FROM THE EDITORS

The holidays are over, and spring semester is under way. The days are getting longer, and the weather will be getting warmer. Unfortunately, our workloads will not be getting any smaller and sitting inside to stare at a computer is just about impossible on that first warm sunny day of the year. Kick the semester off strong, get as much work done as you can so that you can enjoy the last part of the semester. Also, spring is prime time for graduations which means you or a friend may be defending in front of their committee. Let’s make sure we support these students as much as possible as they begin that final push, and to everyone, Welcome Back!

Cheers,
Ryan Alberdi, Andrew Schranck, and Dave Burney, Newsletter editors
ANNOUNCEMENTS

**Shuo Yang** has been awarded a travel grant by the Seismological Society of America to attend its 2018 Annual Meeting to be held in Miami, Florida, May 14-17, 2018. Shuo will be presenting a paper entitled *Investigation of H/V Spectral Ratio, Spectral Decay Parameter, and Strong-Motion Duration Based on a Ground-Motion Database of Chilean Subduction-Zone Earthquakes*. The Seismological Society of America is an international scientific society devoted to the advancement of seismology and the understanding of earthquakes for the benefit of society. The society has members throughout the world representing seismologists, geophysicists, geologists, engineers, insurers, and policy-makers. Co-authors of the paper are George Mavroeidis from University of Notre Dame, Tim Sonnemann, Benedikt Halldorsson and Birgir Hrafnkelsson from University of Iceland, and Juan Carlos de la Llera, Paula Aguirre and Alan Poulos from Pontifical Catholic University of Chile.

Congratulations to **Andrew Schranck**, who has been awarded a Patrick and Jana Eilers Fellowship from ND Energy for his project titled *Urea electrolysis cells for producing hydrogen fuel*. Check out the announcement on the ND Energy website: [https://goo.gl/iPMPES](https://goo.gl/iPMPES) and a spotlight of Andrew on the CEEES Department website: [https://goo.gl/cyQs4C](https://goo.gl/cyQs4C).

**Pi Day 5K**

Consider volunteering with the annual Pi Day 5K on campus to support science, engineering, fitness, pie, and South Bend youth programs all in one fun-filled day. Check out the website for more information ([https://awis.nd.edu/piday5k/](https://awis.nd.edu/piday5k/)). The event is on March 10 so the event can be on a weekend, but the race does start at 3:14 pm.

**Chili Cook-Off**

Keep your eyes open for this year’s chili cook-off! Last year’s event was cancelled due to a lack of participation, so this year we’re going to sweeten the deal for any participants. Start looking up recipes now, and keep an eye out for an email listing the dates and available prizes!

**Call for Newsletter Contributors**

Two of the three CEEES Grad Student Newsletter editors are moving on to bigger and better things! **Andrew Schranck** and **Ryan Alberdi** have their eyes set on graduation and need to pass off their Newsletter duties to new editors.

The Newsletter editors are strong believers in the value of news, especially the effect CEEES grad student news has on one another. The Newsletter is a space where everyone can catch up on
each other’s accomplishments amidst the busy lives grad students lead. The Newsletter is also a
great way for grad students to get involved in the department and gain perspective and exposure
in the CEEES department.

The Newsletter editors are eagerly searching for students with 1-2 hours a month to contribute
to the sustainability of this publication, to continue to provide CEEES grad students with updates
and news many months, semesters, and years into the future.

If you are interested in contributing your time and talent to making this publication a success,
contact Andrew Schranck, Ryan Alberdi, or David Burney for more information. Their contact
info is listed at the end of the Newsletter.

GRADUATE STUDENT UNION (GSU) UPDATE

The most recent council meeting for the GSU took place on Thursday, January 18 in the
LaFortune Student Center. Most students’ time since the last meeting has been spent focusing
on final exams, research, and holiday activities, but a few updates and upcoming events were
presented.

General
• GSU and Grad Life are officially up and running in their new location in the Duncan Student
  Center at the Southwest corner of the second floor. Go check out the space that includes lots
  of comfy seating and a coffee pot for you to make coffee.
• Make your voice heard! All are welcome at GSU Meetings (next meeting: February 22, 2018,
  6:30 pm, location TBD)
• If you have any questions, concerns, or information about anything GSU, reach out to your
department rep, Andrew Schranck (aschranc@nd.edu) and let him know!
• You can also submit questions and concerns to the GSU executive board or to gsu@nd.edu for
  concerns to be brought to the council anonymously.

Professional Development
Grad Career Services: As you likely know from an email you received shortly after the conclusion
of the Fall semester, the Director of Grad Career Services (GCS) and two Consultants (including
the College of Engineering Consultant Cindi Fuja) have recently left GCS, leaving a large gap to fill
in career consulting and professional development services for graduate students. Thanks to a
couple students in the CEEES Department, student concerns were raised in early December and
graduate students from the Colleges of Science and Engineering have actively been serving in the
interview process to help select the new members of the GCS team. No hires have been made
yet, but be on the lookout for a new team to serve you and your career development needs.
Information Panels: Three panels have been planned for the Spring semester in cooperation with
the Gender Studies program, Africana Studies program, and several other groups. The panels will
focus on navigating issues of Gender, Sexuality, and Race on the job market. These panels will be held early **March, mid-March, and early April**, pending the availability of our panelists.

**Healthcare**

**Insurance**: Do you have concerns about the current graduate student healthcare plan? Have you had issues with the plan? Would you like to give input for future considerations of graduate student coverage you would like to see? GSU Healthcare Chair, Kris Murray, has arranged a Q&A for all graduate students on **Friday, January 26, 2-3 pm in LaFortune 202** for questions regarding healthcare with Connie Morrow. If you have questions in advance please send them to Kris Murray with subject: GSU Healthcare questions for Connie Morrow and he will pass them along to her so she can be prepared at the meeting. If you miss this initial meeting, there will be a second meeting on **February 22 from 6:30-7:30 pm, location TBD**.

**Academic Affairs**

**Software**: Is there a piece of software you need for your research that isn’t currently provided by the University? If the graduate student body has a unanimous need for some software, the University Council for Academic Technologies (UCAT) may consider providing it. Please submit requests or inquiries to GSU Academic Affairs Chair, Kaijun Feng (**Kaijun.Feng.11@nd.edu**).

**Quality of Life**

International students who missed it last month, there was a GSU Survey on Visa Assistance created that you can still access at: [https://goo.gl/WXwcCg](https://goo.gl/WXwcCg)

**Upcoming Events**

- **February 17, 8 am - 4 pm**: Swiss Valley Ski Trip, cost is $15.
- **March 1, 10 am - 5 pm**: GSU sponsored blood drive at Hesburgh Library Circle. There will be a raffle for Amazon gift cards.
- **TBD**: Grad Student Rock Climbing event in the Duncan Student Center, Winery tour, Brewery Tour, and Charity Gala.
Ryan Alberdi: The propagation of energy in elastic and inelastic materials has long been a subject of investigation, and with the increase in computational capacity over the last decade it is now possible to carry out large-scale numerical simulations to understand the mechanisms of energy propagation in complex materials and structures. However, the inverse problem of achieving optimal energy management by designing appropriate materials and structures is still an open issue. Materials and structures wherein energy propagation can be optimally managed are needed in various applications. For instance, materials that can be used to control the flow of energy carried by mechanical waves are needed in numerous applications involving vibration and sound control. In this case, the material behavior is elastic, and the focus is on manipulating the flow of energy – both spectrally and spatially – through tailored design of the material microstructure. In addition, many engineering applications involve events such as impact or blast, wherein a large amount of energy enters a system in a short time span. For these events, protective structures are designed by utilizing inelastic behavior in the underlying material to dissipate energy entering the system. My research focuses on the development of computational methods for the multiscale analysis and design of nonlinear multifunctional materials and structures for energy management.

Multiscale analysis is carried out in the hierarchical framework of computational homogenization using RVE-based multiscale models. These models extract macroscopic material states from the response of a microstructural domain containing a statistically representative sample of microscale heterogeneities, known as a representative volume element (RVE). Examples of material microscale heterogeneities include aggregates in concrete, polycrystals in metals, fibers in reinforced composites, etc. My focus is on incorporating state of the art computational analysis techniques, namely isogeometric analysis, for the numerical solution of the RVE boundary value problem which provides macroscopic material response. This numerical technique offers a more robust geometrical representation which in turn provides an accurate numerical response while requiring significantly lower computational costs than traditional finite element analysis methods. This is important as multiscale analyses are extremely computationally demanding. Additionally, robust computational representation of intricate microstructural geometries is paramount for capturing the macroscopic response of architectured materials and metamaterials whose properties are derived from their tailored microstructural geometries.

Computational design of materials and structures is performed using the topology optimization technique which aims to find the optimal placement of material in a given domain so as to attain the best design performance. A significant bottleneck in the application of this method to problems involving inelastic material behaviors is the accurate evaluation of response sensitivities (i.e. the rate of change of a response function with respect to model parameters) for the highly nonlinear constitutive models used to simulate dissipative material behavior. This sensitivity information is needed to guide gradient based optimization algorithms toward solutions. My research has focused on the derivation of these sensitivity analyses for a number
of inelastic material models and its application to the design of optimal energy dissipating structures using topology optimization. Additionally, much of the promise of architectured materials lies in the idea of “materials by design” wherein an engineer will determine the material properties needed for a specific application and then design a material with these properties by manipulating the geometry and composition of the microstructure. To this end, applying topology optimization to the design of microstructural RVEs composed of inelastic materials is something I am currently working on. This can result in materials with vastly improved energy dissipation capabilities as compared to the current state of the art materials such as metallic foams.
GROUP SPOTLIGHT

The organic biogeochemistry and molecular paleoclimatology laboratory, led by Dr. Melissa Berke, includes graduate students Alejandra Cartagena-Sierra (fourth year), Keith O’Connor (third year), and Audrey Taylor (first year). Their research utilizes “biomarkers”, organic molecules derived from once-living organisms preserved in sediments, to investigate past climate changes. In addition, they also use biomarkers from modern samples to calibrate proxies and improve paleoclimate applications.

Alejandra’s research focuses on the study of processes and mechanisms that relate the Agulhas Current to paleoclimate variability and identify responses in the Indian-Atlantic gateway circulation during the last two major climate transitions in Earth’s history. She is analyzing the molecular and isotopic composition of sediment biomarkers to reconstruct salinity and sea surface temperatures in the Agulhas Plateau, southwest Indian Ocean, using samples that Alejandra and 28 more scientists collected during IODP Expedition 361. Her research aims to examine possible latitudinal migration of the subtropical front in the southern Indian and Southern Ocean through time and relate these temperature and salinity shifts to global climate and Atlantic meridional overturning circulation variability.

Keith’s research focuses on biomarkers from modern plant and soil samples taken along a transect of northern Alaska. He uses compound-specific stable isotope techniques to better understand the mechanisms behind plant and microbe incorporation of waters along an environmental gradient. This research aims to calibrate the usage and mechanistic understanding of proxies utilized for paleoclimate studies, focusing on lesser known high-latitude climates. Stable water isotopes (δ²H and δ¹⁸O) of preserved plant tissues are widely utilized in paleoclimate reconstructions, but the unique environmental modifications of water isotopes are regionally specific and need to be better constrained.

Audrey is using the chemical and isotopic composition of molecular fossils from sediment cores collected near the Mozambique Channel to reconstruct terrestrial climate change in southern Africa and its linkage to oceanographic variability driven by the Agulhas Current, an influential conveyor of heat and moisture in the southwest Indian Ocean. Audrey is also using similar proxies to add climatic and environmental context to societal change in ancient Greece. This research aims to advance our understanding of the past and present human, climate, and environment nexus in a region that is especially vulnerable to anthropogenic climate change.

https://www3.nd.edu/~mberke/
# THE GRADUATE SCHOOL – SCHEDULE OF DEADLINES

<table>
<thead>
<tr>
<th>Event</th>
<th>Fall 2017</th>
<th>Spring 2018</th>
<th>Summer 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching assistant list submitted to Graduate School</td>
<td>Aug. 20</td>
<td>Jan. 4</td>
<td>—</td>
</tr>
<tr>
<td>First class day</td>
<td>Aug. 22</td>
<td>Jan. 16</td>
<td>Jun. 18</td>
</tr>
<tr>
<td>All course changes</td>
<td>Aug. 29</td>
<td>Jan. 23</td>
<td>—</td>
</tr>
<tr>
<td>Initial graduation list available in GradAdmin (Registrar)</td>
<td>Sept. 5</td>
<td>Jan. 30</td>
<td>Jun. 26</td>
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<tr>
<td>Fall/Spring break begins</td>
<td>Oct. 14</td>
<td>Mar. 10</td>
<td>—</td>
</tr>
<tr>
<td>Course discontinuance</td>
<td>Oct. 27</td>
<td>Mar. 23</td>
<td>—</td>
</tr>
<tr>
<td>Preliminary theses/dissertations submitted for formatting check*</td>
<td>Nov. 6</td>
<td>Mar. 5</td>
<td>Jun. 11</td>
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<tr>
<td>Thanksgiving break begins (Wed. – Sun.)</td>
<td>Nov. 22</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Easter break begins (Fri. – Mon.)</td>
<td>—</td>
<td>Mar. 30</td>
<td>—</td>
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<tr>
<td>Master’s comprehensive examinations &amp; PhD dissertation defenses**</td>
<td>Nov. 20</td>
<td>Apr. 3</td>
<td>Jul. 2</td>
</tr>
<tr>
<td>Final theses/dissertations submitted to Graduate School</td>
<td>Nov. 27</td>
<td>Apr. 9</td>
<td>Jul. 9</td>
</tr>
<tr>
<td>All admission to candidacy forms submitted to Graduate School</td>
<td>Dec. 4</td>
<td>Apr. 12</td>
<td>Jul. 16</td>
</tr>
<tr>
<td>Last class day</td>
<td>Dec. 7</td>
<td>May 2</td>
<td>Jul. 27</td>
</tr>
<tr>
<td>Final exams begin</td>
<td>Dec. 11</td>
<td>May 7</td>
<td>—</td>
</tr>
<tr>
<td>Graduation date (official degree conferral)</td>
<td>Jan. 7</td>
<td>May 19</td>
<td>Aug. 5</td>
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</tbody>
</table>

*Formatting checks should be submitted to the Graduate School when the document is given to readers, at least two to four weeks prior to the defense.*

**Reader’s reports must be submitted to the Graduate School at least two days before the defense takes place.*
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:

Ryan Alberdi, PhD student, Ryan.A.Alberdi.1@nd.edu
David Burney, PhD student, David.C.Burney.2@nd.edu
Andrew Schranck, PhD student, Andrew.F.Schranck.1@nd.edu
Mollie Dash, Department Administrator, dash.1@nd.edu