



North Central Mathematical Bulletin

The Newsletter of the North Central Section
of the Mathematical Association of America

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Spring 2011, Volume 14, Number 1

UPCOMING MEETING

Hope to See You at the Carleton College in Northfield, Minnesota!

The Carleton College will host the MAA-NCS Spring Meeting, April 15-16.

Our two invited speakers for the spring meeting are [Jonathan Rogness](#) (University of Minnesota - Twin Cities) and [Doug Ensley](#) (Shippensburg University).

A program for the Spring 2011 meeting will be posted approximately one to two weeks on the MAA-NCS website prior to the meeting.

INVITED SPEAKERS AND ABSTRACTS

- [Jonathan Rogness](#) - University of Minnesota - Twin Cities

Abstract: What happens when 1.8 million people encounter high-level mathematics on YouTube? "Möbius Transformations Revealed" is a short film that illustrates the beauty of Möbius Transformations and shows how moving to a higher dimension makes them easier to understand. After winning an award from the National Science Foundation and Science magazine the video went viral, with unexpected and entertaining results. This talk will describe the behind-the-scenes making of the movie, explore the mathematics it illustrates, and show the reactions of YouTube users who discover the visual allure of mathematics.

- [Doug Ensley](#) - Shippensburg University

Abstract: By understanding invariant properties of a group action (shuffling!) on a deck of cards, a magician can find order where the spectator believes he or she has created disorder. This presentation will introduce some general mathematical principles of group actions by looking at some specific card tricks that anyone can do.

OFFICER REPORTS

Governor's Report

Steve Kennedy, Carleton College

New Orleans, when I arrived for the Board of Governors Meeting the day before the Joint Meetings, was a sea of red as Ohio State was preparing to face Arkansas in the Sugar bowl that night. I don't actually know who won the game, all I know is that lots of people wearing red were very excited (and very loud).

The major topic of discussion at the board meeting the next day was the operating budget. The MAA annual operating budget is approximately \$8M. Income for this year is falling short of projections and, because our endowment is small and our margin of error is therefore tight, cuts in spending had to be made to get closer to a balanced budget for this year. We have operated at a deficit for a couple of years and used up too much of our reserves. Most members will not observe many effects from the cuts. The most painful cuts were to MAA staff salaries. Staff at the director level received no raises, others received only 1% increases. Our endowment and investments have bounced back somewhat after the recession; we continue to meet or exceed our benchmarks. Gift-giving for 2010 amounted to approximately \$125K. Financially we are in decent but not stellar health.

The most visible MAA product of course is publications. The MAA published seventeen books in 2010 and expects to produce twenty this year. The Monthly has a new editor-elect, **Scott Chapman** of Sam Houston State University. Back issues of all the journals (now including Math Horizons—yay!) are available on JSTOR.

There was mixed news about membership. Membership renewal rates have bounced back a bit after taking a big hit last year. It is now possible to obtain an e-membership which comes with electronic-only access to the journals at a reduced price, this is becoming an increasingly popular choice. The board of governors approved a new, reduced-rate, category of membership for high school teachers. There are lots of high school teachers teaching calculus and other collegiate-level mathematics who could benefit from access to MAA products and services. Institutional and student memberships are still down, this, especially the former, is a financial problem.

In 2005 the Association embarked on a cycle of strategic planning. Working groups have produced long-term planning documents on a variety of big-picture topics (Meetings, Student Memberships, Periodicals, etc.). In January Paul Zorn delivered a preliminary report on the future of the MAA book publishing enterprise. Most of the nouns in that report began with the prefix "e-." As are all publishers, the MAA is struggling with figuring out what the future of the book will be. That report is not finished yet, but several completed strategic planning reports are available at <http://www.maa.org/strategicplanning/index.aspx>.

Finally, and I said this in my last report also, I am asked each spring to suggest names of folks for appointment to MAA committees. If you would like to be more involved in the activities of the Association, look at the list of MAA committees (<http://www.maa.org/EBUSPPRO/committee-list.aspx>) and send me a note (skennedy@carleton.edu) indicating your interest and any special qualifications you have. I'll be happy to send it on.

All of us at Carleton are looking forward to hosting the section meeting in a couple of weeks. I hope to see you then.

Addendum: Feel free to view the presentation given for Section Governors (in PowerPoint). ([link](#)).

President's Report

Jason Douma, University of Sioux Falls

Our next gathering as a section will be April 15-16 on the beautiful campus of Carleton College. We can all look forward to a delightful weekend together, including invited addresses from two highly engaging (and often entertaining) invited speakers: Jonathan Rogness (from just up the road at the University of

Minnesota – Twin Cities) and Doug Ensley (from way down the long and winding road at Shippensburg University). We are also featuring a pre-meeting workshop, co-sponsored by our section NExT but expressly open to all who are interested. Aaron Wangberg and Jonathan Rogness will lead workshop participants through an introduction to WebWork, beginning at 3:30 p.m. on Friday, April 15.

It's also time to be thinking about summer! I encourage each of you to make plans to join us in Bemidji on July 24-29 for our 2011 NCS Summer Seminar. This year's offering will be led by **Glen Van Brummelen**, who will be guiding us through the historical development of mathematical astronomy and spherical trigonometry. Beautiful mathematics in a beautiful setting...a great way to spend a few days in the summer. Check the section website regularly for details and updated information. I apologize for the delay in posting registration materials. As of this writing, we are still waiting to confirm some of the housing details from our host campus.

As the president of our section, I have enjoyed being connected to some excellent work that is carried out by a number of truly dedicated colleagues. More often than not I have felt like a visitor in the kitchen, poking my eyes over people's shoulders and maybe sneaking a spoonful of whatever's cooking. But the real chefs are the officers and leaders scattered across the section, each doing their part to contribute to the vitality of our collective professional life. Special thanks go out to the officers who are just now completing their terms of service: to past president **John Holte**, who continues to be my teacher even "several" years after completing my degree from Gustavus; to treasurer **Randy Westhoff**, who has a gift for making even the craziest tasks seem manageable; to student chapter coordinator **Peh Ng**, who brings more enthusiasm and creativity to the table than a dozen mere mortals; to member-at-large **Angela Hodge**, who is surely one of the rising stars in our section; and finally to committee chairs **Karen Saxe** (teaching award committee) and **Deanna Haunsperger** (service award committee), both of whom continue to embody "professionalism" at its very best. It has been a pleasure and honor to work with each of you, and I look forward to our continued interactions in the years to come.

Treasurer's Report

Randy Westhoff, Bemidji State University

I would like to thank the following colleges and universities for becoming institutional members of the North Central Section. As in previous years all proceeds will be used to support our Section NExT program.

Augsburg College	Augustana College	Bemidji State University	Bethel University
Carleton College	Concordia College	Concordia University, St. Paul	Gustavus Adolphus College
Hamline University	Lakehead University	Macalester College	Minnesota State University, Mankato
Minot State University	Normandale Community College	Northern State University	Saint Mary's University
South Dakota State University	Southwest Minnesota State University	St. Cloud State University	St. John's University/College of St. Benedict
St. Olaf College	University of Minnesota, Duluth	University of Minnesota, Twin Cities	University of Sioux Falls

If your institution is not listed and you would like to become an institutional member the cost is \$25 and checks (made out to NCS-MAA) can be sent to me at the address below. If you would like an invoice, please let me know and I will send one out. Thanks again and I'll see you at the spring meeting.

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CAMPUS NEWS

Augsburg College

Pavel Bělik was awarded tenure. Congratulations to Pavel and Augsburg!

Katy Micek along with Unbounded, the Augsburg Mathematics Club, is organizing a multi-school Math Jeopardy contest for undergraduates. The contest is on April 1, 2011 on the Augsburg campus. A: This Minnesota university is where Katy earned her undergraduate degree.*

Student **Jeremy Anthony** has been selected to present his research "Wavelet analysis of ecosystem carbon uptake data" on April 13, 2011 on Capitol Hill for the annual Posters on the Hill event organized by the Council on Undergraduate Research. Jeremy's work is directed by his research advisor, John Zobitz.

*Q: What is St. Thomas?

(submitted by Matt Haines)

Augustana College

Here at Augustana, we are gearing up to host an undergraduate conference, Math on the Northern Plains. It is unfortunate that, due to an apparent shortage of Saturdays this spring, the conference will coincide with the section meeting. Nevertheless, we hope that we will see some of you and your students here (for information see <http://www.augie.edu/events/2011-04-16/mathematics-northern-plains-undergraduate-conference>).

Our Math Club recently held its first "Pi Day" observance. Pi(e) was baked, eaten and thrown – photos should be up at the website shortly! *(submitted by Martha Gregg)*

College of St. Benedict/St. John's University

St. Ben's and St. John's are pleased to announce two new colleagues: Dr. **Sunil Chetty** and Dr. **Anne Sinko** will be joining our department next fall. Sunil is coming from Colorado College and Anne is coming from Kenyon College. Connected with our hiring is the (re) retirement of **Jim Johnson**. After a full career at St. Cloud State, Jim has been a well appreciated member of our department for nine years. We are grateful for his teaching, dedication to our students and gentle humor. We will miss him and wish him well. Also connected with our hiring is **Mike Tangredi's** upcoming sabbatical. He will be studying ways to make our calculus courses more successful. **Gary Brown** announces the upcoming publication of his second book of short stories, *The Continued Adventures of the Parrot*, the product of his recent sabbatical.

Two of our students, **David Byrne** and **Matt Donner**, recently presented their research at the CURM conference in Provo, Utah. CURM (Center for Undergraduate Research) is an NSF sponsored and **Tom**

Sibley received an NSF grant through CURM to fund these students' research. *(submitted by Tom Sibley)*

Concordia College-Moorhead

The Department of Mathematics and Computer Science at Concordia College Moorhead was stunned this spring by the administration's announcement that the college was phasing out the computer science program. There was no hint that computer science was in trouble or being considered for a cut, and no faculty or students from the department were consulted during the closed and secret process that led to the decision. At the time of the announcement, there were 38 declared computer science majors at Concordia. Of the 3 computer science faculty affected, the 2 tenured members will be rehired by Concordia's Offutt School of Business to begin a Management Information Systems program (yet to be determined), while the tenure-track but untenured Ph.D. in computer science will see his position terminated. *(submitted by Doug Anderson)*

Gustavus Adolphus College

Every year the Rydell Professorship brings an eminent scientist or scholar to Gustavus for an extended stay. This year Gustavus was fortunate to have Dr. **Robert Lang**, an internationally renowned origami expert, as our Rydell Professor. In January Term he joined professors **Carolyn Dobler** and **Barbara Kaiser** in teaching "The Mathematics of Origami." The Hillstrom Museum also hosted an exhibition of his work, and Dr. Lang gave public demonstrations of his talents and a public lecture that featured some of the amazing applications of origami, such as the design of space telescopes that can be folded into a rocket for launch into orbit.

This past January Term Visiting Assistant Professor of Computer Science **Choong-Soo Lee** hosted a StarCraft II tournament for 16 students, an event that was covered by the Mankato Free Press. StarCraft 2 is a real-time strategy game. "I've heard people say it's like chess on steroids," said Choong-Soo.

Also in January, **Yan Yan Ji**, Professor Mike Hvidsten's teaching assistant last year at United International College (UIC), joined Mike at Gustavus to assist with a robotics course here.

Professor **Max Hailperin** testified before the Minnesota Senate Local Government and Elections Committee on March 14, 2011. His topic was the use of so-called "electronic rosters," which are computer systems for processing voters at polling places.

During June 23-26 Gustavus will host the "Differential Equations across the Collegiate Curriculum Conference," featuring guest speakers **Paul Blanchard**, **Robert Devaney**, **Jim Walsh**, and **Darryl Yong**. Professor **Tom LoFaro**, chair of our department, is one of the organizers. Email tlofaro@gustavus.edu for more information. *(submitted by John Holte)*

Minnesota State University-Mankato

Next academic year will be a challenging one as the department of mathematics and statistics loses three and half faculty positions due to university-wide budget cut. In addition, Professor **Pavel Kitsul** retires at the end of Spring semester, 2011.

The department has launched "Center for Statistics and Applied Mathematics," which will focus on research and consultation in statistics and applied mathematics problems. *(submitted by Namyong Lee)*

Minnesota State University-Moorhead

Ron Jeppson and **Jim Hatzenbuhler** are retiring this spring. Jeppson came to MSUM in 1981 after completing his Ph.D. at Montana State. In 1987 he was advisor for the university team which took first place in the national Mathematical Competition in Modeling. He chaired the Mathematics Department from 1993 to 1997, when he was appointed acting dean of the College of Social and Natural Sciences. He served as acting dean, then dean of the college until 2009, when he returned to the Mathematics Department.

Hatzenbuhler came to the department in 1973 after completing his Ph.D. at Kansas State. He had a long and productive research collaboration with Don Mattson in topology, which resulted in many publications and meeting presentations. Hatzenbuhler served as department chair from 2002 to 2008. *(submitted by Wally Sizer)*

Normandale Community College

Mark Ahrens is fully up to speed in his first year as Math/Csci department chairperson. The department is in the middle of a large redesign of our developmental Math Center, and will be switching from a MyMathLab backbone to ALEKs', beginning Fall 2011. We have applied along with Anoka-Ramsey CC, and are one of 50 finalists (32 to be awarded), for a Next Generation Learning Challenge grant for our developmental redesign. We recently received an NSF implementation grant to develop a SENCER (Science Education for New Civic Engagement and Responsibility) course, at the same general level as Mathematics for the Liberal Arts, integrating mathematical ideas with energy/environmental issues, and are part of partnership applying for an NSF Engaging Mathematics grant to develop several other SENCER courses. We will be sad when **Thomas Kersten** retires from our faculty at the end of Spring semester, after 39 years at Normandale, during part of which he held a joint appointment at Metro State University. *(submitted by Christopher Ennis)*

St. Olaf College

Prof. **Paul Zorn** officially began his term as President of the MAA in February. He is the third Minnesotan in a row (following Joe Gallian and David Bressoud) to hold the position.

Belated congratulations go to Prof. **Steve McKelvey** who was promoted to the rank of Professor a year ago.

Prof. **Tina Garrett** will become the new North American Director of the Budapest Semester in Mathematics sometime this summer.

Prof. **Jill Dietz** began her term as Chair of the Department of Mathematics, Statistics, and Computer Science nearly a year ago.

Prof. **Dick Brown** has been recognized by Intel Corporation as both a "rock star" and "academic black belt" for his work promoting the teaching of parallelism in undergraduate computer science courses.

Congratulations to Prof. **Zajj Daugherty**, who accepted a post-doctoral position at Dartmouth College, beginning in September.

St. Olaf hosted the annual Konhauser competition in February with nearly 30 teams competing from St. Olaf, Carleton, Macalester, University of St. Thomas, and St. Catherine's University. The beautiful "pizza" trophy now resides at Carleton College in honor of their win.

St. Olaf successfully concluded a tenure-track search for an applied mathematician and is happy to announce that Prof. **Becky Vandiver**, currently at Bryn Mawr, will be joining the faculty in September. *(submitted by Jill Dietz)*

University of North Dakota

Richard Millspaugh is nearing the end of his term as department chair. **Joel Iiams** is our next department chair and will assume that position beginning July 1. *(submitted by Richard Millspaugh)*

University of St. Thomas

Prof. **John Kemper** of the University of St. Thomas Mathematics Department is retiring after 35 years. In his honor a conference will be held at St. Thomas on May 26th, 2011, from 11a.m.-5p.m. Scheduled speakers are: **Chris Bendel**, **Gary Hatfield**, **Theresa Jorgensen**, and **Katie Micek**. Those interested in attending should contact Dedrick Mays, ddmays@stthomas.edu.

The University of St. Thomas has been named a Center of Actuarial Excellence by the Society of Actuaries (SOA).

St. Thomas is now one of the 21 schools in North America that have been awarded the CAE designation by the SOA. The programs at each of these schools met eight rigorous criteria and specific requirements related to degree curriculum, graduate counts and quality, faculty composition, appropriate integration, connection to industry and research/scholarship in order to qualify for the CAE distinction.

Donald J. Segal, president of the SOA, commenting on the recognition, noted: "Universities that have been named Centers of Actuarial Excellence by the SOA truly exemplify the highest standards in actuarial education, research and scholarship. We are honored to recognize them for this accomplishment and look forward to building strong links between these universities and the actuarial profession."

"Obtaining the status of Center of Actuarial Excellence has been a collective achievement of our students, alumni, industry liaisons and faculty members of the program." remarked **Heekyung Youn**, director of the university's Actuarial Science Program. *(submitted by Doug Dokken)*

University of Sioux Falls

Joy Lind has received word that her joint work with **Darren Narayan** and **Andrew Lee**, a classroom module titled *Optimally Routing Data in Fiber-Optic Networks with Existing Flow*, has been accepted for publication in the *Bulletin of the Institute of Combinatorics and Its Applications*. *(submitted by Jason Douma)*

SECTION NExT

Designed for new college and university faculty in the mathematical sciences, Section NExT (New Experiences in Teaching) is a professional development program that addresses the full range of faculty responsibilities including teaching, scholarly activities, and service.

Each year, applications will be solicited for new MAA-NCS Section NExT fellows to serve for a two year term. We will accept applications from faculty who are within the first four years of beginning full-time employment with teaching responsibilities at the college or university level. The application consists of a short personal statement and a letter of support from the department chair, guaranteeing financial support for transportation, meals, and lodging at the fall and spring meetings of the North Central Section.

The MAA-NCS Section NExT will meet as part of a joint workshop on April 15, 2011 at Carleton College in Northfield, Minnesota with Jonathan Rogness and Aaron Wanberg on an "Introduction to WebWork" immediately prior to the NCS Spring Meeting (detailed information below). Details about the MAA-NCS Section NExT program and its spring meeting may be found at <http://sections.maa.org/northcen/secNext.html>.

CONFERENCES AND ACTIVITIES

32th Annual Pi Mu Epsilon Conference

Plan to come with your students to the 32nd Annual Pi Mu Epsilon Conference April 8 and 9 at St. John's. Have your students submit titles and abstracts of talks to Kris Nairn (knairn@csbsju.edu), whom you can also contact for more information. Or go to our web site <http://www.csbsju.edu/Mathematics/Pi-Conference.htm>. The featured speaker this year is William Dunham, the well known and engaging expert on all things Euler.

Introduction to WebWork (Workshop)

Friday, April 15, 2011

3:30 to 5:30 pm

at Carleton College

CMC201

CAM Colloquium Series (University of St. Thomas)

This colloquium series, sponsored by the Center for Applied Mathematics, is intended to introduce the University of St. Thomas community to a variety of problems, careers, and professional activities involving applications of mathematics. All presentations will be held in the 3M auditorium in the Owens Science Hall, Frey Science and Engineering Center, located at the southwest corner of Summit and Cretin Avenues in St. Paul. All talks start at 3:30 pm with refreshments at 3:15 pm.

- February 24, 2011

"What Happened to the Supercomputers", Bill Harrod, formerly with the Defense Advanced Research Projects Agency (DARPA)

Abstract: High Performance Computing (HPC) is entering a new phase where computer designs will be driven by the goal to minimize power consumption. Performance per Watt is the new metric for measuring progress and improvements in performance provided by new computer designs. Performance improvements depend primarily on two factors: the level of parallelism and minimizing data movement. This new metric is a result of the necessary flat-lining of clock rates (to keep power requirements manageable) and the growing gap between microprocessor technology and memory structures and memory bandwidth. The new metric relies on the optimal use of multicore microprocessors as the primary means by which performance is improved, and will require dramatic changes in system architectures, which will force new methods of use, including programming and system management. HPC is now faced with the need for new effective means of sustaining performance growth as microprocessor technology advances through rapid expansion of multicore processors, with anticipated structures of hundreds of millions of cores by the end of this decade, which will have the potential for delivering exascale performance (1000 times today's emerging petascale computers). This presentation will discuss the driving trends and issues of this new phase in HPC and will discuss the major challenges that must be attacked to achieve the goal of delivering power-efficient exascale computers. Achieving sustained exascale performance in a 20MW power envelope requires significant power reduction beyond what will be provided by current technology scaling.

- March 10, 2011

"Understanding Ecosystem Processes with High-Resolution Data and Mathematics" John Zobitz, Augsburg College.

Abstract: The availability and distribution of multi-year, multi-scale, automated measurements are transforming the ecological and environmental sciences. In addition to continuous measurement of environmental variables such as temperature, sunlight, and moisture, other data streams include rates of change of atmosphere-ecosystem carbon and water. The application of mathematical models and techniques to these data is essential to explore fundamental biological processes occurring at the ecosystem scale. In this talk I'll how mathematics can be used to quantify and describe carbon uptake at the ecosystem scale and identify linkages between these measurements at multiple timescales by analyzing a dataset from a high elevation subalpine forest. Mathematical techniques will range from differential equations, statistics, and numerical analysis. A key objective of the talk is to not only illustrate the collaboration of mathematics and biology, but the collaboration across different areas of mathematics.

- April 14, 2011

"The Zero Forcing Number", Linh Duong, University of St Thomas (Student)

Abstract: What do students do when they face a difficult mathematical question? A good portion of us give up. Unlike most students, mathematicians ask new questions in an attempt to answer their existing ones. The minimum rank problem is a complicated matrix problem that has troubled many mathematicians. The zero forcing number is a graph parameter, recently introduced at AIM08 as tool for exploring the minimum rank problem. In this talk, I will introduce you to the zero forcing number, basic terminologies, how the zero forcing number behaves in different types of graphs, and how it relates to the minimum rank problem.

- May 12, 2011

"Biological Pattern Formation Seen Through a Mathematical Lens", Hans Othmer, University of Minnesota.

Abstract: Pattern formation during development of the adult form of an organism requires precise spatio-temporal control of gene expression. This typically involves complex signal transduction and control networks, but some basic issues can understood using simple paradigms such as the French flag problem. In this talk we will address the question of how to produce the same pattern on organisms of very different size, i.e., how do developing systems produce scale-invariant patterns

MAA-North Central Section 2011 Summer Seminar

Heavenly Mathematics:

The Birth of Mathematical Astronomy and Spherical Trigonometry

Principal Lecturer: Glen Van Brummelen
Quest University Canada

Location: Bemidji State University, Bemidji, Minnesota

Dates: July 24-29, 2011

Contact: Jason Douma jason.douma@usiouxfalls.edu

Registration Information to be updated as available.

The Program: The story of trigonometry is nothing like the lifeless collection of algorithms seen in high school. It came into being at the birth of science itself --- at the merging of geometrical models of the motions of celestial bodies with the desire to predict where the planets will go. The math itself was much deeper as well, flowing almost seamlessly into numerical analysis (as much as can be done without calculus), and mostly taking place on the surface of a sphere. In the mornings we shall explore the development of trigonometry through the astronomy of Greece, India and Islam, its surprising diversion into geography through the needs of Muslim religious ritual, and the beautiful modern spherical theory pioneered by John Napier alongside his invention of logarithms. In the afternoons we shall explore the forgotten art of spherical trigonometry as conceived by several cultures from ancient to modern times. This will include:

1. The historical foundation of mathematical astronomy, the spherical version of Menelaus's Theorem;
2. The discovery of surprising symmetries in modern spherical trigonometry, dismissed as mere mnemonics by Delambre and DeMorgan but demonstrated geometrically by Napier with his "miraculous pentagram";
3. The first proof (by Legendre) of Euler's polyhedral formula ($V-E+F=2$);
4. A shocking new path to spherical trigonometry using stereographic projection, discovered only in the early 20th century.

The Lecturer: Glen Van Brummelen is a historian of mathematics, especially trigonometry and astronomy in ancient Greece and medieval Islam. He is past president and current vice president of the Canadian Society for History and Philosophy of Mathematics, and was a senior fellow at the Dibner Institute for History of Science at MIT. In addition to authoring 30 scholarly and 10 encyclopedia articles, he is co-editor of *Mathematics and the Historian's Craft* (Springer) and recently published the first history of trigonometry in over a century with Princeton University Press called *The Mathematics of the Heavens and the Earth: The Early History of Trigonometry*. Van Brummelen has taught most of the traditional courses in mathematics as well as classes in mathematics and music, mathematics and democracy, mathematics and computer graphics, how to be an ancient astronomer, and spherical trigonometry (an award-winning class, using a 19th-century textbook). A passionate teacher-scholar, Dr. Van Brummelen has dedicated most of his career to teaching in a liberal arts setting, and has successfully guided several students through the process (and publication) of their undergraduate research.

FUTURE SECTION MEETINGS

Spring 2011	Carleton College	April 23-24
Fall 2011	Minnesota State University-Moorhead	October 28-29
Spring 2012	Concordia University, St. Paul	TBD

INFORMATION FOR CONTRIBUTORS

Submissions should be sent electronically (preferred method) to the shawn.chiappetta@usiouxfalls.edu or mailed to:

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Comments or corrections can be sent to the [webmaster](#). This page was last modified on: 08/07/2019 16:53:57.