January | February 2021

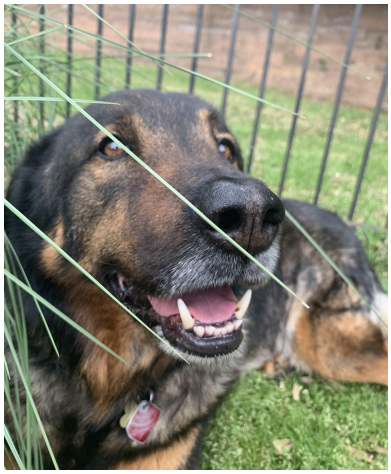
The following newsletter has been created to engage with those passionate about Humanitarian Engineering (HE) by providing information and resources to our subscribers. This issue highlights key events, projects, and opportunities for involvement all related to HE at Mines and around the world.

HE @ Mines

HE Pets

Hayley Glover

Staying at home hasn't been all bad for those of us with pets! Sure, sometimes you have to mute your microphone when your ducks start quacking, or turn off your camera when your dog is looking so cute and just in need of pets, but we love them for it! And for those of you without pets, thank you for understanding when ours just want to get on camera and say "Hi!".
To honor the MVPs who are helping us get through the school year, we asked our HE community for pet photos! Here are some of our favorites:



Archer - Colleen McCulloch

Gordito - Salwa Aletan

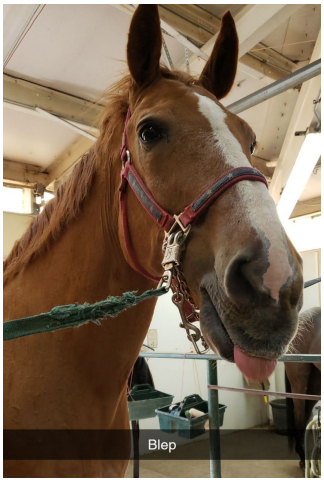
Mira - Cassidy Grady

Lucy 2, Marigold, and Francis - Julia Roos

Max - Nina Guizzetti

Jules Brown

Gavin Wilson



Hogan - Cecilia Schroeder

Elizabeth Reddy

Elote - Casey Gibson

Ziggy - Paige Kadavy

Ivy - Jessica Smith

S.T.E.M. Education Project Update

Allison Palmer

In the S.T.E.M. (Science, Technology, Engineering, and Mathematics) Education Project, a small group of Shultz Scholars and Fellows is finding opportunities to assist in local S.T.E.M. classrooms. This spring semester, the team will be partnering with Greeley's S. Christa McAuliffe S.T.E.M Academy and the other Scholars and Fellows to create Earth Day activities

for the K-8 students. Each individual group will create an activity for a particular section of grades (e.g. K-2, 3-5, 6-8), and, during the school's Earth Day event, the students will participate in the activity. The theme of the activities is going to be "impact on the environment," so this can include humans' carbon footprints, water usage and conservation, or any other related topic. The purpose of the activity is to teach the younger students about the environment, the impact that they can have on it, and other topics and future opportunities in the S.T.E.M. field.

During the month of March, the Shultz Scholars and Fellows will be in the process of creating each activity, discussing and bouncing ideas off of one another, confirming the activity plans with the Academy's teachers and administrators, and finalizing necessary supplies and instructions. On the day of the event, the Mines students, who will be attending virtually, will introduce themselves and the Humanitarian Engineering program to the in-person Academy students, and then the Academy's teachers will take over and lead the students through the planned activity.

The team hopes that this project will positively impact the Academy students by showing them interesting and important applications of S.T.E.M. The team also wants this project and these activities to benefit the teachers and administrators; a major purpose of doing this project is to take a burden off of teachers, especially in these challenging times. In the future, the team wants to continue working with local schools, teachers, and students to improve their S.T.E.M. education experience and to help out educators in any way that we can.

SRSE and HE Symposium Update

Wyatt Ellison, President and Emily Robinson, Symposium Chair

Socially Responsible Scientists and Engineers (SRSE), the Mines Humanitarian Engineering club, kicked off their semester on February 8th by hosting Mines alum and daughter of Chuck Shultz, Julie King. Julie currently works for Into Your Hands Africa, a non-profit based out of Denver that empowers children and families in rural Uganda to rise above the constraints of poverty through education and business development. Julie led a discussion on how it is possible to focus on your personal values in the workplace and offered tips on asking the right questions to understand if a company's values align with those of your own.

On February 22nd, the club welcomed back Mines and Humanitarian Engineering alum Seamus Millett to discuss how he has applied his HE skills to the workplace and how his company BGC Engineering, a geotechnical firm with an office in Golden, promotes corporate social responsibility. BGC Engineering implements a program that allows employees to work on non-profit projects called BGC Squared though as employees, it has been a challenge as these projects are separate from the more-traditional projects working with geohazards, oil and gas, landslide mitigation, and the mining industry. Despite time challenges associated with balancing this program with other work, Seamus has been effective in building trust among his team

members and has been able to work with others that have a different perspective, skills that he has been able to practice and apply during his time in HE!

This year's Humanitarian Engineering Symposium will focus on Environmental Justice through four sessions spread throughout the remainder of the spring semester. We will begin with a screening of the documentary Plastic China, then host a speaker session with Dr. Greg Rulifson on what can go wrong to create issues of environmental injustice. The third session will be a panel event on how to respond, and the series will conclude with a session on individual takeaways and ways to get involved. The symposium will be mostly virtual with limited in-person opportunities for Mines students. We look forward to your participation and registration will be coming soon!

Jefferson High Project

Kevin Greene

This semester the HE program has begun to explore a new partnership with Red Rocks Community College and Jefferson High School, a local high school in Edgewater, CO. Jefferson High is a school where 91% of the students qualify for free and reduced lunch. We hope that by working with Red Rocks and community members at Jefferson, we can find ways that all parties can work to address some of the needs of the community while also working to help high school students get interested in STEM and the possibility of going to college at Red Rocks or Mines. While this collaboration is in the very early stages, three of the Shultz Scholars, Allison, Nina and Kevin, have been meeting with teachers and community members in order to better understand the needs of the community and the resources that are available. We have many partners who are excited to work with us and see where the collaboration goes.

Working with a community so close to Golden shows the many inequalities that exist in our own communities, but also has shown how many amazing organizations and people are working to address those inequalities. Using skills we've learned in HE classes to talk with teachers and community members is rewarding as we hope to create a difference in our community. While many may see HE as something that can only be applied to international organizations, working with local communities is just as important and a great way to be involved and create change locally.

Upcoming Events

Save the date for these upcoming HE events! Contact Julia Roos at jroos@mines.edu for more information.

- **Gold Nuggets Interview with Dr. Paul Santi, March 24 from 4-5 PM MDT**
- **April HES Colloquium, April 5 from 5-7 PM MDT**
- **May HES Colloquium, featuring Mines HE grads! May 3 from 5-7 PM MDT**

Past Events

February HES Colloquium

Promising Resilience: Research Downsizing and Survival in Contemporary British Columbia

Summary by Nick Yavorsky

Back on February 1st the Humanitarian Engineering and Science program held their first colloquium of the spring semester. We had the pleasure of listening to a presentation from Dr. Thomas Özden- Schilling, a researcher and professor from Johns Hopkins University. Dr. Thomas Özden- Schilling spoke about his work in British Columbia and across western Canada where he has been working with a variety of individuals involved in land and resource management. More specifically, Dr. Thomas Özden- Schilling has been analyzing and reflecting on the methodology of the BC Cumulative Effects Framework, a provincial government initiative focused on systems style analysis of resource management. Dr. Thomas Özden- Schilling drew attention to the program's impact on community resiliency, autonomy and overall effectiveness of environmental research paired with its accompanying communication across different groups and players in government and private sectors. Dr. Thomas Özden- Schilling's poignant but paid-back style made for an enjoyable presentation of thought-provoking material. We thank him for his time and encourage anyone to take a listen to the full presentation that is available on the Mines website (https://humanitarian.mines.edu/mshes-colloquium/).

Gold Nuggets: A Humanitarian Interview Series

Dr. Jonathan (Josh) Sharp

Director, Hydrologic Science and Engineering Program and Associate Professor, Civil and Environmental Engineering

Summary by Jules Brown

The interview series began with quick introductions by our interviewers Allison Palmer, a junior in the BSE Program (Bachelor of Science in Engineering) and a Shultz Scholar at Colorado School of Mines, and Evelyn Lundeen, a Humanitarian and Environmental Engineering alumna from Mines. Dr. Jonathan (Josh) Sharp was then introduced as the Director of the Hydraulic Science and Engineering Program and an Associate Professor in the Department of Civil and Environmental Engineering at Mines. His recent work has focused on

water quality at the intersection of microbiology, hydrology, and environmental engineering, and he has done fieldwork on related topics in Switzerland and Peru. Dr. Sharp grew up in a small town in Delaware and, after undergraduate school, took two years to conduct research in the mining industry before attending graduate school. His excitement for microbes began during his undergraduate studies with the inspiration that “microbes work for free” and the goal to sustainably harness these free ‘workers.’ His research now focuses on locally-relevant climate change and ecosystem disruption topics/issues. In our interview, Dr. Sharp gave an overview of the effects that microbial metabolism can have on water quality, and how the positive mobilization of these microbes can promote more sustainable processes in the environment.

Dr. Sharp’s belief that “you have to enjoy what you do” motivates his research and teaching philosophies, allowing both of these positions to give him the “intellectual freedom to work on what he believes is environmentally relevant” while engaging his students in real-life problems. Dr. Sharp also emphasizes the importance of social engagement in connection with technological advancement within engineering and how that connection is currently lacking in industry. In his research experience, Dr. Sharp has performed this social engagement with different communities, as well as done outreach with elementary school children to convey the real-world environmental problems to them at an early age. He then touches on the importance of how positively promoting scientists and their passions results in the direct advancement of society as a whole. To emphasize this, he states that “we need to do a better job of calling out the value of science and engineering towards society in schools and on a daily basis” through connections of programs like Humanitarian Engineering within engineering education.

We are very grateful that we had the chance to interview and chat with Dr. Josh Sharp about his journey, work, and perspectives. Thank you to everyone who attended, and if you were not able to attend, you can find our interview on the following website: https://humanitarian.mines.edu/media/. Be sure to check out the rest of our past and upcoming interviews!

Girls Lead the Way

Nina Guizzetti

The weekend of February 20th, the HE Shultz Scholars group had the pleasure of presenting the Humanitarian Engineering Program at Girls Lead the Way, an event put on by the Mines chapter of Society of Women Engineers to pique high school girls’ interest in STEM and introduce them to amazing STEM opportunities at Mines. The Scholars guided these bright, young, and thoughtful high school students through a presentation that introduced them to HE values as well as bias and stereotypes in and because of engineering. Finally, the girls were put into breakout groups with the task of brainstorming solutions to the problem of the Digital Divide, with special emphasis on community engagement tactics and community problem definition.

One major idea taken away from this presentation, and reflected in the girl's responses, is that Humanitarian Engineering values are present and applicable across all disciplines. Within every room, there were a wide array of interests within engineering, but those differences do not

matter because Humanitarian Engineering does not apply to one discipline of engineering, HE is simply a way of being an engineer and doing engineering. We are so happy these girls took to these ideas and are excited to introduce HE values and principles in the future!

Annual Gathering with Shultz Family

Julianna Valenzuela

Group gatherings are tricky to manage these days, but they have become a routine part of our semesters. This week we had the honor of hosting Chuck and Louanne Shultz, and their daughter Julie King, whose generous donations have been supporting the Humanitarian Engineering program for many years. Without their support and wonderful contributions, we would not be able to go to conferences, collaborate on international and local projects, or continue to engage new and current HE students with our lectures and symposiums. They have created the foundation for an amazing campus program that has been revolutionizing what good engineering means. We are so grateful for everything that they have done and continue to do.

In our meeting, the Shultz family was able to meet the undergraduate scholars and graduate fellows supported by Shultz scholarships (made possible through the Shultz family's gift), and left saying their heads were touching the ceilings, which are 13 feet tall! To be able to show off amazing projects like PIRE Responsible Mining, Resilient Communities and our favorite HE classes like Engineering for Social and Environmental Responsibility, and chat with some of the most amazing students at Mines (I suppose I'm a little biased) was such a treat for us as well, but we're glad that our donors are equally happy.

The Shultz family expressed how ecstatic they always are to catch up with us, and they were delightful to chat with as a group. Even though Zoom will never be the same as in-person get-togethers, this was one virtual meeting everyone left with a smile.

Faculty Spotlight

Dr. Jeffery Shragge, Associate Professor, Geophysics
Mines Humanitarian Geoscience

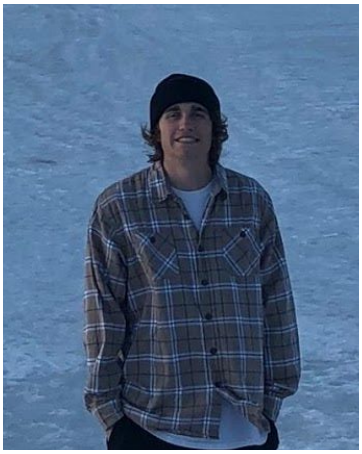
The applied geoscience and geoengineering disciplines are rapidly evolving and geoscientists and engineers increasingly are being asked to address important and socially relevant challenges that will largely define the 21st century: securing, monitoring, and remediating groundwater resources; mitigating geohazards (e.g., landslides, earthquakes, tsunamis, droughts); building urban environments resilient to climate change; enhancing food security; enabling access to clean and affordable energy; and working toward sustainability and responsible consumption of earth resources. As researchers and practitioners in a relatively new discipline, humanitarian geoscientists focus on understanding the complex interplay between the technical and social elements behind these challenges and work toward developing solutions that contribute to sustainable community development. The scale and importance of these challenges also have led to the rise of non-profit organizations, such as Geoscientists without Borders (GWB) and Thriving Earth Exchange, that support humanitarian geoscience projects throughout the world.

The Mines Geophysics department has a growing research program in humanitarian geosciences and actively participates in the new Mines Humanitarian Engineering and Science MS degree programs. One research focus area is developing, testing, and validating low-cost geophysical instrumentation as well as open-source software and instruction materials to help lower the "barriers to entry" for geophysical practitioners-to-be throughout the world. While these do-it-yourself (DIY) solutions are not as robust as commercial-grade instruments, in many cases they do not have to be: a $200 DIY resistivity meter usually will acquire nearly the same data as a $5000 commercial instrument when exploring for, e.g, shallow freshwater aquifers for communities in need.

Partially funded by a multi-year GWB grant (PI Shragge), our instrument development work involves a number of Geophysics faculty, MS and undergraduate students who use Raspberry Pi and Arduino microcontrollers and third-party sensors to build low-cost electrical and seismometer hardware and to prototype the associated software and algorithms. The Mines team is working with our project partners at the University d'Abomey-Calavi in Cotonou, Benin to use these "geomaker" solutions to equip and train francophone West African students on the theory and practice of undertaking hydrogeophysical investigations. The project also involves running hydrogeophysics and instrumentation workshops for a broader network of West African geoscientists who are interested in developing the skill sets required for locating new sources of groundwater in an era and region of increasing scarcity.

If you are interested in the humanitarian application of geoscience (and geophysics in particular), please feel free to contact me at jshragge@mines.edu.

Alumni Corner



Franco Pilone
May 2020 Mines graduate in Environmental Engineering and Engineering for Community Development minor

Hello HE friends. I graduated with a B.S. in Environmental Engineering and a minor in Engineering for Community Development last May. During my time at Mines, I was very involved with HE through being one of the Shultz scholars, a PIRE scholar, and the President/Treasurer/member of the School's Engineers Without Borders Chapter. Through these outlets, I was able to participate in international projects and learn about community development. I was able to travel to Colombia, play a part in projects in Nicaragua and Uganda, co-started a domestic greywater project in Denver, traveled across the U.S. for conferences, and more! HE has helped me apply my learning in many ways. I was also able to be a part of the ReNUWIt (Reinventing the Nation's Urban Water Infrastructure) labs on Mines campus working with engineered stream beds at the Mines Park facility. Once graduation came, I decided to continue my education in graduate school at the University of New England (UNE).

Only one week after graduation, I began taking classes in my graduate program. Due to the pandemic, I took those first classes online while continuing my work part-time at the Mines Park facility with ReNUWIt. My thesis is focused on the wastewater management of large-scale Recirculating Aquaculture Systems (RAS) and looking into potential value-adds from the waste stream of RAS. I continued my education online this Spring, however, I plan to head back east to UNE this summer.

Graduate school at home has brought a lot of different feelings. Some days are intensive and very engaging. I learn about very interesting topics and get to discuss them with my peers. Some other days, however, can feel stagnant and frustrating. I am sure many of us feel that way during the pandemic. Graduate school has taught me a lot about organization, how to gather the main points of an article efficiently, and how to write more concisely. Diving into endless journal articles gets messy very fast. Though, the HE coursework I took at Mines has helped me significantly handle my course work and understand the larger social concepts within my courses and research.

I will continue reading journal articles and taking classes this Spring. I will also begin conducting my research through remote interviews, with the hope of connecting in person this summer. A legitimate job search is in store for me this winter 2021, where I hope to land a career in water/wastewater engineering.

Best wishes,
Franco

Director's Corner

Dr. Kevin Moore
Executive Director, Humanitarian Engineering; Director, Mines Robotics Program; Professor, Division of Engineering, Design, and Society; Professor, Department of Electrical Engineering

Hello! I'm Kevin Moore, a new face to the Directors' Corner. It is an honor and privilege to introduce myself as the newly-named Executive Director of the Humanitarian Engineering Program. This is a new position that has been established by Mines in partnership with the family of Chuck and Louanne Shultz. The Shultzes have recently given a significant new gift to HE to support the program's continued growth, strengthen its leadership, and extend its reach, both inside and outside the university.

The new gift was publically announced on March 1, 2021, in a Zoom event with the current scholars and fellows, each of whom had a chance to introduce themselves and talk with the Shultzes (see article above about the event). Several members of Mines' leadership, including President Paul Johnson, Provost Rich Holtz, Foundation President Brian Winklebauer, and EDS Division Director Dean Nieusma also attended.

Chuck '61 and Louanne Shultz, and their daughter Julie King '86, are well-known to the Mines HE Program. This is the fourth major gift from the family, whose support has provided funding for a variety of programming, including the "Shultz Leadership in Humanitarian Engineering Lecture Series" and awards to over 70 Shultz Scholars, and Shultz Graduate, Postdoctoral, and Faculty Fellows since 2013. With the new gift the Shultz family has three goals: (1) to provide executive leadership focused on securing external funding that will provide a sustainable base of long-term program support; (2) to see HE at Mines expanded to a larger community of students, faculty, staff, and alumni; and (3) to see the HE program become a national and international exemplar as the thought leader in socially-responsible engineering.

So who am I and what do I have to do with all of this? Well, I am no stranger to HE. I have been at Mines since 2005 and for most of the last ten years, I was in leadership as a Dean and Vice Provost. During that time, I worked closely with Juan, and then with Juan and Jessica, and more recently with Juan and Jessica and Julia, to bring the program to where it is today. And, I believe strongly in the HE mission and the HE message. This was one of the reasons that I started the Division of Engineering, Design, and Society when I was a Dean (I was also its Interim Division Director until Dean Nieusma was hired). EDS is the academic home of HE at Mines and many of the conceptual precepts of EDS were driven by HE-based thinking.

I want to note that the other leadership in HE will continue to work together as always. Juan Lucena will continue as the HE Director for Undergraduate Programs, Jessica Smith will remain

as HE Director for Graduate Programs, and Julia Roos is still the HE Associate Director. While I will continue to work closely with them on all aspects of the program, as I did as Dean, my role will focus on fundraising and strategic initiatives.

I am committed to the mindset of humanitarian engineering and its potential to change the world and I am truly excited to be joining the HE team and to help advance the program! And, I would love to hear from you. If you have ideas about how HE can make a difference, please let me know by sending a message to kmoore@mines.edu.

Humanitarian Engineering Newsletter
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