

Wisconsin-Upper Peninsula of Michigan Junior Science and Humanities Symposium

2019 JSHS PARTICIPANT LIST

Big Foot High School

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Cashton, WI
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Enrich Excel Achieve Learning Academy

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Alyssa Welch – Teacher
Katherine Bober – Teacher

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Lake Linden, WI
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Montello, WI
Sequoia Anderson
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JSHS OBJECTIVES

To Promote

research and experimentation in the sciences, humanities, mathematics, and engineering at the high school level.

To Recognize

the significance of research in human affairs, and the importance of humane and ethical principles in the application of research results.

To Search Out

talented youth and their teachers, recognize their accomplishments at symposia, and encourage their continued interest and participation in the sciences, humanities, mathematics, and engineering.

To Expand

the horizons of research-oriented students by exposing them to opportunities in the academic, industrial, and governmental communities.

To Increase

the number of future adults capable of conducting research and development.

The Wisconsin-Upper MI Junior Science and Humanities Symposium is presented annually by the University of Wisconsin-La Crosse School of Education and Department of Military Science in cooperation with the National Science Teachers Association and the United States Army Research Office, Office of Naval Research and Air Office of Scientific Research.

The Symposium is one of 48 similar regional programs conducted by the National Science Teachers Association.

Outstanding students from regional symposia will be chosen to participate in the 57th National Symposium to be held in Albuquerque, NM, April 24-27, 2019.

Wisconsin-Upper Peninsula of Michigan Junior Science and Humanities Symposium

January 26-27, 2019 | Treehaven in Tomahawk, Wis.



SYMPOSIUM AGENDA

Saturday, January 26

10–11 a.m.	Arrival/Registration Upload presentation to computer Board Games/Pool/Foosball/Gift Shop
11 a.m.–Noon	Welcome to Treehaven & JSHS Team Building Activity
Noon–1 p.m.	Lunch
1:15–2 p.m.	Practice Presentations Student Observers Learn about JSHS
2:30–5:30 p.m.	Oral Research Presentations
5:30–6:30 p.m.	Dinner
6:30–7:15 p.m.	Poster Presentations
7:30–9:30 p.m.	Movie & Popcorn/Games
8–8:30 p.m.	Teacher/Mentor Meeting
10 p.m.	Quiet Time

Sunday, January 27

8–8:55 a.m.	Breakfast/ Turn in Keys
9–9:30 a.m.	Badger State Science Fair
9:30–10 a.m.	JSHS Panel
10 a.m.–11 a.m.	Group 1: Hike Group 2: Science Stations
11 a.m.–Noon.	Group 1: Science Stations Group 2: Hike
Noon–1 p.m.	Lunch
1–1:20 p.m.	JSHS Survey
1:20–1:40 p.m.	Awards Ceremony
2 p.m.	Head Home

SAFE TRAVELS AS YOU JOURNEY HOME

UNIVERSITY of WISCONSIN
LA CROSSE

Wisconsin-Upper Michigan Symposium Late January or Early February, 2020

www.uwlax.edu/conted/JSHS

Sponsored by the National Science Teachers Association and the U.S. Armed Forces
Co-sponsored by the University of Wisconsin-La Crosse

Oral Presentations

SIONA BEAUDOIN *Lake Linden-Hubbell High School*

Do the Effects of Simulated Nitrogen Deposition on a Hardwood Forest in Michigan Persist After Deposition is Stopped?

In forests, chronic nitrogen (N) deposition has been shown to increase carbon stored in the ecosystem and reduce carbon dioxide flux to the atmosphere from soil respiration. From 1994 to 2017, simulated elevated atmospheric N deposition was added to sugar maple forests at four locations in Michigan. Measurements were made at the northernmost site, located in Twin Lakes, MI in 2018, the

first year after N additions had ended. I hypothesized that even though the experimental inputs of N have stopped, the suppression of soil respiration on the N addition plots would continue. Soil respiration was tested using a soil CO2 flux system (model LI-800, LI-COR Environmental, Lincoln, NE) with a 10 cm survey chamber (model 8100-102). The testing was done six times in July and August of 2018. In 2018, the soil respiration levels for the N addition plots were similar to the control. This contrasts with 2017 and earlier when soil respiration for the N addition plots was reduced by 13%, which contrasts with my hypothesis. This means that in 2018 either the respiration from the autotrophs, heterotrophs, or both was no longer suppressed. This would cause more carbon to be released by their respiration. This would mean that trees are now using less carbon for themselves and are instead supplying it to mycorrhizae.

ALYSSA CARPENTER *Cashton High School*

Nitrogen Fertilizer Management for Hops in Wisconsin

An increase in demand for hops in Wisconsin has led to a climb in hops production.

Because of this, the old practices of hops farming needs to be examined, as the nutrient management recommendations for hops in Wisconsin may be obsolete. There were two purposes of this experiment: to find the amount of nitrogen that produces the highest amount of cone yield and to test if a nitrate ion meter used in the fields is accurate enough to be a replacement for laboratory results. We tested two different varieties of hops and had four different experimental groups (rates of nitrogen). Currently, the best option for farmers is to apply 100 lbs of nitrogen per acre. However, the split rate of nitrogen produced a high cone yield, so we will continue this study to determine if the split rate could be the better option. The results from the nitrate ion meter show the correlation is not yet strong enough to be used as a replacement, but we will continue this

Poster Presentations

AMANDA BENDER *Big Foot High School*

The Effect of Calcium Carbonate in Water on the Color of Processed Vegetables

The testing of lime content in water and its effect on food processing was conducted because in Walworth, Wisconsin’s water there are high lime levels. The rationale was to figure out whether or not if more lime would affect processing results. As of now the agriculture industry needs water to produce and process food. This project has value because without clean water food is less appealing and less profitable. It also shows that the processing of water can affect food quality, in addition, this benefits the agriculture industry by finding out the value to efficiently and inexpensively alter water quality for food processing. This experiment used red cabbage and spinach as the test food sources. Calcium carbonate was added (30, 150, 1000 mg, control) to water and then processed with vegetables. Results showed that the more lime you add and then boil the red cabbage/spinach the darker the water gets and the more color pulled from the food. More specifically, that higher pH values have more effect on the color of processed food.When food processing companies decide where to locate a facility if less money is needed to change the water quality the more attractive the location site.

investigation in the future. The results from this experiment have been used by the University of Wisconsin Agriculture Extension Agency to guide hop farmers on maintenance and fertilizer recommendations.

AIDEN COOK *Cashton High School*

A Survey for the Presence of the *Perkinsea* Pathogen on the Epidermis of Amphibians in Wisconsin

Nearly half of the world’s amphibian species are declining or threatened with extinction, and this crisis is attributed to habitat degradation and infectious disease. Although *Batrachochytrium dendrobatidis* and *Ranavirus* are the two primary diseases responsible, a third pathogen is emerging and requires further study: *Perkinsea*. The purpose of this study was to determine if *Perkinsea* is present in the amphibian habitats of Wisconsin. 72 samples were collected from various locations in western Wisconsin by swabbing the external surface of each amphibian. qPCR was used to determine the prevalence of *Perkinsea* in the samples. The results indicated that *Perkinsea* was not present in the studied habitats. Although *Perkinsea* was not found in this study, this subject merits further research.

MELISSA KONKEL *Big Foot High School*

Determining the Effects of Adding Ascorbic Acid to Pomegranate Juice on Antioxidant Levels

The health benefits of antioxidants have become more evident and costly, so determining how much is beneficial when ingesting synthetic antioxidants may expose more of our population to more antioxidants. Pomegranate is naturally high in antioxidants, specifically, pomegranate juice. Ascorbic acid is also an antioxidant. So, which amount of ascorbic acid added to 100% pomegranate juice will add the most antioxidants before a negative affect is seen? To accomplish this, 100% pomegranate juice with varying levels of ascorbic acid were created (0%, 0.003%, 0.013%, 0.023%, & 0.033%). Antioxidant amounts were measured using the Briggs-Rauscher reaction, which creates free radicals that, if antioxidants are present in the solution, slow down the oscillation occurring and therefore determine the approximate antioxidant levels. The solution of 0.003% ascorbic acid had the highest concentration of antioxidants. Even though not hypothesized, this result makes sense because, based on the first control used (pomegranate juice drink with 0.003% ascorbic acid), this

PERLA CASTANEDA *Big Foot High School*

The Use of Proteinase K in Extracting DNA from Sheep’s Blood

The purpose of this lab was to test if there is DNA in the plasma of a sheep. 3 tubes were filled with 7 ml of sheep plasma, then they were placed into hot water. After around 15 minutes about 0.001 g Proteinase K was added to 7 ml of water. After that 7 drops of the water and proteinase mixture were added to each of the tubes, then SDS was added as well as cold ethanol. To test if there was DNA I tested it with the DPA test, PH test and a solubility test. In the end of the experiment I came to a conclusion that there was DNA in sheep plasma.

ANAHIS FIGUROA *Big Foot High School*

Determining Whether Different Types of Light Affect Bacterial Growth in the Environment

The purpose of this experiment is to find out whether different types of light affect bacterial growth. In this experiment three trials, which consist of three petri dishes with animal bacteria, are conducted and in those three main trials are three mini trials. Trial 1 will be exposed in sunlight, Trial 2 will be exposed under LED lights and Trial 3 will be exposed under gamma radiated light. In summary, Trial 1 had the most amount of bacterial growth, Trial 2 was inconclusive and so was Trial 3.

was used for good reason. Once the level of artificial ascorbic acid went beyond 0.003%, its effects became negative, ultimately decreasing the concentration of antioxidants, therefore answering my question by saying that 0.003% is the most effective synthetic antioxidant amount for food product use.

ISOBEL MASON *Cashton High School*

Validation of Nitrogen Management Technologies for Corn in Wisconsin

Farmers all over the world are striving to make their crops as efficient and productive as possible, and nitrogen is a key component of plant growth. Therefore, finding the optimum use of nitrogen will be beneficial to all corn growers. There were two objectives of this experiment. The first, to gather more corn nitrogen data that will allow the Statewide MRTN database to be validated. This database provides a guideline for the amount of nitrogen to be applied to corn crops, based on soil type, previous crop, and other factors. The second objective is to assess the correlation of crop light reflectance measurements taken with a Crop Circle sensor (proximal active sensor) and a MicaSense RedEdge drone (aerial passive reflectance sensor) and also evaluate their ability to predict yield. These technologies measure two indices, NDVI and NDRE, which are the difference of two different wavelengths reflected by plants. From our results, we can conclude that the Economic Optimum Nitrogen Rate is 119 lbs/acre, which is consistent with the current nitrogen guidelines in our area for a 0.1 N: Corn Price ratio. Also, there is a 96% correlation between the Crop Circle measurements and drone measurements, which is excellent.

AFIYA QURYSHI *University School of Milwaukee*

Role of GATA4 in Early Gastrointestinal Tract Development

GATA4 is a transcription factor critical in the developmental process and early differentiation of the gastrointestinal tract. Studies using genetically modified mouse models have shown GATA4 is necessary for glandular stomach epithelium development, yet its role in humans is unknown.

We hypothesize that GATA4 is required for human stomach development. To address our hypothesis, we utilized the differentiation of human induced pluripotent stem cells (iPSC) into stomach organoids. The differentiation of iPSCs into stomach organoids recapitulates the stages of human stomach development in vitro. To study GATA4 during human stomach development, we generated an

BRYCE PETERSON *Big Foot High School*

Testing Organic Corn Products for GMO through PCR

I tested to see if organic corn products are truly organic because I wanted to know if producers were actually telling us the truth. I had read an article about Monsanto, an agrochemical company, suing organic farmers. They claimed that organic farmer’s crops were being pollinated by the Monsanto corn. The purpose of this research asked the question: Is organic cornmeal truly organic? This purpose led to the following hypothesis: If organic cornmeal and non-organic cornmeal is both tested for GMO then the organic will show up negative and the non-organic positive because the organic should not be processed or altered in anyway so it has genetically modified organisms in it. For the experiment, I went to the local grocery store and purchased organic and non-organic cornmeal. I then went through the whole process of PCR to isolate the GMO part of the DNA. And the thermal cycler would then rapidly reproduce that desired DNA. I then put them into wells in a 3% gel and let it run for 45 minutes. Then placed it in fast blast stain for a day and then looked at my results. This told me if they were telling the truth.

iPSC line that stably expresses an shRNA targeted against GATA4 (G4iPSC).

At day three, the endoderm stage, GATA4 was knocked down by 70% within the G4iPSCs as compared with control, however G4iPSCs generated endoderm efficiently. At day six of differentiation, posterior foregut buds formed in the control cell line and were propagated into stomach organoids. In contrast, the G4iPSCs produced almost no budding spheroids. To determine why budding morphogenesis was inefficient in the G4iPSCs, we evaluated the expression profile of markers known to be expressed in posterior foregut spheroids. HNF1b levels did not change, however SOX2 levels decreased in the G4iPSCs as compared with control. From preliminary data we can deduce that GATA4 is likely required for human stomach development and GATA4 levels have an effect on SOX2 quantities in posterior foregut spheroids. This study adds to the basis that patient derived iPSC cells may be utilized to better examine human development, disease and drug screening.

GRETA SCHMIDT *Verona Area High School*

Phenotypical Characterization of *pux1* Mutants in Response to GA3 Treatment

The phytohormone Gibberellin (GA) regulates numerous aspects of plant growth and development. CDC48/p97 is a homohexameric AAA-ATPase molecular chaperon that is negatively regulated by Plant UBX containing protein, PUX1. Preliminary data indicates that PUX1 interacts with the GA receptor GID1 (GA-INSENSITIVE DWARF1), and *pux1* loss-of-function mutants exhibit accelerated growth. The goal of this project was to further characterize the *pux1* mutants and determine if they behave like GA-insensitive mutants. Seed germination, root growth, and flowering time assays were performed in the model system Arabidopsis. Results demonstrated that the *pux1* mutants exhibited accelerate developmental growth compared to wild type in the mock treatment; however, when treated with exogenous GA, *pux1* mutants showed no response to the exogenous GA compared to wild type. More specifically, *pux1* mutants seed germination, flowering time and stem height was not affected by the addition of exogenous GA, unlike wild type control WS. This lack of response to exogenous GA that the *pux1* mutants display is due to the decreased sensitivity of the receptor to recognize GA. Overall, this data demonstrates *pux1* mutants behave like GA-insensitive mutants, further supporting the new role of GA in plant development through the regulation of PUX1.

