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**Inaugural annual report**

The School of Mechanical and Materials Engineering (MME) at Washington State University is committed to delivering a world-class education to our students and engaging in cutting edge research for society’s benefit. We are also committed to continuous improvement, which begins with measuring and tracking various performance indicators for the School. Indicators include such metrics as degrees awarded, enrollment trends, number of faculty, extramural research support, research publications, student scholarships, and student demographics. The purpose of this annual report is to summarize that data in a concise and meaningful format. This is our inaugural annual report, and it is our plan to continue to track our progress by issuing a report in the first quarter of each calendar year.

**Record number of students**

In 2014 we continued to see significant growth in our undergraduate mechanical engineering program. We awarded 191 baccalaureate degrees in 2014, including 13 BS degrees in Materials Science and Engineering and 178 BS degrees in Mechanical Engineering, making us the largest mechanical engineering program in the Northwest, as measured by BS degrees awarded. Our undergraduate student numbers have doubled in the past decade. The year 2014 was also a historic high for our graduate programs, particularly in the number of PhD students. In fall 2014 there were 156 graduate students advised by faculty in the School of MME. The total number of PhD students in Mechanical Engineering has jumped from 26 in 2005 to 67 in 2014. Likewise, the number of PhD students in Materials Science and Engineering advised by MME faculty has increased from 18 in 2005 to 41 in 2014.

**New hires**

To keep up with this rapid growth, we hired several new faculty members to provide the unique and transformative educational experiences that allow our students to succeed, and we are searching for up to eight additional faculty to start in 2015/2016. In 2014 we welcomed four new tenure track faculty to Pullman. These new faculty were selected from a pool of over 400 applicants:

- Qizhen (Katherine) Li, hired as an associate professor, an expert in lightweight metals, materials synthesis, and processing; previously at University of Nevada, Reno.
- Rahul Panat, hired as an associate professor, an expert in manufacturing, microelectronics/flexible electronics, Li-ion batteries; previously at Intel.
- Arda Gozen, hired as an assistant professor, an expert in manufacturing processes, micro-nano manufacturing, flexible-stretchable electronic devices; previously at Carnegie Mellon University.
- Min Kyu Song, hired as an assistant professor, an expert in energy technologies (batteries, fuel cells, supercapacitors) and rational design of materials and manufacturing technologies; previously at UC Berkley.
We also hired three new clinical faculty, Dr. Nandita Biswas, Dr. Iman Salehinia, and Dr. Behrang Asgharian, and one new part time instructor, Peter Jung, in Everett. Finally, we welcomed Lauren Wells to the school as Senior Secretary.

**Awards and honors**

Our faculty, staff, and students continued to win personal recognition in 2014:

- Cill Richards was elected Fellow of ASME.
- Amit Bandyopadhyay was elected Fellow of the National Academy of Inventors.
- Charles Pezeshki earned the Sahlin Faculty Excellence Award for Instruction.
- Graduate student Ian Richardson earned a Space Technology Research Fellowship from NASA.
- Kurt Hutchinson, Michael Shook, and Pam Loughlin earned Crimson Spirit Awards in March, June, and August 2014, respectively.
- Yuehe Lin was listed among the world’s most cited researchers by Thomson Reuters.
- Susmita Bose received the Richard M. Fulrath award from the American Ceramic Society.
- Senior ME student, Breanna Bence, was selected by the college as the CEA Outstanding Senior.
- Tyler Strom, was selected by the college as the CEA Employee of the Year for his work as undergraduate academic coordinator in MME and coordinator for the branch campus undergraduate programs.
- Thanks to Lloyd Smith’s Sports Science Laboratory, Washington State University was selected as one of the nation’s top 5 sports engineering programs in the nation by the Seattle Post-Intelligencer.
- Eight mechanical engineering seniors in WSU's mechanical engineering program in Bremerton were named as co-inventors on two patents in 2014. Two of the Bremerton senior design teams worked with Eagle Harbor Holdings to develop two patents. For each patent, four students were named as the inventors. The total number of Bremerton mechanical engineering students who have been listed as co-inventors on patents since 2010 is 22.

**Milestones and promotions**

We celebrated several milestones in 2014:

- The first 23 students from our mechanical engineering program at WSU North Puget Sound at Everett received their diplomas in May.
- The School of MME awarded $170,650 in scholarships to 101 students. These scholarships were provided by generous gifts from over 30 different donors. We celebrated these scholarships with a scholarship recognition ceremony and reception in September.
- We inducted 147 graduating students and friends of the school into the Order of the Engineer, with two induction ceremonies in Pullman (one in the spring and one in the fall), and additional ceremonies in Bremerton and Everett. The Order of the Engineer induction ceremony is a tradition in the School of MME, and emphasizes pride and responsibility in the engineering profession.
In addition, several of our faculty and staff have earned promotions in 2014.

- Kelvin Lynn was promoted to the rank of Regents Professor—a rank which can be held by no more than 30 Washington State University faculty members at any one time. Kelvin was honored at the Celebration of Excellence Dinner at Showcase in March.
- Sinisa Mesarovic was promoted to Full Professor.
- Steve Brown was promoted to Senior Instructor

**New programs**

We started several new programs in 2014:

- We launched the new Center for Bioplastics and Biocomposites (CB²) with a kick-off meeting in Ames, IA. This new NSF funded Industry/University Cooperative Research Center (I/UCRC) is co-located at Washington State and Iowa State and includes 23 member companies supporting research projects through their annual membership dues to the center.
- A new $1.8 million NIH research grant, led by Susmita Bose and Amit Bandyopadhyay, on improving the way bone implants integrate into the body began in 2014.
- John McCloy started two projects in 2014 related to vitrified nuclear waste from the Department of Energy, one titled “Compositional dependence of glass corrosion associated with nepheline formation” from the DOE Office of River Protection, and another titled “Apatite and sodalite based glass-bonded waste forms for immobilization of 129I and mixed halide radioactive wastes” in collaboration with Rutgers University from the DOE Office of Nuclear Energy.
- Katie Zhong began a new project from the US Department of Agriculture’s Agriculture and Food Research Initiative (AFRI) on “Applying Abundant Plants to Develop Battery Materials and Benefits to the Agricultural Economy.”
- Kelvin Lynn was awarded a $750K grant from the DOE’s Proliferation Detections Program which will result in the production of a clearly documented innovative cadmium zinc telluride (CZT) crystal growth system for use of room temperature radiation detectors, which is critical to the Nation’s security.
- Our faculty participated in five different Joint Center for Aerospace Technology Innovation (JCATI) projects in 2014.
- With a $3 million donation from the estate of Robert Stewart, we established the Robert Stewart Memorial Scholarship Fund to support $120,000 per year in scholarships to WSU students from Bremerton and surrounding counties pursuing degrees in our engineering program in Bremerton.

And, of course, we continued to do great science and engineering. In 2014 our faculty led advances in fields ranging from biomaterials to energy storage. Some of their most significant accomplishments the past year include:

- Katie Zhong and her research team developed a chewing gum-like battery material that can dramatically improve the safety of lithium ion batteries.
• Jinwen Zhang and his research team developed a biodegradable gel made mostly from soy protein that can absorb more than 250 times its weight in water and could help farmers retain moisture in drought-stricken fields.
• A research team led by Grant Norton and Su Ha developed a fuel cell that can directly convert liquid fuels, such as jet fuel or gasoline, to electricity—providing a dramatically more energy-efficient way to create electric power for planes or cars.

I think you will find the School of MME is continuing to build on the tradition of excellence established through generations of outstanding students, faculty, and staff at WSU. I would welcome hearing from you about your thoughts for the School’s future. Please feel free to contact me by phone at 509-335-8654 or by email at MichaelR.Kessler@wsu.edu.

Mike Kessler
Berry Family Director and Professor
MME Statistics

Undergraduate Education

BS Degrees Awarded

Female BS Enrollment

Mechanical Engineering

BS Enrollment

Minority BS Enrollment

Materials Science & Engr.

BS Enrollment

Undergraduate Diversity

Percent Female Enrollment - ME: 8.3%
Percent Female Enrollment - MSE: 17.2%
Percent Minority Enrollment - ME: 26.3%
Percent Female Enrollment - ME: 27.6%
Undergraduate Certification

Certified MME Students

% of Pullman ME Applicants Certified

New Pullman ME Students Certified Each Year

New MSE Students Certified Each Year
**Certification Requirements**

Students apply for certification after completing Math 171, Math 172, Chem 105, Chem 106 (for MSE only), Phys 201, and CE 211.

The School of MME establishes the total number of students certified into the ME and MSE programs.

Applicants are ranked based on the average GPA of math, science, and engineering courses taken at WSU.

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**Graduate Education**

**PhD Degrees Awarded**

- PhD ME
- PhD MSE (MME advised)
- PhD EngS (MME advised)

**MS Degrees Awarded**

- MS ME
- MS MSE

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**PhD Enrollment**

**MS Enrollment**

- ME MS Students
- MSE MS Students
MME Statistics

Domestic/International Graduate Enrollment

US News & World Report Graduate School Ranking

Female Graduate Enrollment

Graduate Student Support (Fall Semester)

Graduate Teaching Assistants 38
Graduate Research Assistants 51
Graduate Fellowships 8
Self-Supported 32

Minority Graduate Enrollment
### MME Statistics

#### Graduate Recruitment

**Grad. Applications**
(MS ME, MS MSE, PhD ME)

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>International</th>
</tr>
</thead>
<tbody>
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<td>2013</td>
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<td>2014</td>
<td>141</td>
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</table>

**Conversion: Ratio of RA & TA Offers to Acceptance Ratio**

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</tr>
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<tr>
<td>2013</td>
<td>2.00</td>
</tr>
<tr>
<td>2014</td>
<td>1.50</td>
</tr>
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</table>

**Number of New Grad Students Enrolled**

<table>
<thead>
<tr>
<th>Year</th>
<th>Enrolled with own support</th>
<th>Enrolled with other support</th>
<th>Enrolled with RA or TA</th>
</tr>
</thead>
<tbody>
<tr>
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<td>7</td>
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</tr>
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<tr>
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<tr>
<td>2013</td>
<td>4</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>2014</td>
<td>20</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>
Departmental Operations

**Personnel (Full-Time Equivalent)**

- Tenure and Tenure-Track Faculty (Pullman): 29.5
- Non-Tenure Teaching Faculty: 11
- Non-Tenure Research Faculty and Post-Docs: 7
- AP and Classified Staff: 9.5

**Research Expenditures**


**Research Expenditures per TTF**


**New Research Grants Awarded**


**Permanent Budget Line**

(by Fiscal Year; Note the Everett and Bremerton positions were made permanent in FY14)

MME Statistics

Total Gift Productions & Scholarships (by Fiscal Year)

- Amount in MME expendable accounts
- Amount added to endowments

MME Scholarship Awards (by Fiscal Year)

Research Sponsors

US Department of Agriculture
Army Research Office
National Institutes of Health
Department of Energy
NASA
National Science Foundation
Sandia National Laboratories
AFOSR
Battelle - ORNL
Battelle - PNNL
Battelle - INL
Rutgers University (DOE project)
FAA
US Department of Commerce
NIST
Life Science Discovery Fund
University of Washington - JCATI
Texas A&M - Qatar Foundation
The Boeing Company
Odysseus Technologies
Insitu, Inc.
Semiconductor Research Corporation
Amateur Softball Association
Johns Hopkins University
Washington Research Foundation
**MME Statistics**

**Journal Publications with MME School Affiliation**
(from Scopus Database)

**Faculty Research**

- Journal Papers Published: 184
- Conference Papers Published: 48
- Sections/Chapters in Books: 5
- Books: 2
- Patents: 9
- Doctoral Dissertations: 10
- Master’s Theses: 16

**Named Faculty Positions**

- **Berry Family Director**
  Dr. Michael Kessler

- **Herman and Brita Lindholm Endowed Chair in Metallurgy**
  Dr. Amit Bandyopadhyay

- **Herman and Brita Lindholm Endowed Chair in Metallurgy**
  Dr. Susmita Bose

- **Westinghouse Distinguished Professorship in Materials Science and Engineering**
  Dr. Wiehong (Katie) Zhong

**Professional Society Fellows**

- **American Association for the Advancement of Science**
  Dr. Amit Bandyopadhyay
  Dr. Yuehe Lin
  Dr. Kelvin Lynn
  Dr. Hussein M. Zbib

- **American Ceramic Society**
  Dr. Amit Bandyopadhyay
  Dr. Susmita Bose

- **American Institute for Medical and Biological Engineering (AIMBE)**
  Dr. Amit Bandyopadhyay
  Dr. Susmita Bose
  Dr. Yuehe Lin

- **The American Physical Society**
  Dr. Kelvin Lynn

- **American Society for Materials (ASM International)**
  Dr. Amit Bandyopadhyay
  Dr. David P. Field

- **American Society of Mechanical Engineers**
  Dr. Jow-Lian Ding
  Dr. Prashanta Dutta
  Dr. Sankar Jayaram
  Dr. Uma Jayaram
  Dr. Hussein M. Zbib

- **National Academy of Inventors**
  Dr. Amit Bandyopadhyay

- **North American Thermal Analysis Society**
  Dr. Michael Kessler

- **Royal Society of Chemistry**
  Dr. Yuehe Lin
Spring 2014 – Pullman

**Heat Exchanger Tube Insertion Device – Colmac Coil Manufacturing Inc.**
Alyssa Antes, Steffen Vinding Nyden, Bernabe Gallardo, D J Kawashima, Alex McSheridan, Ron Lindhe, Jesse Howard

**Low Cost Prosthetics for Developing Nations – Sierra Leone Ankle**
Eric Shults, Andrew Harring, Jared Byers, Lowell Troyer, Veronica Perez, Prabin Pandey, Kassiopeia Smith, Cesar Nunez

**Cart Mover System – Genie Industries**
Taylor Olson, Andrew Hayward, Ben Edwards, Andrew Terrell, Spencer Croom, Brandon Ellerman

**Heat Exchanger Tube Insertion Device – Colmac Coil Manufacturing Inc.**
Alyssa Antes, Steffen Vinding Nyden, Bernabe Gallardo, D J Kawashima, Alex McSheridan, Ron Lindhe, Jesse Howard

**Chemically Powered Quadrotor – Hydrogen Properties for Energy Research (HYPER) Lab, WSU**
Jesse Kysar, Sean Elliott, Kenneth Rea, Thomas Malchodi, John Brenteson, Hayden Grimbly

**Load Cell Calibration – Intel Corp.**
Trevor Hart, Casey Emery, Jimmy Wolfrom, Forrest Queen, Kit Arbogast, Vinh Chouaychath

**Pneumatic Control Systems Tester – Kenworth/PACCAR**
Spencer Mattausch, Sultan Nafisah, Stephanie Smolinski, Blake DeMars, Garrett Radley, Max Robinson

**SAMPE Composite Bridge Competition – MME SAMPE Student Section**
Alexander Sanchez, Edward Crawford, Max Burdick, Tyler Bakes, Joseph Bray, Kevon Zadeh

**Kevlar Blanket Attachment System – Lifeport/Sikorsky**
Dawn Keehnell, Fiona Heath, Patrick Carlson, Kevin Doty, Shaun Federighi, Nick Krehoff

Microsoft Surface Debonder Oven – Microsoft Corp.
Daniel Peters, Yu-Chung Chang, John Freitag, Hunter Gabriele, Eric Schwartz, Allison Dullin, Jonathon Lueck, Sean Cysewski

Bark–Gravel Separator – Weyerhaeuser Co.
Ryan Barr, William DeLashmutt, John Melter, Aaron Dost, Blake Miyazaki, Tomas Whitehall

Fall 2014 – Pullman

**Insert Cutter Replacement – Boeing Co.**
Russell McDonald, Connor Hollis, Herman Yuen, Alex McNeill, Stetson Steiger, Jordon Gerry, Clinton Mochizuki, Sean Durick, Michael Moloney, Tim Mitchell, Alexander Mattson, Jon Stucky, Tu Huynh, Eli Shoemake

**Microsoft Surface Debonder – Microsoft Corp.**
Donald Osborne-Moss, Nicholas Wang, Kyle Weber, Justin Erickson, Jonathan Hrehoj, Matthew Weydert, Brian Ellsworth

**Quadcopter for Orangutan Tracking – ConservationDrones.org**
Alex Olason, Casey Carte, David Nguyen, Jessie Salmonson

**Fairing Attachment for Truck Delivery – Kenworth/PACCAR**
Bob Johnson, Alan Vandegrift, Angelica Santos, Sean Brinkmann, Austin Heinrich

**Low-cost ankle for Developing Nations – Mobility Outreach International**
Kai Reckinger, Austin Melvin, Blake Digiovanni, Teagan Ryan

**Helicopter Blade Bonding Attachment Methods – Hertelendy Research**
Caleb Huxford, Xavier Pina, Ian Nelson, Dylan Hudspeth

**Bend Test Fixture for Nuclear Safeguards Work – Pacific Northwest National Lab**
Colleen McInnis, Marc Simm, Greg Tashjian, Ethan Fitzpatrick, Hovey Moore

**Reactor Core Simulator for Pressurized Water Reactors – Pacific Northwest National Lab**
Senior Design Projects

Andy Kwon, Rodrigo Guerrero, Ben Luce, Martin Nerbovig, Ronny Schack

Boiling Water Reactors – Pacific Northwest National Lab
Keith Ferguson, Matthew Filer, Seth Larsen, Nathan Pindras, David Hsu

Spring 2014 – Bremerton
Cutting the Ropes: Getting into the Backcountry (Split Board binding design) – Eagle Harbor Holdings
Ryan Duff, Daniel Uebele, Katie Aspen, Melissa Helwig

Reinventing the Wheel (Lug-free vehicle wheel design) – Eagle Harbor Holdings
Christopher Allbee, Greg Rivers, Justin Craven, Ashton Alexander

Hydraulic Safety Relief Valve Test Stand – Puget Sound Naval Shipyard
James Clark, Jessica Carlson, Lisa Luong, Cody Rogers

Automated Fuel Delivery (Feeding wood fuel into a cookstove) – BURN Manufacturing
Forest Carlson, Scott Carlson, Christopher Eudaily, Ted Gerhard

Jet Fuel Pump and Pipeline Design – Manchester Fuel Depot Navy Base
Crisanto DeGuzman, Ryan Clark, Michael Stojack, Alexander Su

Spring 2014 – Everett
Lightweight Structural Partition (Team 1) – Boeing Co.
Thomas Arnold, Sean Dailey, Brittney Atterbury

Lightweight Structural Partition (Team 2) – Boeing Co.
Nathaniel Oppie, Yan Lopatin, Milen Kosev, Stephanie Tu

Case Type Joint Designs – Boeing Co.
Ashton Danitschek, Jefri Djunaidi, Lisandro Mercado, Sergey Fomin

Adjustable Pressure Indicating Dec-Lam Tool (Team 1) – Boeing Co.
Dane Grubaugh, Emily Nesting, James Swartz, Allen Wahlman

Adjustable Pressure Indicating Dec-Lam Tool (Team 2) – Boeing Co.
Danielle McCauley, David Knoll, Samuel Yossef, Alex Staheli

Stable Cold Water Temperature Sink for WSU ME 406 – WSU-Everett.
Derek Strong, Chris Smith, Sami Jurdi

Brenden Singh, Aldo Bartetta, Josiah Frye
Spring 2014

Alex Sanchez
Faculty Advisor: Amy Wo
Senior Thesis: Dislocation Density Gradient Effects on Mechanical Properties

Jesse Kysar
Faculty Advisor: W. H. Katie Zhong
Senior Thesis: Gummy Electrolyte with high transference number for Lithium Ion Batteries

Kassiopeia Smith
Faculty Advisor: David Field
Senior Thesis: Strengthening of pulled carbon nanotube filaments through ion infusion in HCl

Kevon Zadeh
Faculty Advisor: Lloyd Smith
Senior Thesis: Characterizing Foam in Nike Soccer Shin Guards and Nike Compression Shorts

Yu-Chung Chang
Faculty Advisor: W. H. Katie Zhong
Senior Thesis: The Dispersion Promotion of Graphite Nanoplatelets in Denatured Soy Protein for Polycarbonate Composites

Sean Cysewski
Faculty Advisor: Amy Wo
Senior Thesis: Mechanical Property Mapping along Cracks in Hexagonal Close-Packed Metals

Tyler Schiff
Faculty Advisor: W. H. Katie Zhong
Senior Thesis: High Dispersity Graphene Nanofillers in Polymer Composite Induced by Denatured Soy Protein in Organic Solvent

Thomas Gualtieri
Faculty Advisor: Amit Bandyopadhyay
Senior Thesis: Laser Processing of Calcium Phosphate Reinforced Cobalt Based Alloys for Articulating Surfaces

Fall 2014

Ben Luce
Faculty Advisor: Indranath Dutta
Senior Thesis: Electro-Fountain Pen Lithography (EFPL) Using Liquid Electromigration

Joey Kabel
Faculty Advisor: John McCloy
Senior Thesis: Compositional Dependence of Crystallization in Lithium Aluminosilicate Glasses

Cole Pruitt
Faculty Advisor: Michael Kessler and Yuzhan Li
Senior Thesis: Stoichiometric Effect on Liquid Crystalline Elastomers

Jimmy Wolfrom
Faculty Advisor: John McCloy
Senior Thesis: The Effects of Iron on Aluminosilicate Glass Systems
Hesam Askari, PhD ME  
*Faculty Advisor: H. Zbib*
A continuum dislocation dynamics framework for plasticity of polycrystalline materials

Sindhu Preetham Burugupally, PhD ME  
*Faculty Advisor: C. Richards*
Development of a small scale resonant engine for micro and mesoscale applications

Christopher Chaney, PhD ME  
*Faculty Advisor: K. Matveev*
An investigation of the accuracy of empirical aircraft design for the development of an unmanned aerial vehicle intended for liquid hydrogen fuel

Nathaniel Darnall, PhD ME  
*Faculty Advisor: D. Lin*
Detecting dyskinesia and tremor in people with Parkinson's disease or essential tremor during activities of daily living using body worn accelerometers and machine learning algorithms

Osama Fakron, PhD ME  
*Faculty Advisor: D. Field*
SEM-based electron tomography of turfs comprised of lineal structures

Mohammedmahdi Salavatian, PhD ME  
*Faculty Advisor: L. Smith*
Shear degradation in fiber reinforced laminates due to matrix damage

Hamid Torabi, PhD ME  
*Faculty Advisor: S. Mesarovic*
Micromechanics of carbon nanotube turfs

Zhe Leng, PhD MSE  
*Faculty Advisor: D. Field*
Texture informed crystal plasticity finite element modeling of polycrystalline material deformation

Tian Liu, PhD MSE  
*Faculty Advisor: K. Zhong*
Graphitic polymer nanocomposites: wear performance and wear debris analysis

Rachel Schoeppler, PhD MSE  
*Faculty Advisor: D. Bahr*
Nanoscale strengthening mechanisms in metallic thin film systems
Annie Chawla, MS ME
Faculty Advisor: C. Richards
Compressor assisted air-cooled single effect absorption chiller

Peter Damstedt, MS ME
Faculty Advisor: L. Smith
1-dimensional microvascular network in carbon composite for enhanced radiographic imaging

Anirudh Deshpande, MS ME
Faculty Advisor: S. Benerjee
Atomistic modeling of ionic liquid based electrolytes for lithium batteries

Gwen Ellis, MS ME
Faculty Advisor: C. Richards
A remote access laboratory for fluids education in mechanical engineering

Amaninder Singh Gill, MS ME
Faculty Advisor: G. Ameta
Quantification of uncertainty in life cycle analysis

Varun Gupta, MS ME
Faculty Advisor: L. Smith
The effect of adhesive bondline thickness on joint strength

Preetam Mohapatra, MS ME
Faculty Advisor: L. Smith
Finite element analysis of adhesively bonded wide area LAP shear joints

Christopher Starke, MS ME
Faculty Advisor: L. Smith
Multi-axial testing of carbon composite cylinders

Kale Warren Harrison, MS MSE
Faculty Advisor: G. Norton
MoO$_2$: a mixed conductivity oxide for solid oxide fuel cell applications

Sean Hoover, MS MSE
Faculty Advisor: S. Bose
Silver doped resorbable tricalcium phosphate ceramic and polycaprolactone composite scaffolds for bone grafts

Cheng-Han Hsu, MS MSE
Faculty Advisor: Y. Gu
Simulation of Study on Electrostatics and Electrical Transport in Semiconductor Nanowire Schottky Diodes

Yang Li, MS MSE
Faculty Advisor: L. Li
Salted liquid lens shape change under electrostatic field and a fabrication method of biconvex microlens array

Yuanyuan Liu, MS MSE
Faculty Advisor: J. Ding
Experimental characterization of the deformation and fracture behavior of carbon nanofillers reinforced high density polyethylene under quasi-static and dynamic compressive and tensile loadings

Chad Nixon, MS MSE
Faculty Advisor: J. Leachman
Design, construction, and characterization of a target cryostat for positron moderation studies

Wenrui Yang, MS MSE
Faculty Advisor: V. Yadama
Resin transfer molding (RTM) of wood strands reinforced composite panels

Linxiao Zhao, MS MSE
Faculty Advisor: D. Field
In situ EBSD observation of grain boundary migration during annealing on copper
School Organization

Michael R. Kessler
Professor and Director

Administrative Manager
Gayle Landeen

A/P Staff
Academic Coordinators
Mary Simonsen
Priscilla Hastay
Tyler Strom
Marisa Naylor
Pam Loughlin

Clerical Staff
Fiscal Specialist 2
Lauren Wells
Timeslip Clerical Assts.

Graphic Designer
Michelle White

Faculty
Pullman, Bremerton, Everett
(Professors, Associate Professors,
Assistant Professors, Clinical Professors, Instructors)
Gaurav Ameta
Yuehe Lin
Amit Bandyopadhyay
Jin Liu
Soumik Banerjee
Kelvin Lynn
Xiaopeng Bi
Konstantin Matveev
Nandita Biswas
Sinisa Mesarovic
Susmita Bose
M. Grant Norton
Steve Brown
Rahul Panat
Jow-Lian Ding
Charles Pezeshki
Indranath Dutta
Marvin Pitts
Prasha nta Dutta
Cill Richards
David Field
Robert Richards
B Arda Gozen
Iman Salehinia
Kurt Hutchinson
Lloyd Smith
Sankar Jayaram
Min Kyu Song
Uma Jayaram
Brad Thompson
Peter Jung
Amy Wo
Jacob Leachman
Hussein Zbib
Lei Li
Jinwen Zhang
Qizhen Li (Katherine)
Weihong Zhong

Adjunct Faculty

Post-Docs and Visiting Scholars

AP Staff:
Research Project Engineer, Lab Manager

Lab Technicians, Research Technologists

Student Employees
RA/TAs, timeslip

Technical Staff
Information Systems Coordinator
Robert Lentz

Technical Staff
Information Systems Manager
Michael Shook
MME Faculty

School Director

Michael R. Kessler - Berry Family Director and Professor
Joined MME in 2013
Ph.D. in Theoretical and Applied Mechanics from University of Illinois at Urbana-Champaign in 2002

Dr. Kessler’s research interests include processing and characterization of polymer composites, bio-based polymers, multifunctional- and nano-composites, materials with self-healing functionality, and thermal analysis of polymers.

Regents Professor

Kelvin G. Lynn - Regents Professor
Joined MME in 1996
Ph.D. in Materials Science and Engineering from University of Utah in 1974

Dr. Lynn’s research interests include solid state and surface physics, defects in semiconductors and metals, photovoltaic materials, room temperature radiation detectors, thermal stimulated spectroscopies, positron interactions in solids, micro-electrical and mechanical systems, growth of semiconductors and oxide crystals, and energy harvesting.

Pullman Campus: Professors

Amit Bandyopadhyay - Herman and Brita Lindholm Endowed Chair Professor
Joined MME in 1997
Ph.D. in Materials Science and Engineering from University of Texas at Arlington in 1995

Dr. Bandyopadhyay’s research interests include processing of ceramics, metals and composites using rapid prototyping; load bearing and non-load bearing implants; patient specific implants; laser processing of materials; microwave sintering of ceramics; and piezoelectric micromachined ultrasonic transducers (pMUTs) for medical imaging and therapeutics.

Susmita Bose - Herman and Brita Lindholm Endowed Chair Professor
Joined MME in 1998
Ph.D. in Physical-Organic Chemistry from Rutgers University in 1998

Dr. Bose’s research interests include nanoscale surface modification of medical devices, and nanoparticles in protein/drug delivery; resorbable ceramics and composited in bone tissue engineering using 3-D printing technology; microwave and plasma processing of materials; in vitro bone cell material interactions; and piezoelectric micromachined ultrasonic transducers (pMUTs) for medical imaging and therapeutics and Ceramic gas sensor.

Jow-Lian Ding - Professor and Associate Director
Joined MME in 1983
Ph.D. in Engineering from Brown University in 1983

Dr. Ding’s research interests include dynamic response of materials and structures (experimental characterization, modeling, and simulation), shock dynamics, thermo-mechanics, electrodynamics, stress-induced phase transformation.

Indranath Dutta - Professor
Joined MME in 2008
Ph.D. in Materials Science and Engineering from the University of Texas at Austin, in 1988.

Dr. Dutta’s research interests include multi-physics phenomena in materials Science; near-interface effects in multi-component materials, with emphasis on materials for microelectronics; materials reliability in micro-systems and composites; and electrically-activated manufacturing at nano to meso scales.
Prashanta Dutta - Professor
Joined MME in 2001
Ph.D. in Mechanical Engineering from Texas A&M University in 2001

Dr. Dutta’s research interests include microfluidics; ion mobility spectrometry; multiscale modeling and simulation of biological flow; electrokinetic flow, mixing, separation and concentration; and micro fuel cell and battery for energy conversion.

David P. Field - Professor
Joined MME in 2000
Ph.D. in Mechanical Engineering from Yale University in 1991

Dr. Field’s research interests include physical and mechanical metallurgy, metal deformation and recrystallization, crystallographic texture, grain boundary structure, thin film and IC interconnect structure/properties relationships, and advanced experimental techniques.

Sankar Jayaram - Professor
Joined MME in 1993
Ph.D. in Mechanical Engineering from Virginia Tech in 1989
(on leave of absence in 2014)

Dr. Jayaram’s research interests include virtual assembly and virtual manufacturing; virtual reality applications for engineering design and manufacturing; haptics integrated in CAD for virtual assembly/disassembly; parametric and feature-based design; data translation and interoperability Collaborative, internet-based design; sustainability in engineering design and manufacturing; and standards for assembly representation and for sustainable manufacturing systems.

Yuehe Lin - Professor
Joined MME in 2013
Ph.D. in Environmental Chemistry from University of Idaho, Moscow, ID in 1997

Dr. Lin’s research interests include synthesis and characterization of functional nanomaterials; materials and devices for sensing, bioimaging, and drug delivery; materials and systems for water monitoring and treatment; nanomaterials for fuel cells, batteries, and supercapacitors; electrochemistry, electrocatalysis and photoelectrocatalysis; and immunosensors, paper and microfluidic biosensors for biomarker detection.

Sinisa Mesarovic - Professor
Joined MME in 2001
Ph.D. in Engineering Sciences from Harvard University in 1996

Dr. Mesarovic’s research interests include plasticity of crystals and interfaces; micromechanics of granular materials; computational methods for coupled moving boundaries problems (phase transformations, wetting); collective behavior of carbon nanotubes; multiscale/multiphysics modeling; contact and adhesion mechanics.

M. Grant Norton - Professor and Dean Honors College
Joined MME in 1991
Ph.D. in Materials from Imperial College, London in 1989.

Dr. Norton’s research interests include ceramic materials, nanotechnology; and clean technology.

Charles Pezeshki - Professor
Joined MME in 1988
Ph.D. in Mechanical Engineering from Duke University in 1987

Dr. Pezeshki’s research interests include global engineering and design of high-performance work environments; development strategies for transcultural understanding for innovation communities; understanding the relationships between design structure, knowledge structure, and organizational social structure in innovation communities; neuroscience and collective intelligence exercises; project-based and experiential learning; and visualization in eco-design, and sustainability education.
School Organization

Cecilia D. Richards - Professor
Joined MME in 1992
Ph.D. in Mechanical Engineering from University of California at Irvine in 1990

Dr. Richard’s research interests include MEMS power, advanced energy systems, spray combustion, two-phase flows, and air breathing engines.

Robert F. Richards - Professor
Joined MME in 1992
Ph.D. in Mechanical Engineering from University of California at Irvine in 1990

Dr. Richard’s research interests include heat transfer, thermodynamics, and micro-electro-mechanical systems (MEMS).

Lloyd V. Smith - Professor
Joined MME in 1996
Ph.D. in Mechanical Engineering from University of Utah in 1994

Dr. Smith’s research interests include composite materials (multi-axial characterization, damage and failure modeling, environmental degradation) and sports science (experimental bat and ball performance, numeric modeling of sport ball impacts, protective equipment and head injury).

Hussein M. Zbib - Professor
Joined MME in 1988
Ph.D. in Mechanical Engineering and Engineering Mechanics from Michigan Technical University in 1987

Dr. Zbib’s research interests include mechanics (multiscale modeling, numerical analysis, plasticity, composites, materials instabilities, damage and fracture) and materials (dislocation theory, dislocation dynamics, crystal plasticity, defects, radiation effects, nanomaterials).

Weihong (Katie) Zhong - Professor
Joined MME in 2007
Ph.D. in Materials Science from Beijing University of Aeronautics and Astronautics in 1994

Dr. Zhong’s research interests include battery materials and renewable energy materials, nanocomposites and multifunctional materials, composite manufacturing technology, and electronic materials.

Pullman Campus: Associate Professors

Uma Jayaram - Associate Professor
Joined MME in 1994
Ph.D. in Mechanical Engineering from Virginia Tech in 1991

Dr. Jayaram's research interests include semantic web and semantic applications for engineering design and knowledge management; ontologies for collaboration and communication between engineering applications and engineering communities; environments for retention of design information and skills; virtual reality for design evaluations and training; CAD/CAM and APIs (Application Program Interfaces) in CAD; product LifeCycle Management; integrated frameworks for engineering tools in design and manufacturing; and sustainability considerations in engineering.

Qizhen (Katherine) Li - Associate Professor
Joined MME in 2014
Ph.D. in Materials Science and Engineering, The Ohio State University, 2004

Dr. Li’s research interests include advanced materials (e.g., light weight materials and structures, nanoporous materials, nanocomposites, nanostructured multilayered thin films, lattice block structures) for structural, energy, and bio-applications; nano and micro fabrication/manufacturing, and materials synthesis/processing; mechanical behavior of materials, nano/micro-mechanics, fatigue and fracture; relationship among processing, structure and property of advanced materials; biomaterials and biomechanics, bone/dental implant materials, biomedical applications of shape memory alloys, magnesium alloys, and titanium alloys.
Konstantin Matveev - Associate Professor
Joined MME in 2006
PhD in Mechanical Engineering from the California Institute of Technology, in 2003

Dr. Matveev’s research interests include high-performance marine craft, ground-effect aerodynamics, free-surface hydrodynamics, unmanned aerial and marine vehicles, and thermoacoustics.

John McCloy - Associate Professor
Joined MME in 2013
Ph.D. in Material Science and Engineering from the University of Arizona in 2008

Dr. McCloy’s research interests include nuclear waste forms, radiation effects on materials, magnetic materials and properties, optical ceramics and glasses, electronic transport, sensors.

Rahul Panat - Associate Professor
Joined MME in 2014
Ph.D. in Theoretical and Applied Mechanics from the University of Illinois at Urbana-Champaign, 2004

Dr. Panat’s research interests include manufacturing, microelectronics/flexible electronics, Li-ion batteries, thermal barrier coatings, and thermodynamics.

Jinwen Zhang - Associate Professor
Joined MME in 2012, with WSU from 2004
Ph.D. in Polymer Science, University of Massachusetts, 1997

Dr. Zhang’s research interests include synthesis, processing and application development of biobased polymer materials; structure and properties of polymer blends and composites; polymer foaming and fiber spinning technologies; polymer stabilization and flame retardancy; and polymer hydrogels and controlled release.

Pullman Campus: Assistant Professors

Gaurav Ameta - Assistant Professor
Joined MME in 2008
Ph.D. in Mechanical Engineering, Arizona State University, 2006

Dr. Ameta’s research interests include design issues in additive manufacturing; sustainable design of product and it’s life cycle; geometric dimensioning and tolerances (tolerance analysis and allocation); and geometric problems in design, manufacturing and inspection.

Soumik Banerjee - Assistant Professor
Joined MME in 2011

Dr. Banerjee’s research interests include nanoscale transport phenomena, molecular modeling of materials, organic photovoltaic solar cells, modeling electrolytes in Li batteries, and synthesis and properties of carbon nanostructures.

Arda Gozen - Assistant Professor
Joined MME in 2014
Ph.D. in Mechanical Engineering, Carnegie Mellon University, 2012

Dr. Gozen’s research interests include manufacturing processes and equipment, micro-nano manufacturing, manufacturing with soft-matter (e.g. elastomers, functional liquids etc.), and flexible-stretchable electronic devices.

Jacob Leachman - Assistant Professor
Joined MME in 2010
PhD in Mechanical Engineering from the University of Wisconsin-Madison, in 2010

Dr. Leachman’s research interests include hydrogen, deuterium, tritium and mixtures; small, modular hydrogen liquefier design; thermophysical property modelling and
measurement; rocket and space stage vehicle design; cryogenics; liquid hydrogen fueling of unmanned aerial systems/vehicles (UAS/UAV).

Lei Li - Assistant Professor
Joined MME in 2013
Ph.D. in Industrial and Systems Engineering from The Ohio State University in 2009

Dr. Li’s research interests include precision engineering optical manufacturing, micro/nano manufacturing, micro-electro-mechanical systems (MEMS).

Jin Liu - Assistant Professor
Joined MME in 2012
Ph.D. in Mechanical Engineering, Johns Hopkins University, 2008

Dr. Bandyopadhyay’s research interests include multiscale modeling and simulation; fluid mechanics, turbulent flow and computational fluid dynamics; micro/nano-fluidic and bio-fluidics; electrokinetic transport and electrowetting; modeling of mesoscale molecule adhesion and targeted drug delivery.

Min Kyu Song - Assistant Professor
Joined MME in 2015
Ph.D. in Materials Science and Engineering from Georgia Tech in 2011

Dr. Song’s research interests include rational design of materials/interfaces and manufacturing technologies; energy technologies (batteries, fuel cells, supercapacitors and smart windows); environmental technologies (electrochemical synthesis of fuels and electrochemical desalination/deionization of water); bio-inspired materials and processes for energy and the environment; structure-property relations in materials and solid-state electrochemistry; and advanced healthcare materials and devices.

Tri-Cities Campus: ME Faculty (not including clinical or adjunct faculty)

Amir Ameli - Assistant Professor
Joined MME in 2015
Ph.D. in Mechanical Engineering, University of Toronto, Canada, 2011

Dr. Ameli’s research interests include multifunctional polymer composites (processing and characterization); nano/micro-structured materials for fuel cells, batteries, and supercapacitors; smart materials and devices for sensors and actuators; green composites for biomedical applications and environmental sustainability; advanced cellular composites for electromagnetic, thermal, and acoustic insulation; modeling and simulation of manufacturing processes and multifunctional properties; and advanced manufacturing.

Joseph Iannelli - Professor
Joined MME in 2014
Ph.D. in Engineering Science with focus in CFD and Aerospace Engineering, the University of Tennessee, Knoxville, 1991

Dr. Iannelli’s research interests include high-performance engineering and scientific computing; minimal-storage iterative numerical linear algebra solvers; computational and theoretical fluid dynamics; finite element algorithms and analysis; numerical analysis; software development; aerodynamics; aeronautical propulsion, including gas turbines, ramjets, and scramjets; chemically reacting aerospace flows; cooperative education programs; and economic development; international-Education initiatives involving universities, businesses, and multinational corporations.

Changki Mo - Assistant Professor
Joined MME in 2010
Ph.D. in Mechanical Engineering from University of Oklahoma in 1996

Dr. Mo’s research interests include vehicular and structural vibration control; energy harvesting; shape memory polymers for morphing systems; micro transducers including actuators, sensors, and energy harvesters; fruit picking robot
Pullman Instructional Faculty

**Nandita Biswas** - Clinical Assistant Professor
Joined MME in 2014
Ph. D. in Mechanical Engineering from Washington State University, 2013

**Steve Brown** - Senior Instructor
Joined MME in 2007
M.S. in Civil Engineering/Sanitary Engineering from University of Idaho in 1974

**L Giancarlo Corti** - Clinical Assistant Professor
Joined MME in 2012
Ph.D. in Mechanical Engineering from University of Idaho, 2006

**Robert (Kurt) Hutchinson** - Instructor
Joined MME in 2012, Joined CEA in 1987

**Iman Salehinia** - Clinical Assistant Professor
Joined MME in 2014
PhD in Mechanical Engineering from Washington State University, 2013

**Pui Ching (Amy) Wo** - Assistant Research Professor
Joined MME in 2012
Ph.D. in Mechanical Engineering (Materials Science), University of Hong Kong, 2006.

Bremerton Campus Faculty

**Behrang Asgharian** - Clinical Assistant Professor
Joined MME in 2013
PhD in Mechanical Engineering from Washington State University in 2013

**Marvin J Pitts** - Clinical Professor and Program Coordinator
Joined MME in 2010
Ph.D., Agricultural Engineering

**Everett Campus Faculty**

**Xiaopeng Bi** - Clinical Associate Professor
Joined MME in 2012
Ph. D. in Aerospace Engineering from University of Illinois at Urbana-Champaign in 2003

**Peter Jung** - Instructor
Joined MME in 2014
MS in Mechanical Engineering from San Diego State University

**Brad Thompson** - Clinical Professor and Program Coordinator
Joined MME in 2012
Ph.D., in Mechanical Engineering from the University of Washington in 2007
Pullman Research Faculty

Annie D. Du - Research Professor
Joined MME in 2013
PhD in Chemistry from Nanjing University, China in 2005

Chengzhou Zhu - Research Associate
Joined MME in 2014
PhD in Chemistry from Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, China, 2013

Thomas F. Garrison - Clinical Assistant Professor
Joined MME in 2013
PhD in Chemistry, Iowa State University, 2013

Vijay Kumar - Staff Scientist
Joined MME in 2013
Ph.D. in Polymer Chemistry from National Institute of Technology, India in 2009

Yuzhan Li - Staff Scientist
Joined MME in 2014
PhD in Materials Science and Engineering from Iowa State University, 2014

Pullman Research Associates

Ming Liu - Research Associate
Joined MME in 2014
PhD in Materials Engineering from University of Kentucky, 2012

Lutz Meinshausen - Research Associate
Joined MME in 2014
PhD in electronics at the Leibniz Universität Hannover and the Université Bordeaux I, Germany and France, 2014

Emeritus Faculty

Stephen D. Antolovich - Emeritus Professor
Joined MME in 1992; Ph.D. in Materials Science from University of California, 1966

Walter J. Grantham - Emeritus Professor
Joined MME in 1978; Ph.D. in Aerospace Engineering from University of Arizona in 1973

John P. Hirth - Emeritus Professor
Joined MME in 1988; Ph.D. in Metallurgical Engineering from Carnegie-Mellon University in 1958

Richard G. Hoagland - Emeritus Professor
Joined MME in 1987; Ph.D. in Metallurgical Engineering from The Ohio State University in 1973

David V. Hutton - Emeritus Professor
Joined MME in 1981; Ph.D. in Engineering Science and Mechanics from Virginia Polytechnic Institute and State University in 1974

William E. Johns - Emeritus Associate Professor
Joined MME in 1978; Ph.D. in Wood Science from University of Minnesota in 1972

D. Bruce Masson - Emeritus Professor
Joined MME in 1960; Ph.D. in Chemistry from The University of Chicago in 1958

Larry C. Olsen - Emeritus Professor
Joined MME in 1981; Ph.D. in Physics from University of Kansas in 1965

B. R. Ramaprian - Emeritus Professor
Joined MME in 1985; Ph.D. in Mechanical Engineering from University of Waterloo, Ontario, Canada in 1969

David E. Stock - Emeritus Professor
Joined MME in 1972; Ph.D. in Mechanical Engineering from Oregon State University in 1972

Timothy R. Troutt - Emeritus Professor
Joined MME in 1980; PhD, in Mechanical Engineering from Oklahoma State University, 1978
School Organization

MME Staff

Tahni Arndt
Administrative Assistant – Sports Science Lab

Priscilla Hastay
Academic Coordinator

Gayle Landeen
Administrative Manager

Robert Lentz
Assistant for Facilities

Pam Loughlin
Academic Coordinator, Everett

Marisa Naylor
Academic Coordinator

Karen Osborn
Program Assistant, Bremerton

Don Shearer
Assistant Director of External Relations

Michael R. Shook
Assistant for Computing

Mary Simonsen
Graduate Academic Coordinator

Tyler Strom
Academic Coordinator

Lauren Wells
Fiscal Specialist II

Michelle White
Graphic Designer/Photographer
School Organization

MME Advisory Board

Greg J. Bogen  
Columbia Energy and Environmental Services, Inc.  
Richland, Washington  
WSU grad: BS 1993, ME

Scott Brandenburg  
Thales Aerospace - US  
Bellevue, WA

Jarrod Carter  
Origin Engineering, LLC  
Liberty Lake, WA  
WSU grad: BS 1989, ME

Jeff Castleberry  
Insitu  
Bingen, WA  
WSU grad: BS 1989, ME

William Chambers  
PACCAR Technical Center  
Mount Vernon, WA

Trevor Devaney  
Hi-Rel Laboratories, Inc.  
Spokane, WA

Sandy K. Fryer  
Fryer Industries, Inc.  
Orinda, CA  
WSU grad: BS 1969, ME

Gene Jones  
Vancouver, WA  
WSU grad: BS 1980, ME

George McEachen  
The Boeing Company  
Seattle, WA  
WSU grad: BS 1985, ChemE

Jacob Montero  
Kenworth  
Kirkland, WA  
WSU grad: BS 2005, ME

Randal J. Morrison  
Hewlett-Packard  
Vancouver, WA  
WSU grad: BS 2006 ME

David Rohrig  
Pacific Northwest National Laboratory  
Richland, WA  
WSU grad: MEM 2004

Eric Sorenson  
Blue Origin  
Kent, WA  
WSU Grad: BS, 1985, MSE

Elaine Thomas  
Bradken-Atlas  
Tacoma, WA  
WSU grad: BS 1976, MSE

Jason Tripard  
Microsoft Corporation  
Bellevue, WA  
WSU grad: BS 1994 ME

Christy L. Turner  
Sandia National Laboratories  
Livermore, CA  
WSU grad: BS 2001, ME MS 2002, MSE

John P. Whitlock  
Inspired Light LLC  
Corvallis, OR  
WSU grad: BS 1981


Publications


Huso, J., Che, H., Thapa, D., Morrison, J. L., Grant Norton, M., & Bergman, L. (2014). Phonon dynamics and anharmonicity in phase segregated structural domains of MgZnO film.
Publications


Publications


Publications


