Pacific Union College

DEPARTMENTS OF MATHEMATICS & PHYSICS
NEWSLETTER

FALL | 2020
ISSUE #4

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WELCOME!

The departments of mathematics and physics at PUC welcome you to our fourth annual newsletter! We are eager to update you on the changes and our accomplishments from the 2019-2020 academic year. It has been a busy year that has tested our abilities to adapt and meet unexpected challenges. We hope you enjoy reading our updates, welcoming new students into the departments, and celebrating the achievements of our alumni.

We look forward to sharing updates from our alumni every fall; be sure to respond to our survey and let us know what you are up to!

Chair's Remarks

Since our last newsletter in 2019 the world has changed, but God has not. He continues to love each one of us and bless us. The college and our department have found ways to strategically grow, adapt course delivery methods, and provide quality Christ-centered education in spite of multiple challenges.

The pandemic forced the college to transition all courses to an online-only delivery in the spring 2020 quarter. For most college courses, this has continued into the fall quarter. The summer provided a much-needed break as well as time to better develop fall courses, especially labs, for remote learning. Although academically we are achieving success in our courses, everyone misses the community aspect that we cherish. Professors and students alike are looking forward to the day when we will return to face-to-face instruction and the family atmosphere in our department.

During challenging times, it can be difficult to find the blessing. One apparent blessing came in the form of Nathaiel Adu who joined our department this year to pioneer the new data science major. You can read more about him and data science in this newsletter. A second blessing was not as apparent at first since it came in the form of what emergency managers call 'a disaster within a disaster'. We were forced to evacuate the college this quarter due to a threatening wildfire. You may be saying to yourself, that does not sound like a blessing to me. It was a blessing in disguise. During the 10-day evacuation, courses continued with very little interruption due to the online delivery methods the pandemic ushered in. Today, the college is safe and undamaged thanks to heroic efforts of firefighters. God is good.

We are thankful for the opportunity to share what has been happening at your school over the last year. Thank you for your continued support of your departmental family at PUC by reading these annual newsletters, sharing your updates with us, providing financial assistance to our students, and interacting with us online through Pioneer Connect.

DEPARTMENTAL UPDATES

Physics Student Research

We had planned two trips to Oak Ridge National Laboratory (ORNL) during the 2019-2020 academic year, but both were cancelled due to COVID-19 related shelter-in-place orders. These trips will be rescheduled as soon as the Physics division of ORNL will allow students to come onsite. Likewise, our trips to attend conferences were also cancelled. However, our students attended the live online sessions of the April meeting of the American Physical Society (APS) and the live online meeting sessions of the APS Division of Atomic, Molecular, and Optical Physics in May. We continue to raise funds to support the future travels of our students when research opportunities resume. If you want to support student research and conference attendance activities like these, **please consider donating to the Mathematics and Physics Departments Fund to supplement the financial expenses of research related travel.**

Publication in The Physics Teacher:
In our update on the Physics Research Room last year we also mentioned an introduction to physics research class that was piloted in an effort to attract transfer students from surrounding community colleges to our physics programs. Zahra Asadollahi, one of the students who took the research class last year used what our General Physics Laboratory could offer as equipment for geometric optics to study the "beauty of the eye". She came back for a few days in summer 2019 to finish her measurements and started to write her report. She trimmed and shaped her report into the format for a paper, then submitted it to a journal, which in turn recommended that the paper be submitted to one of the journals published by the Association of American Physics Teacher (AAPT). We congratulate Zahra on the acceptance of her paper, "Eye Accommodation, Near Vision, and Far Vision from Geometrical Optics Point of View", that will appear in an upcoming issue of AAPT's *The Physics Teacher*.

ORNL Equipment Transferred to PUC

We are pleased to be the recipient of equipment from ORNL through the United States Department of Energy (DOE) Laboratory Equipment Donation Program (LEDP). The original acquisition cost of this equipment was $283,426.00 and as qualified DOE high risk property, a custody transfer from ORNL to PUC was required according to the Export Controlled Property rules and regulations. We would like to thank President Bob Cushman for agreeing to sign the Custody Transfer Form that allowed the release of the materials to PUC. We would also like to thank PUC Facilities Management, led by Dale Withers, for their help to safely move this equipment to our Physics storage room last summer. Unfortunately, we are not allowed to publish any pictures of the actual equipment due to the Export Controlled Property rules. However, we hope you will appreciate seeing some of the work that was involved in bringing the equipment into storage.

Vola works with members of facilities to transport the supports for the new ORNL equipment from the Chan Shun Loading Dock to the physics storage room.

Members of the facilities crew move the high voltage cage for the ORNL equipment into position for unloading.

This equipment is versatile and allow different kinds of measurements that are relevant in Fundamental Physics, Atomic and Molecular Physics, and Astrophysics. Our plan is to use it for our H + H2+ charge transfer research, which is similar to, or a continuation of, what we did at ORNL in the past years, except that we can now conduct the experiment without traveling to ORNL.

NEW PROGRAM IN DATA SCIENCE

Data Science Major

We are excited to announce that our data

science program was approved and launched this fall quarter. In a year that has been consumed with tracking the spread of a pandemic and the outcome of an historic election, it is more clear then ever how important data is in our information society. Our program, which culminates in a bachelor of science degree, will help students gain the knowledge of how to mine and obtain the necessary data needed to help us understand more about the complex world we live in.

Housed in the PUC department of mathematics, the new program will be taught by faculty who have varied, rich backgrounds and they are hard at work ensuring that our students get the best grasp of the data science field. The curriculum is well structured, including courses in data science, mathematics, statistics, and business and enriched with resources to equip our students with the skills of drawing sound conclusions by using knowledge of inferential statistics, machine learning and data management strategies. The program focuses on equipping students with practical skills and knowledge that will prepare graduates for employment in a variety of industries, including entertainment, healthcare, technology, and political and social sciences or a background for pursing graduate studies in data science or related fields.

Our introductory data science course provides an overview of the data science field. It is a survey course introducing the essential elements of data science: data collection and management, summarizing and visualizing data, basic ideas of statistical inference, machine learning. Students will gain hands-on experience using the R programming language and we hope to attract more majors through this new course. You can find more details about the program in data science by following this link.

Chan Shun Computer Lab updated with new computer towers and configured for social distancing

Chan Shun Computer Lab Upgrades

The Chan Shun Computer Lab has gone through many changes as the departments' needs have changed. Changes like replacing the chalkboard with a dry erase board, installing a video projector, and replacing old computers with Raspberry Pi terminals. But whatever the configuration, the students were provided the resources they needed. Now, with the Data Science major spinning up, the college's IT department has invested in the latest upgrade. The Pi terminals have been replaced with stand-alone computer towers and the old tables were replaced with ergonomic tabletops. This upgrade will provide more stability, upgradeability, and the processing power needed by the students in our newest academic program.

STUDENT & ALUMNI UPDATES

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 five new majors:

Freshmen:

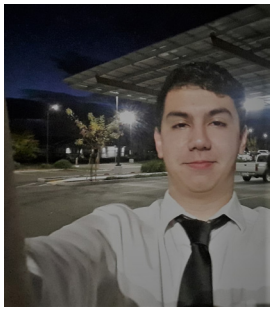
Name: Thiago Morales
Major/Program: Physics
High School: Buckingham Charter Magnet High School

Name: Jared Quezada
Major/Program: Mathematiics
High School: Livingstone Adventist Academy

Name: Christopher Russell
Major/Program: Mathematics (Minor in Art)
High School: Pacific Union College Preparatory School

Name: Joseph Shiu
Major/Program: Data Science (Minor in Aviation)
High School: Weimar Academy

Name: Davielle Smith
Major/Program: Mathematics, Music (Performance)
High School: Fiorello H. LaGuardia High School of Music & Art and Performing Arts



Thiago Morales

Jared Quezada

Chris Russell

Joey Shiu

Davielle Smith

2019–2020 Academic Year Departmental Scholarships, Commendations, Honors, and Awards

The **MPE Departmental Commendation** for a four-year student demonstrating scholarly excellence, outstanding academic achievement, non-curricular leadership, character, service, and/or community involvement was awarded to **Vola-Masoandro Andrianarijaona** .

The **MPE Departmental Student Worker Award** for students with strong work performance and excellence, demonstrating initiative, integrity, and dependability in their on-campus jobs was awarded to **Vola-Masoandro Andrianarijaona** (Head Physics Lab TA), **Taylor Bothwell** and **Noelle Madrio** (MP Co-Head Secretaries).

The **Math Scholarship** for a deserving Mathematics Major was awarded to **Taylor Bothwell**.

Mathematics and Physics Alumni Scholarship Fund

The Mathematics and Physics Alumni Scholarship Fund that was created and announced by email last November has been a huge success and a timely blessing. Almost $20,000 in scholarship funds were distributed to 14 mathematics and physics majors this year. In at least three known cases the scholarship made the difference in their ability to return to PUC this fall. Now, more than ever, students are under extreme financial pressures. We appreciate your generous gifts to our students and so do they. Here is a small sample of the responses of thanks we received.

- *I was very happy to learn that I was chosen as a recipient of the Mathematics & Physics Worthy Student Scholarship Fund! I would like to thank the PUC alumni donors for their generous financial support towards my education. This scholarship will be used towards tuition and on-campus housing. With this gift, I will be able to devote my time to schoolwork rather than worrying about finances. Once again thank you very much!*

- *I am really blessed to have been granted a scholarship by the Math/Physics Department and have already been able to benefit from the award. With school being online, working and communicating with new professors has been more difficult than in previous quarters. A few of my courses have had last minute textbooks added or changed, and this scholarship has helped immensely for covering these costs and allowing me to stay focused on schoolwork instead of finances. I have also been able to cover my general fees and I know that I have been able to get a strong start for this quarter because these worries never fell upon me. I am incredibly grateful for anyone who has contributed to my schooling and to the alumni who recognized the benefit in putting money into this department that is able to help hardworking students like me. Thank you so much to everyone who contributed and made this quarter possible for me!*

- *Thank you so much for this great blessing. It truly means a lot to my family and me. I've been working all summer and continue to work throughout the school year to be able to financially manage and this will really help a lot.*

You can contribute to this scholarship fund to support students in mathematics and physics at PUC by navigating to https://www.puc.edu/alumni?form=math-physics-alumni.

Current Student Spotlight

For the 2020-2021 academic year we will miss mathematics and physics major, Edwin Shultz, as he serves as a missionary with Adventist Frontier Missions (AFM). He is working with Suzy Baldwin-Noutehou and herhusband in Benin, West Africa where he is currently learning French and doing well. Follow the Pendjari project on the AFM website.

Updates from Alumni

We are always thrilled to hear back from our alumni and are happy to share the following news:

Darren George (History, Mathematics, Religion 1970)

Professor and Chair of Psychology at Burman University, Darren George, shares that he and coauthor Paul Mallery, Professor of Psychology at La Sierra University, celebrated the release of the 16th edition of their book *IBM SPSS Statistics 26 Step by Step: A Simple Guide and Introduction* in December of 2019. The book is distributed in 85 countries (several editions translated into Chineese) and employed in graduate and undergraduate programs at schools including Johns Hopkins, Harvard, UC Berkeley, University of Michigan, and UCLA. Their book is an academic best sller with sales now surpassing 100,000. Darren and Paul are proud of their book and we are impressed!

John Brenneise (Computer Science 1990)

Invites you to join him in participating in http://www.foldingathome.org/.

Warren Comulada (Biophysics 1993)

W. Scott Comulada, an Associate Professor at UCLA in the departments of Psychiatry and Health Policy and Management, recently took on a new role as Director of the UCLA Semel Institute Center for Community Health.

Demetrio Villar (Mathematics 2002)

I'm teaching mathematics at Auburn Adventist Academy in Washington Conference. We moved here four years ago after teaching at Pleasant Hill Adventist Academy for 14 years.

Sarah Hall (Biomathematics 2015)

I started working as a pediatric resident physician at Kaiser Sunset in Los Angeles!

Josue Tobar

Josh Tobar (Engineering, Physics 2016)

Working as a Systems Engineer for Northrop Grumman Space Systems.

Joy Huynh

Joy Huynh (Biomathematics 2017)
During the pandemic, I started a new job as Clinical Data Manager/ Analyst at Verily Life Sciences (formerly known as GoogleX). It was such a blessing for me since this is my dream company to work for ever since I graduated from college. Currently, I am the data lead of the Baseline COVID-19 Testing program - launched as part of the California state-led community-based COVID-19 testing program to establish protocols and a framework for broader and systematized testing, and continues to scale nationally. It has been an amazing experience to contribute to the screening and testing efforts in the nation during this critical time.

Taleah Tyrell (Biomathematics 2017)
Started Law School at Columbia Law so I've moved to New York City.

Jarred Taylor (Engineering, Physics 2018)
I am still at LSU getting my PhD in medical physics. I have recently joined a new research group focused on space radiation as the PHALANX Project Lead. If you want to see what our group is doing check out https://spartanphysics.com/.

Announcements for Alumni

Handshake
As an alum, how would you like to give back to PUC? There are many Pacific Union College students who would like to connect with alumni from PUC who are professionals along the same career path. Handshake provides opportunities where alumni can become a mentors, host a site visit, provide a job shadow, hire interns, participate in educational workshops, and conduct hiring events. We've already set up a Handshake account for you. Just go to app.joinhandshake.com, select Pacific Union College, and follow the prompts to log in and get started. You can also download the app and log in today.

HANDSHAKE

Pioneer Connect
Pioneer Connect is an online community for mentoring PUC students. Mentorship is the best way to give your time and talents, and while getting started takes just a few minutes of your time, the support you provide to a PUC student can have a lifelong impact by setting them on course toward a meaningful career and life of service. Join Pioneer Connect today!

Departmental Newsletter
We would love to hear what you have been doing. 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 UPDATES

It's been a busy year for our students and also a busy year for the Mathematics and Physics faculty here at PUC. Some of the changes over the last year include farewells to several faculty and the arrival of our newest member.

Farewells

Vola Andrianarijaona:
As some of you have already heard, I moved to Southern Adventist University last July. Pacific Union College has been a continuous source of blessing for my family during my 14 years of service. It was the first Adventist institution I had served. It was during my service at Pacific Union College that I was awarded two National Science Foundation grants and the equipment from ORNL from the DOE LEDP. My wife, our oldest son, and our oldest daughter graduated from PUC during my years at Pacific Union College, and two others are on their way. But God called me to move on another mission and challenge, which I accepted after a long reflection. Unfortunately, PUC has decided to freeze the process of hiring new faculty and I am aware of the big hole that I left. To keep the physics and biophysics programs at PUC going on, I accepted the offer to remain as an affiliate professor at PUC. In this new role I will be able to continue to help teach some of the independent study and research classes. I must say that I am fortunate to be a PUC affiliate professor.

PUC Afiliate Professor of Physics Vola Andrianarijaona in his office at Southern Adventist University

Raulton Haye:
Raulton Haye recently left our department following the teach-out of the remaining engineering majors. He came to us in 2014 and served as an assistant professor, the engineering academic advisor, and the astronomy labs instructor. Still in the area, Raulton now works for Napa County in the Engineering Division. As his schedule allows, we plan to have him continue to teach Winter astronomy labs in the evenings.

Lawrence Turner:
We don't have adequate words to express how grateful we are for the year that Larry took out of retirement to join our Departments. He not only taught several classes for us each quarter but took on additional class responsibilities as a result of some staff changes during the fall quarter and transitioned with the rest of us from winter to spring when we moved online due to the COVID-19 pandemic. It isn't easy to completely change how a course is delivered and to put in so much work and effort knowing he wouldn't likely be teaching these courses again was really going above and beyond. We will miss the puns and snazzy vests that Larry brought to our departments this last academic year and wish him all the best as he returns to a more relaxed pace of life in Texas. We hope you will be able to enjoy your travel plans you had in mind sooner than later!ty.

New Faculty Introduction

We are thrilled to introduce you to our newest faculty member in the department of mathematics. He accepted his position and obtained housing without ever setting foot on the PUC campus since his interview was


Nathania, Nathaniel and Nathan Adu at Goat Rock Beach

scheduled right when the pandemic shut down both travel and our campus last spring. Nathaniel's story coming to PUC, sight unseen, makes us think of the story of Abraham who packed up his family and his things to go to a new land that God would show him and we expect many blessings will result. Please enjoy getting to know Nathaniel better.

Nathaniel Adu

I grew up as a farmer in Ghana, West Africa. Even while obtaining my degree at the University of Ghana Legon, you could find me out on the field tending to my sheep, chickens, and various other livestock and crops during my studies. After graduating from the university, I moved to Abuja, Nigeria where I obtained my Postgraduate Diploma in mathematics.

Amor (left) and Opi (right)

I always knew I wanted to obtain a Ph.D. in mathematics and was blessed to receive the opportunity to immigrate to America in 2012 to fulfill this dream. I first studied at the University of North Florida in Jacksonville, FL. While in Jacksonville, I met my beautiful wife Nathania who came to pursue her Bachelor of Science degree in nursing at the same university. After graduation, we moved to Orlando, FL, where I completed my Ph.D. in mathematics at the University of Central Florida in 2019 and she completed her Master's in nursing.

Nathania and I welcomed our son Nathan in September and now my days are filled with diaper changes, sleepless nights, and other joys of parenthood. Of course, our family would not be complete without our two amazing cats, Opi and Amor, who we love very much.

Updates

Stefan Sremac:

I was invited to present at the SIAM Conference on Optimization scheduled to take place in May in Hong Kong. Sadly, I was not able to go since the conference was postponed due to the COVID pandemic. Presently, it is set to take place in Spokane, Washington in July of 2021. Certainly less exciting than Hong Kong, but more affordable.

This summer has been both productive and relaxing for me.

On the relaxing side, I was able to spend two months travelling up to Canada with my wife, Jodi, and our children, Jerra and Malachi. We visited our families and friends, and a lot of beautiful scenery.

The Sremac family hiking near Banff

On the productive side, I got my work visa renewed, so that I can continue to be at PUC!

Also, I submitted a paper for publication back in June. The paper is titled "Error Bounds and Singularity Degree in Semidefinite Programming." A semidefinite program (SDP) is an optimization problem where the variables are positive semidefinite matrices. The best known algorithms designed to solve SDPs can sometimes provide a "solution" that appears accurate, but in reality it is nowhere near the set of actual solutions. Not only is the "solution" poor, but there is no way of knowing that it is poor without having knowledge of the actual solution set. Of course, such knowledge cannot be expected in practice. In the paper, my coauthors and I introduce several methods to detect this type of unfavorable scenario. Moreover, we make a theoretical connection between such SDPs and singularity degree, a measure used for classifying SDPs. This measure had been thought to be a proxy for how hard an SDP is to solve and we proved a theorem that gives credence to this notion. Recently, I was invited to present this research at the Joint Mathematics Meeting in January 2021.

An interesting application of SDPs arose early in the summer when we were trying to create socially distanced classrooms. Lecture Hall 1 in Chan Shun Hall has fixed desks setup somewhat irregularly. Finding a seating arrangement that

Lecture Hall 1 in Chan Shun Hall

maximizes the number of students in the lecture hall, while ensuring that all students are seated at least 6 feet away from each other, proved to be a challenge. It turns out that this problem is readily modelled as an SDP. Each desk is assigned a variable that is binary: 1 indicates that the desk is included in the arrangement, 0 indicates that it is not. The objective is to maximize the sum of the variables, i.e., the number of seats in the arrangement, while ensuring that the product of any variables representing desks that are closer than 6 feet apart is 0. This is equivalent to saying that those two desks cannot both be in the arrangement. In general, binary optimization problems are quite hard. In this particular case, the binary problem could be approximated by an SDP and we were able to find an arrangement that would accommodate considerably more students than was initially thought possible.

Richard Rockwell:
Last year we intended to share an update from Emeritus Professor, Richard Rockwell, but somehow his update was mistakenly omitted from our third issue. We now share his update from last year, along with a current update.

After 43 years of math teaching at PUC I officially retired in 2012. I then taught part-time at PUC for the next three years and part-time at PUC Prep for the following three years. My loving, sweet wife Joan passed away on Thanksgiving day 2018 after struggling with Alzheimers for several years. Last school year I did some math/stat tutoring for PUC and some volunteering in an Alzheimer's support group.

Joan and Richard Rockwell 2013

In the crazy year 2020 our house of 46 years burned down in the Glass Fire. Fortunately I'm able to stay with relatives in Angels Camp. We all have hard times sooner or later but no complaints from me. I'm truly grateful for the many blessings in my life.

Rockwell home after the Glass Fire

We have been grateful for Richard's continued contributions to our mathematics department through his tutoring, especially his support of our students in statistical methods.

We regret that this update for Richard has to include so much sad news but we are inspired by his ability to see the blessings amidst the trials. If you want to reach out, Professor Emeritus of Mathematics, Richard Rockwell, can be reached by email at rrockwell@gmail.com.

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Please consider giving to the departments of mathematics & physics to help us continue to educate the next generation of PUC students.

DEPARTMENTS OF MATHEMATICS & PHYSICS

NEWSLETTER

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