

Jeffrey W. Kysar

Work Address:
Department of Mechanical Engineering
Columbia University
New York, NY 10027

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Education

Harvard University, Division of Engineering and Applied Science

- Ph.D. Engineering Sciences 1998
 - Advisor: James R. Rice
 - Dissertation title: Experimental and Continuum Plasticity Aspects of the Brittleness and Ductility of Bicrystal Interfacial Fracture
- S.M. Engineering Sciences 1993

University of Canterbury, Christchurch, New Zealand

- Rotary Foundation Ambassadorial Scholar 1988

Kansas State University

- M.S. Mechanical Engineering 1992
 - Advisor: Daniel V. Swenson
 - Thesis title: A Validated Finite Element Model of A Livestock Trailer
- B.S. Mechanical Engineering, *magna cum laude* 1987

Professional Experience

Columbia University

- Professor of Mechanical Engineering and of Otolaryngology–Head & Neck Surgery 01/17–
- Chair, Department of the Department Mechanical Engineering 07/14–06/21
- Professor of Mechanical Engineering 07/11–12/16
- Visiting Associate Professor, École Nationale Supérieure des Mines de Paris 06/10–07/10
- Associate Professor, Department of Mechanical Engineering 07/08–06/11
- Associate Professor (untentured), Department of Mechanical Engineering 01/06–06/08
- Assistant Professor, Department of Mechanical Engineering 07/01–12/05

Brown University

- Adjunct Assistant Professor, Division of Engineering 09/99–12/99
- Research Associate, Division of Engineering 09/98–08/01

Harvard University

- Teaching Fellow (Quarter-time for three semesters) 09/93–05/96
- Research Assistant, Division of Engineering and Applied Science 06/93–09/98
- Graduate Fellowship, Division of Engineering and Applied Science 09/92–05/93

Prior Experience

- Engineer and farmer in family business.....09/91–08/92
- Research Assistant, Department of Mechanical Engineering, Kansas State University 06/90–05/91
- Teaching Assistant, Department of Mechanical Engineering, Kansas State University 08/89–05/90
- NASA-USRA Summer Fellow, Marshall Space Flight Center 05/89–08/89
- Rotary Foundation Ambassadorial Scholar, Christchurch, New Zealand.....02/88–03/89
- Research Assistant, Department of Physics, Kansas State University 06/87–02/88

Consulting Activities

- Sandia National Laboratory 2008–2012
- State University of New York (SUNY), Stony Brook 2004–2005
- The Gillette Company 1998–1999

Research Accomplishments

The overarching theme of my research is the mechanical response of materials exposed to extreme conditions that typically lead to highly inelastic behavior and usually fracture or rupture. My laboratory develops a fundamental understanding of deformation mechanisms through innovative experiments as well as their associated activation criteria through computational and theoretical studies. I work closely with surgeons in Columbia University Irving Medical Center to develop novel medical devices to translate knowledge from my research “from bench to bedside.” What follows is a brief description of a few research projects. Numbers in square brackets correspond to publications listed herein.

- Crystal plasticity
 - Developed diffraction-based experimental method to measure spatial distribution of the density of Geometrically Necessary Dislocations in highly deformed metal single crystals [33].
 - Used method to determine scaling relationship of how the intrinsic length scale associated with plastic deformation evolves with increasing deformation across multiple length scales [45, 49, 61, 68, 74, 81].
 - Derived analytical solutions of the stress and deformation fields around cylindrical voids in single metal crystals as a consequence of far-field loading while accounting for the full anisotropy of the material. These solutions give fundamental insight into the ductile fracture mechanisms of metals [15, 19, 29, 35, 37, 67].
 - I was recognized for these advances with the following awards:
 - ▷ International Journal of Plasticity Young Researcher Award
 - ▷ Department of Energy Early Career Scientist and Engineer Award
 - ▷ Presidential Early Career Award for Scientists and Engineers (PECASE).
- Two-dimensional materials
 - Measured (with Hone) the elastic properties and rupture strength of atomically-thin graphene and of single-layer MoS₂ [39, 62, 63].
 - Developed multi-scale computational model to demonstrate that the rupture strength of defect-free graphene corresponds to the intrinsic strength of the carbon covalent bond [57].
 - Developed (with Marianetti) stress-strain constitutive models for single-layer graphene and MoS₂ that account fully for the non-linear and anisotropic elastic properties of the two-dimensional material. The model starts with Density Functional Theory calculations that are then expressed in continuum form through a higher-order Taylor series expansion of the strain energy density potential function [47, 62, 70].
 - Developed multi-scale model of the rupture of graphene grain boundaries. Starting from Molecular Dynamics simulations the results are expressed in continuum form as a traction-separation relationship and implemented in the finite element method as a cohesive zone model [78, 86].
- Nanomechanics and nanomaterials

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- Developed MEMS-based method and also nanoindentation-based method to measure the mechanical response of free-standing metallic nanowires demonstrating strength of up to 1 GPa [24, 64].
 - Developed (with West) methods to fabricate crack-free thin-films of nanoporous gold, which introduced a new class of materials that can be incorporated in MEMS devices [50, 55, 60, 176].
 - Characterized (with Kumar and also with Herman) and rationalized mechanical response of various novel thin-films containing nanocomponents [20, 25, 41, 59, 72].
 - Developed (with Osgood) a model to explain the thermal exfoliation of YAG thin films following ion implantation and a model for nanoscale strain engineering on the surface of a TiO₂ crystal [58, 69].
 - Developed (with Anil Lalwani, MD, Department of Otolaryngology – Head & Neck Surgery) a suite of medical devices to create the field of precision medicine of the inner ear.

Background: With the current standard of care, ENT clinicians are unable to access the inner ear directly to aspirate fluid or to inject therapeutics. Thus hearing and balance disorders with inner ear etiology can neither be diagnosed nor treated directly, so current standard of care does not represent precision medicine. The Round Window Membrane (RWM) separates the air-filled middle ear space from the fluid-filled inner ear space and is the only potential portal into the inner ear that does not require drilling through bone. The RWM is 75 μm thick and 2 mm in diameter with a shape approximating a hyperbolic paraboloid. The RWM is under significant residual tension so it rips spontaneously across its entire width when surgeons attempt perforate it with even the smallest standard surgical instrument. Such destruction of the RWM leads to severe consequences to hearing and balance.

- To understand the RWM mechanical properties, we performed detailed measurements via confocal microscopy of its geometry and histology. The results indicate that collagen and elastic fibers within the RWM are closely aligned with directions of zero-curvature across the entire width of the RWM surface. This observation rationalizes the RWM's approximate hyperbolic paraboloid shape in exactly the same sense that the hyper roof in structural engineering (such as at Lincoln Center) contains straight rebar that span the entire width of the roof oriented in directions of zero curvature [107].
- My group has developed a suite of microsurgical tools that allow surgeons to perforate safely the RWM *in vivo* in the guinea pig model. Several milestones are described below. Each new use case requires significant redesign of the tools also with significant changes to the mode of deployment.
 - ▷ Designed a microneedle with 100 μm diameter and fabricated it via two-photon photolithography with sufficient resolution to maintain a needle tip radius of 500 nm. *In vitro* perforation of the guinea pig RWM demonstrates that a controlled perforation can be introduced and that the ultra-sharp tip perforates via separation and not scission of the connective fibers [88].
 - ▷ Deployed same microneedle during *in vivo* guinea pig surgery to introduce a controlled perforation across the RWM with no consequence to hearing, with the RWM healing fully within 48 to 72 h [93].
 - ▷ Developed hollow microneedle with single lumen along with microfluidic system. During *in vivo* guinea pig surgery aspirated 1 μL of perilymph from the inner ear across the RWM, with no significant loss of hearing and full RWM healing. Proteomic analysis of the aspirated perilymph demonstrates ability to detect differential expression of protein within the inner ear due to different delivery routes of a steroid [100, 104].
 - ▷ Modified the single lumen microneedle and microfluidic system to inject 1 μL of siRNA across the guinea pig RWM *in vivo* and demonstrated distribution of the siRNA throughout most of the inner ear along with expected transfection of the intracochlear tissues [118]. In separate study, injected 1 μL of dexamethasone (a drug commonly used to treat deafness) directly into inner ear without structural or functional consequence [116].
 - ▷ Developed novel dual-lumen microneedle and associated microfluidic system to allow simultaneous injection and aspiration of fluidic volumes greater than 1 μL across the RWM in a guinea pig model. This technology allows simultaneous injection & aspiration that minimizes inner ear pressure changes during the process and thus reduces risk of damage to the hearing and balance apparatus. Demonstrated via *in vivo* guinea pig surgeries that the dual-lumen microneedle can efficiently inject significant amounts of siRNA into the inner ear safely with excellent distribution and transfection [manuscript under preparation].

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- ▷ Developed microneedle and associated microfluidic system that can operate in the high-magnetic field of an MRI system. Injected 1 μ L of gadolinium contrast agent and used MRI to image the individual chambers of the guinea pig inner ear. This technique has the potential to enable direct diagnosis of a debilitating balance disorder called Meniere’s disease [manuscript under review].
 - ▷ I am PI of a Department of Defense project in which we are developing gene therapies to be injected into the guinea pig inner ear for the purpose of preventing noise-induced hearing loss. Our collaborators developing the gene therapies are at the University of Geneva.
 - ▷ Our technology in its current form requires significant surgery and total anesthesia for the surgeon first to gain access to the middle ear space before perforating the RWM. I am a co-founder of a NIH-funded startup to adapt this technology for humans use. Importantly this new technology will require only an out-patient office visit and no surgery. This will significantly decrease the “fear” barrier for patients and also be much less expensive than if a surgical procedure were required.

Overview: We are presently developing IRB applications to apply this technology to humans. We are on the path to revolutionize the diagnosis and treatment of inner ear disorders and to establish the field of Precision Medicine of the Inner Ear.

- Developed (with David Kalfa, MD, PhD of the Department of Surgery) a prosthetic combination of heart valve and artery that will “grow” as a child recipient grows.

Background: David Kalfa, MD, PhD is a pediatric cardiology surgeon who specializes in treatment of neonates born with heart deformities. One deformity in particular requires a prosthetic combination of an artery and heart valve (called a valved-conduit) for implantation into neonates. Current standard of care is to perform open heart surgery on a three-day old baby to implant a valved-conduit, followed by repeat open heart surgeries and re-implantations every 18 months to 2 years until the child reaches the late teens at which time an adult-sized prosthesis is implanted.

- We designed and fabricated two distinct prototypes of prosthetic valved conduit from various polymers. We have demonstrated that the valved conduit can be dilated via a balloon catheter to progressively larger sizes [91, 105, 108, 114].
- We are currently preparing a prototype for implantation into a large animal model.
- Developed (with Tongalp Tezel, MD, of the Department of Ophthalmology) a microneedle that can cannulate capillary-sized arteries and veins in the retina.

Background: Many diabetic patients suffer from arterial or venous occlusions or emboli within the retina that inevitably lead to blindness. The current standard of care is use of a hyperbaric chamber to reduce ischemia to temporarily stave off blindness, followed by lifelong management of blindness. In addition, some toddlers are afflicted with cancerous retinoblastoma tumors in the retina. These children are treated locally, but systemically, with chemotherapeutic agents to save the child’s sight and eye.

- We designed and fabricated a microneedle that allows direct cannulation of individual capillary-sized veins and arteries within the retina [134].

Overview: Our technology created the field of Endovascular Retinal Surgery. It will enable the direct injection of lysing agents into retinal vessels to break up occlusions to prevent blindness as well as the localized injection of chemotherapeutic agents directly into feeder vessels of retinoblastoma tumors. In addition, the technology will enable precision subretinal injections of viral vectors for ocular gene treatment.

Honors and Awards

Columbia University

- One of Top Cited articles in journal Hearing Research since January 2021 2024
 - Novel 3D-Printed Hollow Microneedles Facilitate Safe, Reliable, and Informative Sampling of Perilymph from Guinea Pigs
- Plenary Lecturer at Symposium Jean Mandel, École Polytechnique, Palaiseau, France 2015

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- William E. Hitselberger Memorial Lectureship from The American Neurotology Society 2015
 - Columbia University Medical School Student Research Day Award for poster “Microperforation Mediated Enhancement of Diffusion Across Round Window Membrane of the Inner Ear” 2014
 - Best Poster Award, Joint National Synchrotron Light Source and Center for Functional Nanomaterials Users’ Meeting at Brookhaven National Laboratory 2012
 - International Journal of Plasticity Young Researcher Award 2012
 - Hot Paper in Chemistry as reported by Science Watch during March-June 2010 as “the most-cited chemistry report published in the last two years, excluding reviews” 2010
 - Séminaire de la *Fédération Francilienne en Mécanique des Matériaux*, Paris 2010
 - Invited Speaker at Ph.D. Convocation at Columbia University 2008
 - Presidential Early Career Award for Scientists and Engineers (PECASE) presented at the White House 2006
 - Department of Energy Early Career Scientist and Engineer Award 2006
 - Frontiers of Engineering Program at National Academy of Engineering 2003
 - NSF Faculty Early Career Development (CAREER) Award 2001

Harvard University

- Outstanding Paper Award, Northeast Graduate Student Symposium on Mechanics 1995
- Certificate of Distinction in Teaching (Bok Center for Teaching and Learning) 1995
- Courtlandt S. Gross Fellow 1994

University of Canterbury, Christchurch, New Zealand

- Rotary Foundation Ambassadorial Scholar 1988

Kansas State University

- NASA-USRA Summer Fellow 1989
- Phi Kappa Phi 1986
- Boeing Scholarship 1986
- State of Kansas Scholar 1986
- Tau Beta Pi 1985
- Golden Key Honor Society 1985
- Pi Tau Sigma 1985

Professional Societies

- American Academy of Mechanics (AAM)
- American Heart Association (AHA)
- American Association for the Advancement of Science (AAAS)
- American Chemical Society (ACS)
- American Society of Mechanical Engineers (ASME)
- Association for Research in Otolaryngology (ARO)
- Materials Research Society (MRS)
- Society for Experimental Mechanics (SEM)

Funding from External Sources

- Department of Defense Congressionally Directed Medical Research Program (HT9425-23-1-0487)
 - Biofabricated Patient-Specific Skin Gloves as a Personalized Therapy for Mitten Deformities in Epidermolysis Bullosa
 - Project Period: June 15, 2023 – June 14, 2027
 - Award Amount: \$1,986,275
 - Abaci is PI, Kysar is Other Personnel, Myers and Rohde are Collaborators

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- National Institutes of Health (NIH-NIDCD-1R41DC021128)
 - Endoscopy-Assisted Intracochlear Access via Ultrasharp-Microneedles
 - Project Period: July 1, 2023 – June 30, 2023
 - Primary Place of Performance: Haystack Medical, Inc.
 - Award Amount: \$350,000
 - Lalwani and Aksit are co-PIs, Kysar is Co-Investigator
 - Fondation Pour l'Audition (FPA RD-202202)
 - Evaluation of safety and cell transduction after intra-cochlear injection of viral vectors by microneedle into the round window in rodents
 - Project Period: November 1, 2022 – October 31, 2023
 - Award Amount: 40,000€
 - Kysar is PI, and Lalwani is co-PI
 - Department of the Army - USAMRAA (W81XWH2210983)
 - Intracochlear Delivery of Newly Developed Gene Therapies for Preventing and Restoring Noise-Induced Hearing Loss via Novel Dual Lumen Microneedle Technology
 - Project Period: September 1, 2022 – August 31, 2025
 - Award Amount: \$1,437,602
 - Kysar is PI, and Lalwani is co-PI
 - National Institutes of Health (NIH-NHLBI-R01HL155381)
 - An Expandable Polymeric Valved Conduit to Repair Congenital Heart Disease
 - Project Period: December 15, 2020 – November 1, 2025
 - Award Amount: \$2,728,525
 - Kalfa is PI, and Kysar, Waisman and Vedula are Co-Investigators
 - American Heart Association Collaborative Science Award (20CSA35310718)
 - Experimental and Computational Proof of Concept of an Expandable Polymeric Valved Conduit to Repair Congenital Heart Disease
 - Start Date: January 1, 2021, Project Duration: 36 Months
 - Award Amount: \$750,000
 - Principal Investigators are David Kalfa, Kysar and Haim Waisman
 - Proposal funded but PIs declined award due to approval of NIH-NHLBI-R01HL155381
 - New York Metropolitan Transit Authority (NYMTA CU17-1525 and PANYNJ CU17-2895)
 - Fire Effects on Main Cable of Suspension Bridges
 - Start Date: May 15, 2017, Project Duration: 24 Months
 - Award Amount: \$999,875
 - Raimondo Betti is PI and Kysar is co-PI
 - National Institutes of Health (NIH-NIDCD-R01DC014547)
 - Intracochlear Delivery of Therapeutics Across RWM via Microneedle Array
 - Start Date: August 10, 2015, Project Duration: 60 Months
 - Award Amount: \$2,144,187
 - Additional Amount: \$53,182 for Supplement to Promote Diversity in Health-Related Research
 - Kysar and Anil Lalwani are co-PIs
 - Columbia-Coulter Translational Research Partnership (PT-0052)
 - Single Needle Perforation of the Human Round Window Membrane to Facilitate Cochlear Implantation
 - Start Date: November 1, 2014, Project Duration: 12 Months
 - Award Amount: \$160,000
 - Kysar and Anil Lalwani are co-PIs
 - National Science Foundation (NSF DMR-1427812)

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- MRI: Development of and Broad-Based Materials Research with the Next Generation Nanomechanical Testing Laboratory
 - Start Date: August 15, 2014, Project Duration: 60 Months.
 - Award Amount: \$1,587,763
 - Pharr is PI, Herbert and Oliver are co-PIs, Kysar is Senior Personnel
 - National Science Foundation (NSF CMMI-1363093)
 - GOALI/Collaborative Research: Improving the Performance of Electrical Connectors Using Extremely Thin Sheets of Graphene Sandwiched Between Metal Layers
 - Start Date: August 1, 2014, Project Duration: 36 Months with 12 month No Cost Extension.
 - Award Amount: \$245,781
 - Kysar is PI, Terrell is co-PI
 - National Science Foundation (NSF CMMI-1437450)
 - Strength and Reliability of Large Area CVD Graphene
 - Start Date: July 15, 2014, Project Duration: 36 Months with 12 month No Cost Extension.
 - Award Amount: \$398,101
 - Kysar and Hone are co-PIs
 - American Otological Society Research Fund (AOS CU14-0751)
 - Development of RWM Microneedle Array for Intracochlear Drug Delivery
 - Start Date: July 1, 2014, Project Duration: 24 months
 - Award Amount: \$110,000
 - Kysar and Lalwani are co-PIs
 - Moxtek, Inc.
 - Moxtek funded summer project for 2014
 - Start Date: June 1, 2014, Project Duration: 3 months
 - Award Amount: \$11,500
 - Kysar and Hone are co-PIs
 - National Science Foundation (NSF DMR-1310503)
 - Probability Density Function of Dislocation Free Path Length: Experimental Determination through GND Measurements
 - Start Date: September 1, 2013, Project Duration: 36 Months
 - Award Amount: \$370,254
 - Kysar is sole PI
 - Columbia-Coulter Translational Research Partnership (PT-0052)
 - Intracochlear Drug Delivery Device
 - Start Date: July 1, 2013, Project Duration: 12 Months
 - Award Amount: \$100,000
 - Kysar and Lalwani are co-PIs
 - National Science Foundation (NSF CMMI-0927891)
 - Monoatomically Thin Films: Nonlinear Mechanical Response and Mechanical-Electrical Coupling
 - Start Date: August 1, 2009, Project Duration: 36 Months
 - Award Amount: \$350,292
 - Kysar is PI, with Co-PIs Hone and Marianetti
 - Air Force Office of Scientific Research (AFOSR FA9550-09-1-0453)
 - DURIP: Equipment Acquisition for the Study of Mechanical Behavior of Materials under High Temperatures and Extreme Conditions
 - Start Date: June 1, 2009, Project Duration: 12 Months

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- Award Amount: \$332,524
 - Kysar is sole PI
 - Air Force Office of Scientific Research (AFOSR FA9550-09-1-0048)
 - Plasticity in High Temperature Materials: Tantalum and Monazite
 - Start Date: February 15, 2009, Project Duration: 58 Months.
 - Award Amount: \$1,210,838
 - Kysar is sole PI.
 - National Science Foundation (NSF CMMI-0826093)
 - Nanoporous Metals Incorporated into MEMS and NEMS Devices for Enhanced Functionality
 - Start Date: July 15, 2008, Project Duration: 36 Months.
 - Award Amount: \$279,978
 - Kysar is sole PI.
 - Department of Energy (LLNL Purchase Requests B571059, BS85562, B587550, B595720, B598431)
 - Presidential Early Career Award for Scientists and Engineers (PECASE)
 - PECASE: Multiscale Investigations into Plasticity in Metals under Dynamic Loading Conditions
 - Start Date: May 1, 2008, Project Duration: 60 Months.
 - Award Amount: \$250,000
 - Kysar is sole PI.
 - National Science Foundation (NSF DMR-0706058)
 - Experimental Characterization of Gold Single Crystals and Bicrystals at the Nanoscale with Emphasis on Interaction Between Dislocations and Grain Boundaries
 - Start Date: July 1, 2007, Project Duration: 48 Months.
 - Award Amount: \$400,000
 - Kysar is sole PI.
 - National Science Foundation (NSF DMR-0213574)
 - Materials Research Science and Engineering Center: Center for Nanostructured Materials
 - Start Date: September 1, 2002, Project Duration: 72 Months.
 - Award Amount: \$6,681,825
 - Herman is PI. Kysar is one of 13 senior investigators, effective as of March 1, 2007 and receives partial support (\$40,000 per year) for one postdoctoral scientist.
 - National Science Foundation (NSF DMR-0650555)
 - SGER: Detailed Interaction of Dislocations and Grain Boundaries in Nanoscale Gold Bicrystals
 - Start Date: December 15, 2006, Project Duration: 12 Months.
 - Award Amount: \$89,619
 - Kysar is sole PI.
 - Air Force Office of Scientific Research (AFOSR FA9550-06-1-0214)
 - Combined Experimental Study of Plastic Deformation for the Development of Multi-Length Scale Constitutive Models
 - Start Date: March 15, 2006, Project Duration: 36 Months.
 - Award Amount: \$322,247
 - Kysar is sole PI.
 - National Science Foundation (NSF DMII-0500239 and DMII-0549629)
 - Effects of Heterogeneity, Anisotropy and Length Scale in Microscale Deformation Processes
 - Start Date: July 1, 2005, Project Duration: 36 Months.
 - Award Amount: \$333,256
 - Kysar is PI, with co-PI Yao.

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- National Science Foundation (NSF CMS-0134226)
 - CAREER: Multi-Scale Experiments of Fracture in Elastic-Plastic Materials
 - Start Date: July 1, 2002, Project Duration: 60 Months.
 - Award Amount: \$374,244
 - Kysar is sole PI.

Funding from Internal Sources

- BiomedX, Columbia University
 - Reti-Needle: An Ocular Microneedle Delivery System for Precise Retinal Disease Treatment
 - Start Date: July 1, 2024, Project Duration: 12 Months.
 - Award Amount: \$100,000
 - Tezel and Kysar are co-PIs.
- SEAS Translational Acceleration Research, Columbia University
 - Metallic Crown Needle to Facilitate Insertion of Cochlear Implant Through Round Window Membrane
 - Start Date: July 1, 2019, Project Duration: 12 Months.
 - Award Amount: \$85,000
 - Kysar and Lalwani are co-PIs.
- Translational Fellows Program, Columbia University
 - A Surgical Tool For Creating Perforations in RWM for Treatment of Ear Disorders
 - Provides partial salary support for Postdoctoral Research Scientist
 - Start Date: April 1, 2019, Project Duration: 12 Months.
 - Award Amount: \$16,991
 - Kysar and Lalwani are co-PIs.
- SEAS Research Equipment Assistance Program (REAP), Columbia University
 - Purchase of a Replacement DCM II Indenter Head and Purchase of Express Test Control Software for Agilent G-200 Nanoindenter
 - Start Date: July 1, 2017, Project Duration: 12 Months.
 - Award Amount: \$40,000
 - Kysar is PI.
- Translational Fellows Program, Columbia University
 - A Surgical Tool For Creating Perforations in RWM for Treatment of Ear Disorders
 - Provides partial salary support for Associate Research Scientist
 - Start Date: April 1, 2015, Project Duration: 12 Months.
 - Award Amount: \$14,441
 - Kysar and Lalwani are co-PIs.
- Academic Quality Fund, Columbia University
 - Nanomechanics Research Center
 - Start Date: October 1, 2004, Project Duration: 24 Months.
 - Award Amount: \$279,632
 - Kysar and Chen are co-PIs.
- Seed Money from NSF-funded MRSEC at Columbia University
 - Metal Nanocomposite Thin Films: Synthesis and Characterization
 - Start Date: October 1, 2004, Project Duration: 24 Months.
 - Award Amount: \$50,000
 - Kysar and Chen are co-PIs.

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- Seed Money from NSF-funded MRSEC at Columbia University
 - Mechanical Constitutive Relationships Appropriate for Nanoparticle Thin Films
 - Start Date: October 1, 2006, Project Duration: 12 Months.
 - Award Amount: \$25,000
 - Kysar is sole PI.
 - Funds toward purchase of MTS G200 Nanoindenter
 - SEAS Dean's Office: \$40,000
 - NSF-funded MRSEC: \$37,800
 - Kysar contribution: \$56,595
 - Purchase Date: May 24, 2007
 - Kysar is sole recipient.
 - Sponsor of Research Experience for Teachers (RET) participant
 - NSF-funded program through PI Jay Dubner
 - Jonathan M. Peter (High school physics and chemistry teacher)
 - ▷ New Explorations Into Science, Technology and Math (NEST+M) High School
 - ▷ Participated in research in Kysar's lab during summers of 2006 and 2007.
 - Award Amount: \$2,000
 - Kysar is sole recipient.

Ph.D. Graduate Students Advised

- Hongqiang Chen, Ph.D..... January 2003 to May 2004
 - Dissertation Title: Microscale laser shock peening: experiment, modeling and spatially resolved material characterization
 - Co-advisor with Y. L. Yao
 - Principal Scientist and Program Leader – Advanced Manufacturing at General Electric Global Research Center
- Yong X. Gan, Ph.D..... September 2002 to May 2005
 - Dissertation Title: High Strain Gradient Deformation States in Elastic-Plastic Single Crystals: Theory, Simulations, and Experiments
 - Associate Professor, Department of Mechanical Engineering, California State Polytechnic University
- Youneng Wang, Ph.D..... June 2004 to May 2005
 - Dissertation Title: Microscale Laser Shock Induced Deformation: Anisotropy and Length Scale Effect
 - Co-advisor with Y. L. Yao
 - Research Scientist at Michelin Research
- Yuki Saito, Ph.D. January 2004 to August 2007
 - Dissertation Title: Investigations into Strain Gradient Plasticity
 - BlackRock Japan
- Xiaoding Wei, Ph.D..... June 2004 to May 2009
 - Dissertation Title: Mechanical Properties of nanoscale and atomic scale materials: Nanocrystalline copper and graphene
 - Assistant Professor, Department of Mechanics and Engineering Science, Peking University
- Sinisa Vukelić, Ph.D. June 2005 to June 2009
 - Dissertation Title: Laser induced deformation and structural modification of crystalline and amorphous materials
 - Co-advisor with Y. L. Yao

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- Lecturer in Mechanical Engineering, Columbia University
 - Muin Öztop, Ph.D. June 2007 to September 2011
 - Dissertation Title: Multi-scale experimental analysis in plasticity: Linking dislocation structures to continuum deformation fields
 - Principal at Mastercard Data & Services
 - Oya Okman, Ph.D. September 2006 to July 2012
 - Dissertation Title: Fabrication and Applications of Nanoporous Gold
 - Global Strategic Marketing Manager at BD
 - Mehmet Yilmaz, Ph.D. October 2007 to January 2013
 - Dissertation Title: Batch-compatible Integration of Nanowires with Uniaxial Micro Tensile Testing Platforms
 - Assistant Professor of Practice at National Nanotechnology Research Center (UNAM), and Institute of Materials Science and Nanotechnology at Bilkent University, Turkey
 - Ryan Cooper, Ph.D. September 2008 to December 2013
 - Dissertation Title: Micro and Nanofilm Mechanics
 - Assistant Professor In Residence, Department of Mechanical Engineering, University of Connecticut
 - Abdulhamit Sarac, Ph.D. September 2009 to May 2014
 - Dissertation Title: Net Burgers Density Vector Fields in Crystal Plasticity: Characteristic Length Scales and Constitutive Validation
 - Mechanical Engineer at The Scientific and Research Council of Turkey
 - Nastaran Ghazi, Ph.D. September 2008 to August 2014
 - Investigation of Plastic Strain Recovery and Creep in Thin Film Nanocrystalline Metals
 - AAAS Science and Technology Policy Fellow, National Science Foundation
 - Christopher DiMarco, Ph.D. June 2013 to December 2019
 - Mechanical behavior of polycrystalline graphene
 - Co-advisor with J. Hone
 - Postdoctoral Research at Johns Hopkins University
 - Shruti Rastogi, Ph.D. September 2015 to August 2021
 - Enhanced Strength and Frictional Properties of Copper-Graphene-Copper Nanolaminates
 - Associate at Exponent
 - Richard Leechung Li, Ph.D. September 2015 to September 2021
 - Toward Growth-Accommodating Polymeric Heart Valves with Graphene-Network Reinforcement
 - Senior R&D Engineer at Edwards Lifesciences
 - Aykut Aksit, Ph.D. September 2016 to August 2022
 - Microneedles for the Inner Ear
 - Interim CEO of Haystack Medical, Inc.
 - Wenbin Wang, Ph.D. September 2016 to September 2023
 - Anisotropic mechanical properties of Guinea Pig Round Window Membranes
 - Position: TBD
 - Abigail Herschman, Ph.D. Candidate September 2019 to present
 - Chaoqun Zhou, Ph.D. Candidate. September 2020 to present
 - Daniella (Hébert) Hammer, Ph.D. Candidate. May 2022 to present

Ph.D. Dissertation Committees

(N.B. Students from Columbia University unless otherwise indicated.)

- 2004-2005
 - R. Krishnan, H. Chen, M. Shilov, B. Turk, M.-H. Wu, S. Oh, M. Nagashima, I. Perez-Luna, J. Lou (Princeton University)
- 2005-2006
 - S. Park, S. Yang, M. Zheng, R. Verastegui, J. Choi, M. Wu, G. Vunni, Y. Wang
- 2006-2007
 - M. Likhitpanichkul, Y. Fan, A. Rambalakos, M. Wu, M.-H. Wu, L. Brant, Z. Zong (Princeton University), K. Q. Chen
- 2007-2008
 - Q. R. Marksteiner
- 2008-2009
 - C. Canal Guterl, A. J. Birnbaum, N. Wilson
- 2009-2010
 - R. Bose, M. Huang, M. Caligaris, W. Wei
- 2010-2011
 - S. Ghassemi, Z. Liu, A. Mathur
- 2011-2012
 - O. Gaathon, S. Kuznetsov, P. Biswas (Indian Institute of Science, Bangalore), A. Montoya, A. Sahin
- 2012-2013
 - X. Liu, C. Chen, Y. Shi, S.-T. Hsu, M. Lan, D. Hochstein, D. Eroglu, N. Gu, E. Sandoz-Rosado
- 2013-2014
 - K. Sasithlathlu, C. McAuliffe, P. Kongsuwan
- 2014-2015
 - Y. Zheng, J. P. Kyle, S. R. Oungo, S. Y. Wang, M. Marko
- 2015-2016
 - Y. Li, Y. Gao, Z. Yuan, S. Liu, D. Chenet, M. Fernandez, J.-H. Park
- 2016-2017
 - O. Ajayi, M. Arriaga, M. Misra, C. Ling (École Nationale Supérieure des Mines de Paris), Y. Wang, M. Kornbluth, W. Yang, A. Brügger
- 2017-2018
 - M. Mobasher, G. Arefe, D. Fafalis, D. Bian, A. Cui, A. Dadgar, J. Kang, J. C. Hou
- 2018-2019
 - J. F. McMillan
- 2019-2020
 - J. Ardelean, K. Wang, D. Wang, B. Zimmerman
- 2019-2020
 - J. Russ, N. Finney
- 2019-2020
 - Shi, L., Wang, D., Zimmerman, B.
- 2021-2022
 - Wang, X., Zhang, Z., Alkhodairi, H.
- 2022-2023
 - Luna, T., Antony, A., Lee, N., Robinson, J., Ungar, Y., Stramel, D., Fang, S.
- 2023-2024
 - Xu, X., Over, V., Louwagie, E., Yanev, E.

M.S. and Professional Degree Students Advised

- Kelly (Horton) Kessler, M.S. September 2001 to May 2002
- John Culkowski, M.S. September 2003 to May 2004

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- James B. Carleton, M.S.....September 2004 to July 2005
 - Varun Hemraj, M.S. September 2004 to December 2005
 - Emine Eda Kuran, M.S. September 2008 to December 2009
 - Jasmine Bridges, M.S.....September 2009 to May 2010
 - Sibylle Delaporte, M.S.....September 2008 to May 2010
 - Arora Shruti, M.S. January 2010 to December 2010
 - Donald Boone, Professional Degree.....June 2011 to May 2012
 - Jaewon Moon, M.S.....April 2013 to May 2014
 - Kwadwo Adu Twum, M.S. September 2014 to December 2015
 - Arnuparp (Nu) Santimetneedol, M.S..... January 2016 to December 2016
 - Zihan Wang, M.S. September 2016 to December 2016
 - Ashwini Karmarkar, M.S.....June 2017 to December 2017
 - Maria Lynette Nadal, M.S.....September 2018 to May 2019
 - Chaoqun Zhao, M.S.....September 2018 to August 2020
 - Pratyaksha Purohit, M.S.....January 2023 to December 2023
 - Christopher S. Moon, M.S.....September 2024 to present

Visiting Ph.D. Students Hosted in Laboratory

- Christopher Nellemann (DTU), Salim A. El-Naaman (DTU)

Undergraduate Students, High School Students and Teachers in Laboratory

(N.B. REU and RET refer, respectively, to NSF-funded Research Experience for Undergraduates program and Research Experience for Teachers program.)

- Marilyn Nourse (Brown University), Luis Romero, Calder Hughes, Jack Barnett, Timothy Lee, Kerstin Perez (REU), Jean Chang (REU), Sarah Lowenthal, Mark Backman, Lindsay Kuhn, Sophie Bourgoin (École Polytechnique, Paris), Salka Keller (REU), Milton Jones (REU), Carlos Maturana, Jonathan Peter (RET from New York City public high school), Timothy Morse (REU), Benjamin Dickman, Gilberto Mendez Arzuza, Allan Fong, Lauren Stolar, Sahar Hasan, Kevin Chan (REU), Hichem Smaoui (École Polytechnique, Paris), Benoit Carrier (École Polytechnique, Paris), James Magargee (REU), Mark Lombardi, Adam Steege, Nicholas Mathis (École Polytechnique, Paris), Darren Pagan, Gerald Brantner, David Zhang, Ilana Foni (Brown University), Alexandra Hammerberg, Katherine Adams, Thomas Cahuzac, Laëtitia Dubois (École Polytechnique, Paris), Pierre Turquet de Beauregard (ENSTA, ParisTech), Christopher DiMarco, Michael Carroll, Joseph Barstad, Tizian Bucher, Kyle Doyle, Henry Loughlin, Katie Fisher, Laurent Guin (École Polytechnique, Paris), Sydney Sherman, Christine Capper, Sylvain Quennehen (École Polytechnique, Paris), Néhémie Guillomâitre, Alexander Timaramiebi Taf Vera, Emanuil Yanev, James Palladino, Breanna Johnson, Camille Guérin (ENSTA-ParisTech), Chengke Fan, Young Jae Ryu, Christopher Ennis, Han-Ting (Tim) Wang

Senior Visitors

- Vivek Shenoy.....January 2011 to June 2011
 - Professor, Brown University
- Dongyun Lee.....February 2018 to January 2019
 - Associate Professor, Pusan National University, Republic of Korea
- François Voruz, M.D.November 2022 to October 2023
 - Surgeon, Department of Otolaryngology – Head and Neck Surgery, Hôpitaux Universitaires de Genève, Geneva, Switzerland

Postdoctoral Researchers

- Dongyun Lee September 2004 to February 2007
 - Current Position: Professor, Pusan National University, Republic of Korea
- Benjamin Fragneaud June 2007 to November 2009
 - Current Position: Professor of Physics at Universidade Federal de Juiz de Fora, Brazil
- Muin Öztö October 2011 to December 2011
 - Current Position: Principal at Mastercard Data & Services
- Carl Dahlberg (Swedish-American Foundation Fellow) February 2012 to June 2013
 - Current Position: Researcher and Lecturer at Swedish Royal Institute of Technology
- Kim Lau Nielsen (Visiting Scientist from Technical University of Denmark) March 2013 to May 2013
 - Current Position: Associate Professor at Technical University of Denmark
- Hirobumi Watanabe (Associate Research Scientist) July 2013 to June 2017
 - Neural interface engineer at Kernel
- Thomas Rousseau October 2016 to September 2017
 - Chef de Projet Recherche et Développement at FILAB SAS in Dijon, France
- Miguel Torre do Vale Arriaga e Cunha January 2017 to December 2018
 - Quantitative Analyst and Team Leader - BNP Paribas
- Dimitrios Fafalis November 2017 to August 2020
 - Assistant Teaching Professor at Drexel University
- Aykut Aksit September 2022 to June 2023
 - Interim CEO, Haystack Medical, Inc.

Medical Students and Medical Residents in Research Group

- Zhen Jason Qian (NIH Summer Fellow, CU College of Physicians & Surgeons) 06/13–08/13
- Catherine Kelso (Dean's Research Fellow, CU College of Physicians & Surgeons) 07/13–06/14
- James Stevens (Dean's Research Fellow, CU College of Physicians & Surgeons) 05/14–04/15
- Charlotte PrevotEAU (Medical Resident from Hôpital Charles-Nicolle, France) 11/16–10/17
- Daniel Arteaga (CU College of Physicians & Surgeons) 07/17–06/18
- Michelle Yu (Dean's Research Fellow, CU College of Physicians & Surgeons) 01/18–04/19
- Harry Chiang (CU College of Physicians & Surgeons) 04/18–04/19
- Betsy Szeto (Dean's Research Fellow, CU College of Physicians & Surgeons) 03/19–07/20
- Christopher Valentini (CU College of Physicians & Surgeons) 05/19–04/20
- Stephen Leong (Dean's Research Fellow, CU College of Physicians & Surgeons) 01/21–03/22
- Sharon Feng (Dean's Research Fellow, CU College of Physicians & Surgeons) 03/22–02/23
 - Served as joint advisor along with Anil Lalwani, MD, and Elizabeth Olson, PhD) for Dr. Feng's M.S. in Biomedical Sciences.
 - Thesis title: Microneedle Mediated Inner Ear Drug Delivery for Diagnostic Imaging & Gene Therapy.
- Eugénie Breil (ENT Surgical Resident, Public Hospitals of Paris, Paris, France) 11/22–10/23
 - Served as joint advisor along with Anil Lalwani, MD, and Ghizlene Lahlou, MD (Sorbonne Université) for Dr. Breil's Diplôme de Master 2 degree from Université Paris-Saclay.
 - Thesis title: Évaluation de l'innocuité et de la transduction cellulaire après injection intracochléaire de vecteurs viraux par micro-perforateur dans la fenêtre ronde chez les rongeurs.

University Service

- **Columbia University**

- Faculty Advisor to Naval ROTC.....2016–present
- University Senate Committee on Campus Planning and Physical Development.....2016–2017
- Chair of ROTC Advisory Committee to Provost2011–2016
- University Senate Budget Review Committee2013–2016
- Task Force on Fringe Benefits.....2010–2011
- University Senate Education Committee2009–2014
- University Senate.....2009–2017
- Undergraduate Recruiting
 - ▷ Columbia Engineering Invitationals2010, 2012–2013
 - ▷ Multicultural Recruitment Committee Open House.....2010

- **School of Engineering and Applied Science, Columbia University**

- Promotion and Tenure Committee.....2022–present
- SEAS Dean Search Committee.....2021–2022
- Executive Committee.....2014–2021
- Nominating Committee.....2008–2017
- Engineering Library Space Committee2002–2003

- **Department of Mechanical Engineering**

- Scribe at faculty meetings.....2001–2003
- Colloquium Organizer.....2002–2003
- Undergraduate Committee
 - ▷ Member2001–2005, 2021–2022
 - ▷ Chair.....2011–2014
- Laboratory Committee
 - ▷ Member2001–2003, 2005–2014
 - ▷ Chair.....2004–2005
- Graduate Committee
 - ▷ Member2003–2005, 2010–2011
 - ▷ Chair.....2006–2009
- Executive Committee
 - ▷ Member2008–2014, 2021–present
 - ▷ Chair.....2014–2021
- ABET Committee Member2006–2007
 - ▷ Conduct annual surveys2006–2010
- Departmental liaison with Center for Career Education2005–2008
- Pi Tau Sigma faculty sponsor2005–2014
- Strategic Planning Committee
 - ▷ Chair.....2009–2010
- Department Chair2014–2021
- Faculty advisor for undergraduate Formula SAE race car club2016–present

Symposium and Conference Organization

- Organizing or Scientific Committees for Conferences

- 15th ASCE Engineering Mechanics Division Conference, New York City2002
- North American Manufacturing Research Conference (NAMRC 33), New York City.....2005
- Fourth Biot Conference, New York City2009
- International Symposium on Plasticity, Nassau, Bahamas2013
- International Symposium on Plasticity, Freeport, Bahamas.....2014

-
- International Workshop on Computational Mechanics of Materials, Madrid, Spain.....2014
 - International Symposium on Plasticity, Montego Bay, Jamaica 2015
 - International Symposium on Plasticity, Kona, Hawaii 2016
 - Mach 2016 Scientific Committee, Annapolis, MD 2016
 - Mach 2017 Scientific Committee, Annapolis, MD 2017
 - International Symposium on Plasticity, Puerto Vallarta, Mexico.....2017
 - IUTAM Symposium - Generalized Continua Emerging from Microstructures, Paris 2021
 - Symposia Organization
 - Organized symposia at American Society of Mechanical Engineers (ASME) annual International Mechanical Engineering Congress and Exposition (IMECE).....2002–present
 - Organized symposia at summer meeting with involvement of Applied Mechanics Division and/or Materials Division of American Society of Mechanical Engineers.....2003–2005

Editorial Responsibilities

- Editorial Board Member of *International Journal of Solids and Structures* 2013–present
- Regional Editor of *International Journal of Fracture*..... 2013–present
- Editorial Advisory Board of *International Journal of Plasticity* 2007–2020
- Associate Editor of *ASME Journal of Engineering Materials and Technology* 2010–2013
- Associate Technical Editor of *Experimental Mechanics*.....2007–2013
- Editorial Advisory Board of *The Open Mechanical Engineering Journal*.....2007–2009

Reviewer for Journals and Proceedings

- Acta Materialia
- Applied Surface Science
- Biomedical Microdevices
- Computational Materials Science
- Computer Methods and Programs in Biomedicine
- Engineering Fracture Mechanics
- European Journal of Mechanics – A/Solids
- Experimental Mechanics
- International Journal of Fracture
- International Journal of Mechanical Sciences
- International Journal of Elasticity
- International Journal of Plasticity
- International Journal of Solids and Structures
- iScience
- Journal of Applied Mechanics
- Journal of Applied Physics
- Journal of Engineering Materials and Technology
- Journal of Engineering Mechanics
- Journal of Materials Science
- Journal of Mechanics of Materials and Structures
- Journal of Physics D: Applied Physics
- Journal of Strain Analysis for Engineering Design
- Journal of Materials Science
- Journal of the American Chemical Society
- Journal of the Mechanics and Physics of Solids
- The Laryngoscope
- Materials Characterization
- Materials Chemistry and Physics

-
- Materials Science & Engineering A
 - Materials Science & Technology
 - Materials Today Communications
 - Materials Research Society Symposium Proceedings
 - Mathematics and Mechanics of Solids
 - Mechanics of Materials
 - Mechanics Research Communications
 - Metallurgical and Materials Transactions A
 - Modelling and Simulation in Materials Science and Engineering
 - Nano Letters
 - Nanotechnology
 - Nature Communications
 - Nature Materials
 - Nature Scientific Reports
 - Otology & Neurotology
 - Pharmaceutics
 - Philosophical Magazine
 - Physica Status Solidi
 - Proceedings of the National Academy of Sciences
 - Proceedings of the Royal Society A
 - Science
 - Scripta Materialia
 - The Open Mechanical Engineering Journal
 - Therapeutic Delivery
 - Thin Solid Films
 - Ultramicroscopy

Proposal or Panel Reviewer

- ACS Petroleum Research Fund
- Columbia University RISE
- Deutsche Forschungsgemeinschaft (DFG)
- DOD Army Research Office
- DOE AFCI (Advanced Fuel Cycle Initiative)
- DOE BES (Basic Energy Sciences)
- DOE NEUP (Nuclear Energy University Program)
- European Research Council (ERC)
- Kentucky Science and Engineering Foundation (R&D Excellence Program)
- NSF CMMI Mechanics of Materials
- NSF CMMI Mechanics of Materials and Structures
- NSF CMMI (CAREER Award Review Panel)
- NSF DMR Metals
- NSF DMR Metals (CAREER Award Review Panel)
- NSF GRFP (Graduate Research Fellowship Program)
- NSF MWN (Materials World Network)
- NSF OISE (Cooperative Activities Program)
- Oak Ridge National Laboratory Proposal Review Committee (PRC) for the SHaRE User Facility
- U.S. Civilian Research and Development Foundation (CRDF)
- Vanderbilt University (IDGP)

Program Reviewer

- DOE-sponsored Predictive Science Academic Alliance Program (PSAAP) at Caltech

-
- Member of Review Team 2008
 - Chair of Review Team 2009–2011

Technical Committee Memberships

- American Society of Mechanical Engineers (ASME)
 - Fracture Mechanics Technical Committee
 - Experimental Mechanics Technical Committee
- Society for Experimental Mechanics
 - MEMS & Nanotechnology
 - Fracture & Fatigue

Teaching Experience

- Columbia University, Department of Mechanical Engineering
 - MECE E1001, Mechanical Engineering: Micromachines to Jumbo Jets
 - MECE E3018, Mechanical Engineering Laboratory I
 - ENME E3105, Mechanics
 - MECE E3401, Mechanics of Machines
 - MECE E6422, Elasticity I
 - MECE E6423, Elasticity II
 - MEEM E6432, Small Scale Mechanical Behavior

Peer Reviewed Archival Journal Publications

- [1] S. Dj. Mesarovic and J. W. Kysar, “Continuum aspects of directionally dependent cracking of an interface between copper and alumina crystals”, *Mechanics of Materials*, volume 23, number 4, pages 271–286 (1996).
- [2] J. W. Kysar, “Effects of strain field on light in crack opening interferometry”, *International Journal of Solids and Structures*, volume 35, number 1-2, pages 33–49 (1998).
- [3] J. W. Kysar, “Directional dependence of fracture in copper/sapphire bicrystal”, *Acta Materialia*, volume 48, number 13, pages 3509–3524 (2000).
- [4] J. W. Kysar, “Continuum simulations of directional dependence of crack growth along a copper/sapphire bicrystal interface. Part I: Experiments and crystal plasticity background”, *Journal of the Mechanics and Physics of Solids*, volume 49, number 5, pages 1099–1128 (2001).
- [5] J. W. Kysar, “Continuum simulations of directional dependence of crack growth along a copper/sapphire bicrystal interface. Part II: Crack tip stress/deformation analysis”, *Journal of the Mechanics and Physics of Solids*, volume 49, number 5, pages 1129–1153 (2001).
- [6] J. W. Kysar, “Crack-opening interferometry at interface of transparent materials and metals”, *Experimental Mechanics*, volume 41, number 1, pages 52–57 (2001).
- [7] J. W. Kysar, “Path of light in near crack tip region in anisotropic medium and under mixed-mode loading”, *International Journal of Solids and Structures*, volume 38, number 34-35, pages 5963–5973 (2001).
- [8] J. W. Kysar and C. L. Briant, “Crack tip deformation fields in ductile single crystals”, *Acta Materialia*, volume 50, number 9, pages 2367–2380 (2002).
- [9] J. W. Kysar, “Energy dissipation mechanisms in ductile fracture”, *Journal of the Mechanics and Physics of Solids*, volume 51, number 5, pages 795–824 (2003).

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- [10] H. Chen, Y. L. Yao, and J. W. Kysar, “Spatially resolved characterization of residual stress induced by micro scale laser shock peening”, *Journal of Manufacturing Science and Engineering*, volume 126, number 2, pages 226–236 (2004).
 - [11] H. Chen, J. W. Kysar, and Y. L. Yao, “Characterization of plastic deformation induced by microscale laser shock peening”, *Journal of Applied Mechanics*, volume 71, number 5, pages 713–723 (2004).
 - [12] H. Chen, Y. Wang, J. W. Kysar, and Y. L. Yao, “Advances in microscale laser shock peening”, *Tsinghua Science and Technology*, volume 9, number 5, pages 506–518 (2004).
 - [13] H. Chen, Y. Wang, J. W. Kysar, and Y. L. Yao, “Systematical characterization of material response to microscale laser shock peening”, *Journal of Manufacturing Science and Engineering*, volume 126, number 4, pages 740–749 (2004).
 - [14] H. Chen, Y. L. Yao, J. W. Kysar, I. C. Noyan, and Y. Wang, “Fourier analysis of X-ray micro-diffraction profiles to characterize laser shock peened metals”, *International Journal of Solids and Structures*, volume 42, number 11-12, pages 3471–3485 (2005).
 - [15] J. W. Kysar, Y. X. Gan, and G. Mendez-Arzuza, “Cylindrical void in a rigid-ideally plastic single crystal. Part I: Anisotropic slip line theory solution for face-centered cubic crystals”, *International Journal of Plasticity*, volume 21, number 8, pages 1481–1520 (2005).
 - [16] Y. Gan, D. Lee, X. Chen, and J. W. Kysar, “Structure and properties of electrocodeposited Cu-Al₂O₃ nanocomposite thin films”, *Journal of Engineering Materials and Technology*, volume 127, number 4, pages 451–456 (2005).
 - [17] G. Cao, X. Chen, and J. W. Kysar, “Strain sensing of carbon nanotubes: Numerical analysis of the vibrational frequency of deformed single-wall carbon nanotubes”, *Physical Review B*, volume 72, number 19, article 195412, pages 1–6 (2005).
 - [18] G. Cao, X. Chen, and J. W. Kysar, “Apparent thermal contraction of single-walled carbon nanotubes”, *Physical Review B*, volume 72, number 23, article 235404, pages 1–6 (2005).
 - [19] Y. X. Gan, J. W. Kysar, and T. L. Morse, “Cylindrical void in a rigid-ideally plastic single crystal II: Experiments and simulations”, *International Journal of Plasticity*, volume 22, number 1, pages 39–72 (2006).
 - [20] S. Banerjee, S. Jia, D. I. Kim, R. D. Robinson, J. W. Kysar, J. Bevk, and I. P. Herman, “Raman microprobe analysis of elastic strain and fracture in electrophoretically deposited CdSe nanocrystal films”, *Nano Letters*, volume 6, number 2, pages 175–180 (2006).
 - [21] G. Cao, X. Chen, and J. W. Kysar, “Thermal vibration and apparent thermal contraction of single-walled carbon nanotubes”, *Journal of the Mechanics and Physics of Solids*, volume 54, number 6, pages 1206–1236 (2006).
 - [22] D. Lee, M. Zhao, X. Wei, X. Chen, S. C. Jun, J. Hone, E. G. Herbert, W. C. Oliver, and J. W. Kysar, “Observation of plastic deformation in freestanding single crystal Au nanowires”, *Applied Physics Letters*, volume 89, number 11, article 111916, pages 1–3 (2006).
 - [23] G. Cao, X. Chen, and J. W. Kysar, “Numerical analysis of the radial breathing mode of armchair and zigzag single-walled carbon nanotubes under deformation”, *Journal of Applied Physics*, volume 100, number 12, article 124305, pages 1–10 (2006).
 - [24] D. Lee, X. Wei, M. Zhao, X. Chen, S. C. Jun, J. Hone, and J. W. Kysar, “Plastic deformation in nanoscale gold single crystals and open-celled nanoporous gold”, *Modelling and Simulation in Materials Science and Engineering*, volume 15, number 1, S181–S192 (2007).
 - [25] D. Lee, S. Jia, S. Banerjee, J. Bevk, I. P. Herman, and J. W. Kysar, “Viscoplastic and granular behavior in films of colloidal nanocrystals”, *Physical Review Letters*, volume 98, number 2, article 026103, pages 1–4 (2007).
 - [26] D. Lee, Y. X. Gan, X. Chen, and J. W. Kysar, “Influence of ultrasonic irradiation on the microstructure of Cu/Al₂O₃, CeO₂ nanocomposite thin films during electrocodeposition”, *Materials Science and Engineering A*, volume 447, number 1-2, pages 209–216 (2007).

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- [27] D. Lee, X. Wei, X. Chen, M. Zhao, S. C. Jun, J. Hone, E. G. Herbert, W. C. Oliver, and J. W. Kysar, “Microfabrication and mechanical properties of nanoporous gold at the nanoscale”, *Scripta Materialia*, volume 56, number 5, pages 437–440 (2007).
 - [28] H. Chen, Y. Wang, J. W. Kysar, and Y. L. Yao, “Study of anisotropic character induced by microscale laser shock peening on a single crystal aluminum”, *Journal of Applied Physics*, volume 101, number 2, article 024904, pages 1–8 (2007).
 - [29] Y. X. Gan and J. W. Kysar, “Cylindrical void in a rigid-ideally plastic single crystal III: Hexagonal close-packed crystal”, *International Journal of Plasticity*, volume 23, number 4, pages 592–619 (2007).
 - [30] G. Cao, X. Chen, J. W. Kysar, D. Lee, and Y. X. Gan, “The mean free path of dislocations in nanoparticle and nanorod reinforced metal composites and implication for strengthening mechanisms”, *Mechanics Research Communications*, volume 34, number 3, pages 275–282 (2007).
 - [31] Y. X. Gan, C.-S. Wei, M. Lam, X. Wei, D. Lee, J. W. Kysar, and X. Chen, “Deformation and fracture behavior of electrocodeposited alumina nanoparticle/copper composite films”, *Journal of Materials Science*, volume 42, number 13, pages 5256–5263 (2007).
 - [32] Y. Wang, H. Chen, J. W. Kysar, and Y. L. Yao, “Response of thin films and substrate to micro-scale laser shock peening”, *Journal of Manufacturing Science and Engineering*, volume 129, number 3, pages 485–496 (2007).
 - [33] J. W. Kysar, Y. X. Gan, T. L. Morse, X. Chen, and M. E. Jones, “High strain gradient plasticity associated with wedge indentation into face-centered cubic single crystals: Geometrically necessary dislocation densities”, *Journal of the Mechanics and Physics of Solids*, volume 55, number 7, pages 1554–1573 (2007).
 - [34] X. Wei, D. Lee, S. Shim, X. Chen, and J. W. Kysar, “Plane-strain bulge test for nanocrystalline copper thin films”, *Scripta Materialia*, volume 57, number 6, pages 541–544 (2007).
 - [35] U. Borg and J. W. Kysar, “Strain gradient crystal plasticity analysis of a single crystal containing a cylindrical void”, *International Journal of Solids and Structures*, volume 44, number 20, pages 6382–6397 (2007).
 - [36] Y. Wang, J. W. Kysar, and Y. L. Yao, “Analytical solution of anisotropic plastic deformation induced by micro-scale laser shock peening”, *Mechanics of Materials*, volume 40, number 3, pages 100–114 (2008).
 - [37] U. Borg, C. F. Niordson, and J. W. Kysar, “Size effects on void growth in single crystals with distributed voids”, *International Journal of Plasticity*, volume 24, number 4, pages 688–701 (2008).
 - [38] Y. Wang, Y. Fan, J. W. Kysar, S. Vukelić, and Y. L. Yao, “Microscale laser peen forming of single crystal”, *Journal of Applied Physics*, volume 103, number 6, article 063525, pages 1–8 (2008).
 - [39] C. Lee, X. Wei, J. W. Kysar, and J. Hone, “Measurement of the elastic properties and intrinsic strength of monolayer graphene”, *Science*, volume 321, number 5887, pages 385–388 (2008).
 - [40] J. W. Kysar, “Direct comparison between experiments and computations at the atomic length scale: A case study of graphene”, *Scientific Modeling and Simulation*, volume 15, number 1-3, pages 143–157 (2008).
 - [41] S. Jia, S. Banerjee, D. Lee, J. Bevk, J. W. Kysar, and I. P. Herman, “Fracture in electrophoretically deposited CdSe nanocrystal films”, *Journal of Applied Physics*, volume 105, number 10, article 103513, pages 1–9 (2009).
 - [42] J. Weissmüller, R. C. Newman, H.-J. Jin, A. M. Hodge, and J. W. Kysar, “Nanoporous metals by alloy corrosion: Formation and mechanical properties”, *MRS Bulletin*, volume 34, number 8, pages 577–586 (2009).
 - [43] S. Vukelić, J. W. Kysar, and Y. L. Yao, “Grain boundary response of aluminum bicrystal under micro scale laser shock peening”, *International Journal of Solids and Structures*, volume 46, number 18-19, pages 3323–3335 (2009).

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- [44] S. Vukelić, Y. Wang, J. W. Kysar, and Y. L. Yao, “Comparative Study of Symmetric and Asymmetric Deformation of Al Single Crystal Under Microscale Laser Shock Peening”, *Journal of Mechanics and Materials of Structures*, volume 4, number 1, pages 89–105 (2009).
 - [45] Y. Wang, J. W. Kysar, S. Vukelić, and Y. L. Yao, “Spatially Resolved Characterization of Geometrically Necessary Dislocation Dependent Deformation in Microscale Laser Shock Peening”, *Journal of Manufacturing Science and Engineering*, volume 131, number 4, article 041014, pages 1–9 (2009).
 - [46] S. Vukelić, Y. N. Wang, J. W. Kysar, and Y. L. Yao, “Dynamic Material Response of Aluminum Single Crystal Under Microscale Laser Shock Peening”, *Journal of Manufacturing Science and Engineering*, volume 131, number 3, article 031015, pages 1–10 (2009).
 - [47] X. Wei, B. Fragneaud, C. A. Marianetti, and J. W. Kysar, “Nonlinear elastic behavior of graphene: *Ab initio* calculations to continuum description”, *Physical Review B*, volume 80, number 20, article 205407, pages 1–8 (2009).
 - [48] C. Lee, X. Wei, Q. Li, R. Carpick, J. W. Kysar, and J. Hone, “Elastic and frictional properties of graphene”, *physica status solidi (b)*, volume 246, number 11-12, pages 2562–2567 (2009).
 - [49] J. W. Kysar, Y. Saito, M. S. Öztö, D. Lee, and W. T. Huh, “Experimental lower bounds on geometrically necessary dislocation density”, *International Journal of Plasticity*, volume 26, number 8, pages 1097–1123 (2010).
 - [50] O. Okman, D. Lee, and J. W. Kysar, “Fabrication of crack-free nanoporous gold blanket thin films by potentiostatic dealloying”, *Scripta Materialia*, volume 63, number 10, pages 1005–1008 (2010).
 - [51] S. Vukelić, I. C. Noyan, J. W. Kysar, and Y. L. Yao, “Characterization of Heterogeneous Response of Al Bicrystal Subject to Micro Scale Laser Shock Peening”, *Experimental Mechanics*, volume 51, number 5, pages 793–796 (2011).
 - [52] Y. Saito and J. W. Kysar, “Wedge Indentation into Elastic-Plastic Single Crystals, 1: Asymptotic Fields for Nearly-Flat Wedge”, *International Journal of Plasticity*, volume 27, number 10, pages 1640–1657 (2011).
 - [53] C. J. Gardner, J. Kacher, J. Basinger, B. L. Adams, M. S. Öztö, and J. W. Kysar, “Techniques and applications of the simulated pattern adaptation of Wilkinson’s method for advanced microstructure analysis”, *Experimental Mechanics*, volume 51, number 8, pages 1379–1393 (2011).
 - [54] X. Wei and J. W. Kysar, “Residual plastic strain recovery driven by grain-boundary diffusion in nanocrystalline thin films”, *Acta Materialia*, volume 59, number 10, pages 3937–3945 (2011).
 - [55] O. Okman and J. W. Kysar, “Fabrication of Crack-Free Blanket Nanoporous Gold Thin Films by Galvanostatic Dealloying”, *Journal of Alloys and Compounds*, volume 509, number 22, pages 6374–6381 (2011).
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 - [281] J. W. Kysar, T. Rousseau, and W. Wang, “Experimental Recovery of the Plastic Distortion from Multiplicative Decomposition of the Deformation Gradient Tensor”, American Society of Mechanical Engineers 2019 International Mechanical Engineering Congress and Exposition, Salt Lake City, UT, 2019.
 - [282] J. W. Kysar, “Rapid Response to Design and Manufacture Face Shields”, COVID-19 Virtual Symposium, Zuckerman Institute, Columbia University, New York, NY, 2020.
 - [283] J. W. Kysar, “Delivery of Therapeutics into the Inner Ear via Perforation of the Round Window Membrane”, Virtual Symposium on Experimental Solid Mechanics, Indian Institute of Science, Bengaluru, India, 2020.
 - [284] J. W. Kysar, “Microneedles to Safely Perforate the Round Window Membrane Fabricated via Hybrid Additive Manufacturing Process”, Association for Research in Otolaryngology 2021 Virtual MidWinter Meeting, 2021.

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- [291] J. W. Kysar, “Behavior of light in crack opening interferometry”, Northeast Graduate Student Symposium on Mechanics, Kingston, RI, 1997.
- [292] J. W. Kysar, “Effects of strain field on the behavior of light in crack opening interferometry”, Joint American Society of Mechanical Engineers (ASME), American Society of Civil Engineers (ASCE), Society of Engineering Sciences (SES) Summer Meeting, Evanston, IL, 1997.
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- [294] J. W. Kysar, “Orientational dependence of interfacial fracture in bicrystals”, NATO Advanced Study Institute on the Physical Aspects of Fracture, Cargèse, Corsica, France, 2000.
- [295] J. W. Kysar, “Intergranular fracture in symmetric tilt aluminum bicrystals”, ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, 2000.
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- [297] J. W. Kysar, “Crack tip deformation fields in aluminum single crystals”, ASCE Engineering Mechanics Division Conference, New York City, NY, 2002.
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- [299] J. W. Kysar, “Kink Shear Sector Boundaries in Single Crystal Crack Tip Fields”, 14th U.S. National Congress on Theoretical and Applied Mechanics, Blacksburg, Virginia, 2002.
- [300] J. W. Kysar, “Brittle to Ductile Transition in Intermetallic Alloys”, Materials Research Society, Symposium BB, Fall Meeting, Boston, MA, 2002.
- [301] J. W. Kysar, “Indentation Deformation Fields: Measurement of Lattice Rotation and Curvature”, International Conference on the Mechanical Behaviour of Materials, Geneva, Switzerland, 2003.
- [302] J. W. Kysar, “Measurement of Lattice Rotation and Curvature at Microscale in Single Crystals”, Society for Experimental Mechanics Conference, Charlotte, North Carolina, 2003.
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 - [323] J. W. Kysar and Y. X. Gan, “Measurement of geometrically necessary dislocation density associated with indentation in single crystals”, 2005 McMat Mechanics and Materials Conference, Baton Rouge, LA, 2005.

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- [351] M. Yilmaz and J. W. Kysar, "Integration of Nano Scale Thin-film Samples with MEMS Actuators during Fabrication", Materials Research Society, Symposium FF, Fall Meeting, Boston, MA, 2009.
- [352] T. Kramer, J. W. Kysar, and I. P. Herman, "Poster Presentation: Investigation of the Mechanical Properties of High Nanoparticle Loading Fraction Polymer Nano-Composites", Materials Research Society, Symposium FF, Fall Meeting, Boston, MA, 2009.
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- [356] M.S. Öztop, J. W. Kysar, B. L. Adams, and C. J. Gardener, "On Determining Length Scales in Plasticity With Lower Bound Geometrically Necessary Dislocation Densities", Society for Experimental Mechanics, Indianapolis, IN, 2010.
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