

## JMM 2021 Call for MAA Contributed Papers

The MAA Committee on Sessions of Contributed Papers solicits papers pertinent to the sessions listed below. Any paper that fits the subject of one of the themed sessions should be submitted directly to that session. All others should be submitted to the general sessions, which will accept abstracts in all areas of collegiate mathematics, mathematical pedagogy, and the undergraduate mathematics curriculum. Presentations in the themed sessions are normally 15 minutes in length while presentations in the general sessions are limited to 10 minutes each.

Each participant may make **at most** one presentation in an MAA Contributed Paper Session, either a presentation in one of the themed sessions or a presentation in one of the general sessions (exclusive or). If a paper cannot be accommodated in the themed session for which it was submitted, it will automatically be considered for the general contributed paper sessions. The session rooms are equipped with computer projectors and screens. Please note that the dates and times scheduled for these sessions remain tentative. Questions concerning the submission of abstracts should be addressed to [abs-coord@ams.org](mailto:abs-coord@ams.org). Abstracts may be submitted electronically at <http://jointmathematicsmeetings.org/meetings/abstracts/abstract.pl?type=jmm>

**The deadline for submission of abstracts is Tuesday, September 8, 2020.**

### Contributed Paper Sessions with Themes

**Alternative Assessments in the Mathematics Classroom, organized by Whitney George**, University of Wisconsin - La Crosse and **Mark Branson**, Stevenson University. The assessment of student work and the assignment of grades to students is an integrable part of the academic profession. Nevertheless, there is little consensus in how students should be assessed and how grades should be assigned. The standard grading scheme of A, B, C, D, and F where A represents 90-100%, B represents 80-89%, C represents 70-79%, D represents 60-69%, and F represents 50% has been in place since the 1940s. To confound this, historically we also associate A with excellence, B with above average, C with average, D with below average, and F with failing. But is a student who earns a 90% truly excellent? Or, is a student who earns a 70% average? This session will highlight alternative grading schemes and assessment tools for student work such as but not limited to specifications grading, mastery-based grading, and oral exams. Speakers are encouraged to share original research, ideas, applications, course material, and assessment tools which are focused toward alternative assessment. Presentations should be scholarly in nature and are encouraged to address how alternative assessment strategies relate to topics such as retention and inclusivity.

**Beyond the Introductory Statistics Course**, organized by **Lisa Carnell**, High Point University and **Judith Canner**, California State University, Monterey Bay. While attention has been paid to modernizing the introductory statistics course, upper-level statistics courses have not necessarily received the same consideration. Driven by the explosion of data, advancements in computing, and the importance of interdisciplinary collaboration, students in statistics and data science need experiences that blend traditional mathematical approaches to statistics with cutting-edge data

analysis skills. The CUPM recommendations for a second course in statistics emphasize developing statistical thinking, using real (and messy) data to answer real questions, and focusing on conceptual understanding rather than rote procedures. The recently updated GAISE recommendations also reflect a similar emphasis with respect to statistics courses beyond the introductory level. This session invites papers that address innovations in teaching courses in statistics beyond the first course. The goal of this session is to engage statistics instructors and data science instructors in thinking about what the second course in statistics should look like in the 21<sup>st</sup> century. These evidence-based papers could address content, pedagogy, technology, or assessment and should reflect CUPM or GAISE guidelines. Sponsored by the SIGMAA on Stat Ed.

**Calculus: Engaging Students through Modeling, Hands-On Projects, and Innovative, Exploratory Approaches**, organized by **Joel Kilty**, Centre College, **Rachel Grotheer**, Goucher College, **Alison Marr**, Southwestern University, **Alex M. McAllister**, Centre College, and **Stephen M. Walk**, St. Cloud State University. The study of calculus is part of many students' college experiences, and we, as instructors, are always looking for innovative ways to enrich our students' understanding. Students come from diverse backgrounds and specialize in diverse areas of study, so the teaching and learning of calculus concepts should be pursued in diverse ways. Embedding the study of calculus in specific real-world contexts or exploratory investigations enables many students to engage with the ideas of calculus and learn them deeply. This session invites presenters to share their own innovative approaches to the teaching and learning of calculus that can be implemented readily at a wide variety of institutions, along with evidence for the effectiveness of those approaches. Such innovative approaches could be modeling scenarios, classroom activities, student projects, or other novel ways to explore concepts. The goal is that each talk will enable everyone to leave the room with some ideas that they can readily implement in their own classroom.

**Combining Technological Tools and Innovative Practices to Improve Student Learning Outcomes**, organized by **Charlotte Knotts-Zides**, Wofford College, **Karl Schmitt**, Valparaiso University, **Marianna Bonanome**, MAA CTME, **Ariane Masuda**, City Tech, CUNY, **Andrew Parker**, City Tech, CUNY, and **Manmohan Kaur**, Benedictine University. Experimentation in instructional methodologies is blooming. An increasing number of instructors are adapting more than one technological tool, integrating them with LMSs, and combining them with active learning techniques to improve student learning both in and outside of the classroom. The number of institutions that recognize and support these efforts through grants and special programs also continues to grow. This session will provide a venue for exposition of recent initiatives, thereby disseminating results (positive and negative), reducing duplication of effort, promoting collaboration between instructors, as well as across institutions, and providing recognition for those on the front lines of experimental learning. Sponsored by CTME (Committee on Technologies in Mathematics Education).

**Complex Analysis: History, Pedagogy, Innovation, and Research**, organized by **Russell W. Howell**, Westmont College, **Michael Brilleslyper** and **Beth Schaubroeck**, United States Air Force Academy. Proposals for this session of the JMM should be scholarly in nature, but can

come from a wide range of topics such as: surveying an episode in complex analysis that is of particular historical interest, demonstrating the use of complex analysis in art, elaborating on a new approach to a standard theorem, reporting on an innovative pedagogical strategy, describing research projects suitable for undergraduate or graduate students, or presenting an atypical idea that could be worked into the standard curriculum.

**Data-Driven Modeling Projects to Motivate Active Learning and Engagement**, organized by **Corban Harwood**, George Fox University, **Mark Branson**, Stevenson University, **Patrice Tiffany**, Manhattan College, **Rosemary Farley**, Manhattan College, **Gizem Karaali**, Pomona College, **Victor Piercey**, Ferris State University, and **Luke Tunstall**, Trinity University.

Modeling is widely used to motivate student learning in courses across the mathematics curriculum. Implementation of the modeling process through data-driven inquiry-based activities varies by course and backgrounds. This session seeks to present such a variety of implementation including a breadth of mathematical models, from conservation laws in differential equations to regression analysis in statistics. Students develop mathematical reasoning through inquiry, as results of a model depend upon the questions asked in forming it. This motivates students to learn needed content, familiarize themselves with technology to make their analysis more efficient, and become aware of assumptions as they revise their model in response to the data. We invite scholarly presentations of data-driven in-class activities or projects that generate active, inquiry-oriented learning across the mathematics curriculum. The diversity of presented modeling implementations benefits the community through shared resources, support, and new perspectives. Presenters are encouraged to discuss the value of modeling to themselves as teachers and to their students as learners, as well as techniques for improved data collection, implementation, and assessment. Sponsored by the QL SIGMAA & SIMIODE.

**Data for Good: Bringing Social and Professional Responsibility into the Statistics**

**Classroom**, organized by **Judith Canner**, California State University Monterey Bay. The data deluge is impacting our everyday life - whether making decisions for us through targeted ads or through the lack of data privacy rights. Many students will go on to be producers of data and data analysis and they will be faced with many choices related to ethics, equity, diversity, and social justice (aka social and professional responsibility). If we do not teach students how to critically approach these issues in the context of statistics and data science, we risk further damage to the fabric of our society. This session invites a variety of papers that address how to teach concepts of social justice, equity, inclusion, ethics, and social/professional responsibility in the statistics and data science classroom. The goal of the session is to promote critical thinking by statistics or data science instructors about pedagogical practices and curriculum development to teach on the intersection of statistics/data science and social/professional responsibility. Papers might address ways to incorporate civic engagement and community-based projects into the classroom, or using real data to address real issues in the local community, or student research projects on issues of ethics and social justice through a data-driven lens. Sponsored by the SIGMAA on Stat Ed.

**Developments, Directions, and Experiences in Open Educational Resources**, organized by **Benjamin Atchison**, Framingham State University, **Robert Beezer**, University of Puget Sound, and **Oscar Levin**, University of Northern Colorado. An increasing number of authoring tools, learning platforms, and related technological enhancements continue to foster the creation of open educational resources (OER) in mathematics and across disciplines, as well as push the boundaries in such areas as accessibility and both online and mobile learning. This session will showcase recent developments in this area. Presentations will include, but are not limited to, newly authored or enhanced OER and technological improvements/innovations related to mathematics instruction and education. Sponsored by the MAA Committee on Technologies in Mathematics Education (CTME).

**Discrete Mathematics in the Undergraduate Curriculum – Ideas and Innovations in Teaching**, organized by **Elise Lockwood**, Oregon State University, **John Caughman**, Portland State University, and **Oscar Levin**, University of Northern Colorado. Discrete mathematics offers many accessible points of entry for students to engage in deep mathematical thinking. Discrete mathematics is a fundamental aspect of mathematics and computer science, and it is increasingly relevant in our digital world. The aim of this session is for researchers and teachers to share ideas for how to improve the teaching and learning of discrete mathematics at all undergraduate levels. We characterize discrete mathematics broadly to encompass topics of sets, logic, proof techniques, recurrences, combinatorics, graph theory, relations, and more. We hope to facilitate communication between mathematics education researchers and those who teach these topics. We welcome scholarly presentations that speak to pedagogical aspects of discrete mathematics, which may include, but are not limited to: research on student thinking about relevant concepts, research demonstrating effective instructional strategies, ideas for incorporating technology into the discrete mathematics classroom, innovative activities or pedagogical interventions, or philosophies toward teaching discrete mathematics.

**The EDGE (Enhancing Diversity in Graduate Education) program: Pure and Applied talks by Women Math Warriors**, organized by **Laurel Ohm**, University of Minnesota, **Shanise Walker**, University of Wisconsin - Eau Claire, and **Ziva Myer**, Duke University. Since its beginning in 1998, over two hundred and fifty women have participated in the EDGE program. Approximately seventy are currently working towards a PhD, over one hundred and thirty have earned Masters degrees, and more than one hundred have gone on to successfully complete PhDs. This session will be comprised of research talks in a variety of different subdisciplines given by women involved with the EDGE program. For more information on the EDGE program, see <http://www.edgeforwomen.org/>.

**Engaging Math Club Activities**, organized by Brian Hollenbeck, Emporia State University, David Dempsey, Jacksonville State University, and Rhonda McKee, University of Central Missouri. What is your math club's favorite activity? This session invites presenters to share a creative or interesting activity that was particularly engaging for students. We especially want to hear about experiences that could be adapted to other institutions. It can be related to Pi Day, an honor society initiation, an MAA student event, or any other math club gathering. Presenters are encouraged to share what went well, and what could have been improved. This session is

sponsored by Kappa Mu Epsilon, in honor of KME's 90th anniversary as a mathematics honor society. KME was founded in 1931 to promote the interest of mathematics among undergraduate students. A reception will be held after the conclusion of the session for KME members as well as anyone who would like to learn more about the organization. Sponsored by Kappa Mu Epsilon, National Mathematics Honor Society.

**Growing from a Teaching Postdoc**, organized by Kayla Blyman, St. Martin's University, Diana Thomas, United States Military Academy - West Point, and Krista Watts, United States Military Academy - West Point. Teaching postdoctoral positions are a mystery. Many early career faculty worry about obstacles these positions may present for future employment due to the limited time they will have to conduct the research necessary to find a permanent tenure track position. However, several institutions invest greatly in their teaching postdoctoral fellows, allowing their fellows to creatively engage in courses and leading undergraduate research in ways that are both unique and transformational. Teaching postdoctoral fellowships give early career faculty an opportunity to diversify their experiences in higher education environments as they learn how to deal with heavier teaching loads and diverse student bodies while still conducting their own research. Former teaching postdoctoral fellows and their mentors are invited to present reflections on their experiences and to share how those experiences have contributed to their success in academia. We look forward to hearing stories of challenging and rewarding experiences that are full of positive – and sometimes surprising – outcomes.

**Incorporating Realistic Applications of Mathematics Through Interdisciplinary Collaborations**, organized by **Mary R. Parker**, Austin Community College, **Mary Beisiegel**, Oregon State University, **Rebecca Segal**, Virginia Commonwealth University, and **Suzanne Doree**, Augsburg University. Finding realistic applications of mathematics from other disciplines that can be included in mathematics courses is challenging. Many of us have benefited from our interactions with faculty and practitioners from other disciplines. Others of us realize that this would be useful but are unsure how to begin such a collaboration. Papers in this session will highlight the process of the collaboration (how it began, the eventual results, and a summary of “lessons learned”) as well as showcasing a particular example of an application of mathematics that was added to the curriculum as a result of the collaboration. Examples at any level of the mathematics curriculum are welcome. All presentations should include evidence of success in the collaboration process as well as evidence of impact on students, for example on student engagement, sense of belonging, student learning, persistence in math/STEM, etc. In the abstract, please identify the partner discipline(s), mathematics course(s), and the nature of examples developed. Sponsored by the Math Across the Disciplines subcommittee and the Committee on Curriculum Renewal Across the First Two Years, subcommittee of the Committee on Undergraduate Programs in Mathematics.

**Innovative and Effective Ways to Teach Linear Algebra**, organized by **David Strong**, Pepperdine University, **Gil Strang**, MIT, **Megan Wawro**, Virginia Tech, and **Sepideh Stewart**, University of Oklahoma. Linear algebra is one of the most interesting and useful areas of mathematics, because of its beautiful and multifaceted theory, as well as the enormous importance it plays in understanding and solving many real-world problems. Consequently, many valuable and creative ways to teach its rich theory and its many applications are

continually being developed and refined. This session will serve as a forum in which to share and discuss new or improved teaching ideas and approaches. These innovative and effective ways to teach linear algebra include, but are not necessarily limited to: (1) hands-on, in-class demos; (2) effective use of technology, such as Matlab, Maple, Mathematica, Java Applets or Flash; (3) interesting and enlightening connections between ideas that arise in linear algebra and ideas in other mathematical branches; (4) interesting and compelling examples and problems involving particular ideas being taught; (5) comparing and contrasting visual (geometric) and more abstract (algebraic) explanations of specific ideas; (6) other novel and useful approaches or pedagogical tools.

**Inquiry-Based Learning and Teaching**, organized by **Susan Crook**, Loras College, **David Failing**, Lewis University, **Nathaniel Miller**, University of Northern Colorado, **Carl Mummert**, Marshall University, and **Mami Wentworth**, Wentworth Institute of Technology. The goal of Inquiry-Based Learning (IBL) is to transform students from consumers to producers of mathematics. Inquiry-based methods aim to help students develop a deep understanding of mathematical concepts and the processes of doing mathematics by putting those students in direct contact with mathematical phenomena, questions, and communities. Within this context, IBL methods exhibit great variety. Activities can take place in single class meetings and span entire curricula for students of any age. Students can be guided to re-invent mathematical concepts, to explore definitions and observe patterns, to justify core results, and to take the lead in asking questions. There is a growing body of evidence that IBL methods are effective and important for teaching mathematics and for fostering positive attitudes toward the subject. This session invites scholarly presentations on the use of inquiry-based methods for teaching and learning. We especially invite presentations that include successful IBL activities or assignments, that support observations about student outcomes with evidence, or that could help instructors who are new to IBL try new methods. Sponsored by IBL SIGMAA.

**MAA Session on Mathematical Experiences and Projects in Business, Industry, and Government (BIG)**, organized by **Vinodh Chellamuthu**, Dixie State University and Caroline Maher-Boulis, Lee University. The extraordinary growth of complex open-ended problems facing business, industry, and government, along with the flood of available information and data to address these challenges, may seem overwhelming. It should not! As mathematicians, operations research analysts, and engineers, including those within academia who have addressed these issues, we experience and tackle these problems with experience, knowledge, and technological tools. We solve applied mathematics problems in business, industry, and government, including military applications, almost daily. We seek presenters to share their real world applied examples of this type of problem-solving. These talks may include successful mathematical applications or problems where you have no clue how to proceed and are seeking ideas from our audience. Your talks will serve as inspiration to solve and tackle the real challenges that we may face in the future. You do not have to be a BIG SIGMAA member to attend or present. Sponsored by BIG SIGMAA.

**Math Focused Integrative Learning**, organized by Evelina G. Lapierre, Johnson & Wales University. Integrative learning is defined as the ability to connect, synthesize and relevantly apply concepts between two or more disciplines; for example, exploring popular culture through

statistics, studying Leonardo da Vinci and his works, or examining symmetry in mathematics, physics and music. Many universities are requiring integrative learning courses as part of their general education programs in order to promote the importance of adaptive thinking. The presenters will share their strategies for developing and delivering math-focused integrative learning courses that are rigorous, inclusive, and popular, while providing students with the opportunity to expand their idea of what math is beyond the confines of the standard mathematics course.

**Mathematics and Music**, organized by **Darren A. Narayan**, Rochester Institute of Technology and **Douglas Norton**, Villanova University. Connections between mathematics and musical elements such as rhythms, scales, and musical compositions been well established. We welcome presentations from various areas of mathematics that have connections to music. In addition, we seek papers that have synergy between the learning of mathematical concepts and the learning of music. Sponsored by the MAA CUPM Subcommittee on Mathematics Across the Disciplines and SIGMAA-ARTS.

**Mathematics and the Life Sciences: Initiatives, Programs, Curricula**, organized by Timothy D. Comar, Benedictine University, Raina Robeva, Randolph-Macon College, [and](#) Carrie Diaz Eaton, Bates College. The 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences identified the life sciences as a key path through the mathematics major to graduate programs and the workforce. Presentation topics include scholarly contributions addressing initiatives, programs, curricula, and course materials at the interface of mathematics and the life sciences that have been implemented and tested at institutions of higher education. Sponsored by BIO SIGMAA.

**Mathematics and Sports**, organized by **John A. David**, Virginia Military Institute, and **Elizabeth L. Bouzarth**, Furman University. The expanding availability of play-by-play statistics and video-based spatial data have led to innovative research using techniques from across the mathematical sciences, with impacts on strategy and player evaluation. Other areas of interest include ranking methods, predictive models, physics-based analysis, etc. Research presentations, expository talks, and contributions related to curriculum or pedagogy are all welcome. With a broad audience in mind, talks should be accessible to undergraduate mathematics majors, and projects involving undergraduate students are particularly encouraged for submission. Sponsored by the Sports SIGMAA.

**Mathematics for Makers, Creators, and Artists**, organized by **Brandy S. Wieggers**, Central Washington University, **Spencer C. Bowen**, National Association of Math Circles, American Institute of Mathematics, **Anil Venkatesh**, Adelphi University, **Karl Kattchee**, University of Wisconsin-La Crosse, and **Douglas Norton**, Villanova University. This session invites presentations on the interplay between mathematics and the arts, broadly construed. We welcome artists who incorporate mathematical subjects or themes, or use mathematics in the creative process. We also welcome mathematical investigations that analyze or are inspired by art, as well as classroom applications that integrate mathematics and the arts. Whether you work directly in these topics or engage occasionally out of curiosity, this session is a place to share your scholarly

or creative practice. We particularly encourage contributions on topics historically less represented in the session, such as dance, literature, film, and architecture. Activities that allow active audience participation or share examples of student work are especially welcomed. Sponsored by SIGMAA-ARTS and SIGMAA-MCST.

**The Philosophy of Mathematics, in Memory of Reuben Hersh**, organized by **Sally Cockburn**, Hamilton College, **Tom Morley**, Georgia Tech (emeritus), and **Kevin Iga**, Pepperdine University. Philosophy of mathematics since the late 1970s owes a great debt to Reuben Hersh (1927-2020), who, arguably more than anyone else at the time, re-engaged mathematicians with questions on the nature of mathematics and proof. Hersh's writings on social constructivism (that the reality of mathematics is as a social, cultural, and historical construct), on actual proofs done by mathematicians (as opposed to formal proofs) and mathematics as a human activity (as opposed to a platonic ideal or a formal system) were and still are controversial. However, his work inspired many mathematicians to elucidate their own views on such matters, and the resulting discussions remain fruitful today. This session welcomes talks engaging with any of the many topics in the philosophy of mathematics that Hersh discussed. Sponsored by the SIGMAA on the Philosophy of Mathematics.

**Promoting Womxn in Mathematics**, organized by **Anila Yadavalli**, University of Minnesota, **Sarah Greenwald**, Appalachian State University, **Francesca Bernardi**, Florida State University, **Judy Holdener**, Kenyon College, and **Semra Kilic-Bahi**, Colby-Sawyer College. The purpose of this session is to encourage meaningful discourse surrounding the underrepresentation of womxn in mathematics and statistics. Certainly, these disciplines benefit from the talents and contributions of all people — regardless of gender — and gender equity is a matter of social justice. To this end, we solicit talks offering promising ideas and solutions for recruiting, encouraging, supporting, or retaining womxn in mathematics. We also welcome talks focusing on issues residing at the intersections of gender with cultural, ethnic, sexual, or other identities. Talks might include, but are not limited to, a novel idea for teaching and learning, a bridge program, a mentoring program, an outreach program, or extracurricular activities. Talks should have practical, transferable advice encouraging scalability and facilitating implementation by practitioners. Claims made within a talk regarding the success of a program/activity/practice or teaching pedagogy should be compelling and may be substantiated by anecdotal reports or by a summary of a formal study. Speakers will be invited to submit their work for consideration in the upcoming PRIMUS special issue on Promoting Women in Mathematics. Sponsored by the AWM 50th Anniversary Committee, the Joint Committee on Women (JCW), the MAA Committee on the Participation of Women, *PRIMUS*: Problems, Resources, and Issues in Mathematics Undergraduate Studies, and SPECTRA.

**Recreational Mathematics: Puzzles, Card Tricks, Games, and Gambling**, organized by **Paul R. Coe**, Dominican University, **Sara B. Quinn**, Dominican University, and **David A. Nash**, Le Moyne College. Puzzles, card tricks, board games, game shows, and gambling provide an excellent laboratory for testing mathematical strategy, probability, and enumeration. The analysis of such diversions is fertile ground for the application of mathematical and statistical theory. Solutions to new problems as well as novel solutions to old problems are welcome. Sponsored by the SIGMAA on Rec Math.

**Research in Undergraduate Mathematics Education (RUME)**, organized by **Brian P. Katz**, California State University Long Beach, **Shiv Smith Karunakaran**, Michigan State University, and **Nicole Engelke Infante**, West Virginia University. The goals of this session are to promote quality research in undergraduate mathematics education, to disseminate educational studies to the greater mathematics community, and to facilitate the impact of research findings on mathematics pedagogy. Presentations may be based on research in any undergraduate mathematical area. Examples include studies about students' reasoning, teaching practices, curriculum design, and professional development. Sponsored by the SIGMAA on RUME.

**The Scholarship of Teaching and Learning in Collegiate Mathematics**, organized by **Jacqueline Dewar**, Loyola Marymount University, **Tom Banchoff**, Brown University, **Curtis Bennett**, California State University Long Beach, **Edwin Herman**, University of Wisconsin-Stevens Point, **Lew Ludwig**, Denison University, and **Larissa Schroeder**, University of Hartford. In the scholarship of teaching and learning, faculty bring disciplinary knowledge to bear on questions of teaching and learning and systematically gather evidence to support their conclusions. Work in this area includes investigations of the effectiveness of pedagogical methods, assignments, or technology, as well as inquiries into student understanding. The session goals are to: (1) feature scholarly work on the teaching of post-secondary mathematics, (2) provide a venue for teaching mathematicians to make public their scholarly investigations into teaching/learning, and (3) highlight evidence-based arguments for the value of teaching innovations or in support of new insights into student learning. Appropriate for this session are preliminary or final reports of investigations of post-secondary teaching methods, student learning difficulties, curricular assessment, or insights into student (mis)understandings. Abstracts should: (1) have a clearly stated question that was or is under investigation and (2) indicate the type of evidence that has been or will be gathered and presented. For example, abstracts might refer to evidence such as student work, reflective writing, participation or retention data, pre/post-tests, interviews, surveys, think-alouds.

**The Teaching and Learning of Undergraduate Ordinary Differential Equations, in memory of William E. Boyce**, organized by **Christopher S. Goodrich**, University of New South Wales and **Beverly H. West**, Cornell University. The teaching of undergraduate Ordinary Differential Equations (ODEs) provides a unique way to introduce students to the beauty and applicative power of the calculus. ODEs are also rich with aesthetically pleasing theory, which often can be successfully communicated visually and explored numerically. This session will feature talks that describe innovative teaching in the ODEs course as well as the description of either projects or pedagogy that can be used to engage students in their study of ODEs. Successful contributions could include but are not limited to: (1.) innovative ways of teaching standard topics in the ODEs course; (2.) strategies for teaching both differential equations and linear algebra simultaneously; (3.) the inclusion of technology in the ODEs course; (4.) examples of interdisciplinary lessons such as, for example, those that connect to social justice and environmental concerns; and (5.) descriptions of applications or nonstandard topics and how such topics can lead to student engagement and interest. In addition, contributors should include

some discussion of the success of their methods, such as in what ways the activity or method under discussion has improved student learning, retention, or interest in the differential equations course. Bill Boyce, working with Richard DiPrima and Douglas Meade over the years created 11 editions of their famous Elementary Differential Equations with Boundary Value Problems, from 1969 to 2017. Boyce transitioned early from a traditional approach finding analytic solutions, to a more reformed approach to teaching ODEs, and jumped on the bandwagon of the computer graphics revolution by the early 1990s. We honor one of our best advocates. Sponsored by CODEE.

**Teaching Math Modeling and Sustainability**, organized by **Victor J. Donnay**, Bryn Mawr College, **Ben J. Galluzzo**, Clarkson University, and **Thomas Pfaff**, Ithaca College. An oft-stated rationale for improving STEM education is the crucial role of STEM in economic competitiveness. Given the wide range of social and environmental issues facing the nation and the world, we suggest that a more motivating rationale, for both students and teachers, would be using STEM to address issues of sustainability. In this session, speakers will present a variety of ways that they have brought issues of sustainability into their college and university math teaching. These examples span a continuum from stand-alone lessons focused on a sustainability topic that can be incorporated into existing courses such as calculus and statistics to entire courses focused on applying techniques of mathematical modeling to issues of sustainability. These more extensive links to sustainability can also include community-based service-learning projects in which math students serve as consultants to analyze a sustainability issue of interest to a community partner. These presentations, while aimed at faculty in higher education, would also be of interest to secondary school teachers. Sponsored by SIGMAA EM.

**Ways of Improving Student Performance in Mathematics That Are Not Specific to Content**, organized by **Wade Ellis**, West Valley College (retired). College mathematics students often perform poorly because they have difficulty reading to learn mathematics, preparing for class, persisting, managing time or being self-reliant, i.e., their learning skills could be strengthened, especially those required for learning mathematics. Historically, mathematics faculty members assume students know these and other learning skills. Moreover, they are hesitant to take up valuable class time developing learning skills even though they believe that strengthening such skills would improve student performance. This CPS seeks scholarly talks that discuss how to effectively integrate learning skills into mathematics courses with minimal impact on content covered while providing evidence that practices and methods presented have been successful in improving student mathematical performance. Sponsored by the MAA CRAFTY Committee.

## **GENERAL CONTRIBUTED PAPER SESSIONS**

**GENERAL CONTRIBUTED PAPER SESSIONS**, Organized by **Cathy Erbes**, Hiram College, **Melvin G. Royer**, Indiana Wesleyan University, and **Diana Thomas**, United State Military Academy - West Point. The MAA's General Contributed Paper Session accepts contributions in all areas of mathematics, curriculum,

and pedagogy. When you submit your abstract, you will be asked to classify it according to the following scheme: Assessment; History or Philosophy of Mathematics; Interdisciplinary Topics in Mathematics; Mathematics and Technology; Mentoring; Modeling and Applications; Outreach; Teaching and Learning Developmental Mathematics; Teaching and Learning Introductory Mathematics; Teaching and Learning Calculus; Teaching and Learning Advanced Mathematics; Algebra; Analysis; Applied Mathematics; Geometry; Graph Theory; Linear Algebra; Logic and Foundations; Number Theory; Probability and Statistics; and Topology.



