

MARSHALL H. AND NELLIE
ALWORTH MEMORIAL FUND

Providing Scholarships in Science and Math Since 1949



the Alworth REPORT

ALWORTH MEMORIAL FUND NEWSLETTER

FALL 2023

75th Anniversary
COMMEMORATIVE EDITION

Celebrating 75 years!

Since 1949, \$55 million granted to 5,400 students for college.

Shane Spangler

From Ely, MN to Racing a Solar Car in the Outback of Australia A Dream Come True!

If there is a recurring theme in Shane Spangler's life thus far, it is a penchant for diving headlong into new learning experiences. His life is illuminated by a fearless quest for discovery.

A 2019 Ely High School graduate and Alworth Scholarship recipient, Shane chose Mechanical Engineering as his major, with a Computer Science minor at the University of Minnesota, Twin Cities. That is where he discovered the Solar Car Club and the opportunity to explore unknown territory.

Starting in his freshman year, Shane was introduced to a cool solar car project with the objective of submitting the club's creation into the international World Solar Challenge. He asked the team leaders what areas didn't have sufficient people working on them and while not having ever performed those activities before, he enthusiastically and anxiously took them on, committed to figuring it out. Once he successfully worked through a problem; he'd ask for the next assignment. Early on, he worked on designing the car's battery casing.



Shane Spangler

Shane Spangler continued on page 5...



The World Solar Challenge is an international event where 99 teams from all over the world race solar-powered vehicles that are designed, engineered and built with their own hands. The goal is to bring together the world's most innovative minds to create a sustainable transport vehicle.

Each car is unique and they will be driven approximately 2,000 miles across the remote Australian Outback. The race starts in the Northern Territory of Darwin and finishes in the City of Adelaide in South Australia. Any problems or mechanical issues that arise along the route will need to be solved in the field by the team. Team members camp along the entire route. **Learn more at:**
<https://worldsolarchallenge.org/>



Amber Zierden

Another northern Minnesota student who will participate in the 2023 World Solar Challenge is **Amber Zierden**, a 2020 Hermantown High School graduate and Gilmore Scholarship recipient

Amber majored in Mechanical Engineering at the University of Minnesota where she served as Director of Engineering and Co-President of the Solar Car Club.

Both Shane and Amber have expressed how the Alworth and Gilmore Scholarships allowed them to participate in the solar car club and more fully dedicate themselves in the solar vehicle program, providing each with exceptional educational growth, and opening doors to future career paths.

Watch Shane and Amber's stories featured on PBS Almanac North at:
<https://fb.watch/mBWTch5t-9/>

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Applications are accepted from November 1 to January 15.

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Charles Dammann

Flying Drones and Blowing Things Up

By Professor Alworth

Over the last year or so, I have spoken to many recipients of the Alworth STEM Scholarships. These graduates have begun careers in a wide variety of fields, and they are all passionate about their work... but none of them more so than Charles Dammann. You see, Charles blows things up for a living.

Charles is a 2019 graduate of Ely High School, where his interest in science began. After-school programs allowed him to work on designing and making things like remote-control boats and airplanes. But his interest didn't end there. Because his father worked in the mines, Charles had an interest in mining and the technology required to accomplish it. When he learned that there was an engineering program in South Dakota that was designed for the mining industry, he knew where he wanted to go. With his Alworth Scholarship, he attended the South Dakota School of Mines & Technology, earning a degree in Mining Engineering, with a special focus on explosives.

During school in South Dakota, Charles spent his summers interning with Twin Metals Mining and Cleveland Cliffs back in Minnesota. Now he works as a Mining Engineer with Dyno Nobel, an industrial & mining explosives manufacturing company. When clients of Dyno Nobel need a carefully designed and precisely executed explosion, Charles ensures that it happens safely, and that any waste or runoff from the blast is directed appropriately for the environment.

He is tremendously excited about the tools of his trade. Drone technology is used in surveying and mapping a site (photogrammetry), to create a 3-dimensional model from



2-dimensional images. Surveying capabilities continually evolve, allowing data to be collected and analyzed digitally in real time. This constantly improving technology supports the three primary goals in mining: Worker safety, environmental safeguards, and cost-effective production

Charles is so enthusiastic when talking about his work, I am compelled to ask him what advances he sees for the future of mining technology. He describes a diminishing need for drilling platforms to discover what lies underground, and that these will be replaced with more and better digital technology survey data, leaving a smaller impact on the land. He anticipates the day when water and soil can be analyzed with mobile technology small enough to fit

in a backpack, providing real-time data that connects field workers and the front office instantly.

When I asked Charles what skills are needed to be a successful engineer, he said that first and foremost, engineering is about problem solving. Thinking on your feet and outside of the box is important. You must be willing to innovate and use the technical tools you have - math, computer science, geology or other sciences - to transform a problem into a solution that works.

Charles closed our conversation by expressing his gratitude for the Alworth Scholarship, and he had some advice for those who may be considering an application. "Take your time and put yourself into the application. Be who you are, not the person you think fits the criteria."

If this advice leads you to a career that you love as much as Charles Dammann loves his, you will be truly successful. ■

Jensen Rice

Concrete: The Unsung Megastar of Civilization

By Professor Alworth

When I was asked write an article on an Alworth Scholar who was doing amazing things in the world of concrete, I'll admit I wasn't sure what to expect. Speaking strictly for myself, I don't know much about concrete - how it's made, what materials and processes are involved. Concrete is one of those things that is so omnipresent in our world, that we don't even really see it anymore. I had many questions.

And so it was that I came to be acquainted with Jensen Rice, a young man who does indeed have a passion for concrete - and changing the world.

I began our interview by asking Jensen to talk about his early life and elaborate on the not entirely obvious factors which led him to the study of concrete.

He grew up in Walker, Minnesota, near Leech Lake. His father is a U.S. Forest Service Firefighter, and Jensen spent countless hours exploring the lakes and woods near his hometown, camping, fishing and hiking. He is a frequent visitor to the north shore of Lake Superior, and just really enjoys being in nature. Jensen told me that originally, he felt he would be pursuing a more directly environmental career, but in high school, he began to really excel at math and physics and knew he wanted to go in that direction.

He chose Civil Engineering for his undergraduate major at UMD in



Duluth. During the engineering coursework, Jensen saw this whole gray area in the overlap between Civil Engineering and Applied Materials Science.

Now I was intrigued. Most interesting things in life happen in the gray areas.

Then Jensen said something which momentarily stunned me into silence. He said the production of concrete is responsible for 5-8% of man-made carbon emissions worldwide. That is a huge global impact. He also shared another fact, of which I was completely unaware. Concrete is the second most utilized material on this planet, second only to water. Second only to water, which is used in making nearly everything.

The implications are immense.

This is where Jensen's passion really came through. That huge carbon impact is why the search for better processes and products is active across the globe. The research he's doing is all about finding more environmentally sustainable materials and processes to make this ubiquitous product.

At UMD he had an opportunity to assist an instructor who was researching new ways to test concrete using image processing software.

Jensen Rice continued on page 4



Nora Hubbard:

Pursuing the 'Domino Effect' in Scientific Discovery

Nora began her studies as a Biology major, with the intention of going in the Pre-Med direction. Part of the reason for this was that

Nora hadn't particularly liked Chemistry during high school, although she did love science in general.

As her time at St. Scholastica unfolded, Nora's interest in Chemistry and Physics took off, and she found herself switching to a Biochemistry major.

Even as she adjusted to being away from home, she wanted to push herself, to grow, to be a leader for other students and expand her circle. She joined the concert band playing clarinet, became a Physics Teaching Assistant and also a Resident Assistant in her dorm.

As an undergraduate Biochemistry student, Nora had an opportunity for an internship at Princeton University. There, she worked in a laboratory doing research on increasing the intrinsic

fluorescence of matter, and how to refine spectrometry measurement for more accurate results. This research has many implications for pharmaceutical and other areas of manufacturing.

Nora said that what she loves about Chemistry is that it's a part of everything. Her enthusiasm is real when she talks about the

"domino effect of discovery," wherein you never know where your research will lead, and what new processes or innovations will result.

Now that her undergraduate work is concluding, Nora will return to Princeton for her graduate studies. With a minor in Computer Science, her future in Biochemistry research is bright. At some point, she will have to decide whether to stay in the academic arena as a Professor leading research in a university setting, or enter the industrial world, applying her research skills to manufacturing, pharmaceuticals or other corporate endeavors.

Her dream job, would be to combine teaching with creating new products that are more environmentally sustainable. In graduate school at Princeton, she is working with a professor who is breaking new ground in synthetic proteins. These proteins are not found anywhere in nature and they offer endless possibilities in therapeutics, manufacturing, and sustainability. ■



David Erickson

A Career Path From Paintball to Aerospace Engineering

By Professor Alworth

By the time his high school Physics (and Cross-Country Skiing) teacher encouraged him to apply for the Alworth Scholarship, David Erickson had already constructed a “chopper bike” to mirror the look of a chopper motorcycle. In shop class and in his free time, David was applying physics to the hobbies he enjoyed.

To improve his paint ball game, he built a remote control car and enhanced its performance and paint-spraying capabilities via the laws of physics. He designed ski jumps to increase jumping distance and landing safety. When talking about his time in high school, David said his favorite “thinking class” was Physics, and since his father was a pilot, he developed an interest in aerodynamics and flight.

When his teacher suggested he include the Massachusetts Institute of Technology (MIT) among the colleges he was applying to, David felt his odds of acceptance were slim. Fortunately, he was mistaken, and he was accepted to MIT.

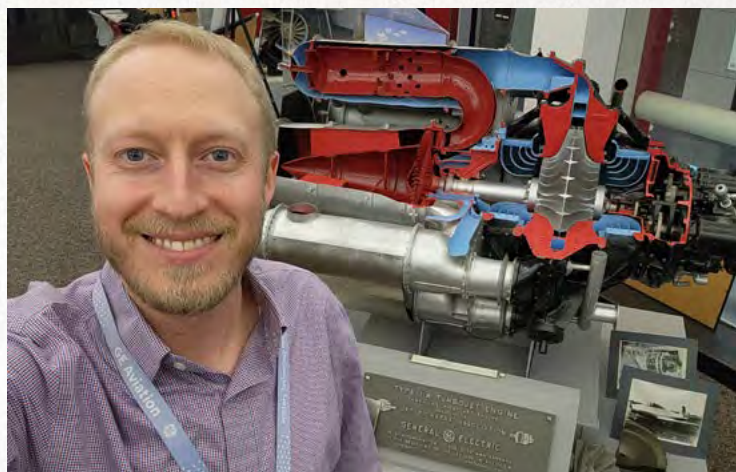
Following his undergraduate studies, David began working at General Electric (GE) and joined the Edison Engineering Development Program (EEDP). The program is a GE engineering leadership program for employees, wherein GE commits to paying for Graduate School, which David chose to pursue at MIT.

David still works for GE as Systems Engineering Lead. In that role he helped our military develop next-generation capabilities during his work on the Future Affordable Turbine Engine (FATE) technology demo program. Jointly funded by GE and the Army, the program is a multi-year initiative to meet a series of aggressive weight, cost and performance goals. The resulting engines broke GE records for power and fuel efficiency in a turboshaft engine.

In the next few years, he'll begin work on the Hybrid-Electric Experimental (HEX) demonstrator program, wherein he will be part of designing and testing a fully-autonomous hybrid-electric vertical-take-off-and-landing (eVTOL) prototype. The program's goal is to demonstrate the potential of large, advanced air

mobility vehicles to perform utility missions for the U.S. military. Eventually, the HEX program could lead to a family of eVTOL vehicles scaled to carry passengers and payload for both military and commercial applications.

David shares with Marshall Alworth a zeal for pioneering new experimental ideas, particularly when it comes to projects that better humankind. David said that in the future, he would love to lead a team working on a brand new engine system that can be built and utilized.



While the future does indeed look very bright, I ask David to pause for a moment and reflect on the past. I ask him what qualities he thinks students should be developing for career success. He talked about challenging yourself in order to grow, saying it will increase your confidence to go forward. We also talked about the communication skills and emotional intelligence needed to be an effective leader. Lastly, he said solid planning and the ability to coordinate work across areas are essential tools.

We concluded by agreeing that students can and should work on sharpening these skills in high school, because they will be positioning themselves for success no matter what career they choose. ■

Jensen Rice continued from page 3

Jensen knew he needed to understand the materials involved, and the research helps him do that. His goal is to work in a structural engineering direction, designing and building large scale projects.

Jensen is extremely knowledgeable about the work being done to explore alternative concrete components from clay to a variety of proprietary materials. He is working with an advisor on a research project studying the potential of recycled glass as a partial replacement for cement in concrete mixes (known as ground glass pozzolan). One of the big challenges in concrete research is the sheer volume of need and variety of uses. New materials have to be scalable, effective, strong and cost-effective to produce.

Jensen talked a lot about a desire to have his feet in both the structural engineering and materials science worlds. It is this overlap he finds so fascinating.

He also touched on how wonderful it is to meet people from other cultures, and how much he learned when he was able to spend six weeks in Morocco last summer. He credits the Alworth Foundation with allowing him to have exceptional educational opportunities, as well as the ability to enjoy friendships and have time to explore.

Despite my initial uncertainty about the conversation, I can now say that this was one of the most interesting and educational interviews I have experienced. My wish for all of us is that our learning never stops. ■

STUDENT SPOTLIGHTS



JESSICA ROSE

Making a Difference on Climate Change

A 2023 graduate of Duluth Denfeld High School, one of Jesse's teachers noticed her aptitude for science, and allowed her to design a more advanced science curriculum than her classmates were undertaking. This work prepared her well to apply for and receive the Alworth Scholarship this spring, which she will utilize to attend the University of Minnesota (Twin Cities) this fall.

Jesse said that her “heart is set” on a new program in the College of Biological Sciences: Ecology, Evolution and Behavior. This program deals with biological and behavioral aspects across many plant and animal species, and how they will evolve, adapt or change migration patterns in response to a changing climate.

Like many of her peers, Jesse is particularly interested in learning (and mitigating) how climate change will impact life on our planet. It's extremely important to her to be part of preserving our environment for future generations, and she has already hit the ground running. She recently participated in a summer camp at Itasca State Park. This camp is required of all students in the College of Biological Sciences and prepares them for the three-semester introduction to their major called “The Nature of Life.”

She also recently returned from a school-organized trip to Europe, for both fun and educational purposes. While visiting various countries, they learned about research opportunities, which she enjoyed. Jesse is interested in both animal and plant research projects and has already met a professor who will be studying Lichen. Something I learned in my conversation with Jesse is that Lichen provides interesting opportunities for study because it is both a moss and a fungus. Jesse said she views this opportunity as a chance to get hands on field experience, while also making connections for future lab work. This will help prepare her for the lab work that is a major focus of freshman and sophomore years, and provide a basis for the field work of junior and senior classes.

Jesse is a friendly and outgoing young woman, and one who is very serious about making a positive difference for the future of our planet. We are fully confident that she will succeed. ■



STUDENT SPOTLIGHTS



CECELIA CHMELIK

Wild about Worms!

After completing her freshman year at Hamline University, Cecelia was surprised and excited to be invited by a professor to participate in a summer research project in Itasca State Park. It is a rare honor for a student just finishing up their first year

to be given such an opportunity, and Cecelia jumped at the chance.

The Biology course in Collaborative Research focused on the genetic analysis of Earthworm populations in Itasca State Park. Specifically, the project sought to investigate gene flow between different populations of Earthworms. As a Biology and Environmental Studies major, this work would lead perfectly into her sophomore year studies.

One of the project's challenges was finding a non-invasive method to get the earthworms out of the ground without damaging the park's soil.

The ingenious plan involved pouring water mixed with mustard powder into the soil. The mustard water would cover the earthworms, who would then rise up through the soil to rid themselves of the mustard. When they came up, they were gently captured and carefully transported to the lab for study. The students succeeded in collecting over 200 worms for the study.



Cecelia and the team devised a clever, non-invasive trick in Itasca State Park to coax earthworms from the ground using mustard powder mixed with water.

The project also entailed writing a proposal to secure funding for the project, which outlined the methods,

study goals and research value of the proposed effort. While Cecelia enjoyed the hands-on field work a great deal, she also recognized that the proposal writing was excellent practice for a future in research.

Cecelia has always wanted to do research, and she has a deep interest in environmental policy. She noted that her field is an inter-disciplinary one that incorporates economics and policy into the science of biology and environment. She said that science has taken great strides in conceiving better tools for environmentally sound initiatives, but that the infrastructure to put these ideas into practical use is not there yet. Cecelia really wants to change that, and move the results of scientific endeavor to the public policy arena.

We can definitely picture future Cecelia testifying before Congress on environmental policy and how to educate the public and integrate that knowledge into public projects. With her passion and energy, that future looks brighter for all of us. ■

STUDENT SPOTLIGHTS



EMELYN BEASTER *By Professor Alworth*

In the Footsteps of Great Women Scientists

I have rarely spoken to a student more excited about their field (Chemistry), or science in general, than Emelyn Beaster. After receiving the Alworth scholarship this spring, Emelyn will begin her undergraduate studies at Lawrence University in Appleton, Wisconsin, this fall.

As a woman of a certain age, I was utterly delighted with Emelyn's deep admiration for the pioneering women in science who inspired her. In third grade, she read a book about the famed oceanographer/biologist Sylvia Earle. Among a lifetime of achievement, Ms. Earle (in 1979) made an open-ocean JIM suit dive, untethered, to the sea ocean floor near Oahu. She set the women's depth record of 381 meters (1,250 ft) which still stands today, and now in her 80s, she continues her dedication to our planet's oceans.

Sylvia Earle, and other ground-breaking women in science, truly inspired Emelyn Beaster. After our conversation, I believe that Emelyn Beaster will prove to be just as inspiring to the young women who come after her, because her excitement was apparent when she spoke about mentoring other young women in science.

Emelyn is also extremely dedicated to her work. In fact, she is so dedicated to her chemistry research that in 2020, when the

pandemic struck and she was unable to utilize the lab at East High School for her science fair project, a retired teacher she knew stepped in to help. Cindy Grindy procured supplies and allowed Emelyn to work in her basement to complete the project. She donned a mask and headed to the teacher's basement and worked by herself - because even a global pandemic could not stop Emelyn from completing her research.

Last summer, Emelyn worked with a professor at UMD who was looking for students to help with research on filtration systems for

micro-plastics in water. This work led to her acceptance into the 2023 International Science Fair competition held in Dallas, Texas, in 2023. The event brings together experts, accomplished scientists and students from 40 countries. Emelyn's entry was a continuation of her work in micro-plastic filtration, quantifying its effectiveness in comparison to active charcoal.

I don't know where exactly Emelyn's work in Chemistry and research will take her, but I promise you that she will be unstoppable.

Oh, and the other reason Emelyn selected Lawrence University to attend? It turns out that in addition to being one of the nation's preeminent liberal arts

universities, Lawrence University also has a nationally recognized Conservatory of Music, and Emelyn's other passion is music, specifically the clarinet and saxophone.

Since I am a jazz fan, and one who is also highly impressed by Emelyn, I'm just going to go ahead and pre-order her future CD from Amazon now, so I can be first in line when it becomes available. ■



Emelyn loves working in a lab, and she is excited to inspire the women who come after her in the same way she was inspired by early women in science.

Shane Spangler continued from page 1

Soon, he learned CAD computer aided design (CAD) to create interior features of the vehicle.

Next, he devoted himself to designing and building a complete car chassis using carbon fiber sandwich panels. At every opportunity, Shane bet on himself, learning and creating different elements of the vehicle, even with no previous experience. He took risks. He explored. He wasn't afraid to fail. He encountered

design and materials issues and set about not just fixing them, but improving them. And all the while, having what he calls "one of the coolest, most educational experiences of my life."

The defining quality of Shane's academic career has been a fearless dedication to learning through hands-on work, research, and through real life trial and error – all of which was rewarded by his team's vehicle being selected to participate in The World Solar Challenge 2023 in Australia - a "dream come true!" ■



Marshall H. and Nellie Alworth

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The Hack Is Back! Let's Build Cool Stuff!

The 3rd Annual **Northland Hackathon** is a virtual event being offered to northland high school students and culminates on **Saturday, April 13, 2024**. Two to three months prior to the Hackathon there will be virtual classes, workshops, advice and mentorship opportunities.

High school students curious about technology have an opportunity to learn more about technology and designing websites, games or apps with this exciting online event. Students will be paired with mentors based on their skill level and interests. No experience necessary to participate. Students may participate solo or join as a team.

Various tech industry professionals will share virtually what it's like to work at Snap, Meta, TikTok, or Microsoft. They will describe what types of cool tech projects they get to work on and will open the chat to answer any questions.

Organizer, Luke Heine, successful software engineer, Minnesotan and a 2013 Alworth Scholarship recipient, was deeply concerned when he read that Minnesota ranks dead last



among the 50 states in computer education offered at the high school level.

This deficiency has, and will continue to have, a real impact on the economy of our state. Luke is deeply driven to introduce high school students to technology career possibilities and closing this gap. He understands that technology fields encompass some of the most in-demand, varied and highly paying career opportunities of our time and the foreseeable future. So, he and his team developed the Northland Hackathon.

Northland high school age student with an interest in software development are encouraged to visit the Northland Hackathon website to learn more and hopefully sign up!! ■

Visit www.northlandhackathon.com.