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SPRING 2016 NEWSLETTER

Section Website   http://sections.maa.org/rockymt

Spring 2016 Newsletter in PDF Format for Printing

Click on the following link for PDF document that is formatted for printing.

http://sections.maa.org/rockymt/newsletters/spring2016news.pdf

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2015 - 2016 Section Officers and Committee Members
Section Website   http://sections.maa.org/rockymt

Section Executive Committee Officers for 2015 – 2016

Chair Elect	Mike Jacobson University of Colorado Denver Denver, CO 80217	michael.jacobson@ucdenver.edu 303-315-1708
Chair	Kyle Riley South Dakota School of Mines and Technology Rapid City, SD 57701	kyle.riley@sdsmt.edu 605-394-2471
Vice-Chair	Erica Hastert Early College of Arvada	ehastert@ecarvada.org 720-858-2334
Secretary/ Treasurer	Heidi Keck Western State Colorado University Gunnison, CO 81231	hkeck@western.edu 970-943-3167
Governor	Bill Emerson Metropolitan State University of Denver Denver, CO 80217	emersonb@msudenver.edu 303-556-3930
Program	Tracii Friedman Cathy Bonan-Hamada Colorado Mesa University Grand Junction, CO	tfriedma@coloradomesa.edu 970-248-1667 cbonan@coloradomesa.edu 970-248-1838

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Other Committee Members and Representatives

Section Nominating Committee

Gus Greivel (Chair), Colorado School of Mines	ggreivel@mines.edu
Mike Brilleslyper, USAFA	mike.brilleslyper@usafa.edu
Mary Pilgrim, Colorado State University	pilgrim@math.colostate.edu

Awards Selection Committee

Mike Jacobson, (Chair), UCD	michael.jacobson@ucdenver.edu
Erica Hastert, Early College of Arvada	ehastert@ecarvada.org
Janet Barnett, CSU-Pueblo	janet.barnett@csupueblo.edu
Carl Leinert, Fort Lewis	lienert_c@fortlewis.edu

Section Student Activity Coordinator

Carl Lienert, Fort Lewis College	lienert_c@fortlewis.edu
Beth Schaubroeck, USAFA	beth.schaubroeck@usafa.edu

Higher Education Representative on CCTM Governing Board

Mary Pilgrim, Colorado State University	pilgrim@math.colostate.edu

Section Book Sales Coordinator

Janet Heine Barnett, CSU - Pueblo	janet.barnett@csupueblo.edu

Section NExT Committee

       Diane Davis (Co-Chair), MSU Denver   ddavi102@msudenver.edu
       Bob Cohen (Co-Chair), WSCU   rcohen@western.edu
       Kim Fix, WSCU   kfix@western.edu

Public Information Officer and Section Liaison Coordinator

       Heidi Keck, Western State Colorado University   hkeck@western.edu

Website Editors

       George Heine   gheine@mathnmaps.com
       Janet Heine Barnett, CSU - Pueblo   janet.barnett@csupueblo.edu

Newsletter Editor

       Linda Sundbye   sundbyel@msudenver.edu
       Metropolitan State University of Denver   303-556-8437
       Department of Mathematical and Computer Sciences
       P. O. Box 173362, Campus Box 38   FAX: 303-556-5381
       Denver, CO 80217-3362

2017 Distinguished Teaching Award Call for Nominations

Each year, the section recognizes one outstanding teacher of collegiate mathematics with an award named in honor of Burton W. Jones, a lifelong advocate of excellence in teaching at all levels. In addition to an honorarium, a certificate and an invitation to deliver the opening lecture at the next Section Meeting, the recipient is eligible to be the section's nominee for the Deborah and Franklin Haimo Awards for Distinguished College or University Teaching of Mathematics. These national awardees (at most three) are honored at the MAA winter meeting with a certificate and $1000 check. All nominators also receive a certificate of in recognition of their efforts to support the section mission of promoting excellence in teaching; nominators and nominees both receive free meeting registration at the next section meeting. To begin the nomination process for an outstanding teacher that you know, simply submit the **one-page nomination form** (available at our website: http://sections.maa.org/rockymt and in this newsletter) by **15 December 2016**. **Complete nomination materials** (described on the website) are due **15 January 2017**.

Chair's Report

Greetings Section Members!

It is amazing how time flies, but I just realized that this next section meeting will be my last meeting as section chair. It turns out that two years is not a lot of time and I can only hope I left things in good enough shape for **Michael Jacobson** to take the wheel and lead our section to the centennial meeting for our section in Pueblo for 2017. In this newsletter you will find the results from the survey we conducted this past fall. There were many useful nuggets of information that we gathered from the survey and I would like to thank everyone that took the time to complete the survey. The survey did lead to one strong conclusion; our section could really use a strategic planning retreat. There are several issues that we need to sort out:

1. How do we attract more people to the section meetings?

2. Should we move the section meetings to October?

3. Can we sustain a Section NExT or should we have a more general Professional Development program that includes a more diverse audience?

4. The Pikes Peak Regional Undergraduate Mathematics Conference (PPRUMC) has lost one of their major sources of funding. The section has regularly contributed to support the conference, but should our role increase? The PPRUMC organizers have asked the section to be more involved in terms of being the nonprofit that handle the management for many of the donations that can be raised to support the conference. The executive committee has agreed to a stronger supporting role for this year, but a long term commitment is something the section should talk about.

5. Is it time to separate the duties of secretary and treasurer? The secretary/ treasurer has been a combined role, but if the section were to increase our role in supporting PPRUMC then the treasurer duty would become much more complicated.

At our next section meeting, I plan to hold an open strategic planning session where anyone from the section can attend. We plan to drop the traditional chairs luncheon on Friday (**April 8**) and replace the event with the strategic planning session. The session will be **11 a.m. – 12:30 p.m.** (location to be announced at a later date) and I hope we can use the time to discuss these larger issues. Everyone from the section is invited to the strategic planning session.

I am very excited about the next section meeting and I have special thanks for **Tracii Friedman**, and her team at Colorado Mesa University, for all their hard work in organizing this meeting. Please remember that this is a joint meeting with the Intermountain Section and anyone that has ever planned one of our section meetings would have to respect the extra effort it takes to make two sections happy instead of just one. The meeting will be in Grand Junction and is scheduled for April 8-9. I also want to make sure everyone is getting excited about our section centennial meeting that will be at CSU-Pueblo, April 21-22, 2017.

I would like to thank everyone that I have had the pleasure to work with as Section Chair. **Michael Jacobson**, Chair-Elect, is going to make

a great Section Chair. **Erica Hastert** has been our rock for Vice-Chair and **Bill Emerson** has been a great Governor. I have enjoyed working with **George Heine** as our Web Page Editor and of course **Janet Heine Barnett** has always been great to work with in promoting the section and book sales. I have always marveled at the work of **Linda Sundbye** as our Newsletter Editor and her ability to produce such a great product every time while dealing with contributors that are late with their reports and cleaning up their articles to make them presentable for the public. I also appreciate the efforts of **Beth Schaubroeck** and **Carl Lienert** as student activity coordinators. My biggest thanks goes to **Heidi Keck** as the heart and soul of the section. Our section has always been very lucky with recruiting fantastic people for Secretary/Treasurer. Heidi has been great to work with and everyone in the section should take the opportunity to thank her for all the work she does for our section. You will still be stuck with me for another year as Past-Chair, but it has truly been my honor to serve the section. Thank you to everyone that has helped me navigate the work that needed to be done and I look forward to seeing you in Grand Junction.

Kyle Riley, SDSMT
Chair, Rocky Mountain Section

Governor's Report

At the January 2016 the Board of Governors approved a change in the Governance Structure of the Mathematical Association of America creating a Board of Directors and an Assembly. The new Board of Directors will consist of 9 members, including:

- President, 4-year term: one as president-elect, two as president and one as past president
- President Elect or Past President
- Vice President, 2-year term, nationally elected
- Chair of the Assembly, 2-year term; elected by the Assembly from its members
- Secretary, 4-year term; at most two terms
- Chair of the Committee on Sections, 3-year term; at most two terms; elected by the Assembly
- Director at Large, elected by the Assembly from its members for a 2-year term

The responsibilities of the Board of Directors include the following:

- Review and approve budget, manage assets, set dues and benefits of membership, fees
  a) Determine categories and privileges (including voting rights of membership),
  b) Establish member dues
- Strategic Planning (determine strategic objectives of organization as well as the principles of action to achieve them)
- Executive Oversight (hiring and evaluating key professional staff, ED CFO)
  a) Debate and approve new MAA policies and changes to existing policies,
  b) Consider proposals for Section bylaws changes
  c) Debate and approve changes to MAA bylaws in advance of action by the general membership
  d) Oversee MAA publications
  e) Oversee MAA prizes and awards
  f) Elect new MAA members upon written application from an individual or organization
- Select Secretary, Associate Secretary, Treasurer, (search committee, applications, Board approves the recommendation and conditions of reappointment)
- The Board of Directors must have input from the Assembly before adding or dropping a program or project.
- Select and appoint chairs of councils for 4-year terms with at most one term.

The Assembly will consist of 29 Section Representatives with 3-year terms, 7 council chairs selected by the Board of Directors for 4-year terms with at most one term, all members of the Board of Directors and 3-6 members at large determinedly undetected by the Assembly.

The responsibilities of the Assembly include the following:

- Serves as a conduit of communication
- Advises the Board on strategic goals
- Elects Chair of the Committee on Sections
- Elects at-large Assembly members
- Elects one of its members as an at-large member of the Board of Directors
- Recommends programmatic and social policies for MAA
- Meets at least once each calendar year at a national MAA meeting.

During the coming year new Bylaws will be written and approved by the Board of Governors

before being submitted to the national membership for approval.

Bill Emerson, MSU Denver
Governor, Rocky Mountain Section

21st Annual Colorado Mathematics Awards Ceremony/Reception

Plans are in the works for CMA XXI -- the 21st Colorado Mathematics Awards Ceremony and Reception to be held on Tuesday, May 17 at the Grant - Humphreys Mansion in Denver. At the school level we'll be recognizing the top ten participants on MATHCOUNTS, the AMC 8, 10, and 12 contests, and the outstanding members of the Colorado American Regions Mathematics League team. At the collegiate level we'll be recognizing all Section Putnam scorers in the top 500, and the top team(s) on the Mathematical Contest in Modeling. We expect to recognize between 50 and 60 winners. With the winners, parents, and teachers, we expect between 120 and 130 to attend the event.

We appreciate the support that the Rocky Mountain Section has provided for this event over the years.

Other sponsors of the Colorado Mathematics Awards are the American Mathematics Competitions, CH2MHill, the Professional Engineers of Colorado, and individual and past members of the Colorado Mathematics Awards Steering Committee.

Suggestions for additional sources of funding are always welcomed. Please contact me at gibbs_d@fortlewis.edu

Dick Gibbs
Co-Chair, Colorado Mathematics Awards Steering Committee
Emeritus Professor of Mathematics
Fort Lewis College

13th Annual PPRUMC Colorado State University – Pueblo Saturday, February 27, 2016

CSU-Pueblo is excited to again be hosting the PPRUMC this year, to be held Saturday, February 27. Please, share the word with your students, and begin to encourage likely speakers to submit a talk of their own.

Registration is now open via our conference website. Location and local hotel information is also available on the website.

We are also pleased to announce that our fund raising efforts for this year are going very well, and we will once more be able to offer the conference, including lunch, at no cost to participants.

However, because our primary funding source in the past (MAA's NSF-RUME grant) no longer exists, we will have very (very!) limited funding for travel reimbursement. Accordingly, if you can arrange for your school is able to provide travel funds for your students, please do (and please also let me know).

Please also send us your suggestions for prospective panelists. We hope that this year's panel, "*Beyond an Undergraduate Mathematics Degree*", will once again include both individuals who can speak about being a graduate student, and other who can speak about career opportunities available to those who choose not to pursue a graduate degree.

And we are looking forward to seeing you and your students in February!

PPRUMC 2016 Website:
http://sections.maa.org/rockymt/PPRUMC/pprumc2016.html

Janet Barnett
CSU-Pueblo

Those attending the Mathematical Association of America North Central Section's Biennial Summer Seminar will get a peek into the world of big data as it relates to various fields from both mathematical and statistical perspectives. Mathematician, **Peter Bubenik**, Associate Professor in the Department of Mathematics at the University of Florida (UF) and member of the UF Informatics Institute will be our invited speaker. Dr. Bubenik specializes in visualization of big data, using topology, a branch of mathematics which serves as a good tool for extracting global qualitative features from complicated geometric structures. Topological data analysis uses topological methods to summarize the "shape" of data. Its main tool, persistent homology provides a summary of how this shape changes with respect to changes of a parameter. For example, if the parameter is scaled, then persistent homology provides a multiscale descriptor of the data.

In addition to Dr. Bubenik's lectures, the seminar will include many workshops. Dr. Bubenik will give a hands-on tutorial on using topological data analysis (TDA). Participants will be able to take this tutorial back to their classrooms and/or be able to start using TDA in their research. Faculty members from South Dakota State University will also be leading workshops to demonstrate various statistical techniques used to analyze data in various fields such as biology, forensics, agriculture, finance, and education. We'll also hear from **Chet Wiermanski**, Global Chief Data Scientist for Transunion and Visiting Scholar for the Federal Reserve Bank, who will speak at the opening banquet, discussing challenges associated with handling vast volumes of real time, time series, metadata.

The Summer Seminar will take place June 22-24 on the campus of South Dakota State University, Brookings, SD. The opening banquet will be the evening of June 21st. Also, on June 21, there will be an optional one-day workshop on programming with R, for those new to the program. For those unable to attend the one-day workshop, materials will be provided for study prior to the summer seminar. For more information:

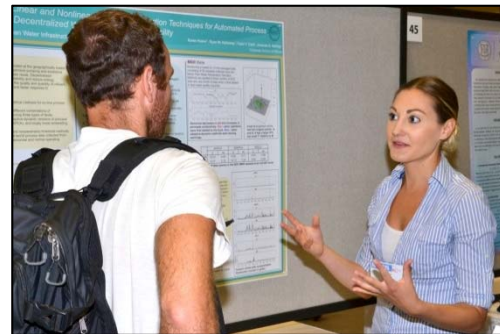http://www.sdstate.edu/mathstat/ncs-maa-summer-seminar-2016.cfm

Respectfully Submitted,
Kyle Riley, SDSMT
Chair, Rocky Mountain Section

Section News

Colorado School of Mines

GRADUATE STUDENT NEWS

Karen Kazor

Applied Mathematics and Statistics (AMS) PhD student **Karen Kazor**, advisee of **Amanda Hering**, was selected as a winner of the 2016 ENVR (the American Statistical Association's Section on Statistics and the Environment) Student Paper Competition for her paper, "The role of regimes in short-term wind speed forecasting at multiple wind farms." She will present her winning paper at the 2016 Joint Statistical Meetings (JSM) this August, in Chicago, Illinois.
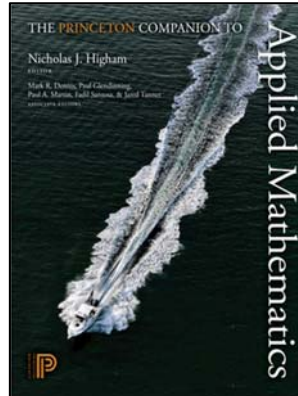
UNDERGRADUATE STUDENT NEWS

Left to Right: Bianca Verlangieri, Jessica Deters, Madison Kellar, Taylor Chott, Carrie Kralovec
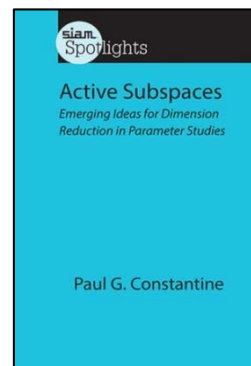
Five Mines students attended the Nebraska Conference for Undergraduate Women in Mathematics in January. The conference provided students an opportunity to learn about careers in mathematics, graduate school, and mathematics research, as well as an opportunity to meet their peers at institutions across the country. All five students participated in the poster session where they presented research from either an REU or a class at CSM.

The Society for Women in Mathematics (SWiM), a student organization at the Colorado School of Mines and an AWM chapter, hosted monthly speakers who shared their mathematical stories, how they used mathematics in their jobs, and any advice they had for the members. Additionally, SWiM sponsored a salary negotiation workshop, held a panel on summer REU and internship opportunities, participated in an elementary school math and science night, and held other social events. Faculty advisors are **Debra Carney**, **Rebecca Swanson**, and **Kelley Tatangelo**. Approximately 20 students and faculty attend the bi-monthly meetings. SWiM is generously supported by FAST Enterprises, a local software and information technology company and the Department of Applied Mathematics and Statistics. FAST has also recently endowed an annual scholarship, which is awarded to one SWiM member each year.

FALL 2015 STUDENT AWARDS

Kelsey Kalmbach

The Fall 2015 Outstanding Graduating Senior Award was presented to **Kelsey Kalmbach**.

PUBLICATIONS

AMS Professor **Paul Martin** is an associate editor of the recently published *The Princeton Companion to Applied Mathematics*. The book introduces readers to applied mathematics and its uses; explains key concepts; looks at research; and explores areas of application. The book also includes articles by **Willy Hereman** and **Paul Constantine**, faculty in the AMS department.

Paul Constantine, Ben L. Fryrear Assistant Professor, authored *Active Subspaces Emerging ideas for Dimension Reduction in Parameter Studies* describing techniques for discovering a model's active subspace and proposes methods for exploiting the reduced dimension to enable otherwise infeasible parameter studies.

STEM RESEARCH

The Office of Naval Research is awarding $542K over three years to a Mines effort to produce graduates with both technical knowledge and the ability to work well with others as leaders and followers as part of its Science, Technology, Engineering and Mathematics initiatives. Physics Teaching Professor **Pat Kohl** spearheaded the proposal, titled "Horizontal and Vertical Integration of 21st Century Skillsets: Leadership, Computation, and Open-ended Problem Solving at an Engineering University." His team includes fellow Physics faculty **Vince Kuo, Tim Ohno**, and **Mark Lusk**; Applied Mathematics and Statistics faculty **Gus Greivel** and **Scott Strong**; and **Leslie Light** of EPICS. The seven faculty members will work together to revise some of the introductory core courses that affect all students at Mines, along with upper division courses that feed into programs of direct interest to the Navy and civilian contractors: physics, nuclear engineering, mechanical engineering, and electrical engineering. The changes will revolve around three pillars -- leadership and group management skills; competence with software and computational tools; and confidence with hands-on diagnostics and problem-solving.

2016 Outstanding Philanthropic Partner Award

The award from the CSM Foundation recognizes outstanding commitment among faculty, staff and administrators for their efforts in building and creating relationships with Mines alumni and friends. **Willy Hereman**, Department Head and Professor of the AMS department, received the Award from the Mines Foundation for his involvement with the ongoing Sayers Fund, the yearly Ryan Sayers Memorial Award and Scholarship celebrations, Pi-mile run, Sayers Computing Laboratory, Michelle Vivona Fund, and AMS Honor Fund in memory of the late Carol Job (adjunct faculty).

Willy Hereman

South Dakota School of Mines & Technology

Our department saw six students compete in the Putnam this past December and were are eagerly awaiting the results along with the Mathematical Contest in Modeling where we had a team compete earlier in February. The big news we are celebrating is that Dr. **Kyle Caudle** and **Erica Daniels** won an award for their paper that was published in *Teaching Statistics*. The Peter Holmes Prize is dedicated to honor outstanding papers in this international journal and this paper came from Erica's senior research project that she presented at the section meeting a couple of years ago. We are so very proud of both Dr. Caudle and Ms. Daniels and hope 2016 contains more awards and honors for our faculty and students.

University of Colorado at Boulder

After 25 years as editor of our Alumni Newsletter, "*Prime Bits*," Professor Emeritus **Bill Jones** is stepping down from the role. The Department will continue reaching out to our Alumni, Friends, and Community with the annual publication of *Prime Bits*.

Dr. **Albert Bronstein** has been hired as an instructor in the Department. We are searching this spring for Instructors and a Director of Undergraduate Research:

See our advertisements on mathjobs.org

We ran a new special topics courses this spring: One on Quantum Computing (taught by Mines Professor **Mark Coffey**) and (with our Applied Math Department) one on Interest Theory (taught by Denver Actuary, **Lauren Aronson**.)

We are raising money for a Graduate Fellowship in honor of our beloved colleague **Richard Laver** who succumbed to Parkinson's disease in 2012. Please see https://giving.cu.edu/fund/richard-laver-graduate-fellowship

University of Colorado at Colorado Springs

Students from the UCCS Mathematics Department participated in the 2015 Putnam exam.

The Putnam exam is a mathematics competition open to undergraduate students in the United States and Canada. The exam has been given annually since 1938. It is held on the first Saturday of December. There are 12 questions, which are typically elementary but very challenging. It is not unusual for about half the test takers across North America to score zero. Any number of students may participate individually. Schools may also designate a team to compete in the team competition.

The UCCS participants were **Benjamin Griffith, Clark Mourning, Katrina Eidolon,** and **Shane Richmond**.

We wish them luck. The results should be available in March.

Rocky Mountain Section History

Section History information is now on the website!
Go to:
http://sections.maa.org/rockymt/history.html
and just click on one of the "HISTORY" links. This is still a work in progress! Anyone with historical documents, photos, or time and interest to work on section history is welcome to contact us at:
George Heine, gheine@mathnmaps.com
Janet Barnett, janet.barnett@csupueblo.edu

Mathematics Awareness Month: The Future of Prediction April 2016

Information on this year's Math Awareness Month will be available soon at:
http://www.mathaware.org

Colorado Council of Teachers of Mathematics (CCTM) News

The Colorado Council of Teachers of Mathematics (CCTM) continues to provide great opportunities for both pre- and in-service teachers! Here are some recent updates:

1. *Colorado Mathematics Teacher* was recently honored by NCTM with a 2016 Publication Award for outstanding newsletter! CCTM is very proud of this honor and the hard work that goes into the journal.
   Don't forget that the Colorado Mathematics Teacher (CMT) Journal is available to everyone
   (http://www.cctmath.org/cmtjournal/).
   If you are interested in submitting a paper, please see the articles published in this issue and feel free to contact the editor, **Sandie Gilliam**
   (sandie.gilliam@coloradocollege.edu).

2. Annual *Math on the "Planes"* conference presented by Colorado Council for Learning Disabilities will take place February 26-27, 2016. This conference is supported by supported by the Colorado Metro Math Intervention Team and CCTM.
   The theme is "*Creating a Classroom Environment that Supports Students Who Struggle with Learning Mathematics.*"
   Info for the conference can be found here:
   http://static1.squarespace.com/static/54f60b a7e4b0625e8c527330/t/56396549e4b0d7ad b676afd2/1446602057022/2016-Conf-Brochure.pdf

3. The NCTM Annual Meeting and Exposition will take place April 13-15, 2016 in San Francisco, CA. The theme is "*Building a Bridget to Student Success.*" This is a great opportunity for pre- and in-service teachers to learn about new ideas for the classroom, implementation of the Common Core State Standards for Mathematics, and best practices. The conference also provides opportunities for teachers to network and build collaborative, working relationships with other teachers.
   Registration information can be found here: http://www.nctm.org/annualreg/
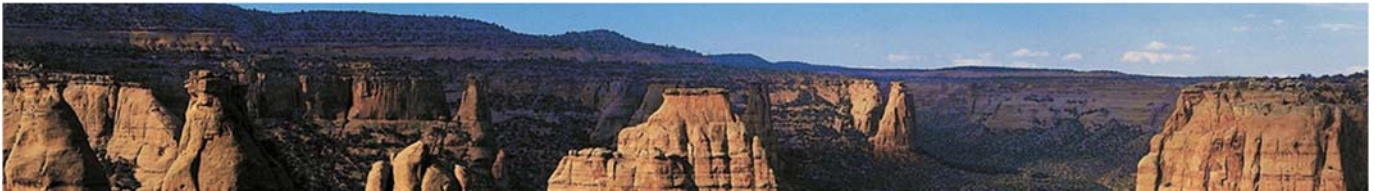
4. NCTM Regional Conferences: NCTM will be holding regional conferences in October and November 2016. Information on these conferences, including registration and proposal submission, go here: http://www.nctm.org/Conferences-and-Professional-Development/Regional-Conferences-and-Expositions/.

5. NCTM Summer Intensive Workshops: NCTM will be doing two summer intensive workshops in Denver in July. On July 18-20, they will do a 6-8th grade institute on Algebra readiness, and on July 21-23, they will do a PreK-5 institute on Number and Operations. For information on the upcoming institute workshops, check out http://www.nctm.org/Conferences-and-Professional-Development/Institutes/.

6. CCTM Regional Workshops: 2016 regional workshops will be held in February, March, late October, and early November. Both pre-service and in-service teachers would benefit from these workshops. More information about upcoming workshops can be found at CCTM website:
   http://www.cctmath.org/workshops/.
   Workshops will emphasize topics such as aligning curriculum to standards, best-practices, exploring the role of tasks, etc.

7. 2015 CCTM Annual Conference: The annual CCTM conference took place at the Denver Merchandise Mart September 24-25, 2015. The theme was "*Putting the Pieces Together for Mathematical Success.*" Materials from the conference can be found here: http://www.cctmath.org/conference/.
   Steve Leinwand gave the Keynote presentation, which can be found here: https://www.dropbox.com/s/8yh7f9j31yqkby1/Steve%20Leinwand%20-%20CCTM%20Keynote.pptx?dl=0

8. **Clark Dollard** and **Richard Kitchen**'s work on certificate for K-8 specialist: work is still in progress.

9. Nominations are now open for **six** positions with CCTM. Due to the number of positions available, this will be an important year for CCTM elections. For more information, please check out
http://www.cctmath.org/spring-2016-board-elections
   Mary Pilgrim, CSU
   CCTM Representative

Colorado Mesa University
to host the Joint Meeting of the
Rocky Mountain and Intermountain Sections
April 8 - 9, 2016

Colorado Mesa University is excited to host the 2016 Joint Meeting of the Intermountain and Rocky Mountain Sections of the Mathematical Association of America, April 8-9 on the CMU campus in Grand Junction, Colorado.The meeting will be held on the second floor of the University Center -- building 35 on the CMU campus map.

You are invited to the 2016 Joint Meeting of the Intermountain and Rocky Mountain Sections of the MAA! Conference registration, abstract submission, hotel information and much more is now available at our conference website: http://www.coloradomesa.edu/maa/

Some important planning information and deadlines to keep in mind:

- Hotel reservations must be made by **March 8th** to receive the group rate.
- Abstract Submission deadline is **March 14th** (Happy Pi Day!).
- Early Registration ends on **March 23rd**. After this date, the price of registration will go up.
- Sign up soon for Joshua Garland's hands-on pre-conference workshop, "*Grappling with Chaos: How Simplicity Gives Rise to Complexity.*" Space is limited!
- Arrive early to attend some or all of the Strategic Planning Session on Friday from 11-12:30pm – all are welcome and encouraged to participate.
- Consider staying until Sunday and joining us for Saturday afternoon social activities (perhaps a wine tasting tour or a local hike), immediately following the conference.

Plenary Speakers

- **Dr. Janet Heine Barnett,** Professor of Mathematics at Colorado State University - Pueblo; 2015 Burton W. Jones Distinguished Teaching Award

History as Travel Guide and Companion: Mathematical Itineraries to Excite, Educate and Entertain
    As a travel companion, history intensifies our experiences by enhancing our understanding and appreciation of mathematics' rich culture, world-famous landmarks and exquisite natural landscapes. In addition to the usual fare of any travel guide – tips on recognizing and avoiding tourist traps, practical advice to make the journey run safely and smoothly, and suggested itineraries that enable travelers to make informed choices – history offers opportunities to create memorable experiences through

unexpected discoveries and the rewards of wandering off the beaten track. By encouraging us to explore and respect the unfamiliar, history also has potential to broaden our intellectual horizons beyond mathematics, and to teach us new ways of measuring the quality and value of our work in mathematics and teaching.

In this talk, I share highlights from 20+ years of travels that my students and I have enjoyed with history as our companion in a variety of mathematic courses. In addition to specific examples of how I have used history in the classroom to enhance students' mathematical understanding, I discuss some less explicit ways in which history has informed my teaching practice and philosophy. In closing, I comment on how historical expeditions have shaped my broader thinking about mathematics and its teaching, and offer travel tips and resources for those who wish to venture out on historical journeys in their own classrooms.

- **Dr. Robert L. Devane**y, Professor of Mathematics at Boston University; Immediate Past-President of the Mathematical Association of America

The Fractal Geometry of the Mandelbrot Set

In this lecture we describe several folk theorems concerning the Mandelbrot set. While this set is extremely complicated from a geometric point of view, we will show that, as long as you know how to add and how to count, you can understand this geometry completely. We will encounter many famous mathematical objects in the Mandelbrot set, like the Farey tree and the Fibonacci sequence. And we will find many soon-to-be-famous objects as well, like the "Devaney" sequence. There might even be a joke or two in the talk.

- **Dr. Robin Wilson,** Emeritus Professor at the Open University, U.K.; Visiting Professor at Colorado College

The History of Mathematics in 300 Stamps

In this talk I cover the entire history of mathematics in one hour, from earliest times to the modern age, illustrating the narrative with attractive (and sometimes bizarre) postage stamps from around the world, featuring mathematics and mathematicians.

- **Dr. Robert Palais**, Associate Professor, Mathematics, Utah Valley University; Research Professor, Pathology, University of Utah

Math, DNA, and Precision Medicine

Analyzing variations in DNA sequence, quantity, and activity and their medical consequences is leading to many interesting mathematical problems that can be studied and solved at the undergraduate level, with beneficial clinical outcomes. Some examples include using calculus, linear algebra, and differential equations to develop a rapid economical test for Ebola and other pathogens, and mining big data for genes associated with tumor aggression, and therapies that suppress them.

Contributed Paper Sessions and Panel Sessions

Contributed Paper Sessions:
Dynamical Systems
The History of Mathematics and Poincaré's Other Conjecture
Mathematics Education
IBL Methods in the Classroom
Classroom Innovations
Teaching Modeling across the Curriculum: Mathematical Biology Labs for the Math Classroom
General Session
Student Paper Session

Two Panel Sessions held on Friday afternoon:
>   Regional Mathematics Experiences in Business, Industry and Government (BIG)
>   Quantitative Reasoning, Common Core, and You!

On Friday, there will be Strategic Planning Session for the Rocky Mountain Section, hosted by Dr. **Kyle Riley**, the current Chair of the section. It will take place from 11-12:30 and all Rocky Mountain Section members are encouraged to participate. During the same time period, the Intermountain Section will have their Liaison meeting.

Preconference Workshop

Grappling with Chaos: How Simplicity gives rise to Chaos
    This will be an interactive workshop where participants will be exposed to introductory concepts in the world of nonlinear dynamical systems. We will begin with a brief lecture designed to familiarize participants with fundamental concepts in dynamical systems including maps, flows, difference and differential equations, periodicity, chaos, period-doubling cascades, the Feigenbaum ratio, fractals and bifurcations.
    This will be followed by an interactive lab where we will investigate some of the central ideas of nonlinear dynamics. We will explore the logistic map, using tools like time series analysis, cobweb diagrams and interactive bifurcation plots. If time allows, participants will also explore flow dynamics with a force driven pendulum. Many of the examples in this workshop can be incorporated into activities intended for use in an undergraduate classroom. They are chosen with the direct intent of sparking new and interesting undergraduate research projects.
    Joshua Garland received a B.S. from Colorado Mesa University in Mathematics, an M.S. from University of Colorado in Applied Mathematics and is currently a Ph.D. candidate at the University of Colorado at Boulder in Computer Science. Garland is also an instructor and project coordinator for the Santa Fe Institute's Complex System Summer School and a recipient of the Intelligent Data Analysis 2013 Frontier Prize. His research interests focus on using the tools of nonlinear dynamics, time series analysis, and information theory to better understand the mechanics of complex systems.

If you have any questions, you are welcome to contact Tracii Friedman: tfriedma@coloradomesa.edu

We look forward to seeing you at the conference!

Best Regards,
Tracii Friedman
Program Committee Chair

Committee Members:
Lisa Driskell, CMU
Shawn Robinson, CMU
Cathy Bonan-Hamada, CMU
Danae Romrell, BYU-Idaho

Conference website: http://www.coloradomesa.edu/maa/

Student Activities

Please join us at the Rocky Mountain Section Meeting in April. Enjoy these great activities!

Free lunch and games session on Friday April 8. When you arrive at the conference, there is a free student lunch and board games session. Please come and join us! Please direct student lunch questions to: **Beth Schaubroeck**, beth.schaubroeck@usafa.edu.

Give a talk! This conference is a great place to give a talk to fellow students and faculty members. Prepare your 20-minute talk and sign up to present in a student session! Please direct questions to:
   Beth Schaubroeck, beth.schaubroeck@usafa.edu.

This is Jeopardy! This year our friends in the Intermountain Section are hosting a Jeopardy tournament at the conference. Get together a team of 4-5 students from your school; or sign up to be put on a team that will represent our section. There is a limited number of teams; they will be entered in the competition on a first-come, first-served basis. There is also a limit of 5 students on the inter-school section team, so register early! To register yourself or your team for Jeopardy, email **Emma Schafer**, emmaturner@suu.edu.

PPRUMC Seeks Funding Arrangement

**Pikes Peak Regional Undergraduate Mathematics Conference (PPRUMC)
Seeks "Financial Housing" Arrangement with the Rocky Mountain Section**

Recently, the Steering Committee of the Pikes Peak Regional Undergraduate Mathematics Conference (PPRUMC) approached the RMS Executive Committee with a request that RMS handle financial contributions to PPRUMC on our behalf. This request was granted on a temporary basis for the upcoming 2016 PPRUMC, to be held in Pueblo on Saturday, February 27, 2016. A proposal to continue this arrangement for future conferences will be brought before the Section membership for approval at the 2016 RMS Business Meeting in Grand Junction on Saturday, April 9, 2016. An overview of the proposal and its rationale is given below. ***Questions, concerns or other feedback on the proposal can be conveyed to the PPRUMC Steering Committee via janet.barnett@csupueblo.edu, and to the RMS Executive Committee via kyle.riley@sdsmt.edu*** .

Rationale:
Founded in 2004, PPRUMC is a one-day mathematics conference held each year at one of four institutions in the Pikes Peak area. The focus of the conference is to give undergraduate mathematics students the opportunity to present their research and expository projects in a professional setting. Following a morning keynote address by a noted mathematician, student talks are scheduled in parallel sessions throughout the day. Faculty and students have opportunities to meet and mix between these talks, as well as during the conference lunch. The conference also features an afternoon panel discussion that aims to raise student awareness of career opportunities in mathematics, and to motivate undergraduates to consider pursuing a graduate degree in mathematics. Past conferences have drawn 50 - 115 students and 15 – 30 faculty from 20 different institutions of higher education.

During its first twelve years, PPRUMC was funded primarily by the *Regional Undergraduate Mathematics Conferences* (RUMC) Program, administered by the national MAA with funding from the NSF, with additional funding provided by the RMS Section Activity Grant Program. Thanks to the generous amount of support available from RUMC, PPRUMC was able to offer the conference at no cost to participants, but to also provide important travel support to the many undergraduates who have to travel long distances in order to attend. Regrettably, the MAA's RUMC grant from the NSF is no more.

The PPRUMC Steering Committee has thus been thinking hard about how to sustain the conference into the future, preferably continuing to offer it at little or no cost to participants. Although we may eventually need to charge a registration or lunch fee, we feel strongly that doing so could affect the success of the conference.

Our fund raising efforts for the upcoming 2016 Conference have thus far resulted in contributions (from the MAA Rocky Mountain Section, CSU-Pueblo, UCCS, and private donors) that will cover all estimated conference costs (including lunch) for up to 100 student and 20 non-student participants.

As we sought these funds, it became clear that the long-term financial stability of PPRUMC is dependent on having some way to process private donations and institutional sponsorships via a mechanism that is independent of the host institution. Accordingly, the PPRUMC Steering Committee approached the RMS Executive Committee with a request that RMS house financial contributions made to PPRUMC on our behalf.

How it would work:
The PPRUMC Steering Committee will continue to be responsible for conference fund-raising by seeking donations from a variety of sources (see list below). These donations would be made to the RMS, but designated to support only costs associated with PPRUMC. Because of the status of the MAA-RMS as a non-profit organization, all private donations to PPRUMC would thus be tax deductible. Conference expenditures for each year would then be paid from the "PPRUMC Account", but only up to the amount of funds already on deposit with the section. The Section Treasurer would be responsible for writing and

mailing the necessary checks upon receipt of invoices from the PPRUMC organizers; the cost of postage and other supplies needed to process these requests would be deducted from the account. Any unspent funds in the account following these payments would then roll forward for use when it was needed in the future. In some years (e.g., if a host institution would be able to support the full cost of the conference through gift funds to the institution), the balance in the account may even grow as contributions and sponsorships from annual supporters continue to come in. In the (unhappy) event that PPRUMC decides to completely disband at some point, any funds remaining on deposit with RMS at that time would then revert to the general RMS coffers (preferably designated for use to support student activities in some way).

Per consultations with the national MAA, there would be no tax implications for the section resulting from such an arrangement. The Associations' financial officer has also indicated that it is acceptable for the section to have an income and expense line in our annual budget notated for a PPRUMC account. As an officially sponsored event of that year's host institution, any legal liability associated with the conference would lie with that institution, so that the section would incur no legal liability either.

Both the current and past Section Treasurers who have been consulted about this proposal report that this arrangement would *not* involve setting up a separate banking account to process PPRUMC transactions, but simply some (minimal) bookkeeping to keep track of PPRUMC Account activity. However, an individual member of the PPRUMC Steering Committee would be designated as a *PPRUMC-RMS Financial Liaison* and charged with the responsibility of assisting the Section Treasurer as needed (e.g., preparation of thank you letters to donors/sponsors) and for regular reporting to the RMS Executive Committee on PPRUMC financial activity. As desired by the RMS membership, the PPRUMC-RMS Financial Liaison could be an individual appointed to the PPRUMC Steering Committee by the RMS Executive Committee, or simply someone already serving as a member of that committee. A minimum three-year term is recommended for this position, to ensure some measure of continuity as the local organizers rotate between host sites.

Potential funding sources include the following:

- The RMS Section Activity Grant Program.
- Sponsorships by each of the three non-military host institution (CC, CSU-Pueblo, UCCS); to date, a continuing sponsorship of $500 per year has been secured from UCCS thanks to the efforts of Barbara Prinari (UCCS).
- Sponsorships from local, regional or national industries/businesses.
- Private donations from alumni of various host sites, past PPRUMC attendees, individual MAA RMS members, etc. Pending approval of this proposal, contributions to PPRUMC might also be sought via the Voluntary Dues Contribution program of the RMS.

Sponsorships may also be sought from other institutions in the section who regularly attend PPRUMC; however, it is more likely that these schools would contribute to the PPRUMC indirectly by providing travel funds for their students, rather than submitting requests to PPRUMC for funding costs.

Rocky Mountain Section Fall 2015 Survey Results

The Rocky Mountain Section conducted a survey using Survey Monkey this past fall 2015 semester. One of the driving reasons for this survey was to investigate the possibility of moving the section meeting from April to the October. However, there were a few other questions that were asked to investigate what attracts people to the section meeting and what changes might attract more people to the section meeting. We had 70 people respond to the survey.

The first question asked about the affiliation of the person completing the survey with 86% being faculty members from a four year institution and the rest of the demographics were spread from two year institutions, high school teachers, department heads, and graduate students.

Table 1: Response to question 1 on affiliation

▼	I am a faculty member at four year institution.	85.25%	52
▼	I am a faculty member at community college.	3.28%	2
▼	I am a department chair.	4.92%	3
▼	I am a high school teacher.	3.28%	2
▼	I am a graduate student.	6.56%	4
▼	I am an undergraduate student.	0.00%	0

The second question asked if a respondent is more like to attend a meeting in April, in October, equally likely to attend either meeting, or equally likely not to attend either meeting.

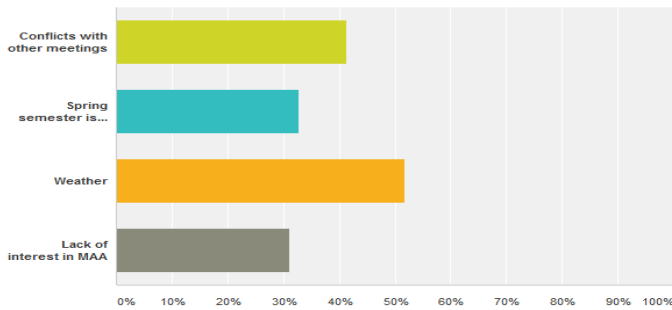Question 2: Are you more likely to attend a section meeting in the fall or the spring?

Answer Choices		Responses	
▼	I am more likely to attend an April meeting versus an October meeting.	20.00%	14
▼	I am more likely to attend an October meeting versus an April meeting.	18.57%	13
▼	I am equally likely to attend either meeting.	57.14%	40
▼	I will likely not attend either meeting.	4.29%	3
Total			70

Question 3: What do you think is a primary difficulty for people attending the spring section meetings now? (Check all that apply)

Over half of the respondents indicated weather being the primary difficulty with attending the spring section meeting followed by the conflict with other meetings in the spring.

What do you think is a primary difficulty for people attending the spring section meetings now? (check all that apply)

Answered: 58   Skipped: 12

Question 4 investigated the features that might attract more people to a section meeting. Respondents were given several options and were asked to rank order the features that they think would make it more likely they would attend a section meeting. The feature that had the highest score was a meeting that included more nationally recognized speakers followed by the inclusion of workshops.

Question 4: What features would make it more likely you would attend a section meeting? Rank the features below in order of your preference.

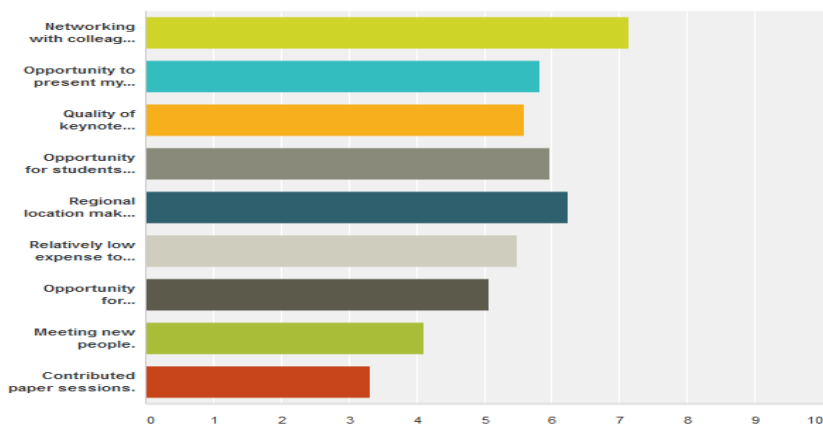|	1	2	3	4	5	6	N/A	Total	Score
Change time of the meeting to the fall	21.05% 12	8.77% 5	5.26% 3	5.26% 3	10.53% 6	7.02% 4	42.11% 24	57	4.06
Keep the time of the meeting in the spring	5.66% 3	3.77% 2	7.55% 4	15.09% 8	15.09% 8	9.43% 5	43.40% 23	53	2.97
More workshops	29.31% 17	15.52% 9	18.97% 11	18.97% 11	5.17% 3	0.00% 0	12.07% 7	58	4.51
Nationally recognized speakers	29.51% 18	40.98% 25	11.48% 7	6.56% 4	0.00% 0	1.64% 1	9.84% 6	61	4.98
Research sessions (specify area in dialogue box, follow up question: are you willing to lead this?)	11.67% 7	18.33% 11	30.00% 18	13.33% 8	8.33% 5	5.00% 3	13.33% 8	60	3.96
Section NExT activities	7.27% 4	9.09% 5	14.55% 8	14.55% 8	9.09% 5	9.09% 5	36.36% 20	55	3.43

It is an open question on which nationally recognized speaker might be a draw for increasing attendance. Question 5 did follow up from question 4 to ask what workshops would be of interest. The clear top

response on workshop suggestions related to teaching and/or pedagogy. Many of the teaching workshop suggestions focused on active learning and inquiry based learning, but they also included discussion on particular classes (e.g., College Algebra, Calculus, Geometry, etc.). Another highly popular workshop suggestion related to the use of technology in the classroom followed by workshop suggestions that covered a particular discipline or topic that would be of interest to professionals in the mathematics community (e.g., Encryption, Differential Geometry, Combinatorics, etc.).

Question 6 investigated the established features of the section meeting that are attractive to the people that already attend. The respondents had several features to consider and were asked to rank order the features they liked best. The opportunity to network with colleagues was a clear winner in this question followed by the fact that the meeting was local and relatively cheap to travel to.
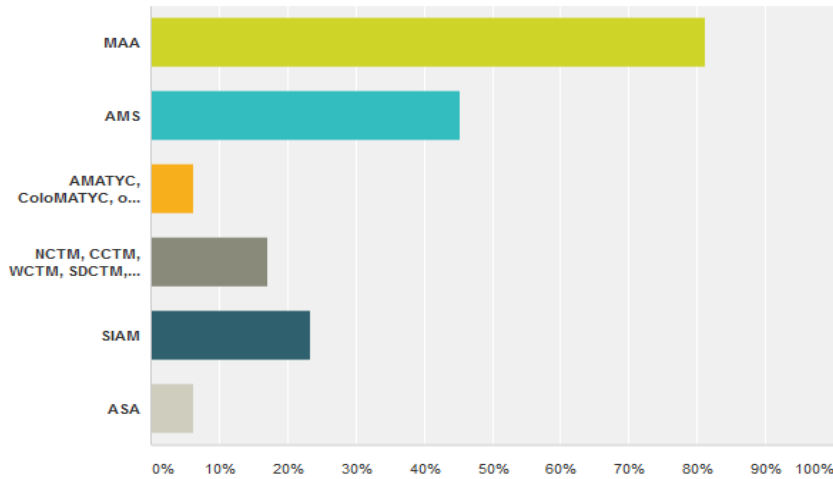
Question 6: If you currently attend section meetings then please rank order the features below that attract you to the section meetings in order of preference.

Networking opportunities have always been highly ranked for professional conferences, but the spring section meeting has traditionally had very little emphasis on networking. This is an area we can clearly work to improve in future meetings. The third feature by rank was the opportunity for students to present their research, which is another area we can work to strengthen.

The subject of question 7 was the recently established Early Career Teaching Award (ECTA). The Distinguished Teaching Award was named in honor for Burton W. Jones and so question 7 asked the respondents their preference on turning the ECTA into a named award to mirror the Burton W. Jones award. The response was strongly in favor of leaving the ECTA unnamed with over 76% indicating they preferred the award to keep the current name. Question 8 asked respondents which section meeting did they last attend and the most recent meeting in Colorado College had the highest response rate followed by the Denver meeting in 2012 that was jointly hosted by MSUD, UCD, and CCD. Membership in professional organizations was the topic of question 9 and the MAA gathered the highest number of responses and that was followed by AMS and SIAM. The last question of the survey asked for suggestions on what respondents think might boost attendance at section meetings. The responses varied greatly on suggestions and general comments, but there were three reoccurring themes: a suggestion to hold more meetings closer to the Metro Denver area; sustaining a Section NExT; and holding the section meetings at a time that did not overlap with classes.

Question 9: Please select all the professional organizations in which you currently have membership.

Special thanks to Michael Jacobson and Heidi Keck for their assistance with the development and implementation of this survey. It is my hope this information will help guide us on a path that will strengthen our section and increase attendance at our section meetings. I would like to thank everyone for taking the **time to respond to this survey.**
Respectfully submitted,
   Kyle Riley, SDSMT
   Chair, Rocky Mountain Section

MAA Rocky Mountain Section
Suggestions for Speakers

The Rocky Mountain Section would like to offer the following suggestions, especially to first-time speakers, regarding preparation of a talk at the conference.

1. The standard talk length is 20 minutes, (with longer times available upon request, subject to the limitations of the program). Thus, you should prepare your presentation to fit the time allotted. If possible, plan to leave a few minutes at the end of your presentation for questions.

2. A moderator will be assigned to facilitate each session of presentations. The moderator will introduce the speaker, assist in distribution of any handouts, signal the end of the presentation, and ask for questions from the audience.

3. If handouts are to be provided, give them to the moderator prior to the beginning of the session including your talk. Plan to bring about 35 handouts and be prepared to give attendees your e-mail address in case the supply runs out. It may also be possible to arrange for posting of electronic materials from your talk on the section website. Check with program organizers concerning this possibility.

4. Do not include too much detailed technical material in your presentation. Focus on providing the audience with insight into your topic and its key notions. Remember that most members of the audience will not be experts in the field you are discussing, and that the audience is likely to include students.

5. All session rooms will be equipped with a projector and a laptop hook up. Accordingly, you can present your talk using Power Point slides, PDF, or similar, which will greatly enhance the pace of a presentation. However, make sure that notes on the slides or transparencies are typed in a font big enough and with spacing adequate to be seen clearly 50 to 100 feet away.

Grants Available

Section Activity Grants Available

The purpose of the Section Activity Grants program is to assist Section members in funding projects in support of Section Mission. These projects must be clearly tied to one or more of the Rocky Mountain Section Mission Goals and the project director must be a member of MAA. Grants will not exceed $750 per project. Matching funds from host institution are preferred, but not required. To apply for a Section Activity Grant, submit the following to the Section Secretary/Treasurer:

   (a) Description of project (no more than one page);
   (b) Statement of how project supports Mission Goals (no more than one page);
   (c) Estimated budget;
   (d) Description of matching funds available, if any;
   (e) Vitae of project director(s).

If funded, a report on the project will be filed by the Project Director upon completion (no more than one page) and a report will be made at the next meeting of the Section. Complete details on the selection process and application guidelines are posted on the section website. Grants will be reviewed once a year. All application materials are due November 1st of each year.

Student Recognition Grants Available

The establishment of a Student Recognition Grant Program was approved by the section membership at the 2003 Annual Business Meeting. In support of this program, the Section will set aside $500 every calendar year. From these monies, the Section will make grants for the purpose of recognizing superior achievement in mathematics on the part of (1) students enrolled in post-secondary institutions within the geographic region served by the Section and (2) high school students whose school districts, or other appropriate political subdivisions, substantially intersect the geographic region served by the Section.

Proposals for such grants must

1. Originate from a member of the Rocky Mountain Section of the Mathematical Association of America on behalf of an agency, institution, or organization whose stated purposes are consistent with recognizing or encouraging superior academic achievement at the high school level;
2. Be in the hands of the Chair of the Rocky Mountain Section no later than March 15 of the year in which the proposed recognition is to be made;
3. Include the criteria under which superior achievement in mathematics is to be recognized, together with the time and the manner of such recognition;
4. Report, insofar as possible at the time of the proposal, other potential sources of support together with proposals or requests made or intended; and
5. Be limited to a maximum amount of $250.

The Executive Committee will review all proposals for grants under this policy and will make such grants as, in its sole judgment, it deems proper. In keeping with the section mission, funding priority will be given to grants that include recognition of undergraduate students. Funding decisions will be announced no later than the Annual Business Meeting of the Section. Monies not expended during any particular year shall revert to the Section's general fund.

About Our Logo

The logo for the Rocky Mountain Section of the Mathematical Association of America was created in by Mark Petersen in 2001. A graduate student in the Applied Mathematics Department at the University of Colorado at Boulder at that time, Mark says of his design:

"The mountain symbols were chosen because analysis is the foundation for all of mathematics. The equation $e^{i\pi} + 1 = 0$ must rank among the most beautiful formulas in mathematics. It connects the five most important constants of mathematics with the three most important operations - addition, multiplication, and exponentiation. These five constants symbolize the four major branches of classical mathematics: arithmetic, represented by 0 and 1; algebra, by i; geometry, by π; and analysis, by e. (Quoted from Eli Maor's *e, The Story of a Number*). I chose to portray this equation as a train because rail has historically been the life blood of the American West, and trains are complementary to any mountain scene."

Meetings Calendar

ColoMATYC; Pueblo Community College
    March 11, 2016
NCTM annual meeting; San Francisco, CA
    April 13-16, 2016
**MAA Rocky Mountain Section Meeting;
    Colorado Mesa University
    Grand Junction, April 8-9, 2016
    Joint meeting with the Intermountain Section**
MAA MathFest; Columbus, OH;
    August 3-6, 2016
AMATYC annual conference; Denver, CO
    November 17-20, 2016

Joint Mathematics Meetings; Atlanta, GA
    January 4-7, 2017
NCTM annual meeting; San Antonio, TX
    April 5-8, 2017
**100th Anniversary
MAA Rocky Mountain Section Meeting;
    Colorado State University - Pueblo
    April 21-22, 2017**
MAA MathFest; Chicago, IL; July 26-29, 2017

Joint Mathematics Meetings; San Diego, CA
    January 10-13, 2018
NCTM annual meeting; Washington DC
    April 25-28, 2018
MAA MathFest; Denver, CO; August 1-4, 2018

Joint Mathematics Meetings; Baltimore, MD
    January 16-19, 2019
NCTM annual meeting; San Diego, CA
    April 6-9, 2019
MAA MathFest; Cincinnati, OH;
    July 31-August 3, 2019

**Joint Mathematics Meetings; Denver, CO
    January 15-18, 2020**
MAA MathFest; Philadelphia, PA;
    July 29 – August 1, 2020

Joint Mathematics Meetings; Washington DC
    January 6-9, 2021
MAA MathFest; Sacramento, CO;
    August 4-7, 2021

The Rocky Mountain Section of
The Mathematical Association of America

Burton W. Jones Award
for Distinguished College or University Teaching of Mathematics

Burton W. Jones Award Nomination Form

Name of Nominee _____
(First name first)

College or University Affiliation _____

College or University Address _____

City _____ State _____ Zip _____

Is the nominee a member of the MAA? _____

Number of years of teaching experience in a mathematical science _____

Has the nominee taught at least half time in a mathematical science
for the past three years (not counting a sabbatical period)? _____

On a separate page, briefly describe the unusual or extraordinary personal and professional qualities of the nominee that contribute to her or his extraordinary teaching success.

Name of Nominator) _____
(First name first)

Address of Nominator _____

_____

Email Address _____

Telephone: Work _____   Home _____   Fax _____

Nominator's Signature _____

Nomination forms should reach Section Secretary by December 15 of each year.
Complete nomination materials should reach Section Secretary by January 15 of each year.

Section Secretary: Heidi Keck, hkeck@western.edu
Western State Colorado University; Hurst Hall; Gunnison, CO 81231.

Please consult the Section webpage (http://sections.maa.org/rockymt) for complete guidelines.

Voluntary Section Dues

Many thanks to those members who have made a voluntary dues contribution to the section along with their Spring Meeting Registration!

Although the section has found itself in good financial health in recent years, additional funds are always needed in order to pursue special initiatives suggested by the membership. The successful John Fauvel Memorial Conference and William Dunham Special Lecture, both supported in part by the Section Activity Grant program, provide excellent examples of what can be done with even a small amount of funding to support our section mission and goals.

A voluntary section dues contribution from you now can help build up funds in support of similar initiatives!

To submit your dues, simply return the coupon below with a check for any amount you wish - every little bit will help, and all contributors will receive a letter acknowledging the contribution for their financial records.

MAA Rocky Mountain Section Voluntary Dues Contribution Form

Name   _____

Address _____

_____ **ZIP** _____

Please indicate in the space provided how you would like your dues to be used:

_____   Undergraduate Student Initiatives
_____   Graduate Student Initiatives
_____   Burton W. Jones DTA Fund
_____   Section Activity Grant Program
_____   Wherever needed most
_____   Other: _____
_____   **TOTAL DUES PAID ($10 recommended)**

Please make check payable to: **MAA Rocky Mountain Section** and return to: Heidi Keck, MAA Rocky Mountain Section Treasurer/Secretary: Western State Colorado University, Hurst Hall; Gunnison, CO 81231

MAA Rocky Mountain Section
Mission Statement

**To promote excellence in mathematics education,
especially at the collegiate level.**

Mission Related Goals

1. To foster scholarship, professional development, and professional cooperation among the various constituencies of the mathematical community within the region.

2. To foster the implementation and study of recent research recommendations for the teaching, learning and assessment of collegiate mathematics.

3. To support the implementation of effective mathematics preparation programs of prospective teachers at all levels.

4. To enhance the interests, talents and achievements of all individuals in mathematics, especially of members of underrepresented groups.

5. To provide recognition of the importance of mathematics, mathematical research and quality mathematics teaching, and promote public understanding of the same.

6. To provide regional leadership in the promotion of systemic change in mathematics education, and in the enhancement of public understanding about the needs and importance of mathematical research and education.