

# 2019 Symposium on Education in Entertainment and Engineering



**SYMPOSIUM  
PROGRAM**

**JULY 25 AND 26, 2019**  
WEST LAFAYETTE, INDIANA

**PURDUE**  
UNIVERSITY

Multidisciplinary Engineering  
SCHOOL OF ENGINEERING EDUCATION

Department of Theatre  
COLLEGE OF LIBERAL ARTS



# Welcome to the Inaugural Symposium on Education in Entertainment and Engineering!

**Do I contradict myself? Very well then I contradict myself, (I am large, I contain multitudes.)** These lines, from Walt Whitman's *Song of Myself*, have echoed in my head throughout my career. Our world sometimes wants to define each of us within narrow categories ("engineer," "theatre technician," "educator"); just recently, I was encouraged in a professional mentoring meeting to start thinking about choosing which of my interests in storytelling, technology on stage, technical design, or instructional design I would start focusing on as my specialization. That's an impossible choice in my mind: each of these areas of research and interest inform and are enriched by the others, and my practice would be lessened by making such a choice.

I am fortunate to have a like-minded partner and colleague in Mary Pilotte, with whom I've been able to craft an educational journey for students that is intentionally silo-breaking, embracing the multitudes our students contain. In the past five years, I've been blessed to meet students who love stories and machines; who are passionate about amusement parks and the fantastic worlds they allow us to explore; who are fascinated with control systems and the animatronic characters they bring to life. Their interests combine multiple domains, and challenge us to find ways to make those combinations possible.

My hope for this Symposium is that it provides opportunities to build connections among other like-minded mold-breakers, whose journeys and passions have taken—and continue to take—them across traditional disciplinary boundaries. Thanks to all of you for sharing your time, your energy, and your passions with us.



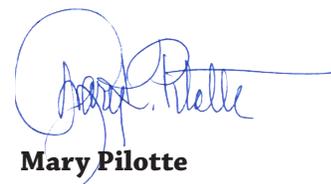
**Rich Dionne**

**Adventurous interdisciplinarity and collaborative/engaging pedagogies of instruction** are values that reside at the heart of the domain of Engineering Education (ENE). So nearly 5 years ago, when I became Director of ENE's undergraduate programs for interdisciplinary engineering studies and multidisciplinary engineering and was introduced to like-minded soul Professor Rich Dionne from the Theatre department, it was like "coming home" to a warm familiar place. Little did we know that our first meeting would be laying the groundwork for the grand collaboration we are sharing in today.

At the time we met, we had a few undergraduate engineering students "dabbling" in the arts, their pathways each hand carved, and one of a kind. Fast forward to today, where we now have two established Theatre Engineering plans of study, we have nearly 20 students either in the pipeline or graduated from these plans, we have co-hosted our first USITT Regional Machine Design Competition, and now stand before you in a formal symposium, one that was born out of a "crazy idea" one day in Chicago.

While each time compressed and residing in our respective disciplinary silos, time spent on these collaborative efforts have multiplied opportunities for our respective programs and students many times over, beside paying personal dividends from joyful collaboration. Our work together has not only been a pleasure, it has resonated for many students who until now, probably made difficult career choices; the kind that swap stability for passion, and challenge the idea that you can actually be all engineer, and all in for the arts as well.

For all that we have accomplished together, we are just getting started. There are so many more "crazy ideas" we hope to bring to life. We most sincerely thank you for sharing your talents and being willing to join in our creative sandbox. We also hope you will be inspired by the many talents and perspectives that are shared today—in the same way our mutual students have inspired both Rich and myself.



**Mary Pilotte**

## Symposium Co-Hosts

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### **Rich Dionne** Purdue University

Rich Dionne is a clinical assistant professor and faculty technical director in the Department of Theatre in the Patti and Rusty Rueff School of Design, Art, and Performance at Purdue University. He specializes in scenery automation and show control systems while also serving as the department's production manager. He has a passion for both the art of theatre and the science and engineering of making theatre happen. Rich is a founding Faculty Fellow of the Purdue Polytechnic Institute, and has served as the technical director for numerous productions in the Department of Theatre. He teaches courses in structural and mechanical design for the stage, automation controls and show networks, project planning and advanced arena rigging to students in theatre and theatre engineering.



Prior to coming to Purdue, Rich was the production manager and resident sound designer at The Shakespeare Theatre of New Jersey, where he mounted numerous productions at various indoor and outdoor venues, including a nationally-recognized educational touring company. Additionally, he has served as the technical director for Berkshire Theatre Festival, Alpine Theatre Project, Weston Playhouse Theatre Company, and Dorset Theatre Festival, mounting critically-acclaimed productions including *The Whipping Man*, *Barefoot in the Park*, *Amadeus*, *Night of the Iguana*, *Avenue Q*, *The Illusion*, and *Death of a Salesman*. Rich's book, *Project Planning for the Stage: Tools and Techniques for Managing Extraordinary Performances*, focused on the application of project planning techniques for theatrical production, was recently published by Southern Illinois University Press. The eighth edition of *Theatrical Design and Production*, for which he is a co-author with Michael Gillette, was recently published by McGraw-Hill.



### **Mary K. Pilotte** Purdue University

Dr. Mary Pilotte is an Associate Professor of Engineering Practice and is also Director of the School of Engineering Education's Undergraduate degree programs in Interdisciplinary Engineering Studies and Multidisciplinary

Engineering.

She teaches varied topics across levels of student development, from professional development to engineering economics and Senior Capstone Design. Outside of the College of Engineering she instructs project management and consulting approaches for the Global and Executive MBA programs at the Krannert School of Management at Purdue, and heads corporate work-shops based on her book "Millennial Reset" (2018) and on Intentional Learning.

Her research interests include engineering work culture including generations-based engineering practices and norms, examining what it means to identify as "multidisciplinary", and exploring new approaches and dynamic strategies around increasing workplace diversity, especially for the neurodiverse, and those with invisible differences.

Prior to her roles in the academic setting, she worked professionally for more than 20 years in the automotive, aerospace, airline, and commercial products industries, holding a variety of titles. She lead high performing teams in manufacturing, design-engineering for new product and process development, and ultimately in plant management and finance completing strategic mergers and acquisitions.

## Symposium Schedule

<b>Thursday, July 25, 2019</b>		
<b>6:30 PM</b>	<b>Early Registration Opens</b>	<b>Armstrong Atrium</b>
<b>7:00 PM</b>	<b>Welcome Reception and Plenary Remarks with Dionne/ Pilotte</b>	<b>Armstrong Atrium</b>
<b>Friday, July 26, 2019</b>		
<b>7:30 AM</b>	<b>Registration Opens</b>	<b>Stewart Center</b>
<b>8:30 AM</b>	<b>Performance as Pedagogy</b> <i>Teaching Rhetoric to Engineers with Shakespeare</i> , John C. Tomkins <i>Understanding the Nuremberg Trials: An Examination of the Use of Live Theatre as an Educational Tool</i> , Amanda Mayes <i>Exploring Diversity Issues Through Robot Theater</i> , Denise Szecsei	<b>Stewart Center</b>
<b>9:45 AM</b>	<b>Morning Panel Session</b> <b>Engineering and Entertainment: An Academic Perspective</b> Mary Pilotte (moderator), Mark Budnik, Dan Lisowski, Ann Shanahan	<b>Stewart Center</b>
<b>11:00 AM</b>	<b>Beauty in Engineering and the Performing Arts</b> <i>Beauty in Engineering and the Performing Arts</i> , Catherine Skokan, et. al.	<b>Stewart Center</b>
<b>12:00 PM</b>	<b>Lunch</b>	<b>Stewart Center</b>
<b>1:00 PM</b>	<b>Robot Theatre Performance</b>	<b>Mallett Theatre</b>
<b>2:00 PM</b>	<b>Afternoon Panel Session</b> <b>Engineering and Entertainment: An Industry Perspective</b> Rich Dionne (moderator), Alvah Aldric, Matt Jackson, Beth Martell, Kimberly Corbett Oates	<b>Stewart Center</b>
<b>3:15 PM</b>	<b>Experiential Learning and Tool Building</b> <i>International Competition as Stopgap Curriculum</i> , Katherine Woodcock <i>Acoustic Engineering Workstation</i> , Geoffrey Akers, Nic White	<b>Stewart Center</b>
<b>4:30 PM</b>	<b>Engineering Art</b> <i>Undergraduate Capstone Project: A Graphic Rain System</i> , Katherine Metzler <i>Photonics for Historical and Modern Visual Arts</i> , Alexandra Boltasseva	<b>Stewart Center</b>
<b>6:00 PM</b>	<b>Dinner and Plenary Remarks with Dionne/Pilotte</b>	

## Presentation Abstracts

*in alphabetical order by the lead presenter's last name*

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### **Acoustic Engineering Workstation**

Geoffrey Akers, College of the Ozarks

The College of the Ozarks is developing the ability to offer acoustic engineering services to on and off-campus customers. The College is the only federally-recognized work college with an engineering program. Students do not pay tuition and are assigned work stations on campus to help defray expenses and to generate income for the College. The engineering program began in 2016, and the Engineering Services workstation began in 2018 with one engineering student supervised by an engineering faculty member. The workstation has two primary objectives. The first is to provide a learning environment for engineering student workers, which includes field experience in the engineering design process, project management, customer interaction, and mentorship by faculty, industry partners, and local engineers. The second is to provide services to campus and off-campus customers. This paper addresses the purpose and administration of the workstation, the perceived benefit to the student workers and the engineering program, as well as the recent work station accomplishments. At a minimum, the accomplishments will include designing, fabricating, testing, and analyzing acoustic panels for a small sound studio, as well as measurements of the small studio before and after the acoustic treatments.

**3:15 pm, Stewart Center**

### **Photonics for Historical and Modern Visual Arts**

Alexandra Boltasseva, Purdue University

The impact of photonic technologies on our society cannot be overestimated; by controlling light, photonics is finding a home in art and design. Microscopy, spectroscopy, hyperspectral imaging and interferometry are tools for unlocking details in centuries-old paintings and enable old paintings and frescos to be preserved. A recent study has investigated how optics was used to create art centuries ago, unlocking the secrets of renowned artists, such as Bellini and Caravaggio, who appear to have used optical projections to guide the proportions in the scene. Lasers have been work horses on performance stages

and in museums allowing artists to do new things by enabling fascinating animation, graphics and magical, “alive” museum portraits.

Recent developments in ultra-thin, flat optics enabled by metamaterials and metasurfaces has expanded the realm of lenses and holograms include extremely thin meta-coatings instead of bulky, volumetric components. These new metasurfaces bring significant advancements into hologram technology with potential impact on visual arts via ultra-compact, easy-to-make, robust and full-colored holograms. New concepts for light manipulation with metamaterials, metasurfaces and photonic crystals could further enhance artists’ capabilities.

This cross-disciplinary talk will give an overview of optical approaches for historical and visual arts involving a wide range of optical designs and materials that merge engineering and arts, such as ceramics, colored glasses (such as those hosted by the Corning Museum of Glass), optical fibers for entertainment and fashion textiles, and more.

**4:30 pm, Stewart Center**

### **Understanding the Nuremberg Trials: An Examination of the Use of Live Theatre as an Educational Tool**

Amanda Mayes, Purdue University

Does experiencing a live theatrical performance help college students contextualize academic content? What benefits do students gain from the performance outside of the stereotypical textbook readings and class discussions? Survey research conducted at Purdue University indicates exposure to live performances offers significant benefits for college students in their ability to understand and critically analyze the historical events they learn within their coursework. Our research indicates that live theatre could assist in enhancing traditional education models at the collegiate level and should be explored further as a potential methodology to aid in student success.

**8:30 am, Stewart Center**

**Undergraduate Capstone Project:****A Graphic Rain System**

Katherine Metzler

A graphic rain system displays visual shapes in the patterns of rain droplets as they fall. Any such system must be closed loop, recycling water with little loss over time and incorporate a self-contained reservoir. Ideally, such a system must be able to display multiple, recognizable shapes as the water droplets fall, and be operated by a user with minimal training. And, of course, all elements of the system must adhere to relevant and appropriate safety codes.

Mechanical engineering students at University at Buffalo-SUNY enroll in a capstone design course in their senior year. Typically, students in this course form small groups and are assigned a challenge by the instructor; during the course of the semester, students progress through a design process to generate a prototype solution to the challenge they've been given. In some instances, students can bring a specific design challenge that matches their career goals and passions, and are permitted to design a solution to that challenge instead.

As part of her capstone project, Metzler undertook to create a small scale version of a graphic rain system. During this presentation, Metzler will share the details of the specific design challenge as well as the solution she has pursued in achieving the design goal. Additionally, Metzler will discuss how this capstone project has allowed her to merge her twin passions of art and engineering. Further, she will examine how this project has provided her with an opportunity to explore both artistic expression and deeper understanding of technological and engineering principles.

**4:30 pm, Stewart Center****Beauty in Engineering and the Performing Arts**

Catherine Skokan, Jonathan Cullison, John Persichetti, Robert Klimek, Colorado School of Mines

This panel presentation will be led by two engineering faculty and two Music and the Performing Arts professors, all of whom work closely in collaboration at Colorado School of Mines (CSM). The presentation will be a combination of discussion, demonstration and 'hands on' challenges.

The engineering design process has been represented in many ways but can generally be distilled into an iteration of elements that include design, construction, evaluation, and cycling back through redesign until a

polished final product is achieved. Music composition and performance use this same process. Likewise, any theatrical production follows a similar envisioned approach that, with the keen eye of a director, is subject to iterative manipulation of staging, blocking and lighting/sound effects, all to fit within the constraints of a particular stage, abilities of those involved, and budget. And, we cannot disregard the same step-by-step process in the visual arts.

History has shown us that many masters of creative genius were both "engineer" and "artist" – those who gave us the engineering marvels of the Egyptian Pyramids, the beauty of Michael Angelo's Sistine Chapel, DaVinci's paintings and the many designers of musical instruments and performance spaces. Why is it then that these creative endeavors are often seen as being at opposite ends of the educational spectrum? Also, should engineers be taught to see themselves as 'artists'?

**11:00 am, Stewart Center****Exploring Diversity Issues Through Robot Theater**

Denise Szecsei, University of Iowa

The University of Iowa's Robot Theater Project promotes STEM education and outreach activities primarily using two commercially available robots: NAO humanoid robots, available through SoftBank Robotics, and Cozmo, developed by Anki. Students involved in this project write scripts and program robots to perform theatrical skits on stage in front of live audiences.

In this paper we introduce our Robot Theater Project, describe the framework used to coordinate the behavior of multiple robots in a scene, discuss the challenges with live performances involving robot actors, present the difficulties in using robots from different manufacturers, and share results from our most recent initiative: working with students to develop a series of short skits that focus on exploring human experiences and behavior using robots as actors, where the content of these performances centers on material related to diversity and representation.

**8:30 am, Stewart Center****Teaching Rhetoric to Engineers with Shakespeare**

John C. Tompkins, Purdue University

This paper presents the use of Shakespeare in the syllabus of a large-format communications class designed for civil engineers. It gives an overview of the

course, including the philosophy behind its creation and the particulars of its population. Shakespeare's presence in the course is justified on two grounds: first, that rudimentary acting practice significantly reduces self-consciousness in public speakers and second, that Shakespeare's speeches exemplify classical rhetoric, and are thus grounds for both the practice of persuasion and the study of its parts. The American Shakespeare Centre has used a similar pedagogy to launch its Leadership Programming initiative, which offers communication training to executives and officials through the medium of great speeches from the plays. A sample assignment, rubrics, and a syllabus are provided.

**8:30 am, Stewart Center**

## **International competition as stopgap curriculum**

Kathryn Woodcock, Ryerson University

Students aspiring to careers in the themed entertainment and attractions industry have few formal options to learn and demonstrate skills and knowledge specific to the industry. Students have shown initiative in developing extracurricular activities, and industry has reached out to offer "next generation" programs and internships. It still remains problematic for industry employers to select the best qualified students from a large pool of aspirants and for motivated candidates to stand out as highly qualified for these opportunities. The Ryerson Invitational Thrill Design Competition (RITDC) was developed to address this problem. RITDC provides learning experiences and performance evaluation with not only completion as an indicator of accomplishment, but concurrent interactive evaluation by judges from industry. As such, although the competition is formally an extracurricular activity, it functions as stopgap curriculum.

RITDC has grown exponentially with the support of industry sponsors. Through participation growth and scope expansion, the competition maintained a focus on specific entry-level professional skills in a unique industry by adopting an interdisciplinary structure. Realistic, focused challenges showcase real skill expectations for entry level professionals and interns, not just technical skills and knowledge but also interdisciplinary collaboration, time management, creative agility, and presentation. Judges from Universal Creative and its partner companies take an avid interest in how teams adjust to time pressures, approach problem definition, make trade-offs, and present their proposals. Competition alumni have

taken internships and graduate employment in the attractions industry.

The competition continues to adapt and learn from year to year as it encounters various challenges, ranging from participant disclosures and media, logistics of academic absence and institutional oversight, challenges for teams to cover their costs, barriers to internship opportunities, and growing workload for production and direction of the competition. Through this evolution, the partners remain committed to sustaining and exploring the potential of the competition, whether it remains "stopgap curriculum" or transitions to formal curriculum.

**4:30 pm, Stewart Center**

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## Panel Discussions

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### **Morning Panel — Engineering and Entertainment: An Academic Perspective**

*“In the longer run and for wide-reaching issues, more creative solutions tend to come from imaginative interdisciplinary collaboration.” Robert Shiller, Contemporary Economist, Author and Nobel Laureate*

In spite of many outside and within higher-education believing in the spirit of this quote, fostering, supporting, and sustaining such vital interdisciplinary collaboration, especially across domains of practice, can be challenging at best. Constraints revolving around curricular control and oversight, limited financial and human resources, lack of shared metrics/incentive systems, and more abound. Yet, for those who endeavor to engage in efforts and programming such as that found within **Entertainment/Theatre Engineering**, the nascent opportunity and personal rewards appear to far outweigh the real or perceived obstacles.

This panel, which will include faculty and administrators from a range of universities, hopes to begin to unpack a range of critical items related to nurturing the interdisciplinary nature of Entertainment/Theatre Engineering, including:

- Barriers to integrating entertainment and engineering programs, and suggestions for overcoming them.
- Fostering the fire for interdisciplinary education innovation and scholarly work.
- Promoting and sharing excellence and best-practice stories in Entertainment Engineering.
- The value of industry voice in promoting creative interdisciplinary programs.
- Exploring the ways engineering-based pedagogies can inform liberal arts education and what arts education can give to engineering students.

Moderated by Dr. Mary Pilotte, this discussion is designed to bring value to all symposium attendees passionate about the growth of this new and exciting interdisciplinary field. Ample time will be set aside to ensure discussion and question/answer is allowed to flourish.

### **Afternoon Panel — Engineering and Entertainment: An Industry Perspective**

As audiences have demanded increasingly spectacular and immersive experiences, the live entertainment industry has expanded to mean more than traditional plays and musicals on regional stages. “Live entertainment” encompasses regional and commercial theatre, to be sure, but has come to include everything from cruise ship performances to concert tours, circus acts to themed amusements, and anything in between. This expansion of the definition of “live entertainment” has occurred concurrent with an increasing expectation in the level of complexity of the visual and aural landscapes that surround these events. From giant, moving stages, to complex immersive rides, from rapidly-moving lighting fixtures to large integrated networks delivering video content, meeting these challenges has required a greater reliance on engineering expertise.

This panel will include representatives from a variety of aspects of the entertainment industry, including product development, design implementation, and architectural consulting, and will attempt to discuss the place of engineering in the industry, examine existing trends in technological advancement, and explore future possibilities in the development of technologies for live entertainment.

Moderated by Professor Rich Dionne, this discussion intends to bring value to attendees who are passionate about current and future applications of engineering practices, techniques, and knowledge to the evolution of live entertainment. Ample time will be set aside to ensure discussion and questions from attendees.

## Special Presentation: Robot Theatre

1:00 pm, Mallett Theatre, Pao Hall

The University of Iowa's Robot Theater Project (UIRTP) began with the goal of incorporating robot technology into the performing arts as an innovative way to promote STEM education to underrepresented students. We offer Robot Theater First-Year Seminars, use robots in demonstrations and outreach activities, offer workshops to K12 students, and invite the public to attend live performances that showcase students' creative works. We are now moving towards the exploration of how robots can be integrated into more mainstream theatrical performances as well as the consequences of that integration.



Inspired by the popularity of dance-off competitions like *So You Think You Can Dance* and *Dancing With The Stars*, teams of Cozmo robots will challenge each other to a dance street battle, with NAO robots serving as the MC and the official judges. Opinions of volunteer human judges will be encouraged.

## Presenter Biographies

*in alphabetical order*

### **Geoffrey Akers, College of the Ozarks**

Dr. Geoff Akers is an Associate Professor of Engineering in the James P. Keeter School of Engineering at the College of the Ozarks, the only engineering program at a federally-recognized work college. Dr. Akers had a distinguished 20-year career in the US Air Force, retiring in 2016 as a Lieutenant Colonel. The majority of Lt Col Akers' career focused on developing and testing state-of-the-art aerospace systems. Geoff now assists in development of a multidisciplinary engineering program that provides essential engineering skills anchored with the Christian worldview to meet the needs of employers in the Ozarks and beyond. In addition to teaching at the College, he has initiated a student work station to provide acoustics engineering consulting service to campus customers, and eventually off-campus customers, as well.

### **Alvah Aldrich, Wenger J.R. Clancy, Inc.**

Alvah Aldrich Joined JR Clancy as the Engineering

Manager in 2017. His duties include managing the engineering and design of rigging components and systems for projects ranging in size from small stages to large scale performing arts centers. Prior to his role with Wenger J.R. Clancy he worked for Eaton developing and designing explosion proof devices and safety equipment used in industrial and oil and gas markets. Alvah has a Mechanical Engineering Degree from Rochester Institute of Technology.

### **Alexandra Boltasseva, Purdue University**

Alexandra Boltasseva is a Professor at the School of Electrical & Computer Engineering at Purdue University. She received her PhD in electrical engineering at Technical University of Denmark in 2004. She is 2018 Blavatnik National Award for Young Scientists Finalist and received the 2013 IEEE Photonics Society Young Investigator Award, 2013 Materials Research Society Outstanding Young Investigator Award, the MIT Technology Review

Top Young Innovator (TR35), and the Young Elite-Researcher Award from the Danish Council for Independent Research. She is a Fellow of the Optical Society of America (OSA), Fellow of SPIE and is Editor-in-Chief for OSA's Optical Materials Express.

### **Jon Cullison, Colorado School of Mines**

Jon Cullison is currently an Associate Professor of Music Technology at Colorado School of Mines. He holds a B.M. in Jazz Composition/Arranging, and a M.M. in Bass Performance, with a concentration in Jazz Studies. Jon has been a professional musician for 30+ years, performing and recording with a wide range of ensembles and styles covering Jazz, Salsa, Orchestral, Rock and Pop. As an audio engineer, he has recorded and mixed multiple artists, including Dan Perkins, Lorenzo Trujillo, and Belinda Womack. He has composed and arranged works for a variety of situations, including movie music with Derrick Boelter Productions and Max Wild Productions.

As an educator, Jon has taught classes ranging from Music Theory and Music History, to Electro/Acoustic Improvisation and Audio and Acoustical Engineering and Science. Mr. Cullison started teaching at CSM 10+ years ago and has built the Music Technology Program and developed the Music, Engineering and Recording Arts Minor for CSM. He also is Director of the Jazz Program at CSM, and his ensembles maintain a busy performance schedule, including public performances in Dublin and Rome, and radio performances on KUVU in Denver. He has also published educational material through XANedu for CSM classes.

### **Robert Klimek, Colorado School of Mines**

Dr. Robert Klimek, BA, MDiv, MA, DA is a CSM Teaching Professor, musician, composer and clinician in ethnomusicology. Some of his past teachers include Aaron Copeland, Philip Glass and Donald Keats. His works can be heard worldwide and can be found in over 100 music collections. He has been a featured artist on a Grammy nominated album, as well as final nominee for the National Booksellers Gold Medallion Award. Currently, he is the director of the Music and the Performing Arts program at Colorado School of Mines, which offers a minor in Music, the Recording Arts and Technology. The program successfully produced its first full album in 2012, and was awarded the Recording of the Month (December) by the Independent Broadcasters Association. Dr. Klimek and Dr. Skokan have been leading international trips with CSM music/engineering students. Each of the

experiences emphasized both sides of the student's skill set (engineering/music). All trips included music performances; ethno-music instruction; engineering lectures, industry tours, and community service projects. Dr. Klimek's hope, through these international experiences, is to create a pathway upon which the CSM student realizes that his/her technical field is an 'art form.' This art form enhances and enlivens both the student and the peoples and cultures visited.

### **Dan Lisowski, University of Madison-Wisconsin**

Professor Lisowski is a faculty member in the Department of Theatre and Drama, Head of the Theatre Technology MFA specialization, and Director of the Entertainment Technology Innovation Lab (ETIL). While pursuing his undergraduate degree from the University of Wisconsin-Madison (BS, Theatre and Drama: 2003), Dan was a member of two Rose Bowl Championship teams (Football 1997-2000). Dan received his terminal degree from the Yale School of Drama (MFA, Technical Design and Production: 2006) and worked professionally as an Entertainment Design Engineer until he returned to join the faculty at UW-Madison in 2009. His primary research interests include Entertainment Automation Control Systems and Network-based Functional Safety. Dan and his wife, Meghan (BA: 2003), have five "badger-loving" children.

### **Verda Beth Martell, DLR Group**

After 22 years as a technical director, Beth has taken her end-user expertise to consulting. In 2016, she joined DLR Group | Westlake, Reed, Leskosky, a national integrated design firm with architects, engineers, designers, and specialists all under one umbrella. Beth has had a hand in designing more than 20 performing arts facilities, including large professional venues, highly tuned recital halls, university performing arts complexes, and expansive high school theatre facilities. Prior to her move to architecture, Beth was the Chair of Scenic Technology for the Department of Theatre and the Technical Director for Krannert Center for the Performing Arts at the University of Illinois. Beth is a current member of the board of directors for the United States Institute for Theatre Technology (USITT) and chairs the Essential Skills for Entertainment Technicians (eSET) Council. She has presented more than two dozen sessions and workshops, including the Physics of Theatre series with her research partner (and husband) Dr. Eric Martell. In 2015, she and Eric published *The Physics of Theatre: Mechanics* as a resource for technical directors, riggers,

and automation specialists. Along with her theoretical work developing mathematical models to predict the action of theatrical machines, Beth also designs theatrical automation systems, and scripts/programs in multiple languages, including ladder logic, LISP, and the National Instruments graphical programming environment LabVIEW. She is an ETCP Certified Rigger - Theatre and an ETCP Recognized Trainer. Beth holds an MFA in theater technology from the University of Wisconsin - Madison and a BS in theatre from Illinois State University.

## **Amanda S. Mayes, Purdue University**

Amanda Mayes is the Manager of Education in Purdue Convocations. She oversees programming for family and youth audiences, outreach activities, and curricular integration at the K-12 and collegiate level. In addition, Dr. Mayes runs all research initiatives at Convocations and serves as a research consultant for the ArtsKC Regional Arts Council. Her research interests include academic and intrinsic impacts of arts experiences, program assessment, professional development, improving cultural competency, and arts advocacy. Previously, Dr. Mayes managed an NIH funded investigation of media's impact on health related behaviors in college women and was a visual arts teacher for over a decade. She has given presentations of her teaching and research at regional, state, and national conferences. She holds a PhD in Curriculum and Instruction from Purdue University, a MA in Visual Arts Education from Purdue University, and a BS in Visual Arts Education from Indiana State University.

## **Katherine Metzler, SUNY Buffalo**

Katherine Metzler is an emerging professional from Buffalo, New York. She attended the University at Buffalo, SUNY, graduating in 2019 with dual degrees: Mechanical Engineering, BS and Theatre, BA with a concentration in design and technology. She intends to use both degrees to work on complex projects, and help with technological and safety advancements in the entertainment industry. Within the undergraduate theatre program, she worked as the Technical Director for three department productions, but also cross trained and held the role of Set Designer, Lighting Designer, Sound Designer, and Master Electrician, among other assistant roles. Within the engineering program there were multiple classes with a lab component or semester long group projects which trained future engineers in the hands on and collaborative aspects of the job more

than just pages upon pages of maths. Ultimately she attempted to cultivate the useful knowledge from each discipline to create a unique blend of skills. Having just come out of these two separate programs which at this stage, are beginning to encourage, but don't necessarily foster interdepartmental cross over, she is excited to join the conversation about the convergence of the fields on the educational and professional levels.

## **John Persichetti, Colorado School of Mines**

John Persichetti, BS, MS Chemical Engineering is a Mines Teaching Associate Professor, Assistant Director for the Engineering, Design, and Society Division, Director of the Capstone Senior Design program for approximately half of the Mines graduating engineers (~500 students per year in a multidisciplinary program), and Director of the general B.S. in Engineering degree at Mines. John is also a choral musician, member of an English Handbell choir, and involved in community theatre as set designer and technical director for a half-dozen productions. Intertwining his engineering background, creative engagement in the classroom, and passion for the performing arts, John likes to bring an added dimension to both his community performances and to the way engineers think about creative problem solving. The B.S. in Engineering degree program that he directs allows students to pursue a passion to help enliven their career pursuits. One of the prescribed and transcribed areas of study for the degree includes a focus in Music, Audio Engineering, and Recording Arts, allowing students 18 semester hours of course study dedicated to any of these aspects of the performing arts and advising on appropriate engineering courses to support the technical dimension of the arts.

## **Ann Shanahan, Purdue University**

Professor Shanahan's research interests and teaching specialties include directing, gender and theatrical space, and theatre and social change. A scholar-artist, her recent publications include essays on directing practice written as the founding co-editor of the Peer-Reviewed Section of the SDC Journal, the official publication of the Stage Directors and Choreographers Society. She is the editor of *Landscapes of Consciousness: Meredith Monk, Robert Wilson and Richard Foreman*, the 6th volume in a new series, *Great North American Theatre Directors* (Bloomsbury Methuen, 2020 forthcoming).

Professor Shanahan has presented numerous papers on acting and directing pedagogy at the

Association for Theatre in Higher Education (ATHE) and Comparative Drama Conference (CDC), and on gender and performance at the National Women Studies Association (NWSA) Conference. She served as Focus Group Representative for the Directing Focus Group at ATHE 2014-16, and as the Vice President for Conference 2018, theme: "Theatres of Revolution: Performance, Pedagogy and Protest."

Professor Shanahan served as dramaturg for the national touring production of *Angels in America, Parts I and II* (dir. Michael Meyer), *Third* (dir. Sarah Gabel) and *The Mistress Cycle* (dir. Kurt Johns) at Appletree Theatre, for Rivendell Theatre Ensemble's productions of *Mary's Wedding* (dir. Mark Ulrich), *Falling: A Wake* (dir. Victoria Delorio) and *The Electric Baby* (dir. Tara Mallen), and for Red Twist Theatre's production of *A Delicate Balance* (dir. Steve Scott).

### **Catherine Skokan, Colorado School of Mines**

Dr. Catherine Skokan, BSc, MSc, PhD – Geophysical Engineering, is an associate professor emerita at the Colorado School of Mines and is the first woman to receive a graduate degree from this institution. Her technical interests include volcanoes, geothermal and energy resources, groundwater resources, and humanitarian engineering. Dr. Skokan has traveled extensively with student groups and she has led humanitarian engineering projects to the Americas, Europe, and Africa. She has also conducted workshops in Italy, Colombia, Tanzania and Zambia. Dr. Skokan is a regular lecturer for the Road Scholar Program where she lectures on cruise ships. Her music interests include playing violin with the CSM orchestra, bassoon with the CSM band, and erhu with the CSM Chinese Ensemble as well as performing with chamber groups outside of CSM. With Dr. Robert Klimek, Dr. Skokan has led trips with Colorado School of Mines students over Spring Break. As a window into culture, Drs. Klimek (Director of Music) and Skokan (Engineering) organize trips to include technical tours and music experiences – both performance and as an audience. These trips have taken students to Italy, Peru, Jamaica, Ireland and Vietnam. With student groups, her passion is for travel and to share with others our beautiful world.

### **Denise Szecsei, University of Iowa**

Denise Szecsei teaches Mathematics and Computer Science at the University of Iowa. She received undergraduate degrees in Physics, Chemistry, and Mathematics from the University of Redlands, and a

Ph.D. in Mathematics from the Florida State University. She enjoys keeping up with new technological developments and incorporates new technology into her classes and research activities. She has been working with NAO humanoid robots for the past six years, and Cozmo for two years. She has designed robot dance and theater classes for students with a variety of interests and backgrounds, and is excited to watch how people of all ages express themselves through these robots.

### **John C. Tompkins, Purdue University**

John C. Tompkins serves as the lecturer in technical communications for the Lyles School of Civil Engineering at Purdue University where he teaches the core writing and speaking classes for the school. He received his BA in English from the University of Colorado at Colorado Springs in 2002 and his PhD in English from Purdue University in 2013.

### **Nic White, College of the Ozarks**

Nic White is currently a junior in College of the Ozarks' engineering program. He began working for the college's Engineering Department in August of 2017, as a student worker. Nic tutors for math and engineering classes, as well as how to use equipment and software; such as 3D printers, laser engravers, and CAD software. Nic has most recently begun helping Dr. Geoff Akers with work in the field of acoustics by using acoustic software to model and analyze the acoustic environment of facilities. Nic White plans on graduating with a BS in Engineering in May 2020 and continuing towards an electrical engineering career.

### **Kathryn Woodcock, Ryerson University**

Dr. Kathryn Woodcock is Professor at Ryerson University in Toronto and director of the THRILL Lab, involved in unique extracurricular training, research, and knowledge mobilization activities focused on human factors of amusement rides and attractions. She studies accident and error analysis, task demands, and interface design, pertaining to guests, operators, and inspectors. Her research, innovation, and service have been published in over 75 peer-reviewed chapters, journal articles and conference papers and over 200 other presentations and publications for both industry and professional audiences. Dr. Woodcock is a member of TEA, ASTM Committee F24, Ontario TSSA Amusement Devices Advisory Council, Global Safety Committee of IAAPA, and Board of Directors of the Canadian National Exhibition, consults to designer/manufacturers and owner/ operators, and

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regularly instructs at AIMS and NAARSO industry seminars. She chairs the inaugural Themed Experience and Attractions Academic Symposium, and leads the international Rider Eligibility Task Group for ASTM Committee F24. She is a registered Professional Engineer, IAAPA Certified Attraction Executive, Canadian Certified Professional Ergonomist, and

Fellow of Association of Canadian Ergonomists. She earned Bachelor and Master's degrees in Systems Design Engineering at University of Waterloo, and PhD in Mechanical and Industrial Engineering at University of Toronto, all specializing in human factors engineering.

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## Symposium Workbook

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Undoubtedly, most everyone here has attended other conferences, and find them to be a source of inspiration and re-invigoration. It is our sincere hope that this event will have the same effect for you as well. It is also our experience—and a swath of education research on learning supports this—that active and goal centered participation in your individual learning aids in “stickier” retention and improves personal achievement more so than passively receiving information or “hoping” you will get something out of your invested time.

Our lives are very full these days, and our brain’s ability to keep all of the important “bits” of information—even the most important ones—can suffer recall problems. To that end, we would like to offer the following reflective prompts and organizational pages as a first step toward encouraging you to actively engage with the symposium and its participants and presentations. The following pages were designed to help you manage your newly formed connections, jot down ideas and concepts, or make note of items you want to take action on or investigate more fully.

We have shamelessly borrowed elements of this concept from other workshops and conferences, including the Lilly Conferences on Evidence-Based Teaching and Learning held across the country each year. We encourage you to consider attending a Lilly Conference, as they can be exceptional experiences.

### Intentional Symposium Goal

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In a brief sentence, set one personal goal for your attendance at this symposium:

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What **one word** captures the essence of this goal? \_\_\_\_\_























