# SCIENCE *exploration* DAY

34 years

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Wednesday, March 18, 2020 • University at Buffalo, Amherst Campus

Featuring Keynote Speaker:

**Dr. Joseph A. Gardella, SUNY Buffalo**

*Thinking About STEM Learning*

Graduate School of Education
University at Buffalo The State University of New York

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# Keynote Presentation

*All students and teachers will attend this presentation*

*Presented by*

**Dr. Joseph A. Gardella, Jr.,**
*SUNY Distinguished Professor, Department of Chemistry, University at Buffalo*

## The Pathways for STEM Learning and a STEM Career

*Thinking about STEM is for everyone*

In this talk I will focus on the key reasons why everyone should have strong exposure and learning in the STEM fields and how we should approach the preparation for a STEM career. While interest in enhancing participation in STEM careers has become a common topic for families, students and educational institutions, there are many aspects of STEM careers that are misunderstood. I will focus discussions on the need for STEM education for participating as a citizen in a democracy and the role of mentoring in pursuit of STEM careers. Some of the reflection will be based on my own career experiences and work in the Interdisciplinary Science and Engineering Partnership with Buffalo Public Schools.

# Small Group Presentations (S)

## S-1
## Explore the Human Brain

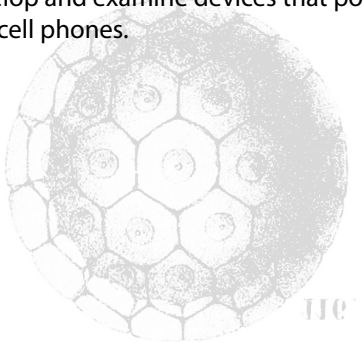
*Students from Neuroscience Graduate Student Association (NGSA), University at Buffalo*

Come join UB's Neuroscience Graduate Student Association in learning about the brain through hands-on activities. Students will learn about the inner workings of human senses such as taste, smell, and sound in addition to the complexities of head injury and addiction. Knowledge gained through these activities are the building blocks for tomorrow's discoveries and we hope you'll enjoy learning about the brain as much as we do.

## S-2
## Tour of UB's Electrical Engineering Cleanroom

*Dr. David B. Eason, Technical Director, Shared Instrumentation Laboratories, School of Engineering and Applied Sciences, University at Buffalo*

UB's Cleanroom is truly a clean room, with many precision tools that enable faculty and students to engage in research, processing and microfabrication of electronic devices. This highly-controlled environment minimizes the presence of pollutants and airborne particles as small as 0.5 micron in size – that's 1/200th the diameter of a human hair – to less than 1,000 per cu. ft. By comparison, the outside air of a typical urban environment contains up to 35,000,000 particles per cu. ft. In this extremely clean space, researchers use a photolithography process, and a variety of tools like deposition systems, etching systems and scanning electron microscopes to develop and examine devices that power familiar electronics like computers and cell phones.



## S-3
## Great Lakes – Great Time to be a Biologist! Learn About Biology in the Lower Great Lakes

*Betsy Trometer, Fish Biologist, U.S. Fish & Wildlife Service, Lower Great Lakes Fish & Wildlife Conservation Office*

Interested in learning about lake biology and being a biologist in the Great Lakes? This session covers the history and ecology of the lower Great Lakes, including how they were formed and their past and current condition. Also learn about the exciting science happening on and off the water first-hand from a fish biologist who has spent time on the water. This talk will cover everything from invasive species to Lake Sturgeon, a giant fish that can live for over 100 years, and will highlight some of the fascinating changes that are taking place in the Great Lakes, not so very far from your doorstep.

## S-4
## Tour the Motion Simulation Laboratory (MSL)

*Dr. Kevin F. Hulme, Senior Research Associate, and Ms. Rachel Lim, The Stephen Still Institute for Sustainable Transportation and Logistics (SSISTL), University at Buffalo*

Tour of the Motion Simulation Laboratory (MSL), located in Furnas Hall (Room 106) and now strategically aligned with The Stephen Still Institute for Sustainable Transportation and Logistics (SSISTL) at the University at Buffalo. The facility is home to a large-scale, high-fidelity, surround-screen, motion-based driving simulator, and is ideally suited for activities relevant to education and training, experiential learning, sponsored research, industrial collaboration, and workforce development. In this presentation, Dr. Kevin Hulme and Ms. Rachel Lim will offer a high-level introduction to Modeling & Simulation (M&S) technologies, and the essential theoretical underpinnings of game-based simulator environment creation as relevant to the ongoing operation and future potential of the SSISTL-MSL. Subtopics will include: a brief history of applied simulation, motion simulator design elements (hardware and software), physics-based modeling, past and present research applications using the driving simulator, and future avenues of research relevant to game-based training (including the Oculus VR). Likewise, the presentation will focus on similar elements of motion-based simulation that are currently implemented (and with great impact) within the entertainment industry (e.g., amusement ride simulators and related applications in theme park engineering).

## S-5
## Astronomy: Portable Star Lab Planetarium

*Tim Collins and Holly Cohen, Whitworth Ferguson Planetarium at Buffalo State College*

Finding their way around the night sky via a portable planetarium, participants will observe projections of constellations, stars and galaxies and learn more about the nature of the universe.

## S-6
## Really Gross Anatomy and Physiology

*Don Gill Jr., Associate Professor, Erie Community College, South Campus*

An interesting laboratory presentation of preserved specimens prepared to various levels of dissection. Comparative anatomy and physiology will be discussed. (Not for the faint of heart.)

## S-7
## Tour the Digital Manufacturing Laboratory (DML)

*Donald Goralski, Director, Shared Instrumentation Laboratories, School of Engineering and Applied Sciences, University at Buffalo*

Tour our Digital Manufacturing Laboratory to learn about the basics of 3D printing (A.K.A.Additive Manufacturing)! The DML is home to a high-definition 3D digital scanner as well as desktop and production-grade printers (PLA, ABS, FDM, SLA, FTI, Polyjet, composite, and more!) The DML provides capabilities for precision rapid prototyping and manufacturing of highly detailed and durable 3D parts. Among other things, the lab serves as a resource for student class and club projects, academic research, and extra-curricular "Tinkering". Please join us to view the facility, and sample some of the 3-D parts we have printed using the various technologies.

## S-8
## Fluorescent Minerals

*Dino Zack, P.G., Geologist/Project Manager, AECOM Technical Services, Inc.*

Approximately 4,000 different mineral species have been identified at this time. Over 500 of them are known to fluoresce visibly in some specimens. This presentation will feature various types of luminescence with a detailed explanation of mineral fluorescence. Fluorescent rock and mineral specimens from New York State, as well as world-know locations, will be on display and used to demonstrate the many types of luminescence including fluorescence, phosphorescence, triboluminescence, thermoluminescence, and tenebrescence.

## S-9
## Structural Engineering and Earthquake Simulation Tour

*Dr. Pinar Okumus, Assistant Professor and Dr. Mettupalayam Sivaselvan, Assistant Professors, Department of Civil, Structural and Environmental Engineering, University at Buffalo*

The Network for Earthquake Engineering Simulation (NEES) laboratory is a part of the Structural Engineering and Earthquake Simulation Laboratory (SEESL). The laboratory is capable of conducting testing of full or large-scale structures using dynamic or static loading. This is enabled by the availability of two shake (earthquake simulation) tables; large-scale dynamic and static servo-controlled actuators; and a 40-ton capacity crane. Participants will hear a presentation describing this very unique facility and observe an example of the nature of seismic testing using a "Mini-Shake Table" prior to the tour of the laboratory.

## S-10
## ATGC Your DNA

*Ashley White and Natalie Jay, PhD Candidates, Genome, Environment and Microbiome (GEM) Community of Excellence, University at Buffalo*

Have you ever seen your own DNA? This interesting program will have students participate in an activity to extract DNA from their cheek cells as an interactive way to learn about the fascinating science of DNA. Students will then be able to take their own DNA home in a keepsake necklace!

## S-11
## Electrical Engineering - Interactive Tour with Hands-on Participation

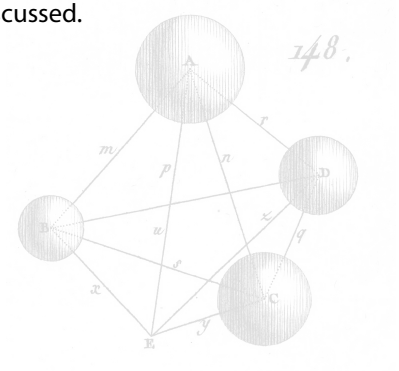
*Dr. Jennifer Zirnheld, Electrical Engineering, University at Buffalo, and departmental colleagues*

Electrical Engineering is an integral part of our lives, contributing on some level to nearly everything we do. Electrical Engineers provide power and energy solutions to light our homes and energize our consumer electronics; develop biomedical instrumentations to save lives; use nanotechnology to produce new materials and devices; provide entertainment with consumer electronics and video games; and advance new green technologies. The tour will focus on demonstrations within several of the research laboratories in the Electrical Engineering Department.

## S-12
## Tour: Chemistry Department Research Laboratories

*Dr. Timothy R. Cook, and Dr. David C. Lacy, Assistant Professors, Department of Chemistry, University at Buffalo*

Students will be given an interactive tour of state-of-the-art research space in the Chemistry Department. The lab synthesizes molecules and materials using equipment that allows air-free reactions, including large glove boxes and elaborate glassware. Projects in the lab include batteries, solar panels, water purification, and catalysis. Students will learn how chemists design molecules and then make them. There will be demonstrations of how these molecules interact with light and glow, how self-assembly chemistry helps make complicated architectures on the molecular level. General information about the pathway from high school to undergrad to graduate school, and careers in Chemistry, will be discussed.



## S-13
## Space Debris: It's Just Floating Space Junk, So Why Do We Care?

*Dr. John L. Crassidis, Professor and Director, Center for Multisource Information Fusion, Dept. of Mechanical & Aerospace Engineering, University at Buffalo*

Currently there are thousands of pieces of space junk, ranging from relatively small objects such as astronaut tools, to large objects such as defunct satellites. This presentation will show why we need to carefully track the space junk that is already in orbit, and also reduce the amount that is generated in the future. Audience participation will be strongly encouraged to provide ideas on how to reduce the dangers space junk poses, followed by ideas that are currently being developed and tested.

## S-14
## Tour: Physics Department Research Laboratories

*Dr. Ia Iashvili, Professor, Department of Physics, University at Buffalo*

In this non-traditional "tour" of the Physics Department, research students will learn about UB's high-energy physics group and their work at the CERN Large Hadron Collider in Geneva, Switzerland. UB's involvement in the discovery of the Higgs particle will be the focus of this discussion that will be highlighted by images, video clips and interaction with UB students who will share their research experience at Fermilab.

## S-15
## The WILD Side of Western New York

*Kristen Rosenburg, Reinstein Woods Environmental Education Center, NYS Department of Environmental Conservation*

Join a naturalist from the NYS Department of Environmental Conservation to learn about the wildlife found in Western New York. This presentation will offer information and a hands-on approach to learning about some of the interesting creatures that live around us.

## S-16
## Breast Cancer Genetic Screening Simulation

*Dr. Adam E. Kisailus, Assistant Dean for Internships and Education Outreach, Department of Educational Affairs, Roswell Park Cancer Institute*

Participants interested in pursuing the medical and research profession will immerse themselves in the role of a clinical geneticist and learn about the process of screening for hereditary cancer mutations. They will learn about and create a pedigree to translate a fictional character's narrative on a familial history of breast cancer. Using this information and National Cancer Center Network Guidelines students will determine if gene screening should be done and use molecular techniques including DNA gel electrophoresis to determine if the fictional character or her sister possesses the familial genetic mutation for breast cancer.

## S-17
## Tour: Biological Sciences Department Research Laboratories

*Dr. Michael Yu, Associate Professor, Department of Biological Sciences, University at Buffalo*

Students touring Dr. Yu's laboratory will get an idea about what it's like to use the budding yeast as a model organism. They will be able to visualize what budding yeast looks like via microscope and how this lab uses molecular biology and biochemical techniques to study important questions in the field of biological sciences.

## S-18
## Living Adaptations– Survival in Nature Through Change!

*Mark Carra, Naturalist for Buffalo Audubon Society*

Come and explore nature's diversity with some of the unique creatures that are found on our planet. Meet some live animals that illustrate the role that adaptation plays in the survival of species and experience the science of nature as it lives and breathes. The Buffalo Audubon Society is devoted to promoting the appreciation and enjoyment of the natural world through education and stewardship.

## S-19
## Wild Weather!

*Judy Levan, Meteorologist in Charge, National Weather Service*

One Hundred Thousand. That's how many thunderstorms occur in the US each year. Let's take a look at how they form. What makes some of them become severe? Why do some of them produce tornadoes? See examples of the damage have they produced in our Western New York area and learn how to stay safe when severe weather threatens.

## S-20
## Chromosomes and Cancer

*AnneMarie W. Block, Ph.D., FACMG, Director Clinical Cytogenetics Laboratory, Roswell Park Cancer Institute*

This presentation will be an introduction to the field of Cancer Cytogenetics. The genomes of cancer cells are very unstable, often characterized by gains/losses of whole chromosomes and re-arrangements between chromosomes. This specialized area of chromosome analysis examines the genetic changes that occur in the cells of cancer patients. Students will receive instruction in this cutting-edge field of genetics. The relevance of these findings to patient diagnosis and prognosis will be discussed. Students will be shown techniques used in the laboratory and will be given the opportunity to cut-out an actual karyotype.

## S-21
## Cosmology – The Real Big Bang Theory!

*Dr. Dejan Stojkovic, Physics Department University of Buffalo*

You know that the Big Bang Theory is a TV show, but it is also part of the study of Cosmology. Have you ever wondered about the origin and evolution of the universe? This presentation on the history and recent developments of modern cosmology will introduce students to the scientific study of the large-scale properties of the universe as a whole. Learn more about this interesting area of scientific study that involves the fields of physics and astrophysics.

## S-22
## Science and Art Meet on the Moon

*John Arnold, Artist / Educator*

Building a city on the moon will provide unique opportunities for human art and culture to innovate and evolve. From housing design to labratory foods and adaptive clothing, the moon, like an Olympic village, will have its own visual style and distinctive aesthetics. We'll take a look at the in-depth scientific research Andy Weir did for his recent book ***'Artemis'*** and imagine how science will help shape the art and design of the first lunar civilization.

## S-23
## Tours of the Department of Chemical and Biological Engineering

*Dr. Mark T. Swihart, UB Distinguished Professor, Executive Director, NYS Center of Excellence in Materials Informatics, University at Buffalo*

Learn how chemical engineering research is advancing the development and production of new materials for next generation batteries, solar cells, and other cutting-edge applications that will shape the future. Visit the research laboratories where these new materials and processes are being developed and tested, and the teaching laboratories where UB students learn the chemical engineering principles underlying these technologies and similar cutting-edge biological engineering advances like the growth of artificial tissues and organs. You won't want to miss the exciting hands on demonstration of the power of chemical reactions at the end of the tour!

## S-24
## Don't "Resist": Power your Knowledge of Electricity with National Grid!

*Daniel R. Keating, National Grid*

National Grid does much more than just fix wires after a storm!  Join us to learn how we keep electricity flowing in Western NY and our approach to energy efficiency. We are committed to renewable energies, electric vehicles and maintaining electrical safety. During this session, you will learn about these initiatives and the many career opportunities that National Grid offers, right here in Western NY.

## S-25
## The Eyes Have It!

*Dr. Steve J. Fliesler, Meyer H. Riwchun Endowed Chair Professor, Department of Ophthalmology, Jacobs School of Medicine & Biomedical Sciences, University at Buffalo*

Do you know the parts of the eye and what each does? Do you know how eyeglasses work and why some people need them, while others don't? Do you know about some common eye diseases and how they are treated? In this session, you will have the opportunity to dissect a sheep eye and learn the answers to these questions and more!

## S-26
## Flow Cytometry: Star Wars on the Cellular Level!

*Dr. Alexis Conway, Flow Cytometry Specialist, Roswell Park Cancer Institute*

Flow cytometry is one of the many technologically advanced tools used at Roswell Park Comprehensive Cancer Center that can be used in cancer diagnosis and research. By interrogating cells with lasers at speeds of over 10,000 cells per second this technology separates the good cells from the bad ones. In this presentation the technology is explained in lay-terms using interactive models involving gumballs, soy sauce, pop bottles, where's Waldo, Christmas ornaments and of course lasers!

## S-27
## Undergraduate Studies in Engineering and Computer Science

*Baylee Richards, EdM, Academic Advisor, Undergraduate Education, School of Engineering and Applied Sciences, University at Buffalo*

Do you like problem solving, working with your hands, or even computer programming? If these are a few of your interests, you may be interested in a career in engineering or computer science! In this presentation, the School of Engineering and Applied Sciences will present on all of the different engineering and applied science majors we have to offer as well as the admissions process for our programs. We will talk about what you can do in high school to prepare yourself for majoring in engineering and be successful. There are so many options in the field of engineering and computer science and you can never explore too early!

## S-28
## UB Pre-Health Programs

*Presenter: Amber Packard, Senior Academic Advisor, Exploratory & Pre-Professional Advising Center, University at Buffalo*

A career in healthcare is both highly challenging and highly rewarding. Whether you plan to pursue medicine, chiropractic medicine, dentistry, optometry, podiatric medicine, veterinary medicine, or physician assistant studies, your preparation must begin as early as possible. Join one of our pre-health Advisors to gain comprehensive information on how to build the academic, professional, and personal accomplishments that will help you achieve your goal. Discussions will include choosing a major, course requirements, extracurricular activities, health-related experience, admission tests, and alternative careers in healthcare.

## S-29
## UB School of Pharmacy and Pharmaceutical Sciences

*Presenter: Sara Robinson, Academic Advisor | Associate Director of Admissions and Advisement, UB School of Pharmacy and Pharmaceutical Sciences*

What does a pharmacist do? How is that different from a pharmaceutical scientist? Learn about opportunities in the pharmacy and pharmaceutical sciences and what it takes to get into these majors. Explore what you should do in high school if you are interested in pursuing these dynamic fields.

## S-30
## There Once Was a Glacier in Your Backyard!

*Jason Briner, Professor, Department of Geology, University at Buffalo*

Ice Age glaciers once covered New York State, and shaped the hills we look at everyday. Present-day glaciers at the Earth's poles play a critical role in global warming and sea level rise. The UB Geology Department studies glaciers all over the world using a diverse toolkit - from digging through dirt to using super-precise satellite instruments. Students will get hands-on experience using some of the tools Earth Scientists use to study glaciers.

# Large Group Presentations (L)

(These presentations will be assigned to students)

## L-1
## Endangered Species & C.I.T.E.S. Trade in Wildlife

*Michael Muehlbauer, Supervisory Wildlife Inspector for Upstate New York, U.S. Fish and Wildlife Service, Office of Law Enforcement*

The importation and exportation of wildlife and endangered species is regulated by the USFWS's law enforcement division. Buffalo is an international border port where inspectors are responsible for monitoring the international wildlife trade. A video, PowerPoint and display materials will add to this session.

## L-2
## 3D Printing, Robots, and Buildings

*Susan Witt, STEM Lab Manager, Buffalo Manufacturing Works and Dr. Ken English, Deputy Director, Sustainable Manufacturing and Advanced Robotic Technologies Community of Excellence (SMART CoE)*

What is Additive Manufacturing and how do 3D printers and robots work together to create new designs from game controllers to buildings? During this session, you will learn about additive manufacturing and understand how robots can help make people's work lives more engaging, cleaner, and safer. You will also see how robots are used in factories to make more products faster and better than ever before.

## L-3
## Sexually Transmitted Infections: The Gift that Keeps Giving

*Beverly Roe PhD, Professor/Biology Department Chair, Erie Community College*

This informative program will provide an overview of both the common and uncommon sexually transmitted infections that young adults should be aware of. PLEASE NOTE: Material presented in this lecture is sexually explicit and may be of concern to some students and/or their parents. If that is the case, a student should notify their teacher immediately and every effort will be made to prevent that student's attendance at this presentation.

## L-4
## Penguins: Some like it Hot!

*Autumn Syracuse, Aquarium Educator, Aquarium of Niagara*

When you think about penguins, you probably imagine a black and white bird waddling through the ice and snow. At the Aquarium of Niagara, our Humboldt penguins prefer the warm climate found along the coast of Peru. We will discuss the differences and similarities between several different species of penguins, and then dive right in to the cold waters of Peru to learn more about Humboldt penguins. Hear facts and funny tales of these birds that call the Aquarium of Niagara home.

## L-5
## A Talk on the Wildside

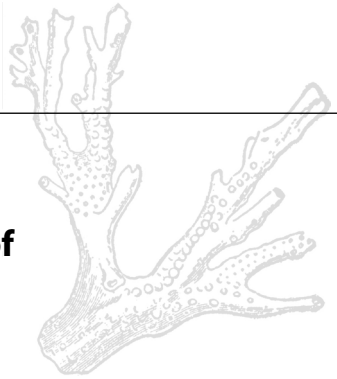
*Educator from Hawk Creek Wildlife Center*

Hawk Creek Wildlife Center will bring nature up-close with a demonstration featuring some of their resident animals. A bird of prey flight demonstration will help teach students about these amazing predators.

## L-6
## Drones in Action

*Nathan Dubinin, PhD Candidate, Department of Geography, University at Buffalo*

Drones are used in a variety of applications from monitoring crops to making maps. As drones are increasingly becoming more accessible and affordable, more disciplines are using them. This session will discuss some basic principles of how drones fly. We will also explore some examples of how these new and exciting technologies are used. A demonstration flight using a professional drone will show some of its capabilities used in research. Volunteers will be invited to participate in an amateur drone flight.



## Tips For Making the Most of Science Exploration Day:

**1** Campus guides, wearing bright SED vests, are located throughout the halls and buildings. They have volunteered to spend the day keeping you from getting lost. Don't hesitate to ask for directions!

**2** Move quickly to your next presentation location. In some cases you will need to move across several buildings to get where you need to be, so you can't just hang around. Keep moving!

**3** If you signed up for any tour, your schedule card will include a color. That color will match a sign hanging from the ceiling in Capen Hall, near the SED registration table. Stand under, or as near as possible to, that sign so you will not miss the tour start.

**4** You must follow the schedule assigned to you. Attendance for each session is closely monitored.

**5** All presenters, guides and SED Committee Members are volunteers, so please treat them with the respect and appreciation they deserve. They are taking part because they want you to learn as much as possible at SED.

**6** Remember, you are representing your school and teachers. Please do not interrupt or disturb the presentions with inappropriate behavior.

**7** Ask questions and be engaged in the presentations. The presenters are trying to provide you with informative sessions.

**8** Please share comments both positive and negative about SED and specific presentations. Your teachers will be asked to share your responses with our Evaluation Committee.

**9** Have fun and enjoy learning about different scientific fields and the research being conducted by the scientists you are interacting with!

## Science Exploration Day Committee

*The following individuals have generously volunteered their time and efforts to make SED a reality:*

**Dr. Jeff Arnold**
Director, WNY STEM Hub

**John Arnold**
Artist/Educator

**Joseph Cozzarin**
Buffalo City Honors School (Retired)

**Barbara Jeziorski**
Williamsville South High School (Retired)

**Dr. Kenneth Licata**
Williamsville South High School (Retired)

**Dr. Xiufeng Liu**
Professor of Science Education, University at Buffalo

**Dr. Monica Lynn Miles**
Coast Literacy Specialist, New York Sea Grant

**Donald Pearce**
University at Buffalo School of Medicine (Retired)

**Baylee Richards**
Academic Advisor, School of Engineering and Applied Science, University at Buffalo

**Paul T. Ruda**
Cleveland Hill Schools (Retired)

**Dr. Sandra Small**
Science Education Manager, University at Buffalo

**Dr. Noemi Waight**
Associate Professor of Science Education, University at Buffalo

**Dr. Gail Zichittella**
Teacher, Cheektowaga Central Schools (Retired)

2020

Distinguished Service Award

**Dr. Rodney Doran**

The Science Exploration Day (SED) Organizing Committee wishes to posthumously honor Dr. Rod Doran for his vision and leadership. Dr. Doran, a founding member of the committee, was instrumental in conceptualizing and organizing SED, an annual event which continues a 34-year tradition of educating area youth about the world of Science, Technology, Engineering, and Mathematics. While SED has evolved since its inception, Dr. Doran was a constant driving force - with a clear vision on how to embrace change while valuing all the contributions of the many people needed to make the innovative event an ongoing success.

Dr. Doran's outstanding work in science education resulted in over 15 professional awards and honors. He was an author or co-author of 15 books, several book chapters, and 70 plus research articles. He was the principal investigator of several multi-million dollar grants which focused on improving the quality of science instruction and assessment in schools. He served as a principal advisor for over 40 doctoral students, and was a dissertation committee member for an additional 30 candidates. To his dissertation students Dr. Doran was warmly referred to as ***Coach.***

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Wednesday, March 18, 2020
University at Buffalo, Amherst Campus

## First Lunch SCHEDULE

| | |
|---|---|
| First Session | 9:15am - 10:00am |
| Second Session | 10:10am - 10:55am |
| Lunch* | 11:05am - 11:25pm |
| Large Group | 11:25am - 12:10pm |
| Fourth Session | 12:20pm - 1:05pm |

## Second Lunch SCHEDULE

| | |
|---|---|
| First Session | 9:15am - 10:00am |
| Second Session | 10:10am - 10:55am |
| Large Group | 11:05am - 11:50pm |
| Lunch* | 11:50am - 12:10pm |
| Fourth Session | 12:20pm - 1:05pm |

* Bag lunches are strongly recommended!

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