GRAND CHALLENGE SCHOLARS PITCH

NICOLAS BROUILLARD
Civil Engineering and Spanish

Senior
Lewiston, Idaho

Faculty mentor: Fritz Fiedler, Civil and Environmental Engineering

Provide Access to Clean Water
Applications of Clean Water Provision in Underserved Communities

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<td>My research emphasis is on two applications of clean water provision: the provision of potable water in the underserved community of Carani, Bolivia and the provision of clean water for tree nurseries in heavily deforested areas in Notsé, Togo.</td>
<td>I work with the Center for Forest Nursery and Seedling Research and the non-governmental organization the Institute for Community Partnerships and Sustainable Development in the Department of International Studies.</td>
<td>I will research how the project communities can participate in entrepreneurial activities that use the skills gained from the projects. I will evaluate these entrepreneurial activities at five Idaho Entrepreneurs Speaker presentations.</td>
<td>I will travel to Notsé, Togo and Carani, Bolivia for the implementation and assessment of the two clean water projects. I would gain cross-cultural perspectives while working with community members in Bolivia and Togo.</td>
<td>I have volunteered with UI Humanitarian Engineering Corps in both fundraising and project-oriented oriented capacities as an officer of the organization. I am also the lead engineer on the Togo forest rehabilitation project.</td>
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GRAND CHALLENGE PITCH

I am constantly inspired and amazed by the ability of civil engineers to shape our world into a more livable and enjoyable place for humanity. Many areas of the world possess minimal amounts of or completely lack the resources to support the most basic human needs. Safe drinking water, a resource required to sustain all human life, is not available to everyone. My first project focuses on providing clean drinking water; my second project focuses on providing clean water to tree nurseries.

GRAND CHALLENGE FOCUS AREA

Provide Access to Clean Water
Today, the availability of water for drinking and other uses is a critical problem in many areas of the world.
GRAND CHALLENGE SCHOLARS PITCH

GABRYEL CONLEY
Biological Engineering and Computer Engineering

Sophomore
Moscow, Idaho
Faculty mentor: Bryn Martin, Biological Engineering

Reverse Engineer the Brain
Hydrodynamic Simulator of the Intracranial Cerebrospinal Fluid

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<td>I am involved in research that focuses on researching the characteristics of the human Cerebral Spinal Fluid (CSF) system by developing a physical 3-D model of the system as well as the associated machines necessary to mimic the functions of the system.</td>
<td>I will earn three credits in the Honors College by completing the class Dancing Hands, Drumming Feet. The class explores the effects of historical events that drive musical rhythms in different cultures around the world.</td>
<td>I will complete Business 415 – New Venture Creation. This will help me understand the process of creating and running a business which will allow me to make more informed decisions throughout my career.</td>
<td>I plan to participate in a yearlong project with the Humanitarian Engineering Corps. I have earned 8 credits of Spanish through my high school AP Spanish.</td>
<td>During my junior/senior year I will tutor 2nd - 5th graders at Moscow’s McDonald Elementary school in math, science, and Spanish. I will host open tutoring sessions that will last between one and two hours at least twice a week.</td>
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GRAND CHALLENGE PITCH

I am working to recreate the Cerebral Spinal Fluid (CSF) space inside the brain and develop a virtual model that will accurately represent the intracranial anatomy. I will create a physical model that will be attached to a SLA printed spine to research the intracranial CSF fluid characteristics. The project, as an entirety, will yield a working model of the CSF system. The project, as an entirety, will yield a working model of the CSF system and will allow for an array of future research projects. I hope to continue researching the Central Nervous System throughout my life particularly, bridging the gap between humans and machines.

GRAND CHALLENGE FOCUS AREA

Reverse Engineer the Brain
For decades, some of engineering’s best minds have focused their thinking skills on how to create thinking machines — computers capable of emulating human intelligence.
I am interested in doing research on photochemical methods to pattern nanoparticles on semiconductors using photoresist techniques. Nanoparticle technology is exciting because these materials exhibit unique chemical and physical properties at a small scale. This development of strategies to accurately place nanomaterials on chips could greatly impact many technologies such as solar panels, lasers, and sensors.

GRAND CHALLENGE FOCUS AREA

Make Solar Energy Economical
As a source of energy, nothing matches the sun. Only a small fraction of the sun's power output strikes the Earth, but even that provides 10,000 times as much as all the commercial energy that humans use on the planet.

GRAND CHALLENGE PITCH

I will do research and coauthor a paper to present at the MS&T19 Conference in October 2019 and present my research to the conference. I will take INTR 316 a class which focuses on leadership skills and the complexities revolving service trips (like if the project will help or hurt a community). I want to learn more about grant writing and set up my own grant writing website. I have a reading list that includes Grant writing books, Entrepreneur.com, Ultimate LLC Compliance Guide, and Start Your Own Information Marketing Business.

I have travelled with U of I to Ecuador. The experience helped me develop a passion for renewable energy. Ecuador has one of the most biodiverse ecosystems in the world and rests on the equator and is closer to the sun, so solar energy seems like a great alternative.

I will attend a second service trip for two weeks in Uruguay U of I as a student leader. This time we are helping rural farmers with supporting sustainable farming and reducing their carbon footprint.

GRAND CHALLENGE SCHOLARS PITCH

MARK CURRIER
Materials Science Engineering

Sophomore
Snohomish, Washington
Faculty mentor: Tom Bitterwolf, Chemistry

Make Solar Energy Economical
Exploring Nanoparticles to Enhance Understanding of Solar Efficiency

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**Reverse Engineer the Brain**

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<td>I will be working with biological engineering Professor Ben Richardson to determine the effect of alcohol dependency on signals across singular neurons in the cerebellum in mice and rats.</td>
<td>I completed a 3-credit course in the Honors College; “Love and Happiness” ISEM. Reverse engineering the brain will bring breakthroughs for mental illness and how we can better deal with them when we understand how they function.</td>
<td>I created the “El Cap Challenge” to fundraise over $600 for the climbing club, encouraging the community to participate and climb to tower 53 times over the course of the semester.</td>
<td>This past summer I studied abroad in China, taking an engineering economics course at the Wenzheng College of Soochow University in Suzhou, China. I was fully immersed in the culture, living with a Chinese roommate, and taking a Chinese Language class on campus as well.</td>
<td>As president of the student branch of IEEE, planned meetings, events, and conferences including Rising Stars Conference, served as an ECE Ambassador and acted as a mentor through the Society of Women in Engineering program.</td>
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**ALLISON ELLINGSON**

Electrical Engineering

Senior
Boise, Idaho

**Faculty mentor**: Ben Richardson, Biological Engineering

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The Grand Challenge Scholars program has encouraged me to pursue interesting opportunities I wouldn’t necessarily have pursued before. It led me to find the connection for studying abroad in China, as well as pushing me to find research that I found interesting and applicable to the grand challenges.

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**Reverse Engineer the Brain**

For decades, some of engineering’s best minds have focused their thinking skills on how to create thinking machines — computers capable of emulating human intelligence.
GRAND CHALLENGE FOCUS AREA

Manage the Nitrogen Cycle

It doesn't offer as catchy a label as "global warming," but human-induced changes in the global nitrogen cycle pose engineering challenges just as critical as coping with the environmental consequences of burning fossil fuels for energy.

GRAND CHALLENGE SCHOLARS PITCH

STEVEN HAENER
Mechanical Engineering

Sophomore
Boise, Idaho

Faculty mentor: Daniel Robertson, Mechanical Engineering

Sustainability
Developing Stronger Wheat Strains

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<td>5% to 15% of wheat is lost due to the stock breaking. I plan to collaborate to work on a design that can measure the strength of wheat. This will allow plant breeders to find stronger strains of wheat.</td>
<td>Music has always been a very influential part of my life which is why I declared a 19/21 credit music minor. I can use this platform to spread awareness around food insecurities in our community and world.</td>
<td>I plan to take the BUS 452 tech venture class. This will give me the experience/knowledge to sell and market my research design to plant breeders.</td>
<td>My main plan is to apply to the RISE program, which is a paid research internship to Germany during the summer. This will drastically improve my German, give me a new cultural perspective, and help me understand the global scope of this food issue.</td>
<td>My project is focused on world hunger, but food insecurity is a serious issue in the US as well. Volunteering time at local food banks and food drives will increase my personal awareness of this issue as well as help the local community.</td>
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Growing up, I never had to worry about food. I never understood the value of food security. For some people, that's not the case. With our exploding population, the problem of global food insecurity is only going to get worse. I became a mechanical engineer to help people and solve big problems, and I’m doing both with my research on wheat.

GRAND CHALLENGE PITCH
I want to perform research in the structural engineering field for the purpose of bridge structures. My research will require partnership with professors and peers and will result in designs for sturdier bridges.

I will complete 3 credits courses in the Honors College. ISEM 101, Sports in American Society, course is an ethics based course that will give me insight into behaviors of future co-workers. The course will help improve my ability to make mature, well thought out, decisions.

I will attend five of the Idaho Entrepreneur’s Speaker presentations and document my experience. I believe this will provide valuable insight into running a business and overcoming many challenges presented in the workplace.

I will attend a mission trip with either my school or a religious group, where I will travel to another country and serve underprivileged people. I want to go on a mission trip to Africa to dig wells, build homes, and work with children, however, I will take any other opportunity I see fitting.

As a member of Kappa Alpha Theta sorority I participate in many community service activities. I have participated in fundraising to support Court Appointed Special Advocates (CASA) a program to help abused children through the foster care system.

The purpose of my research is to test the potential benefits of reinforcing concrete beams with Carbon Fiber or Glass Fiber reinforced polymer grids as opposed to traditional steel rebar. The results will be used to determine the advantages of using Carbon or Glass fiber over traditional steel used for structures such as bridges.

GRAND CHALLENGE FOCUS AREA

Restore and Improve Urban Infrastructure

In 2005, the American Society of Civil Engineers issued a report card, grading various categories of U.S. infrastructure. The average grade was D (Updated to D+ in 2013).
I wrote a paper on the state of global clean water provision for a class assignment. I had no idea it was still as big of an issue as it is and immediately desired to find out what I could do to make any difference. The U.N. declares access to water as a basic human right, and yet roughly 10% of the globe is lacking. If I can learn about the causes of the problem, study the effects of implementing solutions and learn why some project succeed and others fail.
I am extremely motivated by my desire to lend a hand to those in need. Many members of the community I grew-up in do not have access to affordable medicine, healthcare, food, housing, electricity, or even water. I am in the Grand Challenge Scholars program to help tackle those problems. Using funds I received from the 2016 pitch event, I have been successful in creating nanoscale fibers. I am currently testing the solubility and stability of them. Next I will test its protein conjugation abilities, cell adhesion, and drug release.
Engineer Better Medicines
Human Mesenchymal Stem Cells and Carbon Nanotubes

I am involved in research which could be used to kill residual cancer cells after the removal of a solid tumor. This could decrease the likelihood of metastasis. I would like to take my research project into production and secure a stable position for a company. Beyond that, I would like to progress the research I am doing to save lives.

GRAND CHALLENGE PITCH

I will engage in more than two semesters of research and become the co-author on at least one peer-reviewed paper.

My plan includes taking three classes in ethics including Ethics, Professional Ethics and Business Ethics (PHIL 103, PHIL 203, PHIL 361).

While at the University of Idaho, I will take Business 414 - Introduction to Entrepreneurship.

To gain perspective as well as experience in business, I will travel on a faculty-led trip sponsored by the College of Business and Economics.

I will volunteer with a student society. My hope is to lead a team and clean out the laboratory I work in.

GRAND CHALLENGE FOCUS AREA

Engineer Better Medicines

Doctors have long known that people differ in susceptibility to disease and response to medicines. But, with little guidance for understanding and adjusting to individual differences, treatments have been standardized rather than individualized.
I plan to complete 4 semesters of research under different professors and take classes in mechanical engineering and material science. I plan to complete entrepreneurship classes and take ISEM 301 on global leadership.

Create a business plan and compete in the Idaho Entrepreneurs Idaho Pitch Competition.

I want to participate in study abroad to learn how other countries space programs work. Volunteer at an organization that helps reduce waste.

AURORA ROSIN
Computer Engineering
Freshman
Boise, Idaho
Faculty mentor: Joe Law, Electrical and Computer Engineering

In high school I was involved in the Idaho Science and Aerospace Scholars program which sparked my interest in space. The program went through many of the challenges that engineers will face in the future regarding space exploration. As a result I have a major interest in doing research on finding a way to handle the debris from dysfunctional satellites. I want to help develop robots that will collect space debris from satellites.

Engineer the Tools of Scientific Discovery
In the popular mind, scientists and engineers have distinct job descriptions. Scientists explore, experiment, and discover; engineers create, design, and build.
GRAND CHALLENGE SCHOLARS PITCH

KENNETH SHEFFLER
Electrical Engineering

Junior
Potlatch, Idaho

Faculty mentor: Erik Coats, Civil and Environmental Engineering

Powering the World Through Biomass Waste

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<td>I will lead an anaerobic digestion related research project. I will be conducting a biogas feasibility assessment paper for the University of Idaho this academic year.</td>
<td>I plan to complete a junior ISEM course on the subject of energy, sustainability, power, or other related topics. Potential classes include Building Our Energy Policy, or Sustainability and Higher Education.</td>
<td>I will complete the 3 credit class BUS 414 in Spring 2019 as well as compete in the Idaho Pitch Event proposing my biogas septic tank digester business idea. This will link the technical information I have been studying to the business world.</td>
<td>I have spent a semester abroad in Suva, Fiji through U of I study abroad program. Additionally, I will actively participate with the Humanitarian Engineering Corps to provide the community of Carani, Bolivia with clean water access.</td>
<td>I will spend two-weeks on a U of I service learning trip to Ecuador and work with Green Empowerment to build biogas digesters and other renewable energy technologies in rural communities.</td>
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I studied abroad at University of South Pacific (USP) in Suva, Fiji. At USP, I took a renewable energies course and one of the main topics covered was anaerobic digestion. Since then, I have been very interested in the application of digesters to convert waste to energy. Studying in Fiji opened my eyes to the impacts of climate change and the importance of finding renewable sources of energy. Learning about renewable sources of energy in a developing country inspired me to implement this process in applications in the United States. It is my belief that anaerobic digesters can be a step to limit waste, mitigate climate change, and represents a great renewable source of energy.

Manage the Nitrogen Cycle
It doesn’t offer as catchy a label as “global warming,” but human-induced changes in the global nitrogen cycle pose engineering challenges just as critical as coping with the environmental consequences of burning fossil fuels for energy.
I have always been interested in medicine, and how it can help heal a person that is sick. However, medicine is far from perfect, there are so many developments to be made in the field of medicine. I will be involved in research with the long-term goal of creating a method for the purification of T cells using magnets. With the arrival of gene therapies that involve removing a patient’s T cells then altering and reinjecting them, finding a better way to purify a patient’s T cells will be of large importance.
GRAND CHALLENGE PITCH

MCKENZIE WALQUIST
Biological Engineering
Junior
Jefferson City, Missouri
Faculty mentor: Sarah Wu, Biological Engineering

Provide Access to Clean Water
Plasma Discharge Technology for Water Treatment

I have participated in water treatment research involving a new reactor design in plasma discharge technology. I want to continue this research, including work involving the removal of bacteria, dyes, and chemicals and their residual components from various water sources. I recognize that there are invaluable resources that must be preserved and people with needs to be met. I want to contribute to a world in which responsible innovation improves lives across the planet.

GRAND CHALLENGE FOCUS AREA

Provide Access to Clean Water
Today, the availability of water for drinking and other uses is a critical problem in many areas of the world.
**GRAND CHALLENGE SCHOLARS PITCH**

**LOUISE YU**  
Chemical Engineering, Biochemistry and Chemistry

Senior  
Boise, Idaho  
**Faculty mentor:** Matthew Bernards, Chemical and Materials Engineering

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**Engineer Better Medicines**  
Nerve Tissue Engineering

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<td>I have worked to build nerve guidance conduits using the polyampholyte polymers. My goal is to be able to present a poster or paper at the AICHE National Conference.</td>
<td>I volunteer in the Psychology’s Mind in Movement Laboratory to better understand how the role of thought in action may lead to novel treatments for movement disorders. I will complete a Pre-Health minor and Biochemistry 2nd major.</td>
<td>I will attend five of the Idaho Entrepreneurs Speakers presentations. I want to do a process engineering co-op/internship at Simplot or Monsanto to understand large scale manufacturing and the logistics</td>
<td>I will gain experience in the disparities of healthcare. I have completed over 200 hours by volunteering and shadowing doctors primarily in the Philippines and U.S. in ophthalmology, surgery, pediatrics, nephrology, and gynecology.</td>
<td>I participated in two medical missions with Doctors without Borders in the Philippines. I plan to volunteer primarily in local hospitals. I also currently volunteer at Moscow Middle School. As president of the Pre-Medicine Club we volunteered at the local nursing homes.</td>
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**GRAND CHALLENGE PITCH**

I have traveled extensively around Asia and lived there for almost half of my life and seeing the disparity in medical care in 3rd World versus 1st World countries led me to pursue a career in which I could be a part of improving the current medicines or practices offered. I would like to take what I have learned about 1st World healthcare and apply practices to the 3rd World.

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**GRAND CHALLENGE FOCUS AREA**

**Engineer Better Medicines**

Doctors have long known that people differ in susceptibility to disease and response to medicines. But, with little guidance for understanding and adjusting to individual differences, treatments have been standardized rather than individualized.
The University of Idaho, College of Engineering is committed to developing a long-term program designed to prepare a minimum of 20 students annually to lead the way in meeting challenges identified by the National Academy of Engineering that are key to maintaining and improving quality of life across the globe.

**Themes and Challenges**

**SUSTAINABILITY**
1. Make solar energy economical
2. Provide energy from fusion
3. Develop carbon sequestration methods
4. Manage the nitrogen cycle
5. Provide access to clean water

**SECURITY**
6. Restore and improve urban infrastructure
7. Prevent nuclear terror
8. Secure cyberspace

**HEALTH**
9. Advance health informatics
10. Engineer better medicines

**JOY OF LIVING**
11. Reverse-engineer the brain
12. Enhance virtual reality
13. Advance personalized learning
14. Engineer the tools of scientific discovery

**GRAND CHALLENGE SCHOLARS PROGRAM**

Key Components

- Research Experience
- Interdisciplinary Curriculum
- Entrepreneurship
- Global Dimension
- Service Learning

uidaho.edu/grandchallenges