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**2023**

**Inclusion in Science Learning a New Direction**

**Conference on Disability and STEM**

**14th Annual ISLAND Conference**

**Friday October 13, 2023 @ [Princeton Marriott at Forrestal](https://www.marriott.com/event-reservations/hotelQuickView.mi?propertyId=ttndf&brandCode=MC&marshaCode=ttndf" \o "Princeton Marriott at Forrestal)**

**100 College Road East, Princeton, New Jersey 08540**

**Saturday October 14, 2023 @ Bowen Hall,**

**70 Prospect Ave, Princeton University, New Jersey 08540**

**Sponsored by:**

**Princeton Center for Complex Materials (PCCM) NSF DMR # 2011750**

**Office of Information Technology, Princeton University**

**Campus Conversations on Identity, Princeton University**

**Independence Science**



**ISLAND Conference Mission**

The Inclusion in Science, learning a New Direction, Conference on Disability, (ISLAND) seeks to shift the societal paradigm and raise expectations as to what is possible in Science, Technology, Engineering, and Mathematics (STEM) education for persons with disabilities. Symposium topics encompass factors that contribute to the under-representation of persons with disabilities in the STEM pipeline and strategies for their retention in this critical area of the 21st century economies and societies of the Fourth Industrial Revolution.

At ISLAND, we believe it is through education that we will reach the hearts and minds of the publics as to what is possible for persons with disabilities, and remove barriers to access. ISLAND presentations intend to drive innovation in pedagogy and methodology, while informing and connecting a community of teachers and future educators to the latest technological interventions and exploring methodological innovations ranging from simple access solutions for learning in a more inclusive way to global alternative praxis. Multisensory and hands-on approaches are emphasized during this conference, to stimulate and promote more equitable and inclusive student learning experiences.

The ISLAND conference, since its founding in 2010, continues to serve as a forum for conference attendees to meet, network, and collaborate to reshape the future of science access for students with disabilities. Originally organized and operated by scientists with disabilities who had a common mission to make the subject they loved more accessible and inclusive, ISLAND has grown to embrace a tapestry of non-disabled partners that have expressed a strong commitment for the full inclusion of persons with disabilities into the STEM professions. All individuals and organizations are welcome to participate at ISLAND.

The conference organizers hope that your participation is equally rewarding and fulfilling. For us, the inclusion of persons with disabilities into the STEM professions is beyond commitment and passion – it is a calling. We are active in promoting the full and authentic inclusion of persons with disabilities within the scientific community through other professional societies and organizations of scientists. I invite you to come and join our community of research and practice as we continue to further shift the societal paradigm to where a STEM professional with a disability is the norm rather than the exception.

*Dr. Cary Supalo,*

*Chair, ISLAND conference*

## Conference Schedule Overview – Friday October 13th 2023

# 8:30 am Eastern Daylight Time (GMT/UTC minus 4 hours)

Zoom open for registrant login and networking.

Please call Carla Vallejo at 346-477-5064 for login support.

#  9:00 am – 9:05 am

Welcome and Introductions.

Dr. Cary Supalo

# 9:05 am

High-Tech and Low-Tech Solutions for Access to Outer Space for Disabled Astronauts

Dr. Sherri Wells-Jensen

NASA/Library of Congress

# 9:30 am

Blindness Memory Perks: Restructuring Access into the System

Dr. Karen Arcos

Department of Psychology, University of California, Santa Cruz

# 9:55 am

Teaching Physics with Disabled Learners: A Review of the Literature

Dr. Erin Scanlon

Department of Physics, University of Connecticut

# 10:20 am, Morning Break

# 10:35 am

Tactile Periodic Table Project

Dr. Michael Fricke

Olon Ricerca Bioscience

# 11:00 am

Best practices in teaching chemistry to students who are deaf and hard-of-hearing

Dr. Annmarie Ross (virtual)

Rochester Institute of Technology/ National Technical Institute for the Deaf (RIT/NTID)

# 11:25 am

A Summer Class Exploring Computer Science with Educators of Deaf and Hard of Hearing Students

Meghan McSherry and Maria Johnson

Playful Learning Lab, University of St. Thomas

# 11:50 am

Tactile Sun-Watching Graphics: Bridging Past and Present

Dr. Nicole E. Johnson\* and Tasnim A. Alshuli\*\*

\*University of Colorado, Boulder, Fiske Planetarium

\*\* College of Education, University of Arizona

# 12:15 to 1:05 pm, Lunch

# 1:05 pm

Introducing Graduate Students to Accessible Data Visualization

Dr. Helen T. Sullivan1,2, Dr. Markku T. Hakkinen2,3, Jenni Arovaara2, Anu Horttanainen2, Dr. Charles Rambo2, Aino Sutinen2, Saara Wahlroos2

1Rider University, Lawrenceville, NJ, USA

2University of Jyväskylä, Jyväskylä, Finland

3Educational Testing Service, Princeton, NJ, USA

# 1:30 pm

Stories of Neurodiversity in STEM: Finding a Common Professional Language

Derek Hidalgo\*, Dylan Sullivan\*, Fernando Zavala\*, Jacob Stolle\*

moderated by Dr. Christin Monroe\*\*

\* panelists, Landmark College

\*\* moderator, Landmark College

# 2:20 pm

Learning from the Experts: Analysing Responses to the Question "Is there anything you wish professors or colleagues knew about being neurodivergent?"

Liam McDermott

Rutgers University

# 2:45 pm, Afternoon Break

# 3:00 pm

Possible Approaches for an Accessible CAD System for the Blind

Robert Jaquiss

Independence Science

# 3:25 pm

The Semantics of Sonics

Sadish D (virtual)

Independent

# 3:50 pm

Wolfram Syndrome

Ellie White

Ellie White Foundation

# 4:15 pm

Updates on Rapid Prototyping, Concept of the Model Lending library and the Comic featuring three blind Labradors

Robert Jaquiss

Independence Science

# 4:40 pm

Access to Forensic Sciences: A Fully Accessible Murder Investigation

Ashley Neybert and Annalise Diodato

Independence Science

# 5:10 pm, Adjourn

# 7:00 pm, Dinner

# 8:00 pm

# Keynote Address

Dr. Siegbert Schmid

Faculty of Chemistry, University of Sydney, Australia

## : Conference Schedule Overview – Saturday October 14th 2023

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# 9:05 pm

Accessible Audio Periodic Table

Dr. Greg Williams

Independence Science

# 9:30 am

Mission INSPIRE: Increasing Conceptual Knowledge, Building Rockets, and STEM Career Exploration

Dr. Tina Herzberg\* and Susan Osterhaus\*\*

\*University of South Carolina Upstate

\*\*Texas School for the Blind and Visually Impaired in Austin, Texas

# 09:55 am

Feel the Difference: Using Texture to Create Meaningful Tactile Graphics

Dan Gardner

ViewPlus Technologies Inc

# 10:20 am, Morning Break

# 10:35 am

Non-Visual Delivery of Accurate Volumes to Improve Laboratory Access for Blind Students

Charis Glatthar (in-person)

Metropolitan State University of Denver

# 11:00 am

Tigers in Tech: Roaring with Excitement over APH’s SALS and Code Jumper!

Katrina Best and Roseanne Hoffmann

American Printing House

# 11:25 am

The State of Accessible Digital Mathematics

Brian Richwine and Mary Stores

 Indiana University

# 11:50 am

 Inclusio: A Convergent Effort for Creating Accessible, Multimodal Graphics

Amy Keith and Dr. Jenna L. Gorlewicz\*

\*Department of Mechanical Engineering, Saint Louis University

# 12:10

Closing Remarks for ISLAND Conference and Invitation to Abacus Bee

Dr. Cary Supalo

Chair, ISLAND Conference

# 12:15 pm, Lunch

# 12:45 pm, Registration for the 2023 New Jersey Abacus Bee

# 1:00 pm – 6:00 pm

2023 New Jersey Abacus Bee

Dr. Monique Coleman

President, VISTAS Education Partners (VISTAS)

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

**Friday, October 13, 2023**

# 9:05 am. High-Tech and Low-Tech Solutions for Access to Outer Space for Disabled Astronauts

### Presenter

Dr. Sherri Wells-Jensen

NASA/Library of Congress

**Abstract**

For the first decades of the human space program, standards for who would become an astronaut were almost impossibly strict, and the idea of disabled people in space was the domain of speculative science fiction. But, with the rise of the private space companies, things began to change. Private astronauts have included people with advanced arthritis, artificial femurs, and hearing loss. Definitions of 'fit to fly' are changing, and the work of making space accessible has begun in earnest.

In April 2023, the Space Analog for the Moon and Mars (SAM) hosted two consecutive four-person missions each containing one fully blind crew member. Analog missions, often referred to as 'space habitats without rockets' are one of the primary ways equipment, techniques and crew configurations are tested before deployment to space. This paper describes how these crews assessed access in the analog habitat, and what changes they were able to make.

Access solutions ranged from electronic instruments (such as an accessible LabQuest and Vernier sensors) to time-tested solutions like bump dots and braille labels made with slate and stylus. The paper concludes with thoughts on next steps for space habitat accessibility.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 9:30 am. Blindness Memory Perks: Restructuring Access into the System

### Presenter

Dr. Karen Arcos

Department of Psychology, University of California, Santa Cruz

## Abstract

I offer cognitive research (Arcos, Jaeggi, & Grossman, 2022) and desires to diversify academic spaces.

Use of verbal encoding strategies among blind individuals may train cognitive systems that maintain and manipulate verbal information. We investigated whether early visual deprivation is linked to improved verbal short term memory (STM) abilities. Blind adults recalled more items on a verbal STM digit span task than did sighted participants. However, blind individuals recalled fewer items in reverse on a braille STM digit span task. We conclude that memory benefits associated with blindness might be restricted to auditory-verbal STM and likely reflect strategy use and practice. Therefore, educators may wish to consider the format in which they expose students to information depending on information type and on how learners are expected to engage with the material, which may affect recall.

In this presentation, I also describe my interest in learning and contributing to creating diverse, equitable, accessible, and inclusive spaces using a set of evidence-based strategies from the American Association for the Advancement of Science’s STEMM Equity Achievement (SEA) Change initiative. I am committed to implementing strategies for all to flourish as individuals while discovering themselves.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 9:55 am. Teaching Physics with Disabled Learners: A Review of the Literature

### Presenter

Dr. Erin Scanlon

Department of Physics, University of Connecticut

**Abstract**

In 2023, the American Institute of Physics published the International Handbook in Physics Education Research: Special Topics which includes a chapter which reviews the

literature about how can support disabled students within physics courses. Included in

the chapter, we reviewed 66 articles focusing on the nexus of physics, disability, and instruction. Within the chapter, we describe findings for practitioners related to laboratory experiences, virtual simulations, direction instruction, demonstrations, textbooks, and general instructional practices as well as findings for researchers related

to investigations of disabled students’ understandings of physics content, research utilizing Universal Design for Learning (UDL), experiences of disabled students, and instructors’ experiences teaching disabled students. The chapter also includes critiques of the extant literature as well as implications for practitioners and researchers. In the talk, we will present trends within the extant literature, suggestions of accessible and

inclusive practices, and implications for future research.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 10:35 am. Tactile Periodic Table Project

### Presenter

Dr. Michael Fricke

Olon Ricerca Bioscience

## Abstract

The tactile periodic table project grew from my experience working with two blind individuals as a graduate teaching assistant in general chemistry at the University of Cincinnati. Tactile representations including molecular models and Picture in a Flash (PIAF) graphics were instrumental in conveying concepts and reactions mechanisms. Both of my students enjoyed the images I prepared and re-enrolled to take organic chemistry and then physics with my visual assistance. After their graduation we remained friends and I took up woodworking and made my first tactile carving - a map of the world on three joined pieces of maple with a walnut frame. I gave this map to my first blind student as a wedding gift. Tactile carvings have been my passion ever since and as an American Chemical Society (ACS) Councillor I brought this specialized skill to the ACS Committee for Chemists with Disabilities. Partnering with Mona Minkara who is a blind professor at Northeastern University we designed the braille periodic table. Our initial prototype will take me approximately 200 hours to carve by hand. Our goal is to build interest in the project and secure capital to bring in automation for mass production.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

**11:00 am. Best practices in teaching chemistry to students who are deaf and hard-of-hearing**

### Presenter

Dr. Annmarie Ross

Rochester Institute of Technology/ National Technical Institute for the Deaf (RIT/NTID)

## Abstract

Interventions in education settings are needed to grow the membership of underrepresented chemists who are Deaf and Hard-of-Hearing (DHH). Such interventions are necessary to improve the educational experience and support of students who are DHH. Resources, such as assistive technologies, as well as collections of best practices and educational design features for implementation in the chemistry classroom and laboratory settings are available to educators for improving the chemistry education for learners who are DHH. Conveniently, educators often find that these implementations for students who are DHH also benefit other students in the learning environment. The brand-new edition of the book, Teaching Chemistry to Students with Disabilities, shares such resources and best practices and specific strategies/resources therein for learners who are DHH. With implementation of the shared best practices and accommodations, students who are DHH can be very successful in the chemistry classroom.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 11:25 am. A Summer Class Exploring Computer Science with Educators of Deaf and Hard of Hearing Students

### Presenters

Meghan McSherry and Maria Johnson

Playful Learning Lab, University of St. Thomas

**Abstract**

The purpose of this research project was to design, deliver, and assess the content and methodology of an introductory course focused on the block-based coding language, Scratch, for educators of Deaf and Hard of Hearing students. Prior work by The Playful Learning Lab examined various STEM resources and their effect on student perception of STEM topics and content retention when utilized for Deaf and Hard of Hearing students. Previous research has shown that computer science and programming resources and curricula available today are not fully accessible for Deaf and Hard of Hearing students. Educators and teachers are faced with creating adaptations themselves, often limited by time constraints (Ladner, 2020). The purpose of the Summer 2023 â€œPlaying with Codingâ€ course is to provide the background knowledge and content to educators of Deaf and Hard of Hearing students so they are able to explore the possibility of teaching the programming language in their own classrooms. Through the course of our research and participant survey reflections, we hope to determine effective methods and resources that educators can successfully use to teach the Scratch programming language to Deaf and Hard of Hearing students.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 11:50 am. Tactile Sun-Watching Graphics: Bridging Past and Present

### Presenters

Dr. Nicole E. Johnson\* and Tasnim A. Alshuli\*\*

\*Fiske Planetarium, University of Colorado, Boulder

\*\*College of Education, University of Arizona

## Abstract

This presentation shares a year-long journey of collaborating closely with educators, students, and community stakeholders to develop a set of seven thermoform tactile art representations that illustrate both ancient and modern methods for observing and recording the solar corona. Funded by the Outreach team for PUNCH, a NASA Small Explorer (SMEX) mission, this work uses an iterative design process to gain invaluable insights through direct engagement with community partners across the U.S. These insights shaped the creation of a tactile graphic set that not only bridges the past and present of sun-watching but also serves as a testament to the impact of community-driven accessibility solutions and the power of collaborative learning experiences in producing meaningful educational resources.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 1:05 pm. Introducing Graduate Students to Accessible Data Visualization

### Presenters

Dr. Helen T. Sullivan1,2, Dr. Markku T. Hakkinen2,3, Jenni Arovaara2, Anu Horttanainen2, Dr. Charles Rambo2, Aino Sutinen2, Saara Wahlroos2

1Rider University, Lawrenceville, NJ, USA

2University of Jyväskylä, Jyväskylä, Finland

3Educational Testing Service, Princeton, NJ, USA

## Abstract

In many graduate programs internationally, students in the sciences are unlikely to receive exposure to academic courses focused on accessibility and inclusive design. The University of Jyvaskyla Summer School, now in its 32nd year, provides a two week program of courses open to graduate students from around the world in subjects including mathematics, physics, biology, computer science, and cognitive science. Since 2017 the Summer School has offered an introductory course in accessible and inclusive design as part of the cognitive science program and in 2022 offered an initial course in Accessible Data Visualizations. Students attending the course come from diverse research areas and are required to attend the introductory course before proceeding to data visualization course. In 2023, the data visualization course was adapted into a three day hackathon format as an experiment with a small number of students. This presentation will describe the summer school program in accessible and inclusive design and focus on the hackathon, the student participants and their project work. Given the intensive, three day format, and the varied backgrounds of the students, we successfully incorporated generative AI as a “coding” apprentice to accelerate prototyping by some students. The ideas developed by the students are explored, ranging from sonification to accessible scientific posters and lithophanes. Implications for future, AI-supported hackathon-based learning opportunities are discussed as a means to develop skills in emerging scientists to support accessible dissemination of their research.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 1:30 pm. Stories of Neurodiversity in STEM: Finding a Common Professional Language

### Panelists

Derek Hidalgo, Dylan Sullivan, Fernando Zavala, Jacob Stolle

Landmark College

### Moderator

Dr. Christin Monroe

Landmark College

## Abstract

This panel will consist of four Landmark College students pursuing undergraduate degrees in Life Science or Computer Science. All students have completed internships and have used the knowledge they gained from participation in the AIE-STEMPLOS NSF-funded program to pursue their passions. The students used a common language extracted from the Birkman survey with their faculty mentor and cohort group to identify and navigate internship opportunities. After successfully earning their internship positions, they sought supplementary funding to support their projects. These projects range from video game coding, reptile rehabilitation, science outreach and research on enzyme kinetics. The students will reflect on their experiences as neurodiverse STEM scholars and how the scaffolds provided by the AIE-STEMPLOS program helped them at each step of navigating their respective internships. (NSF DUE S-STEM Award #2129912)

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 2:20 pm. Learning from the Experts: Analysing Responses to the Question "Is there anything you wish professors or colleagues knew about being neurodivergent?"

### Presenter

Liam McDermott

Rutgers University

## Abstract

The neurodiversity paradigm, created by Australian sociologist Judy Singer, and expanded upon greatly by many other scholars, has begun to gain traction in the classroom. As more and more educators commit to celebrating the diversity of minds present in their classroom, we have an incredibly valuable opportunity to ask ourselves how we can expand the boundaries of an accessible classroom to meet the needs of neurodivergent students, and make make our institutions more accessible to our neurodivergent colleagues. However, we cannot begin to ethically make these changes without the explicit inclusion of our neurodivergent colleagues and students, and without making sure their voices are at the forefront of any conversation about neurodiversity in the classroom. Therefore, we here present an analysis of 18 responses from neurodivergent students and faculty to the question: "is there anything you wish professors or colleagues knew about being neurodivergent?" and discuss the implications for teaching practices and creating a more accessible classroom.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 3:00 pm. Possible Approaches for an Accessible CAD System for the Blind

### Presenter

Robert Jaquiss

Independence Science

## Abstract

For a number of years, considerable efforts have been made to encourage persons in the BLV community to engage in STEM careers. Equipment exists that can create good tactile images.

One major requirement for many STEM courses is the drawing and working with images. The proposed design is an attempt to allow a person who is blind to create CAD images. Currently, the OpenScad system allows a user to define an object using a mashup of set theory, geometry and program constructs. Three possible approaches are:

* Use a 3d scanner to scan a physical model.
* Use software and/or 3d scanner to log changes to a physical model as it is being built.
* Use a haptic device to design using Virtual Clay™

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 3:25 pm. The Semantics of Sonics

### Presenter

Sadish D

Independent

## Abstract

I propose a (preliminary) unified semantic architecture for sonification that is agnostic to the field of study and independent of an implementation in a programming language. It incorporates the opportunities and constraints of both, the physics of sound, and the neuropsychology of sound perception. Through an interactive implementation in the Julia programming language, I demonstrate three advanced data analysis functionalities: exploration of data distributions, numerical comparison, and dimensionality reduction.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 3:50 pm. Wolfram Syndrome

### Presenter

Ellie White

Ellie White Foundation

## Abstract

My name is Ellie White. I have an ultra rare genetic disorder called Wolfram Syndrome.  It is an autosomal recessive disorder caused by two genetic mutations in the WFS one chain. WS causes type one diabetes, progressive vision, loss, progressive, hearing loss, progressive coordination, loss, and eventually brainstem/breathing difficulties. It has a life expectancy of 35 years but research is being done to extend that. Type one diabetes has essential supplies, such as an insulin pump, that are not accessible for visual impairments. And the essential accessories needed for potential. Correction of hearing loss are also not made for easy visual accessibility. Research needs to be done and needs to be made accessible for all impairments.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 4:15 pm. Updates on Rapid Prototyping, Concept of the Model Lending library and the Comic featuring three blind Labradors

### Presenter

Robert Jaquiss

Independence Science

## Abstract

This presentation covers three topics:

Since this author's last presentation on the state of the art of Rapid Prototyping, improvements have been made to the equipment available that allows for faster model production, larger build envelopes and finer surface features. There are a few systems that utilize CNC routers, laser cutters and 3d printers.

The concept of the Model Lending Library has been modified to include a STEM materials production component. The production of STEM materials will enhance revenue and help justify the purchase of a better braille embosser.

The Comic featured in the last few Independence Science newsletters is a way in which STEM concepts can be explained to students. The main characters are three blind Labradors (Isci a black lab, Stella a yellow lab and Gadget a chocolate lab). The three labs have and will have adventures here on earth, in space and on the Moon. There are a number of humans in the comic including characters who are blind and who read braille.

 **ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 4:40 pm. Access to Forensic Sciences: A Fully Accessible Murder Investigation

### Presenters

Ashley Neybert and Annalise Diodato

Independence Science

## Abstract

When Annalise got her degree in forensic chemistry, she had to struggle to try to “fit in” and “pass” as a “sighted” person causing difficulty finding work in a laboratory setting typical in her field. Working with Independence Science, we have worked to make sure that students don’t have to struggle through such a fate anymore.

From research on accessible fingerprinting methods and blood spatter analysis tutorials to ground penetrating radar analysis and drug identification, we have worked to design a fully accessible end-to-end murder investigation suitable for students of all visual acuities, including totally blind students. Join us on how we created this investigation, the research behind it, our first commercialization of the program in Kentucky, and how you can make this experience accessible to your students as well.

 **ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 8:00 pm. Bridging Research Frontiers: Li-ion Battery Advancements and Inclusive Chemistry Laboratories for the Visually Impaired

### Keynote Address

Professor Siegbert Schmid

Faculty of Chemistry, University of Sydney



## Biography

Siegbert ‘Siggi’ Schmid is Professor of Chemistry at the University of Sydney. He graduated with a PhD from the University of Tübingen, Germany. After a few years at the Australian National University, Canberra, he returned to Germany to complete a Habilitation at the University of Tübingen. Subsequently, he accepted a position at the School of Chemistry of the University of Sydney, combining both materials chemistry and chemistry education research. He leads the Chemistry Education & Communication Research (CECR) theme at the University of Sydney and is very active in chemistry education research and development. Siggi’s education research aims to improve current teaching practices and learning outcomes for tertiary-level students as well as improve diversity and inclusion in chemistry teaching. His materials chemistry research interests lie in the synthesis and structural characterisation of aperiodic crystals and other materials with technological applications (e.g. electrode materials for rechargeable batteries). He is a Past Chair of the Royal Australian Chemical Institute’s Division of Chemical Education. His contributions to Chemistry Education have been recognised with many awards, including the Vice Chancellor’s Award for Outstanding Teaching (The University of Sydney, 2012), an Australian Government Office of Learning and Teaching Citation Award (2012) for Excellence in Teaching, and the Divisional Medal of the Royal Australian Chemical Institute’s Division of Chemical Education (2016). In 2019 he was awarded the Fensham Medal of the Royal Australian Chemical Institute for outstanding contributions to chemical education.

## Abstract

This presentation covers two seemingly distinct but interconnected realms in the field of science and technology: the advancements in lithium-ion (Li-ion) battery research and the imperative need for inclusivity in chemistry laboratories for visually impaired people.

In the first part of the talk, the rapidly evolving landscape of Li-ion (and other) batteries will be explored. Li-ion batteries have become the backbone of modern energy storage, powering everything from mobile devices to electric vehicles. The latest developments in Li-ion technology, including improvements in energy density, safety, and sustainability. Understanding these innovations is crucial for addressing the pressing energy and environmental challenges of our time.

The second part of the presentation shifts its focus to inclusivity within the chemistry laboratory setting. We highlight the unique challenges faced by people with visual impairments in pursuing careers and education in chemistry. Drawing attention to these challenges, we explore strategies and technologies that can be implemented to make chemistry laboratories more inclusive. From tactile equipment labels to accessible laboratory protocols and adaptive software, these innovations aim to empower visually impaired individuals to fully participate in hands-on scientific experimentation.

In conclusion, this talk underscores the mutual benefits of advancing Li-ion battery research and fostering inclusivity in chemistry laboratories. It highlights how scientific progress and innovation are intrinsically linked to diversity and equal access. By embracing these principles, we can create a more equitable and sustainable future, where scientific endeavours are truly inclusive, and groundbreaking discoveries emerge from a diverse pool of talent.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

**Saturday October 14, 2023**

# 9:05 am. ACCESSIBLE AUDIO PERIODIC TABLE

### Presenter

Dr. Greg Williams

Independence Science

## Abstract

In 2020 Independence Science released the Accessible Audio Periodic Table (AAPT) which is a free web based periodic table that leverages the use of audio sonification to communicate periodic trend information that is traditionally communicated through either color or arrows. We will briefly review previous adaptations of the periodic table and discuss the challenges in teaching periodic trends to BLV students. The current features of the AAPT will be demonstrated, and we will preview a new iOS app version of the AAPT.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 9:30 am. Mission INSPIRE: Increasing Conceptual Knowledge, Building Rockets, and STEM Career Exploration

### Presenters

Dr. Tina Herzberg\* and Susan Osterhaus\*\*

\*University of South Carolina Upstate

\*\*Texas School for the Blind and Visually Impaired in Austin, Texas

## Abstract

Have you ever wondered how to get your students with visual impairments more involved in science? Through this presentation, you will learn about how students increased their conceptual knowledge of rockets, got involved with building and testing rockets, and collected their own data. The students and their families also had a blast interacting with Dr. Wells-Jensen, a NASA employee who is blind, and learning about her recent space-related missions.

We will share how the team taught the content online (after extensive revisions based on what we learned in 2022) and the impact of the accessible instruction, models, and tactile graphics on student knowledge and understanding. Attendees will acquire access to curriculum materials, including electronic tactile graphic files, that can be easily duplicated for use with other students.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 9:55 am. Feel the Difference: Using Texture to Create Meaningful Tactile Graphics

### Presenter

Dan Gardner

ViewPlus Technologies Inc

## Abstract

Creating accessible tactile graphics requires more than just replicating visual information. This presentation explores the use of texture to add meaning and depth to tactile graphics. By incorporating texture mapping techniques, designers can enhance the user experience and create more meaningful and inclusive representations of information for individuals with visual impairments.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 10:35 am. Non-Visual Delivery of Accurate Volumes to Improve Laboratory Access for Blind Students

### Presenters

Charis Glatthar and Dr. April Hill

Metropolitan State University of Denver

## Abstract

In the analytical chemistry laboratory, volumetric glassware is used to transfer accurate and precise quantities of liquids for analysis. These devices require the analyst to visually align the level of liquid with a fill line printed on the glassware. For blind chemists, this is not possible, which creates a barrier for their participation in this field. As an alternative, we investigated the amount of error between tacked syringes and notched syringes as a method for measuring liquid chemicals for blind and low-vision (BLV) students to determine which are better suited for analytical laboratory work. Seven syringes of differing brands and/or volumetric quantities were marked with tactile indicators, either a notch cut into the fin of the plunger or a tack pushed into the syringe to physically stop the plunger. These were calibrated with deionized water and their accuracy and precision were compared to the tolerance of class A volumetric pipettes. Variation between individuals was analyzed using a group of 10 volunteers measuring trials from a notched and tacked syringe while wearing sleep shades, and the results were compared using ANOVA and compared to syringe calibration data. Once we determined the tacked syringe was more precise and accurate, we used a common analytical procedure, the spectrophotometric analysis of iron, to compare the accuracy and precision obtained by a blind student using the tacked syringe to that obtained with the standard method using volumetric glassware, which was carried out by sighted analytical chemistry laboratory students.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 11:00 am. Tigers in Tech: Roaring with Excitement over APH’s SALS and Code Jumper!

### Presenters

Katrina Best and Roseanne Hoffmann

American Printing House

## Abstract

Get ready for an electrifying virtual presentation brought to you by two dynamic product managers from APH! Join us as we embark on an exhilarating journey, unveiling groundbreaking innovations that will revolutionize the world of accessibility. Get excited to explore cutting-edge educational tools, where science, coding, and electronics merge seamlessly to create an inclusive learning experience like never before.

Our featured products, the Submersible Audio Light Sensor (SALS) device and the Code Jumper Kit, are set to ignite your passion for STEM education. Witness the power of SALS, a state-of-the-art device that opens doors for students with vision impairment in grades K-12, empowering them to excel in science experiments that captivate the imagination.

And that's not all! Brace yourself for the Code Jumper Coding Module—an interactive, real-time coding adventure that unlocks the world of programming for all learners, you won't want to miss this captivating event.

Join us and be part of the change that's shaping the future of STEM for everyone!

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 11:25 am. The State of Accessible Digital Mathematics

### Presenters

Brian Richwine and Mary Stores

Indiana University

## Abstract

Technologies for accessible digital mathematics hold potential to dismantle STEM barriers. In this presentation, we'll explore electronic document formats and assistive technologies, including text-to-speech and electronic braille access to mathematical content. We will immerse you in a simple math quiz using speech access and examine reading mathematics using screen reading software. Through demonstrations of linear and non-linear speech access with expression explorers, we will emphasize the efficacy of these technologies, identify areas needing progress, and discuss individual supports for skill-building in accessing mathematics via speech. This analysis will bring awareness to the current state of accessible digital mathematics, highlighting both the achievements and the challenges that remain.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 11:50 am. Inclusio: A Convergent Effort for Creating Accessible, Multimodal Graphics

### Presenters

Amy Keith and Dr. Jenna L. Gorlewicz\*

\*Department of Mechanical Engineering, Saint Louis University

## Abstract

Current practices for creating accessible graphics are time and resource intensive, requiring specialized tools and manual authoring. In this talk, we present a convergence effort – Inclusio – that brings together stakeholders from across the creation process toward lowering the barriers of finding and creating accessible content. Inclusio’s software application which consists of three key values. The first is timely creation of new content through the combination of an accessible authoring suite and automated conversion with Artificial Intelligence. The second is choice in the way content is received through Inclusio’s ability to intake multiple file formats (e.g. text, image, numerical) and output to multiple platforms including text description, tactile graphics, multimodal touchscreen display, and refreshable haptic displays. The third is a one-stop shop for finding accessible content through a vetted content marketplace. These three pillars were imagined through iterative design cycles with Teachers of Students with Visual Impairments (TVIs) and individuals with Blindness or Visual Impairments (BVI). Inclusio’s end-to-end platform will reduce the time and resources required to obtain accessible content and will bring stakeholders together in one platform to create and share best practices and guiding principles toward supporting access anywhere, anytime, and in any modality.

**ISLAND Conference 2023, Princeton University, Princeton, NJ**

# 1:00 pm - 6:00 pm. The 2023 New Jersey Abacus Bee

### Presenter

Dr. Monique Coleman

President, VISTAS Education Partners (VISTAS)

## Abstract

The ISLAND conference is proud to collaborate with Dr. Monique Coleman, to host the inaugural New Jersey Abacus Bee. This math competition is open to blind and low vision students ages 5-21. Contestants can use an abacus, mental math, finger math, and/or manipulatives. Contests are available in braille and large print. The Abacus Bee will include a pop up Makerspace facilitated by the Mountain Lakes Library Makerspace in the auditorium starting at 2:30. The full agenda for the Abacus Bee is provided below:

**12:45         Check-in**

**1:00           Welcome Ceremony**

**1:30           Mercury Round – all groups**

**1:50          Gemini Round – all groups**
                   Family Workshop: The Abacus is Fundamental (starts at 2:15)

**2:10       Apollo Round – all groups**
                       Family Workshop cont’d

**2:30          Artemis Round – Movers, Riders, Flyers and Blasters**
                       Makerspace Activities– Rovers, Starters

**3:00           Break – all groups**

**3:30           Space Race Dictation Round – all groups (optional)**   Makerspace Activities

**4:30          Voyager Round – Flyers, Blasters** Makerspace & Abacus Craft Activity – Rovers, Starters, Movers, Riders

**5:00**  **Break - all groups**

 Refreshments

**5:30         Closing Ceremony**

**6:00 Adjourn**

# ISLAND 2023 Acknowledgements

The chair and organizers of the 14th annual ISLAND conference would like to thank you for your participation at this year’s conference. We hope you found the presentations and informal discussions informative, interesting, insightful, and useful for your teaching and research. We also would like to welcome the parents, students, and volunteers of the inaugural New Jersey Abacus Bee event.

We feel the ISLAND conference serves as an active forum to effect necessary paradigm changes in the STEM education community. We grow our community so that more people encounter, become interested in, and are informed about how to effectively promote inclusion and equity in STEM. We believe that as STEM education and related industries and professions become aware of the challenges and talents of persons with disabilities, and how to provide accommodations in an effective and inclusive way, they will embrace, not fear, the participation of persons with disabilities in STEM.

We look forward to your continued interest and participation in the ISLAND community in the months and years ahead. We invite all attendees to join our online community. We also invite all interested presenters to submit a peer reviewed paper for the ISLAND proceedings issue of the [Journal of Science Education for Students with Disabilities](https://scholarworks.rit.edu/jsesd/) (JSESD). This open access free journal is a valuable resource for science educators and researchers alike. Details about deadline submissions and publication guidelines, as well as previous ISLAND conference proceedings, are available on the JSESD website.

The ISLAND conference organizers thank all our sponsors for helping to make this year’s conference a huge success: Princeton University’s Office of Information Technology, Princeton University’s Campus Conversation on Identities, the Princeton Center for Complex Materials (PCCM), an NSF-funded MRSEC DMR # 2011750, and Independence Science. We also thank all our ambassadors and volunteers for their support throughout the conference. We also wish to thank all our presenters, whose contributions to the field of accessibility in STEM make ISLAND possible.

We look forward to welcoming you to the 15th annual ISLAND conference in 2024. Please check the ISLAND conference website in spring 2024 for more specific details as they become available.

*Cary Supalo,*

*Monique Coleman, Daniel Steinberg, Mary Albert, Peter Walters, Jas Bhattacharya.*