# Session Descriptions

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| **Keynote Address** 8:45 - 9:45 | **Quantum Information Science and Technology** | **Raymond Laflamme** is a native of Quebec City, he earned his PhD at Cambridge University Department of Applied Mathematics and Theoretical Physics under Stephen Hawking. After post-doctoral fellowships in Vancouver and in Cambridge, he settled at Los Alamos National lab until 2001 when he came to Waterloo to become the Founding Director of the Institute for Quantum Computing that he as led for 15 years. He has also been an Associate Researcher at the Perimeter Institute for Theoretical Physics since 2001. As a pioneer in quantum information processing, he has earned Fellowships from the American Association for the Advancement of Science, the American Physical Society and the Royal Society of Canada and the Royal Society of Canada. He is the recipient of an honorary degree from Universite de Sherbrooke (2012), a Queen Elizabeth II Diamond Jubilee Medal (2013), and became an Officer of the Order of Canada in 2019. He presently holds the Mike and Ophelia Lazaridis "John von Neumann" Chair in Quantum Information and a Canada Research Chair in Quantum Information. In 2010 he co-founded Universal Quantum Devices, a startup commercializing spinoffs of quantum information research and in 2015, he founded QuantumLaf Inc. |

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| **Session A** 10:00 – 10:45 | **IQC: The Two Golden Rules of Quantum Mechanics.** When teaching quantum mechanics, it can be difficult to avoid getting bogged down in the details. The key rules of quantum mechanics, however, can be stated simply as the superposition and measurement principles. We'll discuss these two "golden" rules of quantum mechanics using the polarization of light in an easy-to-replicate demonstration. We'll then show how they alone can be harnessed to implement quantum cryptography, an encryption method which guarantees secure communication through the laws of physics. | **John Donohue** is the Scientific Outreach Manager for the Institute for Quantum Computing. His job is to make quantum science and technology accessible, bringing it out of the labs, off the whiteboards, and into the classrooms and public discussion. He is from the city of Chatham, Ontario, and obtained his PhD from the University of Waterloo in 2016, specializing in quantum nonlinear optics and laser physics. |
| | **Acting Out in Large Lecture Halls**. This semester, I face the challenge of entangling hundreds of students in learning physics in a large concert hall. Following a tip from Eugenia Etkina, I use the venue's stage to co-create three-dimensional physical representations of abstract concepts with my students. Creating moving 3D representations is not only a lot of fun, it also offers new insights into old, familiar introductory physics problems and how to help students conceptualize them. Come to this session if you would like to explore co-creating dynamic, interactive physics representations that you may wish to try in your class (of any size). | **Carolyn Sealfon** has taught, or more, facilitated learning in the University of Toronto Department of Physics, at Princeton University as Associate Director of Science Education, at a Pennsylvania public university, at an inner-city high school in New Jersey, and in interactive workshops across the continent. She earned her PhD in theoretical cosmology at the University of Pennsylvania and her BA in physics from Cornell University. She aims to foster scientific reasoning, curiosity, and compassion to empower diverse demographics to realize their full potential. |
| | **A. Using Quizlet Live in Your Math Class**. Are you looking for a fun, engaging game for your classroom where students can learn from each other? Quizlet Live is designed to bring fresh energy into classroom. Teams of students work together to complete a set of multiple-choice questions together. Correct answers move teams ahead, but wrong answers send teams back to zero. In order to | **A. Steve Fotheringham** has been a teacher of Math & Science at Oakville Trafalgar High School for the past 10 years. In his free time, Steven is working on his certification in Culinary Arts at George Brown College.<br>**B. Alasdair Paterson. A**lasdair has taught at White Oaks S.S. in Oakville for ten |

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| | win, students need to communicate with each other to make sure they pick correctly. With the option of building your own quiz or choosing from the HUGE library of pre-made questions, this can be easily implemented into your classroom immediately.<br>**B. Current Electricity: Predict, Observe, Explain.** A 15 minute interactive demo of series and parallel circuits, where students have to predict outcomes, observe outcomes, and explain outcomes. Could easily be adapted into a lab. | years. Before that, he was a metallurgical engineer at a steel mill in Hamilton. |
| | **Storytelling for High School Physics Teaching.** In this workshop, we will discuss the use of storytelling and narrative in physics teaching. Neuroscience research is revealing the interconnection between emotion and learning, and stories are one tool for engaging emotion. Metaphors and stories are powerful ways of teaching concepts by helping form new neuronal pathways and promoting memory formation. Narrative techniques can benefit students by improving engagement, enhancing imagination and ability to visualize abstractions, and developing deeper interactions with teachers. As physics teachers, we ourselves are storytellers who tell the larger story of the nature of science, the process in which humans seek to understand the world. | **Brian Lim** is a science and physics teacher at Rosedale Heights School of the Arts in Toronto. He came to high school teaching after working as a research scientist at Princess Margaret Hospital with a background in biomedical engineering. He has enjoyed experimenting with creative ways to engage students and build the physics program at an arts-focused high school, and also volunteers as an after-school math and science tutor with the Pathways to Education program in Regent Park, a priority neighbourhood in Toronto. |
| | **A Tiny Talk about Micro:Bits.** We have recently introduced applied coding in Science using microcontrollers such as Arduino and MicroBits. This session will introduce participants to our initial classroom experiences, associated assignments, and student results and feedback. Participants will be walked through a coding exercise using the Micro:Bit platform and a chance to try experiments of their own. A laptop or Chromebook with internet access is suggested for best participation. | **Dwight Robinson** and **Geoff Shore** are classroom teachers at Keswick High School teaching science and physics. Each has more than 20 years teaching experience but is just recently been experimenting with including more student centred technology in the classroom. |
| 10:45 – 11:15 | **Break and Exhibitors** | |
| **Session B** 11:15 – 12:15 | **Bang on a Buck! Exciting physics demos you can afford.** How can an in-lecture demo compete with the unlimited budgets of popular YouTube science channels? The answer is, they can't. However, it IS possible to create conversation provoking demos on a budget. In this session Orbax will lead you through a variety of inexpensive homemade physics demos, but also show off a few expensive ones. | **Orbax** is a sessional lecturer at the University of Guelph as well as the Science Communication & Media Officer for the Dept of Physics. He has spent a decade teaching first year physics at Guelph as well as appearing as a science educator on television and social media worldwide. |
| | **Working with DIY simulations.** This session focuses on the use of DIY simulation software to incorporate the use of technology to support students' creative and critical thinking. The session begins with learning about some of the challenges and successes of incorporating DIY simulation projects into the classroom, as Tasha shares some of her students' projects and lessons learned. In the second half, you are invited to BYOD to develop your own simulation – the session will focus on using Algodoo and Physion. | **Tasha Richardson** has felt privileged to teach students about physics since 1997. She has co-authored textbook chapters and articles on STEM education and presented at numerous conferences about the importance inclusivity in STEM, supporting students and teachers in their own physics identity development, and physics education. This past year, Tasha worked in the Faculty of Education at Western University as a lecturer on STEM Curriculum and Pedagogy**.** |

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| **Teaching Mechanics Backwards from Energy & Mass Principles.** Physics has always been taught and written starting from the first principles. Several students (more so now) drop the course because they don't see value in their learning at the beginning of the year. I designed the curriculum this time to start with students experiencing an experience with masses and a dynamic cart to discuss work and energy principles and help students formulate Newton's Laws themselves. The vocabulary motion (speed, velocity, acceleration etc.) was learned along the way. The students learned about graphs, went back to the dynamic cart to "hypothesize" the graphs for the motion of the cart by changing masses and force and then tested them using video analysis software. | **Anjuli Ahooja.** "Using Technology is not a 21st Century skill. Technology must be used to help ourselves and our students develop the 21st Century skills". Anjuli is passionate about education, education pedagogies and technologies, and physics; and if given the opportunity to do it all over again, she wouldn't change a thing! Anjuli is an innovative curriculum developer, one of the pioneers for using newest technologies, a TEDx speaker - "What Makes a 21st Century Teacher?" • a Keynote Speaker and Member, Advisory Board Panel for Education Technology Strategies Summit, a Microsoft Innovative Education Fellow (MIEF), President Elect and Vice President for STAO (Science Teachers' Association of Ontario) from 2015-17, has a PhD in semiconductor physics, AP Physics teacher for 17 years, Mutual Respect Facilitator |
| **Light 'em Up! – Electric Greeting Cards for Gr. 9 Electricity.** Students often struggle with the "Physics" unit in grade 9 science - electricity. This can lead to a negative association with Physics and less students taking grade 11/12 Physics. At our school we have tried to make the electricity unit (and specifically the idea of circuits) more fun and engaging by having students create an electric greeting card consisting of LEDs and a battery. This can be done for around $2 each. In this session you will create your own electric card and go home with the confidence to implement this or a similar project in your classroom! | **Andrew Moffat** has been teaching Physics and Design Technology at BSS (The Bishop Strachan School) in Toronto since 2007. He is particularly interested in teaching through inquiry, a project-based approach toward classes and "building things". He is always looking for great new demonstrations, ideas and projects. |
| **Perimeter Institute: Electromagnetism in Special Relativity**. Einstein proposed his theory of special relativity to address concerns with electromagnetism and relativity. Join us as we discuss these concerns and explore a hands-on activity that is being developed by the Perimeter outreach team to show how length contraction addresses the concerns. | **Dave Fish** has been a high school Physics teacher for 20+ years. His involvement with Perimeter Institute dates right back to the beginning with the initial development of ISSYP, EinsteinPlus and several other outreach activities. He has played a leading role in the production of both Perimeter Exploration and Perimeter Inspiration resources. He has given workshops on modern physics at local, provincial, national and international levels. Dave is currently working for Perimeter Institute while on leave from teaching Physics at Sir John A Macdonald Secondary School in Waterloo. In his spare time, he enjoys reading, travelling, sports and spending time with his wife and three children.<br><br>**Dr. Kelly Foil** is an outreach scientist at Perimeter Institute delivering and developing science educational content. She has developed online enrichment courses in cutting-edge physics for high school students and develops the content for Perimeter's International Summer School for Young Physicists. She has given workshops on science and modern physics across Canada and abroad. Kelly has a |

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| | | doctorate in astrophysics from the University of Heidelberg in Germany and was a postdoctoral researcher at McMaster University working before joining Perimeter in 2013. She loves sharing her passion for physics and astronomy with students, teachers and the public. |
| 12:15 – 1:30 | **Lunch and Exhibitors** | |
| **Session C** 1:30 – 2:30 | **IQC: Wave-Particle Duality and Simple Quantum Algorithms.** One of the most striking features of quantum physics is wave-particle duality, often exemplified through the photoelectric effect and the double-slit experiment. In this workshop, we'll examine the Mach-Zehnder Interferometer, where light's wave and particle behaviours can be examined simultaneously. We'll provide a craft-based method to model the interference and show how this simple system can be used to demonstrate the first quantum algorithm: the Deutsch-Josza algorithm. | **John Donohue** is the Scientific Outreach Manager for the Institute for Quantum Computing. His job is to make quantum science and technology accessible, bringing it out of the labs, off the whiteboards, and into the classrooms and public discussion. He is from the city of Chatham, Ontario, and obtained his PhD from the University of Waterloo in 2016, specializing in quantum nonlinear optics and laser physics. |
| | A. **Simple Center of Mass Demonstrations.** Center of mass is of one the topics that does not occupy a space it deserves in physics curriculum. Simple demonstrations on centre of mass do not require special equipment. A number of demonstrations can be performed using everyday objects. The ideas behind these demonstrations and the concepts involved are accessible for the students of any level. Balancing a meter stick, "floating" forks, searching for a center of mass are just a few examples of center-of- mass favorite demos. The presentation will include demos and a short discussion how they can be used in the classroom.<br>**B. The impact of pre-lecture modules in an intro physics course.** In 2017, the Physics Department created a series of pre-lecture modules for an introductory physics course for Biological Sciences. The modules include a series of videos interspersed with 'checkpoint' questions, which serve to prepare students for upcoming lecture content, and to identify potential topics to be discussed in class. I will present the results of a study over four course offerings, in which data was gathered on student performance, work habits, and evaluation of the modules.<br>**C. Promoting Student Success in 1st Year Physics at University.** Incoming first-year university students commonly display weaknesses in mathematics, specifically with numeracy that includes converting units, deriving equations, relationships between variables, and mental mathematics. To address this gap at UTM, a joint initiative between the RGASC and the Physics Department developed supplementary mathematics/physics support sessions within first/second-year physics courses. Voluntary student participation in these sessions has shown to lead to a better understanding of the mathematical concepts and their applications to physics. In this session, we will discuss the resources developed for | A. **Dr. Tetyana Antimirova** is an Associate Professor at the Department of Physics at Ryerson University. Her current interests include Physics Education Research, Curriculum Development and Science Education. Her current work is focused on active learning and the impact of technology in large introductory physics courses. Tetyana is a member of CAP, OAPT, AAPT and GIREP, and represents Canada on the Physics Education (C14) Commission of IUPAP. Tetyana credits her interest in physics and her career choice to her high school teachers.<br>B. **Michael Massa.** I obtained my B.Sc. in Physics in 2000 from University of Guelph and completed my Ph.D. in 2006 from McMaster University. After completing a post-doctoral fellowship in 2008, I began teaching undergraduate courses at both Alma Maters. I've had the opportunity to teach a variety of physics courses and implement different strategies to promote student engagement and learning.<br>C. **Marc De Benedetti.** Marc De Benedetti is a Ph.D. candidate in the Physics Department at the University of Toronto Mississauga (UTM). He completed an H.B.Sc. and received a B.Ed. at OISE. He is passionate about physics education and has taught physics at a secondary and tertiary level. Currently, he is first-year physics courses instructor.<br>**Dr. Andie Burazin** is an Assistant Professor, Teaching Stream, at UTM. She teaches university-level mathematics courses and provides |

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| these sessions and make recommendations for how high school mathematics/physics teachers might address these areas of weakness. | foundational mathematics support at the Robert Gillespie Academic Skills Centre (RGASC). Her current research interests are in mathematical education, particularly focusing on the transition from high school to post-secondary education. |
| A. **Physics for All (PFA): Career Access and Opportunity.** The focus of this presentation is to alert educators and policymakers to the realities of inequities in STEM education especially physics and the consequent long-term impact on high demand career acquisition by racialized students. Relevant enrolment and employment data will be presented to provide a context for the need for a Physics For All agenda in order to create career access and opportunity for underrepresented students in the 21st century and beyond. Examples of physics lessons incorporating the principles of equity and inclusive education will be presented, with the notion that meeting students where they are will lead to meaningful engagement in the principles of physics, hopefully leading to career interests and acquisitions.<br>**B. What can you do with a Physics Degree?** Many students who show an interest and an aptitude for physics and mathematics in high school tend to pursue an engineering degree. For many students this is a great choice and leads to many exciting career options. For some students, however, they may be more suited to the more theoretical side of math and physics. While these students may prefer a physics or math degree over an engineering degree, they may be hesitant since the job prospects are not as clear. In this talk I am to dispel these fears with real data to prove that a physics degree leads to a wide variety of rewarding, high paying careers. | A. **Dr. Leroy Clarke**'s focus is on equipping our youth with future skills for the economy of the 21st century and beyond, embedded in new and innovative technologies and diverse cultures. The objective of his work is to help our youth, especially those who are underrepresented reflect on their academic journey, find suitable mentors, thereby finding hope to forge sustainable and courageous solutions to successfully participate in the new economy. Dr. Clarke is a science, technology, careers and business teacher as well as equity and inclusive education resource for the Durham Catholic District School Board. He obtained his Ph.D. in Science and Technology Education with a focus on mentoring from the University of Toronto and brings over twenty-five years of experience spanning elementary to post-secondary institutions as well as industry. He has a passion for youth and is convinced that investing in them is investing in the future of Canada.<br>**B. Sara Cormier** is currently an Instructional Assistant at McMaster University where she teaches and manages the large first year physics course for the Life Sciences. She has been a member of the Physics & Astronomy Department at McMaster for over a decade in a variety of roles. First as an undergraduate, then as a graduate student studying “squishy” physics, followed by a stint as the Outreach Coordinator for the Department. In the role of Outreach, Sara became a member of the OAPT and hasn’t left since. She greatly enjoys attending the OAPT conferences and interacting with the members. |
| **Unpacking Current and Electromagnetism!** In the learning journey from static to current electricity and to electromagnetism, there are several low-tech, high-concept activities which anchor pivotal student concepts. The accessibility of simple everyday materials and the robust mental models which emerge level the learning field and nurture 21st century competencies. Inquiry to Equity – yagottaloveit! | **Dave Doucette** taught secondary science – physics, chemistry - for 25 years in the TDSB and YRDSB. In over 200 workshops for teachers, Dave bridged Physics Education Research with original guided-inquiry activities to ‘Get the HOTS*’ for physics. In 2014 Dave stepped out of the classroom to serve as a STEM consultant in exciting educational and entrepreneurial |

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| | | initiatives, most notably with FAST Motion Studios in Toronto. True to his first passion, Dave continues to tutor in physics, chemistry, calculus, relations and functions. (*Higher Order Thinking Skills) |
| | **Perimeter Institute: Using Fields for Propulsion.** Are you looking for a cool design challenge that connects abstract concepts like electric and magnetic fields with a concrete problem like propulsion? Join us as we explore a hands-on design challenge being developed by the Perimeter outreach team that uses magnetohydrodynamic propulsion to consolidate student learning in the 4U Fields unit. | **Laura Pankratz** has taught at the high school level in Alberta for 8 years before working for almost 20 years with Alberta Education as the Physics 30 Examination Manager. She has been associated with the Perimeter Institute since 2010. Most recently she has been a facilitator at the last few Einstein+ teacher institutes and as the Alberta and Western Canada Teacher Network Coordinator. She has presented Perimeter resources across Canada and has been involved in the development of the resources since 2012. Laura finds joy in helping students learn, and in helping teachers get better so students learn. She is currently on a one year leave from Alberta Education to work at the Perimeter Institute. When she isn't at work Laura enjoys cycling, online strategy games and crafting.<br><br>**Dave Fish** has been a high school Physics teacher for 20+ years. His involvement with Perimeter Institute dates right back to the beginning with the initial development of ISSYP, EinsteinPlus and several other outreach activities. He has played a leading role in the production of both Perimeter Exploration and Perimeter Inspiration resources. He has given workshops on modern physics at local, provincial, national and international levels. Dave is currently working for Perimeter Institute while on leave from teaching Physics at Sir John A Macdonald Secondary School in Waterloo. In his spare time he enjoys reading, travelling, sports and spending time with his wife and three children. |
| 2:30 – 3:00 | **Break and Exhibitors** | |
| **Session D**<br>3:00 – 4:10 | **A. Authentic Assessment in Physics:** A case study. How can we include authentic assessment in physics teaching? "Technical Communication Skills" is a multi-genre, collaborative, physics course at the University of Windsor that provides demonstration of a variety of "affective" learning outcomes. The course involves the completion of a "real world" task, i.e., the development of a multimedia web module for high school teachers, that the student can use to showcase competencies in their career development. I will present this course as a case study. Attendees will participate in a group discussion on how one might create Authentic Assessments in our own courses. | A. **Dr. Chitra Rangan** has been teaching physics courses at all levels at the University for the past 15 years. She has been involved in program development at the departmental, faculty-wide and university-wide levels. She is one of the University of Windsor's 6 inaugural Teaching Leadership Chairs. She has held numerous teaching-related grants and conducted several significant pedagogical development projects in physics.<br>**B. Bei Cai** is an adjunct instructor and Teaching and Learning Fellow in the Department of Physics, Engineering |

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| **B. Using reflections to explore student learning in lab course.** We redesigned an 3rd-year undergraduate physics laboratory course to include a project component at Queen's University. The intention was to address learning outcomes such as modeling, design of experiments, teamwork, and developing technical skills in using apparatus and analyzing data. The course included experimental labs in preparation for a six-week team project in which students designed and implemented a research experiment. The final assignment given to students was a reflective essay, which asked students to discuss their learning and satisfaction in doing the project. Qualitative analysis of the students' reflections showed that the majority of the students reported satisfaction and achievement, functional team dynamics, learning outcomes unique to this experience, practicing modeling skills, and potential future improvements. We suggest that reflections are useful as support for student learning as well as in guiding curricular improvements.<br>**C. Closing the Gender Gap in Engineering and Physics: The Role of High School Physics.** Attracting more women to the fields of engineering and physics is essential to maximize innovation, creativity, and competitiveness in Ontario. Currently, the critical point where the largest number of potential female engineers and physicists are lost occurs in high school, specifically in the physics classroom. Of all female students who have completed the required Grade 10 Academic Science in Ontario, only about 15% enroll in Grade 12 Physics compared to 30% of male students. This corresponds to a female participation rate of only 34% in the physics classroom – a trend seen over the past decade. This talk will cover our current understanding of why this gender disparity exists, summarizing the academic literature, reviewing the most recent ministry data available, and discussing the design and implementation of a future intervention research study. | Physics and Astronomy at Queen's University. She teaches 3rd-year undergraduate physics lab courses and also help other instructors to redesign their lab courses. She helps implement course changes and measures the effectiveness of the new approaches. Bei has a Ph.D. in experimental particle astrophysics from the University of Minnesota - Twin Cities.<br>**C. Eamonn Corrigan** is currently a PhD student at the University of Guelph, studying intervention techniques to improve female enrollment in upper level physics courses. Having previously completed an MSc in theoretical relativistic physics at Guelph, and his BEd at Queen's University, it seems the switch to physics education research was inevitable, merging his two largest interests. Within the physics classroom, Eamonn works on sharing his knowledge and helping other TAs update their teaching skills, using current active learning techniques. Beyond academia, Eamonn has a passion for science outreach, working as an observatory tour guide and director of the physics graduate seminar series at Guelph, as well as publishing a series of elementary books about physics and astronomy. |
| **A. Feedback-based Learning.** If the future of assessment is gradeless, how would one implement this feedback-based learning? After a brief discussion of what it is like to pilot this initiative, we will show how you can practically provide feedback to your students through google classroom using google forms with its doc appender (this is not a paid advertisement for google). This is a BYOD event.<br>**B. Group Multiple Choice Tests: Assessment as Learning.** Multiple choice tests are often good ways to test conceptual understanding, but how do we know the students actually learn from their mistakes? Can students actually enjoy a test? The answer is yes! Come see how you can using DIY scratch-off cards to turn the test into a positive learning experience.<br>**C. As, for, of... How to effectively assess cooperative learning.** In this session, I will be looking into assessment practices of physics | **A. Saara Naudts.** Saara has teaching physics in Peel since 2004. She likes to ask questions, and maybe not so surprisingly was the OAPT physics contest editor from ? - 2018. She likes explaining how the world works to her 2-year old, learn new things, and ride her bike (preferably fast).<br>B. **Andrea McPhee** teaches physics and math at Jarvis Collegiate in Toronto. Most of her really cool ideas come from the internet. Using PER, she has been transforming her classrooms into student-centred and inquiry-driven so the learning sticks. As a TDSB Digital Lead Learner, she thinks technology can be a valuable tool to enhance student learning and collaboration, as well as making many processes more efficient. She tweets at @Ms_McPhee |

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| | educators who use cooperative learning strategies in their classes. I will examine education research concerning connections between cooperative learning and assessment. Is there a good way to track how effective those group testing strategies are? Is there a noticeable difference in learning when standard quizzes and tests are given vs. allowing students to cooperate while being assessed? My hope is to form a group of Ontario physics teachers who would look into their own assessment practice in a structured way and report the findings to the OAPT community. | and blogs occasionally at http://equalsmcsquare.blogspot.ca<br>C. **Vjera Miovic** While completing her degree at OISE, Vjera read a bunch of educational research papers and took courses that got her thinking about implementing the research into her own teaching. Being a physics enthusiast, researcher and educator, she naturally wanted to put all the talk about cooperative learning and authentic assessment into practice. If Vjera read the research for you, would you want to try it out in your practice? |
| | **A hands-on overview of STEMcoding project resources.** Ever wondered how to integrate a little bit of coding into a high school or early college physics class without overwhelming your students or taking up lots of class time? This hands on workshop will provide an overview of simple, conceptually-motivated exercises where students construct games like asteroids and angry birds using a free in-browser editor that works great on chromebooks or whatever devices you have. Most of these activities have tutorials on the STEMcoding youtube channel (http://youtube.com/c/STEMcoding ) which is useful as a "flipped classroom" resource for introducing coding into physics. | **Chris Orban** I am a professor of physics at Ohio State University with a background in computational physics and physics education research. |
| | **Scared Scriptless.** Students learn more effectively when instruction is responsive to students' states. Yet active learning approaches can seem frightening because they are less predictable than traditional instruction. As instructors, it is helpful to practice the ability to listen to what our students are thinking and give real-time responses that resonate with them. Improv provides a toolbox for practicing this ability, to face our fear of feeling put on the spot, to build creatively and constructively on unexpected situations, to co-create learning experiences with our students. All are welcome to join us for this interactive and laughter-filled workshop. | **Nancy Watt** is a sought-after speaker, writer and improviser. A graduate of Second City's Improv Conservatory and Sketch Writing Programs, she delivers dynamic workshops on communications and creativity in unconventional environments. Rated in the top five of the Leadership Workshops at the International Microsoft World Partner Conference and a regular at Huffington Post's team building events, Nancy delivers powerfully creative and memorable sessions for the corporate, education and healthcare sectors.<br><br>**Carolyn Sealfon** has taught, or more, facilitated learning in the University of Toronto Department of Physics, at Princeton University as Associate Director of Science Education, at a Pennsylvania public university, at an inner-city high school in New Jersey, and in interactive workshops across the continent. She earned her PhD in theoretical cosmology at the University of Pennsylvania and her BA in physics from Cornell University. |
| | **Twitchy is Good: Reaction Times in the Physics Classroom.** In this session we would examine a lab to measure our student's reaction times, and a separate activity to measure the speed of signals through our nerves. Taken together, these allow us to both explore | **Greg Macdonald** has taught Physics and high school Science for 20 years, most recently at Thorold Secondary School. He has attended the OAPT conference regularly and co-facilitated the 2017 OTF Summer Institute at Laurentian University. |

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| | what affects our reaction time but also apply some kinematics math in a practical way. | Astrophysics is his favourite subject, but he can be found dabbling in Biophysics as well. Greg enjoys reading, playing in what would be a beer hockey league if it allowed beer and thrilling his wife and three daughters with science news and whatever he's ranting about this week. |

# Saturday, May 4

| Time | Description | Presenter(s) |
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| **Session E**<br>9:00 – 10:10 | **A. Explore Energy Transformations with a Rube Goldberg Device.** Our goal as educators is to develop creative, collaborative and critical thinking skills that a 21st Century STEAM student needs. Building a Rube Goldberg device can be used to do all of that and to teach or solidify physics concepts. The physical connection to 3D application of principles, the problem solving and team building skills that they develop from trying to get their device to work may be hard to assess but are certainly undeniably achieved. Students learn best when they have a vested interest in the outcome… a working device! In this workshop you will participate in a culminating task I used for my SPH 4C course (though it would be easily adjusted for use in a 3U or 4U class). Using materials mostly found in the physics lab and dollar store students build and then give both written and oral explanations of a Rube Goldberg Device that involves every unit. Come and join me in the exploration of energy transformations in 3D!<br>**B. Meeting the Challenge of College Physics.** Students who take the college physics course have a huge range of skills and attitudes. Many are math-phobic and don't understand why they should attend class or pay attention when they are there. During this session Mari-Ann and Roberta will share some of the activities that helped convince their students to buy-in to the course. Like the college students, you will have lots of opportunities to get your hands on the materials and exchange ideas with your peers. | **A. Margaret Scora.** I came to Ontario in 1987 from rural Manitoba to join my husband who was working on his Ph. D in physics at the U of T. With a B.Sc in Honours Physics and newly minted B.Ed in hand I joined the teaching staff at Monsignor Paul Dwyer CHS in Oshawa. There I stayed until I retired last June! My goal as a physics teacher has always been to give the students a lot of hands on experiences in physics in order to generate those light bulb moments and to help them understand how to solve problems. My favorite experience driven learning environment was the ice rink where the students investigated "Physics on Ice". Though retired, I still have a lot of FIZZICKS PHUN to share!<br>**B. Mari-Ann Goettsch** has been teaching High School Physics since 2011 and has used both traditional and inquiry-based approaches in the classroom. While still fine tuning her craft, this year has been experiential for her as well as for her learners. This will be her first time presenting at OAPT and she looks forward to sharing in the gains and experiences with other teachers of the 4C course. **Roberta Tevlin** has been teaching for several decades, but this year was the first year she taught the 12C course and she was surprised at how different this was from her previous experience and how difficult it was to engage the students. She was very glad to be able to compare notes with Mari-Ann and looks forward to meeting with other 12C teachers. |
| | **Mantis Shrimp - the Attack of Elastic Energy!** Get better understanding of the physics of fastest and probably most powerful puncher – shrimp mantis! They use specialised forelimbs to strike pray with enormous power. In captivity they are known to break aquarium glass with a single hit. The secret lies in saddle-shaped structure in the mantis shrimp's limbs, which acts like a spring to store and then release energy allowing it to swing its fist-like clubs to speeds up to 23 meters per second! Through an inquiry-based lesson and with | **Milica Rakić** works as a physics teacher at Walkerville Collegiate Institute, Windsor, ON. |

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| | help of some toys, we will try to get better understand of stored elastic energy. | |
| | **Electricity - The Deep Dive.** Electricity is invisible and perplexing, leaving many a physics teacher and student wondering why it does such strange things. What actually moves from surface to surface when you rub a balloon on your head? How do electrons "know" which path to take and how much energy to "give up"? Join Chris for a deep dive into the physics of static and current electricity. Try new and shockingly simple demos that reveal deep insights into electricity's eccentricities. Once you journey down this rabbit hole, the world of electricity will never look the same again! | **Chris Meyer** has been teaching physics for 21 years in the Toronto District School Board where he is now a Hybrid Teacher-Coach. He is currently serving at president of the OAPT. This electricity workshop began as his attempt to develop new electricity lessons for grade 9 science - and then he fell in the rabbit hole and ended up learning many new things! |
| 10:10 – 10:30 | **Break** | |
| **Session F** 10:30 – 11:40 | **An Authentic Introduction to Work and Energy.** What is energy? Is it the ability to do work? What is work? Is it a transfer of energy? Do these two definitions seem a bit circular, to you? Do you want to introduce the concepts of work and energy – in a more – hands-on – and authentic – way? During this session; teachers will be introduced to a series of lessons that they can use to introduce the concepts of work and energy. The lessons introduce these concepts through hands-on experiences. Further, the lessons are scaffolded to avoid the circular definitions of work and energy that are presented above. The session will take the form of an interactive workshop. Teachers will be able to try out specific activities from each lesson. Teachers will leave the session with resources that are ready to implement in their classroom. | **Edward Gissing** Teaching physics has always been a lifelong passion of Edward's, he just got a little sidetracked along the way. Edward trained as a Mechanical Engineer at the University of Waterloo. He then worked in a variety of fields ranging from automotive production, aircraft design, financial consulting, through to beer sales. Eventually Edward got around to pursuing his passion and is now a physics teacher at Richmond Hill High School. Edward has always been fascinated by complex problems. He believes that there is no problem more challenging than attempting to find a solution to the problem of; designing effective learning environments for young people. |
| | **Optics Through Inquiry.** In this session you will be guided through inquiry-based activities that can be used to assist you in teaching the Optics Unit in Grade 10 Science. We will complete hands on activities using lenses, prisms and ray boxes, play with simulation software and create a rudimentary movie projector. | **Adam Mills** teaches IB Physics and Chemistry at Assumption College Catholic High School in Windsor. He is very interested in developing an inquiry-based classroom and improving the role that assessment plays in the learning process. Adam has currently received nomination to complete his second TLLP next year and was honored by the University of Chicago with their Outstanding Educator Award. He is actively involved in the Math Club and coaches soccer. |
| | **Spiralling... reshuffling the deck in the order you teach.** Over the past two years I have modified my program from that standard unit model to a spiral model. In a spiral model, you touch on all units at a base level and then come back to all units again building on what you have learned. You can cycle as many times as you like, building the complexity and knowledge each time. There are many benefits to both models and I will be sharing my reasoning why I moved to spiralling in SPH3U and why I'm sticking with it! | **Ashley McCarl Palmer.** My name is Ashley and I have been teaching physics in the Waterloo School Board for almost 10 years. I studied engineering in university and love to find unique ways to solve problems, and the biggest problem I love to tackle is how can I make my courses better? As a true scientist at heart I love conducting experiments, and my experiments are done in the classroom! Though the students don't always love being my guinea pigs I have come across a few really great things that have dramatically changed my practice and how I view |

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| | | the classroom and I'd love to share them with you! |