



Mechanical Engineering

Department Newsletter

University of New Hampshire, Durham, NH

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A Word from the Chair

I hope that everyone had a wonderful summer! We are excited to start up another academic year here in the ME department, which continues to grow. We have the largest incoming first year class in our history, 138, bringing our undergraduate population also to an all-time high of 518 students! This is of course a blessing and a challenge to continue to provide the high quality education that our department aspires to while helping to grow the much needed mechanical engineering workforce. In future issues, I will describe ways that we are attempting to balance these opportunities.

In this issue, you will get to learn about the great work that Ian Gagnon ('15) has done both on campus and abroad through Engineers Without Borders; hear the trials-and-triumphs of last year's baja team; and meet Marko Knezevic (Assistant Professor), Firat Eren (graduate student), and Osman Okyay (distinguished alumni). A special thanks as always to Prof. Barbaros Celikkol, Tracey Harvey and especially Lauren Foxall (who is now a full time administrative assistant in our department!) for taking on the challenge of creating this newsletter and sustaining it now through three issues. We all truly appreciate their efforts. Enjoy this current issue and let us know your thoughts! It is easy for us to include our current students and faculty in such newsletters. Please let us know about alumni accomplishments and news, both personal and professional, to include as well. We highlighted a few of them in this issue for the first time.

Brad Kinsey

Professor and Chair, Mechanical Engineering Department

Featured this month:

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Newsletter Coordinators:

Barbaros Celikkol
Tracey Harvey
Lauren Foxall

Mechanical Engineering Shorts

- Martin Wosnik was promoted from Assistant Professor to Associate Professor in June 2014.
- Yaning Li was awarded a NSF Award entitled: "A Bio-Inspired Strategy for In-Plane Energy Dissipation through Suture Interfaces".
- The following students were awarded the Movers and Shakers Award for leadership and service activities: Paige Balcom, Douglas Carter, Ian Gagnon, Stephanie Medicke, Siddharth Nigam, Carolyn Przekaza, Will Taveras and Zhou Zhu.
- The Lunacats team were invited to spend a week in Hawaii competing in the Robotic International Space Mining Competition held by the Pacific International Space Center for Exploration Systems.
- A Bachelors of Science degree in Ocean Engineering has been approved for AY 2015-2016 and will be housed in the ME Department.



Lunacats Team

ME Statistics:

Current Enrollment: FR 138, SOPH 134, JR 105, SR 141

Grand Total: 518 Undergrad Students & 71 Grad Students

Degrees Awarded in May 2014 : BSME 72, MENG 1, MS 3



Ian Gagnon, Class of '16

Always on the move with Energy

Ian is a graduate of Kimball Union Academy in Enfield, NH. He is currently a senior interested in fluid mechanics, alternative energy, and entrepreneurship. Since his freshman year, he has been heavily involved with Engineers Without Borders. He has traveled to Uganda twice to work on the group's clean water project and has been heavily involved with the fundraising efforts.

This past year, he worked with a senior design team under the guidance of Professor Wosnik and Ivalyo Nedyalkov (Grad Student) who investigated how to improve tidal turbine blades so that they can operate more aggressively in more confined spaces without cavitating. The team won both the Mechanical Engineering and Ocean Engineering Senior Design Competitions.

Ian also serves on the CEPS Alumni Society Board as one of the student representatives, and is a recipient of the Movers and Shakers Award. This past summer Ian worked for Prof. Korkolis to redesign and build a Bi-Axial Tensile Test Machine. Once finished, the machine will allow for bi-directional tensile testing of sheet metal cruciform specimens at UNH. Basically the machine will stretch a piece of

metal in two different directions at the same time. The experimental tests this machine will perform, some of which Ian intends on performing later this fall, will allow future researchers to develop more high fidelity computational models to predict how various anisotropic materials behave under tensile loads. These computer models could be used to better predict the behavior of new alloys allowing manufacturers to use these new materials to make lighter and more crash worthy cars. It was a great experience for Ian because under the mentorship of a UNH grad student he got to design the entire machine, and soon he will get to put the machine together and see it come to life.

During his free time, he enjoys spending time outdoors fishing, hiking and camping. He is a member of the UNH club ski team. Ian encourages people to be as active as possible while at UNH. In the future, Ian hopes to go to graduate school to pursue a MS degree and possibly a Ph.D. in Mechanical Engineering. He hopes to own and operate his own R&D shop focusing on alternative energy technologies.

BAJA SAE 2014

Every year, UNH Baja is tasked with designing and building a one man off-road vehicle capable of surviving the courses at the competitions based around the country. The team is a group of like-minded individuals with common interests in off-road driving, vehicle design and fabrication. While the team is usually mostly seniors doing this as a senior project, anyone can get involved. We encourage underclassmen to come into our shop to see what's happening and become a part of the team.

This year's team was made up of 11 mechanical engineers: Andrew Nelligan, Tucker Nugent, Dan Holm, Jeff Moore, Taylor Gamble, Cameron Keefe, Jon Slowe, Ethan Morris (junior), Josh Feltner, Chase Borden and Hau Doan. In addition to them, we also had 3 marketing students: Bridget Fay, Cole Jaillet, and Dan Crowley. The first semester was mostly design work for the engineers, as well as ordering materials. The

marketing students researched the industry for the best way to pitch our vehicle. Over winter break, fabrication began. This lengthy process is one of the most rewarding parts, seeing the SolidWorks model come to life. As the spring semester progressed, we went from a pile of metal, to a rolling chassis, to a fully completed vehicle just before we departed for competition. So we packed up everything we had and set off for Peoria,

Illinois. Twenty-four hours and a few cases of red bull later, we pulled into the hotel. There were teams from other schools already there, working and testing their vehicles. Over the course of the next four days, we shuttled back and forth between the hotel and the competition, held at the Caterpillar testing facility. After a lot of long lines and a few quick fixes, we passed technical inspection and began the dynamic

events. The design presentation and the sales presentation (provided by the marketing students) were scheduled throughout the first two days. We placed 45th overall, and had a great performance in the rock crawl with a 5th place finish.

The 24 hour ride home left plenty of time to celebrate our success and talk about what worked and what didn't. We have plenty of tips for next year's team.





Under the Microscope with Marko

Assistant professor Marko Knezevic joined the faculty of the ME Department in the spring of 2013. His research is in the emerging interdisciplinary field of materials modeling that cuts across materials science, solid mechanics, applied mathematics, manufacturing science, and computer programming.

Historically, much of the development of novel processing routes for materials with new and better combinations of properties was the result of clever intuition combined with an empirical and phenomenological methodology and some degree of serendipity. This traditional methodology, in addition to being time consuming and expensive, is not contributing towards fundamental understanding of material behavior. The demand for high performance specialty materials with ever more extreme properties continues to grow. To meet these needs, students working with him are developing computational strategies that enable designing materials tailored for specific performance criteria. Of particular note, is research they are conducting into the use of discrete Fourier transforms to speed up multi-scale simulations involving crystal plasticity.

This pioneering work opened a new field called spectral crystal plasticity and attracted major attention from peers in the field. To complement these computational tools, in his research group they use specialized mechanical testing equipment and microscopy for multi scale characterization of materials. The background image is showing a polycrystalline grain structure captured using orientation image microscopy. The research work of Prof. Knezevic has produced over 30 articles in refereed journals with a paper published in Acta Materialia, which is in the list of 10 most cited articles on the Acta Mat web site. His goal in teaching is to empower students to become leaders within their chosen field. To that end, he emphasizes collaboration, writing and communication skills in addition to the problem-solving skills that make them experts in the subject. His philosophy is based on the beliefs that: learning in engineering is an iterative process, motivated students are capable of learning anything, a comfortable and respectful environment fosters learning, and open communication between the student and instructor is vital.

Background image is a microstructure of polycrystalline zirconium. Different colors indicate different crystallographic orientations.

Optical Communication & Control in the Ocean

Firat Eren is currently a Ph.D. candidate at UNH supervised by Prof. May-Win Thein (ME) and Prof. Shachak Pe'eri (Center for Coastal and Ocean Mapping (CCOM)). He received a B.S. degree in Mechatronics Engineering from Sabanci University in Istanbul, Turkey in 2008 and a M.S. degree from the ME Department at UNH in 2011. During his time at UNH, Firat has been helping to foster undergraduate interest in the world of ocean engineering. During the past three years, he was the graduate student advisor for the UNH Remotely Operated Vehicle (ROV) team that included design and construction of ROVs for the annual Marine Advanced Technology Education Center (MATE) International ROV Competition.



Firat Eren

Firat is working to develop an optical communication system for use in the control of a "leader-follower" type formation between a team of Unmanned Underwater Vehicles (UUVs). In addition to UUV operation in controlled formation, an underwater communication link can also be used for UUV docking or data transfer from an operating UUV to a data storage platform.

The two latter applications allow UUVs to operate underwater for longer periods of time. Firat is now developing and researching different optical detector array designs that can be mounted on a UUV. Using image processing techniques, these array designs will provide the position and orientation of the follower UUV.

During his Ph.D. studies, he received a Dissertation Year Fellowship from UNH Graduate School (2014-2015), a Link Foundation Fellowship for Ocean Engineering and Instrumentation (2013-2014), a Summer Teaching Assistant Fellowship from UNH Graduate School (2012) and a Leslie S. Hubbard Marine Program Endowment to Support Marine Research Development/Equipment (2012).

Kale Pratt & Whitney

Osman Okyay, MSc Class of '90



Osman Okyay (on the Left) and Mike Papp, General Manager of Pratt & Whitney at North Berwick, during the opening of Kale Pratt & Whitney

After receiving my MSc degree in Mechanical Engineering at UNH, I moved back to Istanbul, Turkey (a slightly bigger town than Durham). I started working for Digital Equipment Corps. (DEC), Istanbul office. DEC was the world's 2nd largest IT company then, with headquarters based in New England. Four years later I joined Kale Group, where I currently serve as the Vice Chairman of the Group and President of the Defense and Aerospace Division. Besides my professional work at Kale, I also chair a few non government organizations. Those include the Turkish – American Business Council, Turkish – Dutch Business Council and Aerospace Cluster Association in Turkey. I am also a member of the Eisenhower Fellowships' Board of Trustees, based in Philadelphia, PA.

Today, at Kale, I have four business units reporting to me:

1) Kale Aerospace is a one-stop shop for machining, special processes, destructive testing/non destructive testing, painting, marking operations for the aerospace world. We build wing and fuselage parts and subassemblies directly for Lockheed Martin Aeronautics, Boeing, Airbus, and Northrop Grumman. F-35, B737, B747, B777, and A320 series are some of the programs we directly supply flight critical parts and subassemblies

for. 2) Kale Pratt & Whitney is a joint venture between the Kale Group and Pratt & Whitney to manufacture parts and assemblies for the P&W engines, such as the F-135 and next generation product family. 3) Kalekalip is a small arms manufacturer. We have recently designed and manufactured a new 7.62 infantry rifle which will be the weapon of the Turkish Armed Forces for years to come. 4) Kale Baykar is another joint venture of ours with a Turkish Company called Baykar. We indigenously design and build UAV's with a wing span that varies between 5 feet and 40 feet. So, it is exciting times at the Kale Group, but never as exciting as my days at UNH.

I will never forget the day I met "Two-Fifty George", the Greek barber on Main Street in Durham, and finding out that we were both fellow citizens of Izmir, Turkey with a 60 year difference. Or my day at sea, to explore the intake pipes that provided the cooling water for the Seabrook Power Plant. It was the winter of 1989, 4:00 in the morning and -19° F, and we were on a boat off Seabrook. We got all wet and of course frozen trying to get the remotely operated vehicle submerged into the ocean. I never felt that cold in my life again, but never complained about it as the project paid for my expenses for a semester.

Stay Connected to ME!

We would like to stay connected with our alumni and friends and would welcome your newsletter contributions and suggestions.

Please send your news items, e.g. awards, promotions, personal updates, memories of UNH, and suggestions by email to:

lauren.foxall@unh.edu

If you would like to make a financial contribution to the ME Department, please go to:

<https://giving.unh.edu/cepsme>

Check out full length stories and pictures on the Mechanical Engineering website:

<http://unh.edu/mechanical-engineering/>