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WELCOME

The last several years at Pacific Union College have been filled with change and transition across campus. In that time, the departments of mathematics, physics & engineering have seen both faculty and students come and go but our alumni have been a constant support.

In this newsletter, the first of what is planned to be a highlight of each new academic year, we want to recognize the contributions of our alumni and also give you a glimpse into what is going on in your departments since you left. Please enjoy our report of how you've made your mark on PUC and what we've been up to these last few years. In our next edition, we look forward to sharing updates from our alumni; be sure to [respond to our survey](#) and let us know what you are up to!

Chair's Remarks

This 2017-2018 school year is one of many exciting changes at PUC. The biggest change, of course, is that Dr. Bob Cushman (a scientist!) is our new president. There has also been a general restructuring of administration, and a renewed emphasis on connecting to our land—"Where nature and revelation unite in education."

More locally, in addition to the personnel changes reported elsewhere in this newsletter, we are starting our second year as the "departments of mathematics, physics & engineering." For those of you who remember "CSMP" days, here's how the new name came to be. First, the old major in computer science has morphed into a new computer information systems degree that is now housed in the department of business. We are still teaching the programming components of this new degree, but its overall focus is more connected to the business world. Second, we now offer more than "a few engineering classes

that transfer to Walla Walla." Our associate of science degree in engineering will still serve as the first two years of Walla Walla's program, but is easily transferable to any other engineering school. It is also a great standalone degree or an add on to another degree. So we've dropped the "CS" and added the "E" to more accurately reflect who we are.

As you read about other changes in our area, I hope happy memories will be triggered and you'll be inspired to reconnect with your college on the mountain.



STUDENT RESEARCH UPDATE

During the past seven years, more than two dozen PUC students from at least five different majors have participated in our physics research. Most of them, if not all, either presented posters or gave oral presentations during national and international conferences. Some of the students were co-authors or even first author of articles published in important journals of physics.

Many of the students' work took them to state-of-art research facilities such as the advanced light source (ALS) at Lawrence Berkeley National Laboratory, others had internships at distinguished laboratories and universities including the Catholic University of Louvain (UCL) in Belgium, Oak Ridge National Laboratory (ORNL) at Oak Ridge, Tenn., and Lawrence Livermore National Laboratory (LLNL) in Livermore, Calif. Two significant components that made these achievements possible were the [Atomic & Molecular Dynamics](#) grant of \$128,324.00 awarded to PUC in September 2011 by the Division of Physics of the National Science Foundation (NSF) and a NASA grant funding a

research subcontract with Lawrence Livermore National Security. The PUC Student Association also donated funds so our students could attend and actively participate in numerous conferences.

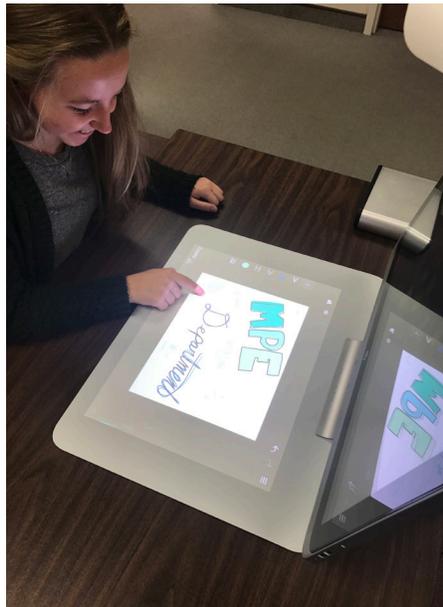
Seven PUC students were in the research group, working in collaboration with two national laboratories, that made several trips to ORNL and LLNL last year. Most notably, physics major Dmytro Panchenko ('17) was published in *Physical Review A* as a first author. In addition, four PUC physics majors spent nearly one month at ORNL during this summer. During this trip they brought the main elements of the three-dimensional imaging device for a test but also worked to build our beamline (a mirror image of the current ORNL beamline) and participated in a cross section measurement, the results of which are now awaiting publication. Search "Andrianarijaona" in the [Astrophysics Data Systems Database](#) to access most of our abstracts.

We are extremely proud of the phenomenal work our faculty and students are doing in physics research. However, due to a lack of travel funds upon the ending of the 2011 NSF grant in 2015, we have missed opportunities showcase our research and student accomplishments at various

conferences. We ask our alumni consider giving to the [Mathematics, Physics & Engineering Fund](#) to support these deserving students' travel to national laboratories and conferences so their tremendous work can continue and be shared. Our goal is to raise \$15,000 to fund travel expenses through fall of 2018. We have raised over \$9,000 so far and want to extend a huge "thank you" to the generous donors who have brought us closer to our goal. Visit the [PUC Special Collection on Physics Student Research](#) to see our majors in action.

COMPUTER UPGRADES

This summer, PUC alumnus John Brenneise ('90), graciously donated three computers with upgraded hardware, along with an HP Sprout, to our departments. In addition, a week before instruction began this fall, John visited the department to assemble a fifth computer out of donated parts. During this visit, he also met with a number of MPE faculty to develop plans for updating the graphics hardware of more computers in the electronics lab. The main focus of these hardware upgrades is to provide our students with invaluable programming experience on computers capable of GPU programming with CUDA. John also hopes to equip our department with the computational resources needed for our department to perform physics and numerical analysis research, as well machines capable of running computer-aided design and engineering software, Solidworks, more smoothly. Finally, in an effort to develop more student interest in scientific computing, John is working with the department to update



Taylor Bothwell, head secretary and sophomore biomathematics major, explores the Touch Mat technology on the departments' new HP Sprout

the display cabinets in Chan Shun Hall with the means to better advertise the accomplishments of students in the department.

PHYSICS LAB EQUIPMENT UPGRADES

The general physics lab received a much-needed upgrade of computer-interfaced lab equipment from PASCO Scientific in spring 2017. The new equipment augments the existing inventory, thereby adding to the number of lab stations available to the students. Additionally, updated sensors will extend the capabilities of some existing instruments, allowing us to offer a

wider variety of laboratory experiments for our students. We are happy to provide students at PUC with access to a top-of-the-line laboratory where they can experience the physical phenomena they have been studying in their classes firsthand. Thanks to Paul Stokstad at PASCO for helping the department of physics obtain high-quality laboratory equipment.

WEATHER UNDERGROUND WEATHER STATION

Since 1950, the department of physics has been an active member of the National Weather Service (NWS) Cooperative Observer Program. As a NWS member, the college is responsible for reporting the official rainfall and temperature data in Angwin. The method of data collection has remained the same over the past 67 years; data is collected manually at 5 p.m. each day and reported monthly to the NWS. In addition to the official NWS data, the department also maintained unofficial, yet accurate, display of current weather conditions in Angwin located in the lobby of Chan Shun Hall for visitors to see. In 2016, the existing, old equipment was replaced with a new RainWise weather station that reports to Weather Underground via the internet for all to see. The department was able to afford this new equipment through the generosity of alumni during the last PUC Phonathon fundraising campaign. A computer monitor now displays our weather station data in place of the old PEET Brothers weather display. Curious about the current weather on Howell Mountain? Visit [Weather Underground](#) or add the Pacific Union College Station (ID: KCAANGWI11) to your Weather Underground mobile app.

Note: We are eager to expand our reporting capabilities by adding a webcam to our station. The approximate cost of the required software and hardware for a webcam is approximately \$150. Please consider giving to the [Mathematics, Physics & Engineering Fund](#) to help upgrade our weather station.

PHYSICS RESEARCH UPDATE

In fall 2015 the Division of Physics of the National Science Foundation (NSF) awarded PUC a \$189,532 [Major Research Instrumentation](#) (MRI) grant. Dr. Vola Andrianarijaona, physics faculty member



Unpacking a shipment of PASCO laboratory equipment

and principal investigator for the grant, has been working to develop a portable three-dimensional imaging device that will allow vibrationally resolved measurements of cross sections of charge transfer in collisions between molecular ions and neutral particles.

The process of building the apparatus began in 2015 with the acquisition of parts from local and foreign companies; the last delivery being received in March 2016. Students were involved in the construction of the apparatus, which began in PUC's advanced physics lab located on the first floor of Chan Shun Hall. Building an

experimental apparatus is a unique experience, but what students found very exciting was that it took place at PUC. After assembly, the equipment was relocated to the new physics research room (formerly the advanced computer lab) on the second floor of Chan Shun Hall. While the new location is spacious enough to host the new three-dimensional imaging device, the room is not equipped to safely run the machine without necessary renovations that were not included in the MRI grant budget. These renovations include the addition of a sink (installed at the end of spring 2017) and the installation of water supplies.



SEMINAR ROOM RENOVATION

During the 2013 PUC Phonathon we asked our alumni to support our departments by donating funds to refurbish our departmental seminar room. Our plans involved updating the technology, replacing deteriorating furniture, and increasing storage to meet the various demands of the courses held there. We are happy to share that together with funding from Academic Administration, your Phonathon donations helped secure a new document camera, SMARTBoard, 10 tables, 20 chairs, new carpeting, and new cabinetry. We have been making good use of our new and versatile equipment for classes, seminars, and occasional committee/meeting use by other departments.

MATH SCIENCE WORKSHOP: A PUC TRADITION FOR OVER FIVE DECADES

In 1966, the faculty at PUC created the Math Science workshop with the goal of providing interested seniors from Adventist academies and other local area high schools with exposure to mathematics and sciences at a college level. Not just for the students, the workshop also gives their teachers opportunities for further education and networking. Held annually for over 50 years, the program has typically started on Sunday with workshops in the areas of biology, chemistry, computer science, mathematics, and physics, and an evening program with laboratory demonstrations and live animals, followed by an overnight stay in the dorms with college classroom visitations on Monday. In recent years, however, attendance and interest in the workshop has been dwindling, due in part to an increase in high school travel to PUC for music, sports, and other events, as well as the difficulties imposed on high school teachers who must miss class days in order to chaperone groups to the annual event. In order to revitalize interest for the workshop in changing times and better accommodate the busy schedules of our high school seniors and teachers, the program underwent changes in 2017 under the leadership of Aimee Wyrick, chair of the department of biology. In its new format, the program includes a fuller Sunday schedule of workshops



Concept perspective rendering
 Credit: Michael Blackburn



Completed project

in mathematics and sciences and an evening demonstration show, but it has been shortened to just the one day with an option of staying for Monday classroom visitations for those schools that are interested and able.

While the workshop activities have varied over the years, many of our science majors and laboratory employees have had opportunities to work with the visiting students. We also know that some of our very own majors chose to come to PUC because of what they experienced during this fun-packed experience where they got to interact with PUC science faculty and students, and experience undergraduate science firsthand. Perhaps you remember working with our computer science faculty as they introduced students to programming as you maneuvered a virtual robot, provided instructions using

arrows and bubbles or blocks, or developed efficient search algorithms.

Our physics faculty have led out in explorations of the geometry of musical instruments, studied standing waves, estimated the gravitational constant, and for many years partnered with the department of mathematics to model and measure radioactive decay. With the recent addition of our associate degree in engineering and the elimination of the department of computer science, at the most recent workshop our physics and engineering faculty worked together to illustrate the notion of torque by simulating a human arm holding an object subject to three torques. We introduced the notions of force, lever arm, and torque then the students assembled the experimental apparatus according to a mechanical model. Thereafter,

they had the opportunity to measure the torques and to verify that the net torque is zero when the three torques were in balance. The workshop concluded with a guided discussion about the physics and engineering concepts they had learned. One of the teachers described the activity as “mind-blowing” and hoped to include it in his own laboratory curriculum. Most, if not all, the high school teachers appreciated the multidisciplinary aspect of this hands-on and very original activity.

In addition to radioactive decay, the mathematics workshops have addressed a variety of topics in the undergraduate curriculum including an investigation of knots and problem solving, modeling infectious diseases, and a taste of calculus in a workshop addressing optimization problems. At the workshop in 2017, the mathematics faculty led out in an investigation of the geometric idea of symmetry for plane figures, specifically finding and operating on the symmetries of a square. A significant portion of the workshop was devoted to a hands-on activity that required students to complete a Cayley table for the eight symmetries using physical squares—an activity inspired by an illustration used by PUC alumna Lynelle Weldon ('91) in the Abstract Algebra course she taught at Andrews University when PUC mathematics faculty member Chantel Blackburn was a student there.

We are excited to share our passion for mathematics and science with high school students who come to the Math Science Workshop at PUC and look forward to continuing the tradition for many years to come.

WELCOMING OUR NEW MAJORS

It is a special time each year when we have the opportunity to welcome new students into our departmental family. This year we are happy to introduce four new majors:



Name: Cliff DeGuzman
Major/Program: Biophysics and pre-medicine
High School: San Diego Academy



Name: Monarc Manlongat
Major/Program: Biophysics and pre-medicine
High School: San Diego Academy



Name: Edwin Schultz
Major/Program: Physics and secondary teaching credential
High School: Indiana Academy



Name: Noelle Madrio
Major/Program: Biomathematics and pre-medicine
High School: Rocklin High School

RECENT GRADUATES

We celebrated the graduation of our majors this past June with an annual gathering at Steve Waters' home in Angwin. We are sad to say goodbye but we are excited to see where life takes the individuals in this impressive and talented group of 2017 graduates. Here is a snapshot of their plans:

Michael Andrianarijaona (Biomathematics B.S.)
Pursuing teaching credentials

William Bronwson (Software Development A.S., Winter 2016)
Computer Operator for Envolve Pharmacy Solutions in Fresno, Calif.

Zachary Dechicchis (Mathematics B.S.)
Assistant chaplain and mathematics tutor at Rio Lindo Adventist Academy

Charles DeGuzman (Biophysics B.S.)
Medical school at Loma Linda University

Thu (Joy) Huynh (Biomathematics B.S.)
Medical product development management M.S. program at San Jose State University

Charles Lambert (Engineering A.S., Software Development A.S.)
Computer Science B.S. program at Walla Walla University

Justin Lyu (Biophysics B.S.)
Medical school at Loma Linda University

Dmytro Panchenko (Engineering A.S., Mathematics B.S., Physics B.S.)
Intern at Lawrence Livermore National Laboratory

Taleah Tyrell (Biomathematics B.S.)
After-school mentor in LA for a year followed by law school

Yuzu Yoshida (Biomathematics B.S.)
Nursing school at Loma Linda University

UPDATES FOR ALUMNI

We would love to hear what our alumni are doing now. Please take a moment to [give us an update](#) for our next newsletter! Not getting our newsletter? You can [update your email](#) as well.

FACULTY UPDATE

Following many years of relative stability, we have had many changes in faculty over the past few years. You are probably already aware of the departure of long-term members Richard Rockwell and Bruce Ivey, and short-term members Alex Noguchi and Wayne Buckhanan, as well as the arrival of Chantel Blackburn and Raulton Haye in the past five years. This year saw the retirement of two more of our long-term members, but also the arrival of a recent graduate who will continue our history of excellence in mathematics education.



Back (left to right) James Robertson, Lloyd Best, Taleah Tyrell, Yuzu Yoshida, Charles DeGuzman, Dmytro Panchenko, Charles Lambert, Raulton Hays, Steve Waters, Roy Benton

Front (left to right) Michael Andrianarijaona, Thu (Joy) Huynh, Vola Andrianarijaona, Chantel Blackburn

Not Pictured : William Brownson, Zachary Dechicchis, Justin Lyu

spring of 2018. After spending an isolated year here in the 90s, and then returning to Columbia Union College, Roy joined us on a more permanent basis in 2004. He immediately became a pillar of the department, college, and community, teaching virtually any mathematics course, as well as philosophy and honors courses, chairing Faculty Development, Research, and Honors Committee and Academic Senate, and serving multiple terms as the head elder of the PUC Church. He was also a trusted advisor to many students and colleagues, and served as a mentor in Amnesty International and other social justice causes. His musical, mountain-climbing, and bicycling pursuits will undoubtedly continue through his many years of blissful retirement, and it will come as no surprise if he continues to teach a course now and then for one of the colleges near his new home in Walla Walla. We wish him well, and look forward to having him with again for two quarters later this year.



Lloyd Best, now professor emeritus of mathematics, retired in the spring of 2017 after teaching for 32 years at this college we love. Before his first 3-year stint (1979–1982), he also worked in the precursor to our Information Technology System and Services office. After leaving us to be a teacher and principal at the secondary level, he rejoined the department of mathematics in 1988 and quickly became one of the most engaged members of our campus community. He served two eight-year terms as department chair, was chair multiple times of Academic Senate and Academic Standards Committee, reported as Board observer twice, and was often asked to serve on ad hoc

committees to deal with difficult issues facing the college. In addition, he founded our PacificQuest program and coordinated graduation activities with his wife, Jennifer. More importantly, he inspired thousands of students with his engaging classes and personal testimony, leading to his being named Educator of the Year in 2015. We will greatly miss his leadership and gentle council, but wish him the best in his retirement revelries with grandchildren and other family.



Roy Benton, professor of mathematics, also retired in the spring of 2017, but has graciously agreed to teach for us again in the winter and



Sidney Shields, assistant professor of mathematics, began what promises to be an illustrious teaching career this fall at PUC. After graduating here in 2012 with a degree in mathematics and a minor in computer science, he went on to advanced studies at the University of Nevada, Las Vegas, where he earned a Ph.D. this past spring. In addition to teaching mathematics and statistics courses, he will be taking on the programming courses for the computer information systems degree. He is also eager to involve students in numerical analysis research. We are thrilled to welcome him as the newest member of our departmental family.

DEPARTMENTS OF MATHEMATICS, PHYSICS & ENGINEERING

NEWSLETTER

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