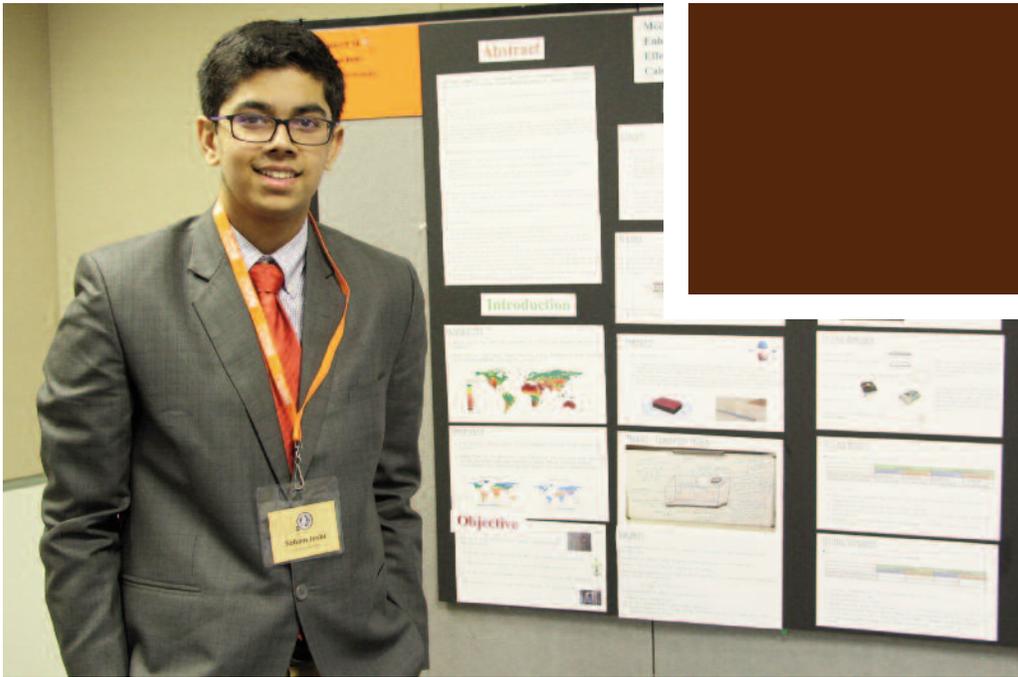# THE 57TH ANNUAL OHIO JUNIOR SCIENCE & HUMANITIES SYMPOSIUM

March 11-13, 2020

**Bowen-Thompson Student Union
Bowling Green State University**

Sponsored by the Northwest Ohio Center for Excellence in STEM Education (NWO) and College of Education and Human Development (EDHD) at Bowling Green State University (BGSU)

In cooperation with National Science Teaching Association (NSTA) and with the support of the United States Departments of the Army, Navy, and Air Force

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BGSU | College of **Education** and **Human Development**

BOWLING GREEN STATE UNIVERSITY

Top Row (L to R) Virginia Ma, Edward Dan, Greta Cywińska, and Sahej Bindra
Bottom Row (L to R) Maanasa Mendu, Priya Bhatt, Hannah Doris, and Garret Blum

(L to R) Laalitya Acharya, Abigail Berk, Emily Gomez, Sophia Lands, and Carsyn Hagans

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The Ohio JSHS online evaluation can be found at:
http://tinyurl.com/yx9qojjg

Let's get trending!
Include #NWOohioJSHS on all of your posts!
#JSHS Regionals

WELCOME TO BOWLING GREEN STATE UNIVERSITY (BGSU)

We are delighted to welcome you to the 57th Annual Ohio Junior Science and Humanities Symposium. The symposium is hosted by the Northwest Ohio Center for Excellence in STEM Education (NWO) and the College of Education and Human Development at BGSU. The JSHS funding comes from the U.S. Army Research Office, U.S. Office of Naval Research, and U.S. Air Force Research Office. The JSHS program encompasses forty-eight regional symposia reaching students throughout the United States, Puerto Rico, and DOD Schools in Europe and the Pacific.

This event offers a valuable opportunity for young scientists and scholars to share their impressive achievements with their peers and parents and with professional scientists and scholars. The Ohio JSHS provides public recognition and certificates, honoring achievement and interest in research pursuits. This program also helps students attain a sense of achievement and self-confidence resulting from interaction with students from other schools and regions and with professional researchers and educators.

The JSHS program was started by an Ohio native, Colonel George F. Leist. Following the 1958 launch of the Russian satellite Sputnik, Colonel Leist, then the Commanding Officer of the Office of Ordinance Research in North Carolina, initiated the Junior Science and Humanities Symposium (JSHS) for secondary school science students. The first symposium took place at Duke University in 1958 and spread throughout the United States to many universities during the next four years. In 1962, the National JSHS was created; the Ohio JSHS was initiated the following year in 1963.

Two student finalists and three delegates from the each regional JSHS program will be chosen (all expenses paid) to attend the National JSHS that takes place in Norfolk, Virginia, April 15-18, 2020. In recent years, three winners of the Ohio symposium, Suraj Srinivason (2019), Aaditya Shidham (2008), and Keith Hawkins (2009), have won the top national award. In 2014 the top award winner at the Ohio JSHS, Bluyé DeMessie, also won the 3rd place award in the Environmental Science division at the National JSHS. Clearly Ohio has many high-achieving young people, and we are proud to be able to highlight some of their success with this event.

We are grateful for your participation in this year's event and we hope that you find the 2020 Ohio Junior Science and Humanities Symposium to be a very beneficial and educational experience. Thank you for joining us!

Dr. Emilio Duran
Ohio JSHS Director
NWO Director

Dr. Dawn Shinew
Dean, College of Education and Human Development

Colonel George F. Leist, U. S. Army
Founder, Junior Science & Humanities Symposium
Recognized by The Academy of Applied Science for Pioneering Effects and Vision

Wednesday, March 11

4:00 PM – 6:00 PM	Check In	*Hotels, Bowling Green*
6:15 PM	Mandatory Meeting for ALL Participants	*Great Room, Hotels*
7:00 PM	Board Buses to *Ice Arena, BGSU*	
7:30 PM – 8:00 PM	Pizza Snack	*Ice Arena, BGSU*
8:00 PM – 9:20 PM	Ice Skating	*Ice Arena, BGSU*
9:30 PM	Board Buses to *Hotels*	
9:30 PM – 11:00 PM	Open Activities	*Hotels*
11:00 PM	Students Report to Assigned Rooms	

Thursday, March 12

6:30 AM – 7:45 AM	Breakfast	*Great Room, Hotels*
7:50 AM	Board Buses to *BGSU*	
8:30 AM	Opening Session	*BTSU, Room 228*
8:45 AM – 9:45 AM	**First Paper Session**	*BTSU, Room 228*
Break (15 minutes)		
10:00 AM – 11:00 AM	**Second Paper Session**	*BTSU, Room 228*
10:00 AM – 4:00 PM	Concurrent Poster Judging	*BTSU, Room 308*
Break (15 minutes)		
11:15 AM – 12:15 PM	**Third Paper Session**	*BTSU, Room 228*
11:15 AM – 12:15 PM	Lunch 1	*The Oaks Dining Hall*
12:25 PM – 1:20 PM	Lunch 2	*The Oaks Dining Hall*
1:30 PM – 2:30 PM	**Fourth Paper Session**	*BTSU, Room 228*
Break (15 minutes)		
2:45 PM – 3:45 PM	**Fifth Paper Session**	*BTSU, Room 228*
4:00 PM – 5:00 PM	Laboratory Research Tours	
5:15 PM – 6:00 PM	Imagination Station	*BTSU, Theatre 206*
6:00 PM – 7:15 PM	**Banquet/Keynote Presentation**	*BTSU, Ballroom*
7:30 PM	Board Buses to *Hampton Inn*	
7:45 PM – 11:00 PM	Open Activities	*Hotel*
8:00 PM – 9:00 PM	Adult Reception	*Great Room, Hotel*
11:00 PM	Students Report to Assigned Rooms	

Friday, March 13

6:30 AM – 7:45 AM	Breakfast	*Great Room, Hotel*
8:00 AM	Pack up all items/Board Buses to *BGSU*	
	Store items (suitcases, etc.)	*BTSU, Room 227*
8:40 AM	Announcements	*BTSU, Room 228*
8:45 AM – 9:45 AM	**Sixth Paper Session**	*BTSU, Room 228*
	Concurrent Poster Viewing	*BTSU, Room 308*
Break (15 minutes)		
10:00 AM – 11:00 AM	**Seventh Paper Session**	*BTSU, Room 308*
Break (15 minutes)		
11:15 AM – 12:35 PM	**Eighth Paper Session**	*BTSU, Room 228*
12:40 PM – 1:40 PM	Lunch	*The Oaks Dining Hall*
	Judges Meeting/ Luncheon	*The Oaks Dining Hall*
	Advisory Board Luncheon	*The Oaks Dining Hall*
	Student Advisory Board Meeting	*The Oaks Dining Hall*
1:45 PM	Students Dismantle Posters	*BTSU, Room 308*
2:00 PM	JSHS Evaluation	*BTSU, Room 228*
2:15 PM	Awards Ceremony	*BTSU, Room 228*
2:45 PM	Adjournment	

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SCHEDULE OF EVENTS

Wednesday, March 11

4:00 PM - 6:00 PM	Check In	*Hotels, Bowling Green*
6:15 PM	Mandatory Meeting for ALL Participants	*Great Room, Hotels*
7:00 PM	Board Buses to *Ice Arena, BGSU*	
7:30 PM	Pizza Snack	*Ice Arena, BGSU*
8:00 PM - 9:20 PM	Ice Skating	*Ice Arena, BGSU*
9:30 PM	Board Buses to *Hotels*	
9:30 PM - 11:00 PM	Open Activities	*Hampton Inn*
11:00 PM	Students Report to Assigned Rooms	

Thursday, March 12

6:30 AM - 7:45 AM	Breakfast	*Hotels, Bowling Green*
7:50 AM	Board Buses to *BTSU*	
8:30 AM	Opening Session	*BTSU, Room 228*

Presentation of Colors: **Pershing Rifles Color Guard, Air Force ROTC, Bowling Green State University**

Opening Remarks

Dr. Rodney Rogers, President, Bowling Green State University

LTC Dallen R. Arny, Professor of Military Science, Bowling Green State University

8:45 AM - 9:45 AM   **First Paper Session**   *BTSU, Room 228*

8:45 AM

Reece Tatchell, Sylvania Northview High School

"Direct ortho C-H Chlorination and Bromination of Free Benzylamines"

One of the most useful techniques for synthesizing organic compounds is C−H functionalization. A transition metal can be used as a catalyst and insert itself between a carbon and hydrogen bond. A traditional organometallic reaction can then convert the C−M bond into a new functionalized product. This study focused on solving one major challenge: selectively functionalizing a specific bond on an organic compound. This challenge was overcome through the use of a directing group. By combining a benzylamine with palladium acetate, copper acetate, copper chloride, and acetic acid, it was possible to prepare these C-H chlorination products. After optimization of a C-H chlorination reaction, the results indicated that a new C−H chlorination reaction was achieved on a single benzylamine substrate with final product yields of 82%. CO_2 was necessary to make other C−H activation reactions on these substrates, or much higher temperatures, and it appears that the harsher oxidizing conditions used for halogenation do not benefit from having a carbamic acid intermediate. Thus the amine is satisfactory to direct the reaction. Future expansion on C-H chlorination could be achieved by demonstrating examples of what types of functional groups can be on the substrate without interrupting the desired reaction.

Thursday, March 12 (Cont.)

9:05 AM

Ishan S. Khare, Ottawa Hills High School

"Sodium pnictogen chalcogenides for photovoltaic and thermoelectric renewable energy generation"

Ternary chalcogenides have been of recent investigation for applications in photovoltaic and thermoelectric devices. We study the structural, electronic, optical, and thermoelectric properties of nine ternary chalcogenides, $NaAX_2$, where A represents pnictogens (As, Sb, and Te) and X represents chalcogens (S, Se, and Te). Calculations based on density functional theory yield the following results: (i) phonon dispersion curves predict three of the compounds, $NaAsS_2$, $NaSbS_2$, and $NaSbSe_2$, to be dynamically stable in the monoclinic, *C2/c*, structure, (ii) the layered atomistic configuration causes the corresponding electronic and optical properties to display a high degree of anisotropy, (iii) A-X electronic bonding features vary significantly with structural distortions arising from atomic size mismatch, therefore directly influencing stability, (iv) strong absorption is observed in the stable compounds, with coefficients ranging from 10^4 to 10^5 cm-1 in the visible-UV range, and (v) remarkably high Seebeck coefficients exceeding 500 μV/K, at carrier concentrations commonly achieved in such materials, are found. From these results, we conclude that $NaAsS_2$, $NaSbS_2$, and $NaSbSe_2$ are suitable candidates for both photovoltaic, particularly in tandem solar cells, and thermoelectric applications. Experimental synthesis and verification are suggested.

9:25 AM

Jacob Zajkowski, Anthony Wayne High School

"A Study of the Effectiveness of Hydroponic Growing Variables on Lactuca sativa var. capitata"

Hydroponic growing in controlled environment horticulture has been an increasingly used method of produce production around the world. Its many methods integrate sustainability and growth efficiency through the control of climatic and system variables. A Study of the Effectiveness of Hydroponic Growing Variables on Lactuca Sativa var. Captitia investigated control variables that would produce and market a more effective lettuce crop. In the study, Experiment 1 looked at the correlation between hydroponic nutrient solution levels, plant tissue spectrometry analysis, and the consumer taste/recognition preference. The experiment was carried out by growing lettuce in different concentrations and seeing if consumers and ICPspectrometry were able recognize differences in varieties. Experiment 2 investigated the comparison between the dimensions of deep water culture systems and the lettuce harvesting length. This test looked at post-harvest length of lettuce grown in different dimensioned sized deep water culture systems to understand which system would be most effective for lettuce growth. Through this study, it was found that spectrometry recognition of lettuce crops grown in different nutrient levels was effective with 7 of the 12 nutrients elements showing sufficient results of concentration in concentrated lettuce. Consumer identification recognition wasn't successful with 40% of consumers unable to recognize any nutrient level compared to two other varieties. The 14 gallon (102 x 50.8 x 66cm) size deep water culture system also produced lettuce with larger harvest-length. This research will impact future studies in effective small scale hydroponic growing and growers looking to expand knowledge of beneficial growth.

Announcements and Break (15 minutes)

10:00 AM – 11:00 AM	**Second Paper Session**	*BTSU, Room 228*
10:00 AM – 4:00 PM	**Concurrent Poster Judging**	*BTSU, Room 308*

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Thursday, March 12 (Cont.)

10:00 AM

Sunay Rastogi, University School

"The Role of SerpinB3 on Glioblastoma Cancer Stem Cell Proliferation"
Use of Patient Derived Glioblastoma Cell Lines to Show the Effect of SerpinB3 on Prognosis

Glioblastoma (GBM) is the most common primary malignant brain tumor and the median overall survival of those affected is approximately 14-16 months. Poor prognosis can be attributed to the extremely high recurrence rate of the disease, which is due, in part, to the presence of cancer stem cells (CSCs). This research is focused on studying the interaction between SerpinB3 and Junction Adhesion Molecule A (JAM-A) in GBM CSCs. Previous studies provide evidence that JAM-A has an intrinsic, pro-tumorigenic role in regulating the CSC phenotype. None of these studies, however, focused specifically on JAM-A's intracellular downstream signaling. A pulldown of His-Tagged JAM-A was done to identify binding partners and resulted in the identification of the serine protease inhibitor SerpinB3. Endogenous JAM-A binding to SerpinB3 was confirmed through immunoprecipitation of SerpinB3. To investigate the CSC-specific role of SerpinB3, SerpinB3 was knocked-down in a human GBM xenograft model (T4121) utilizing two non-overlapping short-hairpin RNA constructs. A Cell-Titer Glow assay was used to measure CSC growth dynamics and a limiting dilution assay was done to determine the stem cell frequency. These in-vitro studies demonstrated reduced function of the CSC when SerpinB3 was knocked down. The GBM CSCs were then orthotopically implanted into mice via an intracranial injection (n=30). The median survival for non-target control mice was 28 days while neither knockdown conditions reached median survival at day 50 (log-rank test p< .001). This finding suggests that SerpinB3 disrupts the CSC state in GBM and may be a future drug target for GBM treatment.

10:20 AM

Rose Gaudiani, Hathaway Brown High School

"Urodynamic Analyses in Adult Rats with Spinal Cord Contusive Injury"

Spinal cord injury (SCI) is defined as damage to any part of the spinal cord or nerves at the end of the spinal cord. The loss of lower urinary tract control can be a consequence of a complete spinal cord injury. Urodynamic testing, or urodynamics, is one form of study to assess the performance of the lower urinary tract in humans as well as animals. Using a surgical procedure, urodynamic testing evaluates both the bladder pressure and the sphincter activity during present lower urinary tract function. Computer software called *LabChart* is used to record the data, showing both the bladder pressure (CMG) and sphincter activity (EMG), over a certain period of time. The CMG data is analyzed using seven parameters: "Time to First Void," "Voiding Efficiency," "Baseline Pressure," "Duration," "Peak Pressure," "Amplitude from the Left," and "Interval." The EMG data is analyzed using six parameters: "Number of High Frequency Oscillation (HFO) Pressure Peaks," "Pressure Oscillation Event Duration," "Number of Total EMG Bursts," "EMG Burst Event Duration," "EMG Burst Interval," and "EMG Burst Average Amplitude." These analyses of normal and SCI groups of rats provide definite parameters to better characterize spinal cord injuries.

Thursday, March 12 (Cont.)

10:40 AM

Rohan Krishnamurthi, University School

"Determing Crohn's Disease Treatment Response Using Radiomic and Clinical Features of Patients"

Crohn's disease (CD) is a chronic inflammatory bowel disease that is assessed using clinical symptoms, physical findings, endoscopy, and imaging tools. Due to the paucity of markers that can accurately characterize Crohn's disease progression in vivo, there is a need for more objective quantitative algorithms to better select therapy for Crohn's patients. Clinical features can be utilized, including a patient's basic demographics and history of disease. Additionally, imaging features from magnetic resonance imaging can be evaluated, as this modality provides a high-resolution non-invasive scan of the gastrointestinal tract. This study aims to identify which clinical and quantitative imaging variables are most significantly associated with a better response to Crohn's treatment. Using a cohort of 240 Crohn's patients with at least one MRE performed, patients were grouped into three treatment categories: biologic drug only, biologic drug combination, and immunomodulator combination therapy. Patients were classified as responders or non-responders of therapy, depending on whether they continued therapy within one year of administration. Clinical variables of sex, age, and surgical history were evaluated. Computerized imaging ("radiomic") features were computed from the terminal ileum of patient MRIs. Statistical testing was performed to evaluate clinical and imaging variables between response groups. The three clinical features did not demonstrate significant differences between responders and non-responders, but did show trends in data. Eight of 86 radiomic features were significantly different between responders and non-responders of immunomodulator combination therapy alone. Study suggests there is promise in building a multi-variable clinical-imaging predictor for response to therapy for Crohn's disease.
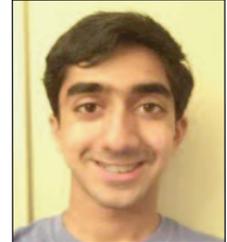
Announcements and Break (15 minutes)

| 11:15 AM – 12:15 PM | **Third Paper Session** | BTSU, Room 228 |
| 11:15 AM – 12:15 PM | **Lunch 1** | Oaks Dining Hall |

11:15 AM

Jonathan Jang, University School

"Analysis of Vitamin A Metabolism in Mice Models with STRA6 Gene Knockout"

Vitamin A is critical for the development and function of the eyes. When circulating, it is bound to Retinol Binding Protein (holo-RBP4). Its cellular uptake is mediated by Stimulated by Retinoic Acid 6 (STRA6) receptor. Upon uptake, vitamin A is esterified for storage by the enzyme Lecithin Retinol Acyltransferase (LRAT). Mutations in the genes encoding these key components of vitamin A metabolism are associated with several inherited blinding diseases. The goal of this experiment was to analyze the consequences of STRA6 deficiency in mice eyes. We hypothesized that the mice without STRA6 would lack vitamin A and have malformations in the eye. STRA6 knockout mice were raised for three months before being analyzed by imaging techniques, including optical coherence tomography (OCT) and scanning laser ophthalmoscopy (SLO). Western blot analysis was used to determine STRA6 protein expression. Ocular retinoids were measured with High-performance liquid chromatography (HPLC). STRA6 knockout mice lacked STRA6 protein expression and displayed reduced ocular retinoid content when compared to wild type controls. OCT analysis showed a smaller outer nuclear layer (ONL) and SLO detected persisting vessels in the vitreous of their eyes. Mutations in the STRA6 protein alter the size of the ONL of the retina, indicating that the photoreceptors do not form properly. This finding was consistent with a reduced ocular vitamin A content of this mutant. The STRA6 mutations also were associated with vascular malformations in the vitreous. Thus, STRA6-deficiency results in a severe developmental vitamin A deficiency in the eyes.

Thursday, March 12 (Cont.)

11:35 AM

Kavita Parikh, Ottawa Hills High School

"The Quest to Conquer Thermal Expansion: Non-hydrolytic sol-gel synthesis and characterization of $Al_{2-x}In_xW_3O_{12}$ Negative Thermal Expansion Materials"

Negative thermal expansion (NTE) materials have many potential applications given their unique properties to contract upon heating. Several families of materials show this interesting behavior; one of them is the scandium tungstate or $A_2M_3O_{12}$ family (A = trivalent metal; M = Mo, W). In this project, the substitution of $A_2M_3O_{12}$ compounds at the A-site was explored by creating various compounds in the structure $Al_{2-x}In_3W_3O_{12}$. This is expected to stabilize the NTE structure. Instead of the traditional $Sc_2W_3O_{12}$, the cations Al^{3+} and In^{3+} were substituted for the metal cation. To synthesize these compounds, a non-hydrolytic sol-gel route was used: $AlCl_3$, $InCl_3$, WCl_6, and diisopropyl ether were dissolved in acetonitrile solvent and heated to a powder, sealed in a glass ampoule, and heated for multiple days. After this, the ampoule was cooled and opened, yielding a raw sample. These were then subjected to various heat treatments and analyzed via x-ray diffraction, thermogravimetric analysis, and energy dispersive spectroscopy, to determine if a single crystalline phase with homogeneity of the two cations had formed. At this time, four compositions have been synthesized and tested, yielding promising results for crystallinity and homogeneity. As this portion of the study focuses on optimization of synthesis conditions for phase-pure samples, it has been observed that longer reaction times and high-temperature heat treatments are essential for proper synthesis because they allow for increased crystallinity and the removal of organics. Once synthesis conditions have been fully optimized, the compounds will be tested for NTE behavior over a wider temperature range.

11:55 AM

Michelle Dong, Hathaway Brown High School

"Sex differences in cancer survival: a pan-cancer analysis"

Significant sex differences exist in cancer, and males have higher incidence and lower survival compared to females for most cancers. However, few large-scale studies have examined sex differences in incidence and survival across all cancers. This study investigated the differences in cancer incidence and survival between males and females. Patients with primary, malignant tumors that were histologically or radiologically confirmed from 2001 to 2016 were included in the analysis, while patients with sex-specific cancers (such as prostate and cervical cancer) and breast cancer were excluded. Incidence rate ratios (IRR) were age-adjusted to the standard U.S. population in 2000. IRRs were generated using SEER*Stat software (version 8.3.5) from the National Cancer Institute's (NCI's) Surveillance, Epidemiology and End Results (SEER) Program. Hazard ratios (HR) were age-adjusted and calculated using Cox proportional hazards models. We observed in our data set (n=11,406,401) that overall cancer incidence was higher in males than females (IRR=1.504; 95% confidence interval [95% CI] 1.502-1.506, p<0.001). Overall survival (n=2,939,995) across all sites was worse for males (HR=1.136; 95% CI 1.133-1.140, p<0.001). The greatest sex difference in incidence was for Kaposi sarcoma, where incidence was more than 900% higher in males compared to females (IRR=9.751; 95% CI 9.287-10.242, p<0.001). Males experienced the lowest survival in thyroid cancers (HR=1.773; 95% CI 1.707-1.845, p<0.001). Understanding the role of sex differences in incidence and survival for cancer is critical for addressing sex-based inequalities and needs to be considered in clinical paradigms.

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Thursday, March 12 (Cont.)

| 12:25 PM– 1:20 PM | **Lunch 2** | *Oaks Dining Hall* |
| 1:30 PM – 2:30 PM | **Fourth Paper Session** | *BTSU, Room 228* |

1:30 PM

Shrey Gupta, Sylvania Northview High School

"In silico prediction of MHC class II epitope of antigenic 14-3-3 ζ"

14-3-3ζ is a highly conserved eukaryotic protein that is well known for its role in cellular signaling and division. Recently this protein has been shown as an autoantigen in the human large vessel vasculitis. This novel function of 14-3-3ζ activates T-cells and is responsible for cytokine production. The antigenic epitope of 14-3-3ζ is not known. Using bioinformatic web portal, seven predicted epitopes were identified. To find out the most dominant epitope, a strategy was developed to use the peptide simulation using PepFold and docking predictions of the individual 14-3-3ζ peptide to the human major histocompatibility complex (MHC) HLA-DRB1*0401 (PDB# 5NI9) using ZDock. Further editing using PDB Editor was used to screen ZDock output to make it compatible with the Prodigy-based calculations. The predictions were refined using FlexPepDock and resulted in ten accurate forecasts of the docking. The results were fed to Prodigy to calculate the binding affinity between the peptide and the MHC. The results showed one of the peptides with a value of -9.5 kcal/mol for the ΔG and 1.2E^-7 M for the Kd value as the energetically viable epitope to interact with HLA-DRB1*0401, which will be validated using an experimental setup.
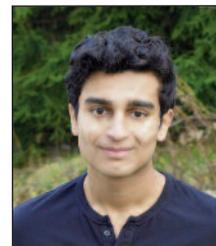
1:50 PM

Laalitya Acharya, William Mason High School

"Nereid: An Interdisciplinary Approach to Detect Bacteria in Water using Microscopic Images for Early Detection of Water-Borne Diseases using Convolutional Neural Network Algorithms"

According to the World Health Organization, 2.1 billion people lack access to clean water and an estimated 1 of 3 drinks from such heavily contaminated water are at risk for a severe water-borne disease. The current methods for detection of bacteria in water are time consuming and expensive. Society needs an effective, affordable, efficient and portable water contamination detection system. This paper proposes a neural network solution to analyze microscopic pictures of water to detect the presence of various bacteria. The model was trained on 3 types of probiotic bacteria: Lactobacillus, Streptococcus, and Saccharomyces Cerevisiae. The model used 2 features and the stochastic gradient descent method for analysis. Prior to training, the images were preprocessed to remove noise and standardize size. As public source data was not available, images were taken with microscope and 2000 images were used for training. Testing was carried out with different sets of 1000 images and it consistently achieved 90-95% accuracy over different categories. This solution is scalable and can be trained to detect multiple bacteria and other contamination and can be deployed as a semi-commercial or commercial method of detection. The future project proposal includes development of solution on non-proprietary TensorFlow and Long Range WAN (LoRa WAN) methods to transmit results of detection across the network.

Thursday, March 12 (Cont.)

2:10 PM

Shruthi Ravichandran, Hathaway Brown High School

"Site-Specific Delivery of Immune Agonists for Antitumoral Response of the Tumor Microenvironment"

Tumor mediated immunosuppression allows tumors to hide from the immune system and avoid recognition. One way of reversing this suppressive microenvironment is to activate antigen-presenting cells (APCs) within the tumor that recruit other immune cells to the area. Cyclic diguanylate monophosphate (c-di-GMP), a drug that works within the cytosol of APCs like macrophages, is used to release inflammatory cytokines like IFN-β to recruit immune cells and initiate an anti-tumor response. However, therapy using freely injected c-di-GMP is limited because c-di-GMP cannot easily cross cell membranes and is quickly cleared from the body. It is hypothesized that c-di-GMP loaded into a nanoparticle will more effectively deliver drug into the cytosol of APCs, which are widespread within the tumor. 30µg of c-di-GMP was loaded into mesoporous silica nanoparticles, a versatile nanoparticle platform that is biocompatible and easily modified. *In vitro* studies showed c-di-GMP-loaded silica nanoparticles boosted the secretion of cytokine IFN-b from murine macrophages by 6-fold compared to free c-di-GMP. Meanwhile, unloaded silica nanoparticles induced low levels of IFN-b secretion comparable to untreated macrophages, verifying the particle has low immunogenicity. This preliminary work demonstrates a potential new treatment that safely increases the efficacy of c-di-GMP. Ongoing and future work includes *in vivo* studies optimizing the delivery of nanoparticles to tumor-associated macrophages and evaluating the therapeutic effects on tumor burden and overall survival.

Announcements and Break (15 minutes)

3:00 PM – 4:00 PM   **Fifth Paper Session**   *BTSU, Room 228*

2:45 PM

Evangelina F. Louis, Sylvania Northview High School

"βOHB Attenuates Depression

The ketone body β-Hydroxybutyrate attenuates depression in a rat genetic model of hypertension"

Depression is often observed as a comorbid condition in patients with hypertension. Using the Dahl salt-sensitive (S) rat, a ketone body, β-Hydroxybutyrate (βOHB) was demonstrated to lower hypertension. βOHB is reported to have neuroprotective effects in neurodegenerative disease models but its mechanism has not been established. βOHB is also an inhibitor of histone deacetylases (HDACs), which are a family of proteins that epigenetically suppress gene expression. It was hypothesized that βOHB attenuates depression by inhibiting HDACs. High-salt fed S-rats with and without exogenous administration of 1,3-Butanediol, a precursor of βOHB, were tested for depression via the Forced Swim Test. Rats given 1,3-Butanediol (n =5, immobile:26±7, climbing:63±6) were less depressed as observed by their increased time (minutes) spent in the climbing phase and decreased time in the immobile phase in comparison to the rats without 1,3-Butanediol (n =5, immobile:57±5, $p<0.001$, climbing:28±7, $p<0.001$). Brain samples were examined using quantitative real-time PCR, for expression of 15 HDACs targeting genes. None of these were differentially expressed between the two groups ($p>0.05$). These results provide evidence to suggest that the mechanism behind the attenuation of depression is independent of HDACs expression.

Thursday, March 12 (Cont.)

3:05 PM

Hannah Basali, Hathaway Brown High School

"Evaluating the Cx26-Focal Adhesion Kinase-NANOG complex in Luminal Breast Cancer"

Luminal breast cancer (LBC) is a specific breast cancer subtype in which the cancer cells are estrogen receptor and progesterone receptor positive and HER2 receptor negative. Luminal breast cancer has a unique subpopulation composed of cancer stem cells (CSCs) which are tumorigenic in nature and contain a complex of Connexin 26 (Cx26), NANOG, and Focal Adhesion Kinase (FAK). Studies have revealed that NANOG is a key pluripotent transcription factor increased in CSCs, playing an important role in the formation and proliferation of these cells. The lab previously researched the connection between the complex in Triple Negative breast cancer (TNBC) and how disrupting the complex disrupted the growth of the CSCs. Currently, the lab is working to better understand the roles of the three complex members in luminal breast cancer cells, where the three-part complex is not actually formed. Here research presents that TNBC forms a Cx26-NANOG-FAK complex whereas LBC binds with NANOG and FAK separately. Cx26 was overexpressed in CSC and non-CSC luminal breast cancer cell lines and the work, still in process, aims to understand what this change does to NANOG and FAK expression, and overall cell phenotype. In addition, LBC cells are transduced to overexpress or knockdown NANOG or FAK. Tumorsphere growth was assessed and revealed Cx26 overexpression causes increased CSC proliferation. Should it be found that NANOG, FAK, or Cx26 play a specific role in increasing CSC functions such as proliferation, migration, or invasion, then targeting them specifically in the future could limit the subpopulation of CSCs in luminal breast cancer.

3:25 PM

Aiden M Archambault, Sylvania Northview High School

"The Effect of Using Cesium Carbonate as an Intermediate In the Stereoselective Synthesis of β-2-amino-2-deoxy mannopyranosides"

Some of the significant components in the capsular polysaccharides of various harmful bacteria strains are 2-amino-2-deoxy-β-mannosides.The stereoselective synthesis of these desirable β-linkages is the greatest challenge in glycosylation chemistry. In order to better understand how these polysaccharides affect humans in a negative manner and to possibly produce new vaccines, a more effective and efficient method of synthesizing these polysaccharides is imperative. In this study, after the synthesis of a triflate acceptor and alcohol donor, cesium carbonate was used as a base for the anomeric O-alkylation to produce stereoselective glycosidic linkages. Typical yields for other methods are between 20%-40% while also creating many unnecessary side products. However, using this method, the final β-linked polysaccharide was 100% stereoselectively produced at a 50% yield indicating that this new method was successful in building the β-linkage in a more efficient manner than previously known. On an NMR, β-linkage shows C-H coupling values at 155 and 160, whereas α-linkage shows coupling values above 165. NMR analysis confirmed the exclusive presence of β-linkage in the product with peaks at 155 and 160.

4:00 PM - 5:00 PM	Laboratory Research Tours	
5:15 PM - 6:00 PM	Imagination Station	*BTSU Theatre 206*
6:00 PM - 7:15 PM	**Banquet/Keynote Presentation**	*BTSU Ballroom*
Keynote Presentation	**Nathan Yaussy**	
	Fairport Harding High School Teacher and Milken Education Award Recipent	
7:30 PM	Board Buses to *Hotel*	
7:45 PM - 11:00 PM	Open Activities	*Hotel*
8:00 PM – 9:00 PM	Adult Reception	*Great Room, Hotel*
11:00 PM	Students Report to Assigned Rooms	

SCHEDULE OF EVENTS

Friday, March 13

6:30 AM – 7:45 AM	Breakfast	
8:00 AM	Pick Up All Items/Board Buses to *BTSU*	
	Store Items	*BTSU, Room 227*
8:40 AM	Announcements	*BTSU, Room 228*
8:45 AM - 9:45 AM	**Sixth Paper Session**	*BTSU, Room 228*
8:45 AM – 9:45 AM	Concurrent Poster Viewing	*BTSU, Room 308*

8:45 AM

Ryan T. Ballou, Carroll High School

"Berberine Products as a Natural Alternative to Antibiotic Treatment for Protozoan Infection"

Poultry producers spend 1.5 billion dollars annually to treat coccidiosis (Sundar, 2017). FDA regulations and consumer demand for non-medicated meats, led producers to identify alternative treatments. Effects of both green tea and sophora flavescens, suspected antibiotic alternatives, were tested compared to sulfadimethoxine, an antibiotic prescribed for protozoan infections. By treating *Paramecium aurelia* (Sonneborn, 1937) with a range of concentrations of these supplements, treatment was most effective at concentrations > 1.5% green tea, or 0.25% to 2.5% sophora flavescens. When the supplements were used in combination with a low dose of sulfadimethoxine, paramecium populations were eliminated. Berberine, a main compound of sophora flavescens, was believed to be an anti-protozoan agent (Izawa, 2010). Berberine at 2.5% and 0.25% daily consumption values were tested against treating using sulfadimethoxine for 15 days. The gut of *Tenebrio molitor* was viewed with DAPI staining and fluorescence microscopy to measure gregarine oocyst density. Specimens treated with 2.5% berberine had similar responses to those treated with sulfadimethoxine, with overlapping error signifying comparable efficacy. The most effective concentration of berberine between 2.5% - 0.25% was identified by testing samples with an identical protocol to prior treatments. Concentrations < 2% did not impede gregarine growth, and oocyst density increased: 2.5% berberine was effective at reducing gregarines, and demonstrated decreasing effectiveness with decreasing concentration. Results demonstrate berberine lowers gregarine levels and establish berberine as a natural alternative to sulfadimethoxine for gregarine infection in *T. molitor*.

9:05 AM

Nathan Mu, University School

"Developing EDTA-polymerized Cyclodextrin as a Drug-Delivering Polymer For Use in a Coronary Drug-Eluting Stent Coating"

Drug-eluting stents (DES) release anti-proliferative drugs to prevent in-stent restenosis. However, current DES do not have sufficient periods of drug release to treat long-term restenosis. Cyclodextrin polymers (pCD) can slow drug release due to unique affinity for small hydrophobic drugs. Ethylenediaminetetraacetic acid (EDTA)-crosslinked pCD, which can chelate to metal stent surfaces, were tested as drug delivery polymers for DES coatings. This study looks at the attachment of these polymers to stent surfaces and compares the drug release patterns of various EDTA-crosslinked pCD particles to verify affinity-based release. It was expected that CD particles with higher degrees of crosslinking would slow release the most due to tighter concentration of cyclodextrins. Chelation tests with $CoCl_2$, FTIR, SEM, and EDS were used to characterize particles and coatings. Drug release studies were carried out using drug-loaded particles, and UV-Vis spectroscopy was used to quantify released drug. Sirolimus was used as a model drug. Color change and FTIR data confirmed chelating activity of EDTA-pCD. SEM indicated a texture difference between coated vs. uncoated stents, and EDS showed an increase of 4% in carbon composition, which comes from the coating. Cumulative drug release within 24 hours from highly-crosslinked EDTA-pCD was 82.4% lower than that of control non-affinity EDTA-dextran particles, a reduction attributed to affinity. Compared to highly-crosslinked EDTA-pCD, however, less-crosslinked EDTA-pCD and control EDTA-dextran exhibited longer drug release. These preliminary results indicate that EDTA-pCD particles can chelate to metal stent surfaces, and that less-crosslinked EDTA-pCD particles and EDTA-dextran particles have promising levels of extended drug release.

Friday, March 13 (Cont.)

9:25 AM

Sally Tsoi, Hathaway Brown High School

"Investigating the functions of novel *CFTR cis*-regulatory elements in the developing airway"

Mutations in the cystic fibrosis transmembrane conductance regulator (*CFTR*) gene cause cystic fibrosis (CF). These mutations prevent clearance of mucus from epithelial cells, which causes infection, inflammation and eventual organ failure. Most CF patient mortality is a result of lung phenotype. Previous research has shown that CFTR lung expression is developmentally regulated, which poses new questions about potential treatments of CF. Differentiating human induced pluripotent stem cells (hiPSCs) into airway cells revealed three novel regions of open chromatin, downstream of CFTR at +19.6 kb, +22.6 kb, and intron 20 of the *CFTR* gene unique to the definitive endoderm (DE) stage. To determine whether these regions encompassed enhancers of the *CFTR* promoter they were cloned into luciferase reporter gene vectors to assess their impact in 16HBE14o- (human bronchial epithelial) cells. The intron 20 region was found to contain an activating element of the *CFTR* gene. Further experiments will investigate the mechanism of action of this element, its activating transcription factors and its role in developmental expression of *CFTR*.

Announcements and Break (15 minutes)

10:00 AM – 11:00 AM   **Seventh Paper Session**   *BTSU, Room 228*

10:00 AM

Daven Sarikonda, Sylvania Northview High School

"The Commensal Gut Microbiota May Be a Mediator for Colonic Aquaporin Expression and Amoxicillin-Induced AAD Pathogenesis"

Antibiotic-associated diarrhea (AAD) is known to result in potentially dangerous water malabsorption; however, the mechanisms by which AAD develops is poorly understood, complicating development of effective medical treatments. Recently, it has been demonstrated in antibiotic mixture-administered rats that the gut microbiota may play an integral role in AAD pathogenesis due to a marked decrease in AQP1, AQP3, AQP4, and AQP8. Aquaporins play a major role in water uptake from feces in the colon, and significantly reduced expression of them would likely result in diarrhea. It is suspected that a relative increase of opportunistic pathogenic elements of the gut microbiota leads to the onset of AAD. This study has found that the fecal water content in GF rats is significantly higher than in GFC rats ($P = 7.93 \times 10_{-5}$), suggesting that it may be the commensal gut microbiota that mediates aquaporin expression and AAD pathogenesis, warranting further study. This study will continue by evaluating AQP1, AQP3, AQP4, and AQP8 expression in the proximal and distal colons of GF and GFC rats using qRT-PCR, custom primers, and the housekeeping gene β-actin. AQP expression will then be evaluated using tissue samples from control and amoxicillin-administered groups of rats to verify previous findings.
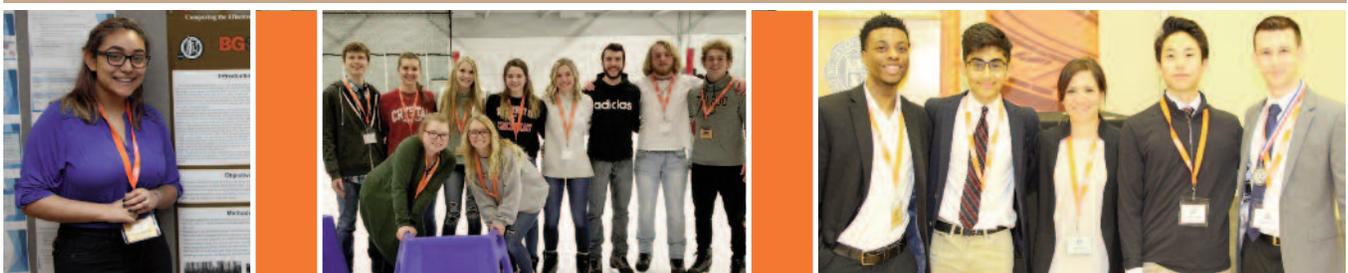
Friday, March 13 (Cont.)

10:20 AM

Anya Razmi, Hathaway Brown High School

"Impact of Haltere Removal on Gravitational Perception and Takeoff in Dipteran Insects"

Animal movement requires the input of sensory information. In particular, flies use sensors known as halteres, a type of mechanosensory organ located on the metathorax, to aid in flight. However, the precise function of halteres beyond their canonical role during flying has yet to be determined. In this study, three major conditions were examined—free fall, tarsal reflex, and takeoff—to better understand the behavioral significance of halteres outside of flight stabilization. First, flies were subjected to free fall; specifically, flesh flies (Sarcophagidae), which oscillate halteres while walking, and long-legged flies (Dolichopodidae), which do not oscillate halteres while walking, were observed.

The behavior of intact flies was compared to behavior of flies with their halteres removed. Each fly was placed in a clear plastic container suspended 2 cm above a surface and filmed using a high-speed videography camera as the container fell. For both flesh flies and long-legged flies, there was no significant difference in median body velocity during the fall between intact and halvereless flies. Secondly, to examine tarsal reflex, the speed at which flesh flies initiated wing flapping when tethered to a pin and pulled away from a contact surface was observed; intact and halvereless flies did not behave significantly differently when subjected to these conditions. Finally, takeoff of intact crane flies was recorded; it was noted that flies began oscillating halteres before the movement of the wings. Taken together, these data suggest that any sensory information from oscillating halteres during shifts in gravity is only supplemental as opposed to necessary for behavioral adaption, and that halteres likely do not play a role in tarsal reflex, but may provide sensory input during takeoff.

10:40 AM

Dawei Liu, Sylvania Southview High School

"The Enhancement of Doxorubicin-Induced Apoptosis in U2OS Cells in the Presence of Hyperthermia"

Background: While the individual effects of doxorubicin and hyperthermia on the apoptosis of osteosarcoma cells has been well established, this study investigates the combined effectiveness of both on the apoptosis of osteosarcoma cells, which has not been thoroughly investigated.

Materials and methods: Four groups were divided based on the difference of the applied temperature and doxorubicin while U2OS was cultured. Group 1, no doxorubicin, temperature of 37°C; Group 2, 100nM doxorubicin, temperature of 37°C; Group 3, no doxorubicin, temperature of 42°C applied for 20 minutes; Group 4, 100nM doxorubicin, temperature of 42°C applied for 20 minutes. The survival rate of the cells was measured by MTT assay. The morphological changes of the mitochondria were observed with a fluorescence microscope following staining with MitoTracker.

Results: The results of the study revealed the survival rates for Groups 1 through 4 were: 100%, 85.6%, 96.0%, and 69.4%, respectively ($p < 0.05$). Furthermore, cells that underwent the combined treatment exhibited condensed and elongated networks of mitochondria.

Conclusions: The combination of doxorubicin increases the effects of thermochemotherapy on the OS cell line by increasing susceptibility to apoptosis.

Announcements and Break (15 minutes)

Friday, March 13 (Cont.)

11:15 AM – 12:35 PM   **Eighth Paper Session**   *BTSU, Room 228*

11:15 AM

Neel Agarwal, University School

"Modeling the Prescription Drug Epidemic with Exponential Growth and Decay Models"

The prescription drug epidemic has quadrupled in the last two decades and continues to skyrocket. There is currently no method to predict the amount of people projected to abuse an unreleased drug or a prescription drug accurately. Using five different literature analysis scales, with various randomly chosen prescription drugs (n=6) from each category of drugs, the prescription drug facts were analyzed to obtain the complexity factor, either a grade level or a readability factor. A correlation was produced for each literature analysis scale by correlating the complexity factor for each drug to the number of each drug's misusers from the year 2008. The two most statistically significant correlations were used to predict the 2008 drug epidemic for different drugs in each category, and compared using percent error, in a real world evaluation. With the obtained correlations, bootstrap aggregating, a form of machine intelligence, was performed, to sample a larger sample size. The Flesch-Kincaid Grade Level correlation was most significant, having a percent error of 3.20%:

$$\log(y) = 0.27865x + 1.3868$$
$$y = 10^{0.27865x} + 10^{1.3868} (r^2 = 0.96916,\ p = 0.00023018).$$

These models suggest that the complexity of drug facts can predict the number of abuse cases for current and future with high significance and low percent error.

11:35 AM

Aditi Kumari, Olentangy High School

"Investigating the Role of Thrombospondin-2 in Extracellular Matrix Formation and Fibroblast Migration in Diabetes"

One of the major complications of diabetes mellitus is poor wound healing, which leads to increased morbidities and mortalities. Thrombospondin-2 (TSP2), is a component of the extracellular matrix (ECM) and is expressed in the proliferating and remodeling phases of wound healing. As a matricellular protein, TSP2 influences cell matrix interactions and is implicated in different wound healing processes. However, there is little information regarding the effect of TSP2 on ECM remodeling and cell functions, specifically the migration of fibroblasts in wound healing. The ultimate goal of this study was to test the hypothesis that TSP2 alters the components of the ECM and function of diabetic cells and that this contributes to poor wound healing. Three types of fibroblast cells were used in this study: wild type, diabetic, and diabetic with TSP2 knockout. The experiments were divided into three components; the first part examined the effect of TSP2 on the migration of fibroblasts, while the second studied the effect of TSP2 on the structures of cell-derived ECM. The third part studied the migration of fibroblasts through the cell-derived ECM. My findings confirmed that TSP2 affects the formation of ECM by increasing the size of fibers, but the results do not indicate differing protein deposition. Additionally, experiments showed that diabetic cells migrate slower and secrete ECM that retards the migration of WT cells. These defects are rescued when diabetic cells are depleted of TSP2. Taken together, these observations provide insights into the role of excess TSP2 in diabetic wound healing.

15

Friday, March 13 (Cont.)

11:55 AM

Sohum Kapadia, University School
"Dimensions and Geometry of the Mitral and Tricuspid Valves in Normal and Diseased States"

The mitral and tricuspid valves are located between the atria and ventricles and are primarily comprised of an annulus and leaflets. They simultaneously open in diastole and close during ventricular contraction in systole to prevent backward flow into the atria. Mitral regurgitation (MR) occurs when there is a defect in the systolic closing of the mitral valve. It was sought to determine the normal dimensions and geometry of both annuli and investigate the changes that occur in severe MR. 50 normal subjects and 50 patients with severe MR who were referred for cardiac computed tomography (CCT) were included. Aquarius CCT software was used to perform all relevant measurements. Clinical characteristics were defined by chart review. In normal subjects, mitral annular (MA) dimensions significantly correlated with tricuspid annular (TA) measurements and were larger in males. There was also a significant correlation between MA size and BSA but not BMI nor age (r=.51, t-test - p<.001). Compared to normal subjects, patients with severe MR had significantly thicker and longer leaflets, and their MA was significantly larger, higher, and more circular. Defining normal values and understanding the changes that occur with the disease is key in developing treatments for patients with severe MR.
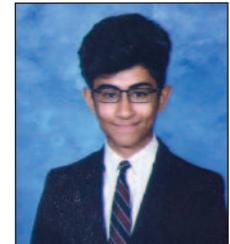
Time	Event	Location
12:40 PM – 1:40 PM	**Lunch**	*Oaks Dining Hall*
	Judges Meeting/Luncheon	*Oaks Dining Hall*
	Advisory Board Luncheon	*Oaks Dining Hall*
	Student Advisory Board Meeting	*Oaks Dining Hall*
1:45 PM	Students Dismantle Posters	*BTSU, Room 308*
2:00 PM	JSHS Survey	*BTSU, Room 228*
2:15 PM	Awards Ceremony	*BTSU, Room 228*
2:45 PM	Adjournment	

Nathan Yaussy

Fairport Harding High School Teacher and
Milken Education Award Recipent

Nathan Yaussy is an alumnus of OJSHS, competing from 2002 to 2004. His project, "Road Mortality of Snakes in the Killdeer Plains Wildlife Area", won him trips to Portland, Colorado Springs, San Diego, China, and even Cleveland. He earned his bachelor's degree in biology from Hiram College, and obtained a master's degree from Kent State University. Other past research projects include: counting aquatic insects, pulling invasive plants, planting native dune grass on the shores of Lake Superior, and tracking endangered iguanas in the Caribbean. After realizing he wanted to be a teacher, he received a Woodrow Wilson Fellowship to attend John Carroll University for his master's of education. He is in his seventh year of teaching at Fairport Harding High School, where he teaches a variety of science courses, from 7th grade science to human anatomy, and quite a few things in between. In November of 2019, he was awarded the Milken Education Award, which is only given to forty teachers throughout the nation each school year.

Jenin Abuhummos, The Bounty Collegium
Physiological Effects of Natural Oils

NoorAlexandria Abukaram, The Bounty Collegium
Reduction of Unwanted Light Reflection from the Surface of a Substance

SyneneMaria Abukaram, The Bounty Collegium
Determining the Antibacterial Properties of a Novel Textile

Christopher Adams, Aerospace and Natural Science Academy of Toledo
Bird Strike Versus Common Protective Materials of Planes

Khalil Al-Rayyes, The Bounty Collegium
The Musical Blender

Mohammad Alshemary & Michael Worden (Jr.), Aerospace and Natural Science Academy of Toledo
Aircraft Noise Reduction

Roman Azzarello & Neva Hargreaves, Aerospace and Natural Science Academy of Toledo
Soil Infiltration and Flow Rate

Ashlee Barnhart, Isabelle Landis, Grace Metzger, Hannah Taylor, & Jason Tucker, Aerospace and Natural Science Academy of Toledo
Arachnophobia

Kaitlin Beck, Aerospace and Natural Science Academy of Toledo
Can Rats be Trained to Steal?

Madison Beck, Pettisville High School
Comparison of the Amount of Bacteria on Various Surfaces at Pettisville High School

Brianna Bell, Hilltop High School
Determining Ratios Among Intervals in the Musical Scale

Charaty Belville, Aerospace and Natural Science Academy of Toledo
Feral Cats

Ellie Bennett, Aerospace and Natural Science Academy of Toledo
What is Preferred when Treating a Common Cold, Essential Oils or Modern Medicine?

Olivia Bibler, Aerospace and Natural Science Academy of Toledo
A Comparative Study of Soil Nutrients in Drainage Ditches

Brooke Billock & Isabella Gilbert, Aerospace and Natural Science Academy of Toledo
What is the Difference of Aerosol Concentration at ANSAT versus NSTC?

Aster Bishop, Heather Helscel, Isabelle Landis, & Nyx Valdez, Aerospace and Natural Science Academy of Toledo
Suicide Prevention

Jade Bowen & Jamilia Faour, Aerospace and Natural Science Academy of Toledo
The World of Scent Dogs: Old vs. Young

Owen Bryson & Michael Hubbell, Aerospace and Natural Science Academy of Toledo
Do Oxygen Levels Improve Performance in Combustion Engines and Why?

Irene Calderon, The Summit Country Day School
Upregulation of Signal Transducer And Activator Of Transcription 1 (STAT1) in Cutaneous Lupus Erythematosus

Defne Ceyhan, Upper Arlington High School
Impact of a Mediterranean Diet and BMI on Gut Viral Communities

Kaya Ceyhan, Upper Arlington High School
Characterization of Human Pegiviruses in a Homologous Rat Model

Jailyn Clouse, Aerospace and Natural Science Academy of Toledo
Water Pollution

Lorna Cole, Aerospace and Natural Science Academy of Toledo
What is the Best Way to Treat Canine Diabetes?

Alexander Craig & Kevin Greer, Aerospace and Natural Science Academy of Toledo
Are Foxes Better at Smelling Scents than Dogs?

Maire Daugherty, Aerospace and Natural Science Academy of Toledo
Comparing Activity Levels of Schools: Career Tech vs Traditional

Johannes DeMessie, William Mason High School
'Salt-Stain Effect' for a Rapid, Low-cost Analysis of Groundwater

Claire Denk, Ottawa Hills High School
Chronic Exposure to E-cigarette Containing Nicotine Effects regarding Neuroinflammation in the Brain

Ryan Devine, University School
Redefining Fast and Saving the Environment: Creating a More Durable Carbon Fiber Composite

Abdulrahman Elhady, The Bounty Collegium
Recreational Ball Design

Sara ElSayed, Sylvania Southview High School
Creation of a Biodegradable Polymer From Fatty Acids

Ariba Fatima, Sylvania Northview Highschool
Cell Signaling of Caenorhabditis Elegans

Abem Fetene, University School
Carbon Sequestration

Katie Geis, Hilltop High School
Designing a Natural Essential Oil Wipe for Elimination of *E.coli*

Serenity Gilbert & Annabelle Rose, Aerospace and Natural Science Academy of Toledo
Chicken Feeder

Nathaniel Gold, Aerospace and Natural Science Academy of Toledo
What Toys Stimulate Different Levels of Activity in Pigs?

Emily Gomez & Alivia Maxcy-Venson, Aerospace and Natural Science Academy of Toledo
Can Animals Who Live in Horizontal Spaces Utilize Vertical Space?

Savannah Haas & Rylee Harrington, Aerospace and Natural Science Academy of Toledo
Rainbow Trout

Carsyn Hagans, Archbold High School
Artificial Light at Night in Northwest Ohio and its Effect on Sleep Quality

Alyssa Harvey, Aerospace and Natural Science Academy of Toledo
Positive Dog Reinforcement

Drew Hoffman, Ottawa Hills High School
Contribution of Satellite Cells to Muscle Regeneration

Aliyah Holmes, Aerospace and Natural Science Academy of Toledo
Goat Stress

Justin Huang, William Mason High School
Preparation of Reusable PVA-Nano TiO2 Foam for Wastewater Treatment

Ashlyn Jaqua & Adan Lopez, Aerospace and Natural Science Academy of Toledo
Does Supplement Reduce Quail Stress?

Bilal Joeujati, The Bounty Collegium
Transliteration

Jaylah Jones, Aerospace and Natural Science Academy of Toledo
Aggressive Behavior in Humans

Nyasia Kynard, Aerospace and Natural Science Academy of Toledo
Panda Population

Sophia Lands, Aerospace and Natural Science Academy of Toledo
What Form of Genetic Analysis will Best Determine Genetic Health and Diversity in a Severely Bottle Necked Species?

Knickolas Laux, Sylvania Southview High School
Efficiency of Thermoelectric Materials Under Cosmic Ray Conditions

Ethan Livingston, Sylvania Southview HIgh School
Kirtland's Snake (Clonophis kirtlandii) Relationship to Terrestrial Crayfish

Zakaria Maaieh, Ottawa Hills High School
The Causes of Aneuploidy Cancer: Investigating the Role of Phosphorylation Site S62A in Mitotic Arrest Deficient 1 (MAD1)

Mariana Machado-Contreras, Aerospace and Natural Science Academy of Toledo
Ophidiophobia

Jenna Melville, Sylvania Southview High School
Validation of the Melville Instrumental Activities of Daily Living (MIADL) Test

Maanasa Mendu, William Mason High School
LeafAI 2.0: A Convolutional Neural Network Based Approach To Plant Disease Detection

Magdalena Meszaros, Bowling Green High School
Effect of Gum Chewing on Reaction Time in the Elderly

Henry Michaelson, University School
Temperature Modeling and Soil Bacteria Survival in Upper Stratospheric Weather Ballon

2020 POSTER PRESENTERS

Toussaint Miller, University School
THIS IS YOUR BRAIN ON MUSIC: An Examination of the Effect of Lonian, Aeolian, and Locrian Scales on Memory Recall Ability

Kian Moore & Neil Seppala, Aerospace and Natural Science Academy of Toledo
Aerodynamics Nature vs Machine

Hari Murali, Sycamore High School
Experimental Study of Lead Leaching and Purification in Water

Rayanne Mustapha, The Bounty Collegium
Novel Solutions to Increase Protection in Contact Sports

Sundus Mustapha, The Bounty Collegium
Determining the Variables Necessary to Fulfill Oxygen Mask Standards Using Electrolysis Project Gills: Part 3, Novel Pollution Mask

Ateeq Najib, The Bounty Collegium
The Perfect Punch

Devi Dheekshita Nelakurti, Metro Early College High School
Applying Artificial Intelligence Approaches to Dual-Energy CT Post-Processing to Augment Visualization of Intraspinal Contents

Faith Newman, Aerospace and Natural Science Academy of Toledo
Female Body Fat Percentage

Morgan Norden, Hilltop High School
Special Needs Children Responses to Sensory Objects Compared to Typical Children - Year 2

Savhanna Noe, Aerospace and Natural Science Academy of Toledo
Effect of Dietary Protein Levels on Growth in Channel Catfish (Ictalurus punctatus)

Deepta Paramasamy, Ottawa Hills High School
Investigating A Real Life Symbiotic Anomaly: Siderophore Producing Bacteria and Algae in Alkaline Environments

Mackenzie Perry, Sylvania Northview High School
Chemotaxis of Borrelia Burgdorferi in a Mouse Model

Anthony Pham, Sylvania Southview High School
Effective Algae Harvesting

Ruth Posta, Aerospace and Natural Science Academy of Toledo
Aggression in Male Betta Fish

Gayatri Rajan, Phillips Academy Andover
Creating an Accessible, Accurate Screening Tool to Assess Risk of Alzheimer's Disease Using Machine Learning Algorithms

Yara Ramadan, The Bounty Collegium
Child Control

Yazda Ramadan, The Bounty Collegium
SeedZ

Malaysia Ratcliffe, Aerospace and Natural Science Academy of Toledo
How do Rusty Red Crayfish Affect the Environment?

Joseph Reamsnyder, Hilltop High School
The Rate of Pollen Reallocation in Cucurbita Pepo

ElleAnna Rhee, Sylvania Northview High School
Dilution Series of DNA to Test the Effect of Rose Bengal's Reactive Oxygen Species

Hannah Riley, Hilltop High School
The Correlation Between *S. salivarius* Bacteria and Toothbrush Storage Sites

Jaden Rising, Hilltop High School
Effects of Color Blindness and Lighting on Depth Perception

Josiah Ruiz, Andrew Saylor, & Evan Stecovich, Aerospace and Natural Science Academy of Toledo
Bird Deflection and Protecting Aircraft Engines

Remy Savoie, Sylvania Northview High School
Developing a Fly Model for the Candidate Centriole Remodeling Protein FAM161

Avinash Singh, Sylvania Northview High School
A Novel Ex-vivo Procedure for Monitoring β-hydroxybutyrate Production from Isolated, Whole Livers

Colin Smith, Sylvania Southview High School
Effects of Music Therapy on Stress Levels of High School Students

Katelynn Smith, Hilltop High School
Effectiveness of Varied Teaching Methods on Turn-Taking in Special Needs Students; A 2 Year Study

Mela'kie Smith, Aerospace and Natural Science Academy of Toledo
Does Pollution Affect Crime?

Elijah Snyder, Aerospace and Natural Science Academy of Toledo
Equine Medicine

Mira Smith, Sylvania Southview High School
The Effectiveness of The Mediterranean Diet on Treatment of Rheumatoid Arthritis Symptoms

Danielle Sun, Ottawa Hills High School
The Effects of Antibiotics on Arterial Function in Hypertension

Ramya Talla, Ottawa Hills High School
Analysis of Spexin mRNA and Protein Expression During Metabolic States of Feeding and Fasting

Cayden Taylor, Aerospace and Natural Science Academy of Toledo
Tilapia Blue Green Algae

Nathan Tooman, Aerospace and Natural Science Academy of Toledo
Does the Presence of Contrails Influence Change in Temperature and Precipitation?

Journee Turner & Lareina Hall, Aerospace and Natural Science Academy of Toledo
Recreation of Algae Absorption In Lake Erie

Jessica Villarreal, Aerospace and Natural Science Academy of Toledo
Comparing Behavior in Shovelnose Catfish Based on Habitat

Isaiah Waiters, University School
The Correlation Between Hepatic Venous Pressure Gradient Measurements and Success of the Transjugular Liver Biopsy

Jujuan Walker-McDaniel, Aerospace and Natural Science Academy of Toledo
Organic vs Inorganic Fertilizer on Plant Health

Malachi Wattley, Aerospace and Natural Science Academy of Toledo
Which Bags Are More Environmentally Sustainable, Durable, and Affordable: Disposable Bags or Reusable Bags?

Peyton West, Aerospace and Natural Science Academy of Toledo
Testing Equine Depth Perception

Jude Wehby, The Bounty Collegium
Radiate Escape

Kelly Wyse, Pettisville High School
Effectively Modeling How Blood Viscosity and Blood Vessel Diameter Affects Blood Flow Rate

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JUDGES SCORE SHEETS FOR PAPER PRESENTERS

Name of Student _____ Name of Judge _____

School _____

The Ohio JSHS recognizes students for original research achievements in the sciences, technology, engineering, or mathematics (STEM). The overall requirement for a paper presentation is that students demonstrate valid investigation and experimentation aimed at discovery of knowledge. The judging criteria and scoring for the Ohio JSHS are presented in the following chart. This scale has a total score of 30 points and serves as the basis for discussions among the judging team. The decisions of the judging team are final.

1= Fair   2 = Satisfactory   3 = Good   4 = Excellent   5 = Superior

Judging Criteria	Suggested Weight
Statement and identification of research problem • Is the problem clearly stated? • Does the presenter demonstrate understanding of existing knowledge about the research problem?	1 2 3 4 5
Scientific thought, creativity/originality • Process skills demonstrated by the student in the solution to the research problem and/or the research design • Student demonstrates his or her individual contributions to and understanding of the research problem • Level of effort	1 2 3 4 5
Research design, procedures (materials & methods), results **1. Science** • Appropriateness of research design and procedures • Identification and control of variables • Reproducibility **2. Engineering, computer science, technology** • Workable solution that is acceptable to a potential user • Recognition of economic feasibility of solution • Recognition of relationship between design and end product • Tested for performance under conditions of use • Results offer an improvement over previous alternatives	1 2 3 4 5
Discussion/conclusions • Clarity in stating conclusion • Logical conclusion that is relevant to the research problem and the results of experimentation or testing • Recognizes limits and significance of results • Evidence of student's understanding of the scientific or technological principles • Theoretical or practical implications recognized • What was learned?	1 2 3 4 5
Skill in communicating research results–oral presentation and written report • Clarity in communicating research results to non-specialized audience and to judges • Definition of terms as necessary • Appropriate use of audio-visuals • Response to questions from audience and judges	1 2 3 4 5
Acknowledgment of sources and major assistance received	1 2 3 4 5
TOTAL SCORE	

JUDGES SCORE SHEETS FOR POSTER PRESENTERS

Scoring Category	1 Needs Improvement	2 Acceptable	3 Good	4 Excellent	Score
Appearance/ Clarity	The poster is difficult to understand, and/or lacks important information or has largely excessive and superfluous information.	Organization and appearance of the poster is adequate but could be improved; some sections are significantly deficient or excessive.	Poster is logically organized; use of headings, fonts, etc. is good; some text is overly lengthy and/or contains errors.	Poster is logically organized; effectively uses headings, fonts, colors and white space; text is concise and error-free.	
Abstract*	Abstract does not represent student's research or is seriously deficient in terms of accuracy, completeness, clarity and conciseness.	Abstract is adequate; but has significant deficiency in accuracy, completeness, clarity, and/or conciseness.	Abstract mostly represents student's research; but is slightly deficient in accuracy, completeness, clarity, or conciseness.	Abstract accurately represents the student's research; clearly and accurately summarizes the project and is complete and concise.	
Research Questions*	Research questions are unclear and not aligned to the purpose of the study.	Research questions are adequately defined but have significant lack of clarity or alignment with the purpose of the study.	Research questions are well defined but have slight lack of clarity or alignment with the purpose of the study.	Research questions are very clearly defined and well aligned with the purpose of the study.	
Significance of the Research	Explanation of the research problem and its connection to broader issues is largely deficient.	Explanation of research problem and its connection to broader issues is significantly deficient but has some good points.	Explanation of research problem and its connection to broader issues has minor deficiencies or is slightly weak.	Student clearly explains the research problem being addressed by the study; clear connections are made to broader issues.	
Research Methods	Methods are not appropriate for the purpose of the study or the description is seriously deficient.	Methods are somewhat appropriate and/or the description has some significant deficiencies.	Methods are largely well chosen and well described but there are some slight deficiencies.	Methods creatively and effectively support the purpose of the study and the description is complete, easy to understand, and concise.	
Conclusions*	Unreasonable conclusions are provided and/or no supporting evidence is provided.	Conclusions are appropriate but there are significant deficiencies in evidence or reasoning.	Conclusions are reasonable and supported by evidence but there are slight deficiencies.	All appropriate conclusions are cited and well justified by evidence, reasoning is sound and complete.	
Limitations	Student identification of limitations is largely lacking or deficient.	Student identification and explanation of limitations has significant deficiencies.	Student identification and explanation of limitations has slight deficiencies.	Student clearly and completely identifies and explains all limitations in the study.	
Graphs and/ or Tables*	Graphs and/or tables are largely deficient with major flaws or omissions.	Graphs and/or tables have significant deficiencies in organization, completeness, or appropriateness.	Graphs and/or tables have slight deficiencies in organization, completeness, accuracy, or appropriateness.	Graphs and/or tables are appropriate, well organized, complete, and accurate.	
Knowledge of Project/Handling of Questions	Student demonstrates little or incorrect knowledge of project when answering questions.	There are some significant deficiencies in the student's knowledge of the project when answering questions.	There are slight deficiencies in the student's knowledge of the project when answering questions.	Student is very knowledgeable about the project; effectively handles difficult questions.	
Presence	Student interacts poorly, unprofessionally, or inappropriately with the judge.	Student speaking and interaction with the judge is adequate but lacks some clarity, confidence, and poise.	Student is professional with only slight deficiency in clarity, confidence, or poise .	Student is professional and displays excellent enthusiasm, confidence, and poise.	

* Score zero if not provided at all

TOTAL SCORE

of 40

1st Place Winner – **Maanasa Mendu**, William Mason High School
- $2,000 College Scholarship sponsored by the United States Army, Navy, and Air Force.

2nd Place Winner – **Priya Bhatt**, Ottawa Hills High School
- $1,500 College Scholarship sponsored by the United States Army, Navy, and Air Force.

3rd Place Winner – **Hannah Doris**, Sylvania Northview High School
- $1,000 College Scholarship sponsored by the United States Army, Navy, and Air Force
- Presented her research paper at the 2019 National JSHS in Albuquerque, NM and competed for a $12,000, $8,000, or $4,000 scholarship.

4th Place Winner – **Sahej Bindra**, Hathaway Brown School
- $500 Award sponsored by the College of Arts and Sciences, BGSU
- Won 3rd Place in the Environmental Science Poster Competition category at National JSHS.

5th Place Winner – **Greta Cywińska,** Hathaway Brown School
- $250 Award sponsored by the Department of Chemistry, BGSU

1st Alternate – **Virginia Ma**, Columbus Academy
- $150 Award sponsored by College of Education and Human Development, BGSU

2nd Alternate – **Edward Dan**, Solon High School
- $100 Award sponsored by the Department of Physics and Astronomy, BGSU
- Presented his research poster at the 2019 National JSHS in Albuquerque, NM

Thomas Alva Edison Award – **Garret Blum**, University School
- $250 Award sponsored by the Department of Biological Sciences, BGSU
- Presented his research poster at the 2019 National JSHS in Albuquerque, NM
- Placed third at the National JSHS in Engineering & Technology

Garret Blum, University School
2019 Thomas Alva Edison Award Winner

TEACHER AWARDEE: 2019

Colonel George F. Leist Distinguished Teacher Award

– **Kathryn Nelson**, Sylvania Northview High School

  • $500 School Award sponsored by the United States Army, Navy, and Air Force

Kathryn Nelson, Sylvania Northview High School

RESEARCH POSTER AWARDEES: 2019

9th – 12th Grade Overall Award – **Laalitya Acharya**, William Mason High School

"Best in Show": $100 Gift Certificate

• Presented her research poster at the 2019 National JSHS in Albuquerque, NM

11th – 12th Grade Awards

1st Place: $50 Gift Certificate – **Abigail Berk**, Ottawa Hills High School
2nd Place: $25 Gift Certificate – **Emily Gomez**, Aerospace and Natural Science Academy of Toledo
Honorable Mention – **Sarah Brown**, St. Ursula Academy

9th – 10th Grade Awards

1st Place: $50 Gift Certificate – **Sophia Lands**, Aerospace and Natural Science Academy of Toledo
2nd Place: $25 Gift Certificate – **Soham Joshi**, Columbus Academy
Honorable Mention – **Carsyn Hagans**, Archbold High School

RESEARCH PAPER AWARDS: 2020

1st Place Winner

$2,000 College Scholarship sponsored by the United States Army, Navy, and Air Force

- Presents research paper at the 2020 National JSHS in Norfolk, Virginia, April 15-18, with expenses paid

2nd Place Winner

$1,500 College Scholarship sponsored by the United States Army, Navy, and Air Force

- Presents research paper at the 2020 National JSHS in Norfolk, Virginia, April 15-18, with expenses paid

The 1st and 2nd place winners have an opportunity to win the following awards at the National JSHS:

- Six $12,000 undergraduate tuition scholarships, awarded to each of the 1st place finalists in the the National research paper competition
- Six $8,000 undergraduate tuition scholarships, awarded to each of the 2nd place finalists in the the National research paper competition
- Six $4,000 undergraduate tuition scholarships, awarded to each of the 3rd place finalists in the the National research paper competition

3rd Place Winner

$1,000 College Scholarship sponsored by the United States Army, Navy, and Air Force

- Presents poster at the 2020 National JSHS in Norfolk, Virginia, April 15-18, with expenses paid

4th Place Winner

$500 Award sponsored by the College of Arts and Sciences, BGSU

- Presents poster at the 2020 National JSHS in Norfolk, Virginia, April 15-18, with expenses paid

5th Place Winner

$250 Award sponsored by the Department of Chemistry, BGSU

- Presents poster at the 2020 National JSHS in Norfolk, Virginia, April 15-18, with expenses paid

1st Alternate

$150 Award sponsored by the College of Education and Human Development, BGSU

2nd Alternate

$100 Award sponsored by the Department of Physics and Astronomy, BGSU

Thomas Alva Edison Award

$250 Award sponsored by the Department of Biological Sciences, BGSU

"Best in Show" Research Poster

$100 Award sponsored by the Department of Sociology, BGSU

TEACHER AWARD: 2020

Colonel George F. Leist Distinguished Teacher Award

$500 Teacher Award for Classroom Materials sponsored by the United States Army, Navy, and Air Force

2020 Ohio Junior Science & Humanities Symposium

Paper Judges

Jon Bjorkman, Ph.D.	Department of Physics & Astronomy, University of Toledo
Jeremy Didion, Ph.D.	Department of Biology, Case Western University
David Meel, Ph.D.	Department of Mathematics and Statistics, BGSU
Stephania Messersmith, Ph.D.	Department of Chemistry, BGSU
Jessica Saul, Ph.D.	Department of Biology, University of Toledo
Daniel Yaussy	United States Department of Agriculture, Forest Service

Poster Judges

Peggy Adams	Department of Social Work, BGSU
Sandy Beach	Biology and Health Science, Lourdes University
Verner Bingman	Department of Psychology/Biology, BGSU
Jonathan Bostic	School of Teaching and Learning, BGSU
Abby Braden	Department of Psychology, BGSU
Steven Chung	Department of Chemistry, BGSU
George B. Clemans	Department of Chemistry, BGSU
Scott William Crawley	Biological Sciences, University of Toledo
Ann Darke	Department of Mathematics and Statistics, BGSU
Kate Dellenbusch	Department of Physics & Astronomy, BGSU
Heath Diehl	Department of English and the Honors College, BGSU
Carly Dinnes	Communication Sciences & Disorders, BGSU
Michael Edelbrock	Biology, University of Findlay
Colleen Fitzgerald	Department of Communications Sciences & Disorders, BGSU
Yuning Fu	Department of Chemistry, BGSU
Joseph Furgal	Department of Geology, BGSU
Rafael Garcia-Mata	Biological Sciences, University of Toledo
Silvia Goicoechea	Biological Sciences, University of Toledo
Enrique Gomezdelcampo	School of Earth, Environment and Society, BGSU
Brandan Gray	Biology, University of Findlay
Karen Guzzo	Department of Sociology, BGSU
Julia Halo	Department of Biological Sciences, BGSU
Carrie Hamady	Department of Public & Allied Health/Food and Nutrition, BGSU
Lisa Hanasono	School of Media and Communication, BGSU
Jodi Haney	College of Education & Human Development, BGSU
Bethany Henderson-Dean	Biology, University of Findlay
Christopher Kluse	Department of Engineering Technologies, BGSU
Dale Klopfer	Department of Psychology, BGSU
Resmi KrishnankuttyRema	Department of Engineering Technologies, BGSU
Andy Layden	Department of Physics & Astronomy, BGSU
JK Jake Lee	Department of Computer Science, BGSU
HeeSoon Lee	Department of Social Work, BGSU

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Marlise Lonn	School of Counseling & Special Education, BGSU
Eric Mandell	Department of Physics & Astronomy, BGSU
W. Robert Midden	Department of Chemistry, Adjunct Research Professor, BGSU
Kate Mejiritski	Department of Chemistry, BGSU
Cordula Mora	Center for Undergraduate Research and Scholarhship, BGSU
Holly Myers	School of Earth, Environment and Society, BGSU
Marco Nardone	Department of Physics & Astronomy, BGSU
Kurt Panter	Department of Geology, BGSU
Gwynne Rife	Science Education, University of Findlay
Kimberly Cervello Rogers	Department of Mathematics and Statistics, BGSU
MD Sarder	Department of Engineering Technologies, BGSU
William Scovell	Department of Chemistry, Professor Emeritus, BGSU
Jeff Snyder	School of the Earth, Environment and Society, BGSU
Glenn Tiede	Department of Physics & Astronomy, BGSU
Eileen Underwood	Department of Biological Sciences, BGSU
Stephen H. Vessey	Department of Biological Sciences, Professor Emeritus, BGSU
Margaret Weinberger	Department of Sociology, BGSU
Haowen Xi	Department of Physics & Astronomy, BGSU
Jenjira Yahirun	Department of Sociology, BGSU
Yu Zhou	Department of Geography, BGSU

2020 Ohio Junior Science & Humanities Symposium

CUMULATIVE AWARDS

THOMAS ALVA EDISON AWARD

The Thomas Alva Edison Award is presented each year to the student who has independently constructed research equipment and carried out a successful research investigation. The recent history of award winners is listed below; a full list of winners is available at: http://www.bgsu.edu/nwo/programs/ohio-junior-science-and-humanities-symposium/about-ojshs/thomas-alva-edison-award.html

Year	Name	School	Year	Name	School
2011	Sulaiman Mustapha	Toledo Islamic Academy	2015	Hannah Meller	Pettisville HS
2012	Chrysta Beck	Pettisville HS	2016	Jordan Skates	Pettisville HS
2012	Bluyé DeMessie	William Mason HS	2017	Mukund Seshadri	Dublin Coffman HS
2013	Mitchell Pallaki	Saint Ignatius HS	2018	Connor Ryan	Lincoln High School
2014	Emily Merickel	Gahanna Lincoln HS	2019	Garret Blum	University School

THE COLONEL GEORGE F. LEIST DISTINGUISHED TEACHER AWARD

Each year, an Ohio teacher is selected to receive The Colonel George F. Leist Distinguished Teacher Award. The United States Army, Navy, and Air Force sponsor this award of $500 to purchase books, supplies, and equipment for the school. The recent history of award winners is listed below; a full list of winners is available at: http://www.bgsu.edu/nwo/programs/ohio-junior-science-and-humanities-symposium/about-ojshs/the-colonel-george-f--leist-distinguished-teacher-award.html

Year	Name	School	Year	Name	School
2011	Robert Sudomir	Louisville HS	2016	Deborah Bogard	Delaware City Schools
2012	Fred Donelson	Gahanna Lincoln HS	2017	Tyler Bruns	Gahanna Lincoln HS
2013	Abbie Smith	Hilltop Junior HS		Rebekah Rice	Gahanna Lincoln HS
2014	Blythe Tipping	Sylvania Southview HS	2018	Sara Laux	University School
2015	Matt Wallschlaeger	Big Walnut HS	2019	Kathryn Nelson	Sylvania Northview HS

CUMULATIVE RECORD OF THE STATE OF OHIO STUDENT PRESENTERS TO THE NATIONAL JSHS

The recent history of award winners is listed below; a full list of winners is available at: http://www.bgsu.edu/nwo/programs/ohio-junior-science-and-humanities-symposium/about-ojshs/ojshs-presenters-advancing-to-national-jshs-and-liysf.html

Year	Name	School	Year	Name	School
2012	Christopher Ellis	Sylvania Southview HS	2016	Graham Lane	University School, Gates Mills
	Brian Haidet	Sylvania Southview HS		Rama Balasubramaniam	Dublin Coffman HS
2013	Bluyé DeMessie	William Mason HS	2017	Arman Serpen	Sylvania Southview HS
	Peeyush Shrivastava	William Mason HS		Srinath Seshardi	Village Academy, Powell
2014	Bluyé DeMessie	William Mason HS	2018	Arukshita Goel	Sylvania Southview HS
	Aditya Jog	William Mason HS		Suraj Srinivasan	Strongsville HS
2015	Pallavi Lanka	Sylvania Southview HS	2019	Hannah Doris	Sylvania Northview HS
	Srinath Seshardi	Village Academy, Powell		Garret Blum	University School

OJSHS INFORMATION DESK & IMPORTANT PHONE NUMBERS

24 Hour Emergency Contact: Susan Stearns (419-704-7458)

An OJSHS staff member is available 24 hours/day during OJSHS. During the OJSHS program, a staff member will be located at the registration/information table located outside Room 228 in the Bowen-Thompson Student Union. Poster Viewing is in Room 308 in the Bowen-Thompson Student Union. While at the hotel, you can contact Susan Stearns, OJSHS Coordinator, by calling or texting her at 419-704-7458.

If you or anyone in your group needs medical attention or have an incident to report, please contact your chaperone. Chaperones must immediately relay any medical emergencies or other incidents to JSHS staff. Chaperones must be able to account for their student/group at all times, in case of emergency. For immediate assistance and in case of life-threatening emergency, dial 911.

MEAL INFORMATION

Wednesday Evening: Pizza snack provided for all students, chaperones, and guests.

Thursday and Friday Breakfast and Lunch:
- Breakfast is provided by each hotel for hotel guests only.
- Lunch is provided for all students, teachers, judges, and paid guests and parents at the **Oaks Dining Hall*** (time specific to the OJSHS schedule for each day).

Thursday Evening: A banquet with a buffet meal and keynote speaker is provided for all students, teachers, judges, and paid guests and parents. The banquet will be held in the BTSU Ballroom (student union 202A).

*You must be wearing your OJSHS nametag to receive entry into The Oaks Dining Hall. The Oaks is an "all you care to eat" buffet. If you leave the dining hall, you are not able to re-enter without paying for another meal at your own expense. Meals are provided for all paid guests of OJSHS.

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TRANSPORTATION WHILE AT THE SYMPOSIUM

Buses will be provided to transport guests from the hotels to Bowling Green State University. Please check the schedule in your program for departure times. If you plan to park a personal vehicle at BGSU during the symposium, please contact Susan Stearns at the OJSHS information desk for a parking pass.

SYMPOSIUM EVALUATION

Please remember to complete the online evaluation for the 2020 Ohio JSHS. Your input is highly valued and necessary for the continuing success of the Ohio JSHS. The survey will open on March 13 at 1:00 pm and you will receive an email reminding you to take the survey. You will also receive an email regarding a survey request for the National JSHS program office. Please be sure to complete both the OJSHS evaluation and the National JSHS evaluation. Thank you in advance for your cooperation!

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