

AUGUST 2021

Department of Chemistry 2021 NEWSLETTER

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A Message from the Chair

Greetings from PLU's Chemistry Department! So much has happened over the past 17 months that we want to share an update with you about we've been up to:

- On March 7th, 2020, all PLU lecture and lab courses transitioned into remote instruction through the end of the spring semester. We graduated 30 Chemistry majors, although no in-person commencement ceremony could be held.
- In July 2020, 4 Chemistry faculty mentored 9 undergraduate students over 5 weeks of socially distanced, in-person summer research projects. We stayed safe by spreading our work throughout all of our labs.
- We continued with remote learning throughout the 2020-2021 academic year but successfully taught 5 upperdivision lab classes in person with full safety precautions.

It's been a long time coming, but faculty and students are vaccinated! We are truly excited to be in-person this coming academic year. We're ready!

Phase Transitions











We welcomed back Dr. Dean Waldow from a year's sabbatical project at the University of Washington, where he collaborated with Dr. David Ginger and other scientists.

Associate Professor Jon Freeman embarked on a sabbatical journey to the University of Shizuoka, a few hours outside of Tokyo. Where he has been working in the Department of Applied Chemistry & Biochemical Engineering to bioengineer cyanobacteria that can produce biofuel. Dr. Freeman has also decided to remain in Japan. We will greatly miss his contributions here! Read more on pages 7 and 8.

After ten years of dedication to our students and our department as a Visiting Assistant Professor, Adam Glass, Ph.D. is leaving PLU for the University of Oregon. We wish him all the best! Read more on his upcoming adventure on page 10.

We were very fortunate to welcome Dr. Sailaja Arungundram as a Visiting Assistant Professor during the 2020-21 academic year. Dr. Arungundram taught lectures and labs in General Chemistry and Organic Chemistry. We've really appreciated her thoughtful work with our students.

This year also marks our department's transition to a new chairperson, Dr. Andrea Munro.



A Note from the Incoming Chair

By: Andrea Munro, P.h.D

Dear Friends,

I look forward to starting my term as chair. I look forward to being able to support my colleagues and our students in my new role. Looking to the fall, I am excited for opportunities to meet and teach in person and to resume our Mole Day Eve and Desserts & Demos celebrations. I look forward to seeing you this year.

I want to thank our outgoing chair Dr. Justin Lytle for leading our department through a challenging time that included a global pandemic and huge shifts in our teaching, advising, and research. Dr. Lytle was committed to keeping our department updated on new developments and helped us work as a team to meet the needs of our students.

As we move into a new academic year, I look forward to the opportunities to meet with students, especially in the lab. Many of us have missed doing in-person lab work for both teaching and research. Quality laboratory experiences and skill development have been a strength of our program and something all of our students will continue to have at PLU.

Thank you for your continued interest in our departmental activities. I invite you to share your news with us by sending me an email at chair@chem.plu.edu. You can stay up to date by visiting our department webpage (https://www.plu.edu/chemistry/) and following us on Facebook (https://www.facebook.com/plu.chemistry/).

2021 Summer Research



Tailored ROMP-based Solid Polymer Electrolytes and

Single-Ion Conductors for Use in Ion Transport Applications

Professor Dean Waldow & Student Researchers: Alyssa L. Bright Duncan X. Haddock Sandra (Sandy) K. Montgomery Jacqueline (Jackie) H. Lindstrom

Funded by: National Science Foundation (NSF) Award Robert C. Olsen Chemistry Student Research Fund



Optimization, Synthesis and Conjugation-Based Characteristics of Benzofulvene Dimers

Resident Assistant Professor Adam Glass & Student Researchers:

> E. Jillian Berkenkotter Reagan L. Neumann

Funded by: Natural Sciences Summer 2021 Undergraduate Research Program



Exploring the Mechanism of Adaptive Mutagenesis in the Yeast Saccharomyces Cerevisiae

Associate Professor Tina Saxowsky & Student Researchers:

> Nicolas (Nic) B. Celebrado Hayden A. Cross-Schroeder

Funded by: Natural Sciences Summer 2021 Undergraduate Research Program

Dr. Dean Waldow awarded prestigious Lynwood W. Swanson Scientific Research Award



"For exemplary research in polymer chemistry with applications to real-world challenges and as an inspiring mentor to scores of undergraduate students for over 25 years."

The Lynwood W. Swanson Scientific Research Award, hosted by the M. J. Murdock Charitable Trust, was awarded to Dr. Dean Waldow in November of 2019. This prestigious award, part of the Murdock College Science Research Program, supports and recognizes undergraduate research in the Natural Sciences at four-year institutions throughout the Pacific Northwest. The award lifts up exemplary senior faculty members who run established, productive and nationally-recognized research programs, and it includes \$15,000 in funding, a portion of which funded student research and supplies. The Murdock Trust began recognizing faculty with this honor in 2016, named in honor of Dr. Lynwood Swanson when he retired from the Trust. Dr. Swanson is a noted educator, researcher, and business entrepreneur, as well as a former trustee for the Murdock Trust.

To be recognized by your peers and in a large setting like this—you know, the whole Northwest—it really made me feel humble," Waldow said. "There are many very deserving people and I just appreciate the chance to share my knowledge and to work with students and see them go out and do very productive things after they leave PLU."

Dr. Waldow's research has been centered around polymer chemistry. He is currently working to develop solid polymer electrolytes for use in lithium-ion batteries, and his research group's work might someday lead to improvements in battery performance and safety. Dr. Waldow's contributions to grant writing have helped fund both his years of extensive research and needed scientific instrumentation for the Chemistry Department, with more than \$2 million in grant funding.

Throughout his time at PLU, Dr. Waldow has mentored more than 78 undergraduate students to date, where more than half have gone on to graduate school. Mentorship is a key part of the department's undergraduate research experience and is an important selection criterion of the Lynwood W. Swanson Scientific Research Award. Student-faculty research helps empower undergraduates, giving them real-world research experience and the opportunity to develop research skills.

"Something that's exceptional about Waldow is that he has the utmost confidence in the students' ability almost from the start," said Hannah Hazel '20, who worked with Dr. Waldow during his 2019 summer research program.

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Continued...

"He lets us make decisions from the beginning . . . and he was always there to provide guidance when we felt lost. That gave us the opportunity to succeed, but more importantly it gave us the opportunity to fail."

Using funds from the Lynwood W. Swanson Scientific Research Award, Dr. Waldow additionally was able to fund summer research experiences for four students during the COVID abbreviated 2020 summer research program. The award also supported a public Swanson Award Lecture, which Dr. Waldow delivered via Zoom in May of 2021, and he has continued his research program, supporting four students for ten weeks during the summer of 2021 with a new NSF award.





The Chemistry of Chocolate

By: Justin Lytle, Ph.D.



I presented lectures about the chemistry of chocolate three times to PLU audiences during the past 18 months, and it never ceases to amaze me how much people love to talk about this food. As a white seed pod interspersed with purplish veiny filaments, it looks nothing like (and tastes nothing like) what we think of as chocolate. Whoever discovered that fermenting and then roasting cacao seed pods improves their color and flavors must have been very hungry indeed-necessity is the mother of invention. The roasted cacao nibs are ground into a waxy paste that is more than half cocoa butter, much of which is separated from the chocolate and set aside for a variety of personal care products. Add in some sugar, finely conch/mill the chocolate until the cocoa particles are smaller than the tongue can detect, and then temper it slowly to form snappy and glistening blocks of chocolate. No matter what you may read about its potential health benefits, be skeptical of foods that are rich in sugar and saturated fats. My audiences at PLU are increasingly aware of and interested in buying fair trade chocolates, which makes a lot of sense because PLU's Mission is to care for others and the Earth. Fair trade chocolates pay farmers a liveable wage, improve their working conditions, set and enforce child labor laws, and use agricultural environmentally sustainable practices--all of which are needed to offset the effects of climate change on growing chocolate around the world.

Supporting STEM Scholars at PLU

By: Tina Saxowsky, Ph.D

In January 2019, the National Science Foundation awarded a team of faculty at PLU a grant of nearly \$650,000 to support academically talented lowincome students to complete degrees in STEM (Science, Technology, Engineering, and Math) disciplines. This team, which includes principle investigator Tina Saxowsky (Associate Professor of Chemistry) along with her colleagues Amy Siegesmund (Professor of Biology), Shannon Seidel (Associate Professor of Biology), and Ann Auman (Professor of Biology and Dean of Natural Sciences), aims to integrate and build upon existing PLU resources to better support the success of all students in the sciences, paying particular attention to lower income students, who tend to leave STEM fields before attaining their degree. Additionally, we know that this demographic often intersects with students from underrepresented groups and those first in their families to attend college.

A significant portion of the funds in this grant (60%) go directly to student scholarships, and in Fall 2020, PLU welcomed a cohort of fourteen students as STEM Scholars. These students participated in a transition course in their first semester, enrolled in linked introductory courses for which supplemental instruction was provided, and met regularly with a faculty mentor over the course of the year.



In addition to supporting student success, the faculty investigators hope to gain some insight into the barriers that low-income students face in pursuing science degrees, as well as the impact of various program elements on both their sense of belonging at PLU and the completion of their degrees. Understanding where the challenges are and what support strategies work best will help to give all PLU STEM students the confidence and skills they need to transition from STEM majors to STEM careers!

Learn more at:

https://www.plu.edu/nsci/s-stem-grant/



Bioengineering Cyanobacteria for Bioprocess Applications

By: Jon Freeman, Ph.D



Since the start of 2020, I have been on a research sabbatical in Japan with Dr. Stefano Ferri at Shizuoka University, Department of Applied Chemistry and Bioengineering. My research project has focused on bioengineering cyanobacteria for bioprocess applications. In short, most of our work has involved inserting foreign DNA or altering the existing genomic DNA to change the behavior or characteristics of the cyanobacteria with the intent that newly engineered strains will be beneficial for producing chemicals such as pharmaceuticals, biofuels, or organic molecules used for bioplastics.

Cyanobacteria have been referred to as "green E. coli" for their relative ease of bioengineering and their ability to grow and produce chemicals by taking in carbon dioxide and using sunlight. Despite their potential, biomanufacturing chemicals using cyanobacteria is often hindered by economic costs due to limited or undeveloped technologies. One of the primary costs associated with bio-manufacturing using cyanobacteria is harvesting the biomass post-cultivation. Traditional harvesting, e.g. using centrifugation to collect the biomass, can account for 20-30% of total production costs. For this reason, several graduate students and I have looked at developing surface display technologies for cyanobacteria. Our goal is to develop a regulated display of a biomolecule on the surface of cyanobacteria that would act like Velcro and cause the cells to clump up and settle at the bottom of the harvesting tank, removing the need for centrifugation. Work is still in progress as research always moves slower than anticipated, especially during COVID. One of the drawbacks to cyanobacteria is the culture time. It takes approximately 1-2 weeks to culture our cyanobacterial strains. A routine genetic experiment, a gene knockout for example, usually takes 1-2 months.

Bioengineering Cyanobacteria for Bioprocess Applications, continued...

By: Jon Freeman, Ph.D

The research in the Ferri lab has been rewarding and working with students from Japan and around the world is always exciting. Communication has it challenges even though most reagents and biomolecules have English names. For example, ethanol is eh-ta-no-ru and plasmid is pu-ra-su-mi-do. I also found the post-graduate careers that students from the Applied Chemical and Bioengineering department go on to accept were interesting. Most students will go on to work for large car or other manufacturing companies, often not related to chemical or bioengineering work.

I have spent most of my time in Japan between research and my family due to COVID. The government has advised against travel outside our prefecture and encouraged people to stay home during peak COVID months. However, most businesses remained open and my family and I would enjoy visiting local bakeries whenever possible. If you haven't been, I would encourage you to google "Japanese bakeries" as they are full of divine treats! Berry tarts, cherry Danishes, apple croissants, anpan (sweet red bean filled breads), bacon filled epipan, and my favorite, the kurumipan (walnut bread) that is nutty, earthy, and wholesome. Plus, it's shaped like a star/flower so you can easily pull apart and snack on those walnutty bits at your leisure. Let me know if you find yourself in Japan or Shizuoka, I'd be happy to chat about the university life here, things to see and eat, or just to chat!

Conversion Conversion

2021 Virtual Chemistry Awards Ceremony

Updates from the Chemistry Department Lab Manager

By: Marlys Nesset, Ph.D.



I have been the Laboratory Manager for almost 3 years. For those older alumni, yes, I am Dr. Burton Nesset's daughter and am also a PLU alum. It is great to be back here at PLU!

I have a varied and interesting position. The major part of my day is making sure that the day's General and Organic chemistry labs have all the reagents prepared and available in the Open Lab, keeping the Open Lab tidy and having baskets of clean glassware ready to go at lab time. We now operate with scheduled lab sections instead of allowing students to vary when they participate in lab each week. Baskets of clean glassware roll out on the cart to the designated course area of the Open Lab. As always, this part of the position is heavily supported with student assistants. With the pandemic came very few in-person labs. I have not had students working with me for over a year. I miss their company! They are all so interesting to get to know.

The rest of my time is involved in monitoring our budget, making purchasing decisions, keeping records of our purchases, maintaining our inventory of about 4,500 chemicals, keeping the stockroom clean and organized, managing the waste, taking care of the administrative portion of student employment, ordering gases and cryogens, filling the magnet for the NMR with liquid nitrogen on a weekly basis and, along with Craig Fryhle, liquid helium 3 times a year, providing miscellaneous support to other chemistry courses and research, and I have been fitting in more and more instrument maintenance. My background is in Analytical Chemistry and so working on the instruments is appealing to me.

If you are ever in the PLU area, please stop in and check out what is happening in the department in person. I am around most of the time and would be happy to be your host.

A Farewell Message

By: Adam Glass, Ph.D



Dear PLU Family,

After one decade of proudly serving as a chemistry instructor in our wonderful department and division, I am sad to report that I will be transitioning to the University of Oregon in the fall of 2021 to continue educating students in chemistry. This was not an easy decision, and has filled the last few months with many swirling thoughts.

As many may remember, I came to PLU as a newly minted PhD in the summer for 2011. I couldn't have been more excited, though I wouldn't be completely truthful If I didn't admit there was quite of bit of nervousness too! From that first moment, I knew PLU was where I wanted to be. The community, the caring nature (of both students and faculty) and the overall ethos of the institution, reinvigorated me after the doctoral grind.

From my first class team-teaching organic chemistry with Dr. Fryhle, to my last class teaching online during the waning days of remote learning, I have been humbled by the dedication of my students and colleagues alike. While I generally try to avoid "bumper sticker" comments, the world really does need more PLU. I was truly fortunate to have been blessed with the opportunity to spend a decade here. Furthermore, even as I transition back to the home of my youth – PLU will forever be part of me. From my own mind, PLU was the perfect place to grow into the instructor I am today. I have had the opportunity to see the world through the lenses of experts in a variety of diverse fields, inside and outside of chemistry. I have been able to work with exceptional undergraduates in both my classroom and research lab. Of course, this has further enhanced my ability to instruct, conduct scholarship, act as a mentor and most importantly to see these folks succeed beyond any expectation.

While the future is difficult to predict, I anticipate everything I've loved about PLU in the previous years will continue to shine brightly. I will deeply miss this place. To all of my students – thank you. To all of my colleagues – thank you. Please keep in touch!

All my best, Adam

Whether Rain, Hail, Wind, or Covid-19 - PLU Chemistry Capstone Students are Resolute





PLU Chemistry Department seniors did a marvelous job adapting to and overcoming the effects of the pandemic on their 2020-2021 Chemistry Capstone experience. The class dove into a wide variety of fascinating and highly relevant topics, including studies on novel materials for solar cells, polymers for better and safer lithium ion batteries. studies on in relation antibiotic retromutagenesis to resistance and tumorigenesis, new reagents and for antibiotic methods synthesis, viral pathogenesis and vaccine development, correlations structure-activity among pharmaceuticals, electrochemical quantitative analysis of biomolecules, natural products in the antibacterial fight against resistance. and organometallic complexes as anticancer agents.

Each student wrote a technical article about their topic using the format of an appropriate chemical journal. Each student gave an oral presentation that was recorded for our online Chemistry Capstone Symposium. Titles and abstracts of their capstone projects can be found online <u>here</u> (www.plu.edu/chemistry/capstonesymposia/capstone-talks-2021-2/).

Working remotely during the pandemic certainly added to the challenge of capstone work, however. The physical isolation of students from their mentors and fellow students added motivational and technical obstacles. Nevertheless, the class was resolute in wanting to overcome the challenges they faced. Their perseverance and can-do spirit in this pandemic year shone through in the results of their work. Now, last year's class of capstone class is off to pursue their post-PLU endeavors, ranging from employment to volunteer work to graduate and professional studies. Our capstone students can be proud of their work. We are, and we congratulate them and wish them the best!

Serving As Vice-Chair Sometimes Requires Adopting Boat Conformer

By: Neal Yakelis, Ph.D.

In Fall 2020, I began a two-year term as the elected vice-chair of the PLU faculty. I had previously served in various roles within our elected faculty governance system at PLU including working on the Admission and Retention of Students Committee, the Rank and Tenure Committee, and the Governance Committee. I had also served as the elected faculty representative to the Board of Regents, so I have become familiar with our PLU shared governance system and the ways in which faculty, administrators, students, and the regents work together to take on initiatives and tackle complex problems.

I explain to students that being faculty vice-chair is a little bit like being "student body vice president", but the responsibility to facilitate and represent the diversity of faculty voice whenever possible is not something I take lightly. Lots of issues have kept me very busy the past year. Adapting our monthly allfaculty assembly to vote on legislation to a Zoom format was challenging, but we were able to improve with each iteration. I worked behind the scenes to support our faculty chair, Dr. Bridget Yaden, Professor of Hispanic and Latino studies, and handle faculty parliamentary procedure and technical issues. Additionally, I was co-chair of our Strategic Enrollment Management Advisory Committee (SEMAC) and joined a PLU group working on a project on equity in retention and degree completion for students of color and working-class students.



Finally, I served to lead the PLU Pandemic Transition Team to consider all of the logistics and issues around how students, faculty, and staff would be able to safely return to in-person learning this fall.

I have one more year of mentorship by Prof. Bridget Yaden before I become faculty chair for a two-year term. I am sure that I will have plenty to learn again over the coming year! Keeping communication lines open, providing space for constructive feedback, making sure that faculty know their concerns are voiced, and considering best practices at other universities are all things that will continue to help me along the way.

Culturally Sustaining STEM (CS-STEM) Teaching at PLU



By: Andrea Munro, Ph.D.

There is a new teacher scholarship program and a new STEM Education minor at PLU. These are the results of work being done by Dr. Andrea Munro (Chemistry), Dr. Ksenija Simic-Muller and Dr. Wendv (Mathematics). Gardiner (Education) at PLU as part of their NSF Novce Grant. This interdisciplinary team at PLU was awarded funding from the NSF Robert Noyce Teacher Scholarship Program. The project, "Pathways to Culturally Sustaining STEM Teaching" is a 5-year, \$1.2 million project designed to recruit, train, and retain excellent K-12 STEM teachers who will teach in high-need school districts using culturally sustaining pedagogy. This project seeks to meet the national needs for more K-12 STEM teachers while improving teacher retention.

The STEM Education minor will begin this fall and combines coursework from Education and the Natural Sciences Division with service learning. This minor is designed to help students develop the broad base of knowledge in mathematics, biological and physical sciences needed for K-8 teaching while also learning how to teach in using pedagogy that serves a diverse student population. The minor will allow students to explore teaching as a vocation and as a viable career option after PLU. Dr. Munro will serve as the chair of the minor as the program kicks off.

The **CS-STEM** Teacher Program awards scholarships of up to \$21,700 per year to each student in the program. The funds can be used to support a PLU undergraduate student in their senior year and the PLU Masters in Education (MAE) program. Seven students were awarded scholarships through the CS-STEM Teacher Program this spring. Four students (CS-STEM Teacher Candidates) started in the MAE program at PLU in June. The other three students (CS-STEM Scholars) will complete their senior year at PLU this academic year and will start in the PLU MAE program in June 2022. Each of these students will participate in equity seminars during their time at PLU and will work with students in high-need schools in the area. You can learn more about the CS-STEM Teacher Program at the website: https://www.plu.edu/noyce/

Special Thanks to Our 2020-2021 Academic Assistance Chemistry Tutors!

Hayden Cross-Schroeder (BIOL) Seth Koivisto (CHEM) Shekinah Lopez (SI) Won Shin (BIOL & CHEM)

Honorable Mention

Chemistry Club is a fantastic and hard-working bunch each year, and this year, Dr. Neal Yakelis is the advisor to the club.

The officers for the 2020-2021 academic year were:

President: Salma Ibrahim Vice President: Roseanne Gamboa Secretary: Aria Manning Treasurer: Julian Marsh Historian: Claire Calderon Public Relations: Raven Lirio

The officers for the 2021-2022 academic year are: Claire Calderon, Raven Lirio, & Julian Marsh.

2021 Award Recipients!

ACS Division of Analytical Chemistry - Analytical Chemistry AwardSaACS Division of Inorganic Chemistry - Inorganic Chemistry AwardACS Division of Organic Chemistry - Inorganic Chemistry AwardACS Division of Organic Chemistry - Senior Organic AwardACS Division of Physical Chemistry - Physical Chemistry AwardAmerican Chemical Society (ACS) CertificationDylan CummirAmerican Institute of Chemists (AIC) - Outstanding SeniorHayderBiochemical Society - Undergraduate AwardHayderGeneral Chemistry Award (CRC)Noor ShatnaPLU CHEM 331-332 - Sophomore Organic AwardJulian Marsh,

Sandy Montgomery Dylan Cummins Sinclair Combs Jackie Lindstrom Dylan Cummins, Hannah Jeffries Hannah Jeffries Hayden Cross-Schroeder Noor Shatnawi, Jonathan Zosel Paige Hinman Julian Marsh, Reagan Neumann

2021 Departmental Honors!

Annie Buchholz Sinclair Combs Dylan Cummins Dana Hiett Salma Ibrahim Hannah Jeffries Seth Koivisto Kristen Long Aria Manning

2021 ACS Spring National Meeting Theme: Macromolecular Chemistry: The Second Century

Held Virtually April 5 - 30

PLU Student Presenters:

Sinclair Combs Phylicia Phan Judson Yancey David Yun

Salute to our Teaching Assistants!

<u>Chem 104</u>

Emily Hicks Annika Phillips

<u>Chem 115</u>

Isaiah Banken Jillian Berkenkotter Aria Manning Sandy Montgomery Bi Tran Alicia Vergara Medina

<u>Chem 116</u>

Jackie Lindstrom Shekinah Lopez Kristen Long Aria Manning Yaquelin Ramirez Ferrer

<u>Chem 333</u>

Dana Hiett Hannah Jeffries Jackie Lindstrom Kristen Long Yaquelin Ramirez Ferrer <u>Chem 334</u> Emily Hicks David Yun

<u>Chem 336</u> Sinclair Combs

<u>Chem 320</u> Dana Hiett Hannah Jeffries

Scholarships and Sponsors

Thanks to Our Sponsors!

Thank you to all of our sponsors for funding chemistry research at PLU. The NSF has generously funded Dr. Dean Waldow's research for years and recently renewed their sponsorship of his work with polymer separators in Li-ion batteries.

The Murdock Charitable Trust has funded our faculty for decades and recently granted us matching funds that we used to help hire a new tenure-track faculty member, Dr. Angela Boysen, who will begin at PLU in 2022-2023.

PLU has also been extremely generous with our department, supporting many research projects each year that launch many professional careers for our students.



Fuesler Scholarship

We are grateful for the generous support of Dr.Tom and Susan Fuesler. Tom graduated from PLU in 1978 and he and Susan have founded a new scholarship for Chemistry majors, and particularly those that focus their studies on biochemistry. Congratulations to this year's recipient, Hayden Cross-Schroeder!





George & Helen Long Fellowship

George and Helen Long have been extraordinarily generous in their support of our department and science education at PLU. George was a 1966 graduate of PLU, earning dual degrees in Biology and Chemistry. In addition to bringing world-class scientists to interact with our students and speak on our campus, the Longs have funded PLU students that do unpaid internships.

The Long Fellowship was first established in 2017 and 10 PLU students have since received awards. We are grateful for the Longs' commitment to helping PLU students advance their professional careers.

Anders & Emma Ramstad Scholarship

The Anders and Emma Ramstad Scholarship is awarded to chemistry major that maintains above a 3.3 GPA and embodies the personal attributes that the Ramstad Family values such as: leadership potential, athletic excellence, concern for religious values and institutions, or other evidence of personal accomplishments or social responsibility. This year's recipients of the Ramstad Scholarship are Julian Marsh & Reagan Neumann. We're proud of Julian and Reagan for all that they bring to PLU!