Welcome to Dr. Rafid Mahbub
He joins us this fall as a Visiting Assistant Professor of Physics.

Rafid Mahbub arrived in Minnesota, from Bangladesh in the Fall of 2016 to begin graduate school at the University of Minnesota, Twin Cities. He received an M.S. in physics in 2018 and finished his Ph.D. in August 2022. Rafid worked on early universe cosmology, mostly focusing on primordial black-hole formation (and its implications for cold dark matter and gravitational waves) and stochastic inflation. While in his final year in graduate school, he was the recipient of the Doctoral Dissertation Fellowship and the Aneesur Rahman Prize for the research leading to this dissertation.

Rafid loves teaching physics at all levels and found the opportunity of teaching physics at a liberal-arts college like Gustavus to be a very refreshing and exciting opportunity – not only from a teaching career perspective but also due to the fact that moving to a small town affords him the opportunity to get away from the bustle of a big city.

This fall he will be teaching General Physics I and is looking forward to use this time to improve and further build his teaching philosophy.

Apart from the teaching during the next two semesters, Rafid plans to continue his research on aspects of early universe cosmology and apply for postdoc positions later this year. Apart from physics, Rafid enjoys reading classic literature, playing the electric guitar, sketching and taking long walks during the cold winter months. He hopes that his time at Gustavus will allow for personal growth as a teacher and educator while also making long-lasting connections with the many people he meets along the way.
Fourteen Gustie physics majors walked across the stage at the Commencement exercises held on Saturday, May 21. Their immediate post-graduation plans are varied, and a number of them have provided those, along with their observations and advice for future physics majors.

**Jack DeGonda** tells us, “While I was at Gustavus, I was on the cross country and track teams, sang in choir, and was a member of the Epsilon Pi Alpha fraternity. This fall I will be starting a PhD program in Structural Engineering at the University of Minnesota Twin Cities. Advice that I would give to a physics student at GAC would be that hard work pays off in the long run—I made some of my closest friends closing down the library working on physics assignments, all of the struggle that we went through ultimately brought us closer together, and I know that they will go off and do great things. Learning a sense of determination to push through any challenge you are faced with, and trusting in your own ability to problem solve the right way was a big takeaway for me moving forward.”

**Alex Florea** is headed to graduate school in Biomedical Engineering at Georgia Tech. He writes, “My time at Gustavus was some of the most formative and enjoyable years I could have asked for, with the GAC physics department quickly becoming a second home for me. I will vividly remember the long nights spent working on challenging problem sets, trying to sneak in a last minute office hour visit, and attending many SPS events. My advice to current students is to not be afraid of failure, as it’s the best way to grow as a person. Early on as a physics student I struggled with classes, having gone through around half a dozen different note-taking, lab, and studying techniques before finding ones that worked for me. If something doesn’t turn out the way you expect, see that as motivation to experiment new things and try again. Eventually, you’ll reach your goals, but I’ve discovered that knowing what doesn’t work is just as good as knowing what does.”

**Noah Freese** says, “I just moved to Connecticut within the last couple of weeks to begin grad school at the University of Connecticut in pursuit of a Ph.D. in experimental physics, (Continued on page 3)
classes with for the rest of my time on the hill. I will remember working in the offices with my peers, whether it was on a homework set or finding ways to procrastinate. The community of the Physics Department is unlike any department at Gustavus and that made it truly special to me to be a part of it. All of the professors pushed everyone to learn the material instead of memorizing it, which is crucial for the learning process. There were many machines that the Physics department owns that I was able to use personally to start a woodworking business for some of my classmates and many Gustavus alumni. Moving into junior and senior year, I was able to oversee some of these machines and meet the students that were going to continue with physics even though the material is difficult. I wasn’t sure of what I wanted to study at Gustavus, and I couldn’t be more thankful that I picked the physics department.

“I am currently working as a General Tester at Elucent Medical in Eden Prairie. It is a medical device company that uses magnetic waves and frequency to help surgeons with Breast Cancer Biopsies. I am incredibly grateful that I am able to use my knowledge learned at Gustavus and apply it to help a serious problem in our world. I hope to continue working in a field related to Physics, but one that helps people. Working for a company that is positively impacting people really encourages me to do my best work.

“My words of wisdom would be that, even though it might be difficult right now and you might see your friends of other majors having 20-30 minutes of homework a night; continue with Physics if you are truly passionate about it. Don’t give up because you’re tired, once you succeed you will feel better about yourself and your capabilities.”

Bryce Knutson says, “I double majored in Physics and Math, ran for the cross country and track teams, and sang in the Gustavus Choir. I thoroughly enjoyed my time in the physics department, especially as a tutor and lab TA.

“I will be attending the University of Colorado - Boulder to pursue a Ph.D. in Materials Science and Engineering.

“My advice to future students is to pursue your passions with diligence. Get involved in things you enjoy and fight for the things you believe in. As far as physics is concerned, find a good study group and work through things together when needed. The major will surely be challenging, but will also be extremely rewarding.”

Zandra Michael writes, “Looking back I wish I had been a more active member of the extracurricular activities that SPS and the department created. I’ve started orientation for graduate school and I’m only really now realizing how close and special the department was. Luckily, I’ve found that the graduate program at Ohio University is similar in culture to the department that kept me dedicated to physics.

“I am at OU, so for the foreseeable future I’ll be a graduate student. I’m currently thinking that, once I start research, it will either be in Nuclear Theory or Astrophysics.

“For new students my best advice is to listen to yourself. If you’re in distress, seek help. I spent my entire undergraduate career in pain, even

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During this past summer, a number of our physics majors were involved in a summer research internship of one kind or another. Many of them have written to share their experiences and, taken together, they paint a picture of the breadth of such experiences that are available to qualified students, from first-year’s to graduating seniors.

Erin Coleman ’25 (Gustavus First Year Research Experience Grant), Anne Monroe ’25 (Fuller Research Endowment), and Rose Paddock ’23 (Fuller Research Endowment) worked with Dr. Darsa Donelan on a radio astronomy project. They write, “We conducted research on campus this summer with award-winning professor Darsa to help develop NASA’s Radio JOVE at Gustavus. We installed the dipole radio antennas previously built by Darsa and recent graduate Maya Lengvenis ’22 to observe radio waves from both Jupiter and the Sun. Using this setup, we measured many sunspots, verifying that the Sun is more active than NASA previously predicted. We also measured and categorized several different types of magnetic storms due to the interaction between Jupiter and Io, its closest moon. These radio storms don’t occur constantly, and only some of them were within our telescope’s field of view, so we had to take advantage of every opportunity to collect storm data. Observable radio storms were typically in the very early morning, which meant we spent a lot of time awake at 3am. We then spent time figuring out how to incorporate a Raspberry Pi micro-computer to automate data collection rather than wake up at 3am to sit in a field until the sun comes up… are we vampires? Finally, we have put together a proposal for a permanent antenna location for the College administration to strongly consider.”

Jackson Berlage ’23 wrote, “This summer I am interning at Argonne National Lab in the Advanced Photon Source X-Ray Science Division. I am working on a couple of projects. The first is finding and designing parts to put together a suitable replacement for the shutters that are used in the beamline to control the path of the X-rays, as the old ones are no longer manufactured. This project has involved a lot of CAD design work and problem solving, as well as using physics to characterize the movement of the servo motor that holds the shutter. The other project I am working on is related to laser additive manufacturing. I am going to be characterizing heating elements that will be used to heat a sample to a given temperature before the additive manufacturing process takes place. This project involves CAD and problem solving as well, but also using various tools, such as thermocouples and thermal cameras to determine the temperature of the element when different voltages are applied.”

Abdissa Efa ’24 tells us, “This summer I worked under Dr. Dave Peters for the Washington University Summer Engineering Fellowship. I worked on making a plot of helicopter blade stability. When helicopter blades rotate, they flap up and down which is a floquet instability (an instability due to periodic changes in the restoring force of the stiffness of the blade). I derived a matrix with which I was able to determine if a helicopter blade was stable. If the absolute value of the trace of the matrix was less than one, then the helicopter blade was stable. I then made a plot with the x axis being the average value of the stiffness and the y value being the amplitude of oscillation of the stiffness and made a plot of stable and unstable points.”

Emma Erickson ’24 says, “This summer, I learned quite a few coding skills at my 12 week internship at IBM in Rochester, MN, working with the Power Toolchain team. Through this, I also co-wrote tutorials explaining how to run Linux distributions on IBM Power hardware virtually, so that someone interested in trying out Power hardware can do so without physically needing the hardware. Additionally, I spent time working on improving the Power team’s instruction set architecture parser, which makes the instruction set used by Power hardware sortable and searchable.”

Katelyn Espe ’23 writes, “This summer I participated in the Duke/TUNL High Energy Physics REU. I spent four weeks on the Duke University campus and then headed to Switzerland to spend the rest of my summer research at CERN as a part of the ATLAS collaboration. I worked on a lower-level analysis to help physicists at CERN as they (Continued on page 5)
search for new particles at the Large Hadron Collider. My lab group is looking for the \(Z’\) boson, which is theorized as a new force carrier in the Higgs sector. I correlated the kinematic properties of the particles that decay from the \(Z’\) boson in simulated data to find underlying physical patterns that could help discern whether or not this new particle exists in real data.

"It was an exciting summer to be at CERN - this year marks the 10th anniversary of the Higgs boson discovery. The Large Hadron Collider was also rebooted for Run 3 in which they were able to accelerate protons to a record-breaking 13.6 TeV! This data taking period will last for four years with the collider running 24/7. I was also fortunate enough to meet a former Gustie, Elise Le Boulicaut ’18, and work alongside her all summer. Small world! Outside of work, the other members of my cohort and I got to spend time exploring Geneva, hiking in the Swiss Alps, and eating pastries in small French villages."

Aaron Johnson ’23 says, “This summer, I participated in the Program in Climate And Space Science Observation (PICASSO) REU at the University of Michigan. Over the course of the ten-week program, I worked closely with Dr. Micheal Liemohn and PhD student Brian Swiger on an extension of Brian’s work. We conducted a thorough statistical analysis of the effectiveness of Brian’s recently developed neural network model of electron flux in Earth’s plasma sheet. This process, in short, consisted of running the model for various subsets of solar wind driving parameters, such as solar wind velocity and interplanetary magnetic field (IMF) strength, and using metrics produced by the model for each subset to assess its performance. Neural-network models and machine learning are increasingly used in predicting space weather because of the sheer number of variables that influence any given weather event; in such situations, physics-based models would require impractical amounts of processing power. Aside from learning a great deal of Python over the summer, I developed life-long friendships, solidified my career plans, and had a great time exploring Ann Arbor. I hope to present my research findings at the American Geophysical Union conference in Chicago this December.”

Ronald Pabi ’25 writes, “This summer, I’ve been working with Dr. Tom Huber. Our research project involved using deep learning to reduce noise in ultrasonic measurements. In measuring ultrasonic waves, there is often a significant amount of noise. Using deep learning, we created a neural network and have been manipulating it in hopes of getting rid of all noise in our measurements. I enjoyed studying deep learning and being exposed to its amazing capabilities.

“I also helped Chuck Niederriter and Steve Mellema this summer with the High Altitude Ballooning Camp for high schoolers. That was a really fun experience.”

Amber Simon ’23 tells us, “This summer I was accepted into the University of Illinois Urbana-Champaign’s Materials Science REU program. I worked in the lab of Dr. Axel Hoffman, whose research involves studying antiferromagnets. My project focused on the ability of MnSn, a non-collinear antiferromagnet, to alter the magnetization of nearby ferromagnetic materials. I analyzed ST-FMR (spin torque ferromagnetic resonance) measurements of thin film bilayers, which consisted of MnSn and permalloy, a ferromagnetic Ni/Fe alloy. These measurements provide information on how effectively the antiferromagnet can convert electric current to something called spin current, which is what changes the magnetization of the ferromagnet. These materials can provide more energy-efficient ways of storing data, which is currently a very energy-consuming process. I learned a lot this summer, and I am so grateful that I had this opportunity. It was so cool to see a lot of the physics I've learned at Gustavus (especially Mechanics) be put into practice. Further, since Materials Science is interdisciplinary, I was able to really see how chemistry and physics go hand in hand.”

Jack Stonecipher ’23 says, “This summer I worked on a project at Montana State University focused on using drone-based imaging to track algal blooms in rivers. Imagery of inland waters often contain sun glints and surface reflections which saturate image pixels, rendering them unusable. Since light reflected from (Continued on page 12)
National Awards for Two Gustie Physics Majors

Katelyn Espe ‘23 and Emma Erickson ‘24 have been named Ros- sing Physics Scholars for their exemplary standing as students in physics.

Katelyn and Emma will each receive one of the $5,000 scholarships awarded by the Rossing Fund for Physics Education Endowment through the Evangelical Lutheran Church in America Foundation.

Funded by Dr. Thomas Rossing, the program awards annual scholarships to students enrolled at one of the 26 colleges and universities affiliated with the ELCA who are pursuing an education in physics. Applicants are nominated by their institution’s professors and selected by the foundation based on the student’s academic and research standing.

In the past 10 years, 15 Gustavus students have been awarded Rossing Scholarships in Physics, including nine women and six men.

Katelyn, a rising senior from White Bear Lake, conducted research in physics at Gustavus for two summers. Her first summer, she worked with Dr. Tom Huber to improve refracto-vibrometry acoustic field visualization by training an AI to recognize and remove background noise from ultrasound pulses traveling through water.

Her second summer, she worked with Dr. Elizabeth Boatman to design and construct a CNC router.

This summer, she worked at CERN in Switzerland through the Duke TUNL Research Experience For Undergraduates Program (see the article on page 4).

Outside of the classroom, Katelyn is involved in Gustie Greeters, Gustavus Campus Band, and plays in the Handbell Choir. She is also the president of STEMinist, which is committed to encouraging and empowering young women in STEM. After graduating, she plans to work towards a PhD in physics.

She encourages other physics students to “remember that if you’re not frustrated, you’re not learning. Keep your head up, stay on Jessie Petricka’s good side, and always remember to include units!”

A rising junior from Rochester, Em-ma works for the physics department and is involved in multiple physics-related programs on campus. These include Womxn in Physics and the Society of Physics Students, which both involve physics outreach and related community events. She values cooperation with others within the physics community, saying: “There is no way to do everything yourself, and your classmates (and professors) are some of your best resources for understanding the things that you do not understand.”

This summer, Emma had an internship at IBM Corporation (see page 4). She is also involved in music on campus and is considering a minor in music. She plays the bassoon in the Gustavus Wind Orchestra and the Gustavus Symphony Orchestra.

Congratulations Katelyn and Emma!

Prize Recognition for Dual-Degree Gustie Physics Major

Kyle Krippner ‘21 recently graduated from the Department of Mechanical Engineering at Washington University in St. Louis, our dual-degree-in-engineering partner school. A dual graduate of our joint “3-2” program in engineering, Kyle was awarded the Kenneth L. Jerina Prize as the outstanding dual-degree or transfer student. He received the award on April 6 at the Washington University Engineers’ Honors Ceremony.

Congratulations to Kyle!
(Continued from page 3)

though I would have had help if I had just asked. Work hard and have fun. And most importantly discover yourself.

“Now for the difficult part, to add some needed context. For all of college I knew something was wrong, but no matter who I talked to they never helped me find a solution, and finally last April during the worst night of my life I finally accepted I needed to change. Since graduating I’ve come out as Transgender. My transition has been going well, and I’ve been amazed at the improvements to my mental health. For the first time in over a decade I feel content, happy, and hopeful. I had gone so long without any of these emotions I hadn’t realized they were gone, and I hope no one else has to suffer through the self loathing that dominated my mind for so long.

“For the first time in my life I’m enjoying life.”

Ana Zaalishvili says, “It has been a busy couple of weeks. I moved to Durham, NC and started my first year of graduate school at Duke University yesterday. This semester I am teaching three lab sections for an introductory EM class for engineers. I am also doing a rotation in a biophysics laboratory, although I plan to visit labs from other fields as well to broaden my horizons. My experience at Gustavus in the small school environment was truly special and personal. I would advise future students, especially international students, to take advantage of that aspect of their college career.”

Alumni Talks Showcase the Diversity of Life After College

The past academic year provided an amazing range of public talks from alumni of our department. In addition to Tutu Adenle ’03 who was the invited guest speaker at our 2022 Sigma Pi Sigma Induction Banquet (see page 9), we heard from:

Dr. Brad Delahunty ’91, Senior Software Developer at Microsoft Corporation, gave a talk entitled “How Many Shakes in a Second—from Physics to Data Science.” Brad received his Ph.D. in physics from Lehigh University.

Dr. Tim Andeen ’01 who is Associate Professor of Physics at the University of Texas at Austin gave a talk on “Building Blocks of the Universe.” Tim has a physics Ph.D from Northwestern University.

Dr. Nara Higano ’12, Research Instructor in Pulmonary Medicine and Radiology at Cincinnati Children’s Hospital, spoke about “From the Hill to the Hospital, A Physicist’s Path into Neonatal Lung MRI.” Nara received a Ph.D. in physics from Washington University. Her current work is on developing a groundbreaking method for the MRI imaging of lungs in prematurely born infants. (See the article on page 10.)

Dr. John Schmidt ’12 is a Senior Research/Design Engineer at Medtronic, Inc. His talk was entitled “Medtronic Structural Heart Device Design and Engineering”, and focused on the work it takes to design and test a new replacement heart valve in order to obtain FDA approval to bring it to market.

Nicole (Ball) Lafata ’14 is a Medical Physicist in the Clinical Imaging Group at Duke University. Her talk was on “The Role of a Medical Physicist - The Science behind Diagnostic Imaging.” Nicole previously obtained her Masters’ degree in Medical Physics at Duke.

Captain Nick Atkins ’12, an F-16 fighter pilot in the United States Air Force talked about “Flying with Physics.” He emphasized how his career as a Gustavus physics major helped him to develop some of the life skills he needs in the high-stakes world of aerial combat.

Dr. Mikaela Algren ’17 is a Postdoctoral Scholar in Chemical and Biological Engineering at Northwestern University. The title of her talk was “From SPS to Sustainability Assessment.” Mikaela received a Ph.D. in Hydrology and Water resources Sciebce from Colorado School of Mines, and introduced multiple aspects of “sustainability.”

Rochelle Widmer ’17 is an Engineer at the City of Minneapolis Water Works. After Gustavus, Rochelle went to the University of Minnesota where she received a Master’s degree in Civil Engineering. We learned about the complexities of providing safe, clean water to Minnesota’s largest city.
Darsa Donelan Named as 2023 Recipient of the Doc Brown Futures Award

The American Association of Physics Teachers has announced that the 2023 recipient of the Doc Brown Futures Award is our very own Dr. Darsa Donelan. The Doc Brown Futures Award recognizes early-career members who demonstrate excellence in their contributions to AAPT and physics education and exhibit the potential to serve in an AAPT leadership role. The award will be presented during the 2023 AAPT Winter Meeting.

A member of AAPT since 2014, they earned a B.S. in Physics and B.A. in Mathematics at Massachusetts College of Liberal Arts and a Ph.D in Physics at the University of Florida.

In 2019 Darsa joined the AAPT/NASA collaboration to produce space science themed educational supplements supported by a grant from NASA. One of their collaborators wrote, “Their scientific background in planetary science and obious skill in teaching and working with students made for an ideal addition to the team. The team is an eclectic group with a range of skills and background, and Dr. Donelan fit right in. At the time, we had received instructions from the project leadership at Goddard Space Flight Center that we could expand of context area beyond heliosphysics to include subjects like planetary science. This led to the development of tutorials on Habitable Zones, Exoplanet Atmospheres, and Stellar Spectra. Dr. Donelan was essential not only to the development of these materials but also in the professional development that we provide to teachers around their use. Moreover, they have increasingly played a leadership role, attending meetings of the Space Science and Astronomy committee, representing our team.”

Darsa brings the same care to their service work that they do to their teaching. At Gustavus, they have served on the Nobel Conference Planning Committee and advised both physics clubs (Rocketry Club and Society of Physics Students) and clubs that support marginalized students (Womxn in Physics Club, Queers and Allies). Their work extends beyond their own college. Donelan has been important to the success of the Faculty Online Learning Communities that follow the AAPT’s New Faculty Workshop, always willing to help colleagues. Congratulations, Darsa!

Other Faculty Happenings

(Continued from page 11)

search students are familiar.

Jessie’s position is in the technical development (physics package) team, where he works with a group of physicists and mechanical, electrical, and software engineers (including former student Bryce Bjork ’11). Their goal is to improve the quantum computing hardware in areas such as increasing ion trapping lifetimes, decreasing ion heating rates, and incorporating new technologies like photonics. Jessie looks forward to learning how physicists work together with engineers in the industrial research environment, and learning which skills and tools are needed for future GAC physics graduates as they explore engineering and industry. So far, Jessie says, “The learning curve has been extreme, much like one of my own courses 😮”, but, he adds, “It has been very rewarding to see how the many liberal arts majors (physics and otherwise) play a crucial part in the organization, have taken many paths post-graduation to develop their career, and come together with others to work collaboratively to achieve amazing research and technical goals.”

Although his daily bike-commute is now 6.5 miles roundtrip, and the Hawaiian shirts are not the norm, Jessie has made the most of his new position and location by raiding the company fridge, and spending time in the outdoors with his family.

Paul Saulnier will be teaching Mechanics, Statistical Mechanics, Senior Seminar, and a General Physics Lab in the fall. His spring teaching schedule has not yet fully solidified. Paul will also be serving as department chair this academic year.
At the annual induction banquet held on May 7, ten Gustavus seniors from the class of 2022 were inducted into our chapter of Sigma Pi Sigma, the national physics honor society. ΣΠΣ is a member of the American Institute of Physics and “exists to honor outstanding scholarship in physics; to encourage interest in physics among students at all levels; to promote an attitude of service of its members towards their fellow students, colleagues, and the public; to provide a fellowship of persons who have excelled in physics.”

At Gustavus, election to membership in the Sigma Pi Sigma chapter requires a minimum 3.0 physics GPA, involvement in the Society of Physics Students, and nomination by two different professors. In addition, each nominee must have fulfilled the requirements for at least one of three induction tracks: academic, research or departmental service.

In her banquet talk, presented remotely, Adetutu Adenle ’03 spoke about the fascinating steps in her career from Gustavus physics major to her current position as Senior Director of Global Trust and Safety Enforcement Operations at Twitter, Inc. Starting as an international student from Nigeria at Gustavus, she went on to earn two Masters degrees—an M.Sc. in Electrical Engineering and an MBA in Strategic Management. She is an inspiring example of charting your way through the myriad of possibilities after graduation from Gustavus.

During spring semester we were honored and excited to have Dr. Alexei Filippenko from the University of California at Berkeley join us under the auspices of the Rydell Distinguished Professorship program. Dr. Filippenko is a renowned astrophysicist who was a member of both groups that shared the 2011 Nobel Prize “for the discovery of the accelerating expansion of the Universe through observations of distant supernovae”.

In addition to giving lectures in multiple courses and a set of public talks, Alex brought along his EVScope telescope, allowing us to view wonderful images of deep-sky objects. It was so good, we bought one for our department, and it’s already up in the Olin Observatory.
Each year the Physics Department presents awards to student majors who have distinguished themselves through academics, research, and service to the department.

The 2022-2023 Milward T. Rodine Award in Physics was presented to Katelyn Espe ’23. This prize is named for the longtime Gustavus professor of physics (he taught here from 1933-1969) and is awarded annually to a rising senior physics major on the basis of interests and scholarly achievements.

This year’s winner of the John Borneman Prize Par Excellence in Mathematics is Aaron Johnson ’23. This prize is decided by the Department of Mathematics, Computer Science and Statistics in consultation with the physics faculty, and was designated in memory of John Borneman ’55 by his family. It is presented annually to an outstanding student in the fields of mathematics and physics.

Joe Weckworth ’23 was awarded the John Chindvall Scholarship in Physics for the 2022-2023 academic year. This scholarship was established in memory of 1970 Gustavus graduate John Chindvall by his parents and friends. It is awarded annually to a student majoring in physics.

Hardik Shresta ’23 is the recipient of the Gerald and Julia Swanson Scholarship in Physics for the 2022-2023 academic year. This scholarship was established to honor the work of the physics department faculty who provided Gerald Swanson with a background that prepared him for graduate study in physics and for a career with the Bendix Corporation.

The 2022-2023 Julian A. Crawford Memorial Prize was presented to Amber Simon ’23. This prize is named in memory of the former chair of the Gustavus Physics Department (1967-69). It is awarded to a good student who has been active within the department and who has the potential to well represent physics to the larger society.

Erin Coleman ’25, Synnove Hunnes ’25, Arya Menk ’25, Mary Davenport ’25 and Ronard Pabi ’25 are the winners of the Harold Q. Fuller and Richard M. Fuller Memorial Award in Physics this year. This award is given to the first-year students majoring in physics who compile the highest overall grade record in the physics course sequence. This award was established in 1997 by the late Professor Emeritus Richard M. Fuller (who taught at Gustavus from 1968-1999) and his wife, Judith. The award honors Richard's late father "HQ", a researcher in the Manhattan Project and physics professor and dean at the University of Missouri, Rolla, for his lifetime commitment to the teaching of young people. It also reflects Dick Fuller's own outstanding 31-year career teaching physics at Gustavus.

For the upcoming academic year, the department has designated Justin Sehlin ’23 and Rose Paddock ’23 as the Physics Academic Assistants for Fall 2022, and Grant Hietpas ’23 and Jack Stonecipher ’23 as Physics Academic Assistants for Spring 2023. These positions, offered to students who have displayed both academic prowess and dedication to the physics department, come with a small stipend and the expectation of additional work in the department.

Nara Higano ’12 Wins the First Decade Award

Physics alumna Nara Higano ‘12 has been named a 2022 recipient of the Gustavus Alumni Association’s First Decade Award “to recognize two individuals for early professional achievement by graduates of the 10th anniversary class. Criteria appropriate to selection shall include the difficulty of accomplishment; quality, creativity, and distinctiveness of performance; recognition by professional peers; and lasting contribution to the world of ideas and affairs.”

Dr. Higano, who received a Ph.D. in physics from Washington University, is Research Instructor in Pulmonary Medicine and Radiology at Cincinnati Children’s Hospital. Her current work is on developing a groundbreaking method for the MRI imaging of lungs in prematurely born infants.

Since 1985, 12 physics alumni have received Gustavus First Decade Awards, including seven women and five men.
Darsa Donelan writes, “This summer I worked with Erin Coleman ’25, Anne Monroe ’25, and Rose Paddock ’23 on NASA’s Radio JOVE project. You can read more about that work in their contribution to this newsletter (see page 4).

“I co-ran a 3-day workshop in San Juan, Puerto Rico with the other members of the American Association of Physics Teachers (AAPT)/NASA Heliophysics Education Activation Team (HEAT) for NASA Space Physics Ambassadors. Our Ambassadors are educators at U.S.-based Two-Year Colleges (TYC) and High Schools (HS) who were exposed to and then committed to sharing our workshop resources with their colleagues, communities, and other members of TYC/HS networks across the U.S.

“I also attended the AAPT Summer Meeting in Michigan where I learned that I am receiving my first national award for physics, the AAPT’s Doc Brown Future Award, which you can also read about in this newsletter (see page 8).”

This summer, Tom Huber worked with Ronard Pabi ’25 on a FYRE grant using deep learning for noise reduction of ultrasound signals.

The highlight of Grandpa Huber’s summer was being with his two new granddaughters: Hallie (born on April 11) and Claire (born on July 2). They are so sweet and, as you can see, are already studying physics!

Besides working on this summer’s High-Altitude Ballooning Camp for high-school students, Steve Mellema and his wife, Shirley, made three short trips out of town. Over Memorial Day, they attended the wedding of a family friend in Chicago. Then, they flew to San Francisco for two weeks visiting family (including two new grand nieces and a grand nephew, all of whom had been born in January). The final trip to Michigan in August was focused on history and visits to museums. For 2022-2023 Steve will serve on the Board of Trustees Marketing and Communication Committee.

After a rough academic year, Chuck Niederriter took a break from Gustavus related work and enjoyed time with family and friends. He travelled to Oregon in June, Pennsylvania for the 4th of July, the Apostle Islands in Wisconsin and St. Croix State Park in August. There was plenty of time for gardening and working around the house, as well as sailing on local lakes and kayaking on the Minnesota River.

Chuck and Steve, with the help of Erin Coleman ’25 and Ronard Pabi ’25, ran their week-long high altitude balloon camp for high school students. This year’s group consisted entirely of children of physics alumni and their friends and relatives, which made it particularly fun. Phil Miesle ’95, parent of two of the students, hung out and helped improve our programming skills.

Chuck will be teaching Electromagnetic Universe this fall. He continues serving, along with colleague Jeff Jeremiason, as director of the Johnson Center for Environmental Innovation. We’re hoping for big things this year, but being realists, aren’t holding our breath. He and his wife, Debbie, are preparing for their J-Term course, Astronomy of the Southern Skies, in New Zealand and Australia.

Jessie Petricka is on sabbatical leave for the academic year. For his sabbatical, Jessie and family moved to the Boulder Colorado area and Jessie will be an Advanced Physicist at Quantinuum Inc. Quantinuum is one of the world leaders in quantum computing, employing over 200 technical researchers, and utilizes trapped ions as qubits, something with which Jessie’s Gustavus re-

(Continued on page 8)
Diversity, Equity, Inclusion (DEI) are rightly important topics in society and higher education today. Even in the last three decades, (during which our program’s enrollment more than doubled) it has been all too rare in the USA to find women or BIPOC physics undergraduates, not to mention Ph.D.’s or college faculty members. The most recent data from the American Institute of Physics continues to show that underrepresentation is a major problem in physics, with only 20% of degrees (Bachelors’ or Ph.D.) being awarded to women, and a similar percentage to BIPOC students.

Representation is an important aspect of support for DEI within an academic discipline. As this newsletter and previous years’ issues clearly demonstrate, the Gustavus physics program is increasingly diverse. In the 21st century, our department has hired a total of 17 faculty members. Eleven of them were from underrepresented groups. So far in this century, our physics graduates have included 23% women. During the same time period, however, only 8% of our graduates were BIPOC. All of these statistics indicate that more work needs to be done within our discipline both nationally and locally.

These numbers raise important questions for our faculty and will help to shape our work going forward. Specifically, we need to consider such questions as how much is the lack of racial diversity in our graduates tied to an overall lack of diversity at Gustavus? How and when do Gustavus students choose to major in physics, and are there impediments preventing BIPOC students from doing so? How does a student’s high-school preparation impact their ability to complete the prerequisite mathematics needed to study physics? Are there initiatives Gustavus could implement that would help to lessen disparities caused by societal systemic racism? Are there actions the physics department could take that would help ameliorate these disparities?

As we try to address these and other questions, we will endeavor to ensure that our program, as it always has, provides support for all students. Our success rates for male and female, BIPOC and non-BIPOC students, (from first year through graduation) are statistically identical. We believe that is because we have always strived to foster a department culture of Belonging—for all.

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Anna Teurman ’22 tells us, “This summer I participated in an IRIS internship. IRIS, or the Incorporated Research Institutions for Seismology, is a group funded by NSF. They are a significant player in Geophysics and Seismology research, providing a public hub for data collection storage, and sharing. I have been working with data from earthquakes. Earthquakes create waves that pass through and along the Earth, following many of the same rules as sound or optical waves. Using this data along with MATLAB, my project aims to determine where discontinuities lie within the structure of the Earth. Specifically, we are looking at the mantle transition zone, an area that lies approximately 410-660km deep. By being able to determine the depth of this zone, the temperature and a rough compositional makeup can be inferred. This knowledge will help the study of tectonics as well as offering a glimpse into the history of the Earth.”