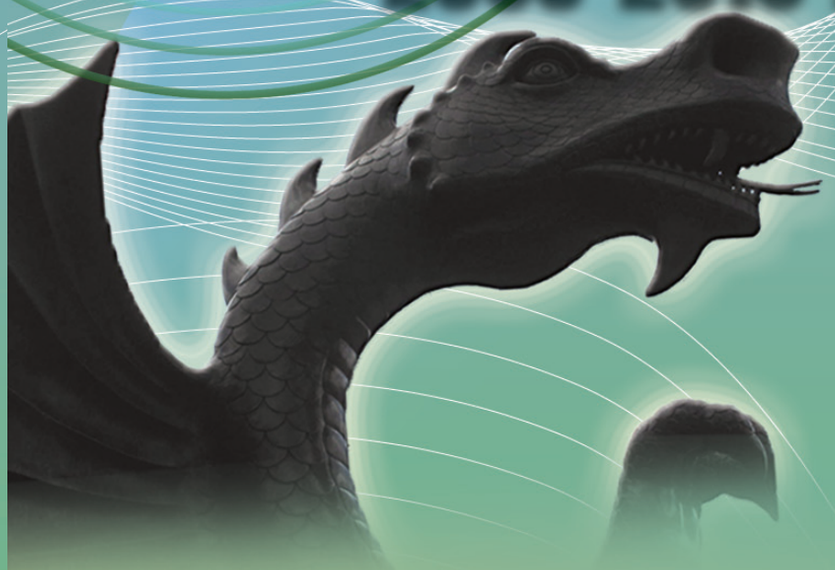
College of Engineering

Mechanical Engineering & Mechanics

2009-2010 Annual Report



Drexel UNIVERSITY

www.mem.drexel.edu

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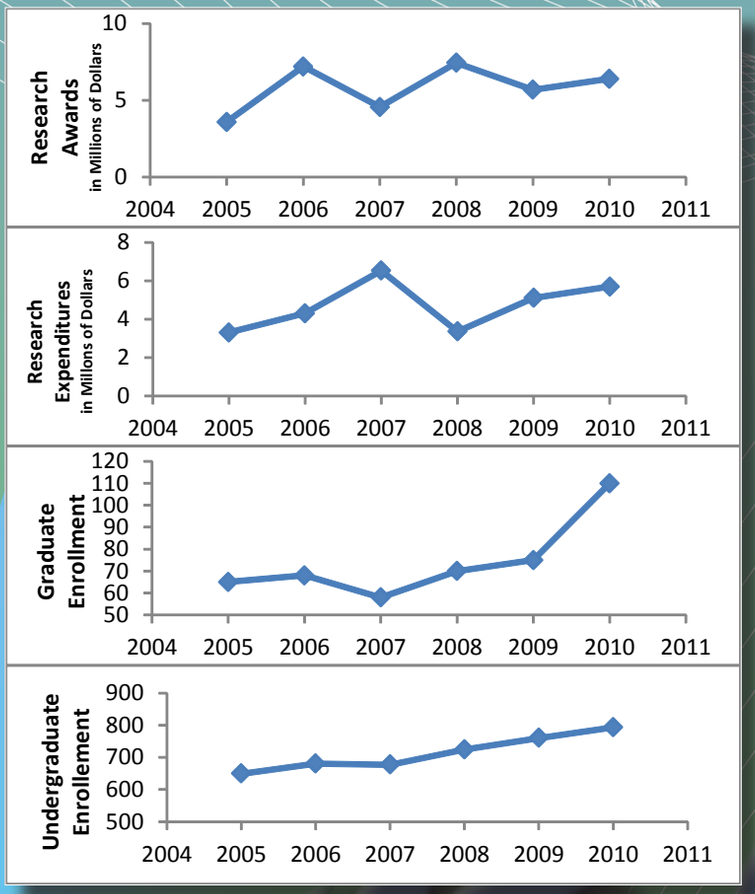
The mission of the Department of Mechanical Engineering and Mechanics of Drexel University is to encourage and enable knowledge through the education of engineers for leadership in industry, business, academia, and government, and the establishment of internationally recogniz.

2009-2010 HIGHLIGHTS



Co-op

- Percentage of Students Placed in Co-op Positions in 2009-10: 96.9%
- Average Co-op Salaries in 2009-10: $16,844.88
- Popular Co-op Employers (top 10): NAVSEA, Synthes, CDI Corporation, Johnson & Johnson, Volvo Powertrain North America, Exelon Corporation, Boeing Corporation, Army Research Laboratory, Johnson Matthey Inc, Lockheed Martin, Philadelphia Water Department, Arora Engineers, Inc.

Tenure-Track Faculty	27
Auxiliary Faculty	2
Undergraduate Students	793
Master's Students	33
Doctoral Students	77
B.S. Awarded	141
M.S. Awarded	49
Ph.D. Awarded	13
New Research Awards	$6.4M
Research Expenditures	$5.7M
Journal Articles Published	74

From The Department Head

It's with great pride that I present our 2009-2010 annual report. While the economy is slowly beginning to show signs of improvement, our department has been fortunate enough this past year to continue experiencing steady growth.

Spring's commencement exercises saw 141 bachelor's degrees, 49 master's degrees and 13 doctoral degrees awarded to our students while this fall we welcomed 200 new undergraduate students and 34 new graduate students. We are also proud to announce the addition of Assistant Professor Dr. Matthew McCarthy to our faculty. Matthew earned his doctorate in Mechanical Engineering from Columbia University in 2006 and gained post-doctoral experience at University of Maryland, College Park, and at Massachusetts Institute of Technology, Cambridge. Matthew's research will focus on micro/nano-scale fluid mechanics for thermal management applications and micro/nano-fabricated energy conversion and storage devices.

The department received several new research awards totaling $6.4M including a DoE GAANN award (Kalidindi, Clyne, Lowman, Cox, Lim, Urias, Hanna), awards from NASA (Kwatny, Chang), ONR (Kalidindi, Doherty), ARO (Kalidindi, Nikolov, Kim), Energy Commercialization Institute (Fridman), AHA (Clyne) as well as several NSF awards (Kim, Noh, Kumbur, Sun, Kalidindi). These awards are a testament to the highest quality of research conducted by our faculty, the novelty of their ideas, and their important contributions to the betterment of the quality of life for our world through engineering and science.

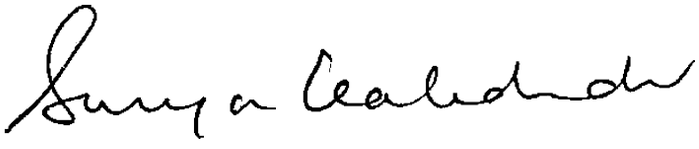
Our students are the foundation of the department and continue to surpass our expectations. This year, we had two graduate students receive the NSF Graduate Research Fellowship (Kevin Freedman and U Kei Cheang), and another receive the UNCF-Merck Graduate Science Research Dissertation Fellowship (Dannielle Figueroa). Nathan Taylor (a member of the ME class of 2010 and now a graduate student in the department) was awarded the ASME Charles T. Main award for service and leadership. This is just a sample of our students' accomplishments, and there are many others listed in this report.

This past summer saw the kick off of the department's first NSF Research Experiences for Undergraduates Program (Kalidindi, Clyne, Kumbur, Sun) centered in the areas of medicine, energy and advanced manufacturing. We invite you to read more about the program featured in this report.

In closing, I invite you to explore this report and learn more about our recent activities. Join us electronically on Facebook and LinkedIn and if you happen to be in the Philadelphia area, please stop by to say hello. We'd be happy to have you visit us in person.

We invite you to learn more about the opportunities that our department has to offer at www.mem.drexel.edu.

Cheers,



Surya Kalidindi
Department Head and Professor
skalidin@coe.drexel.edu

People

FACULTY

Jonathan Awerbuch *(Ph.D., Technion)*
Professor

Franco Capaldi *(Ph.D., MIT)*
Assistant Professor

Nicholas Cernansky *(Ph.D., U C Berkeley)*
Frederic O. Hess Chair Professor

Bor-Chin Chang *(Ph.D., Rice University)*
Professor

Young Cho *(Ph.D., U. of Illinois, Chicago)*
Professor

Bakhtier Farouk *(Ph.D., U. of Delaware)*
J. Harland Billings Professor

Alexander Fridman *(Ph.D., Moscow Institute of Physics)*
John A. Nyheim Chair Professor

Ani Hsieh *(Ph.D., U. of Pennsylvania)*
Assistant Professor

Surya Kalidindi *(Ph.D., MIT)*
Professor and Department Head

MinJun Kim *(Ph.D., Brown)*
Assistant Professor

Antonios Kontsos *(Ph.D., Rice University)*
Assistant Professor

E. Caglan Kumbur *(Ph.D., Penn State)*
Assistant Professor

Harry Kwatney *(Ph.D., U. of Pennsylvania)*
Herbert S. Raynes Professor

Alan Lau *(Ph.D., MIT)*
Professor and Associate Department Head, Graduate Advisor

Matthew McCarthy *(Ph.D., Columbia)*
Assistant Professor

David Miller *(Ph.D., LSU)*
Professor and Associate Department Head for Undergraduate Affairs

Alisa Morss Clyne *(Ph.D., Harvard-MIT)*
P.C. Chou Assistant Professor

Hongseok Noh *(Ph.D., Georgia Tech)*
Associate Professor

Paul Oh *(Ph.D., Columbia)*
Associate Professor

Sorin Siegler *(Ph.D., Drexel)*
Professor

Wei Sun *(Ph.D., Drexel)*
Albert Soffa Chair Professor

Ying Sun *(Ph.D., University of Iowa)*
Assistant Proessor

Tein-Min Tan *(Ph.D., Purdue)*
Associate Professor

James Tangorra *(Ph.D., MIT)*
Assistant Professor

Ajmal Yousuff *(Ph.D., Purdue)*
Associate Professor

Jack Zhou *(Ph.D., NJIT)*
Associate Professor

AUXILIARY FACULTY

Andrei Jablokow *(Ph.D., U. of Wisconsin-Madison)*
Associate Teaching Professor

Jin Kang *(Ph.D., Korea Aerospace University)*
Associate Teaching Professor

Bradley Layton *(Ph.D., Michigan)*
Assistant Professor

AFFILIATED FACULTY

Richard Y. Chiou
Associate Professor, Applied Engineering Technology of the Goodwin College of Professional Studies

Gary Friedman
Electrical & Computer Engineer
Associate Director, A. J. Drexel Plasma Institute
Director of Biomedical Laboratory
Research Assistant Professor

Yury Gogotsi
Trustee Chair Professor of Materials Science & Engineering

Grace Hsuan
Professor of Civil, Architectural & Environmental Engineering

Peter I. Lelkes
Calhoun Chair Professor of Cellular Tissue Engineering, School of Biomedical Engineering, Science & Health Systems

Michele Marcolongo
Associate Professor of Materials Science & Engineering

William Regli
Professor of Computer Science

Jonathan E. Spanier
Associate Professor of Materials Science & Engineering

Antonios Zavaliangos
Department Head and Professor of Materials Science & Engineering

RESEARCH FACULTY

Alexander Rabinovich
Associate Director of A. J. Drexel Plasma Institute
Director of the Fuel Conversion & Hydrogen Production Laboratory
Research Professor

Gregory Fridman
School of Biomedical Engineering
Research Assistant Professor,
Co-director, Plasma Medicine Lab

Alexander Dolgopolsky
Mathematics
Associate Teaching Professor
Director for Special Projects

Gary Nirenberg
Research Engineer
Fuel Conversion & Hydrogen Production Division

EMERITUS FACULTY

Leon Y. Bahar
Pei Chi Chou
Gordon D. Moskowitz
Donald H. Thomas
Albert S. Wang

STAFF

Yelena Alekseyeva
Program Coordinator

Earl M. Bolling
Machinist

George Ciarrocchi
Systems Administrator

Clare Coppa
Administrative Assistant

Kathie Donahue
Executive Assistant

Dustin Doss
Materials Engineering Laboratory Manager, Center for Plasma Processing

Scott E. Eichmann
CNC Machinist

Geri Sue Kneller
Research & Graduate Coordinator

Kristin Imhoff
Education Programs Coordinator

Kate Lang
Finances Manager

Colleen M. Rzucidlo
Recruitment & Publicity Manager

Mark A. Shiber
Machine Shop Director

Alla Skorokhod
Program Manager

Brandon Terranova
Laboratory Manager

Paul P.I Velez
Lead shop machinist

Welcome New Faculty & Staff

Dr. Matthew McCarthy

Matthew McCarthy began his faculty appointment in September as a tenure-track Assistant Professor. Dr. McCarthy was previously a Postdoctoral Associate in the Mechanical Engineering Department at the Massachusetts Institute of Technology, and prior to that, a Postdoctoral Research Associate in the Department of Electrical and Computer Engineering at the University of Maryland. He earned his B.S. degree in Aerospace Engineering from Syracuse University (2002) and both his M.S (2004) and Ph.D. (2006) degrees in Mechanical Engineering from Columbia University, New York. His research at Drexel will focus on multiscale thermofluidics, with particular emphasis on micro and nano scale structures, devices, and systems for small-scale cooling, energy, and sensor applications.

Outside of work, Dr. McCarthy spends most of his time with his newborn son, Cole Brennan McCarthy, and his wife.

Dr. Leslie Lamberson

Leslie Lamberson will be joining the faculty as a tenure-track Assistant Professor in the spring of 2012. She is currently a Postdoctoral Research Scholar at the Johns Hopkins University in the Center for Advanced Ceramic and Metallic Systems. Dr. Lamberson earned her B.S. degree in Aerospace Engineering and B.A. in Dance Performance from the University of Michigan as a Shipman Scholar, M.S. Degree in Aerospace Engineering from the Georgia Institute of Technology as an Amelia Earhart Fellow, and Ph.D. in Aeronautics from the California Institute of Technology as an NSF Graduate Research Fellow and NASA Aeronautics Scholar. Her research investigates the dynamic behavior of materials by exploring damage evolution bridging various time and length scales. Leslie is also an avid ballet dancer and student pilot. She is currently performing with Bowen McCauley Dance (BMD), a Washington Metro Area contemporary dance company, as well as volunteers with BMD's Dance for Parkinson Disease.

Geri Sue Kneller

Geri Kneller started her position as Research and Graduate Coordinator in the Mechanical Engineering Department in the late fall. She brings 10 years of collective experience in higher education including Graduate Recruitment at Lehigh University. She enjoys helping graduate students become successful and strongly believes in the value of a higher education. Geri worked her way through night school to earn a Bachelor of Science in Finance from DeSales University in Center Valley, PA and currently lives in Bethlehem, PA with her 2 cats. Geri ran her 1st 10k run for charity this past Fall and enjoys spending time with her niece and nephew.

Congratulations to all

Bachelor of Science in Mechanical Engineering

* Henry Albert Ahnert IV†
* Paul Opida Alba
Ricardo R. Anderson
John G. Anderson, Jr.
Burke Lee Andrejko
* Vaibhav Arya
Michael Robert Ashleigh
* Daniel L. Baker†
Matthew J. Bechtel
Ryan Leon Bellevou
** Andrew C. Bergan
Stephen J. Berger
***Theodore Auten Bieniosek
Eric J. Bird
* Brian T. Breslin
Mark J. Brown, Jr.
William Harvey Bupp, Jr.
Phillip Westley Calhoun
Bradley Russell Campbell
** John Robert Capone†
Peter Conrad Carrion
* Christopher Michael Cauley
Dean Edward Chanliongco
* U Kei Cheang
Young Woong Choi
Kenneth Church
Nicholas P. Cocca
Allen B. Cochran III
Giancarlo Antonio Cosini
John Alan Crum II
William Michael Danley
*Daniel S. Davenport
Christopher S. DeMichiel
*Christopher R. Dennison†
Sahil Diwan
Jayme C. Dodd
Sean Edward Donahue
Cameron DeKay Douglas
**Robert Ellenberg
Stephen Erdosi
**Stephen Peter Evasic
Casey A. Falls
Evan J. Filter
Brandon John Fischer
*Drew S. Flast
*Brian Daniel Folkes
John M. Fordham
Peter C. Frye
*Dean Hunter Galarowicz
**John Anthony Galleo III
Victor E. Garcia
*Michael Ryan Gartland
*Kevin Anthony Glover
*Jarret Rian Griesemer
William J. Griffin
Karl Patrick Gutwein-Guenther
Rayna Joy Hall
Timothy Allen Harper
**Gary E. Henderson, Jr.
Jimmy Hoac
Brian Homay
David Wade Howard
Joo-Hyun Hwang
Binsu C. John
Prashanth Sidhartha Kande Veera
***Gauri Rajendra Khanolkar
**Sean B. Killeen
Katheryn Ashley Kimmel
Sidrit Kosta
Nicholas Paul Kozlowski
Steven M. Leach, Jr.
Steven K. Leist
**Benjamin E. Letter
Andrew J. Lewandowski
Ta Yau Lin
Victoria c. Lo
Kevin Lyden
Thomas Anthony Madonna III
Mudassar Iftikhar Malik
Kenneth Mallory
Nicholas F. Marchione
Shaun P. Matthews
Robert Mcmichael
Thomas Anthony Meeley
**Douglas R. Mikita
*Basil Milton
Kevin J. Mirarchi, Jr.
Derek William Mitchell
Mustafa Mohammed
Michael t. Morgenstern
Matthew C. Morley
Tad R. Morrison
Avishek Nandi
Daniel Jason Nugent
Jeffrey John Opila
*Venkat Sreedhar Palgat
Justin R. Palmer
Ryan Thomas Park
Lakir B. Patel
Jennifer a. Patti
**Abhimanyu Jayant Patwa†
Charles Robert Pindle
Ismail Yagiz Polat
Stephanie Diane Poleshuck
Gagandeep singh randhawa
Alexander P. Reber
John Sweeney Reid
John Renna
**Francis Charles Reynolds
Kyle Ray Robbins†
Thomas James Robinson
Michael r. Ruggieri, Jr.
***Ali M. Sajwani
Anthony James Salvatore, Jr.
Kevin ellsworth Sanford
*David ScottSchubert
*Ryan Paul Sellman
*Matthew Totman Shanaman
Shipra Sharma
Michael Simmonds, Jr.
Trevor L. Smith
***John Hugo Smolko†
Lonnie M. Snyder
Nicholas Tassos
Nathaniel Dale Tylor
Stephen Paul Testen
Albert Tran
Eric Tran
Stephen Tran
Jason W. Trefz
Peter Triantafylidis
Prashanth Vanniamparambil
Muchael t. Walsh
***Eric Alexander Wargo
Kevin J. Weiler
*Jordan Michael Welles
Gregory D. Wheaton
Robert J. Wilhelm III
Chiu Yen Woo
Xa Yang
Razmig Yeremia Yeremian
**Joseph Leslie Yobb

*** Summa Cum Laude
** Magna Cum Laude
*Cum Laude
†Kappa Theta Epsilon (National Co-op Honor Society)

OF OUR 2010 GRADUATES!

Masters of Science in Mechanical Engineering

Anthony M. Acocella

Dion Savio Antao

Andrew C. Bergan

Christopher Cauley

Reewanshu Chadha

Po-Chun Chan

U Kei Cheang

Christopher R. Dennison

Sahil Diwan

Cameron Dekay Douglas

Andrew James Feit

Drew S. Flast

Brian Daniel Folkes

Peter C. Frye

John Anthony Galleo III

Christopher Gerald Geisler

John M. Glowa

James Walford Northway Green

Hung-Wei Huang

Jessica Lauren Isaacs

Gauri Rajendra Khanolkar

James Peter Koniers

Hsuan-Ping Kung

Matthew Shawn Kurman

Muhammed Enes Kuyumcu

Benjamin E. Letter

Ta Yau Lin

Ying-Sheng Lin

Kenneth Mallory

Mary LuXuan Milone

Basil Milton

Augustine Matthew Musa

Robert Harris Natelson

Venkat Sreedhar Palgat

Christopher Phelan

Gagandeep Randhawa

Aneesa Payne Romans

Ali M. Sajwani

David Scott Schubert

Ryan Paul Sellman

Michael Simmonds, Jr.

Yanwei Sun

Sophia Esther Liiba Tetteh

Prashanth Vanniamparambil

Nicholas Anthony Vena

Eric Alexander Wargo

Kevin K. Weiler

Liang Wu

Yueh-Ting Yang

Doctor of Philosophy

Halim Ayan

Dissertation Title: *Uniform Dielectric Barrier Discharge with Nanosecond Pulse Excitation for Biomedical Applications*
Supervising Professor: Alexander Fridman and Gary Fried man
Current Status: Assistant Professor, Engineering and Physics at Murray State University; Assistant Professor (Joint Appointment) at University of Kentucky

Kivilcim Buyukhatipoglu

Dissertation Title: *Bioprinted Superparamagnetic Nanoparticles for Tissue*
Engineering Applications: Synthesis, Toxicity Studies and Novel Hybrid Printing Systems
Supervising Professor: Alisa Morss-Clyne
Current Status: Research & Design Engineer, Neurosurgery Department, Integra Life Sciences, Plainsboro, NJ

Moogega Cooper

Dissertation Title: *Elucidation of Levels of Bacterial Viability Post-Non Equilibrium Dielectric Barrier Discharge Plasma Treatment*
Supervising Professor: Alexander Fridman
Current Status: Caltech Postdoctoral Scholar at Jet Propulsion Laboratory

Jean-Etienne Temgouga Dongmo

Dissertation Title: *Aircraft Loss of Control Prevention and Recovery: A Hybrid Control Strategy*
Supervising Professor: Harry G. Kwanty

Michael J. Gallagher

Dissertation Title: *Elucidation of Levels of Bacterial Viability Post-Non Equilibrium Dielectric Barrier Discharge Plasma Treatment*
Supervising Professor: Alexander Fridman
Current Status: Research Scientist, National Energy Technology Laboratory (NETL) - U.S. Department of Energy, Morgantown, WV

James Toshiro Hing

Dissertation Title: *Mixed-Reality for Unmanned Aerial Vehicle Operations in Near Earth Environments*
Supervising Professor: Paul Y. Oh
Current Status: Research Scientist, Navair, Lakehurst, NJ

Zhiheng Lei

Dissertation Title: *Thermoacoustic Convection and Transport in Supercritical Fluids Under Normal and Micro-Gravity Conditions*
Supervising Professor: Bakhtier Farouk
Current Status: Mechanical Engineer, DLB Associates, Eatontown, NJ

Yi Ma

Dissertation Title: *High –Lewis Number Premixed Flame Instabilities*
Supervising Professor: Nicholas P. Cernansky and Howard Pearlman
Current Status: Currently in Buffalo, NY and is seeking employment in industry

Robert Harris Natelson

Dissertation Title: *Oxidation of N-Butylcyclohexane in Low Temperature Region*
Supervising Professor: David L. Miller and Nicholas P. Cernansky

Keith Wayne Sevcik

Dissertation Title: *A Hardware in the Loop Testing Facility for Unmanned Aerial Vehicle Sensor Suites and Control Algorithms*
Supervising Professor: Paul Oh
Current Status: Lockheed Martin Space Systems, Senior GNC Software Engineer

Edward Brian Steager

Dissertation Title: *Actuation and Control of Microfabricated Structures Using Flagellated Bacteria*
Supervising Professor: MinJun Kim
Current Status: Postdoctoral Fellowship at the University of Pennsylvania

Jason Robert Toy

Dissertation Title: *Subject Specific Models of the Hindfoot Reveal a Relationship Between Morphology and Passive Mechanical Properties*
Supervising Professor: Sorin Siegler
Current Status: Engineer, National Pipe Hanger Corporation

Nasir Mohammad Uddin

Dissertation Title: *Modeling and Simulation of Carbon Nanotube (CNT) Dispersion in Water/Surfactant/Polymer Systems*
Supervising Professor: Franco Capaldi and Bakhtier Farouk
Current Status: NRC Postdoctoral Fellowship; Postdoctoral Fellowship at NIST in Gaithersburg, MD

AWARDS & ACHIEVEMENTS

Moses Noh Granted Tenure Promoted to Associate Professor

The Mechanical Engineering & Mechanics Department is excited to announce that the Drexel Board of Trustees awarded Dr. Moses Noh tenure at their May 2010 meeting and approved his promotion to the rank of Associate Professor effective September 1, 2010. Congratulations to Moses for his many accomplishments, including this latest one.

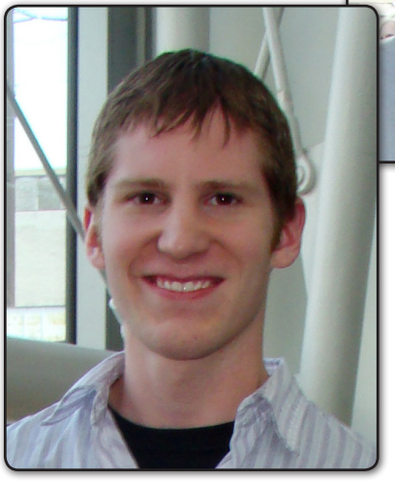
Paul Oh Honored as NSF/ NSB Distinguished Lecturer- "Voice from the Future"

Dr. Paul Oh, Director of the Drexel Autonomous Systems Lab (DASL), was selected as a 2010 National Science Foundation/National Science Board Distinguished Lecturer as part of the lecture series commemorating NSF's and NSB's 60th anniversary. He presented a talk on February 4th that covered academic robotics research from 9/11 disaster-response robots to K-12 STEM outreach using humanoids, and US and world-wide robotics.

Oh was chosen for this very prestigious honor for meeting the following criteria: investigators early in their careers with potential for making an impact on science education, individuals who have made stunning discoveries that have influenced the direction of science, individuals who are notable as the "best minds in science," those who have contributed to research that benefits society, individuals who display a passion about their research, and those with the ability to engage their audience and motivate their listeners."

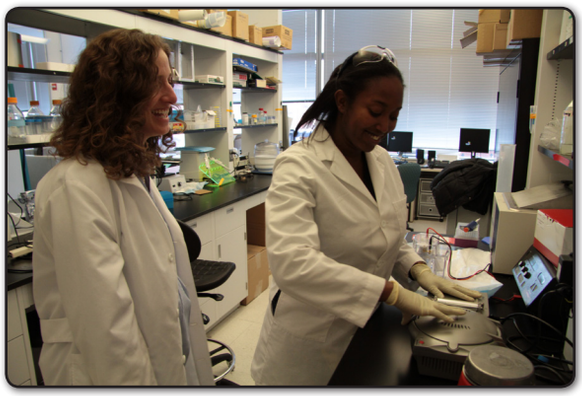
Kevin Freedman and U Kei Cheang Receive NSF GRFP Award

Kevin Freedman and U Kei Cheang, Mechanical Engineering graduate students, have been awarded the prestigious National Science Foundation Graduate Research Fellowship. Kevin and U Kei have been working in the Biological Actuation, Sensing & Transport Laboratory (BAST) under their advisor Dr. MinJun Kim (MEM). U Kei's research involves the investigation of bacteria-powered microrobots. He completed his B.S. in Mechanical Engineering (2010) and will continue his graduate studies in mechanical engineering at Drexel. Kevin's research is in single molecule analysis to understand protein kinetics. Kevin completed his Bachelor's degree in biomedical engineering and is currently pursuing his graduate studies in mechanical engineering at Drexel as well.



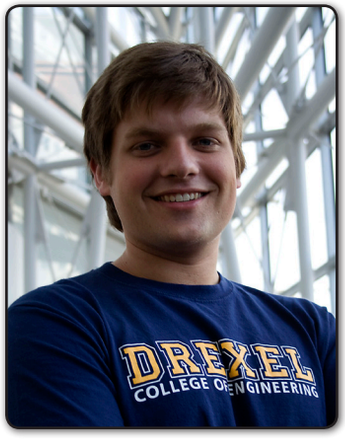
Dannielle Figueroa Awarded 2010 UNCF- Merck Graduate Science Research Dissertation Fellowship

Dannielle Figueroa, a MEM/Biomed graduate student, was awarded the 2010 United Negro College Fund (UNCF) - Merck Graduate Science Research Dissertation Fellowship. The predoctoral program includes a Fellows Day, mentorship experience with a Merck research scientist, and working in Merck's labs on a research project. Under her advisor Dr. Alisa Morss Clyne (MEM), Figueroa is currently a PhD candidate in Biomedical Engineering studying the effects of hyperglycemia on endothelial cell response to strain and extracellular matrix signaling. She is the president of the Drexel Biomedical Grad Association and a Drexel NSF IGERT fellow.



Nathan Taylor Receives 2010 ASME Charles T. Main First Place Award

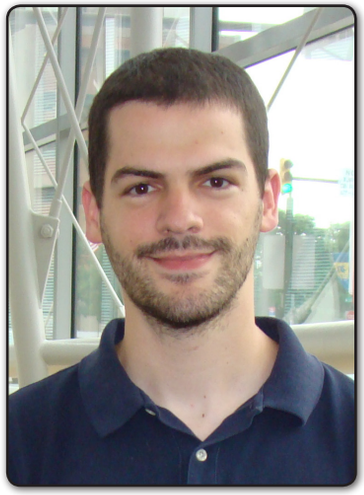
2009-2010 ASME President Nathan Taylor was awarded the 2010 American Society of Mechanical Engineers Charles T. Main First Place Award. Originally established in 1919 in honor of the 37th President of ASME, the award was designed to encourage student members and young engineers to become active in public service. Nate was nominated by Dr. Paul Oh (ASME Advisor and MEM Associate Professor), Dr. Surya Kalidindi (MEM Department Head), Dr. Alan Lau (MEM Graduate Advisor and Professor), Dr. Brad Layton (MEM Assistant Professor) and former ASME President and MEM Alumni Frank Barmes.



Nate will receive a gold medal, $3k cash award and travel to the awards ceremony which will be held on November 15th, 2010 during the ASME International Mechanical Engineering Congress & Exposition. Nate is the second Drexel ASME President to receive this prestigious award. MEM Alumni Daniel Hanna (first ever from Drexel) won in 2007. Nate graduated in 2010 with his BSME and is continuing his studies to pursue a Ph.D. in Mechanical Engineering at Drexel.

Frank Leone Wins 2nd Place in 2010 Aircraft Airworthiness & Sustainment Conference Student Paper Competition

MEM graduate student Frank Leone received 2nd place in the 2010 Aircraft Airworthiness & Sustainment Conference student paper competition for his paper entitled "Progressive Damage Modeling of Full-Scale Sandwich Composite Aircraft Fuselage Panels." The conference (formerly known as the "Aging Aircraft Conference") is jointly sponsored by NASA, the Department of Defense, and the Federal Aviation Administration and was held May 10-13, 2010 in Austin, TX. There were 27 student papers entering into the competition. Leone is currently working toward finishing his PhD in Mechanical Engineering under his advisors Drs. Tein-Min Tan and Jonathan Awerbuch. He received his BS and MS in Mechanical Engineering at Drexel University in 2007. Leone is also the recipient of the 2010 Koerner Fellowship.



Student Profiles

Danielle Castley

Mechanical Engineering Undergrad- 4th year Junior
Hometown- Mullica Hill, NJ
Co-Ops- NAVSEA, Philadelphia, 2009
KAIST (Korea Advanced Institute of Science and Technology), South Korea, 2010

-Why did you choose Drexel?

"I came to Drexel because I participated in the College of Engineering Summer Mentorship Program for high school students. After working in Dr. Capaldi's Bio-Mechanics Lab for just a few weeks I realized how much I enjoyed research and applied for the BS/PhD program."

-What classes have been your favorites so far?

"Controls is one of my favorite classes because it's the most useful in the long run. To prepare for co-op in a robotics lab, my Manufacturing class was the most useful because I learned how to properly use a CNC machine to manufacture a mold."

-How did you get involved with research as an undergraduate?

"Since I had enjoyed research during the high school Summer Mentorship program, I immediately started work in a lab at the beginning of freshman year. I studied piezoelectric cement in the Hybrid Energy Systems Lab and continued researching full time during the STAR program over the summer. The goal of my project was to enhance the output voltage and power from aluminum-PZT-Portland cement composites. By sophomore year, I had been introduced to the robots in the Drexel Autonomous Systems Lab (DASL) and began researching to prepare for a co-op at KAIST in South Korea. Working with Dr. Paul Oh, the DASL's advisor, my research comprised of writing various tutorials about using motion capture systems, laser scanners, and software for human-robot conversations. While at KAIST I studied humanoid robotic hands and robotic hand prehension."

-Describe your co-op experience in Korea.

"Co-op in a foreign country, especially in a small Asian city, was very challenging but the Hubo Lab in KAIST is the most enjoyable place to work. Everybody in Hubo Lab is an inspiration with their disciplined work ethic and eagerness to teach others about robots. Upon my arrival at Hubo Lab, I saw a video of a novel actuator that I thought could be applied to robotic fingers to increase their number of degrees of freedom. Hubo Lab & Dr. Oh were supportive in letting me explore different actuators as an introduction to learning about robotic hands. Hubo's hands, like many universal robotic hands, are underactuated because size and space constraints prevent placing a motor to move each joint in each finger. My goal was to design a finger that could use one motor to bend three joints. To create such behavior required mixing an anisotropic rubber tube that could elongate without expanding in the radial direction. Inside the tube, I placed a cylindrical packet of gel and aluminum joint that causes bending. When a force is normally applied to the gel packet, weight shifts to the tip of the tube and the external rubber shell elongates and bends downward forced by the joint. Three joints can be built into the finger and locked or unlocked with electromagnetic clutches to model precision grip and power grasping finger positions.

In my free time I had the opportunity to practice the Korean language, learn Tae kwon do, travel to traditional Korean houses & palaces and see ancient Buddhist temples. "

Jessica Snyder

Mechanical Engineering graduate student- Advisor- Dr. Wei Sun
Hometown- Atco, NJ
Research Area- Biofabrication/Cell Printing

-How long you have been studying as a grad student?

"I started at Drexel as an undergrad in the fall of 2004, enrolled in the BS/MS program and began taking graduate classes in fall of 2007. I was officially matriculated as a PhD student in June 2009."

-When did you become interested in pursuing an advanced degree in mechanical engineering?

"During a CAD/CAM lecture here at Drexel more than three years ago, Dr. Sun introduced the class to tissue engineering and biomanufacturing. He started by telling the story of the artificial heart. It was a decade's long research effort which finally yielded an implant approved for clinical use. From that success, we have to recognize the simplification and omissions of the original design. The implant came in one size and was made of inert artificial material. Dr. Sun presented the idea of making the implant from biological material assembled in 3D using a variety of manufacturing techniques interfaced with optimized biomodels. A living implant would grow with the patient and adapt to fluctuating demands to meet real time physiological needs. The concept was so novel and imaginative to me that I immediately wanted to become involved."

"One of the most important design concepts I learned at Drexel is whatever you design, keep in mind someone is going to have to maintain it when it breaks."

-How did you hear about the summer internship with NASA?

"The Biofabrication Lab has ongoing collaborative work with NASA's Biophysics Radiation Lab. This project is to prepare for long term manned missions by exploring the health effects of the space environment using a microfluidic test platform and tissue analogs. We have hosted NASA scientists to conduct experiments here in Philadelphia. When the NSBRI Summer Internship was announced, the lab's collaborator at NASA passed the message along and encouraged me to apply. It was an opportunity to visit their facility and conduct some experiments for our research project."

-Tell us about your experience.

"NSBRI's Summer Internship Program gives selected students an opportunity to spend 10-to-15 weeks working on projects with scientists at JSC, NASA Glenn Research Center in Cleveland or NASA Ames Research Center at Moffett Field, Calif. With the addition of this year's class, more than 130 students have participated in this highly competitive program since it began in 1998."

"NASA and its partners are committed to introducing new technology to enable working, learning and living safely beyond the Earth for extended periods of time in a sustainable and possibly indefinite manner. In the responsible acquisition of that goal, life sciences has taken on the task to pursue scientific research to advance medical technology to care for human health and wellness in the space environment. The effect of radiation and microgravity individually and synergistically on cell function are not well understood. The objective of this work is to study the effect of microgravity on hepatic metabolism and tissue function. To experimentally observe implications of microgravity on drug metabolism we develop

two models. (1) A ground model of microgravity to characterize the kinetic metabolism of the antinasaeu drug by liver cells. (2) A co-culture of fat and endothelial cells to model real time downstream effects of metabolized drug. Fat tissue is of specific interest because of its role as an endocrine organ in the body. The results provide insight into the effect of the environments on cell function and how we can tune medical technology to care for humans in space."

In The News

Michael Witkowski (MEM '99) Receives 2010 Young Engineer of the Year Award

The Philadelphia Engineers Club chose Drexel Mechanical Engineering alumnus Michael Witkowski as their 2010 Young Engineer of the Year award recipient for his many contributions to the Philadelphia engineering community and the future of engineering education in the Delaware Valley.

Witkowski graduated from Drexel with his BSME in 1999 and his MSCIVE in 2007. Nominated by his employer, Joseph McHugh-McHugh Engineering Associates, Dr. Selcuk Guceri -Drexel's College of Engineering and 2010 Delaware Valley Engineer of the Year, Eric Poulson – Drexel University College of Engineering Alumni President , Paul Pellini-Region II Vice Chair of Student Activities and Bill Hart- Philadelphia Chapter President of ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers), Witkowski was honored during the Engineers' Week activities with the Philadelphia Engineers Club. "It is an honor and exciting to be recognized for the work that I put forward over the past 10 years," he said.

Witkowski became actively involved in several organizations during and after his time at Drexel. He is currently on the ASHRAE Board of Governors and serves as their Student Activities Chair- a position in which he was actively engaged with several collegiate ASHRAE chapters as well as a proponent for exposing grade school students to math and science and introducing high school students to engineering. "I enjoy talking to younger students and opening their eyes to the engineering field, more specifically the HVAC industry," said Witkowski. "What other field do you get to dream up ideas and then see them built?"

Witkowski also serves as the Executive Vice President of the Drexel University College of Engineering Alumni Association, the Drexel University Alumni Board of Governors and the Drexel University Student Relations Committee and Global Outreach Committee. As a further testament to his commitment to engineering and the Drexel community, Witkowski is a technical advisor and HVAC consultant for the Drexel Smart House project- a multi-disciplinary student lead effort to develop and study the use of new and emerging green technologies in a student housing setting on Drexel's campus. As an Adjunct Instructor, he taught Environmental Engineering from 2006 to the present at Villanova University.

In his current position as a Mechanical Engineer, Project Manager and Associate with McHugh, Witkowski designs heating ventilation and air conditioning systems as well as plumbing and fire protection systems. He passed his PE in 2004 and in 2008 passed his Leadership in Energy Efficient Design Test making him an Accredited Professional in LEED.

Drexel's Oldest Living Alumni Inducted into College of Engineering Alumni Circle of Distinction

At 106 years young, Mr. William Allen Wood (MEM, '28) of Delanco, NJ, was inducted into the Drexel College of Engineering Alumni Circle of Distinction during the 2010 Engineers Week celebrations.

Born in Camden in 1904, Wood attended the Drexel Institute of Technology and graduated with his mechanical engineering degree in 1928. He ran a pipe factory, C-Lec Plastics, Inc. for 35 years, retiring at the age of 62. He was recently featured in an article in the Cherry Hill Courier Post highlighting his love for sailing, family and staying involved at his age.

ASME Places 2nd, 3rd in Various Heats of the 2010 ASME Human Powered Vehicle Competition

Three teams from Drexel (Dragon Wagon (DW) versions 2.2, 3.1 & 4.0) competed in the American Society of Mechanical Engineering's Human Powered Vehicle Competition at the Stafford Motor Speedway in Stafford Springs, Connecticut in May.

Hosted by Central Connecticut University, the teams competed in the speed-endurance race, utility-endurance race and a drag race, and successfully brought home three trophies in a field of 25 vehicles. The DragonWagon 2.2 placed 2nd in the Men's Drag Race Event, DragonWagon 4.0 placed 3rd in the Women's Drag Race, and DragonWagon 3.1 placed 2nd in the Utility-Endurance Event.

This is the third year that Drexel has competed. First held at the California Polytechnical University in 1983, the event has spawned some extraordinarily fast vehicles with students pedaling at speeds over 50 MPH. Drexel University hosted the event last year on its Philadelphia campus and in historic Fairmount Park. The competition's overall mission is to explore transportation options that do not rely on external energy sources.

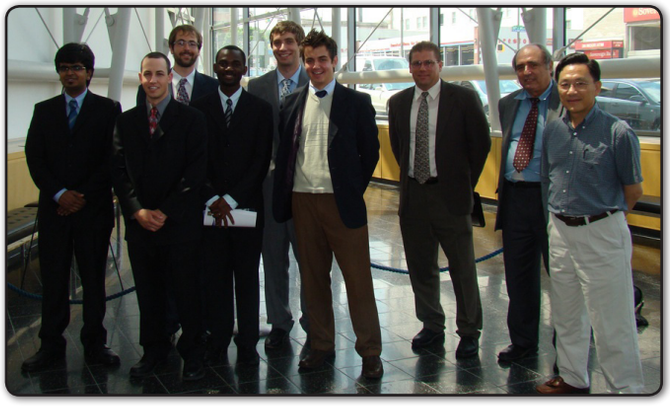
MEM Hosts Visiting Undergrads for First Research Experience for Undergraduates Program

This summer, six undergraduate students from various other colleges and universities came to Drexel's University City campus to participate in the Mechanical Engineering & Mechanics Department's first NSF funded Research Experience for Undergraduates Program (REU) program. The program titled iREU: Interdisciplinary Research Experience for Undergraduates in Medicine, Energy, and Advanced Manufacturing, was the result of a grant through the National Science Foundation and the US Department of Defense (PI- Surya Kalidindi, Co-PI Alisa Morss Clyne).

The Mechanical Engineering department was happy to host the following 2010 iREU participants: **Hendrik Boghaert, Latoya Riley, Hosie Tart, Nathaniel Thorne, Pareesa Vahidi, Rebekah Yang**

MEM Senior Design Teams Take First Place and Honorable Mention in CoE Competition

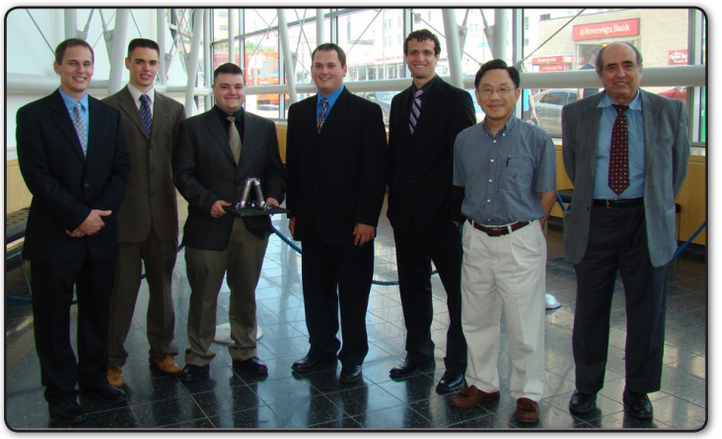
Two teams representing the Mechanical Engineering & Mechanics Department competed in the College of Engineering Senior Design Competition in June. Both teams presented their projects with skill and poise and were both rewarded:



First Place Award:

Remote-Controlled Underwater Camera System for Real-Time Monitoring of Fatigue Damage in Fuselage Panels

Team: Andrew Bergan (MEM), Prince Codjoe (ECE), David Schubert(MEM), Mark Shuck(ECE), Ross Staszak (ECE), Arudra Venkat (ECE)
Advisors: Dr. Jonathan Awerbuch-MEM, John Bakuckas-FAA, Dr. Timothy Kurzweg-ECE, Dr. Karkal Prabhu-ECE, Dr. Tein-Min Tan-MEM



Honorable Mention:

Energy Absorbing Composite Structures to Improve Rotorcraft Crashworthiness

Team: Gary Henderson, Doug Mikita, Kevin Mirarchi, Ryan Park, John Smolko
Advisor: Dr. Tein-Min Tan, Dr. Jonathan Awerbuch

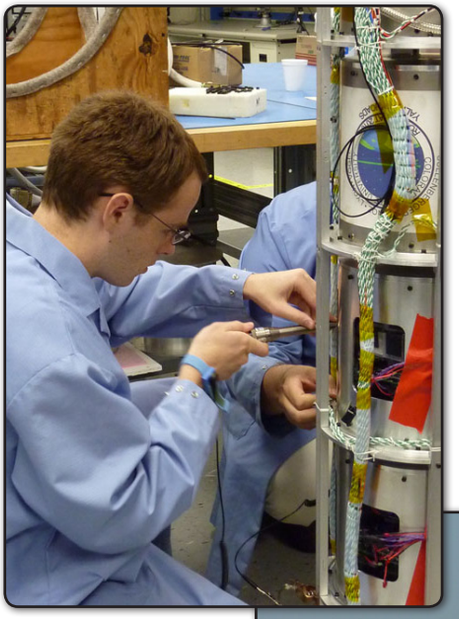
Congratulations to all of our Senior Design teams for their outstanding presentations!

Dragons in Space- Jin Kang's Students Aim for the Stars

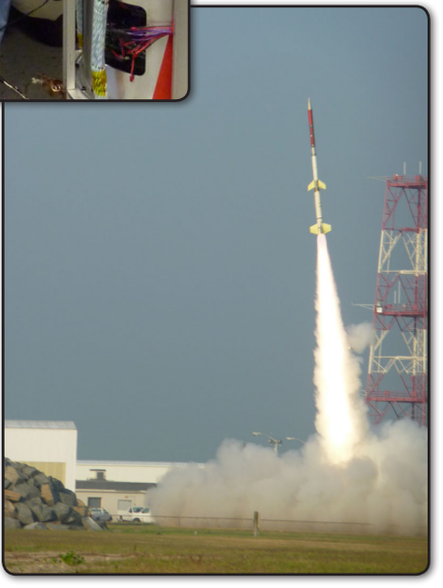
Kenneth Mallory, a 2010 MEM BS degree recipient and current MEM Ph.D. student under the direction of his advisor Dr. Jin Kang, launched a science payload into space onboard the NASA Terrior-Orion sounding rocket on June 24th to an altitude of 120km (space starts at 100km). The launch took place at the NASA Wallops Flight Facility in Virginia as part of the "Rock-On!" workshop through the NASA Pennsylvania Space Grant Consortium. There were only 10 schools across the nation invited for this program! The mission of this flight was to measure space radiation which was accomplished with total success.

Aside from the three MEM alumni NASA astronauts, this is the first presence of our student/faculty activities in space. A follow-up launch with a new payload is scheduled for June 2011, also sponsored by the NASA Space Grant, which will put the first Drexel satellite DragonSat-1 in orbit.

Eric Tran, also a 2010 MEM BS degree recipient and current MEM Ph.D. student under Kang's direction, was recently selected to participate in the NASA Space Science Student Ambassador Program. The program was designed encourage undergraduate and graduate students to participate in NASA's Space Science educational activities and to help generate excitement about NASA scientific discoveries in space science.



Tran will be coordinating with The Franklin Institute in Philadelphia to run an education program in Space Science for young children and students hosted at the Franklin. From a short research, this seems to be the third time a student from Drexel was selected for this program. The award was given to only 50 students in the United States and thus far Tran is the only student representing Pennsylvania.



For more information on the program, please visit: http://www.spacegrant.org/nssa/

New Research Initiatives

Surya R. Kalidindi (PI), and Dr. Alisa Clyne (Co-PI), received $393,795 for their Graduate Assistance in Areas of National Need (GAANN) award from the Department of Education. This highly interdisciplinary three-year grant, titled "GAANN in Mechanical Engineering and Sciences" is a need-based fellowship that funds Ph.D. students who will receive exceptional training in research and education in the field of mechanical engineering and sciences with emphasis on medicine, sustainable energy, manufacturing, and robotics. Other Key Personnel in this grant are: Dr. Anthony Lowman (Associate Dean of Research for the College of Engineering; Interim Senior Associate Vice Provost for Research for Drexel University), Mr. Steven Cox (Director of Regional AMP – minorities recruitment), Drs. Teck-Kah Lim (Associate Provost for Graduate Students – teaching pedagogy workshops), and David Urias (College of Education – evaluation and assessment). MEM Research Coordinator, Ms. Anne C. Hanna coordinated and contributed much to this effort.

Moses Noh (PI), Kenneth Barbee (Co-PI- Associate Professor of Biomedical Engineering), Jason Baxter (Co-PI- Assistant Professor of Chemical Engineering), Jonathan Spanier (Co-PI- Associate Professor of Materials Science & Engineering), and Ying Sun (Co-Pi) have received an NSF award for their project titled, "Upgrade and Renovation of Drexel Microfabrication Facility". This award is for $1.1M for the proposed three year project. This project will upgrade and renovate the Drexel Microfabrication Facility (MFF) to support rapidly growing sponsored and unsponsored research activities, and to facilitate the integration of researchers. The Drexel Microfabrication Facility (LeBow 334) currently houses a number of microfabrication instruments such as a mask aligner, inductively-coupled plasma etcher, e-beam/filament evaporators, and an optical profilometer. Currently this facility is not a classified cleanroom facility, which is essential for micro- and nanofabrication processes. The project will: 1) upgrade the MFF to a cleanroom (Photholithography Area - Class 100, General Process Area - Class 1000), 2) expand Gowning/Maintenance/Storage Area, and 3) install cleanroom fixtures.

Surya R. Kalidindi (PI) and Roger D. Doherty (Co-PI- Emeritus Professor of Materials Science & Engineering) have been awarded a GOALI award by NSF for the project titled, "GOALI: Deformation Mechanisms and Microstructure Evolution in Thermo-mechanical Processing of Mg alloys for Structural Automotive Applications". This award is for $450K over three years. Strong but light magnesium (Mg) alloys offer tremendous potential for dramatic increases in the fuel efficiency of automobiles, with corresponding reductions in automotive CO2 emissions. The proposed interdisciplinary collaboration between researchers at Drexel University and at the General Motors Global R&D Center will result in the development of better Mg alloys for the automotive industry and may also have implications for the processing of other metals with similar crystalline structures.

Moses Noh (PI) and Caglan Kumbur (Co-Pi) have received an NSF award for their project titled, "Microfluidics Laboratory Modules and Kits for Undergraduate Education". The award totaled $537,260 for the three year project. The objective of this project is to develop and evaluate a set of laboratory modules and kits that will allow engineering and science undergraduate students to explore microscale fluid behaviors and microfluidic devices. This type-2 project will build up on the achievements of type-1 project with the same title and expand the scale of development and evaluation. This project will carry the development of the new learning materials, Microfluidics Laboratory Modules and Kits, from a demonstration stage to a stage in which the evaluation results present evidence for the positive impact of the new learning materials on undergraduate science and engineering education leading to wide distribution and commercialization. In total, 10 lab modules and kits will be developed and tested at Drexel University, University of Connecticut, University of Massachusetts at Lowell, the Cooper Union, and Philander Smith College.

B.C. Chang (PI), Harry Kwatny (Co-Pi) along with Dr. Gaurav Bajpai (MEM PhD alum, '01) of Techno Sciences, Inc, Washington, DC, have been awarded a NASA SBIR Phase II Grant. The objective of this research is to design an on-board envelope protection system and develop up-

set recovery schemes to address loss of control incidents in commercial aircraft. Loss of control incidents can be attributed to variety of factors including environmental (icing, clear air turbulence, wakes, etc.), failure of aircraft components (stuck control surfaces, failure of hydraulic systems, broken cables, etc.), human factors (pilot error, insufficient training, crew distraction, etc.) or a combination of any of them. Usually the final catastrophic event is linked to nonlinear phenomena (like stall, excessive roll, and nose dive, etc.) and there is a small time window of opportunity for the pilot (or the flight computer) to react and avoid accident. Their goal is to provide verifiable tools and software for commercial aircraft flight safety. The total amount for the NASA award is $600,000 for two years and Drexel's portion is $200,000.

Alisa Morss Clyne received an American Heart Association National Scientist Development Grant titled "Endothelial cell-basement membrane response to strain in high glucose." The concept of the research is to investigate how cardiovascular biomechanics changes in disease, with the goal of understanding why people with diabetes get accelerated cardiovascular disease. Dr. Clyne is studying how high glucose-induced changes in vascular wall proteins affect the cellular response to the cyclic strain that blood vessels experience with each heartbeat; hopefully this will lead to new therapies for people with diabetes. The award is for $306,965 for 4 years.

MinJun Kim (PI) has been awarded a grant from the National Science Foundation (CMMI: Control Systems) for his project entitled "Collaborative Research: Motion Control of Bacteria-Powered Microrobots". Drexel is the lead institution in this collaborative research project with Rensselaer Polytechnic Institute. The objective of this very innovative research program is to acquire an in-depth understanding of the fundamental scientific principles that govern the control of bacterial propulsion systems, as well as to demonstrate the enabling technologies necessary to accomplish the feedback control of bacteria-powered microscale structures for use in micro-assembly and micro-robotics. The budget for this three year project is $580K with Drexel receiving $300K.

Surya Kalidindi (PI) and Roger Doherty (Co-PI-Emeritus Professor of Materials Science & Engineering) and Scientific Forming Technologies Corporation (Columbus, OH) have been awarded a new grant from ONR titled, "Integrated Thermo-Mechanical Processing, Microstructure, and Property Simulation System for Aluminum Alloys - Phase II". Drexel's portion of this award is expected to be $375,532. This project aims to improve the in-service lifetime of modern marine alloys (such as AL5083 and AL5456). In these alloys, corrosion is the most significant life limiting factor, mainly occurring due to preferential attack on b-phase precipitates that form continuous thin film at the grain boundaries. This project aims to reduce this corrosion by attracting b-phase precipitates to nucleate on deformation substructure within the grains, rather than at the grain boundaries, thereby preventing the formation of a continuous percolating film at the grain boundaries.

MinJun Kim (PI) along with co-PIs Jack Zhou, Sally Solomon (Chemistry), and Guoliang Yang (Physics) has been awarded a new NSF CCLI Exploratory Grant entitled, "Collaborative Teaching and Interdisciplinary Discovery-Based Experiments for Understanding Nanoscale Metrology and Manufacturing". The main objective of this project is to bring relevant nanoscale engineering physics and chemistry into the educational experience of undergraduate engineering students as well as develop and test a set of collaborative lecture and laboratory modules in nanoscale metrology and manufacturing. The budget for this two-year project is $200K.

Tein-Min Tan and Jonathan Awerbuch (Joint PI) have received a new grant from the Federal Aviation Administration for their project entitled "Analytical and Experimental Studies on Airworthiness and Sustainment of Aircraft Structures." The objectives of this three-year program, with a total award amount of $501,433, are to study: (1) Adhesively Bonded Repairs of Metallic Fuselage Structure, (2) Robustness of Metal-adhesive Bonded Joints, (3) Penetration Mechanics of Aircraft Fuselage Skins made of Aluminum Alloys, GLAss-REinforced Fiber Metal Laminates (GLARE), and Graphite/Epoxy Laminates, (4) Damage Tolerance of Pultruded Rod Stitched Efficient Unitized Structure (PRSEUS), and (5) Material Mechanical Characterization of Aluminum-Lithium 2196 and 2198 Alloys.

A Special Thanks

The Department of Mechanical Engineering and Mechanics gratefully acknowledges its donors. Your generosity will benefit both current and future generations of MEM students and faculty, reaching well beyond the classroom and the lab. If you are interested in making any form of contribution to the department, please visit http://www.mem.drexel.edu/alumni/

When you contribute to Drexel, please be sure to designate your contribution to Mechanical Engineering and Mechanics. Possible venues for contribution include:

Departmental endowment fund

Undergraduate and Graduate scholarship funds

Teaching and laboratory supplies and funds

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We appreciate your support and value your contribution to the future of our students, faculty and department!

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