

2022 June RiSE Conference



**Integrating Research and Practice:
Working Together to Support Robust Student Learning in STEM**

Conference Program

June 26–28, 2022 • University of Maine • Orono, Maine

Hosted by the Maine Center for Research in STEM Education

Co-hosted by Maine-eDNA



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University of Maine Land Acknowledgement

The University of Maine recognizes that it is located on Marsh Island in the homeland of the Penobscot Nation, where issues of water and territorial rights, and encroachment upon sacred sites, are ongoing. Penobscot homeland is connected to the other Wabanaki Tribal Nations — the Passamaquoddy, Maliseet, and Mi'kmaq — through kinship, alliances and diplomacy. The university also recognizes that the Penobscot Nation and the other Wabanaki Tribal Nations are distinct, sovereign, legal and political entities with their own powers of self-governance and self-determination.

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Introduction

Welcome to the 2022 June RiSE Conference at the University of Maine's flagship campus in Orono, located on Marsh Island in the homeland of the Penobscot Nation.

We are delighted to once again gather in person, exchanging ideas and current work centered on integrating STEM education research and practice. This year we focus on "Working Together to Support Robust Student Learning in STEM" and our themes are as follows:

- Teaching for Robust Understanding (TRU Framework)
- Building Inclusive Classroom Communities and Promoting Social Justice in STEM
- Engaging Students with Active Learning (K–16)
- Supporting Science Learning with Computing and Computational Thinking

National and local experts have been invited by the conference committee to provide thought-provoking ideas, newest research findings, best practices, and strategies for addressing challenges. Our agenda includes a keynote presentation and other plenary sessions, concurrent talk and workshop sessions, and opportunities to network with other educators and researchers.

An experiential "sandbox" area will be available between sessions for drop-in interactions with computing and computational thinking activities that are part of the current NSF-funded Maine STEM Partnership project known as STEM+C. Have fun and take advantage of this hands-on opportunity to explore integrating computer science into existing science resources!

We hope you find this conference a valuable experience. Enjoy every minute of these two packed and exciting days of our annual conference. Thank you for all that you are contributing to our educational and professional communities.

May our time together be enriching for us all.

The 2022 June RiSE Conference Planning Committee and RiSE Center Staff

Susan McKay, Director of the RiSE Center
and Professor of Physics

Sara Lindsay, Assistant Director of the RiSE
Center and Professor of Marine Science

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Specialist

Beth ByersSmall, NSF Teaching Fellowship
Program Coordinator and June RiSE
Conference Planning Committee Chair

Franziska Peterson, Assistant Professor of
Mathematics Education and RiSE Center
Graduate Coordinator

Maureen Raynes, Financial & Personnel
Manager

Yadina Clark, Administrative Specialist

Maine Center for Research in STEM Education

The Maine Center for Research in STEM Education (RiSE Center) provides an integrated approach to University-based research and professional learning experiences in science, technology, engineering and mathematics education. The RiSE Center is an interdisciplinary research center with 21 faculty members from the College of Education and Human Development, the College of Engineering, the College of Liberal Arts and Sciences, and the College of Natural Sciences, Forestry and Agriculture. RiSE faculty members are involved in partnerships with other STEM and STEM education faculty, PreK–12 teachers and administrators, and members of nonprofits committed to improving STEM education. Their work includes basic and applied research on learning and teaching in science and mathematics; research-guided modifications to introductory and upper level science, mathematics, and engineering courses to include more student-centered practices; establishing content-rich, research-based teacher preparation and ongoing professional learning; and building infrastructure for ongoing STEM education improvement with teachers, schools, and administrators throughout the state.

The Master of Science in Teaching Program, offered by the RiSE Center, provides a rigorous research-based route to initial certification for STEM majors interested in teaching secondary science and/or mathematics; an opportunity for veteran teachers to build their knowledge of teaching and learning in their disciplines while earning a Master's degree; and a chance for STEM majors to conduct STEM education research, often in preparation for doctoral work in a related field. All MST graduates must complete a research thesis as part of the degree requirements. The University of Maine has recently established a Ph.D. program in STEM Education, offered by RiSE Center faculty members through the College of Education and Human Development.

Since its formation in 2001, the RiSE Center has hosted conferences annually focused on integrating STEM education research and practice. This integration is a significant part of many of the Center's initiatives, including the Maine STEM Partnership, a state-wide preK–16+ STEM education improvement community with 160 Maine schools, 100 school districts, 700 teachers, 29,000 students, and over 40 University of Maine faculty members. The Partnership sustains a state-wide professional community that brings educators and education researchers together to support high-quality, evidence-based instruction for students at all levels. More information about the RiSE Center and its programs can be found at umaine.edu/risecenter.



Celebrating the 20th Anniversary of the RiSE Center

Mission: To advance the research and practice of teaching and learning in science, technology, engineering, and mathematics – the STEM disciplines

The Maine Center for Research in STEM Education (RiSE Center) was founded in 2001 (originally with the name Center for Science and Mathematics Education Research) with a \$1.23 million grant from the U.S. Department of Education Fund for the Improvement of Education. This initial grant began the development of the RiSE research portfolio, using discipline-based education research to study teaching and learning. It also established the Master of Science in Teaching Program, a content-rich, research-based program for secondary teacher preparation or further graduate study for those interested in STEM education research.

Faculty who were part of the team to launch the Center, develop and teach the core courses, and form partnerships during Center's first decade are: François Amar (Chemistry), Mitchell Bruce (Chemistry), Robert Franzosa (Mathematics and Statistics), Chris Gerbi (Earth and Climate Sciences), Susan McKay (Physics and Astronomy, Founding Director), Eric Pandiscio (Learning and Teaching), Molly Schauffler (Earth and Climate Sciences), Natasha Speer (Mathematics and Statistics), John Thompson (Physics and Astronomy), Michael Wittmann (Physics and Astronomy), and Professor Emeritus Steve Norton (Earth and Climate Sciences). This team provided the foundation for the success of RiSE and its growth to its current 21 faculty members, over 20 graduate students, and 10 professional staff. RiSE faculty members come from four of UMaine's colleges: Education and Human Development, Engineering, Liberal Arts and Sciences, and Natural Sciences, Forestry and Agriculture. Thus, RiSE brings together multiple disciplinary perspectives in its research, which often includes the ongoing involvement and contributions of teachers and administrators as well.

The RiSE research portfolio now contains a broad spectrum of basic and applied research and evaluation studies, such as investigations of knowledge for teaching, reasoning chains in student development, creation of more authentic laboratory learning experiences, using virtual reality to support learning, quantitative reasoning in context and data literacy, emotional aspects of science teaching and learning, incorporating ethics and justice in STEM communication courses, student knowledge transfer across courses and disciplines, and teacher supports needed to integrate STEM disciplines and conduct community-based, project-based learning.

In its second decade, RiSE received a major NSF Math Science Partnership grant, closely followed by a Maine Department of Education grant. These awards combined brought over \$15 million to build partnerships to improve science education at the elementary, middle and 9th grade levels, with particular attention to physical sciences across the critical junction between middle and high school and the recruitment and preparation of STEM teachers. This work involved over 1,100 Maine teachers and has been sustained since the grants ended through the formation of the Maine STEM Partnership at the RiSE Center, a statewide STEM education improvement community. Current RiSE programs initiated through these grants include the Faculty Course Modification Incentive Grant –

Maine Learning Assistants Program (FIG-MLA), the RiSE Materials Warehouse, and professional learning communities for teachers using RiSE task-force-selected instructional resources, and RiSE teacher collaboratives. These expanded state-wide programs would not have been possible without the talents and commitment of RiSE staff members, many of whom bring valuable teaching experience and knowledge of STEM education research to their work.

RiSE continues to expand its research portfolio and build research – practice partnerships with teachers, STEM and STEM education faculty, community members and other stakeholders to strengthen STEM education for all Maine students. Examples of current partnerships include the NSF Teaching Fellowship Program, which recruits, prepares, supports and retains STEM teachers in high-need Maine districts; the NSF STEM+C Program, which integrates computing and computational thinking into middle school science; and NSF EPSCoR Track-1 and Track-2 partnerships, which bring cutting-edge, environmentally relevant research into Maine classrooms. This work brings the excitement and opportunities offered by a high quality STEM education to over 9,000 students annually, PreK–16+, while building a culture of evidence to guide ongoing improvement.

umaine.edu/risecenter

The 2022 June RiSE Conference is hosted by the RiSE Center and Maine e-DNA.

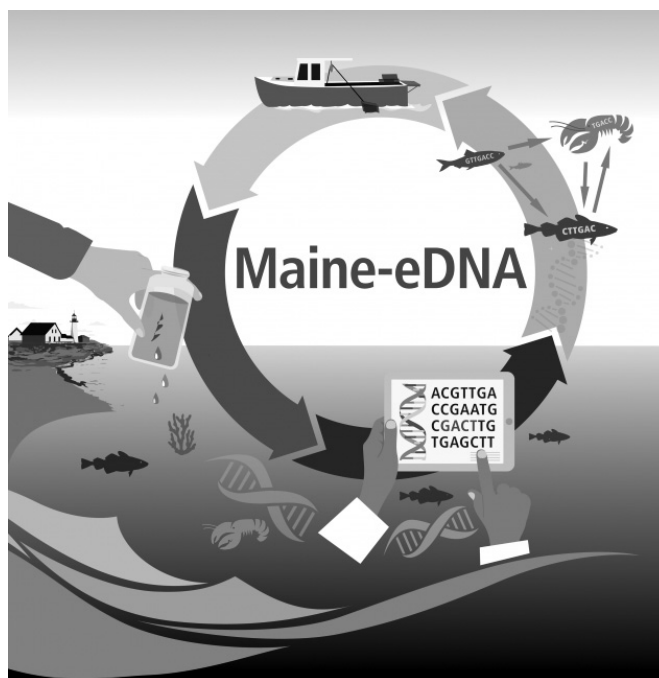
We gratefully acknowledge all of the units at the University of Maine that contributed financially to this conference:

- In the amount of \$500-\$999: College of Engineering; Department of Physics and Astronomy; School of Earth and Climate Sciences
- In the amount of \$1,000-\$2,499: College of Education and Human Development
- In the amount of \$2,500-\$4,999: College of Natural Sciences, Forestry and Agriculture
- In the amount of \$5,000 or more: Office of the Vice President for Research and Dean of the Graduate School

Conference Co-Host: Maine-eDNA

Coastal systems are central to Maine's economy and culture, but are also undergoing unprecedented environmental and societal changes. Maine-eDNA, a 5-year, Maine EPSCoR Track-1 project in its third year, aspires to make Maine 'the DNA Coast' - a world leader in eDNA-based partnerships, understanding, and sustainability of coastal marine and freshwater ecosystems, harnessing the power of eDNA science to 1) advance ecological understanding crucial to the current needs of Maine's marine and freshwater resources, while 2) building the Big Data and IP innovations, technical workforce, and partnership capacities to address the increasingly large-scale and complex sustainability challenges of changing coastal ecosystems.

The project is designed to significantly advance our understanding and use of coastal ecosystems, through emerging environmental DNA (eDNA) science that is transforming how we collect, share, and integrate biological data. Maine-eDNA research will underpin technical advances in the utilization and interpretation of eDNA data to address ecological knowledge at scales that have eluded prior research but are essential to understanding and sustaining this large and complex macrosystem. The approach is through 1) transdisciplinary team science that builds from topic-focused studies to coast-wide Big Data integration, and 2) training of a diverse STEM workforce that is prepared for the molecular and informatics skills of the future. This is coupled with an educational outreach program that will develop curricula for K-12 and college students, train teachers, as well as engage partners and citizen scientists.



umaine.edu/edna

Conference Schedule

Sunday, June 26

5:00–6:00 p.m.	Conference Check-In	Wells Conference Center
6:00–7:00 p.m.	Banquet and Cash Bar	Wells 1
7:00–8:00 p.m.	Keynote Presentation	Wells 1

Monday, June 27

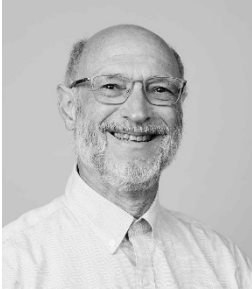
7:30–8:30 a.m.	Breakfast	Wells
8:30–9:30 a.m.	Welcome, Opening Activity and Discussion	Wells 1
9:45–10:15 a.m.	Talk Session A	Wells 1, 2, 3
10:15–10:45 a.m.	Networking, STEM+C Sandbox, Bookstore	Wells Atrium
10:45–11:15 a.m.	Talk Session B	Wells 1, 2, 3
11:15 a.m.–12:30 p.m.	Lunch (Gourmet Sandwich Wraps)	Dining Tent
12:30–2:00 p.m.	Workshop Session A	Wells 1, 2, 3
2:00–2:45 p.m.	Networking, STEM+C Sandbox, Bookstore	Wells Atrium
2:45–4:15 p.m.	Workshop Session B	Wells 1, 2, 3
4:30–6:00 p.m.	Poster Session (with Appetizers and Cash Bar)	Wells 1
6:00–8:00 p.m.	RiSE Center 20th Anniversary Picnic (Black Bear Barbecue with Burgers and Hot Dogs)	Dining Tent

Tuesday, June 28

7:30–8:30 a.m.	Breakfast	Wells
8:30–10:00 a.m.	Workshop Session C	Wells 1, 2, 3
10:00–10:30 a.m.	Networking, STEM+C Sandbox, Bookstore	Wells Atrium
10:30–11:45 a.m.	Panel with Roundtable Discussion	Wells 1
11:45 a.m.–1:00 p.m.	Lunch (Chef-Made Sandwich Buffet)	Dining Tent
1:00–2:30 p.m.	Workshop Session D	Wells 1, 2, and Bennett 301
2:30–3:00 p.m.	Wrap Up and Door Prizes	Wells 1

Keynote Presentation

Sunday, 7:00–8:00 p.m.



Alan Schoenfeld

Elizabeth and Edward Conner Professor of Education
Affiliated Professor of Mathematics
University of California at Berkeley

Teaching for Robust Understanding: Powerful instruction for all students

We want our students – all of our students – to emerge from our classrooms as knowledgeable and resourceful thinkers and problem solvers, with a sense of personal agency and positive dispositions about themselves as mathematics learners. The question is, how do we get there? That is, what kinds of learning environments help all students become powerful mathematical thinkers?

The Teaching for Robust Understanding (TRU) framework says what counts. If the content is rich; if students are engaged in sensemaking and productive struggle; if there are ways to engage every student with core mathematical content and practices; if norms support engagement that supports a sense of agency, ownership over the content, and a sense of mathematical self; and if there are robust feedback mechanisms (formative assessment), then good stuff happens.

I'll illustrate the framework with a video and talk about tools that can help these ideas come alive in classrooms.

Welcome, Opening Activity and Discussion

Monday, 8:30–9:30 a.m.

Welcome!

Beth ByersSmall, *RiSE Center, University of Maine*

Opening Activity and Discussion

Do you copy?

Samantha Poll, *Samuel L. Wagner Middle School (RSU #22)*

Marina Van der Eb, *RiSE Center, University of Maine*

Beth ByersSmall, *RiSE Center, University of Maine*

Please join us in kicking this conference off with this fun hands-on teacher led activity using computational thinking skills. Roll up your sleeves, put your ears on and test your skills, then join your colleagues in a discussion about engaging students in STEM.

Talk Session A

Monday, 9:45–10:15 a.m.

Wells 1	Wells 2	Wells 3
An Introduction to Social Emotional Learning Grace Coffe Nick Innis Betsy Trenckmann	Findings and Impacts from a Research-Practice Partnership to Integrate Computer Science into Middle School Science Classrooms Chrissy Siddons Marina Van der Eb	Factors that Affect Effort Kristen Pratt

A1. **An Introduction to Social Emotional Learning**

Grace Coffe, *Brewer High School, NSF Teaching Fellow*

Nick Innis, *Mt. Ararat High School, NSF Teaching Fellow*

Betsy Trenckmann, *Hermon High School, NSF Teaching Fellow*

We will introduce an immersive professional development opportunity to explore social emotional learning in a science and mathematics classroom setting that will be offered next year by the Maine STEM Partnership. We will discuss the skills learned in the session that will foster an inclusive classroom for you and your students.

A2. **Findings and Impacts from a Research-Practice Partnership to Integrate Computer Science into Middle School Science Classrooms**

Chrissy Siddons, *RiSE Center, University of Maine*

Marina Van der Eb, *RiSE Center, University of Maine*

Over the last four years, the RiSE Center's STEM+C research-practice partnership, Integrating Computing into Science Teaching and Learning in Grades 6-8: A Diverse Partnership to Develop an Evidence-Guided Model to Serve Rural Communities, has worked with over 30 teachers across the state of Maine to explore the opportunities around integrating computer science into middle school science classrooms. During the course of the project, STEM education faculty, computer science faculty, graduate students, and external partners worked together to develop integrated Earth, life and physical science lessons and to learn about the supports needed by teachers to integrate computer science into their classrooms. We will share some of our preliminary findings from this work including the resources teachers identified as critical to this integration effort, the knowledge teachers developed through this partnership, and the impacts on student learning and engagement.

A3. **Factors that Affect Effort**

Kristen Pratt, *Maine Maritime Academy*

Student effort is a key factor for academic achievement, as well as a core issue in education. The purpose of this research is to gain an understanding of the factors that influence student effort and to determine how student effort can be improved. Effort is a critical element of success in school, and educators should strive to gain knowledge about the factors that influence effort at the high school level. Many studies have shown that student effort varies by cultural ethnicity (Fwu et al., 2014; Gneezy et al., 2019; Kang & Chang, 2016; Swanson et al., 2017; Xu, 2019; Zang, 2018). This investigation explored those factors. An understanding of the different cultural attitudes toward education could help raise aspirations for all students.

Talk Session B

Monday, 10:45–11:15 a.m.

Wells 1	Wells 2	Wells 3
Investigating Student Science Identity in a Middle School Social Studies Classroom Hazel Cashman	Average Rate of Change in College Math: An Active Learning and Meaningful Applications Perspective Allison Dorko	Intuitive or Rational? Students and Experts Need to be Both Mila Kryjevskaja

B1. Investigating Student Science Identity in a Middle School Social Studies Classroom

Hazel Cashman, *RiSE Center, University of Maine*

Much science identity research has focused on the role that recognition by others plays in students' negotiations of science identity, yet little research exists on how students' self-recognition shapes science identity. Research on students' ideas about science has also not frequently intersected with research on student science identity (Avraamidou & Schwartz, 2021). This thesis addresses this gap by describing how sixth grade students negotiated science identities when sharing their science experiences and their own ideas about science. Interviews were conducted with ten students in a 6th grade social studies classroom in the Northeastern US, during an integrated science and social studies unit. Analysis of the interview data showed that these 6th grade students have multifaceted conceptualizations of science, including both inclusive and exclusive sets of ideas. Despite authoring a diverse range of science selves, seven of the ten total students did not recognize themselves as scientists. This was primarily due to the fact that students drew from their inclusive ideas about science when authoring science selves, but made their self-recognition contingent on their exclusive ideas about science. This thesis project therefore contributes to an understanding of the ways in which students' ideas about science shape their negotiations of science identities.

B2. Average Rate of Change in College Math: An Active Learning and Meaningful Applications Perspective

Allison Dorko, *Mathematics Department, Oklahoma State University*

Average rate of change is a key topic in our entry-level undergraduate mathematics courses, from college algebra to calculus. I'll share how we build from students' idea of slope, with an eye toward how we think about and design for instruction that engages students in active learning and meaningful applications.

B3. Intuitive or Rational? Students and Experts Need to be Both

Most science instructors will probably agree that one major goal of our instruction is cultivating the ability to use formal knowledge to construct logically sound arguments. When students struggle to build such arguments, it can be easy to assume that they either do not possess the necessary content knowledge or their reasoning skills are weak. While these interpretations may be productive, dual-process theories of reasoning from cognitive psychology suggest that intuition is also a critical aspect of cognition. In fact, intuition is often powerful enough to significantly enhance or hinder explicit reasoning (even by those who hold correct formal knowledge). Indeed, many scientists and expert teachers cherish their intuition because it makes their thinking and problem-solving more productive and enjoyable. However, it may not be the case for our students who are just starting their journey toward developing their expertise. In this talk, I will discuss how insights from cognitive psychology can help science instructors gain a deeper understanding of the roles of intuition and formal knowledge in reasoning. I will describe common reasoning pathways suggested by the dual-process theories of reasoning and discuss reasoning hazards present along the way. I will highlight promising instructional approaches to help students navigate the reasoning hazards more successfully.

Workshop Session A

Monday, 12:30–2:00 p.m.

Wells 1	Wells 2	Wells 3
Making Learning Sticky Anita Stewart McCafferty	Elementary Geometry: Exploring Meaningful Tasks Franziska Peterson	Incorporating Ethics and Justice in STEM Communication Courses Heather Falconer Elizabeth Payne

A1. **Making Learning Sticky**

Anita Stewart McCafferty, *School of Education and Human Development, University of Southern Maine*

Join Anita for an interactive session where participants will actively engage in varied brain-friendly strategies designed to improve learning and memory retention/recall. Participants will be able to explain how a greater understanding of neuroscience and the science of learning can help improve student learning plus make learning last while having fun! Throughout the session, participants will examine and engage in varied evidence-based practices, such as assessment for learning strategies and tools, and brain-friendly principles.

Session Goals:

I Can...

*Examine and deepen my teaching, learning, and assessment competencies and the strategies I use to help make learning stick.

Here's How:

through active participation in session learning activities and individual reflection

I Can...

*Explain how a greater understanding of neuroscience and the science of learning can help improve student learning.

Here's How:

through discussion and individual reflection

A2. **Elementary Geometry: Exploring Meaningful Tasks**

Franziska Peterson, *Department of Mathematics & Statistics and RiSE Center, University of Maine*

Geometry is a critical area of mathematics that connects to several other mathematical content areas, such as algebra, measurement, and proportional reasoning. It also plays a major role in linking mathematics with the physical world. Spatial sense and geometric reasoning are used to create real-world models to investigate and explain phenomena and model the world around us. In this workshop we will engage in meaningful and hands-on geometry tasks that promote spatial sense and geometric reasoning.

A3. **Incorporating Ethics and Justice in STEM Communication Courses**

Heather Falconer, *Department of English and RiSE Center, University of Maine*

Elizabeth Payne, *Department of English, University of Maine*

In this workshop, participants will learn ways to normalize social justice themes as part of STEM writing instruction. Facilitators will discuss strategies they've used in engineering and science communication courses that address sustainability and environmental ethics, "bioracial rhetorics," disability, and language instruction. Workshop attendees will have opportunities to reflect on their own curriculum and identify ways in which they can create space for alternative ways of thinking and doing in STEM communication.

The workshop will begin with a short reflection exercise, asking attendees to think about the content and format of their current STEM communication courses. What do they privilege? How do they teach the work? What perspectives are included? What challenges do they experience? In small groups, participants will identify where they are similar and different, and then report out. Facilitators will share readings, tools, assignments, and strategies they have used in their courses to address ethics and social justice. Participants will have opportunities, in small groups, to try some of these activities and tools, and discuss ways they can incorporate such approaches into their existing and future courses.

Workshop Session B

Monday, 2:45–4:15 p.m.

Wells 1	Wells 2	Wells 3
An educator's guide to environmental DNA (eDNA) Karen E. James	How Would You Count That? Integrating Computer Science and Environmental Sampling Using Dataloggers and CODAP Ginny Brackett Vanessa Rehmeyer	Engaging Undergraduate Students in Class with the Help of Learning Assistants: Perspectives from Faculty Instructors Natasha Speer (moderator) Ayesha Maliwal Bundy Margaret Moore Kate Ruskin MacKenzie Stetzer

B1. An educator's guide to environmental DNA (eDNA)

Karen E. James, *Maine Center for Genetics in the Environment, University of Maine*

Environmental DNA (eDNA) is rapidly becoming an important method for biodiversity monitoring and public health surveillance. Academic scientists, government agencies, NGOs, industry, and community groups have gravitated to eDNA as a way to participate in natural resource research and sustainability. For this reason and because eDNA is relatively straightforward, conceptually, compared to other areas of genetics, genomics and molecular biology, eDNA is an ideal educational topic. This suitability has been recently enhanced by the widespread use of eDNA methods in COVID-19 testing and surveillance. In this 90-minute session, we will introduce eDNA both conceptually and as a suite of methods, and give an overview of how eDNA can be deployed in educational settings. We plan to conclude the session with breakout discussions to explore participants' interests, challenges and technical and training needs, looking forward to future opportunities facilitated by RiSE and Maine-eDNA.

B2. How Would You Count That? Integrating Computer Science and Environmental Sampling Using Dataloggers and CODAP

Ginny Brackett, *Winslow Schools*

Vanessa Rehmeyer, *All Saints Catholic School, Bangor, Maine*

Through the RiSE Center's STEM+C project, middle school science teachers have developed lessons that integrate computer science into middle school science lessons. During this workshop we will experience components of an ecology lesson that includes data collection and analysis. We will conduct a transect and collect environmental data using HOBO Dataloggers. We'll then spend

time working with the data in CODAP, a free program for easy online data analysis. Participants will be able to practice working with these tools and consider opportunities for using them in their own classrooms. Please bring a computer to this session or plan to work with a partner.

B3. Engaging Undergraduate Students in Class with the Help of Learning Assistants: Perspectives from Faculty Instructors

Natasha Speer (moderator), *Mathematics & Statistics and RiSE Center, University of Maine*

Ayesha Maliwal Bundy, *Department of Mathematics & Statistics, University of Maine*

Margaret Moore, *Department of Mathematics & Statistics, University of Southern Maine*

Kate Ruskin, *Ecology and Environmental Sciences, University of Maine*

MacKenzie Stetzer, *Physics & Astronomy and RiSE Center, University of Maine*

Instructors at the University of Maine and University of Southern Maine have implemented a variety of approaches to actively engage students in undergraduate STEM courses. In this panel discussion, several of these instructors will describe how they have designed their courses to incorporate research-based practices that can enhance student learning and retention. As part of the course design, these faculty have developed various approaches to leverage the help of Learning Assistants (undergraduate students with experience in the course who serve as peer-level support to students in the course). Panelists will describe their course design work and will share reflections on the impact of having learning assistants in the course on their own instructional practices and on students' experiences in the course.

Poster Session

Monday, 4:30–6:00 p.m.

This year we have posters by various STEM education researchers sharing their work as well as RiSE Center faculty and staff showcasing the scope of the RiSE Center's reach and impact over the past 20 years.

BIO204 - Molecules to Ecosystems: A Course-Based Undergraduate Research Experience

Louise J. Brogan, *Biology Department, Bates College, Lewiston, Maine*

In any given section of BIO204, we have a good mix of molecular biology/genetics, biochemistry, neuroscience ecology and environmental science students, as well as students majoring outside biology or biochemistry. Having their different perspectives enriches our classroom discussions, however, the current design of the course presents a divide in emphasis between the laboratory methodologies, which are largely molecular biology techniques, and the approaches to scientific communication, which largely relate to ecology and environmental science. With enhanced curricular materials, I want to develop additional eDNA platforms for broadening the research questions that the course can focus. The goal is to:

1. Give molecular biology/genetics students experience in laboratory methods related to ecology, evolutionary and environmental science;
2. Give ecology, evolutionary and environmental sciences students the opportunity to better engage in the molecular biology/genetics methods;
3. Help more faculty get excited about teaching in the course;
4. Keep the authenticity of the research experience fresh for faculty and students, alike.

Developing a Microbiology and Chemistry Focused Multi-Disciplinary CURE Course

Yolanda M. Brooks, *Biology Program, Saint Joseph's College of Maine*

Yi Jin Gorske, *Biology Program, Saint Joseph's College of Maine*

We have developed a multidisciplinary course-based undergraduate experience (CURE) for students at Saint Joseph's College of Maine. The course demonstrates the cross-disciplinary nature of scientific research. Combining our areas of expertise in microbiology and organic chemistry, the course provided students with a deeper understanding of scientific discovery, as well as provide opportunities to delve into various types of scientific communication. Our course centered on three objectives: 1) the cultivation of novel soil organisms that metabolize antimicrobial compounds; 2) extraction and isolation of compounds derived from microorganisms and evaluation of its inhibitory

properties; and 3) development of scientific communication skills with manuscript-style writing and podcasts. Students worked towards these course objectives during two laboratory sessions plus one lecture session per week. Students also collaborated outside of class to write and record content for 6 podcasts, and contributed to the writing of a manuscript-style lab report that was reviewed and revised throughout the semester. Students reported that the course was foundational to a better understanding of the dynamic process of antimicrobial drug discovery. Students were particularly appreciative of the student-driven nature of the laboratory work, the opportunity to collaborate with a biotech company on the cutting edge of this area of research, and the realistic experience of new data generation and regular troubleshooting opportunities.

Our plan is to develop the next sequence of the course, which will focus on structural characterization and the use of whole genome sequencing to determine the species and genes encoding the metabolic pathway for the antimicrobial products.

Integrating Computing into Science Teaching and Learning in Grades 6-8: A Diverse Partnership to Develop an Evidence-Guided Model to Serve Rural Communities

Mitchell Bruce, *RiSE Center, University of Maine*

Mia Callahan, *RiSE Center, University of Maine*

Jim Fratini, *Hermon Middle School*

Sara Lindsay, *RiSE Center, University of Maine*

Susan McKay, *RiSE Center, University of Maine*

Laura Millay, *RiSE Center, University of Maine*

Harlan Onsrud, *School of Computing and Information Science, University of Maine*

Marina Van der Eb, *RiSE Center, University of Maine*

The Maine Center for Research in STEM Education (RiSE Center) has begun a partnership with 30 middle school teachers across 20 school districts to integrate computer science into middle school science instruction and provide professional learning opportunities for teachers to support integration. This research-practice partnership, guided by Computer Science Teachers Association (CSTA) standards for middle school, is working to develop, implement, test, and refine modules for middle school life, Earth, and physical science. Project research is focused on the knowledge and supports teachers need to teach integrated modules, impacts for students, and the process of building a research-practice partnership. Findings will be used to develop a model for integrating science and computer science at the middle school level.

Changing Perception of Mathematics

Ayesha Maliwal Bundy, *Department of Mathematics & Statistics, University of Maine*

Math anxiety is a real phenomenon that enlarges the perceived instructor-student gap. The Introduction to Calculus course at UMaine is primarily taken by non-math majors who often have a negative view of mathematics, particularly of their own mathematical ability. The addition of learning assistants to this course has allowed students to connect to peers, communicate quantitative ideas and grow in their confidence. Moreover, the increased emphasis on group work and student-led learning led to a natural transition to a flipped classroom which has enabled students to be more in control of their own understanding and has reduced the perceived divide between facilitators and learners. The poster aims to highlight the shift in student perception over the course of a semester as reflected in surveys and student outcomes.

SEL in the STEM Classroom

Grace Coffe, *Brewer High School, NSF Teaching Fellow*

Nick Innis, *Mt. Ararat High School, NSF Teaching Fellow*

Betsy Trenckmann, *Hermon High School, NSF Teaching Fellow*

This is an overview of an upcoming SEL professional development series being offered by the RiSE Center in the upcoming school year.

Investigating Tick Density at Massabesic High School in an Earth and Space Sciences Classroom

Erin Doran, *University of Maine RiSE Center Alumna, Massabesic High School*

Massabesic High School is located in a rural town densely populated by trees, lakes and foliage. The school grounds are used for community events such as sports games, walking trails and mountain biking. Students conducted an investigation to construct community resources to indicate Tick population and density among its most trafficked trail. For eight weeks students mapped out sections of the trail and collected data on vegetation differentiation, soil conditions, sun/shade exposure among other various ecosystem characteristics. Using their findings students created a trail system to show areas of high, medium and low tick density as well as creating a key for tick differentiation.

Integrating Quantitative Reasoning Skills in the Context of Forest Research into Middle and High School Science Instruction

Laura Honders, *RiSE Center, University of Maine*

Sara Lindsay, *RiSE Center, University of Maine*

Susan McKay, *RiSE Center, University of Maine*

Laura Nickerson, *Leitzel Center, University of New Hampshire*

Franziska Peterson, *RiSE Center, University of Maine*

Chrissy Siddons, *RiSE Center, University of Maine*

Regina Toolin, *College of Education & Social Services, University of Vermont*

Marina Van der Eb, *RiSE Center, University of Maine*

This work is being conducted as a part of the EPSCoR grant Leveraging Intelligent Informatics and Smart Data for Improved Understanding of Northern Forest Ecosystem Resilience (INSPIRES). This grant is a three state partnership between Maine, Vermont, and New Hampshire focused on researching the Northern Forest Region.

The RiSE Center is leading one theme within this larger project focused on supporting students' quantitative reasoning skills in the context of forestry. Through partnership with the University of New Hampshire and the University of Vermont along with middle and high school teachers, this team is working together to develop lessons for the classroom focused on forestry and Quantitative Reasoning in Context (QRC).

Quantitative Reasoning in Context (QRC) involves Mathematics and statistics applied in real-life, authentic situations that impact an individual's life as a constructive, concerned, and reflective citizen. QRC problems are context dependent, interdisciplinary, open-ended tasks that require critical thinking and the capacity to communicate a course of action.

During the course of this project, members of this team will learn about QRC and forest research to support the development of lessons that will then be piloted in partnering teachers' classrooms.

The Role of Quantitative Reasoning in Science Understanding: An Interdisciplinary Investigation through Data Story Assignments

Bryn Keenhold, *RiSE Center, University of Maine*

Franziska Peterson, *RiSE Center, University of Maine*

Molly Schauffler, *RiSE Center, University of Maine*

Asli Sezen-Barrie, *RiSE Center, University of Maine*

This research project explores how 9th grade students' quantitative reasoning (QR) skills impact scientific understanding during the creation of Data Stories, a pedagogical teaching strategy. In a data-driven world, it is necessary that students graduate high school as quantitative literate citizens who have the ability to interpret quantities within a context to make informed decisions for their lives. many organizations have called for a greater presence of quantitative reasoning (QR)

throughout K-16 education. As the PISA (Programme for International Student Assessment) suggests, U.S. students seem to display mathematical weaknesses when:

- Translating real-world problems into mathematical terms, and
- Interpreting mathematical aspects in real-world problems.

Additionally, a critical component of science learning is developing the ability to make sense of data, critically evaluate it, and effectively communicate scientific ideas (National Research Council [NRC], 2012). Data Stories, developed by the Maine Data Literacy Project, are by nature interdisciplinary, bringing QR skills into the science classroom and encouraging students to explore authentic, real-world scientific data.

By investigating the interdisciplinary relationship between QR and scientific understanding, we seek to help teachers enhance their understanding of why students may excel, or struggle, when interpreting data and drawing conclusions, especially within the science contexts.

Student-Led Physics Investigations: Developing Science Research Skills in a High School Classroom

Rosalee Lamm, *Portland High School, Portland Public Schools, Portland, Maine*
Anupam Raj, *RiSE Center, University of Maine*

We present a method of developing research skills in high school students, including a student-led final investigation. Through multiple labs over the course of a year, skills are developed one piece at a time, culminating in a final project in which students are in charge of every phase of the investigation: they develop a question, design their methods, collect and analyze data, evaluate their results and present their findings. The topics are small and manageable, and the project takes about eight class periods. The teacher plays an advisory role for the final investigation, checking in regularly with student groups as they work to provide guidance, help troubleshoot problems, and give feedback.

BMB207 Fundamentals of Chemistry: Faculty Course Modification Incentive Grant and Maine Learning Assistant Program

Jennifer Newell-Caito, *Department of Molecular and Biomedical Sciences, University of Maine*

Digital Learning Modules in Fundamental & Organic Chemistry: Faculty Course Modification Incentive Grant and Maine Learning Assistant Program

Jennifer Newell-Caito, *Department of Molecular and Biomedical Sciences, University of Maine*
Edward Bernard, *Department of Molecular and Biomedical Sciences, University of Maine*

A Six-Institution Partnership to Deepen Student Understanding and Engagement with Food Processing and Food Engineering Concepts: Preliminary Results of a Pilot Implementation of Research-Based Active Learning Strategies in Three Courses

Chrissy Siddons, *RiSE Center, University of Maine*

Denise Skonberg, *School of Food and Agriculture, University of Maine*

Susan R. McKay, *Department of Physics & Astronomy and RiSE Center, University of Maine*

Additional contributing team members: Bode Adedeji (U. of Kentucky), Anna Bruce (Horizon Research), Girish Ganjyal (Washington State U.), Haibo Huang (Virginia Tech), Laura Honders (UMaine), Qing Jin (Virginia Tech, UMaine), Helen Joyner (Perfect Day Food), Buddhi Lamsal (Iowa State), Anupam Raj (UMaine), Sean Smith (Horizon Research), and Deborah Shulman (UMaine)

This poster presents work by a partnership of six universities to enhance learning and success of non-engineering students in Food Processing and Food Engineering courses. Faculty from Iowa State University, University of Idaho, University of Kentucky, University of Maine, Virginia Tech, and Washington State University co-developed active learning strategies to implement in their classes. Strategies included project-based learning, “clicker questions,” peer-to-peer discussion, use of undergraduate learning assistants (LAs), and virtual career-education panels with food science and engineering professionals. Course modifications were piloted in the 2021 – 2022 school year at three institutions, with the faculty team continuing to meet throughout to discuss and refine approaches based on feedback data. Major takeaways from the pilot year include structuring project deadlines and feedback, strategies for effective LA implementation, and best practices for deeper class discussions.

This work was supported by Higher Education Challenge Grant # 2019-70003-29082 from the USDA National Institute of Food and Agriculture.

Improving the Preparation of Graduate Students to Teach

Natasha Speer, *Department of Mathematics & Statistics and RiSE Center, University of Maine*

The College Mathematics Instructional Development Source (CoMInDS) project is a collaboration with the Mathematical Association of America (MAA) to enhance our community's ability to provide high-quality, teaching-related professional development (PD) to graduate students. We support faculty who are Providers of PD to graduate student Graduate Student Teaching Assistants (GTAs) and of Scholars who conduct research on TAs and college instructor professional learning.

RiSE Center 20th Anniversary Posters

Many faculty, staff members and students have contributed to RiSE Center work over the last 20 years. The following posters were assembled by current faculty and staff to highlight and celebrate that work. Contributors include: Mitchell Bruce, Tim Boester, Beth ByersSmall, Justin Dimmel, Laura Millay Honders, Sara Lindsay, Susan McKay, Beth Muncey, Eric Pandiscio, Franziska Peterson, Chrissy Siddons, Natasha Speer, John Thompson, Marina Van der Eb, and Erin Vinson.

The Maine Learning Assistants Program at the University of Maine: A Transformative Student and Faculty UMaine Program

With support from the University of Maine Office of the Executive Vice President for Academic Affairs & Provost, the Maine Center for Research in STEM Education (RiSE Center) offers opportunities for science, technology, engineering, and mathematics (STEM) instructors at the University of Maine to apply for course modification incentive grants through the Faculty Course Modification Incentive Grant – Maine Learning Assistant (FIG-MLA) Program. The goals of the FIG-MLA program are to: improve the quality of undergraduate STEM education, promote and support evidence-based teaching, help STEM majors build career-relevant teaching and communication skills, and encourage institutional change at all levels of STEM teaching. As of 2021-2022, a total of 71 STEM instructors with 52 courses in 16 departments have participated in the program. This poster provides an overview of the FIG-MLA program's history and activities since it began in 2012.

RiSE Center PK-12 Partnerships by the Numbers

The RiSE Center partners with Maine schools and teachers to promote high-quality STEM education instruction and resources. This presentation summarizes the past 20 years of partnerships.

Mathematics Education

The poster provides an overview of the history of mathematics education research at the University of Maine.

Physics Education Research at the University of Maine

The poster provides an overview of the history of physics education research at the University of Maine.

Workshop Session C

Tuesday, 8:30–10:00 a.m.

Wells 1	Wells 2	Wells 3
Investigating the world of sustainable fishing through eDNA Gabrielle Brodek	Ungrading Workshop: Alternatives to Approaches to Grading Jen Newell	Building Models in STEM Classrooms while Building Bridges from High School to College David Champlin

C1. Investigating the world of sustainable fishing through eDNA

Gabrielle Brodek, *RiSE Center and 4-H Cooperative Extension, University of Maine*

Engage in a hands-on investigation activity about sustainable fishing and eDNA created for students in grades 3-5, and hear about the ways students related to the activity through the lens of the TRU framework.

C2. Ungrading Workshop: Alternatives to Approaches to Grading

Jen Newell, *Molecular & Biomedical Sciences, University of Maine*

In this workshop we will focus on de-emphasizing grades in the classroom. The system of grading creates a balance of power between students and teachers. This approach focuses on bringing students into the conversation about their grades to discuss how and why they receive their grades. At the center of this conversation is the focus on creating equity in the classroom. The restructuring approaches discussed will be based on the book "Ungrading- Why Rating Students Undermines Learning" by Susan Blum. In this workshop we will discuss approaches for decentering grading that can be taken in classrooms. After this, we will discuss implementation of ungrading in an upper level collegiate STEM course. The majority of the workshop will be focused on engaging participants in designing an ungrading activity relevant to their own area of teaching. Please join us for a participant-focused workshop!

C3. Building Models in STEM Classrooms while Building Bridges from High School to College

David Champlin, *Department of Biological Sciences, University of Southern Maine*

For several years, I have been collaborating with Westbrook High School biology teacher, Amy Troiano. Part of the workshop will be explaining how we created our working relationship and what work we do together. In the workshop, we'll discuss how each of us can work toward building valuable, synergistic bridges between secondary and post-secondary educators. Then, the main part of the workshop will be about model building in STEM classrooms. Amy and I have

found that focusing on model building has been an excellent way for a high school teacher and college professor to build a working relationship that then becomes significant for our students in a variety of ways. In building models, Amy can bring the pedagogy theory and teaching practices while I can bring content expertise. Models are fascinating and the creativity involved in designing model building lesson plans can be very rewarding. Participants are encouraged to bring examples of model building they do in any STEM topics. We'll have opportunities to share these during the workshop. Our goal will be to provide some practical examples to help inspire and understand the powerful value that model building can contribute to STEM classrooms.

Panel with Roundtable Discussion

Tuesday, 10:30–11:45 a.m.

Recruiting and Retaining STEM Teachers

Susan McKay (moderator), *RiSE Center, University of Maine*

Mary Nadeau, *Nokomis Regional High School, RSU 19*

Cameron Fudge, *NSF Teaching Fellow, Sumner Memorial High School, RSU 24*

Jim Fratini, *Hermon Middle School, Hermon Maine*

Beth ByersSmall, *RiSE Center, University of Maine*

Teacher turnover continues to concern K-12 educators who see teachers leave every year. According to the National Center for Education Statistics (NCES), 8% of teachers leave the profession yearly and another 8% move to other schools, bringing the total annual turnover rate to 16%. In October 2020, The Maine Education Policy Research Institute, from the University of Southern Maine stated, "Teacher turnover and retention rates are on par or slightly better than the national average, yet still create challenges for some districts."

This presentation offers teacher, school administrator, and RiSE Center perspectives on recruiting and retaining STEM discipline teachers. Questions on this topic will also be presented for conference attendees to discuss at each table. As educators who all have a stake in this issue, this discussion will allow us to exchange ideas with colleagues and acknowledge varied perspectives.

Workshop Session D

Tuesday, 1:00–2:30 p.m.

Wells 1	Wells 2	Bennett 301
Supporting Instruction and Learning Aligned with the TRU Math Framework David Foster	Developing Scientist Spotlights to Help STEM Students Build Metacognitive Skills and Science Identity Sara Lindsay	UMaine Labs: Active and Engaging Labs for Students of Any Level (K-16) that Are Easier on the Instructor! Frank Dudish

D1. Supporting Instruction and Learning Aligned with the TRU Math Framework

David Foster, *Silicon Valley Mathematics Initiative (SVMI)*

The Silicon Valley Mathematics Initiative (SVMI) has been involved with the TRU Math Framework from its original development and uses the Framework as the central focus of our professional learning programs. This presentation will show how to use TRU Math to improve student learning and shift instructional beliefs and practices. Classroom videos, curricular and assessment tools, student achievement data will be share to demonstrate how mathematically powerful classrooms change the lives and opportunities for all students in an educational system focused on the five dimensions of TRU Math.

D2. Developing Scientist Spotlights to Help STEM Students Build Metacognitive Skills and Science Identity

Sara Lindsay, *School of Marine Sciences and RiSE Center, University of Maine*

Students who can see themselves in a particular role (e.g., as a scientist) and feel that they belong to a scientific community tend to have greater academic success in STEM disciplines. Thus, how we portray scientists in our classes and textbooks, and the people that students encounter as role models and mentors matter. Students also succeed when they learn to practice metacognitive skills that university faculty often take for granted. In this workshop, we will explore how STEM professionals are portrayed in pictures, discuss recent data related to student persistence and sense of belonging in STEM disciplines, and I will introduce the Scientist Spotlights Initiative that seeks to “empower middle/high school, college, and university science educators to implement inclusive curricula that help ALL students see themselves in science”. I will share lessons learned from developing and piloting Scientist Spotlight activities in an introductory undergraduate marine biology course. Workshop participants will explore existing Scientist Spotlight resources, and plan their own.

D3. **UMaine Labs: Active and Engaging Labs for Students of Any Level (K-16) that Are Easier on the Instructor!**

Frank Dudish, *Department of Physics & Astronomy and RiSE Center, University of Maine*

Participants will engage in a lab of their choosing to immerse themselves in a different kind of lab structure that better exemplifies the foundations of Science, is more active for the students, and is easier for the instructor to grade. Each participant will experience and discuss what students have the opportunity to learn. We will also cover what the instructor needs to know and do to support student learning in inquiry based labs in different contexts and disciplines.

Presenter Biographies

Ginny Brackett

Winslow Schools

vbrackett@winslowk12.org

Workshop B2

I have been the Gifted and Talented teacher at Winslow Junior High for 22 years. The GT program focuses on the Science curriculum. I also teach a STEM class where student participate in First Lego League, make wind turbines, use microbits, build solar cars and other projects. During the pandemic I mentored a team of students who built a Cube Satellite that was launched on a weather balloon. Our Cubesat deployed a solar sail using Nitinol wires. I have used a variety of programs with my students including microprocessors, ARCGIS, Netlogo, Scratch, Code.org.

Outside of school, I spent my time in my gardens, at the lake, and hiking in Lubec. There is nothing quite like being greeted by loons on an early morning kayak, or having a seal rise behind your kayak and snort.



Gabrielle Brodek

RiSE Center and 4-H Cooperative Extension, University of Maine

gabriellebrodek@gmail.com

Workshop C1

Gabrielle Brodek is a recent graduate from the University of Maine's Center for Research in STEM Education Master of Science in Teaching program, and holds a B.S. in Environmental Science from Drake University. During her graduate experience, Gabrielle held a Graduate Assistant position in the 4-H Cooperative Extension office, where she developed a 4-H Science Toolkit about sustainable fishing and eDNA for grades 3-5, as part of the National Science Foundation Maine eDNA ESPSCoR grant. Gabrielle's STEM education (research) interests include teaching and learning in formal and informal learning settings, personal significance, and place-based learning. Currently she lives near Machias, Maine.



Ayesha Maliwal Bundy

Department of Mathematics & Statistics, University of Maine

ayesha.maliwal@maine.edu, @AyeshaBundy

Workshop B3

Ayesha Maliwal Bundy is a Lecturer in the Department of Mathematics and Statistics at the University of Maine. She earned her bachelor's and master's degrees in economics in India and her master's degree in mathematics from the University of Maine in 2016. She primarily teaches introductory level mathematics courses and extends her training in early childhood education to create inclusive, student-led, active learning environments.



Her research focuses on enhancing student success through emphasis on peer learning, involving learning assistants and engaging student response systems. She designs courses and curriculum using the Universal Design for Learning. As a course coordinator, she trains Maine Learning Assistants (MLAs) and TAs in facilitating group work and increasing student engagement to support a flipped classroom structure. She works closely with the Center for Innovation in Teaching and Learning (CITL) and the RiSE Center on campus to continuously improve and support student learning.

In 2020, she was appointed Presidential Fellow for fostering Learner Success and in 2021, she joined the UMS Transforms Gateways to Success initiative to increase student success and retention.

Beth ByersSmall

RiSE Center, University of Maine

elizabeth.byerssmall@maine.edu



Opening Activity and Discussion, Panel with Roundtable Discussion

Beth coordinates the NSF Fellowship Program, a program to recruit, prepare, support, and retain highly-qualified STEM teachers in rural, high-need Maine schools. In this capacity, she works with a community of early career and experienced teachers. As program coordinator, Beth designs and leads professional learning opportunities, conducts classroom observations to provide feedback and support to new STEM teachers. She also develops, supports, and facilitates professional learning opportunities for teachers in the Maine STEM Partnership Community, including through statewide content discussions. Prior to taking on her position as NSF Fellowship Coordinator, Beth coordinated professional learning for K-12 teachers in the Maine STEM Partnership and MainePSP. She also has over 20 years of experience teaching students at the elementary, middle and high school. When not working Beth has tried her hand at various creative pursuits, and presently she can often be found quilting.

Hazel Cashman

RiSE Center, University of Maine

hazel.cashman@maine.edu

Talk B1

Hazel Cashman is a current graduate student in the Master of Science in Teaching (MST) program at the RiSE Center, finishing the program in August of 2022. After graduating in 2018 from Bates College with a degree in geology and anthropology, she worked as an Earth/Environmental science experiential educator before coming to UMaine to get her Physical Science teaching certification for grades 7-12. Her research in the MST program focuses on student science identity in a unique integrated science and social studies learning context, incorporating Indigenous and Western science.

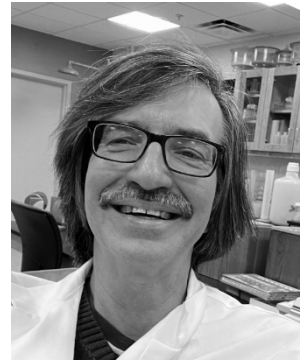


David Champlin

Department of Biological Sciences, University of Southern Maine
champlin@maine.edu

Workshop C3

David Champlin has a PhD in molecular biology and biochemistry from Cornell University and was an American Cancer Society postdoctoral fellow at the University of Washington. He has been a professor at the University of Southern Maine for twenty years. He teaches Intro Bio, Developmental Bio, Cell/Mol Bio, and Ecological Developmental Biology. His research is on hormonal control of insect metamorphosis to help understand the role hormones play in animal development.

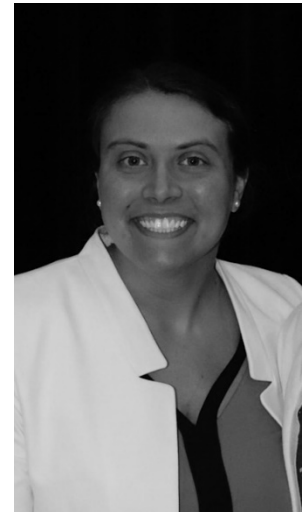


Grace Coffe

Brewer High School, NSF Teaching Fellow
gcoffe@breweredu.org

Talk A1

Grace graduated the University of Maine with a BS in Biology; she immediately after did an internship at the Jackson Lab studying reproductive biology and infertility. In August 2018, she graduated with a Master of Science in Teaching from the University of Maine. She has been teaching at Brewer High School for 6 years. She teaches all levels of physics, including AP, an introductory engineering course, and a more robotics/mechanics-focused engineering course. She is the advisor of the Student Council. Grace prides herself on building strong relationships with her students and fostering an emotionally safe space for all. Grace has been involved with the University of Maine RiSE Center in varying capacities over the years. She is currently finishing up her involvement in the NSF Fellowship Program and looks forward to becoming a teacher leader in this program. She has a large family and looks forward to spending this summer exploring with them.



Allison Dorko

Oklahoma State University
allison.j.dorko@okstate.edu

Talk B2

Allison is a Teaching Assistant Professor at Oklahoma State University. She supervises, coordinates, and teaches an undergraduate mathematics course that combines algebra I, II, and precalculus content. She is a RiSE Center graduate!



Frank Dudish

Department of Physics and Astronomy, University of Maine
frank.dudish@maine.edu

Workshop D3

Frank teaches introductory and advanced physics and astronomy courses in the Department of Physics and Astronomy.



Heather M. Falconer

Department of English and RiSE Center, University of Maine
heather.falconer@maine.edu, @hmfalconer

Workshop A3

Heather Falconer is an Assistant Professor of Professional and Technical Writing and a faculty member of the Maine Center for Research in STEM Education at the University of Maine. In addition to this role, Dr. Falconer is a Co-Editor for the Perspectives on Writing book series and Co-Chair of the Research and Publications Committee of the Association for Writing Across the Curriculum. She serves on multiple editorial and regional boards. As a Writing Studies scholar, Dr. Falconer focuses on the intersections of culture, discipline, and pedagogy, with a special emphasis on creating inclusive educational spaces. Dr. Falconer's research has appeared in journals such as *Written Communication*, *The WAC Journal*, the *Journal of Research in Science Teaching*, and the *Journal of Hispanic Higher Education*, as well as multiple edited collections. Her book *Masking Inequality with Good Intentions: Systemic Bias, Counterspaces, and Discourse Acquisition in STEM Education* is in press with University of Colorado Press/The WAC Clearinghouse.

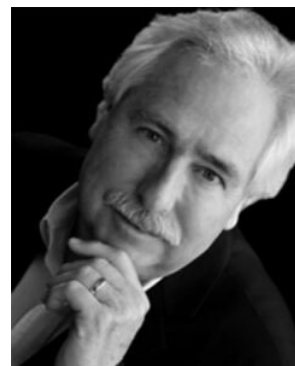


David Foster

Silicon Valley Mathematics Initiative (SVMI), 6980 Santa Teresa Blvd, Suite 100, San Jose, CA 95119
dfoster@svmimac.org

Workshop D1

David Foster is the Founder of the Silicon Valley Mathematics Initiative (SVMI) whose mission is based on high performance expectations, ongoing professional learning, examining student work, and improved math instruction. David established SVMI in 1996 working as Mathematics Director for the Noyce Foundation. SVMI has an extensive data base of mathematics teaching and learning resources (MAC/MARS performance tasks, Problems of the Month, videos, MAC Toolkits, Coaching Materials, etc.). Foster is the primary author of *Interactive Mathematics: Activities and Investigations*, published by Glencoe/McGraw-Hill, 1994. David was a Regional Director for the Middle Grade Mathematics Renaissance, of the California State Systemic Initiative. David taught mathematics and computer science at middle school, high school, and community college for eighteen years.



Jim Fratini

Hermon Middle School

james.fratini@schools.hermon.net

Panel with Roundtable Discussion

I am a veteran teacher at Hermon Middle School, teaching 8th grade physical science and 6th grade computer science, I was a co-PI on the STEM+C grant integrating computer sciences into the current Science curriculum. When not teaching I can be found playing bass guitar in a number of local bands.



Cameron Fudge

Sumner Memorial High School, RSU 24, NSF Teaching Fellow

cfudge@rsu24.org

Panel with Roundtable Discussion

I am a second year physics and chemistry teacher working at Sumner Memorial High School in Sullivan, Maine. I was recruited into the teaching field by the Noyce NSF fellowship program through the RiSE center at the University of Maine. Through this program I developed a passion for education and have integrated myself into rural education. In my first years of teaching I have expanded into teaching AP level courses, facilitated a SCUBA dive training program for students working in the fishing industry, participated in innovative educational grant projects, and developed a board recognized competitive esports program.



Nick Innis

Mt. Ararat High School, Topsham, Maine, NSF Teaching Fellow

innisn@link75.org

Talk A1

Nick has been teaching at Mt. Ararat for four years. Nick has helped to realign and redevelop the Mt. Ararat 9th grade physical science curriculum so it better addresses the NGSS, has taught 9th grade, chemistry and physics, and has recently developed both Wildlife and Marine Science electives.



Karen E. James

Maine Center for Genetics in the Environment, University of Maine

karen.james@maine.edu

Workshop B1

Karen James is a Research Scientist in the Maine Center for Genetics in the Environment and the Research Coordinator for the NSF EPSCoR RII Track 1 Maine-eDNA program. She is a long-time participant of the International Barcode of Life community, which pioneered standardized tools, infrastructures and methods for DNA-based species



assignment, which underpins eDNA research. She collaborates on a wide range of interdisciplinary eDNA-related projects within and beyond UMaine.

Mila Kryjevskaja

Department of Physics, North Dakota State University
mila.kryjevskaja@ndsu.edu

Talk B3

Mila Kryjevskaja is an Associate Professor of Physics at North Dakota State University. She received her Ph.D. in Physics in 2008, working with the Physics Education Group at the University of Washington. She has been developing research-based instructional materials for undergraduates and K-12 teachers since 2001. Over the past few years, a primary focus of her work has been an in-depth, multi-institutional investigation of student reasoning in the context of scaffolded, inquiry-based instruction. Other areas of research interests include student learning of waves and optics, metacognition in introductory physics, and the professional development of college instructors. Dr. Kryjevskaja is an active member of the American Physical Society (APS) and the American Association of Physics Teachers (AAPT). She currently serves as chair of the APS Topical Group on Physics Education Research.



Sara Lindsay

School of Marine Sciences and RiSE Center, University of Maine
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Workshop D2

Sara Lindsay teaches and conducts research in the School of Marine Sciences and the RiSE Center at the University of Maine. A past winner of the University of Maine Presidential Outstanding Teaching Award, she integrates inquiry and data literacy activities, as well as perspectives from the arts and humanities into her undergraduate and graduate courses to engage students in deeper learning about marine biology, the process of science and biology teaching methods. At the RiSE Center, she serves as Assistant Director, co-leads the Faculty Course Modification Incentive Grant-Maine Learning Assistant Program (FIG-MLA) and works with K-12 teachers as part of several Research Practice Partnerships. She has two grown daughters, a friendly golden retriever, and enjoys walking and kayaking the beautiful Maine woods and waters.



Dr. Susan McKay

Department of Physics & Astronomy and RiSE Center, University of Maine
susan.mckay@maine.edu



Panel with Roundtable Discussion

Susan joined the faculty in the Department of Physics and Astronomy at the University of Maine (UMaine) in 1986. There she became a full professor and served as Department Chair for six years, conducted research in theoretical condensed matter physics and taught many of the department's graduate physics courses. In 2001, she led a small group of STEM and STEM Education faculty to establish the RiSE Center and the research-based Master of Science in Teaching (MST) Program at UMaine, focused on education research to improve teacher preparation. Since then, she has served as the center's Director, building strength in STEM education research and advancing evidence-based teaching and learning in the STEM disciplines in Maine schools and at UMaine. She was the Principal Investigator of the Maine Physical Sciences Partnership and the Maine Elementary Sciences Partnership, which led to the formation of the Maine STEM Partnership at the RiSE Center, a statewide STEM education improvement community involving more than 120 Maine school districts and the Maine Department of Education as partners. She is currently the Principal Investigator of an NSF Teaching Fellowship Program, which recruits, prepares, and supports new science and mathematics teachers in Maine's rural, high-need districts, tapping into the leadership and expertise of experienced Maine teachers. She is also the Principal Investigator of an NSF STEM+C award that has formed a research-practice partnership to integrate computer science into middle school science. Research done as part of this grant will provide knowledge about the supports for teachers that are needed to successfully accomplish this integration. She is also the Principal Investigator of an NSF ITEST grant and a USDA multi-institutional partnership to bring active learning and enhanced student engagement to food science and engineering courses. Under Susan's leadership, the RiSE Center has grown to include 21 UMaine faculty across multiple disciplines, 10 accomplished professional staff with expertise in STEM education, and more than 20 graduate students. Over the years, she has been awarded more than \$20 million in federal and state competitive grants to support STEM education research to strengthen learning for students and provide professional learning experiences for current and future teachers. These accomplishments were recognized in 2019 with the University of Maine's Presidential Public Service Achievement Award.

Susan received her Bachelor's (Princeton University), her Master's (University of Maine), and her Ph.D. (Massachusetts Institute of Technology) in physics. She completed requirements for secondary teaching certification in mathematics and physical sciences through Princeton University's Teacher Preparation Program and worked as an engineer before joining the faculty at UMaine. Her research interests in teaching and learning support the goal of providing a rigorous and exciting education in the STEM disciplines for all Maine students, including those from groups currently under-represented.

Margaret Moore

Department of Mathematics & Statistics, University of Southern Maine
mhmoore@maine.edu

Workshop B3

Margaret (Peggy) Moore is a member of the mathematics faculty at the University of Southern Maine. Peggy earned her undergraduate degree from Colby College. A declared history major taking multivariable calculus for fun, her path was forever changed when her faculty mentor convinced her to pursue a second major in mathematics. Peggy earned her MS in Statistics from the Virginia Polytechnic Institute and State University, but returned to Maine to begin her teaching career, first at Colby College and later at Maine Maritime Academy before joining USM in 2004.

Peggy is passionate about teaching; helping her students achieve academic success is her top priority. She has been teaching with Learning Assistants since 2018 and is a member of USM's LA Program Leadership Team. She has been involved with general education and curricular reform over the last decade and has presented at numerous state and national conferences about innovative teaching strategies.



Mary Nadeau

Nokomis Regional High, RSU 19, Newport
mnadeau@rsu19.net

Panel with Roundtable Discussion

Mary Nadeau has worked at Nokomis Regional High as a teacher and administrator for the past 30 years. During that time, she has worked as a Business Education teacher, an Academic Support teacher, the Director of Guidance, Assistant Principal, and currently serves as Principal of Nokomis Regional High. Ms. Nadeau has been involved in a wide variety of extra-curricular activities throughout her 30+ tenure in education. Currently, Ms. Nadeau serves on the National Federation of High School Sports Field Hockey Rules Committee as the Northeast Representative, on the Board of Directors for Skills Incorporated, is a member of the Kennebec Consortium for School Administrators and serves on the Maine Principals' Association Board of Directors and is the President Elect for the MPA.

In 2017, Mary was named as the State Champion for Maine by the New England Secondary School Consortium and the Maine Agency of Education.

In 2007, Mary was named the Maine Principals' Association, Assistant Principal of the Year. She has a Bachelor's Degree in Business Administration from Husson (College) University and a Master's Degree in Educational Leadership from the University of Maine and resides in Corinna.



Jen Newell

Department of Molecular and Biomedical Sciences and RiSE Center

jennifer.newellcaito@maine.edu

Workshop C2

Jen is an instructor at the University of Maine who has been teaching for 10 years at the collegiate level. She obtained her PhD in Biochemistry from the University of Rochester and completed four years post-doctoral training and earned a teaching certificate from Vanderbilt University. Her teaching philosophy focuses on active learning and universal design. In addition to teaching she loves to garden and spend time with her three young girls.



Elizabeth Payne

Department of English, University of Maine

elizabeth.payne@maine.edu

Workshop A3

Elizabeth Payne is a Lecturer in Professional and Technical Communication at the University of Maine, Orono, where she specializes in engineering communication and business and technical writing. Her experience teaching writing labs embedded in several engineering curricula has enabled her to see inside the engineering profession, collaborate closely with engineering faculty on assignments and assessments, and guide senior engineering students in preparing capstone proposals, design reports, posters, and oral presentations. As a humanist, she seeks to engage students with gray areas of professional life, such as engineering ethics. She also works with campus sustainability specialists to create multidisciplinary research-writing projects that involve student teams in real-world problems in environmental sustainability on campus. As a practitioner and citizen activist, Elizabeth has for years managed grants, written newsletter articles, and presented at meetings promoting environmental sustainability, biodiversity, and water quality for her local lake association.



Franziska Peterson

Department of Mathematics & Statistics and RiSE Center, University of Maine

franziska.peterson@maine.edu

Workshop A2

Franziska (Franzi) Peterson is an Assistant Professor of Mathematics Education at the University of Maine in the Department of Mathematics and Statistics and the Center for Research in STEM Education. Her research centers on quantitative reasoning and mathematical literacy in interdisciplinary contexts. She has been collaborating with faculty from the RiSE Center on several grant proposals and is part of the education team on the NSF EPSCoR Track-2 grant (INSPIRES). This team focuses on quantitative reasoning in context and connects teachers and students to locally relevant research and datasets, broadening and deepening STEM engagement. The team also investigates the knowledge teachers need to support students in developing quantitative reasoning skills.



Besides teaching mathematics content and educational courses, Dr. Peterson engages in providing professional learning experiences in form of content immersions for practicing elementary teachers. When developing and leading professional learning opportunities, she emphasizes the connections between mathematical content areas, between mathematics and other disciplines, and most importantly the K-8 progression of a mathematical concept.

Samantha Poll

Samuel L. Wagner Middle School, RSU #22, Winterport
spoll@rsu22.us

Opening Activity and Discussion

Samantha Poll is an 8th grade math and science teacher at Samuel L. Wagner Middle School in Winterport, Maine. She has been participating in RiSE Center provided professional development and projects since 2014. Most recently, Sam has been serving on the Leadership Team of the STEM +C project where the integration of computer science into traditional science classes was a main focus. She has very much enjoyed learning what computer science entails, how it can captivate students, and how to best facilitate computational thinking in her classroom!



Kristen Pratt, Ed.D.

Professor of Mathematics, Maine Maritime Academy
kristen.pratt@mma.edu

Talk A3

Kristen Pratt is a Professor of Mathematics at Maine Maritime Academy. She has many years of experience teaching in both the public school system and at a private school. She has taught many levels of math as well as running gifted and talented programming for both academics and arts grades K-12. Dr. Pratt spent time studying abroad and has integrated working with multicultural students into her schedule ever since.



Vanessa Rehmeyer

All Saints Catholic School, Bangor
Vanessa.Rehmeyer@allsaintsmaine.org

Workshop B2

Vanessa Rehmeyer teaches middle school science at All Saints Catholic School in Bangor, Maine. After graduating from the University of Maine in 2010 with a degree in Biology, Vanessa worked as a veterinary assistant before choosing to stay home with her three young children. She returned to the workforce as an educator in 2020, just in time for a worldwide pandemic. Amidst the adventure of teaching middle schoolers



that “science is not a contact sport” and “ties are not for chewing,” Vanessa enjoys being with her family, studying theology, and exploring the great state of Maine.

Kate Ruskin

Ecology and Environmental Sciences program, University of Maine
katharine.ruskin@maine.edu

Workshop B3

Kate studies conservation in the face of global change, and she uses this topic to broadly work at the intersection of education, research, and outreach. She thinks both education and outreach have the power to maximize the impact of research, which is particularly important for conservation of biodiversity and ecosystems worldwide. For the past few years, she has studied the demographics of tidal marsh birds, which are threatened by habitat loss and sea level rise, human development and resource use on public lands such as Acadia National Park, and the efficacy of experiential learning on improving STEM learning and retention. In general, she uses field-collected data to advance our understanding of ecological theory, engage with stakeholders such as wildlife managers and the public, and educate people about environmental science.



Alan Schoenfeld

School of Education, University of California, Berkeley
alans@berkeley.edu

Keynote

Alan Schoenfeld is the Elizabeth and Edward Conner Professor of Education and Affiliated Professor of Mathematics at the University of California at Berkeley. A mathematician by training who studies issues of mathematical thinking, teaching, and learning, he has served as President of the American Educational Research Association and been awarded the Felix Klein Award for life-time achievement in mathematics education research by the International Commission on Mathematical Instruction. His main R&D focus is on the Teaching for Robust Understanding (TRU) Framework. The goal of TRU is to help create learning environments from which all students emerge as knowledgeable and flexible thinkers and problem solvers.



Chrissy Siddons

RiSE Center, University of Maine
christina.siddons@maine.edu

Talk A2

Chrissy Siddons is a Program Evaluation Specialist at the Maine Center for STEM Education (RiSE Center) at the University of Maine, where she supports diverse research and evaluation efforts using a variety of qualitative and quantitative research methods to inform and support formative and summative evaluation of projects and programs. Additionally, Chrissy works with project leaders and stakeholders to communicate and disseminate results to support, inform, and strengthen integration of STEM



education research into practice. Prior to joining the RiSE Center, Chrissy taught middle school science, researched heart tissue regeneration in zebrafish, and taught practical oceanography skills to undergraduates aboard sail training vessels in the South Pacific and Caribbean.

Natasha Speer

Department of Mathematics & Statistics and RiSE Center, University of Maine
speer@math.umaine.edu

Workshop B3

Natasha Speer is a faculty member in the Department of Mathematics and Statistics and the RiSE Center at The University of Maine. Her work focuses on the teaching and learning of college level mathematics, with particular attention to the professional growth of those who are at the beginning of their careers as instructors. She is a co-leader of the College Mathematics Instructor Development Source (CoMInDS) project, supporting faculty who design and provide professional development to novice college mathematics instructors. This effort includes providing access to instructional materials for use in teaching-focused professional development programs and offering workshops to those who design such programs. Her research interests include investigations into the knowledge instructors use to effectively support students to learn via collaborative groupwork and problem-solving.



MacKenzie Stetzer

Department of Physics & Astronomy and RiSE Center, University of Maine
mackenzie.stetzer@maine.edu

Workshop B3

I am an Associate Professor in the Department of Physics and Astronomy at the University of Maine and a member of the Maine Center for Research in STEM Education. Much of my research in physics education focuses on student reasoning and metacognition in physics – particularly the role that the (domain-general) nature of human reasoning and decision-making plays when students are answering qualitative physics questions. My colleagues and I are working to leverage dual-process theories of reasoning (from cognitive science) to gain insight into inconsistent student performance on analogous physics questions and to develop interventions to better support student reasoning. I am also deeply involved in the preparation and professional development of graduate TAs, undergraduate LAs, K-12 teachers, and college instructors.



Dr. Anita Stewart McCafferty

University of Southern Maine, Portland
anita.stewart@maine.edu



Workshop A1

Anita Stewart McCafferty is Associate Professor at the University of Southern Maine, Chair of the Educational Leadership and Adult & Higher Education Department, and Program Lead for the Maine Online Teacher Leadership and Educational Leadership Master's Programs.

Prior to joining USM, Anita served as a middle school principal, assistant principal, athletic director, professional development provider, undergraduate part-time faculty member, and classroom teacher. She has taught at the elementary, middle, high school, community college, undergraduate university, and graduate university levels.

Dr. Stewart McCafferty is passionate about professional learning done well and has recently opened Stewart Professional Learning Center in Lincoln, ME. Her research interests include assessment literacy, high-impact/evidence-based teaching strategies, and brain-based teaching and learning strategies; mentoring/instructional coaching; the impacts of technology and social media on the work-life balance of principals; teacher and principal feedback and evaluation processes and results; middle level education; and experiential learning/service learning/project-based learning.

Betsy Trenckmann

Hermon High School, NSF Teaching Fellow
betsy.trenckmann@schools.hermon.net



Talk A1

Betsy Trenckmann is a life and physical science teacher at Hermon High School (HHS) where she has been teaching Physics, Ecology, and Biology for five years. In addition to her role as a teacher, she is also a class advisor at HHS and a high school volleyball coach at Hampden Academy. She is heavily involved with the RiSE center, participating in many professional development opportunities, as well as leading professional development for the Maine STEM Partnership. In her free time, Betsy enjoys taking naps with her dogs. :)

Marina Van der Eb

RiSE Center, University of Maine
marina.van@maine.edu

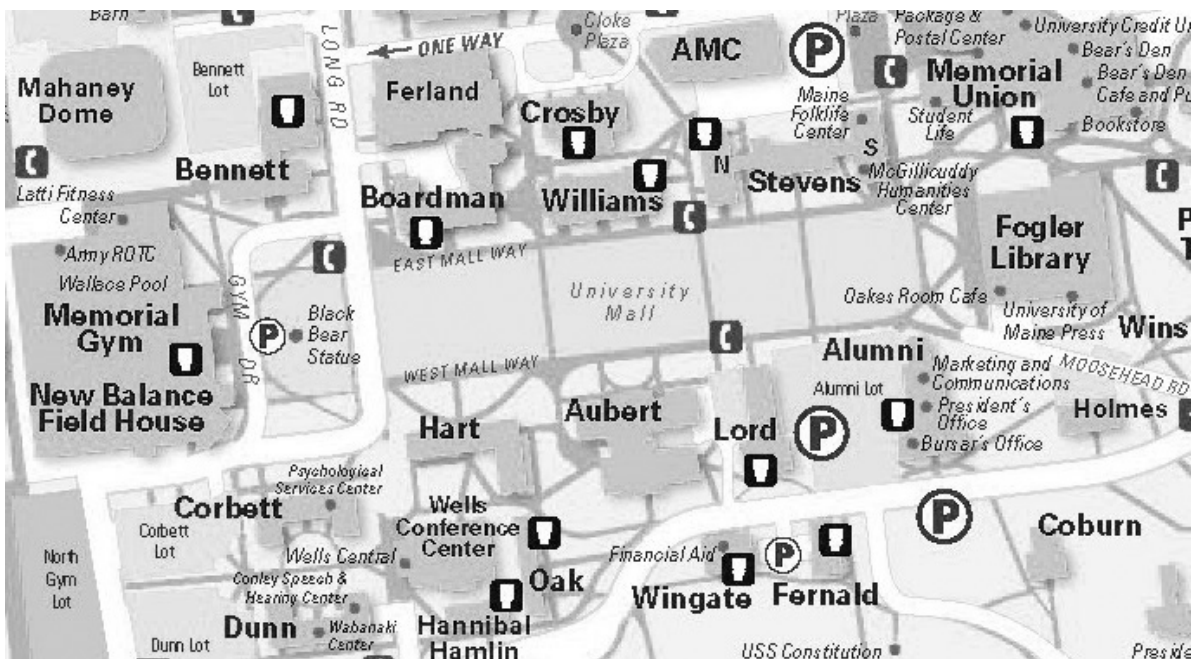
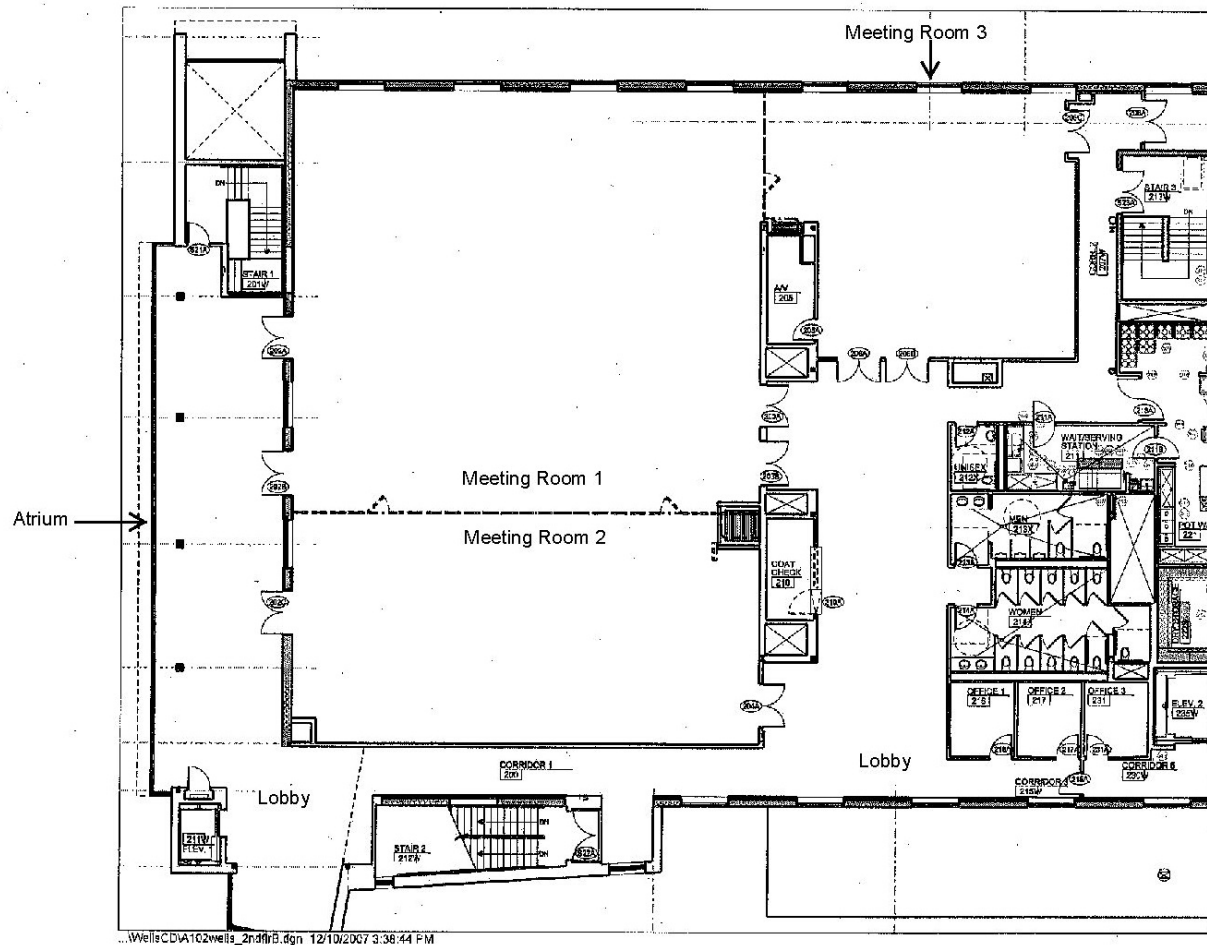


Opening Activity and Discussion, Talk A2

Marina Van der Eb manages the day to day operations of the Maine STEM Partnership, a research-practice partnership focused on improving STEM education statewide from Kindergarten through the University level. This involves providing cost effective science resources to K-12 districts, professional learning opportunities for K-12 STEM educators, and coordinating research grants that are conducted through the partnership. Currently she is involved two NSF funded projects research projects focused on

integrating computing into middle school science instruction (Award #1842359) and teaching quantitative reasoning in the context of forest research (Award #1920908).

Wells Conference Center ~ 2nd floor
University of Maine





2021-22 Campus Map

- P** VISITOR permits authorize parking in any black lot or visitor space.
- RED** (Resident Student) permits authorize parking in red lots.
- BLACK** (Commuter Student) permits authorize parking in black lots.
- BLUE** (Faculty/Staff) permits authorize parking in any blue or black lot.
- GREEN** (Carpool) permits authorize use of individually allocated spaces.

Permits **MUST** be displayed on interior mirror.

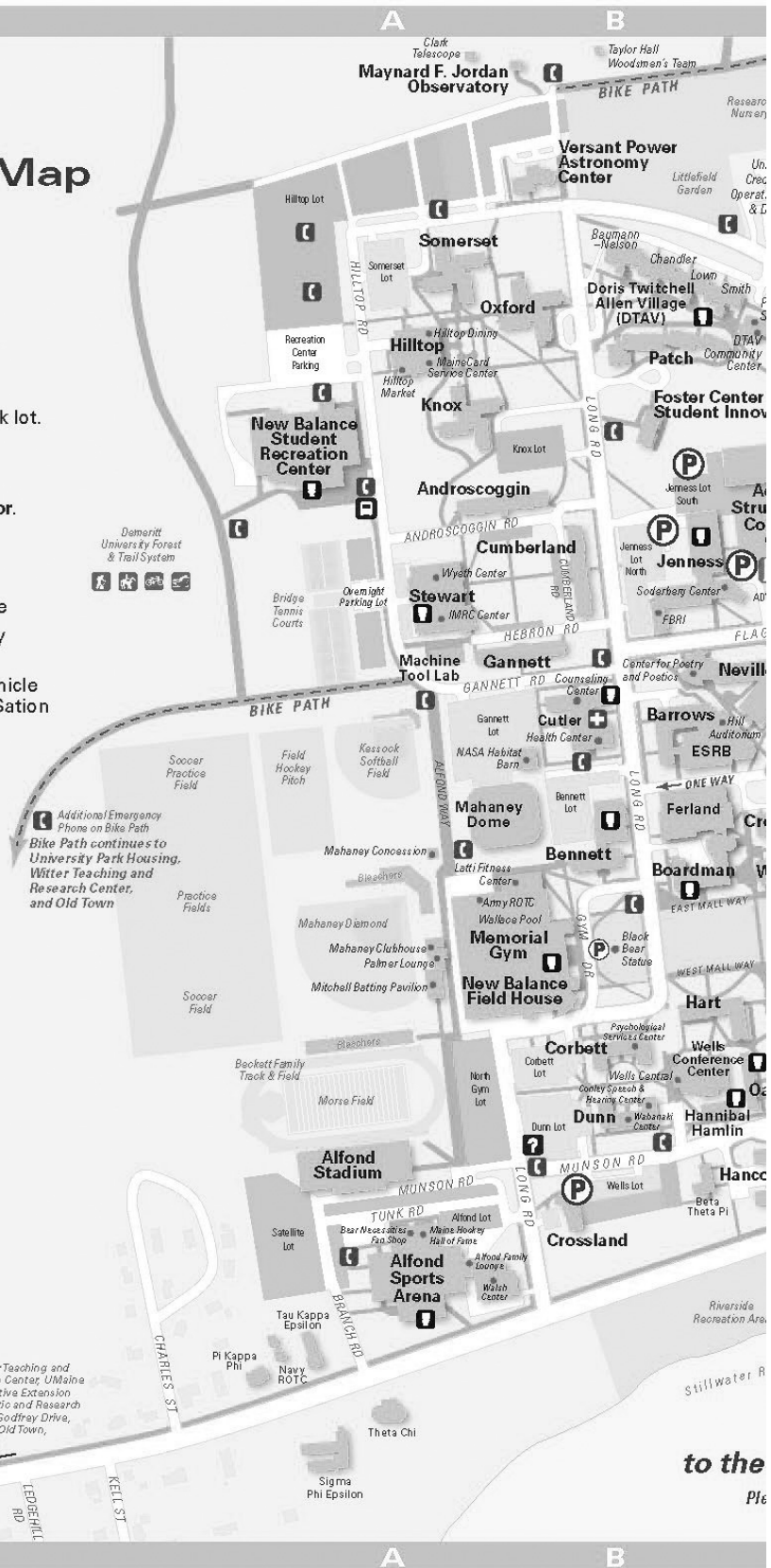
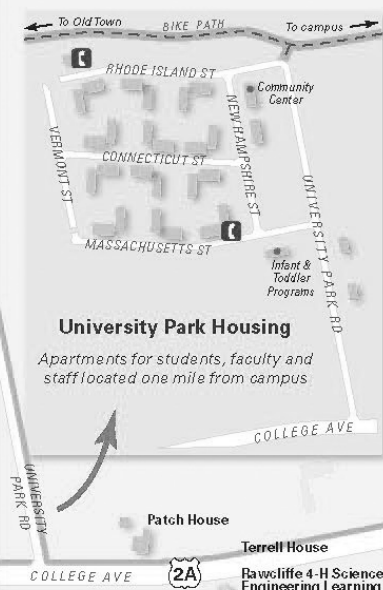
Signs governing lots take precedence over all maps and permits

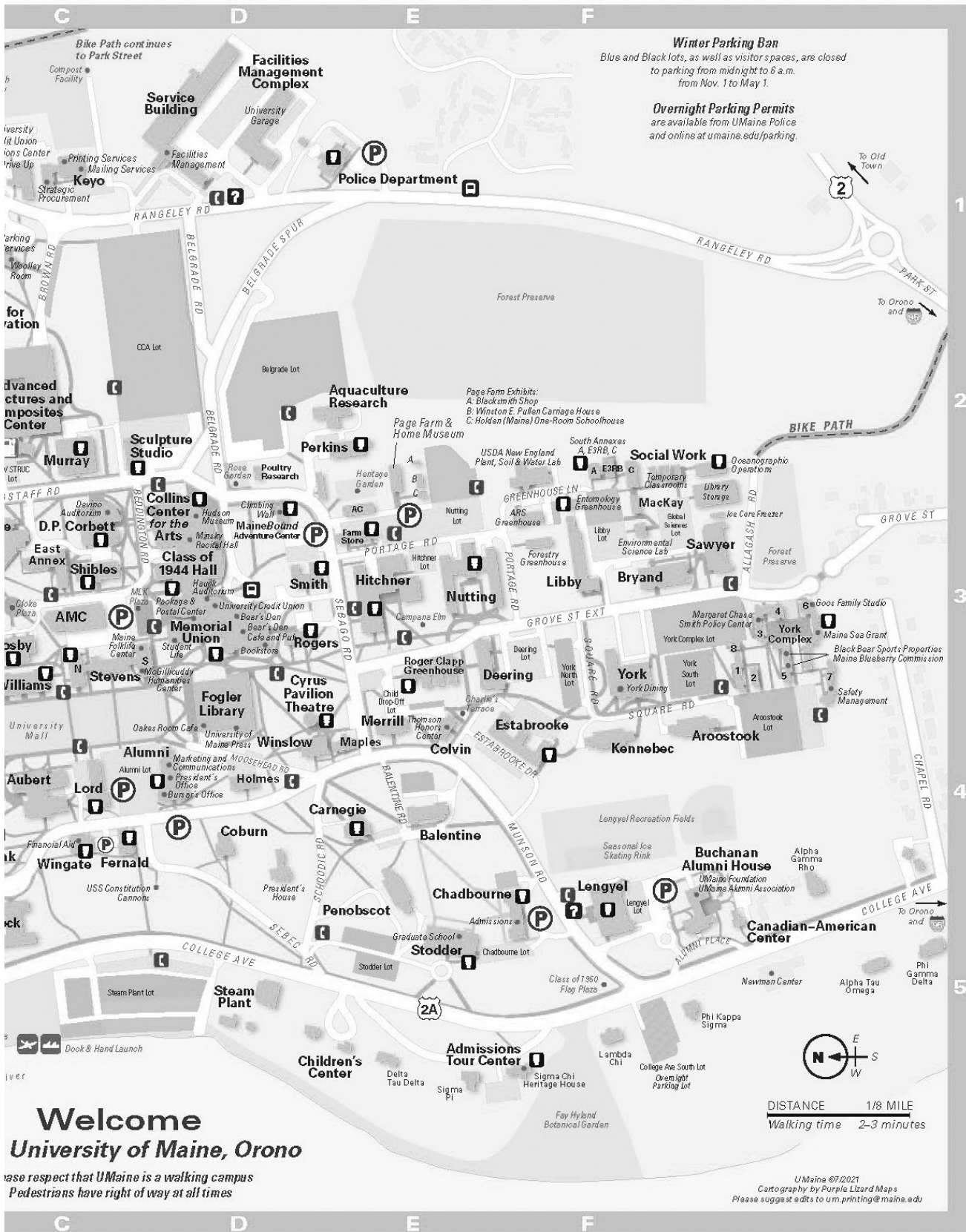
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| ? Information | + Ambulance |
| P Public Bus Stop | E Emergency Phone |
| G Gender Inclusive Restroom | B Electric Vehicle Charging Station |

P Visitor Parking

Visitors need permits. Visitor Permits allow parking in metered spaces and in any **BLACK** lot. They are available for free online at umaine.edu/parking or at the UMaine Police Department.

Parking Office: 207.581.4047



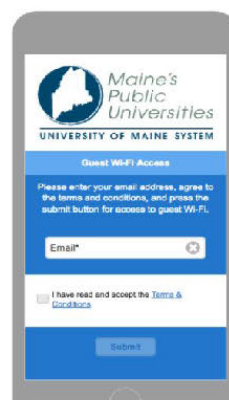


Guest Wi-Fi



University of Maine System Guest Wireless

- Open the Wi-Fi manager on your device
- Select the UMS-Guest network and connect.
- Open a web browser on your device
- Enter your valid email address in the web form



The guest wireless service at the University of Maine is an open network created to allow a basic level of wireless access for visitors at UMS locations. The guest wireless service is not intended for primary use by staff, students, faculty. This service will not connect with an @maine.edu email.

Phone Support - 207.581.2506

Monday - Thursday, 7:30 AM - 7:00 PM

Friday, 7:30 AM - 5:00 PM

Saturday, closed

Sunday, 2:00 PM - 8:00 PM

Walk-in Support, 17 Shibles Hall

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