



# Mathematical Matters

The Newsletter of the Pacific Northwest Section of the MAA  
Spring 2017

## Summer Meeting of the PNW MAA Section

Gonzaga University, June 16-18, 2017

The Summer meeting of the PNW MAA Section will be held at Gonzaga University in Spokane, WA from June 16-18, 2017. The PNW Project NExT meeting will be on Friday, June 16th, followed by mini-courses Friday afternoon from 3:00-5:30. Mini-course 1 entitled, "Mathematica, an Interactive Experience," will be conducted by Eric Shulz of Walla Walla Community College. The second mini-course entitled, "Inquiry Based Learning," will be conducted by Stan Yoshinobu of California State Polytechnic University. The main conference sessions and speakers will be on Saturday and Sunday, June 17-18.

The invited speakers are MAA President Deanna Haunsperger of Carleton College, Computational Neuroscientist John Milton of Claremont McKenna College, and Academy of Inquiry Based Learning Director Stan Yoshinobu. We offer special sessions in Algebra and Topology, Applied Mathematics, Discrete Mathematics (Combinatorics and Graph Theory), Ordinary Differential Equations, Partial Differential Equations,



Spokane, Washington, Photo by Matt Gollnick

Mathematical Teaching and Pedagogy, Student Talks, and General Contributed Papers. We will also offer panel discussions, activities for students, and a special interactive workshop on delayed differential equations, conducted by John Milton and Rick Cangelosi (Gonzaga University).

Registration and abstract submission is now open. Please see our webpage at <http://www.gonzaga.edu/Academics/Colleges-and-Schools/College-of-Arts-and-Sciences/Majors-Programs/Mathematics/PNW-MAA-2017.asp> for details. Early registration and abstract submission are available until May 15th. This year, we are implementing a 3-tiered registration fee system to encourage early continued on pg. 2

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### **Meeting, continued from pg. 1.**

registration. Rates increase by \$15 on May 15th and again by \$15 for on-site registration June 16-18.

Gonzaga University is located near downtown Spokane, along the Centennial Trail. We have reserved rooms in campus dorms and local hotels within walking distance of campus. See our website for lodging options. We are also home to the Ale Trail and the Cork District. Spokane offers lots of hiking, biking, running, large parks, lakes, and numerous outdoor activities. Come enjoy Riverfront Park, Mount Spokane State Park, and Riverside State Park while you are here. See <https://www.visitspokane.com/> for more information.

Mark your calendars, the 2018 Meeting of the PNW section of the MAA will be held at Seattle University April 20-22, 2018.

## **PNW Project NExT**

Application deadline for 2017 PNW NExT Fellows is April 17, 2017. If you are a new faculty member in the PNW, please apply. If you are not new to the profession, please encourage your new colleagues to apply! More information on the program, eligibility requirements and applications can be found on-line: <http://sections.maa.org/pnw/next/>.

The PNW Section NExT is a professional development program for new college-level faculty in the Pacific Northwest interested in “improving the teaching and learning of undergraduate mathematics.” PNW NExT is an extension of the MAA-sponsored national organization, Project NExT, to the section level. PNW NExT Fellows meet once a year prior to the MAA PNW Section meeting to discuss topics related to all aspects of an academic career: improving the teaching and learning of mathematics, engaging in research and scholarship, finding exciting and interesting service opportunities, and participating in professional activities. During the year, PNW NExT members communicate via an electronic discussion group.

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## **Future PNW MAA Section Meetings**

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<p><b>2017 Linfield College, April 8 (NUMS only)</b></p> <p><b>2017 Gonzaga University, June 16 - 18</b></p> <p><b>2018 Seattle University, April 20 - 22</b></p> <p><b>2019 Lewis and Clark College</b></p> <p><b>2020 University of Alaska Anchorage</b></p> <p><b>2021 Western Washington University (tentative)</b></p>
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# News from the Governor

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**By Jennifer Nordstrom**

Greetings from your PNW Section Governor!

One of my roles as your governor is to serve as a connection between our section and the national MAA. I recently attended the Joint Mathematics Meetings in Atlanta. One of the biggest pieces of news from the MAA was that the new bylaws were passed. The leadership structure changed: the Executive Committee has been replaced by a Board of Directors, and the Board of Governors has been replaced by a new Congress. This means I am no longer the Pacific Northwest Section Governor. Instead I am the PNW Representative to the Congress! January was the last meeting of the Board of Governors. The meeting at MathFest will be our first meeting as a Congress. As the PNW representative, I will still have a primary role facilitating communication between the national MAA and our section, but I can now take a more active role representing the concerns and needs of our section. You can read more about the changes at <http://www.maa.org/about-maa/governance/maa-members-approve-important-updates-to-association-bylaws-and-articles-of-incorporation>.

I would like to encourage you to make sure your department is participating in the new MAA Departmental Membership. Not only does this include a full membership for one departmental member, it includes an unlimited number of student memberships!

I have enjoyed serving on a national MAA committee, and would like to encourage other



members to think about serving on a national committee. We currently have about 33 section members on national committees. I would love to significantly increase our participation. It is a great way to broaden your connection with the mathematical community and help with the mission of the MAA. There are many different committees and subcommittees, see <http://www.maa.org/about-maa/governance/council-and-committees-list>. If you are interested in serving on a committee or subcommittee, please contact me and let me know some possible interests. You can also self-nominate at <https://www.surveymonkey.com/r/PDXSSQL>.

I hope to see many of you at NUMS at Linfield College in April and the PNW Section Meeting at Gonzaga University in June. I also hope to see our section well represented at the next MAA MathFest in Chicago, July 26-29!



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## PNW MAA Distinguished Teaching Award

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By Stuart Boersma

I am pleased to announce that Aaron Montgomery is this year's recipient of the PNW-MAA's Distinguished Teaching Award. Aaron has been teaching at Central Washington University for nearly 17 years and during that time has demonstrated over and over again his commitment to teaching and student learning. A former student of Aaron's recently wrote: "The [Mathematics] department was represented by a wealth of talent and Aaron certainly stood out as one of the best with respect to his devotion to teaching and exploring ways to support students." In addition to teaching mathematics courses, Aaron has also taught several courses in Computer Science as well as a variety of courses for the Douglas Honors College (DHC), including "Games and Politics" which combines materials in philosophy, psychology, economics, and political science with game theory. In 2011 the director of the DHC wrote: "The [DHC curriculum] committee was impressed by the interdisciplinary nature of the courses and Aaron's pedagogical strategies...Aaron's courses employ quantitative and experimental techniques to understand social groups and institutions."

In addition to his outstanding teaching on CWU's campus, Aaron has made meaningful contributions to the improvement of undergraduate mathematics education across the country – most notably on two projects: Quantway II and a STEM-Prep Pathway titled "Reasoning with Functions". Quantway II is a college level quantitative reasoning course designed by the Carnegie Foundation for the Advancement of Teaching. Aaron was a member of the authoring team for this innovative curriculum. His leadership position with SIGMAA-QL together with scholarly contributions in this area allowed him to write engaging curriculum for this project. The Quantway II project has been very well received and is being taught in over 15



institutions across the country. Additionally, in 2015 Aaron served as an author for the Reasoning with Functions curriculum, a project that is led by the Charles A. Dana Center at the University of Texas at Austin. Again, Aaron was a member of the authoring team which created curricular materials for this year-long sequence of courses. Aaron was one of the more prolific authors and was responsible for writing 27 lessons.

Aaron's influence beyond his own institution is also evidenced by his participation in the writing of a Quantitative Literacy (QL) assessment instrument. Aaron was Co- PI on an NSF funded project to develop a valid and reliable tool to assess undergraduate students' quantitative reasoning abilities. The instrument developed is now being used at over 100 institutions of higher education across the US.

Aaron Montgomery has shown extraordinary success as a teacher. He has fostered curiosity and excitement in his students and is widely recognized as an outstanding teacher here at CWU. Great teachers can be measured by the impact they have in the classroom, across their university's campus, and within their profession. Aaron is such a teacher and it is great to see him recognized with this year's Distinguished Teaching Award.

# Outreach in the PNW

By Kelly McKinnie, editor

Throughout the Pacific Northwest, many of our colleagues organize and participate in outreach activities which benefit not only their communities at large, but also the Universities in which they are held or originate. In this edition of Mathematical Matters, we asked for contributions of outreach activities to highlight and received many. Way to go, PNW outreach!

If you are interested in joining a network of math outreach in the Pacific Northwest consider joining the Pacific Northwest Mathematical Outreach Web (Math-POW) organized by Brandy Weigers at Central Washington University:

brandy.wiegers@cwu.edu,  
<http://www.cwu.edu/math/MathPOW>

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## Math in a Bubble - Central Washington University Goes Out and Presents in the Real World Brandy Weigers

On a windy Tuesday evening in July, all sorts of people, young and old, gathered at Cornerstone Pie in Ellensburg WA to have fun and learn about the mathematics of bubbles. Under the leadership of Dr. Linhart, Dr. Bisgard and Dr. Weigers of the Central Washington University Mathematics Department, the participants learned about the importance of mathematical problem solving, patterns, and general inquiry. By tying together mathematical thinking to bubbles we were able to discuss the idea of shortest distance and introduce even the youngest attendees to minimal surfaces with nary a mention of equations, epsilons, or deltas. After a brief introduction to mathematical problem solving,



audience members had the opportunity to craft their own bubble wands (from pipe cleaners

and straws). Next, they had to guess what shape their bubbles would take.

Finally, the bubble dipping craziness began with children and adults both entranced by the results. By going from table to table with different demonstrations, we

engaged the participants more deeply by discussing square bubbles, the angle between different bubbles, and much more. We had so much fun and so did our participants - many of them left asking for more opportunities to do math in the future. We wanted to share this event with the PNW MAA because it was so much fun and we learned so much including our favorite bubble solution (from [soapbubble.wikia.com](http://soapbubble.wikia.com)):

- 1 gallon of warm water
- 1 cup dishwashing liquid (Dawn Pro is recommended)
- 1 teaspoon guar gum in a slurry with 91% Isopropyl Alcohol
- Mix and enjoy

Some dipping tips (from [zometool.com](http://zometool.com) and [soapbubble.wikia.com](http://soapbubble.wikia.com))

- Get rid of excess bubble foam
- Humid, still days are best
- Use a wet finger or straw to “re-arrange” your bubble, make it bigger, or add a second bubble to your bubble wand.

This event was first representation of mathematics at the monthly public science outreach event series, “Science in a Pint” hosted by the Center for Excellence in Science and Mathematics Education (CESME).  
<http://www.cwu.edu/cesme/>



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## Math PLUS, a Mentoring Program at Linfield College Jennifer Nordstrom

Over the years I have judged several science fairs, from the local public school fair to the INTEL Northwest **continued on pg. 6**



## Outreach, pg. 5

Science Expo. I have always been disappointed by both the quality and quantity of mathematics projects, especially when compared to other science and technology categories. At the same time, I recognized that top projects in any category often meant that the students had access to both mentoring and science facilities. As mathematician at a local college, I felt I was in a position to provide both for kids at the local middle school. Many Linfield students participate in undergraduate research projects, but I felt it would add a new dimension to their experience to be able to have them mentor others. We also have many students who plan to pursue a career in education. Many of these students do not see a role for research in the secondary school classroom. All of these factors led to my



mentoring program.

The Math PLUS (Projects with Linfield Undergraduate Students) program pairs mathematically talented middle school students with undergraduate mentors to work on mathematically-based science fair projects. The program is concluding its second year and is funded primarily by an MAA Dolciani Mathematics Enrichment Grant. Each year has had approximately six middle school students and six mentors. The program begins with a one-day workshop at Linfield College in which the mentors present a variety of project ideas for the middle school students to think about. There is an interactive math talk and time for the students to brainstorm specific ideas for their projects. After the workshop, each student is paired with a mentor. We have regular meetings at Linfield once a month in the fall, and each week in January where the pairs work together on their projects.

The projects have covered a wide variety of mathematics. One student looked at the limit of the ratios of consecutive terms in the Fibonacci sequence, as well as sequences with different

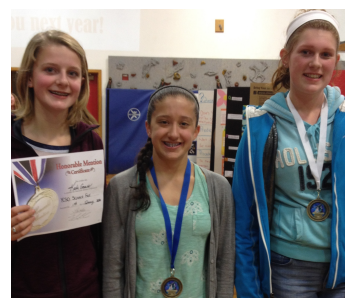
initial conditions.

Another student looked at symmetry patterns in Julia sets.

A couple students have incorporated statistics as a major component of their projects.

Another student studied tricolorability of certain classes of knots. All of these students learned college-level mathematics as well as the nature of mathematical proof or statistical confidence.

Even after only two years, I would say the program has been a success. The local middle school science fair is now a STEM fair and actively encourages students to do technology and math projects alongside the usual science fair projects. Math PLUS projects have received awards all the way to the state level. Middle school students are getting a taste of college and college-level mathematics. Undergraduates are learning how to incorporate independent projects in a secondary school classroom, as well as how to mentor research. Overall, I think the program is easy to start and maintain and provides both local middle school students and undergraduate students with a formative mathematical experience.



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### Western Oregon University Mathematics Department

Each year the WOU Mathematics Department teams up with the local elementary schools from Central School District for the Math Buddy Program. The elementary school children complete math problems and write letters to our WOU students, who score the math problems with the state scoring guide and write letters back. Each term the program culminates in a Math Buddy Fair, where the elementary students come to WOU campus to meet their buddies and participate in fun math games.

Finally, the WOU Mathematics Department sponsored its 12th annual Sonia Kovalevsky

## Outreach, pg. 6

Day in February 2016, with over 100 high school girls in attendance.

### Washington State University Mathematics Department

Faculty member Mindy Morgan serves as coach of the local middle school math team. With over 25 members on the math team, Mindy often relies on the volunteer efforts of members of WSU's Math Club. The middle school math team has participated in competitions such as Math is Cool, MATHCOUNTS, and Math Olympiads for Elementary and Middle Schools. Statistics faculty member Dean Johnson organizes an annual statistics poster competition for 4th and 5th grade students at

Jefferson Elementary School in Pullman, Washington. Students demonstrate the basics of collecting, summarizing, and analyzing data to address questions of their interest. Faculty in the department serve as judges, and prizes are provided by the department as well as local businesses. The winning poster is sent to the National American Statistical Association poster contest.

Faculty member Kimberly Vincent, together with the Pre-Teachers of Math Club, and the Math Club, organize a bi-weekly Math Circle during the academic year, held on the campus of WSU. Students from local elementary and middle schools participate in mathematical challenges beyond the usual school curriculum.



### KRYPTOS7: A Series of Cryptanalysis Challenges April 13 – 17,

By Stuart Boersma , Central Washington  
University  
and Cheryl Beaver, Western Oregon University

2017 KRYPTOS7 is a contest open to undergraduate students. The theme of the contest is centered around the breaking, or cryptanalysis, of ciphers (secret writing). Each challenge presents contestants with a brief scenario together with some ciphertext (encoded message). The goal is to discover the original plaintext message! Clues to help break the cipher may be contained in the actual ciphertext or in the details of the accompanying scenario. Participants will need internet access during the contest but can otherwise work from wherever they happen to be. While it is not the intent of this contest to test overly technical aspects of cryptanalysis or advanced mathematical algorithms, some

familiarity with basic codemaking and codebreaking is certainly helpful. Some useful sources include:

- Challenges from previous contests.
- The American Cryptogram Association.
- Wikipedia entries for Cryptography and Cryptanalysis
- The Code Book by Simon Singh.
- Secret History: The Story of Cryptology by Craig Bauer
- Codes and Ciphers by R.F. Churchhouse
- Codes, Ciphers and Secret Writing by Martin Gardner

We had over 200 students participate last year and many have been clamoring for more! Please announce this contest to your students! Cool prizes are sent out to first and second place winners! Visit:  
<http://www.cwu.edu/math/kryptos/> for more information -- including instructions on registering students for the contest.

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## NUMS Conference, April 2017

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By Xiaoyue Luo, Assoc. Prof of Math,  
Linfield College

You can register for the conference here:  
<http://www.linfield.edu/nums.html>

We are excited to announce that the 2017 NUMS will be on held on Saturday, April 8, 2017 at Linfield College in McMinnville, Oregon. NUMS is a regional mathematics conference providing a venue for undergraduate students to present mathematical research. Students will have opportunities to present their research by giving 15 minutes talks. In addition, this conference will feature a keynote talk from Professor John Caughman (Portland State University) and some fun mathematical games and activities for students. Registration is free and lunch will be provided for all participants who registered online.

The deadline for abstract submission is March 17 and the deadline for online registration is March 31.

We are looking forward to seeing you at Linfield!



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## News and Notes from the PNW MAA section

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### Oregon

#### Western Oregon Univesity

The Western Oregon University welcomes two new hires.

**Ander Erickson** joins the department as a new tenure-track assistant professor. Ander earned his Ph.D. in Educational Studies (Mathematics Education) from the University of Michigan in 2015. Ander studies the introduction of information-literacy instruction into mathematics classrooms. This includes analyzing the features of classroom tasks that help students engage productively with expert communities, the role of mathematics in these tasks, and how teachers facilitate the development of a critical stance towards quantitative claims.

**Brenda Bradley** joins us as an instructor; Brenda has a Bachelor's in Mathematics from UC Santa Barbara, and a Master's in Teaching from WOU. She taught developmental math at

Chemeketa Community College for 6 years, and at Portland Community College for two terms before coming to WOU. At Chemeketa, she helped restart the independent study lab at the Yamhill Valley campus, and at PCC she helped create the Math 20 Supplemental Activity Packet to be offered through the Open Resource Library.

**Tim Brown** also joins us as an instructor; Tim received his MA in Mathematics from the University of Alabama-Huntsville and after working for a number of years as a forensic accountant and a day trader, Tim most recently was an adjunct faculty member at the University of New Mexico-Los Lunas, and at Carrington College and at Brown-Mackie College, in Albuquerque, New Mexico.

**Cheryl Beaver** earned the Mario and Alma Pastega Award for Excellence in Teaching for 2015-16. This prestigious award is given to one faculty member at WOU each year.

**Matthew Nabity** was the January 2016 Pacific



## News and Notes, pg. 8

Affiliate of College and University Residence Halls (PACURH) Campus OTM (Of the Month) Winner in the category of Institution Faculty/Staff and he was the January 2016 PACURH Regional Winner in the same category. **Matt Ciancetta's** article Revisiting Geoboard Squares: Going Off The Pegs was chosen as the Editorial Panel's volume-year favorite article for NCTM's journal Mathematics Teaching in the Middle School.

In student news, **Sally Peck, Kaylee Church, Svetlana Dyachenko, Amanda Evola, Mackenzie Koll, Jasmine Quang and Kathryn Wilson** were inducted into the (WOU) Oregon Delta chapter of Pi Mu Epsilon, and **Brittany Johnson** won the Charlie Dolezal Mathematics Scholarship.

## Washington

### Pacific Luthern University

"On Polyominoes and Digital Cameras" by alumnus Robert Rydberg and Ksenija Simic-Muller is scheduled to appear in Mathematics Magazine, with a tentative date of June 2017. Ksenija Simic-Muller also did summer research with two undergraduate students (Justin Bryant and Alex Robkin). They proved a number of results about knots embedded on Lorentz like templates. In particular, they classified the knot types given some simple classes of Lyndon words.

Tom Edgar worked as a co-mentor with Steve Klee (at Seattle University) as part of the SUMMER REU. They oversaw seven students split into two teams: one focused on digital patterns associated with binomial coefficients and the others studied combinatorics associated to rational base representations of integers.

### Washington State University

The Department of Mathematics and Statistics at Washington State University will be hosting the Spring Western Sectional Meeting of the American Mathematical Society on April 22 and 23, 2017, on the campus at Pullman, WA. Over three hundred mathematicians are expected to attend.

On April 21, participants from universities, industry, and government labs will attend the 2017 Data Sciences Day on the WSU campus. This will feature a day of short talks and workshops devoted to challenging data analysis problems.

Professor Jean Taylor of Rutgers University, and visiting faculty member at the Courant Institute of New York University, will deliver the Thirty-Sixth Ostrom Lecture on April 19. She will give a public lecture entitled "Everything you always wanted to know about soap bubbles". She will give a colloquium in the department the following day.