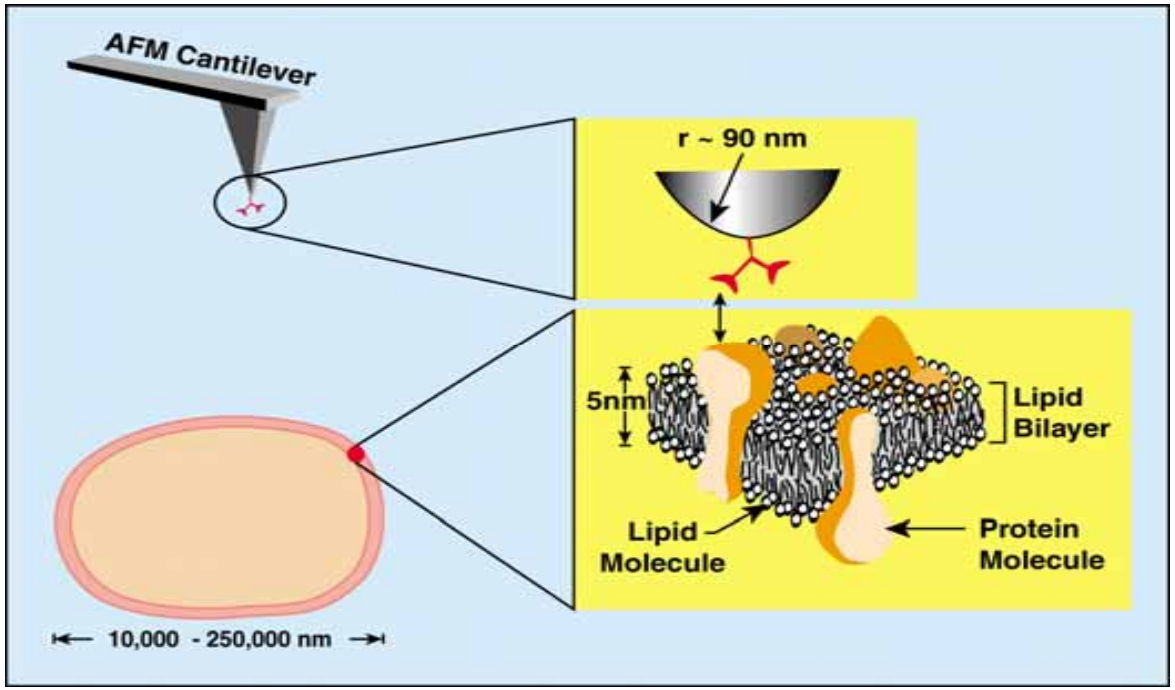
Jae Sung Park

Solid Mechanics

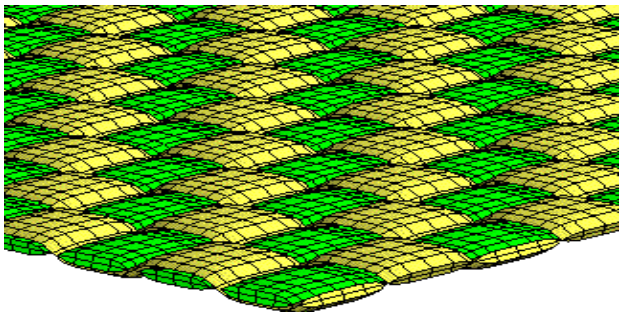
- Electromechanical effects
- Fiber networks
- Biomechanics



Cell mechanics and sensing



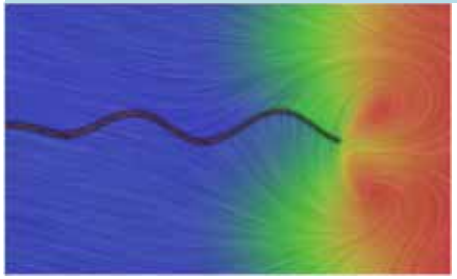
Fiber networks



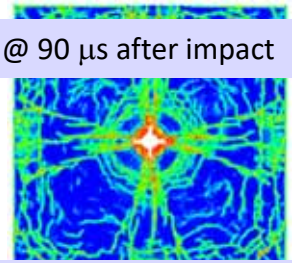
Computational Modeling and Discovery

- Peridynamic (PD) modeling
- Dynamic brittle fracture with PD models
- Corrosion damage and stress corrosion cracking with PD
- Dynamic fracture in fiber-reinforced composites
- PD models of thermomechanical fracture
- Shape and material optimization
- FEM-DEM models for enhanced mixing in granular materials

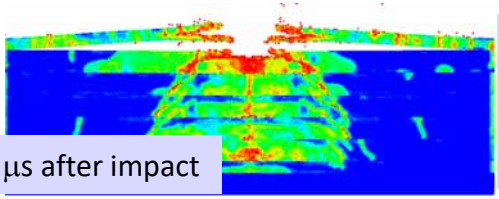
Oscillating crack in glass. Elastic vortices around the crack tip control crack growth



Pitting corrosion with lacy cover and secondary pit formation



@ 90 µs after impact



@ 90 µs after impact

Damage in a multilayered glass target from impact with a projectile at 1000m/s
Above: view of top layer
To the left: view of cross-section

Funding agencies:

AFOSR, ONR, Sandia (DOE)
ARL, ARO, Boeing, NASA

Thermal-fluids: inverse methods; analytical solutions

RECENT PROJECTS

- Flow tests on catheter-deployable growth-adjustable bioprosthetic valve for infant heart-defect repair (with UN Medical School). See Fig. 1.
- Measurement of thermal properties for fiber-epoxy composite tanks (Hexagon Lincoln). See Fig. 2.
- Heat dissipation in railroad wheel bearings (Brenco Bearing). See Fig. 3.
- Design of thermal experiments: for jet-engine exhaust-tube thermal coating (Navy); for vehicle armor (Army).
- Exact Analytical Conduction Toolbox: website of heat transfer solutions (NSF)

Fig. 1. Adjustable-diameter bioprosthetic heart valve

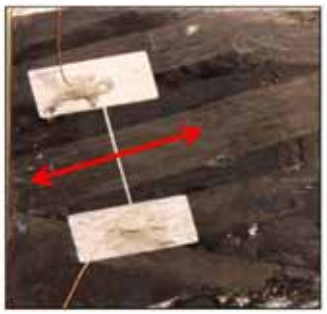


Fig. 2. Platinum sensor on fiber-epoxy pressure vessel for non-destructive thermal property measurement. Arrow shows fiber direction.

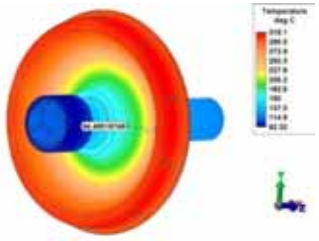


Fig. 3. Temperature in railroad wheel and bearing caused by brake malfunction.

EXACT
EXACT ANALYTICAL CONDUCTION TOOLBOX

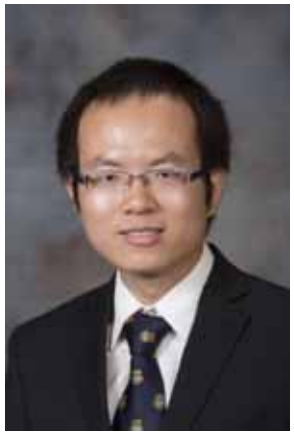
Bai Cui

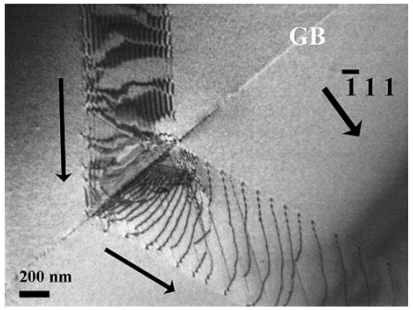
Nebraska Engineering

Materials for Extreme Environments (Me^2) Lab

Research Areas:

- Materials for extreme environments
- Laser processing
- Pulse electric current process
- Corrosion
- Irradiation damage
- In-Situ TEM studies

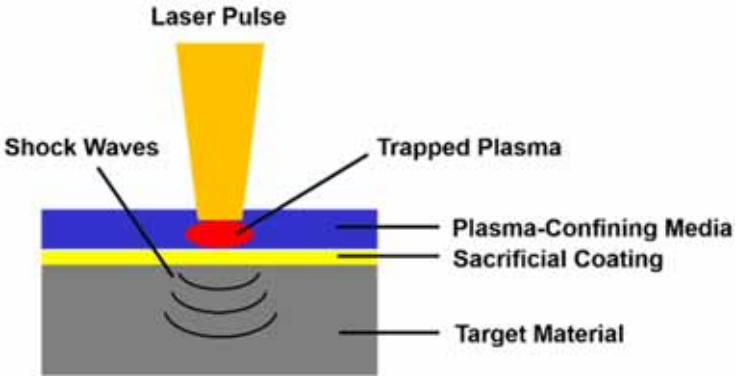




In-situ TEM observation of materials during straining/heating/irradiation

Current Projects:

- NSF: *Mechanisms of toughening structural ceramics by thermal engineered laser shock peening.*
- Petroleum Research Fund: *Controlling stress corrosion cracking of alloys in chloride environments by laser shock peening*



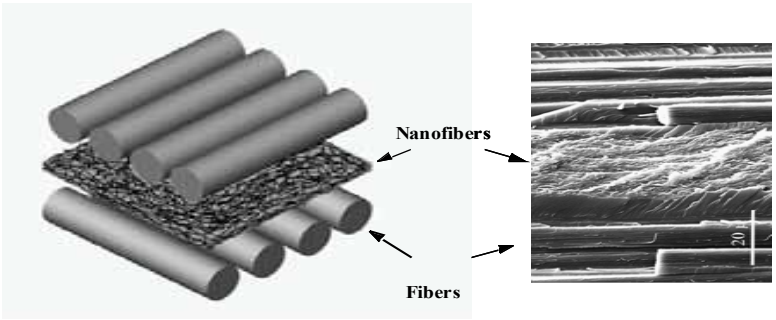
Laser shock peening of the surface of ceramics and metals

PhD/Master research projects are available. Email: bcui3@unl.edu

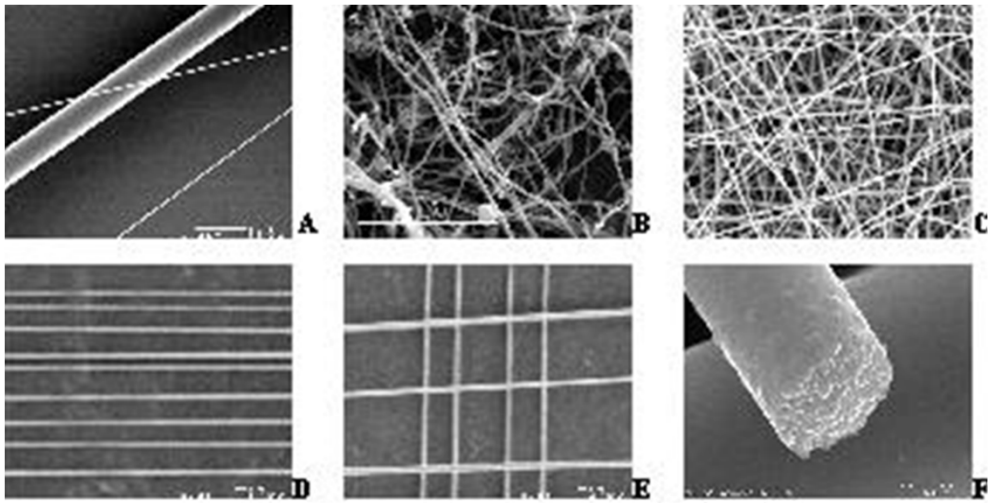
Advanced Functional Nano-materials and Nano-manufacturing

- Nano-fibers
  - Advanced fibers
  - Functional fibers
- Electro-spinning
- Advanced composites
  - Nano-reinforcement of interfaces
- Nondestructive evaluation
- Biomechanics of arteries
- 3-D scaffolds for tissue growth

Nanoreinforcement of Interfaces



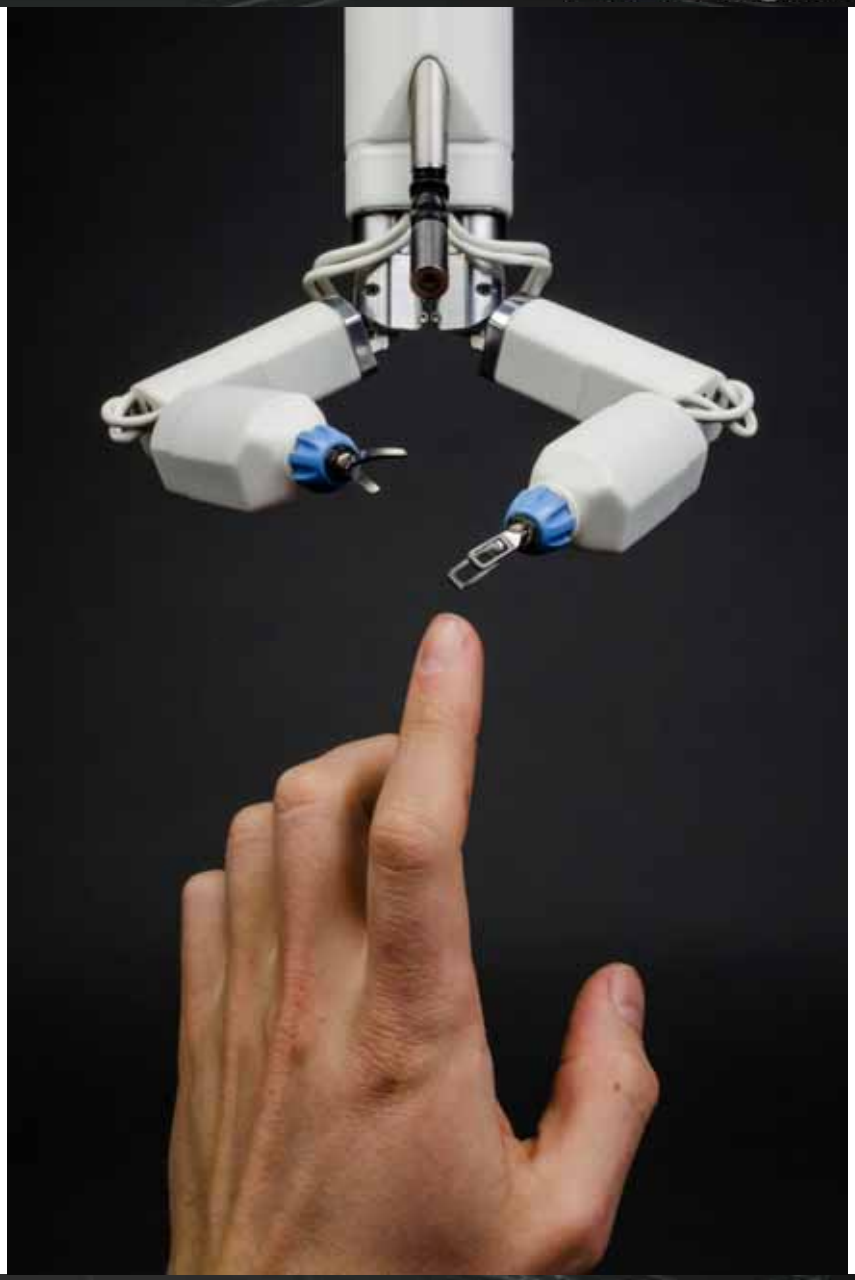
Continuous nanofibers



Shane Farritor

Robotics

- Surgical Robotics
- Robots for space exploration
- Cooperative Robotics
- Mechatronics
- Mechanical Design



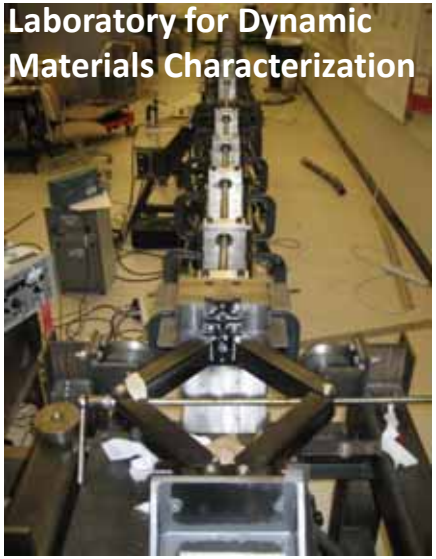
Ruqiang Feng

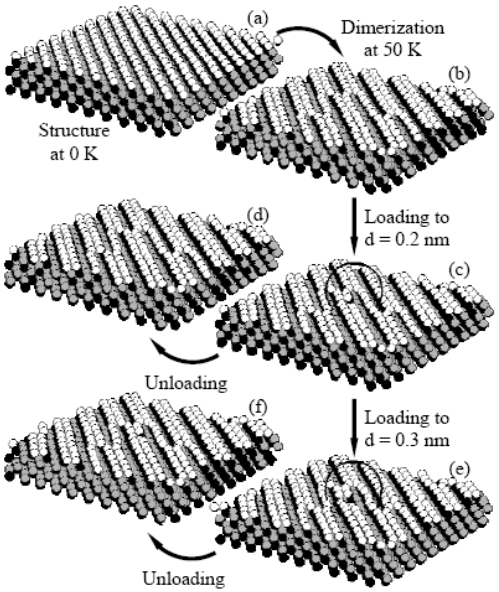
Nebraska Engineering

Experimental and Computational Mechanics of Materials

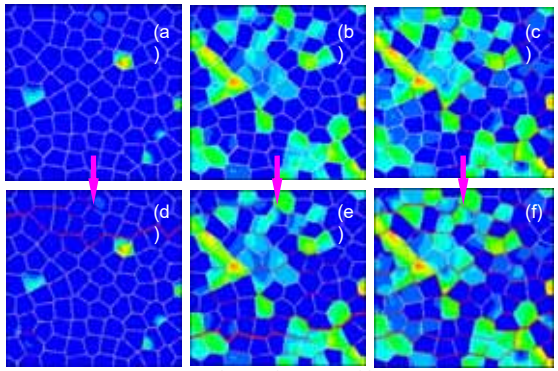
Research Interests:

- High strain-rate experiments and material modeling
- Shock wave/blast wave experiments and simulations
- Atomistic-continuum hybrid modeling and simulations of material systems with strong heterogeneities
- Polycrystal modeling and simulations of ceramics under shock compression and spallation





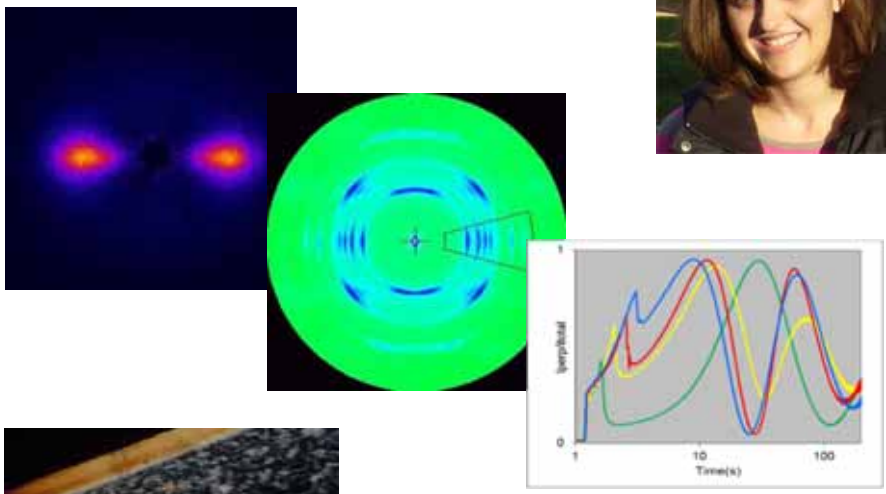
Shock-Induced Crystal Plasticity

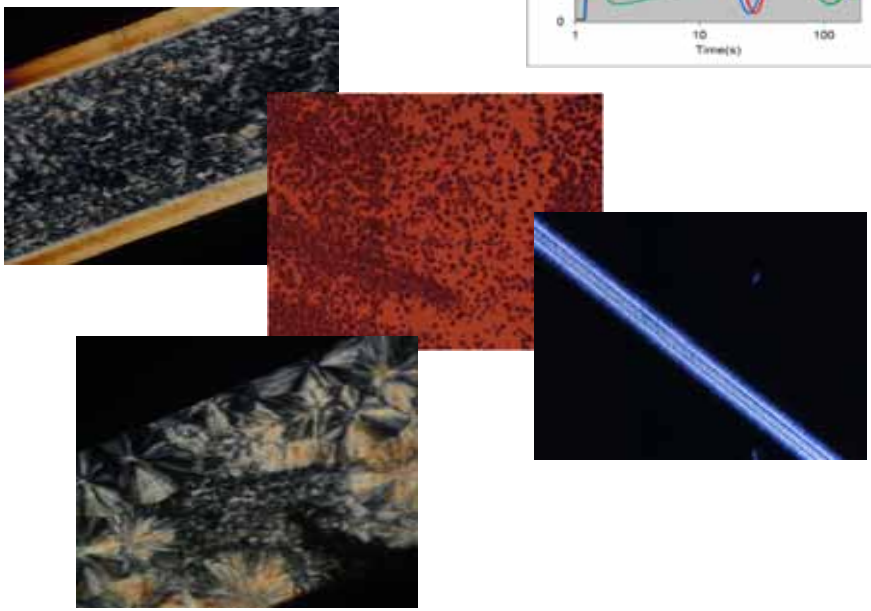


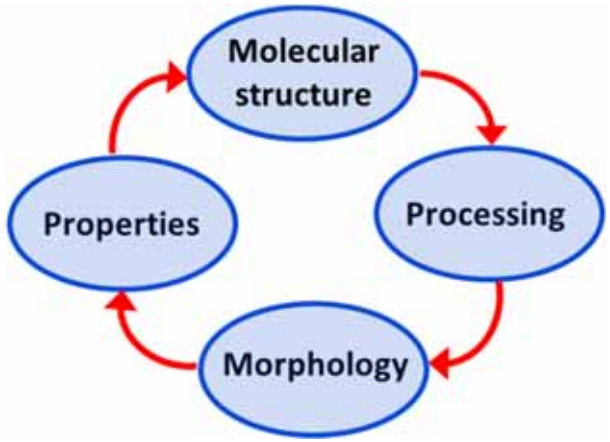
Post-Shock Spallation

Processing, structure and properties of polymers

- Processing and flow-induced crystallization of polymers
- Conjugated polymers
- Biopolymers
- Control of nucleation
- Micro/nanostructures
- Morphology-property relationships



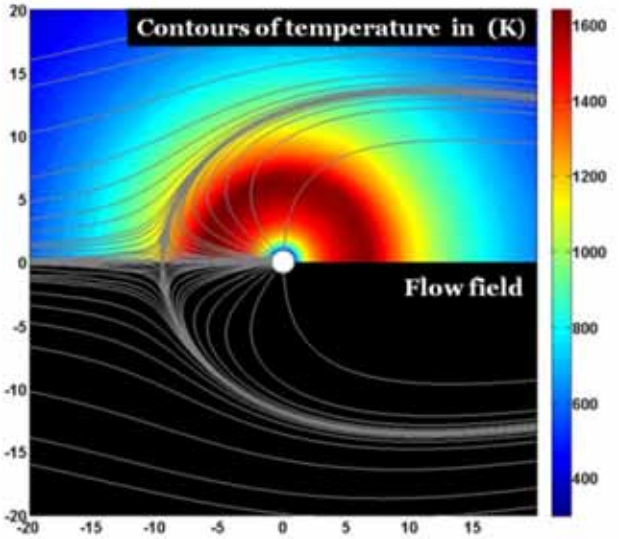




George Gogos

Heat Transfer and Fluid Mechanics

- Spray Combustion
- Flaming Weed Control
- Blast Wave Mitigation
- Plastics Processing

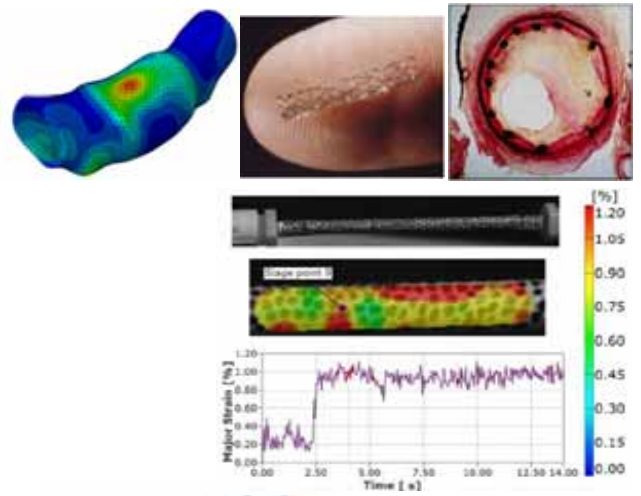


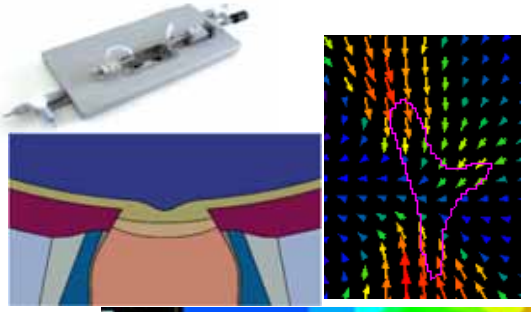
Droplet combustion simulation

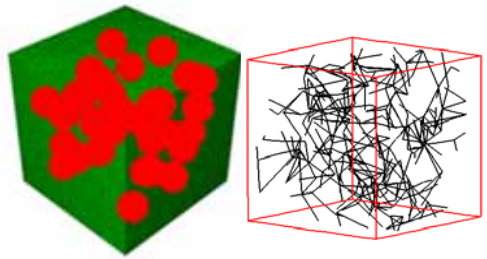
Flaming research at UNL's Haskell Ag Lab

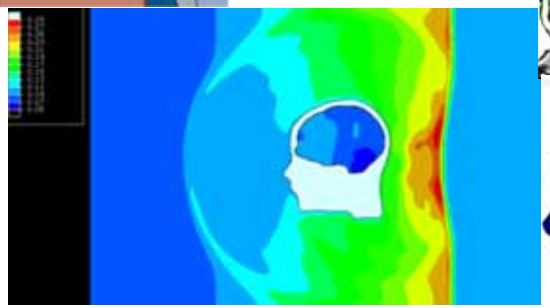
Mechanics of Biomaterials

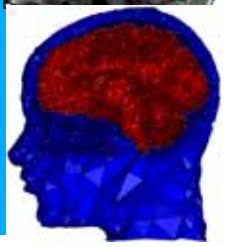
- Multi-scale modeling with application to blood vessel, brain, and optic nerve
- Fluid-structure interaction
- Traumatic brain injury
- Structure-function relationship within non-diseases and diseased tissues
- Tissue remodeling
- Extracellular matrix remodeling
- Minimally invasive medical devices
- Experimental validation of computational techniques







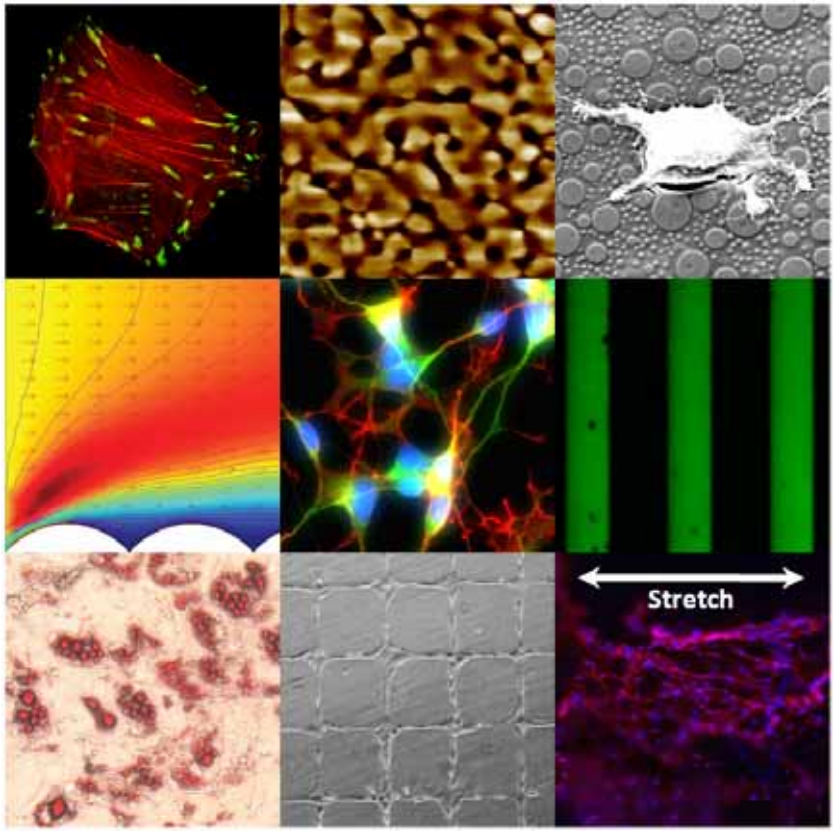




Jung Yul Lim

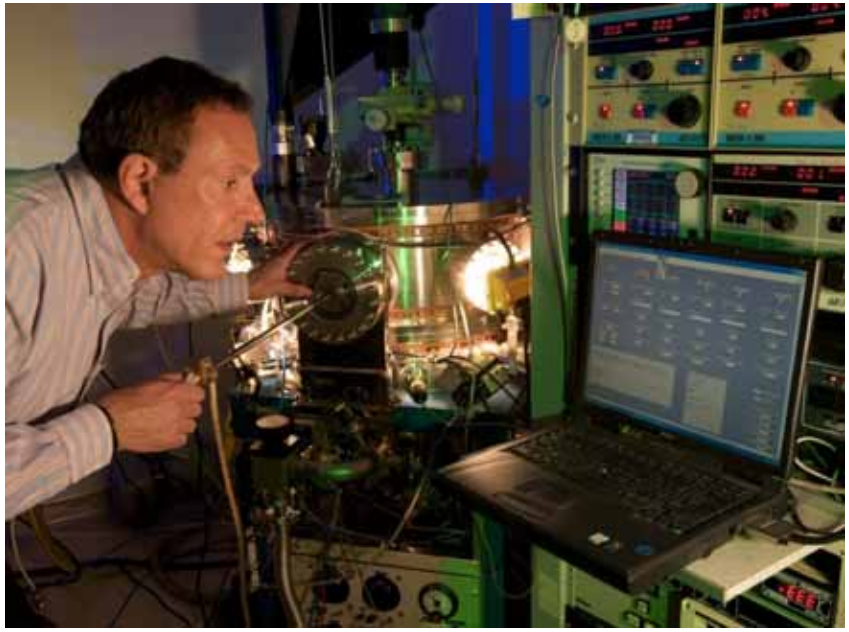
Biomaterials & Mechanotransduction

- Nanoscale biomaterials for stem cell osteogenesis and FAK signaling
- ROCK signaling in fluid flow regulation of bone and stem cell differentiation
- Geometric-molecular integrative control of cadherin cell-cell junction
- Adipogenesis inhibition by biochemical-mechanical cues
- Adipocyte stretch mechanobiology for insulin signaling and T2D
- Traumatic brain injury (TBI) and neuronal regenerative medicine
- Microfluidics for bone cell mechanotransduction and stem cell migration



The Study of Ion-Solid Interactions in the Modification of Matter

- Ion-solid interactions
- Irradiation induced phase transformations
- Ion irradiation and plasma modification of materials
- Ion beam analysis of materials
- Synthesis and properties of high strength nanolayered composites
- Surface mechanical properties.

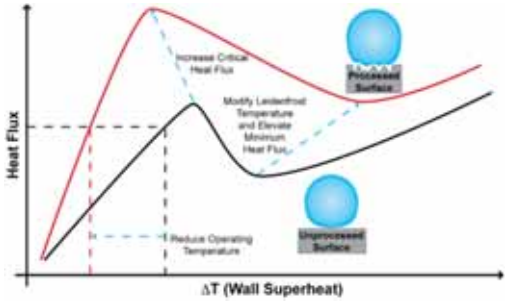


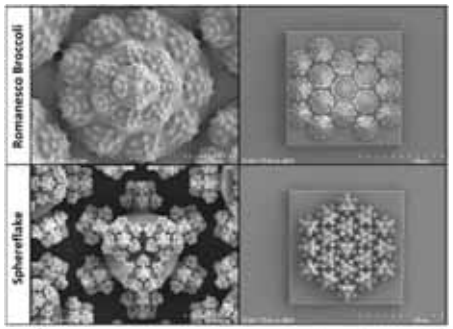
Sidy Ndao

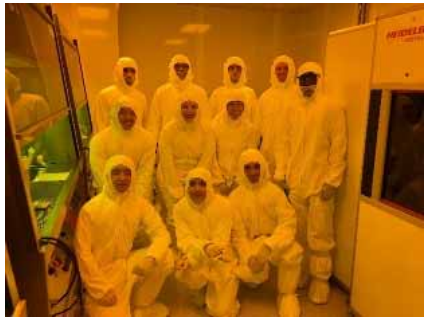
Nebraska Engineering

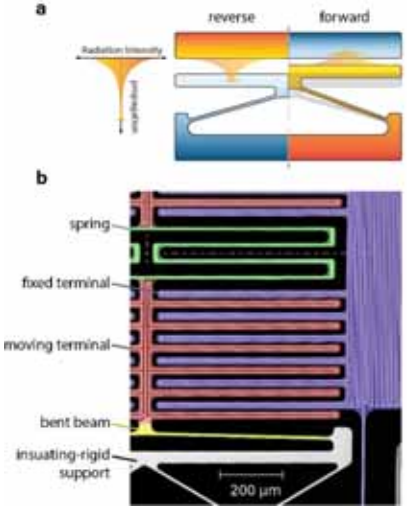
Nano / Microsystems and Thermal Fluids

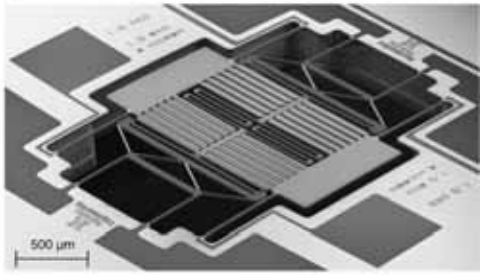
- Micro/Nano systems energy conversion, storage and power generation
- Two-phase heat transfer in Micro and Nano domains
  - Boiling, Condensation, and Droplets
  - Thermal Management of High Heat-Flux Microelectronics and Photonics
- NanoThermoMechanical Computing
- Microfluidics & Lab-on-a-chip
- Surface & Interface Science
- Micro / Nanostructures fabrication

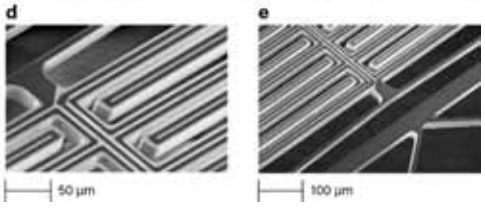


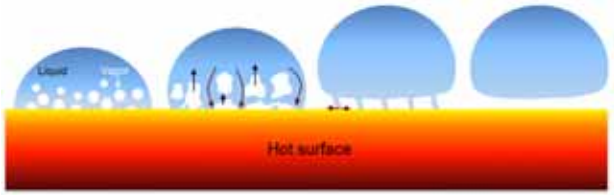


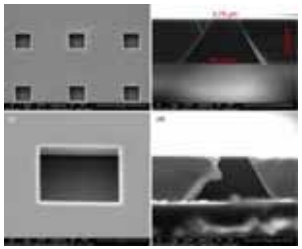












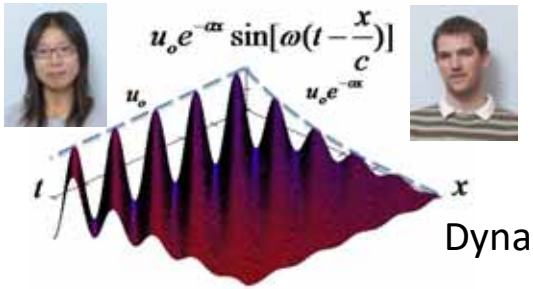
Mehrdad Negahban

Nebraska Engineering

Mechanics and Thermodynamics of Solids: Theory, Experiment, Computation

- Continuum thermodynamics of solids and constitutive theory
- Nonlinear material response
  - Elasticity, plasticity, and viscoelasticity
- Dynamic loading and waves in solids
- Experimental characterization and modeling
  - Polymers and biological tissues
- Nonlinear finite-element methods
  - General shell elements
  - Object oriented FEM
  - Complex material response
- Inverse problems for material characterization, design and manufacturing

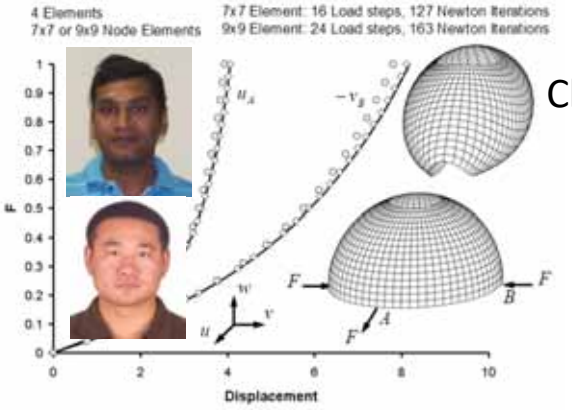
Waves in viscoelastic materials



Dynamic response of tissue

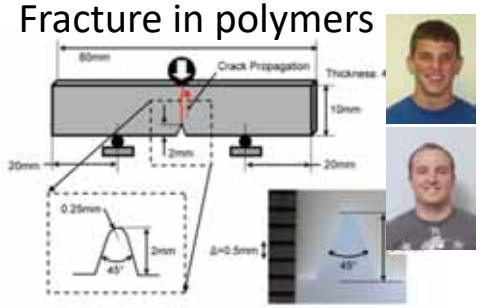
Skin and dura

Nonlinear finite elements



Characterizing polymers

Fracture in polymers

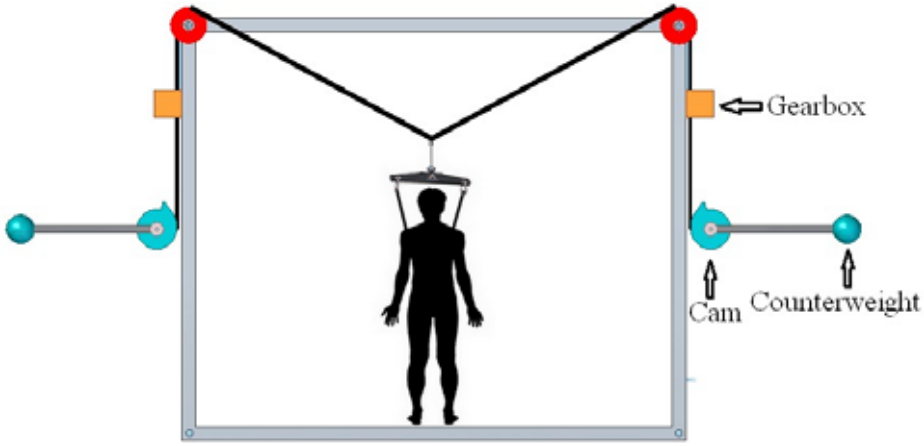


Stereo optical measurement

Strain of a mouse tibia

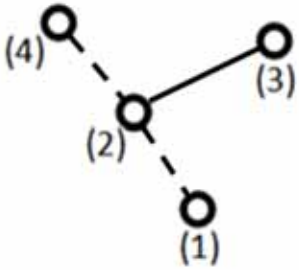
Robotics and Mechanical Design

Research interests:
Surgical robots
Surgical tools and devices
Rehabilitation engineering
Modular and reconfigurable robots
Kinematics of linkages
Robot kinematics and dynamics
Design education



Passive body-weight support for rehabilitation

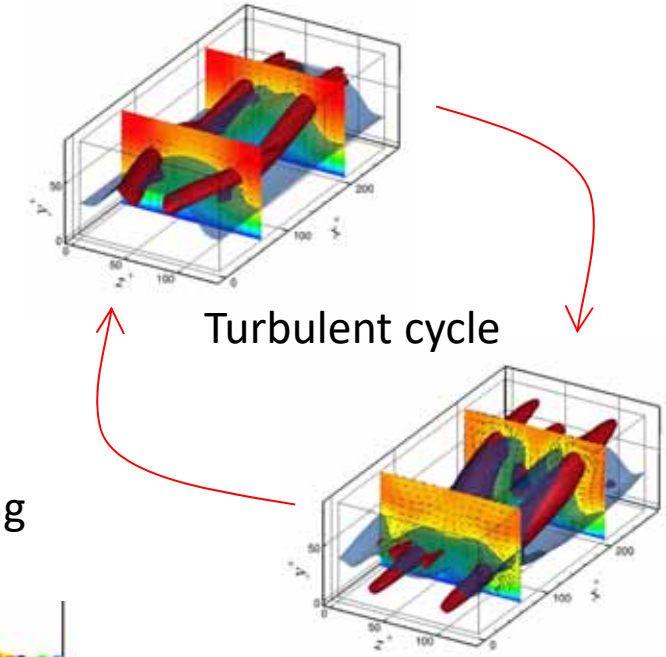
Modular surgical robot



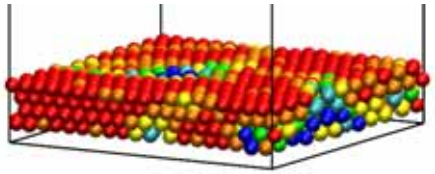
Unit-modular robot and graph-theoretic model

Fluid Dynamics and Computational Science

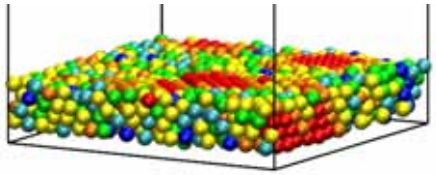
- Flow physics in turbulent flows
  - Nonlinear dynamics of near-wall turbulence
  - Exact coherent structures representing turbulence dynamics
  - Dynamical systems theory to turbulence
  - Turbulent flow control for drag reduction
- Flow physics at nano/micro scales
  - Particle suspensions in electrokinetic flows
  - Hydrodynamic interactions in colloidal suspensions
  - Stokesian/Brownian dynamics simulations
  - Applications to biomedical and materials engineering



Turbulent cycle

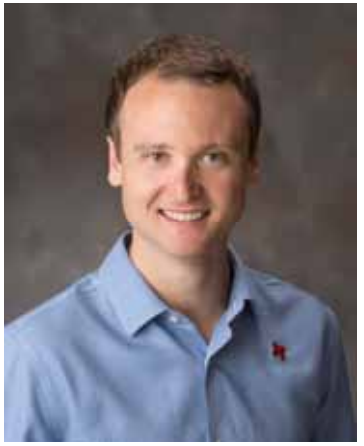


Crystal



Amorphous

Biomechanics and Mechanobiology



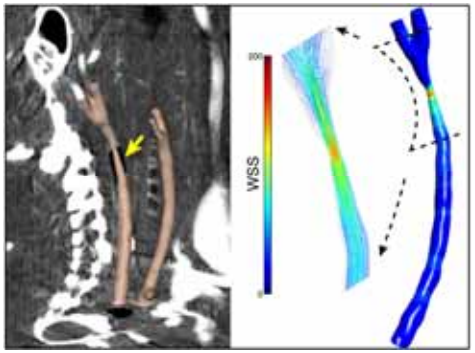
Research Interests

- Mechanotransduction
- Experimental and computational biomechanics
- Regenerative medicine
- Cell and tissue engineering
- Medical devices
- Cardiovascular medicine, diabetes, ophthalmology, and fibrosis

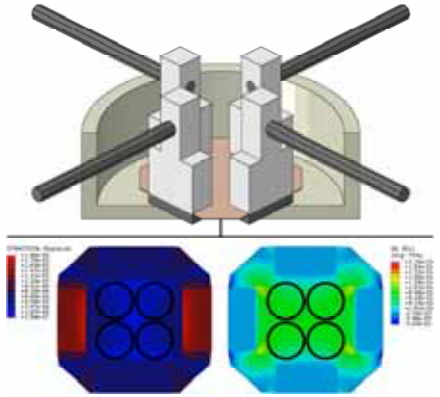
Collaborating with clinicians

Research Projects

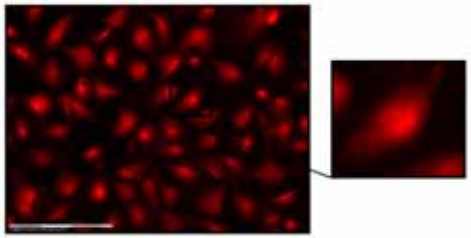
- Fluid-structure interaction modeling of diseased arteries from *in vivo* imaging
- Modeling ultrasound sonication of cells
- Examining signaling in endothelial cells under flow and stretch
- Examining how hyperglycemia effects mechanosensitive signaling in cells



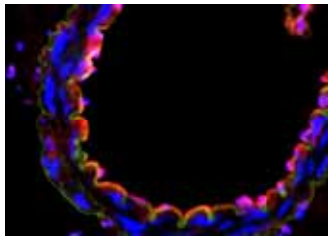
Modeling arteries from imaging



Custom cell stretching device



Endothelial cell signaling (NF-kB)



Imaging the artery wall

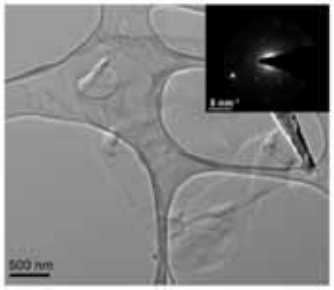
Carbon Based Materials Manufacturing and Characterization

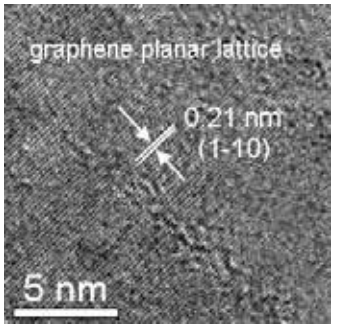
Research Interest

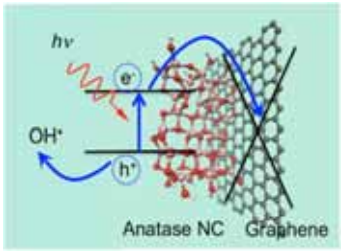
- Graphene and graphene based composites for renewable energy
- Systematic characterization of electrical, thermal, mechanical and crystalline structure of carbon based materials
- Pd-based catalyst for water purification
- Carbon spheres and nanotubes for hydrogen adsorption

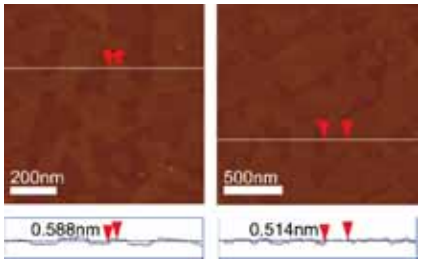
Current Research Project

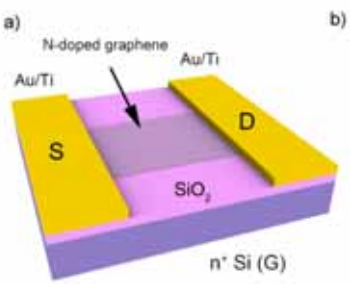
- AFM probe tip modification for high sensitivity and high durability

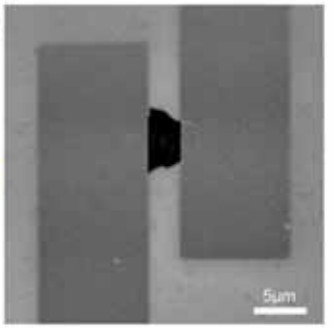


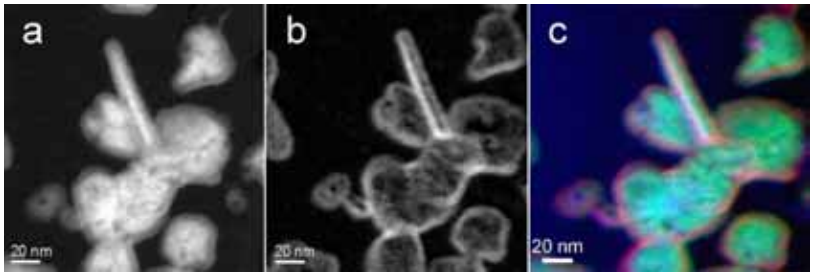


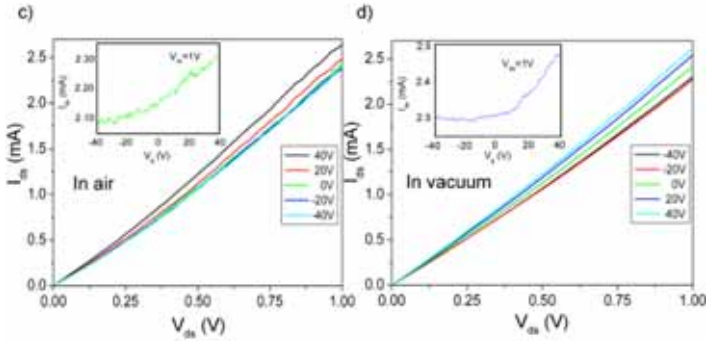










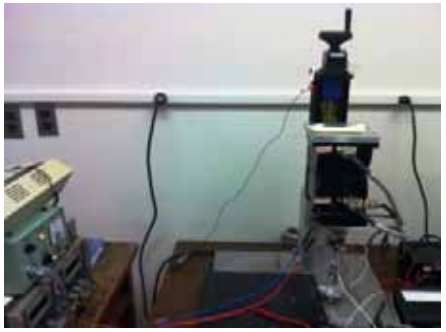


K. P. Rajurkar

Advanced Macro, Micro and Nano Machining; and Stochastic Modeling and Analysis of Systems

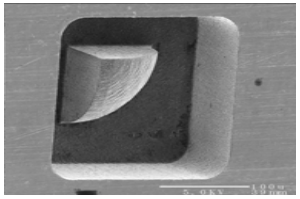
Research Interests:

- Process Mechanisms, Modeling and Simulation
- Process-Material Interactions
- Sensing and Control
- Sustainable Manufacturing
- Bio-inspired Surfaces
- Surface Texturing

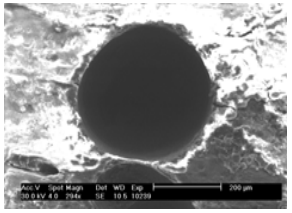


Micro-RUM

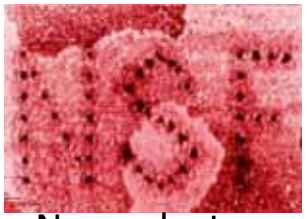
Micro-EDM



3-D machining using Micro EDM



Bone machining using micro-RUM



Nano electro-machining on gold

Prahalada Rao

Nebraska Engineering

Advanced Manufacturing, Sensing, and Data Analytics

Advanced Manufacturing

- Additive Manufacturing (AM)
- Ultra-precision Machining (UPM)
- Precision Polishing and Superfinishing

LAMPS Laboratory for Advanced Manufacturing Processes and Sensing

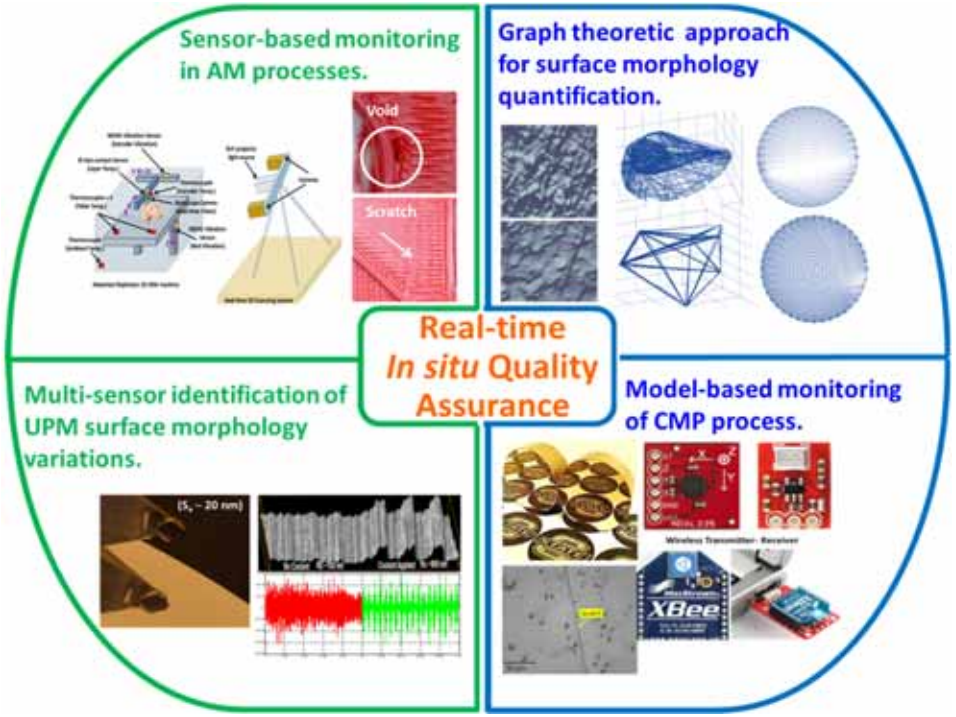
Sensing and Big Data Analytics

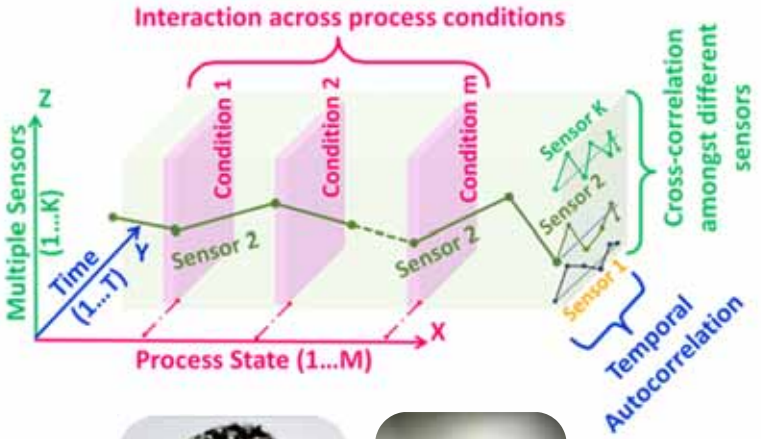
- Neurophysiology and Healthcare Diagnostics
- Statistics, Machine Learning and Sensor Fusion
- Spectral Graph Theory and Nonlinear Dynamics

Ongoing Research Projects Funded by the National Science Foundation.

Cyber-Enabled Online Quality Assurance for Scalable Additive Bio-Manufacturing (2017-21)

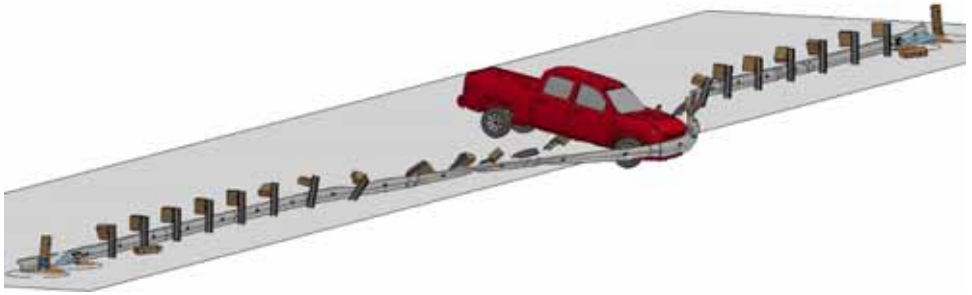
Biosensor Data Fusion for Real-time Monitoring of Global Neurophysiological Function (2015-18)

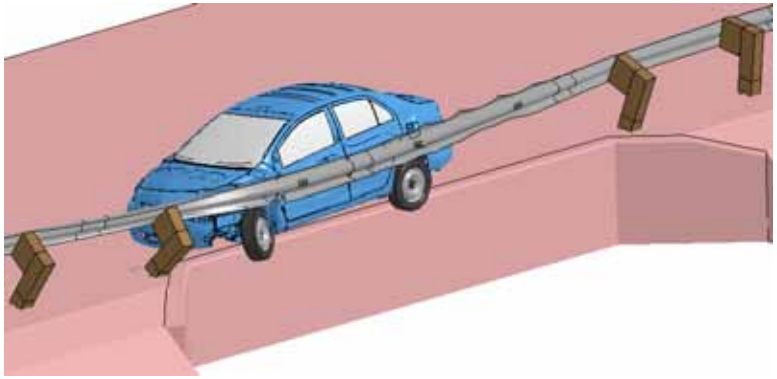




Roadside Safety and Vehicle Crashworthiness

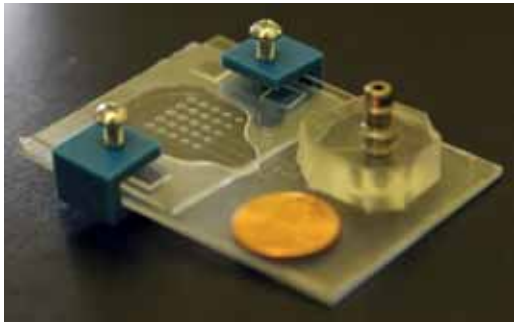
- Nonlinear finite elements analysis of impact events
- Projects include:
  - Maximum MGS Guardrail Height
  - Semi truck simulations
  - Long spans over culverts
  - High-speed high-angled impacts

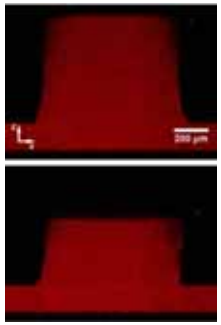




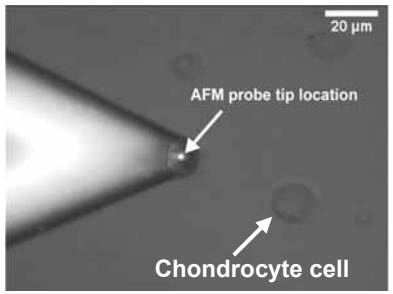
Fluid/Cell Mechanics

- Microfluidics for bioengineering:
  - Microfluidic cell compression device
  - Atherosclerosis-on-a-chip
  - Paper-based microfluidic devices
- Cell mechanics:
  - Mechanical characterization of growth plate chondrocyte cells
  - Shear stress effect on endothelial cells
  - Ca^{2+}-powered stalk contraction of *Vorticella*
  - *In vitro* reconstruction of Ca^{2+}-responding nanofilaments
- Surface-tension-governed flows:
  - Soap bubble pinch-off
  - 2D liquid drop coalescence

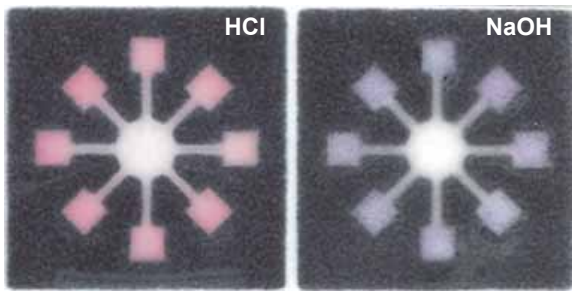




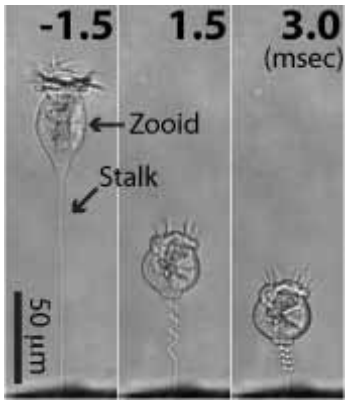
Microfluidic cell compression device / Compressed hydrogel

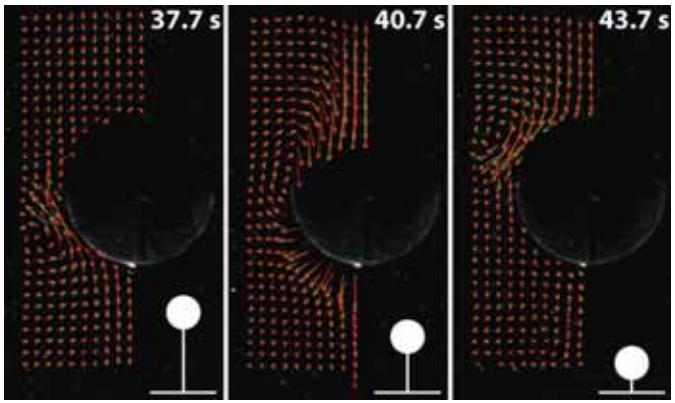


AFM indentation on live cells



Microfluidic paper-based analytic devices





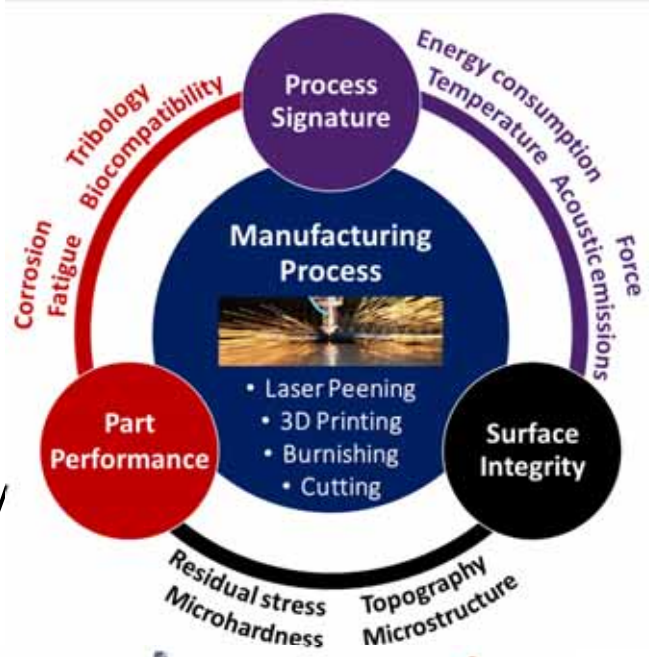
Stalk contraction of *Vorticella* / Simulated water flow caused by *Vorticella* models

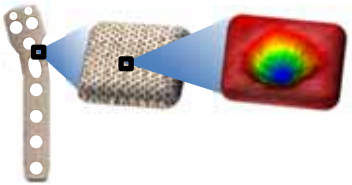
Michael Sealy

Advanced Manufacturing

Research Interests:

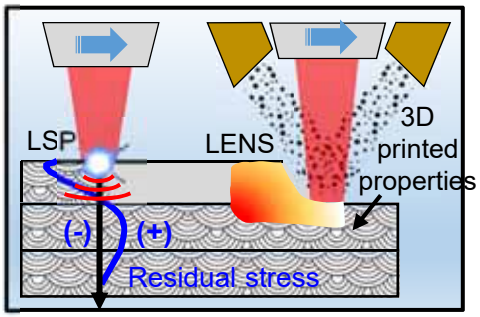
- Biodegradable metal implants
- Additive manufacturing
- Laser processing
- Surface integrity
- Corrosion, fatigue, and tribology
- Sustainable manufacturing
- Finite element modeling

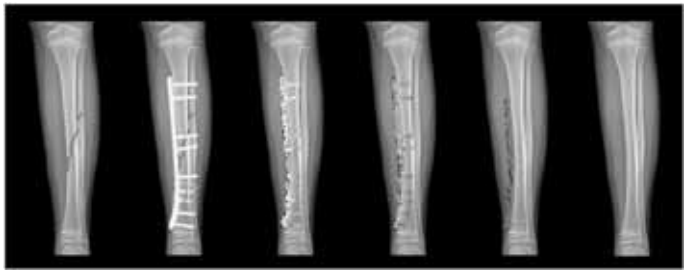




Research Projects:

- Laser peening biodegradable magnesium implants to control corrosion for orthopedic and cardiovascular applications
- Energy consumption as a process signature in machining
- Hybrid additive manufacturing for enhanced performance

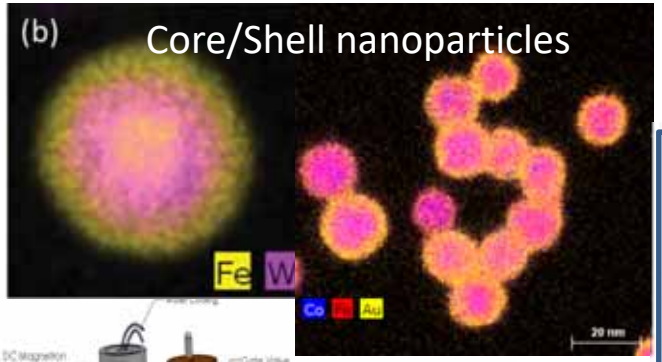


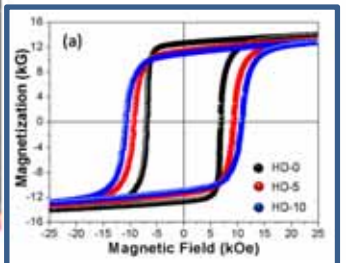


Jeff Shield

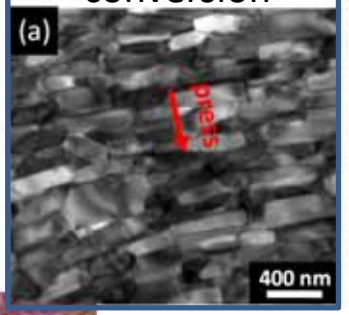
Non-Equilibrium Processing and Microstructural Evolution in Metallic Materials

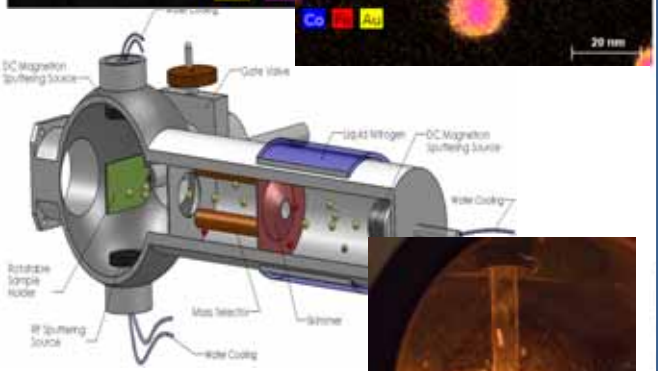
- Gas Aggregation of multifunctional alloy clusters/nanoparticles
- Rapid Solidification Processing
- Laser processing for 3D printing and surface modification
- High-Energy Permanent Magnets
- Nanomaterials
- Electron Microscopy and X-ray Diffraction

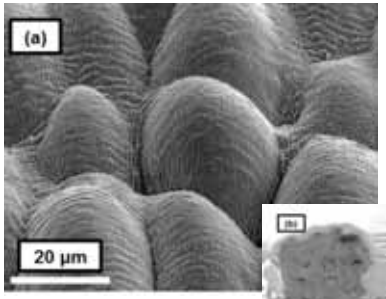




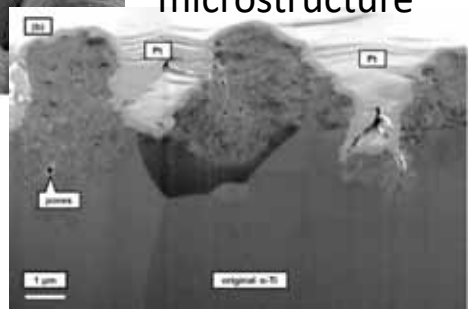
Permanent magnets for energy conversion



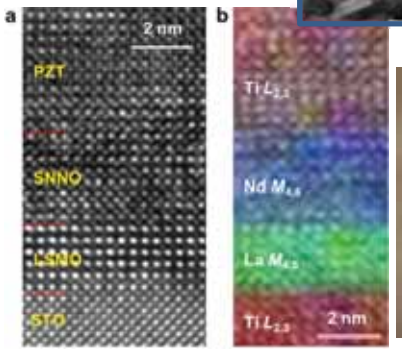




Laser surface-processed mounds and subsurface microstructure

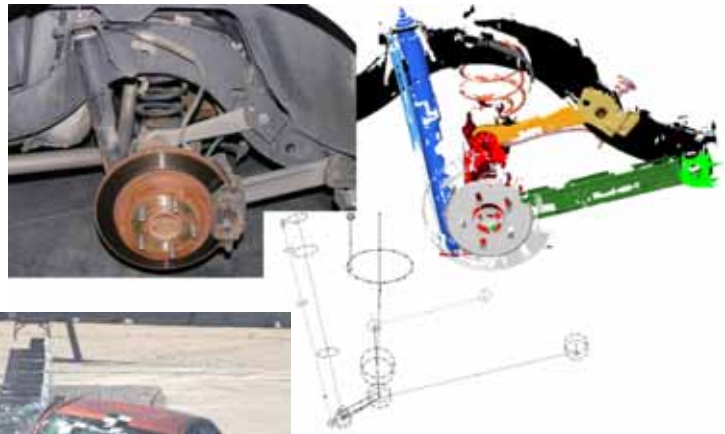


Multiferroic multilayer HRTEM and EELS



Vehicle Dynamics: Safety and Controls

- Crashworthiness
  - Onboard EDR analysis
  - Nonlinear FEA
  - Roadside barrier design
- Occupant Protection
  - Response triggers and timing for occupant safety systems (e.g., airbags, seat belts)
  - Statistical analysis of crash data
- Path Prediction
  - V2V and V2I applications
  - Threat vehicle trajectory analysis and prediction for passive safety schemes at military bases
  - Suspension properties measurement and simulation modeling



Eli Sutter

Nebraska Engineering

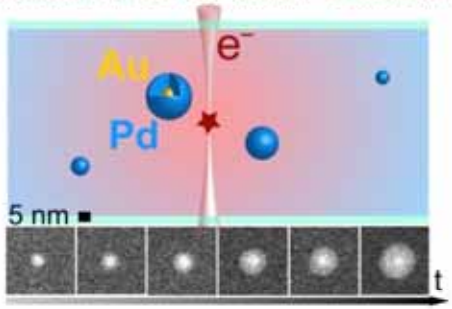
In-Situ Electron Microscopy of Nanomaterials and Nanoscale Processes

Real-time high-resolution transmission electron microscopy (TEM) and spectroscopy

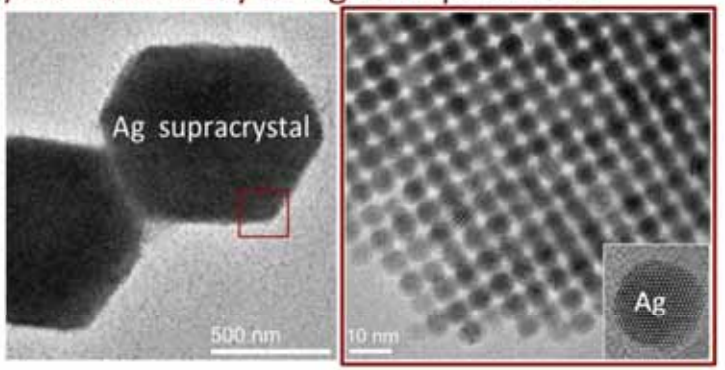
- In-situ, variable temperature studies of properties of nanoscale objects – alloy phase diagrams, solute solubility, phase transformations, oxidation, solid state reactions @ variable temperatures: 10 K - 1600 K.
- Liquid-cell TEM observations in wet environments: growth processes (1), self-organization of nanoobjects into 2D and 3D materials in solutions (2), galvanic replacement reactions, protein self-assembly, etc.

- In-situ TEM cathodo-luminescence spectroscopy with sub-nm spatial and sub-meV spectral resolution: 2-D materials: graphene, h-BN, metal dichalcogenides (3), heterostructures

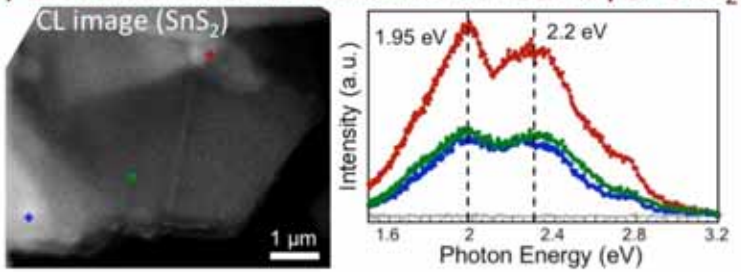
(1) Formation of core-shell nanoparticles in solution: Au-cores and Pd-shells.



(2) Self-assembly of Ag nanoparticles.



(3) Electronic band structure of few-layer SnS_2.

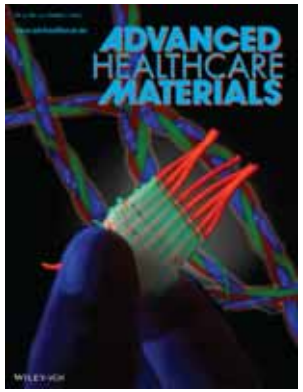


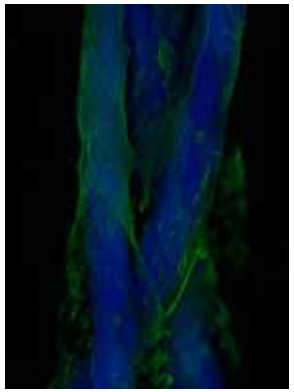
Ali Tamayol

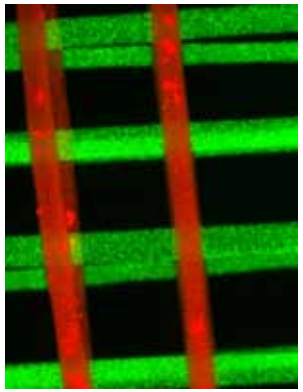
Nebraska Engineering

Micro and nanotechnologies for biomedical engineering

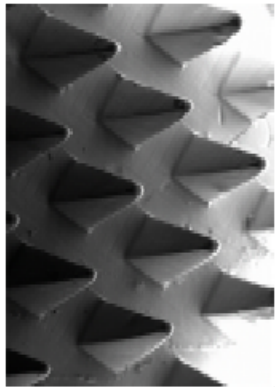
- Fiber based technologies
  - 3D bioprinting
  - Biotextiles
  - Tissue engineering
  - Nanocomposites

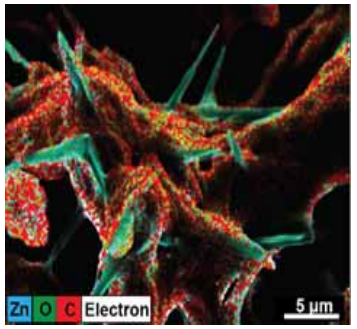




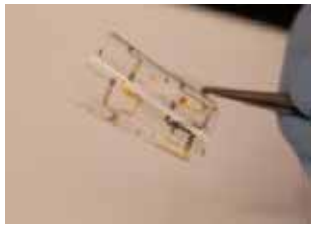


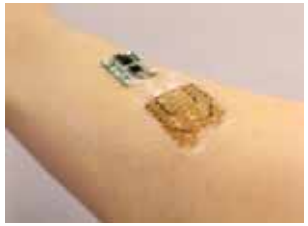
- Drug delivery systems
  - Microneedle-based delivery systems
  - Engineering advanced drug carriers
  - Dressings for the treatment of chronic wounds
  - Microfluidic systems in drug delivery

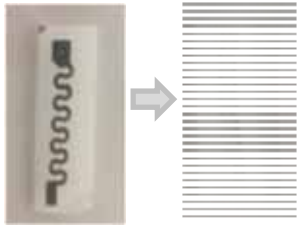




- Flexible and bioresorbable electronics
  - Wearable devices
  - Implantable devices







Unconventional Materials Design and Processing

Unconventional materials are very unique materials and systems. They may look like conventional metal, ceramics, or polymers, but they behave differently. For example, they may enjoy a structure of ceramics but behave like a polymer; or they may look like solid metal, but functions as a pool of liquid. As old principles in structure-property are going to be disrupted here, we also design special processes to manufacture and test these unconventional materials.

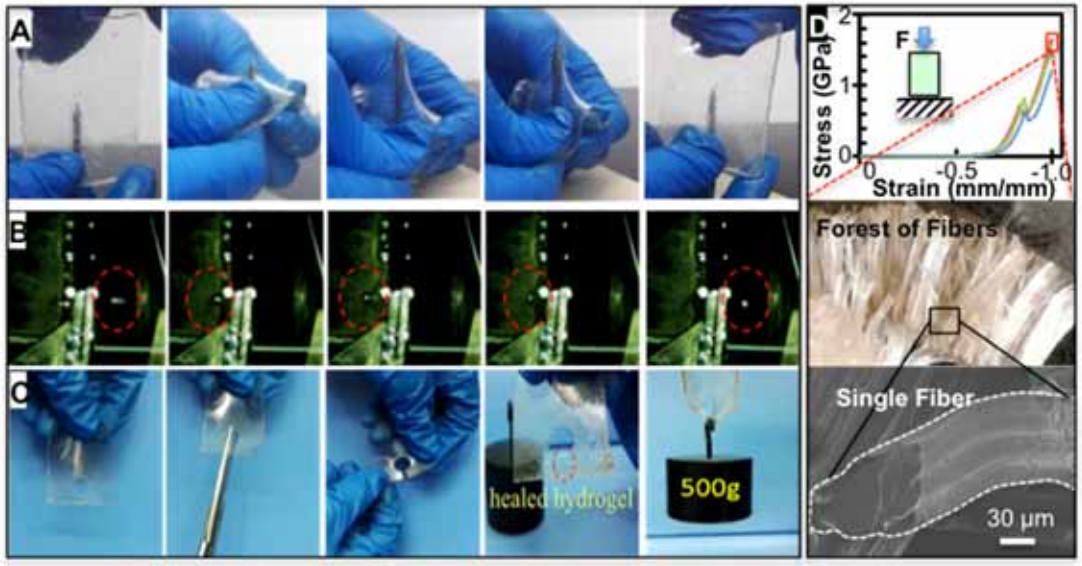


Figure. Snapshots using a 2-mm thick gel-glass (made in Tan's group) against (A) a sharp nail without a scratch mark, (B) a bullet traveling at 150 m/s (left then bounced to right), and (c) a heavy load after cutting & healing. Compression in (D) crushes the material into forest of fibers.

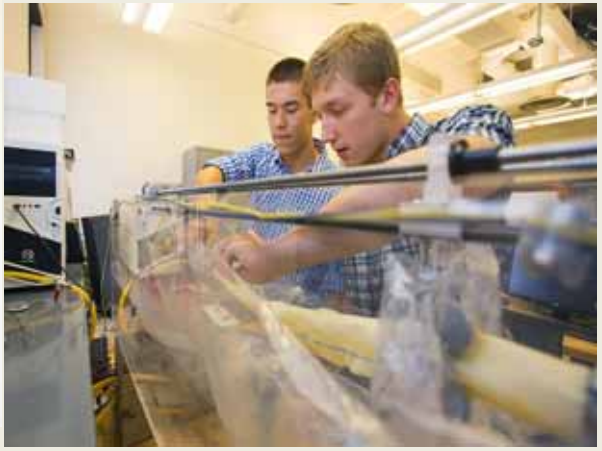
Benjamin S. Terry

Systems and Design Focused on Medical Therapy and Diagnosis

Current Projects

- Swallowable sensors
- Extrapulmonary ventilation
- Coronary artery catheter
- Cable-driven parallel robots for agriculture
- Threat reduction for defense

Medical device design



Bench testing

Collaboration with surgeons

In vivo testing

Joseph A. Turner

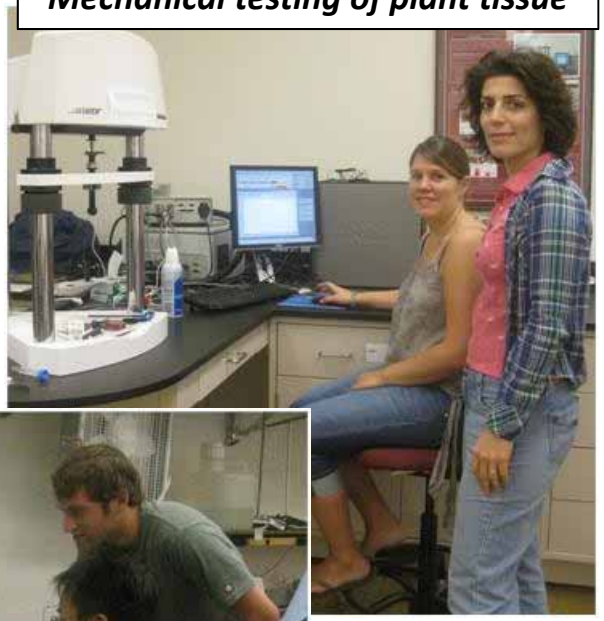
Nebraska Engineering

Ultrasound, nanoindentation, and atomic force microscopy for characterizing materials and microstructures

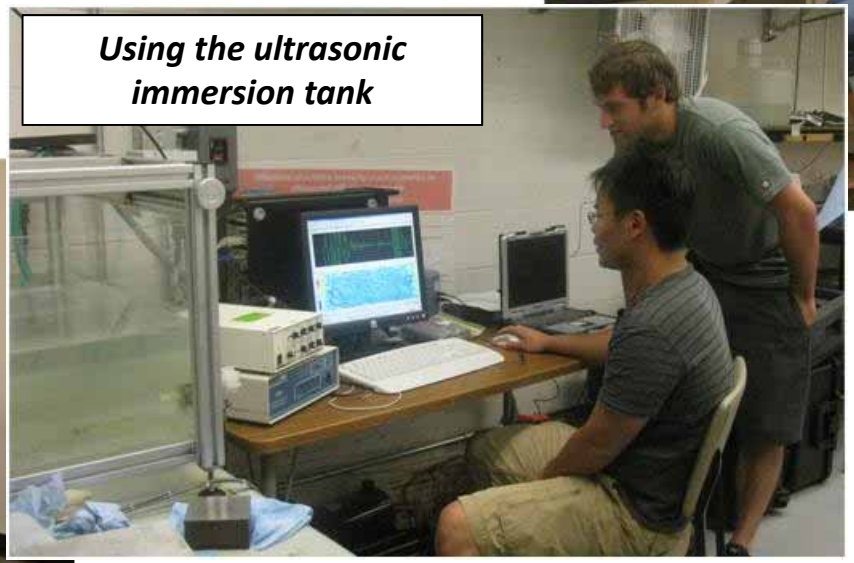
- Fundamentals of ultrasound (metals, composites, concrete, bone, cartilage)
- Stress measurement from diffuse ultrasonic scattering
- Nanoindentation for biological materials (e.g., plants, bone, cartilage)
- AFM cantilever vibrations

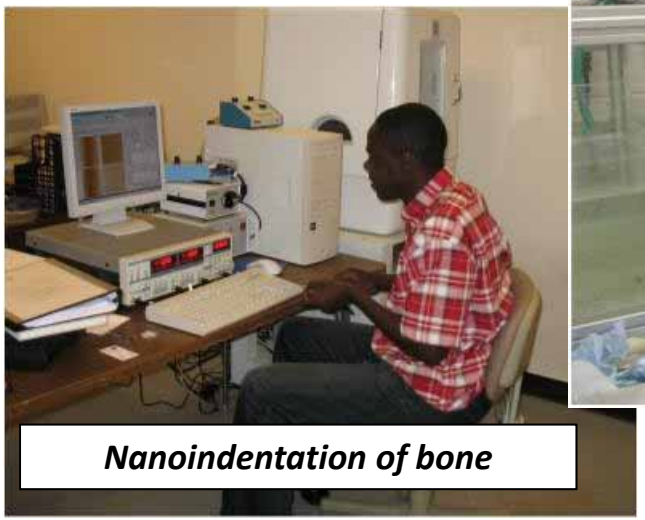
Experiments, computations, theory

Mechanical testing of plant tissue



Using the ultrasonic immersion tank





Nanoindentation of bone

Jian Wang

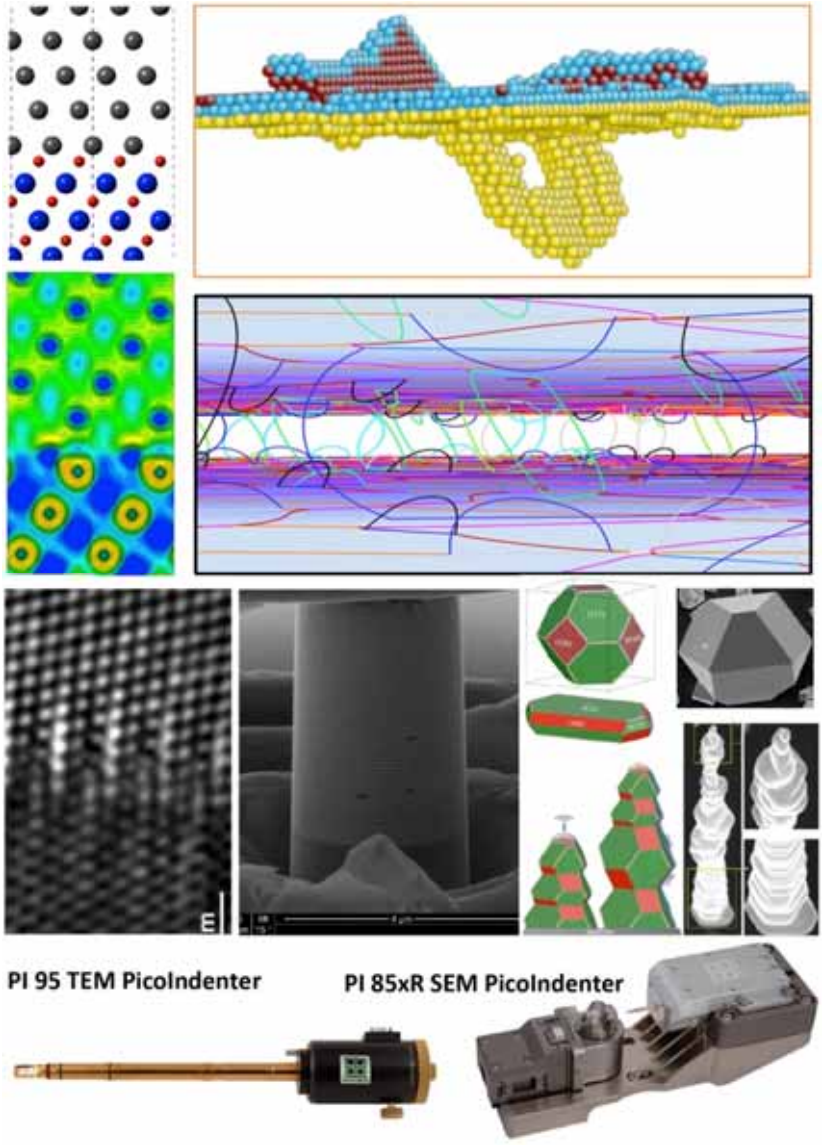
Nebraska Engineering

Multi-scale INterfaces Design in Solids (MINDs): Theory, Modeling and Experiment

Improve Mechanical Properties and Irradiation Tolerance of Materials by Tailoring Interfaces in Solids

Current research projects

- Understanding interaction of deformation twins in hexagonal metals (DoE-LANL)
- Computational and experimental characterization of twin-twin interactions in hexagonal metals (NSF-CMMI-MOMS)
- Plasticity of high-strength multiphase metallic composites (DoE-BES)
- Understanding Structure and Properties of Irradiated Amorphous Ceramics (NCERS-UNL)
- Making Light-weight Mg-Metal Laminated Nanocomposites (NCERS-UNL)
- Atomic-level Design of High Entropy Alloys for Energy Applications (ORED-UNL)



Graduate students and Postdocs

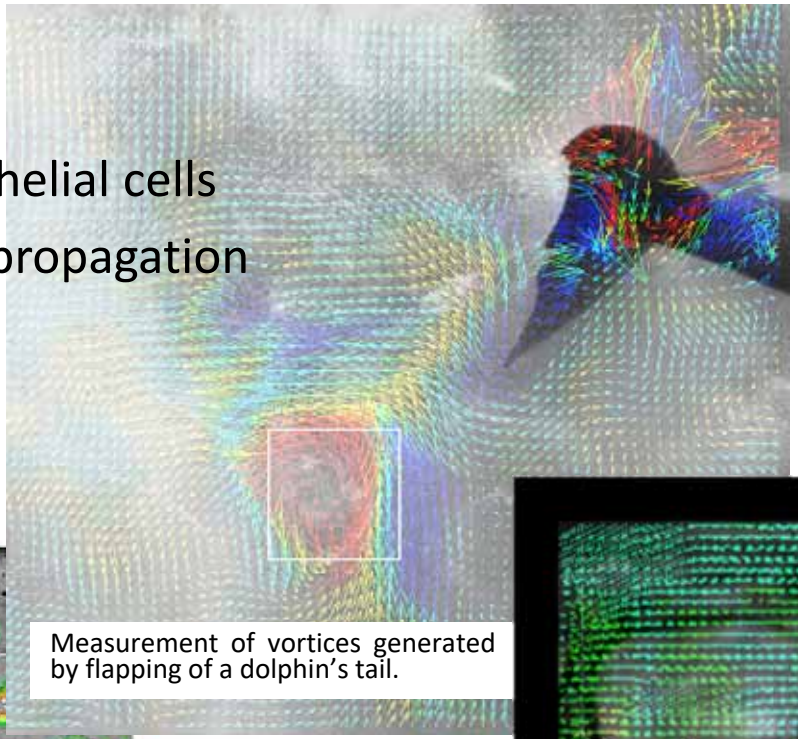
We are recruiting self-motivated students and postdocs who are interested in mechanics, materials, and irradiation study of structural materials.

Backgrounds: solid mechanics, physics, and materials.

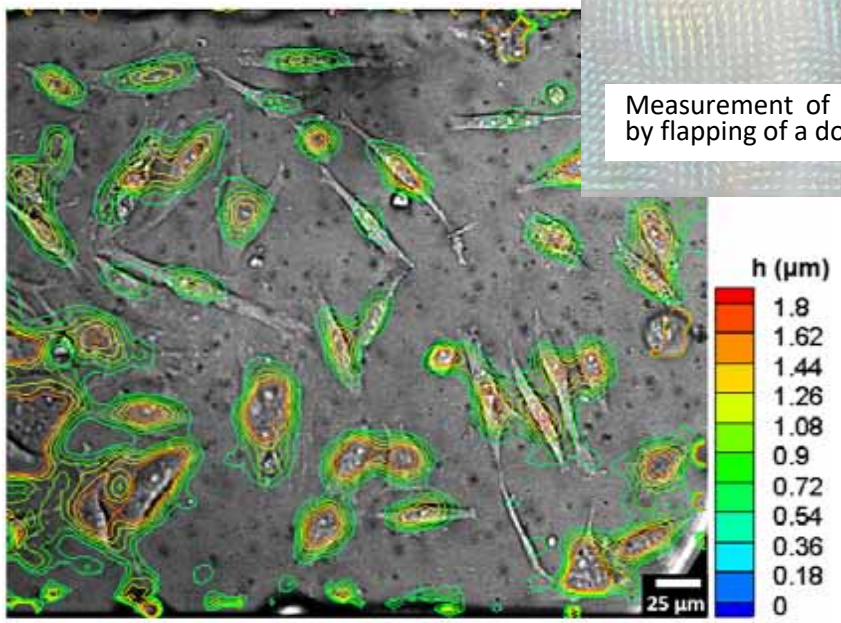
Timothy Wei

Fluid Dynamics

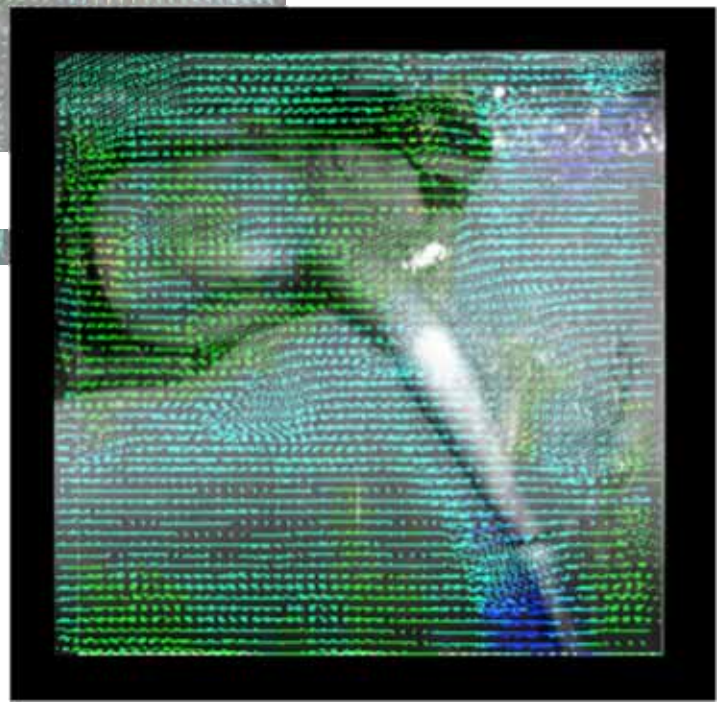
- Effect of flow on endothelial cells
- Biofilm formation and propagation
- Swimming
- Human voice



Measurement of vortices generated by flapping of a dolphin's tail.



Cell surface topography calculated from microscale flow measurements.



Instantaneous DPIV vector field showing flow generated by 200 IM world record holder Arianna Kukors' freestyle stroke.

Sustainable Manufacturing and Energy Efficiency

- Director of new, DOE-funded Nebraska Industrial Assessment Center (NIAC)
- Additional funding from Nebraska Department of Environmental Quality (NDEQ) for summer internships related to Industrial Assessments and Waste Reduction
- Assessing Nebraska companies and wastewater treatment facilities with support from the NE State Energy Office and the U.S. Environmental Protection Agency

NIAC Assessment Team at Aurora WWTF

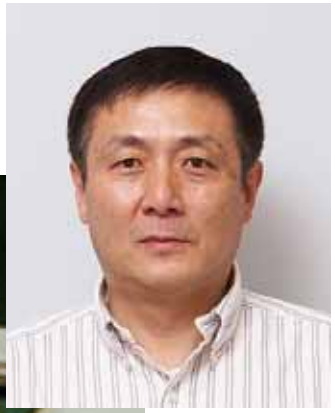
Thermal Image of Overheated Blower Motor at Valentine WWTF

Cyclone Separator

NIAC Graduate Student, Matt Thompson, using a Light Meter

NIAC Website Link: http://engineering.unl.edu/iac/

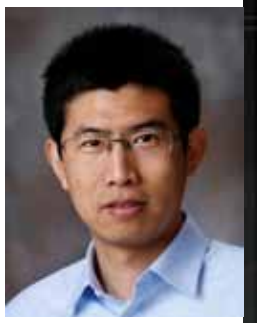
Mechanics of Electromechanical Materials and Devices



Research areas:

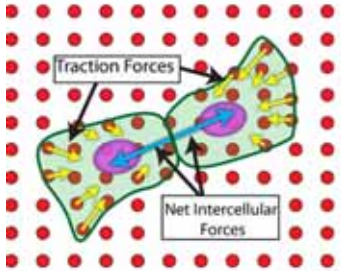
Theoretical and numerical modeling of electromechanical and semiconductor devices including resonators, filters, accelerometers, gyroscopes, force sensors, mass sensors, fluid sensors, temperature sensors, biosensors, transducers, transformers, and energy harvesters.

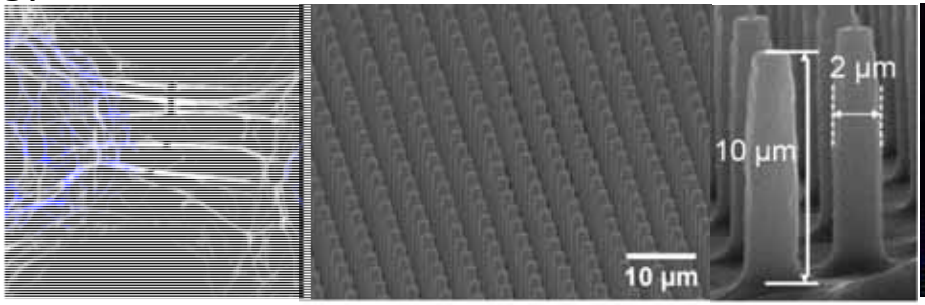
Quartz crystal and resonators

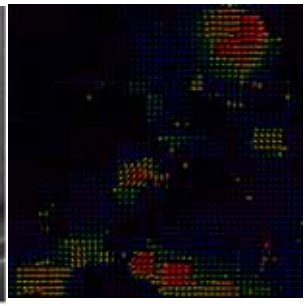


Main research area, title

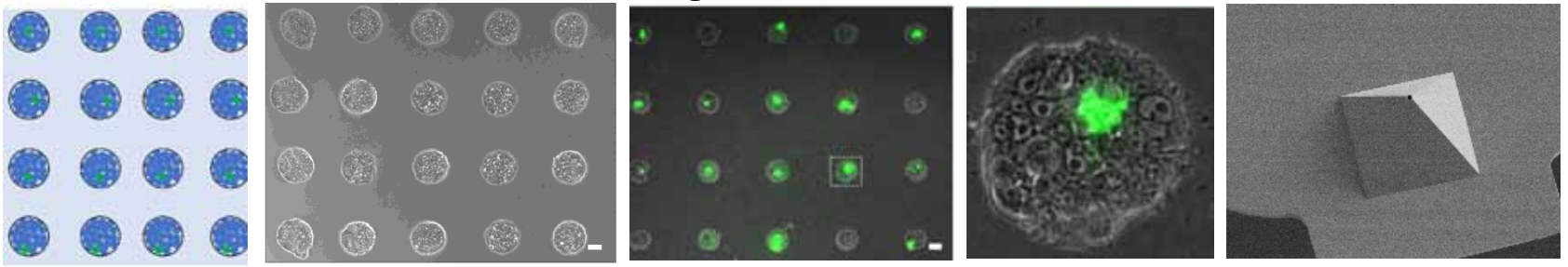
- Mechanobiology and Mechanotransduction



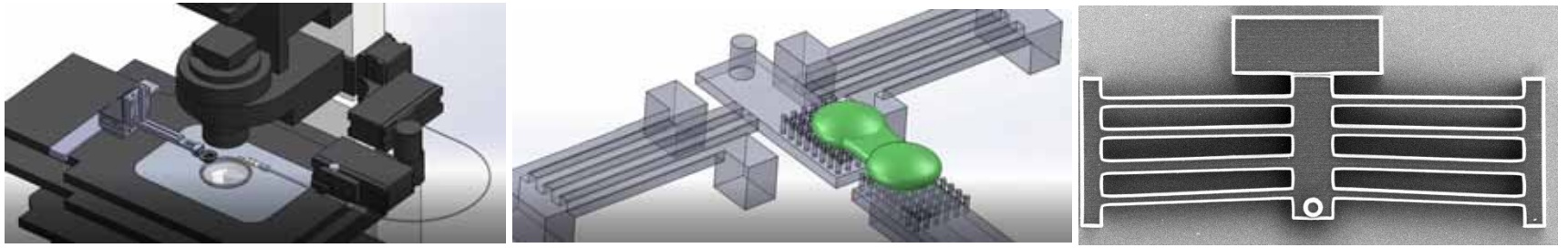




- BioMEMS and Nanorobotics for single cell studies

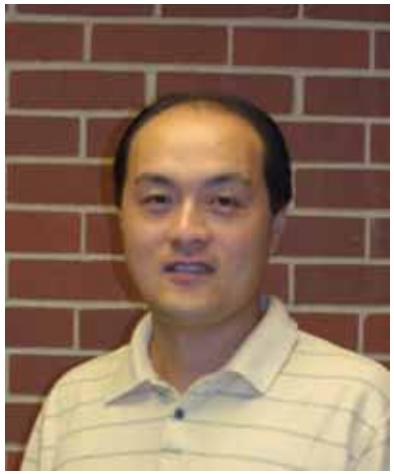


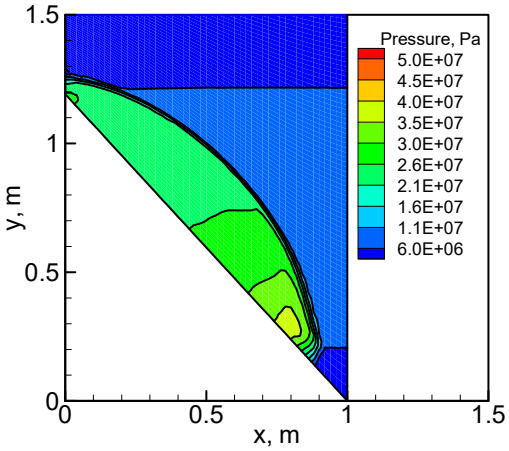
- Cell manipulation for automated mechanical interrogation

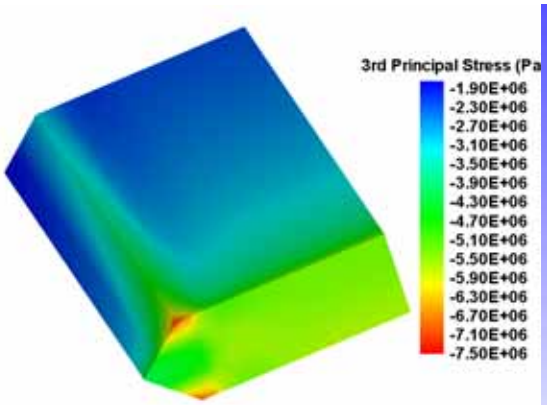


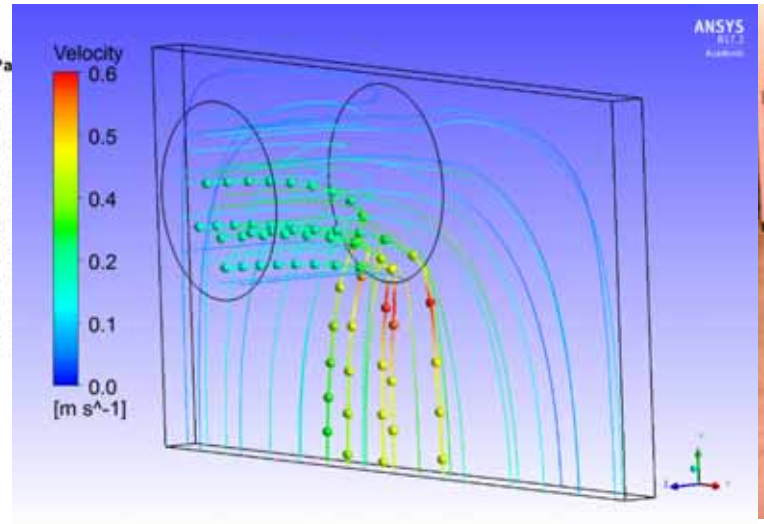
Fluid Mechanics and Heat Transfer

- Particle laden flow in food processing
- Blast wave mitigation
- Shock wave propagation during laser-material interactions
- Diesel engine aftertreatment



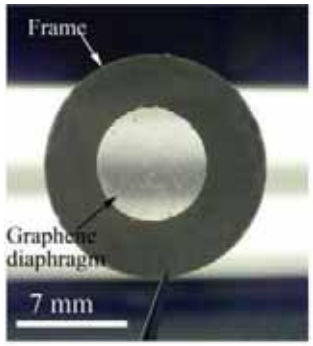




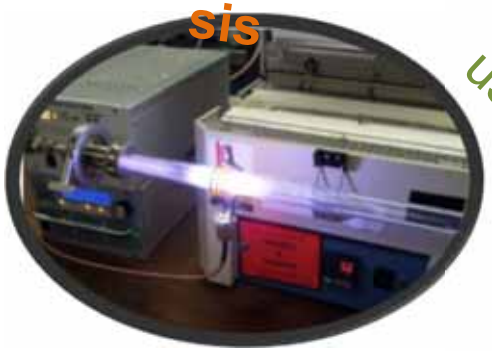


MADMAN Mechanics And Dynamics of Materials At Nanoscale

atomically *thin* materials



their **synthesis**



use them to *make stuff*

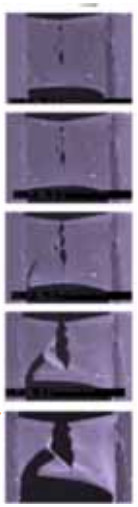
like **earbuds**

have *fun*

Or put them in

Micro machines

so you can *play* with these special materials, like *tear them apart*

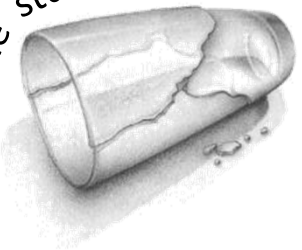


study at *nanoscale*

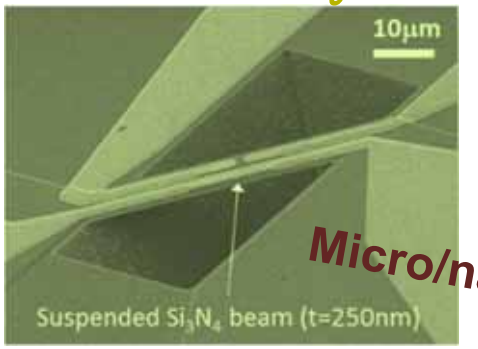
you are in **peace**

stuff **breaks**,

so next time



Micro/Nano sensors to protect YOU from *harmful gases*



Micro/nanofabrication

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