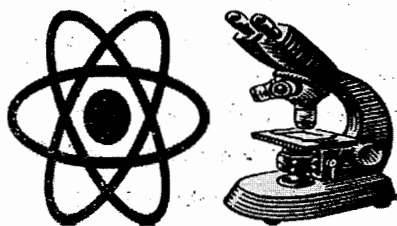


Francis "Bucky" Thompson
22nd Annual
Student Science Research
Symposium
Tuesday June 6th, 2017

Hoosic Valley



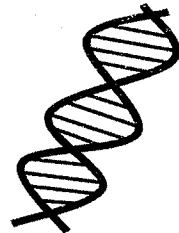
Research Program



Schedule



- ⊗ **Opening Remarks** 7:00
Paige Nightingale
- ⊗ **Keynote Speaker** 7:10
Kyle Pallozzi
- ⊗ **Presentations** 7:30
Darwin Honsinger
Katherine Rice
Matthew Rose
Paige Nightingale
- ⊗ **Final Remarks and Awards** 8:15
Mr. Myott
Research Program Director
- ⊗ **Posters and Desserts**
8:35
In The Cafeteria



The Student Science Research Program

Student Science Research is a 3-year college credit course associated with UAlbany through its University in the High School Program. Over the course of the 3 years students learn college level skills including presentation techniques, scientific writing, organization, and time management while completing research on a topic of their own choosing.

Students are expected to do a thorough Review of the Literature, develop a problem and/or hypothesis, and with the help of a professional with the expertise in that field, develop an appropriate methodology for testing their hypothesis. Once they have gained approval by the research Review Board, student researchers carry out the experiment, collect and analyze data, and draw conclusions.

Once their work is complete students are encouraged to submit their work for publication in an appropriate journal or to a competition such as the Junior Science and Humanities Symposium.

Each year the students must present their finished work or work to date as a PowerPoint and/or a poster before the general public. Which brings us to our 20th Annual presentation of student research at Hoosic Valley.

Keynote Speaker

Kyle Pallozzi

A Synoptic Climatology of Combined Severe Weather/Flash Flood Events

Classical forms of severe weather such as tornadoes, damaging convective wind gusts, and large hail, as well as flash flooding events, all have potentially large societal impacts. This impact is further magnified when these hazards occur simultaneously in time and space. It is a major challenge for operational forecasters to not only accurately predict the development and evolution of such combined events, but also to communicate multiple threats to the public in real time. This goal of this study is to gain further insight into combined severe weather/flash flooding events across the contiguous United States through the development of a seven-year climatology (2009-2015) of such events.

Combined severe weather/flash flooding cases were identified using reports from the NOAA Storm Data publication in conjunction with mosaic radar imagery. In order to focus on cases affecting mesoscale regions in time/space, a minimum threshold of 30 severe reports and 10 flash flood/flood reports was applied to identify candidate events. During the seven-year study time period 211 events were identified. Data from these events were analyzed to extract diurnal, seasonal and geospatial information about the events. Climatological results suggest that combined severe weather/flash flooding events are most common geographically in the Mississippi, Missouri and Ohio River Valleys, as well as the Lower Great Plains.

Paige Nightingale

Effects of Aromatherapy on Memory In Mice

The research that has been performed in the area of essential oils' effect on memory has produced mixed results. Rosemary oil has been shown to have a positive effect on memory in research done by Pengelly, et al. (2011) and Moss, et al. (2003). Peppermint oil however, has been shown to have mixed results. Moss, et al. (2008) showed that peppermint oil had a positive effect on memory, whereas Fox, et al. (2012), Zoladz, et al. (2005), and Manuel, et al. (2014) all showed peppermint oil to have no significant effect on memory. The purpose of this research was to test rosemary and peppermint oil on mice to see if the oils had a positive effect on their memory. The mice were tested using the Barnes Maze and the results were analyzed using single factor ANOVA. It was found that there was a statistically significant difference between the rosemary, peppermint, and control groups.

Acknowledgements:

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Katherine Rice

Discovery Learning In High School Mathematics

Discovery learning is a type of active learning where students work with their peers to come to their own conclusions about specific principles. Discovery learning encourages a questioning attitude and an inquisitive spirit in students. A review of literature shows that discovery learning is an effective way to enhance student learning in science classes. In addition, various claims have been made regarding the effectiveness of discovery learning in mathematics. The curriculum of high school mathematics classes has changed over the last several years to better adhere to the Common Core standards. These standards require students to develop a deeper understanding of mathematics through modeling problems, the use of logical reasoning, discussion with their peers, and critiquing the work of others. The purpose of this research is to determine whether discovery learning in mathematics has an impact on student learning. If discovery learning proves to be beneficial, it could help students succeed in Common Core math classes.

Acknowledgements:

I would like to thank my mentor, Dr. James Allen, the research class, Mrs. Suite and Mr. Frederick, and Mr. Myott and Mr. Pagano.

Darwin Honsinger

The Mycoremediation of Nylon-6

When synthetic is produced, a large portion of the components will be discarded as waste. This is seen with the manufacturing process of Nylon-6. Nylon-6 is a hydrocarbon commonly found in clothing and toys. Since it is a hydrocarbon, hypothetically, it can be degraded by mycelium.

Acknowledgements:

I would like to thank Mr. Pagano, my family, peers, and teachers for their support of the program and their support of my research.

Matthew Rose

The Effects of Sulforaphane on HIV Viral Load in Human Macrophages

Retroviruses are a class of viruses which include Human Immunodeficiency Virus 1 (HIV-1), Simian Immunodeficiency Virus (SIV), and Feline Immunodeficiency Virus (FIV). There is a protein that can be extracted from plants, known as sulforaphane (SFN), that has been shown to block HIV-1 infection in human macrophages. It works by turning on a set of about 100 genes in the Nrf-2 pathway. This action has been observed in human macrophages, but not human T-cells. Beyond these findings, the exact mechanism of the action is not known. This work may help shed light on how the protein works, adding another avenue for a possible cure.

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Braden Allen

The Dynamics of Water and Salt Stress In Plants

Plants, like all other organisms, are affected by stress in one form or another. Stress has various forms of effects on organisms, and can often be relieved by certain methods that are developed naturally, or are provided by an outside source. In plants, the quickest solution to this was to use various forms of chemicals or genetically modify them to survive such conditions. This research is focused on stress that is caused by salt and water in the soil, and which varying amounts have the most affect on plants. This research will also look at dynamics between the two stresses, and if the two can be used to balance a poor environment.

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Carolyn Burnell

Exercise and its Effects on the Brain

Physical exercise is not only important for the body's health, but it is also crucial for the brain. It can help to increase connections in the brain, boost brain stimulation, and effect the processing of information. Exercise is known to have beneficial effects on brain health and on cognitive function. It has been shown to improve attention, memory, learning, and cognitive performance. The Review of Literature has consistently shown that there is a positive relationship between exercise and hippocampal volume. The hippocampus is a region of the brain closely associated with memory. Significant increases in memory performance, academic achievement, and long term potentiation (LTP) may be an effect of physical activity. LTP strengthens synaptic connections and contributes to the long lasting signal transmission between neurons after repeated stimulation (in this research, exercise). The main purpose of this research is to determine whether or not physical activity has an impact on the brain's function in terms of recollection and processing. Also, this research will possibly direct towards determining the effect, if at all, of acute exercise on memory. This research is important because it aims to demonstrate how exercise could possibly be essential for the improvements of self-regulation skills and classroom performance in students of all ages.

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Taylor Hansen

Which Solar Cell Material is Most Efficient and Cost Effective?

The search for alternative energy has become a big demand worldwide, and because of this, the solar industry is flourishing. Today scientists are researching different materials on how to improve efficiency while lowering the cost. Silicon is the material that is currently dominating the market. However their efficiency is only 25%. Researching new materials and comparing them to each other will help convey which material will be the best for a residential home that is efficient and affordable. The materials that will be tested against each other are Copper Indium Gallium and Cadmium Telluride, because they have similar compounds; and Amorphous silicon and Gallium Arsenide will be tested since they are both thin-film materials. There are many materials that are currently being researched which won't be released commercially for a few years, however this shows that the solar industry is growing and will continue to grow for many years.

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I would like to thank my family, friends, and members of the Research Program, in addition to Mr. Pagano and Mr. Myott.

Christopher Hallam

The Effects of Sea Surface Temperature and Soil Moisture Anomalies on the 2016 Summer New York Drought

The topic of this research is the Effects of Sea Surface Temperature and Soil Moisture Anomalies on the 2016 Summer New York Drought. This research is meant to uncover the cause of one of the worst droughts to happen in New York State. The Drought began later in the spring in 2016 in western NY, and spread throughout the state. As much as ten percent of New York was in an extreme drought. In 2016, there was an El Nino in the Pacific, which may have been a large factor to the drought. Other anomalies may have existed in the Indian ocean, or even in the Atlantic ocean that could have caused this drought.

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I would like to thank Mr. Pagano, Mr. Myott, fellow research program members, and my family.

Braden Jarosz

The Integration of Music in Early Childhood Education

For over 25 years, a variety of research has been conducted in order to further investigate the impacts of music on the education process. Research in this field has mainly focused on what impacts musical training can have on young people with reading disorders and learning disabilities. Although extensive research has been performed in this field, there is a void that needs to be filled. The goal of this research is to look deeper into what way music should be integrated into the classroom environment in order to hold the most positive impact on the education process.

Acknowledgements:

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Special Thanks To:

Research Review Board

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Mr. Ryan, Mrs. Stover)

Mrs. Phillipone, the High School Librarian

Mrs. Adams, Jr/Sr High School Principal

Mr. O'Brien, Asst. Principal

Mrs. Goodell, Superintendent

Finally

Parents and Families,
who gave time to the preparation and
success of the symposium and their
continued support of the projects.

*Program By: Taylor Hanson, Braden Allen,
and Matthew Rose*