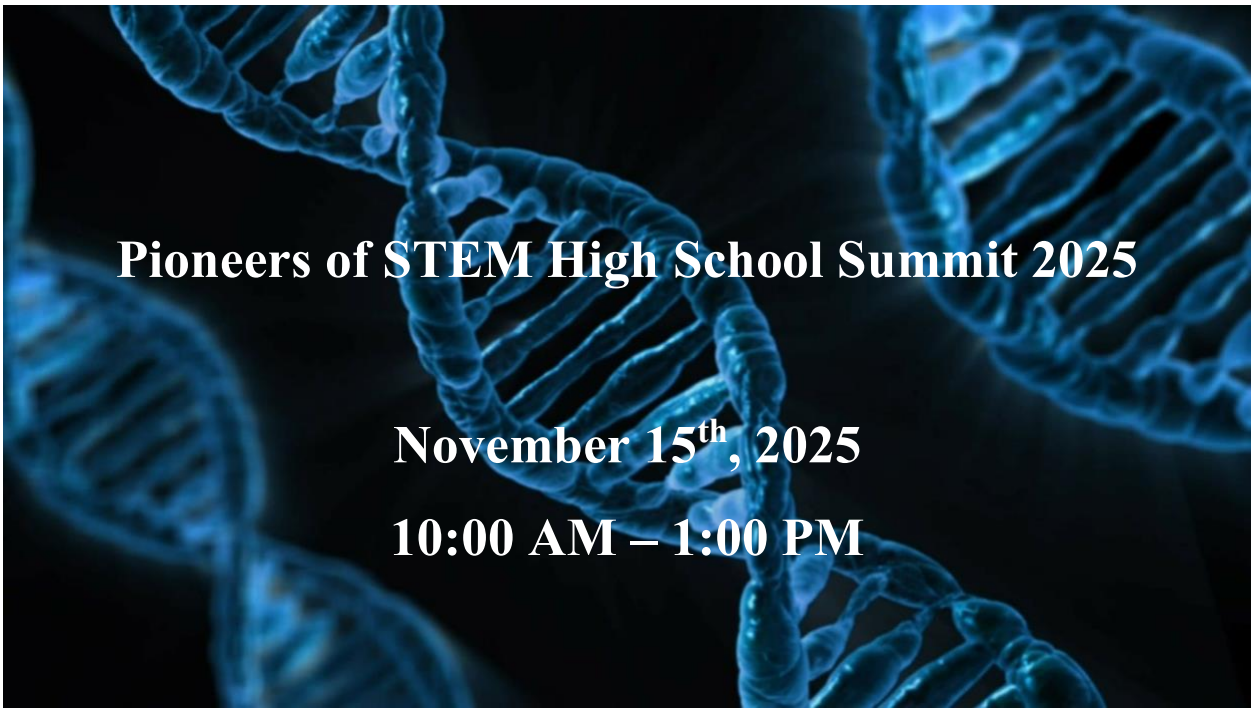

# Pioneers of STEM High School Summit 2025

**November 15th, 2025**

**10:00 AM – 1:00 PM**

## About the Pioneers of STEM High School Summit

The Pioneers of STEM High School Summit is an academic forum created to highlight, support, and celebrate the scientific work of high school students. This summit provides an opportunity for young scholars to present their research, exchange ideas, and engage with peers, educators, and scientists from a wide range of disciplines.

The summit brings together oral presentations, poster sessions, and a keynote lecture delivered by an expert in the field. By offering a structured yet welcoming environment, the event encourages students to develop their communication skills, receive meaningful feedback, and gain exposure to the broader STEM community.

The summit is guided by a commitment to inclusivity, intellectual curiosity, and early engagement in scientific inquiry. It aims to inspire the next generation of researchers by fostering an environment where students can share their achievements and envision future pathways in STEM.

The Proceedings of the Pioneers of STEM High School Summit include abstracts from all oral and poster presentations, highlights from the event, and recognition of award recipients. We hope this collection serves not only as a record of the summit but also as a source of encouragement for students to continue pursuing scientific discovery.

## Schedule at a Glance

Welcome & Introductions

Keynote Speaker

Oral Presentations

Poster Session

Closing Remarks

## Founder and Organizer

Lale Devany – The Academy for Mathematics, Science, and Engineering, Morris Hills High School, Rockaway, NJ

## Advisory Committee

Our advisory board includes faculty and professionals who support student-led STEM initiatives. They provided guidance during planning, assisted with outreach, reviewed applications, and gave feedback and encouragement during the event.

**Dr. Paola DiMarzio** - Department of Chemistry and Chemical Biology, Stevens Institute of Technology
**Dr. Valerie Feng** - Department of Mathematics and Computer Science, Drew University
**Dr. Andrea Lee** - Department of Chemistry, Drew University
**Dr. Xiaokan Zhang** - Department of Cardiology, Columbia University Medical Center

## Keynote Speaker

**Dr. Murat Alper Cevher**

Assistant Professor, Brooklyn College, City University of New York, Department of Biology, Brooklyn College Cancer Center, Graduate Center Biology and Biochemistry PhD program

**Title: Molecular Mistakes: How Small Errors in Gene Control Cause Big Problems**

Dr. Murat Alper Cevher is an Assistant Professor in the Department of Biology at Brooklyn College (CUNY). His lab studies how genes are switched on and off inside cells. Dr. Cevher's team focuses on the Mediator complex, a key molecular machine that regulates nearly all protein-coding genes and plays an important role in cancer. He has published widely, received national and international research grants, and mentors high school, undergraduate, and graduate students in cutting-edge molecular biology. Dr. Cevher is passionate about inspiring young scientists to help uncover the hidden secrets of life.

## Program

| Time (ET) | Session | |
|---|---|---|
| **10:00 – 10:10** | **Welcome & Opening Remarks**<br>**Lale Devany & Dr. Andrea Lee** | |
| **10:10 – 10:40** | **Keynote Speaker**<br>**Dr. Murat Alper Cevher**<br>Brooklyn College, City University of New York<br>Department of Biology, Brooklyn College Cancer Center, Graduate Center Biology and Biochemistry PhD program | |
| **10:40 – 11:30** | **Oral Presentations (Breakout Rooms)** | |
| | **Breakout Room A**<br>**Engineering & Technology**<br>**Moderator: Dr. Paola DiMarzio** | **Breakout Room B**<br>**Biology & Life Sciences**<br>**Moderator: Dr. Xiaokan Zhang** |
| **10:42-10:54** | **Yujing Sun**<br>The Bronx High School of Science<br>Bronx, NY<br>**Title:** Exploring Feature Engineering for Crystal Structure Classification: Interactive Applications of PCA and PLS-DA Clustering | **Rianna Mitra**<br>Monmouth County Academy of Allied Health and Science Neptune, NJ<br>**Title:** Effect of in vitro methods on infectivity of bumble bee gut pathogen |
| **10:54-11:06** | **Eileen Najafov**<br>Morris Hills High School/Academy for Math, Science and Engineering<br>Rockaway, NJ<br>**Title:** Optoelectronics Engineering | **Benjamin Tamari**<br>John L. Miller Great Neck North High School<br>Great Neck, NY<br>**Title:** Extraction and Quantification of DNA from Angiosperm Species using the Edwards Method |
| **11:06-11:18** | **Rayan Imran**<br>Millburn High School<br>Millburn, NJ<br>**Title:** The Moving Talking Animatronic | **Aras William Taylor**<br>Deep Run High School<br>Glen Allen, VA<br>**Title:** The Effect of Vermicompost on Irradiated Seed Growth |

| | | |
|---|---|---|
| **11:18-11:30** | **Dhiraj Banerjee**<br>Morris Hills High School<br>Rockaway, NJ<br>**Title:** 1/400 scale JFK Airport | **Cristian Leon Lorenzo**<br>North Bergen High School<br>North Bergen, NJ<br>**Title:** Wasteland Survivors: How fungi adapted to radioactive environments |
| **11:30 – 11:40** | **Break** | |
| **11:40 – 12:20** | **Poster Session*** | Breakout Rooms |
| **12:20 – 12:30** | **Closing Remarks – Lale Devany** | |
| **12:30 – 1:00** | **Optional Networking/Feedback Session** | |

*Poster Presenters

| **Presenter** | **High School** | **Title** |
|---|---|---|
| Joseph Oziel | Bronx High School of Science<br>Bronx, NY | Improving Structural Predictions with KNN-Enhanced SISSO Models |
| Joseph Oziel | Bronx High School of Science<br>Bronx, NY | Systematic Ternary Exploration of Gd–Os–Ge with Novel Phases |
| Rishan Pawar | Manalapan High School<br>Manalapan, NJ | Air Pollution and Air Quality Trends and Predictions using AI model |
| Maya Moore | Western High School<br>Davie, FL | Engineering CAR-Extracellular Vesicles to Target FAP Cancer-Associated Fibroblasts via the Ras/MAPK/ERK Pathway |
| Eileen Najafov | Morris Hills High School/Academy for Mathematics, Science, and Engineering<br>Rockaway, NJ | STEM-ed Initiative for Young Women and Girls |
| Siddharth Selvaraj | The Wardlaw + Hartridge School<br>Edison, NJ | Evaporating the Darkness: An exploration of Hawking Radiation |
| Nanki Kaur | Morris Hills High School/Academy for Mathematics, Science and Engineering<br>Rockaway, NJ | Your Computer, Dissected |

| | | |
|---|---|---|
| Nava Youseflaleh | Village School of Greak Neck<br>Great Neck, NY | Molecular Similarities and Differences Between BRCA1, BRCA2, and CHEK2 Genes |
| Selma Elbenni | The Wardlaw + Hartridge School<br>Edison, NJ | Artificial Intelligence increasing presence in children's media and the effect on their development |
| Anushka Patchigolla | The Wardlaw + Hartridge School<br>Edison, NJ | Design and Analysis of GITR-Targeted Small Molecules |

## Pioneers of STEM High School Summit 2025 Awards

We are pleased to congratulate the following students on their outstanding contributions.

### Best Oral Presentations

**Eileen Najafov –** Morris Hills High School/Academy for Math, Science and Engineering, Rockaway, NJ

Title: Optoelectronics Engineering

**Rianna Mitra –** Monmouth County Academy of Allied Health and Science, Neptune, NJ

Title: Effect of in vitro methods on infectivity of bumble bee gut pathogen

### Best Poster Presentation

**Anushka Patchigolla –** The Wardlaw + Hartridge School, Edison, NJ

Design and Analysis of GITR-Targeted Small Molecules

## Oral Presentations

**Breakout Room: Engineering and Technology**

**Yujing Sun**

The Bronx High School of Science, Bronx, NY

Co-authors: Danila Shiryaev, Emil I. Jaffal, Anton O. Oliynyk

**Title: Exploring Feature Engineering for Crystal Structure Classification: Interactive Applications of PCA and PLS-DA Clustering**

**Abstract:** Active learning through interactive exploration significantly enhances student engagement and understanding in chemical education. This educational activity leverages Principal Component Analysis (PCA) and Partial Least Square-Discriminant Analysis (PLS-DA), two foundational machine learning techniques widely applied in contemporary research. Interactive Python-based Jupyter notebooks offer accessible educational platforms for students exploring the chemical data, requiring no prior 15 programming experience. These notebooks allow learners to actively engage in feature exploration and dimensionality reduction processes, applied to clustering and classifying binary AB equiatomic solid state compounds. Students can actively select and modify chemical and physical features, observing in real time how these choices impact the effectiveness of PCA and PLS-DA clustering models. Initially, PCA enables unsupervised visualization of natural clustering and correlations among compounds 20 without prior labeling. Subsequently, employing PLS-DA, students develop supervised models capable of predicting crystal structures, explicitly illustrating supervised versus unsupervised learning paradigms. The proposed activity highlights the importance of explainability in machine learning models, rather than operating the models as a "black box". Beyond learning fundamental concepts, the activity encourages students to participate in genuine exploratory processes, mirroring the investigative 25 approaches historically utilized by researchers and practiced today. By experimenting freely with datasets and computational methods, students experience firsthand the iterative nature of scientific discovery, fostering deeper insight into both chemical informatics and the broader research methodology.

**Rayan Imran**

Millburn High School, Millburn, NJ

**Title: The Moving Talking Animatronic**

**Abstract:** The goal of this project was building a working animatronic that could move, talk, and have articulating eyes and a mouth. The idea was to use CAD, coding, and building while creating a proof of concept for bigger projects later on. The base was a four-motor drive system built out

of book covers, with custom CAD eyes inspired by a YouTuber named Maxwell and a hinged cardboard mouth powered by a servo. As the design developed, I expanded the base for better stability and added wooden stilts that held the body. The body was then standoffed from the base, forming a neck to mount the head securely. I wired in the servos, an NRF2401 module for wireless control, and a DF Mini Player to give the animatronic a voice. In the end, it could drive, move its eyes and mouth, and "speak" through the MP3 player—all run wirelessly through paired Arduinos. This project proved I could bring together mechanical design, electronics, and wireless communication into a single build, and it sets the stage for more advanced animatronics in the future.

**Eileen Najafov**

Morris Hills High School/Academy for Math, Science and Engineering, Rockaway, NJ

**Title: Optoelectronics Engineering**

**Abstract:** I was involved in an optoelectronics engineering internship this summer, where I researched methods on increasing transmission in yttrium iron garnet (YIG) thin film samples, a widely used rare-earth iron garnet crystal in optical isolators – critical for optical communication devices. Specifically, the methodology to increase transmission/reduce insertion loss that I explored was to remove Beilby layers. Beilby layers are thin, amorphous surface layers on the film that contain impurities. These induce the garnet's subsurface damage and interfere with precise crystalline film growth techniques – affecting the crystal's performance in an optical device. The layers are notoriously tricky to remove, since they are embedded in the crystalline at an atomic level. I researched plasma-assisted and Argon ion beam polishing machines to combat the problem, along with YIG growth techniques such as pulsed laser deposition and liquid-phase epitaxy.

**Dhiraj Banerjee**

Morris Hills High School, Rockaway, NJ

**Title: 1/400 scale JFK Airport**

**Abstract:** This project focuses on the recreation of JFK Airport's Terminal 4 in 1/400 scale in order to appreciate the complexity of major airports. Designed with special detail to accuracy with CAD software, this airport includes many key features of JFK airport, such as multi-part functional moving gates, large concourses, and complex details. The model features a special roof design, "pushed-in" windows, and staircases on the edge of the terminal, along with other eye-appealing details. With a focus on digital modeling and 3d-printing, this project emphasizes planning, precision, and authentic details. This allows for major airports like JFK to be realistically made on a smaller scale for accurate visualization. Throughout the process, it is seen how CAD tools can

be used to replicate real-world engineering projects in order to understand complex architecture. Challenges, such as staying accurate, incorporating certain designs, optimizing the concourse layout, and ensuring practical design were addressed through the use of careful planning and learning from past experiences. Overall, this project serves as an educational tool for the exploration of airport design with CAD and 3d-printing and emphasizes how technology can be used to understand and design complex structures.

## Breakout Room: Biology and Life Sciences

**Rianna Mitra**

Monmouth County Academy of Allied Health and Science, Neptune, NJ

Co-authors: Dr. Lynn Adler, Sonja Glasser, Caleb Hopkins

### Title: Effect of in vitro methods on infectivity of bumble bee gut pathogen

**Abstract:** Crithidia bombi (C. bombi) is a gut pathogen affecting the health and foraging behavior of bumble bees and transmitted through fecal-oral contact. C. bombi can be cultured in media and then used for infection trials in bumble bee hosts, but we are unaware of the selection pressures of in vitro cell culture and how this affects infectivity of C. bombi cells. This is important from a methodological perspective but also an evolutionary perspective. In culture, parasites face different selection pressures than in hosts. C.bombi in vitro is contained in a simple lab environment, while it interacts with numerous complex biological processes in vivo. Bombus impatiens worker bees were inoculated with Crithidia bombi cells that were cultured in media for one of the four time treatments: 4 weeks, 2 weeks, 1 week, and 3 days. The gut was then homogenized in ringer solution with a small sample counted for Crithidia bombi to estimate infection levels. There is a suggestive but insignificant trend toward lower infection probability with longer time spent in media. This indicates that extended culturing may reduce the likelihood of C. bombi infecting Bombus impatiens, but the evidence is not strong enough to confirm this statistically.

**Benjamin Tamari**

John L. Miller Great Neck North High School, Great Neck, NY

Co-author: Farshad Tamari

### Title: Extraction and Quantification of DNA from Angiosperm Species using the Edwards Method

**Abstract:** The extraction of DNA from plants is a common procedure and uses various methods such as the Cetyltrimethylammonium bromide (CTAB) method, as well as the Edwards buffer method. Our lab recently showed that the Edwards buffer method yielded better quality and higher

quantities of DNA in Petunia hybrida, while not using the organic and toxic compounds required with the CTAB method. We hypothesized that the Edwards method can be effectively used to extract DNA from other angiosperm species as well. To test our hypothesis, the DNA from eleven angiosperm species was extracted from leaf tissue using the Edwards method. The extracted DNA was quantified using a Spectrophotometer. Preliminary data analysis was completed using Microsoft Excel, and statistical analyses used ANOVA and Tukey's test. The results from ANOVA indicated that one or more of the means are different from each other statistically. Tukey's test indicated that only two pairs of samples were not significantly different from each other. This leads us to believe that while the Edwards buffer method is an effective method of DNA extraction, there is variability in the quantity of DNA obtained. This is an ongoing study as the extracted DNA will be further examined using downstream applications.

**Aras William Taylor**

Deep Run High School, Glen Allen, VA

Co-authors: Hannah Kornell, Milo Chen, Julia Herbert, Jasmine Leung, Becky Smolka

**Title: The Effect of Vermicompost on Irradiated Seed Growth**

**Abstract:** When it comes to growing plants in space, exposure to radiation is inevitable. Our team wanted to know how this radiation would affect the application of vermicompost, which is compost processed by worms, as a means of replacing fertilizer for plants in the ISS. Our team tested the effects of vermicompost on irradiated seeds of Brassica rapa in a simulated ISS environment using a growth chamber from NASA's Growing Beyond Earth program. The plants were grown over 5 weeks. They received an average of 500mL of water everyday, and their sizes were measured every week. At the end of the 5 weeks, the plants were removed from their pots and their root and leaf masses were measured individually. We found that the group with the regular fertilizer still grew the best, but the experimental group with the vermicompost could keep up with the control group, suggesting that vermicompost is applicable as a replacement for fertilizer in future space missions.

**Cristian Leon Lorenzo**

North Bergen High School, North Bergen, NJ

**Title: Wasteland Survivors: How fungi adapted to radioactive environments**

**Abstract:** In 1991, years after the Chernobyl incident, Zhadanova and others found fungi growing within a damaged reactor at the power plant. This discovery led to a variety of studies researching its potential properties and versatility as a biomaterial. During my presentation I plan to discuss the key studies responsible for our current understanding of these organisms, along with the

possible applications of these fungi in nuclear power stations and on the International Space Station.

## Poster Presentations

**Joseph Oziel**

Bronx High School of Science, Bronx, NY

Co-authors: Balaranjan Selvaratnam

**Title: Improving Structural Predictions with KNN-Enhanced SISSO Models**

**Abstract:** The structure of materials plays an important role in determining their properties; hence predicting the preferred structure of a composition before synthesis is valuable, as trial-and-error approaches are costly. Several structure maps, and recently machine learning methods, have been developed to predict structure from composition. Structure maps offer simple, intuitive models, often at the cost of accuracy, while machine learning provides higher accuracy with less interpretability. Symbolic regression-based methods, such as the Sure Independence Screening and Sparsifying Operator (SISSO), construct interpretable structure map-like models by combining elemental features through mathematical operators. However, SISSO is sensitive to data noise, which can lead to overly complex, less interpretable features. In this work, we apply the k-Nearest Neighbor (kNN) method to screen features effectively while mitigating noisy and erroneous data. When tested on experimental perovskite and spinel datasets, the kNN-enhanced SISSO model achieved improved predictive performance. For example, in the perovskite dataset, the top two features ((n_B/r_X)*(r_B + r_X)) and ((r_B/r_A) - (n_B/n_X)) yielded an accuracy of 0.962, with precision, recall, and F1-scores of 0.962, 0.968, and 0.965, respectively. This demonstrates that integrating kNN improves both the robustness and interpretability of SISSO-based structure prediction.

**Joseph Oziel**

Bronx High School of Science, Bronx, NY

Co-author: Emil Jaffal

**Title: Systematic Ternary Exploration of Gd–Os–Ge with Novel Phases**

**Abstract**: The ternary system Gd–Os–Ge (gadolinium–osmium–germanium) was investigated to identify the phases formed across various compositional ratios and to establish a preliminary foundation for phase mapping within this system. Samples with different Gd:Os:Ge compositions were synthesized and characterized using scanning electron microscopy (SEM) and X-ray diffraction (XRD). Diffraction data were further analyzed using a laboratory-developed XRD matcher tool designed to assist in the identification of impurity phases through pattern comparison

with reference databases. The collected data were used to begin constructing a ternary phase diagram, providing insight into phase formation trends and potential regions of phase stability. This study serves as an initial step toward a comprehensive, high-throughput, and systematic exploration framework for ternary intermetallic systems and provides a replicable methodology for future student researchers and amateur scientists engaged in exploratory materials synthesis.

**Rishan Pawar**

Manalapan High School, Manalapan, NJ

**Title: Air Pollution and Air Quality Trends and Predictions using AI model**

**Abstract:** Air pollution is a growing concern across the globe, especially in cities like Denver, Colorado, where high elevation, vehicle emissions, and wildfire risks contribute to poor air quality. Ozone pollution, in particular, can lead to serious health issues such as asthma and cardiovascular disease. My project focuses on building an AI-powered forecasting model to predict ozone levels and help people make healthier, more informed decisions. My research question was: Can machine learning accurately predict daily ozone pollution in Denver using historical data? I hypothesized that applying a time series model, specifically ARIMA, to smoothed ozone data would improve the accuracy of predictions compared to raw data. To test this, I collected daily ozone data from the EPA (2012–2021), cleaned it, removed duplicates, and applied rolling average smoothing. I then used statistical tests and autocorrelation analysis to train and evaluate different ARIMA models. The model trained on 90-day smoothed data performed best, with the lowest prediction error (MAE: 0.0030). This project benefits public health, environmental awareness, and future policy-making. It can be adapted for other U.S. and international cities, supporting global efforts to track and reduce air pollution using accessible, data-driven tools.

**Maya Moore**

Western High School, Davie, FL

Co-author: Dr. Yan Li, Department of Chemical and Biomedical Engineering, Young Scholars Program, Florida State University

**Title: Engineering CAR-Extracellular Vesicles to Target FAP Cancer-Associated Fibroblasts via the Ras/MAPK/ERK Pathway**

**Abstract:** Glioblastoma multiforme (GBM) are aggressive brain tumors whose progression is intensified by the tumor microenvironment (TME). Cancer-associated fibroblasts (CAFs) within the TME promote GBM growth by producing fibroblast activation protein (FAP), which enhances cancer signaling and proliferation. Targeting FAP through chimeric antigen receptor–engineered

extracellular vesicles (CAR-EVs) offers a promising therapeutic strategy. Due to their small size (50–150 nm), CAR-EVs can cross the blood–brain barrier, making them well suited for GBM treatment. In this study, human pluripotent stem cells were CRISPR-Cas9–edited and differentiated into neutrophils to work with CAR-EVs carrying miRNA cargo that interferes with the Ras/MAPK/ERK pathway, a key driver of tumor proliferation. Specifically, miR-219a-2-3p targeted ERK1/2, and miR-148a-3p targeted SOS2 to slow mRNA replication. LN229 glioblastoma cells treated with CAR-EVs showed decreased mRNA expression of SOS2 compared to control lines, indicating inhibited signaling activity. These results suggest that CAR-EVs can disrupt key oncogenic pathways and reduce tumor growth. Overall, this work highlights the therapeutic potential of CAR-EV immunotherapy for GBM and provides a foundation for future applications in other cancers.

**Eileen Najafov**

Morris Hills High School/Academy for Mathematics, Science, and Engineering, Rockaway, NJ

**Title: STEM-ed Initiative for Young Women and Girls**

**Abstract:** Over the past year I'm honored to have led/to currently be leading a STEM/Engineering Outreach Initiative for girls in Morris County, NJ! I design and teach hands-on, scholastic STEM + engineering activities/lessons biweekly to girls in grades 3-6 in the Wharton/Dover area. We span a variety of STEM fields, ranging from robot-building competitions to chemistry-based food coloring fireworks! I train the girls' scientific thinking and reasoning, challenging them to come up with reasons and creative guesses on why scientific processes occur and investigating how the engineering problem solving process is critical for solving real-world problems. Additionally, I network with teachers, teen volunteers, elementary/middle schools, and industry engineers to get more student teachers involved and to incorporate practical expertise from real scientists into my teaching – further enhancing accessible STEM education for young women and girls!

**Siddharth Selvaraj**

The Wardlaw + Hartridge School, Edison, NJ

**Title: Evaporating the Darkness: An exploration of Hawking Radiation**

**Abstract:** Hawking Radiation, a groundbreaking theoretical prediction by Stephen Hawking, bridges the gap between general relativity and quantum field theory. It proposes that black holes are not entirely black and eternal, but they emit thermal radiations due to quantum effects in and around the event horizon. This phenomenon of quantum particles radiating from the black hole

arises from the existence of particles and antiparticles. Usually, this pair would immediately annihilate one another, colliding to produce other particles such as photons, which carry the energy from the collision. However, at the event horizon, the singularity's infinite curvature of spacetime makes gravity inescapable, meaning one of the particles can get consumed by the black hole while the other escapes. This emission leads to a gradual loss of mass and energy from the black hole, and eventual evaporation. Hawking's idea challenges the common notion of black holes being eternal and unchanging. In this presentation, I will explore the origin, mathematical framework, and observational aspects of Hawking radiation and its role in the quest for a unified field theory. By examining the radiation, we gain deeper insight into the nature of spacetime, the limits of physical laws, and the fates of cosmic structures.

**Nanki Kaur**

Morris Hills High School/Academy for Mathematics, Science and Engineering, Rockaway, NJ

**Title: Your Computer, Dissected**

**Abstract:** My project's goal was to create a functional, 16-bit breadboarded computer using various components (ICs, registers, flip flops, etc.) to explore what exactly makes the hardware of a computer capable of storing, retrieving and manipulating data. It involved developing timing circuits, an understanding of clock cycles, physically working with many different kinds of chips, and understanding signal transfer between the ROM, RAM and CPU.

**Nava Youseflaleh**

Village School of Greak Neck, Great Neck, NY

Co-author: Farshad Tamari

**Title: Molecular Similarities and Differences Between BRCA1, BRCA2, and CHEK2 Genes**

**Abstract:** Mutations in Breast Cancer Genes1 and 2 (BRCA1/2) and Checkpoint Kinase2 (CHEK2) have been implicated in the development of breast and other cancers in humans. While all three genes affect both sexes, at least for breast cancer, a higher ratio of females are afflicted compared to males. BRCA1 is a tumor suppressor gene and is involved in DNA repair. When mutated, it significantly increases the risk for breast, ovarian, prostate, and pancreatic cancers. BRCA2 is a tumor suppressor gene. Involved in DNA repair, when mutated it increases the risk of mainly breast, ovarian, pancreatic, prostate and melanoma cancers. CHEK2 is a tumor suppressor gene which helps regulate the cell cycle. Mutations increase the risk for mainly breast,

prostate, thyroid, kidney and colorectal cancer. The goal of this project is to compare the protein sequences of the three genes using bioinformatics. Due to the similarity in nomenclature and tissues affected, we hypothesize that BRCA1 and BRCA2 share more molecular similarity compared to BRCA1 and CHEK2 and BRCA2 and CHEK2. To test this hypothesis, DNA sequences for all three genes will be obtained from NCBI/PubMed to create a FASTA input file and used in Jalview for comparisons.

**Selma Elbenni**

The Wardlaw + Hartridge School, Edison, NJ

**Title: Artificial Intelligence increasing presence in children's media and the effect on their development**

**Abstract:** The project analyzes how artificial intelligence is being utilized in children's media, specifically children's content on social media may affect how the adolescents that consume this type of content may develop and perceive the world. Children's media and entertainment in the past few decades or so was used to aid in educating children so that they may further in their cognitive development, such as linguistic, learning, social, and emotional ability. However, there has been an ongoing shift of children's entertainment going from television networks to social media and streaming platforms. Children's media is harder to regulate on social media than it is on television, and lately there has been concern with the increasing presence of Artificial intelligence in children's media and what it means for their cognitive learning. Artificial intelligence has been utilized in children's education by providing tools and resources, making them easily accessible to learning children and fostering creativity. But since AI programs have been made accessible in use for the public, widespread misinformation and poorly produced content has been on the rise. Anyone can masquerade poorly produced content riddled with misinformation as children's content, and children are unknowingly consuming this type of content. Many AI generated children's content have no incentive to educate children, and barely provide aid for children's cognitive development. There are unprecedented risks to Artificial Intelligence, and its effects remain widely speculated and unquantifiable. It is more important than ever to put focus on the psychological ramifications of industries and media being affected by AI.

**Anushka Patchigolla**

The Wardlaw + Hartridge School, Edison, NJ

Co-author: Dr. Moustafa Gabr- Weill Cornell Medicine

**Title: Design and Analysis of GITR-Targeted Small Molecules**

**Abstract:** The glucocorticoid-induced TNF receptor (GITR) has emerged as a promising target in cancer immunotherapy due to its role in modulating T cell responses. This study employed computational techniques to identify small-molecule compounds capable of binding to GITR, offering a potentially scalable, cost-effective, and orally bioavailable alternative to biologics. Using a combination of geometric, energy-based, and machine learning approaches, potential binding sites on the GITR protein were identified. Pharmacophore maps generated through PocketQuery and ZINCPharmer enabled virtual screening of 22 million compounds from the ZINC database. Twenty candidate compounds with low Root Mean Square Deviation (RMSD) scores (0.1–0.3) were further assessed via SwissDock molecular docking simulations to determine binding affinities. ZINC63709365 exhibited the strongest binding affinity ($\Delta G = -9.61$ kcal/mol), but ZINC20760846 was selected for analysis due to commercial availability. ADME profiling demonstrated high gastrointestinal absorption, favorable hydrogen bonding and molecular weight, low blood-brain barrier permeability, and zero violations of Lipinski's Rule of Five, confirming drug-like properties. Toxicity predictions indicated moderate toxicity (LD50 = 1000 mg/kg), supporting its potential for systemic administration. These findings underscore the potential of ZINC20760846 as a practical, orally bioavailable small-molecule GITR agonist with advantages in tumor penetration, cost, and manufacturability compared to biologics.

## Acknowledgements

We thank the advisory committee for their support of this student-led summit, their help and guidance in organizing the event, and reviewing the abstracts. Thanks also to our keynote speaker for delivering a wonderful keynote and networking with the students. We thank all of our speakers for their wonderful presentations and for the time and effort they put into preparing for this summit.

www.pioneersofstem.org

Contact us at: pioneersofstem@gmail.com