



CEEES GRADUATE STUDENT NEWSLETTER

December 2016



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DGS' DESK

Hope you all enjoyed the Thanksgiving Holiday! The end of the Fall semester is just a few weeks away, and with it comes the stress of getting research done, and for some of you completing courses and taking final exams. Most of you entering your fourth semester in early January will be taking qualifying exams, so wishing you much success with the studying and on the exams themselves!

For those of you in candidacy, please consider participating in the upcoming *3MT competition* (held in March 2017). You should have received information via email in relation to this event. Last year's winning 3MT presentation was given by our very own Maria Gibbs, so let's try to make it two years in a row!

You also received recently information regarding the *Social Responsibilities of Researchers Program* offered within the Reilly Center. They are still looking for 1st and 2nd year PhD students to join! The SRR Program is hosting a special information session on December 7th at 5 PM in the Jordan Hall of Science Reading Room.

Wishing everyone a Merry Christmas and Happy New Year!

Best wishes, Tony Simonetti

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ANNOUNCEMENTS

Conferences

Rob Devine presented at the 2016 American Nuclear Society Winter Meeting on November 9th in Las Vegas, NV.

Technical Session: *High-Strength Concrete: Research by U.S. DOE NEUP-Sponsored Students*
Cost-Benefit Analysis of High-Strength Materials for Safety-Related Nuclear Reinforced Concrete Shear Walls, Barbachyn, S. M., Devine, R. D., Thrall, A. P., Kurama, Y. C.

Patrick Conry presented an oral presentation entitled *Observations of Equatorial Kelvin Waves and their Convective Coupling with the Atmosphere/Ocean Surface Layer* while attending the 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics in Portland, Oregon on November 20, 2016.

Academic Social Happy Hour

Friday November 18 / Saturday November 19

November brought us two more great speakers to the monthly seminar/social event. This month we learned about a new bridge design coming out of the Thrall group from Yao Wang and the exciting modeling work Brian Joyce from the Westerink group has done to better understand coastal storm events in Alaska. We enjoyed research presentations on Friday with a brown bag lunch and then continued our fellowship on Saturday before the Irish football game. We finished up the football season with our second tailgate of the year, which proved to be a blustery, chilly day. No worries. It was no match for the resolve of our dedicated CEEES socialites and ND football fans. Thanks to everyone who helped make the seminar and tailgate a success. The organizers desire to continue providing opportunities within the department for everyone to feel included and valued as part of the CEEES community.



Yao Wang: *“Adjustable Module for Variable Depth Steel Arch Bridges”*



Existing rapidly erectable, steel panelized bridge systems (e.g., Bailey, Acrow, Mabey-Johnson) have limited material efficiency (span squared per weight) as they are comprised of rigid modules in a girder-type configuration. My research addresses this limitation by developing a new adjustable, steel module comprised of a four-bar linkage which can form more efficient variable depth arch bridges. The objectives of my presentation are to (1) present methodologies for the development of rational variable depth three- and two-hinged arch forms, (2) evaluate the geometry of the adjustable module to scribe these rational forms, and (3) demonstrate the promise of the adjustable module through three-dimensional finite element analyses (Adviser: Dr. Ashley Thrall).

Lab Link: <http://www3.nd.edu/~athrall/index.html>

Brian Joyce: *“Modeling Tides, Storm Surge and the Effect of Sea Ice Coverage on Storm Surge Response in Alaska”*



Due to the broad, shallow Bering Sea shelf and the low lying topography of the coastal environment, Western and Northern Alaska are highly susceptible to storm surge caused by powerful storms. Storms such as the November 2011 Bering Sea cyclone have troubled coastal communities with flooding, ice shove, and millions of dollars in damages. These large and potentially damaging storms are more likely to occur in the the late fall and winter in the Bering Sea. This coincides with a period of time when ice is either forming along the Alaskan coast in partial ice bands, or covering the Bering Sea in dense pack ice. Air-sea momentum transfer in the presence of ice depends strongly on the ice concentration. It is generally agreed upon that partial ice coverage may enhance the drag. Dense pack ice, which intuitively would eliminate momentum transfer from the air to the water, does in fact allow for substantial air-water momentum transfer. The variable effect that different ice environments have on the storm surge produced by these storms is therefore important to understand.

An ADCIRC unstructured grid circulation model has been developed that can accurately model the complex hydrodynamics and topography present along the intricate Alaskan coastline from

the Gulf of Alaska to the Beaufort Sea. ADCIRC is a high resolution, finite element, free surface circulation model used extensively by FEMA, the US Army Corps of Engineers and others to model regions such as the Gulf of Mexico, the East coast of the United States, and the Great Lakes. This model is capable of simulating tides as well as storm surge and wind-wave interaction in response to meteorological forcing. In order to include the effect of ice coverage, a parameterization which modifies the air-sea momentum transfer in the presence of ice coverage has been implemented. I will present on the development of the tide and storm surge model in ice free conditions, as well as the application of the model to strong winter storms which occurred during different ice coverage scenarios (Adviser: Dr. Joannes Westerink).

Lab Link: <http://coast.nd.edu/>

If you have any suggestions, feedback, or constructive criticism regarding the Academic Social Happy Hour events, please contact any of the co-organizers: **Andrew Schranck**, **Theresa Aragon**, **Lara Grotz**, and **Stefanie Lewis**. We would love to hear from you.

GRADUATE STUDENT UNION UPDATE

A lot is going on within the Graduate Student Union. The November meeting was the last one for the semester. As usual topics were diverse and discussion was intense. Our guest speakers this month presented a detailed overview of the Library renovations that will continue for several more years. The first and second floors will continue to be renovated until almost every square foot is transformed. Other topics covered throughout the evening by the council included the new two step authentication being implemented by OIT (please enroll as soon as possible), a GSU blood drive likely to take place in February, a research slam competition (similar to 3MT but less restrictive) to happen in early spring and sponsored by the Professional Development committee, and a grocery carpooling/taxi service hoping to be resurrected at FOG in the near future. Please let **Andrew Schranck** (aschranc@nd.edu) know if you have any concerns or feedback about your experience as a student in the Graduate School.

GRADUATE STUDENT SPOTLIGHT



Zachariah Silver is part of the Environmental Fluid Dynamics group, and his research focus has been on stably stratified flows in the planetary boundary layer. As part of this research, he has participated in three field campaigns focused on measuring real atmospheric conditions to enhance the understanding of these flow. Two of these field campaigns were part of the Mountain Terrain Atmospheric Modeling and Observations Program (MATERHORN). The motivation for this research program is to further develop the understanding of flow features in mountainous terrain and improve atmospheric simulations. Weather forecast models, such as the Weather Research and Forecasting Model (WRF), have spatial resolution limitations in mountainous terrain. In this program, his research focused on using the WRF model with a 500 meter horizontal resolution for the field site. High resolution simulations were necessary to investigate flow features that are induced by stably stratified flow

interactions with mountainous terrain. These features include the dividing streamline (upstream), lee waves, rotors, and vortices (downstream). He developed specialized software to analyze 3D atmospheric simulation data from the WRF model, to study the flow features of interest. Zachariah has been represented on several peer reviewed publications in journals such as *Pure and Applied Geophysics* and the *Journal of Geophysical Research: Oceans*, and he has another currently under review. His adviser is Dr. Harindra Joseph S. Fernando. Additionally, he has done a great deal of work with Professor Reneta Dimitrova, a visiting researcher from the Department of Meteorology and Geophysics at Sofia University "St. Kliment Ohridski". Most notably, congratulations are in order to Zachariah as he recently defended his dissertation recently in late September.

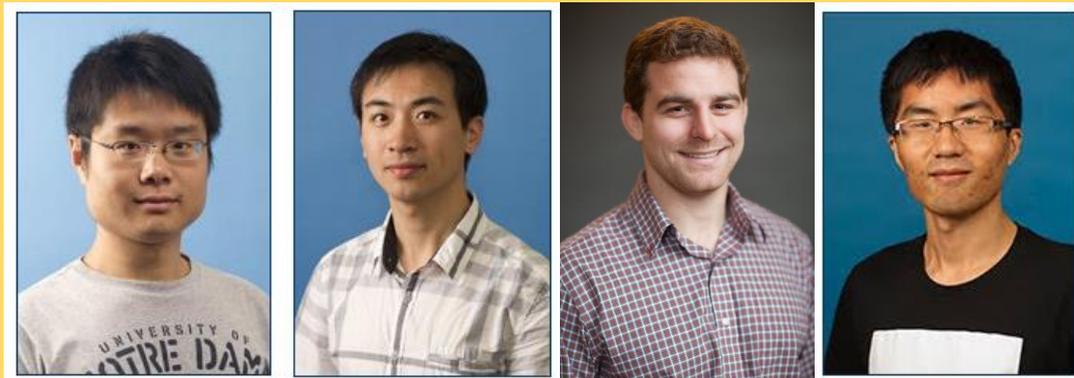
Lab Link

<http://www3.nd.edu/~dynamics/>

RESEARCH GROUP SPOTLIGHT

Dr. Kapil Khandelwal – The Khandelwal research group (Computational Physics and Structural Simulation Lab) develops computational techniques for the simulation and design of advanced material systems. The group consists of PhD students **Lei Li** (fifth year), **Guodong Zhang** (fourth year), **Ryan Alberdi** (fourth year) and **Nan Feng** (second year). The main focus of the group is on the development of finite element methods for the simulation of solids with geometric and material nonlinearities. These are developed alongside adjoint techniques for the analytical calculation of sensitivity values to be used in topology optimization. Topology optimization is a technique that seeks the optimal placement of a limited amount of material within a given design domain in order to enhance a desired behavior. In this way, topology optimization offers significantly more design freedom than traditionally used methods of size and shape optimization.

A current focus of the computational physics and structural simulation lab is on developing topology optimization techniques for the design of energy absorbing structures and materials. Energy absorbing structures and materials are needed for a variety of uses including vehicle crashworthiness design, design of structures under seismic, blast or impact loads and design of sports equipment and body armor. Lei is currently working on techniques for designing structures that can absorb a maximum amount of energy while limiting the accumulation of material damage. Guodong is currently working on techniques for designing energy absorbing materials using multi-scale simulations. Ryan is looking into techniques for the design of energy absorbing structures subjected to high strain-rate impact loads.



Lei Li

Guodong Zhang

Ryan Alberdi

Nan Feng

More information on the Computational Physics and Structural Simulation Lab and a list of publications can be found at the following website: <http://www3.nd.edu/~cpsl/>

THE GRADUATE SCHOOL – SCHEDULE OF DEADLINES

	Fall 2016	Spring 2017	Summer 2017
Teaching assistant list submitted to Graduate School	Aug. 15	Jan. 5	—
First class day	Aug. 23	Jan. 17	—
All course changes	Aug. 30	Jan. 24	—
Initial graduation list available in GradAdmin (Registrar)	Sept. 6	Jan. 31	June 27
Fall/Spring break begins	Oct. 15	Mar. 11	—
Course discontinuance	Oct. 28	Mar. 24	—
Preliminary theses/dissertations submitted for formatting check*	Nov. 7	Mar. 13	Jun. 19
Thanksgiving break begins (Wed. – Sun.)	Nov. 23	—	—
Easter break begins (Fri. – Mon.)	—	Apr. 14	—
Master's comprehensive examinations & PhD dissertation defenses**	Nov. 28	Apr. 7	Jul. 11
All admission to candidacy forms submitted to Graduate School	Dec. 5	Apr. 13	Jul. 17
Final theses/dissertations submitted to Graduate School	Dec. 5	Apr. 13	Jul. 17
Last class day	Dec. 8	May 3	Jul. 28
Final exams begin	Dec. 12	May 8	—
Graduation date (official degree conferral)	Jan. 8	May 20	Aug. 6

FELLOWSHIP/SCHOLARSHIP/EMPLOYMENT OPPORTUNITIES

- **National Defense Science and Engineering Fellowship (NDSEG)** (Deadline: December 9)
(https://ndseg.asee.org/about_ndseg/eligibility)
- **American Water Works Association (AWWA) Scholarships** (Deadline: January 10)
(<http://www.awwa.org/membership/get-involved/student-center/awwa-scholarships.aspx>)
- **Air & Waste Management Association (A&WMA) Scholarships** (Deadline: January 11)
(<http://www.awma.org/resources/students/scholarships-awards>)
- **Electrochemical Society Summer Research Fellowship** (Deadline: January 15)
(<http://www.electrochem.org/summer-fellowships>)

- **ASCE Scholarships and Fellowships** (Deadline: February 10)

(<http://www.asce.org/scholarships/>)

(http://www.asce.org/asce_fellowships/)

NEWSLETTER CONTACTS

If you wish to include or contribute news items for the next issue of the newsletter, please contact one of the editorial members below:

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