



GEORGE FOX UNIVERSITY

## BECOME A GRAND CHALLENGE SCHOLAR

If you are interested in applying and/or receiving more information on the program, please contact the program director, Dr. Jeff Walters, at [jwalters@georgefox.edu](mailto:jwalters@georgefox.edu).

# GRAND CHALLENGES SCHOLARS PROGRAM

BRUINS TAKING ON GRAND CHALLENGES

## LEARN MORE

For even more information about the program, visit our website at [www.georgefox.edu/GrandChallenges](http://www.georgefox.edu/GrandChallenges)

To learn more about the engineering degree program at George Fox, visit [www.georgefox.edu/engineering](http://www.georgefox.edu/engineering)



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# WHAT IS THE GFU GRAND CHALLENGES SCHOLARS PROGRAM?



In an increasingly interconnected and complicated world, it is evermore important that engineers apply their talents and skills to address the inevitable challenges that continue to arise in both local and global contexts. As a response to this call to action, the National Academy of Engineering

(NAE) Grand Challenges for Engineering program was created in 2008 as an aspirational vision of what engineering needs to deliver to all people on the planet in the 21st century.

With 14 goals in total - ranging from providing clean water and energy to reverse engineering the brain and providing energy from fusion - the NAE Grand Challenges Scholars Program focuses student research and professional development towards accomplishing this vision over the next century. Over 120 universities across the globe have Grand Challenges Scholars programs, including Duke, Georgia Tech and the University of Michigan.

The Grand Challenges Scholars Program at GFU (GFU-GCSP) was launched in 2015 to offer a way for students to start applying their passions and talents towards addressing the Grand Challenges. GFU-GCSP has a curricular and extracurricular structure comprising six complementary components (innovative research, interdisciplinarity, entrepreneurship, global focus, service learning, and faith integration). A key feature of GFU-GCSP is deep student engagement within the Christian ethos for how and why engineers can and should have tremendous socio-economic and socio-technical impact in the communities they serve. The honor of becoming a GFU-GCSP scholar signifies a student has spent significant time and effort engaging in impactful research, coupled with deep reflection on the responsibility and implication of being an engineer and global citizen. In doing so, GFU-GCSP desires to foster empathetic and globally-minded engineers - a powerful transformation that is sure to be worth the effort.

# STUDENTS ENGAGE IN HIGH-IMPACT RESEARCH

During the 2019-2020 school year, 15 GFU undergraduate research students worked on research projects that spanned across the 14 NAE Grand Challenges Grand Challenges. This year we graduated our first cohort of four students with GCSP honors. Below we highlight the impressive work from two of these students.

## JONATHAN WILSON

### Grand Challenge: Provide Access to Clean Water

Over 700 million people worldwide lack access to safe potable drinking water. Increasingly, centralized piped water systems are becoming much more prevalent in low to medium-developed countries (such as in Peru), however, there are a lack of studies on the drivers of sustainability and functionality for scaling up these types of interventions. Jonathan Wilson's research sought to evaluate the system, discover deficiencies and analyze other interconnected factors related to sustainability and functionality, focusing on a case study in Santa Rita, Peru, where a piped water treatment and distribution system had recently been installed.



By modeling the treatment processes and hydraulics of the water distribution network, Jonathan's work developed a broader understanding of the potable water distribution, along with the prevalence of non-technical factors, to evaluate their effect on the water system management and operation. His analyses offered recommendations to the Santa Rita water officials for how to best operate their water system to mitigate suboptimal system functionality. This work was published within the proceedings of the IEEE Humanitarian Engineering Technology Conference in 2019 "Seeing the forest for the trees: A systems approach for rural water and sanitation service management and operation".



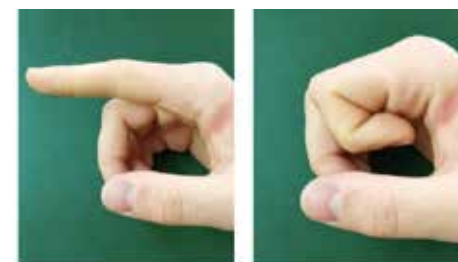
# THOMAS NOEL

### Grand Challenge: Reverse Engineer the Brain



Limb amputations affect a significant portion of the world's population every year. The necessity for these operations can be associated with related health conditions or a traumatic event. Currently, prosthetic devices intended to alleviate the burden of amputation lack many of the premier features possessed by their biological counterparts. The foremost of these features are agility and

tactile function. In an effort to address the former, Thomas investigated the fundamental connection between agile finger movement and brain signaling. In this study each subject was asked to move his or her right index finger in sync with a time-aligned finger movement demonstration while each movement was labeled and the subject's brain waves were recorded via a single-channel electroencephalograph (EEG). This data was subsequently used to train and test a deep neural network (DNN) in an effort to classify each subject's intention to rest and intention to extend his or her right index finger. The associated publication, *Utilizing Deep Neural Networks for Brain-Computer Interface-Based Prosthesis Control*, can be found in the Journal of Computing Sciences in Colleges Vol. 35 No. 1.



## INTERESTED IN BECOMING A GFU GRAND CHALLENGE SCHOLAR?

The GFU Grand Challenges Scholars Program is growing and we are currently accepting new applicants for the 2020/2021 school year. If you are interested in applying and/or receiving more information on the program, please contact the program director, Dr. Jeff Walters, at [jwalters@georgefox.edu](mailto:jwalters@georgefox.edu).