Welcome to the 32nd Annual Upstate New York Junior Science and Humanities Symposium (Upstate NY JSHS)! Plan to be amazed by the hundreds of high school students who demonstrate an extraordinary commitment to scientific research.

We have more than 500 science research students and teachers from 41 schools across New York State attending this year’s symposium.

The 69 students presenting their original scientific research as speaker or poster presenters over the next two days are the finalists from among 500+ talented science research students in upstate New York.

Congratulations to all student presenters whose vision and hard work have brought them to this milestone moment and to the teachers and mentors who form the science research in the high school team.

The research presented today is the result of the students’ hard work and passion for their projects, the guidance of trained teachers and scientist mentors, and the support of family and classmates.

The work of these students will be reviewed and judged by teams of scientist judges with expertise in the fields of research represented at the Symposium. In addition, science teachers serve as moderators and recorder.

This group of volunteer professionals ensures that the presenters’ works are given the full consideration and appreciation they so deserve.

The final five winners of the Upstate NY JSHS receive recognition, and an invitation to the 55th National JSHS held on April 26 – 30, 2017 in San Diego, California. The top two winners will present their research at the National JSHS.

We hope you enjoy the next two days of student presentations, special guest speakers, workshops, awards, food, and fun.

This year, we are able to provide three of the final winners at the Symposium with scholarships. First, second and third place winners will be awarded scholarships (1st place: $2,000; 2nd place: $1,500; 3rd place: $1,000) by the U.S. Army, Navy and Air Force, sponsors of the JSHS program.

As part of its ongoing support of JSHS, the American Chemical Society – Corporation Associates will award a $750 scholarship to the student with the most outstanding paper in chemistry.

We gratefully acknowledge the support of our sponsors, listed on page 39, who have made these scholarships and opportunities available to our presenters.

Enjoy the 32nd Annual Upstate New York Junior Science and Humanities Symposium!

Cover artwork designed by Fariha Fawziah, 10th Grader, Manhattan Center for Science and Mathematics
History of the
Upstate New York Junior Science and Humanities Symposium

The Upstate New York Junior Science and Humanities Symposium (Upstate NY JSHS) was founded in 1986. It is among the most prestigious fora for young scientists to present their original research in a symposium-style format.

Each spring in Albany, NY young scientists from high schools across New York State, present the results of original scientific research before more than five hundred science research students, teachers, mentors and judges. Their work is the culmination of a three year Science Research in the High School program that unites students, teachers and mentors in dynamic research. This program has cultivated future scientists from schools in every region of the state.

The students chosen this year to present at the Upstate NY JSHS are finalists from two regional symposia: one in the Capital District at Burnt Hills–Ballston Lake High School and one in Westchester at John Jay High School. Of the hundreds of students who present their papers at the symposia, only a select number are chosen statewide to present at the Upstate NY JSHS in Albany. This program has inspired hundreds of students to present their papers at the regional symposia.

At the Upstate NY JSHS, one finalist is chosen from each of five scientific disciplines and from these five, a final overall winner is selected. Scholarships are awarded to first, second, and third place winners. First and second place winners are given an expense paid trip to compete in the national JSHS for much larger scholarships and a trip abroad.

Those delegated to move on to the National Junior Science & Humanities Symposium will present their research and posters. Over the past fifteen years, the Upstate New York JSHS has produced winners at the National JSHS.

For more information on the Upstate NY JSHS, visit www.albany.edu/jshs/

Congratulations to the students at the 32nd annual Upstate NY Junior Science and Humanities Symposium

Karen E. Magee, President
Andrew Pollotta, Executive Vice President
Catalina Fortino, Vice President
Paul Pecorale, Vice President
Marlin Messner, Secretary-Treasurer

Representing more than 600,000 professionals in education, human services and health care.

www.nysut.org
Affiliated with AFT / NEA / AFL-CIO
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### Symposium Schedule

#### Tuesday, March 7, 2017

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<th>Event</th>
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<tr>
<td>10:00 a.m.</td>
<td>Registration for attendees, speakers, poster presenters and guests <em>(Outside of Ballroom)</em></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Speaker presenters load PowerPoints</td>
</tr>
<tr>
<td></td>
<td>Poster presenters set up posters in Campus Center <em>(Assembly Hall)</em></td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Registration, orientation, and lunch for judges, moderators and recorder <em>(Physics 129)</em></td>
</tr>
<tr>
<td>12:15 p.m.</td>
<td>Symposium opens <em>(Ballroom)</em></td>
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</table>

**Welcoming Remarks *(All must attend)***
- Dr. Edelgard Wulfert, Dean, College of Arts and Sciences, Professor of Psychology and Collins Fellow
- Lieutenant Commander Steve Bravo

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>1:00 – 4:30 p.m.</td>
<td>Concurrent speaker presentations <em>(Standish Room, CC375, Recital Hall, Main Theatre, and Studio Theatre)</em></td>
</tr>
<tr>
<td>4:30 – 6:00 p.m.</td>
<td>Posters judged and deliberation <em>(Assembly Hall)</em></td>
</tr>
<tr>
<td></td>
<td>Speaker sessions judged and deliberation <em>(Standish Room, CC375, Recital Hall, Main Theatre, and Studio Theatre)</em></td>
</tr>
<tr>
<td>6:15 p.m.</td>
<td>Awards Dinner</td>
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<tr>
<td></td>
<td>- Keynote Address by Dr. Melinda Larsen</td>
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<tr>
<td></td>
<td>- Announcements of American Chemical Society Scholarship for Best Paper in Chemistry by Dr. Craig Westphal</td>
</tr>
<tr>
<td></td>
<td>- Sessions Winners in Ballroom</td>
</tr>
<tr>
<td>8:30 p.m.</td>
<td>Students and teachers return to hotel</td>
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#### Wednesday, March 8, 2017

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:30 – 7:45 a.m.</td>
<td>Buffet style breakfast at hotel</td>
</tr>
<tr>
<td>8:15 a.m.</td>
<td>Students and teachers arrive in Campus Center</td>
</tr>
<tr>
<td>8:30 a.m.</td>
<td>Judges assemble in the <em>Ballroom</em></td>
</tr>
<tr>
<td>8:45 a.m.</td>
<td>Final speaker presenters load PowerPoints</td>
</tr>
<tr>
<td>9:00 – 10:45 a.m.</td>
<td>Final speaker presentations in <em>Ballroom</em></td>
</tr>
<tr>
<td>11:00 – 12:00 p.m.</td>
<td>Workshop by Mrs. Sabine Goetz Erickson: “Your Data Tell a Story: How Statistics Helps You Write the Story” <em>(Assembly Hall)</em></td>
</tr>
<tr>
<td>12:15 – 1:45 p.m.</td>
<td>Lunch and announcement of final Upstate NY JSHS winners <em>(Ballroom)</em></td>
</tr>
<tr>
<td>1:45 p.m.</td>
<td>Closing Remarks</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Return trip home</td>
</tr>
</tbody>
</table>
Upstate New York Junior Science & Humanities Symposium

Staff

Mr. Leonard “Len” Behr
Director of SRHS Program

Mr. Behr is a founding partner of the Science Research in the High School Program, where he continues to offer guidance, support, and training new and participating teachers. Before becoming involved with the SRHS and the University at Albany, Len taught Biology, Earth Sciences, and Science Research at Taconic Hills High School for nearly 30 years.

Dr. Timothy Lance
Upstate NY JS SHS Co-Director

Dr. Lance is a Distinguished Service Professor of Mathematics and Statistics and is also president and chairman of the board of NYSERNet, which provides Internet service to research universities throughout New York State. Dr. Lance’s involvement with Upstate NY JS HS has evolved over the years through partnership with former Director, Dr. Dan Wulff; starting as speaker judge to his current position as Co-Director.

Ms. Marissa Tanner
Upstate NY JS SHS Coordinator

Ms. Tanner is alumna of the 2009 class of the College of Saint Rose, where she graduated with a Bachelor’s degree from their Communications Program. Marissa has previously worked at the Union College Community Outreach Department (Kenney Community Center). In this position she gained experience working with another STEM based program known as STEP (Science Technology Entry Program).

Dr. Donald Orokos
Upstate NY JS SHS Co-Director

Dr. Orokos has been a member of the University at Albany Department of Biological Sciences teaching staff since 1995. He currently instructs courses in Cellular and Developmental Biology. In 2012, he became a Co-Director of the University at Albany’s Junior Science and Humanities Symposium. He also serves as Director of the Master’s in Forensic Biology program.

Ms. Kristine Newson
Upstate NY JS SHS Coordinator

Ms. Newson is an alumna of the 2015 class of University at Albany’s History Graduate Program. Before joining the JS HS staff in early 2017, Kristine worked with the SUNY System Administration Office of the Education Pipeline to extend STEM literacy and formal and informal STEM education opportunities to K-12 students.
HOW TO GET INVOLVED WITH THE UHS SCIENCE RESEARCH PROGRAM

The Science Research courses offered through the University in the High School Program are derived from a unique research initiative overseen by Mr. Len Behr of the University at Albany (formerly of Taconic Hills High School). Completing an approved training workshop is a required first step for gaining admission into the UHS Program. Once that has been done, teachers must request approval for their science research course curricula by sending a letter to the UHS office stating, in effect, that the workshop has been completed and that they agree to follow the guidelines of the Science Research Program as specified by Mr. Behr. The résumé and training certificate of the high school teacher who will be responsible for monitoring and evaluating students choosing to earn UHS credit must accompany any request for admission into the UHS Program.

UHS Science Research Course Descriptions:

A CAS 109 Intermediate Science Research
Students learn research methodology in the natural and social sciences by accessing scientific databases, by using online bibliographic search techniques, consulting doctoral-level research scholars, developing hypotheses and performing experiments to test them, and by writing research papers and making presentations at scientific symposia. It is expected that the students will have done many of these activities in the prerequisite high school course, and in this course emphasis is placed upon the formulation of hypotheses and initiation of experiments in consultation with mentors. Prerequisite(s): completion of one year of an approved course in science research at the high-school level; permission of instructor. Offered summer session only. Offered through the University in the High School Program only.

A CAS 110 Intermediate Methods of Research
Students learn research methodology in the natural and social sciences by accessing scientific databases by using online bibliographic search techniques, consulting doctoral-level research scholars, developing hypotheses and performing experiments to test them, and writing research papers and making presentations at scientific symposia. It is expected that the students will have done many of these activities in the prerequisite high school course, and in this course emphasis is placed upon performing experiments in consultation with mentors. Students are expected to spend at least three hours per week outside of class. Prerequisite(s): completion of one year of an approved course in science research at the high-school level; permission of instructor; available for year-long course of study only. Offered through the University in the High School Program only.

A CAS 209 Advanced Science Research
Continuation of work undertaken in A CAS 109 or equivalent with emphasis placed upon the completion of experiments in consultation with mentors. Students will consult with their teachers as necessary, but will not meet in a formal classroom period. Prerequisite(s): satisfactory completion of A CAS 109 or completion of two years of an approved science research course at the high school level; permission of instructor; offered summer session only. Offered through the University in the High School Program only.

A CAS 210 Advanced Methods of Research
Continuation of work undertaken in A CAS 110 or equivalent with emphasis placed upon the communication of results. Students are expected to spend at least three hours per week outside of class. Prerequisite(s): satisfactory completion of A CAS 110 or completion of two years of an approved science research course at the high school level; permission of instructor; students must be enrolled throughout an entire academic year to obtain credit. Offered through the University in the High School Program only.
Welcoming Remarks

Dr. Edelgard Wulfert
Dean, Colleges of Arts and Sciences, Professor of Psychology and Collins Fellow

Dr. Edelgard (Elga) Wulfert is Dean of the College of Arts and Sciences, Professor of Psychology and a University at Albany Collins Fellow. She received her Bachelor's degree from the Instituto Tecnológico y de Estudios Superiores de Occidente in Guadalajara, Mexico (1981), her master's degree (1983) and Ph.D. (1986) in psychology from the University of North Carolina at Greensboro, and she completed a clinical internship at Brown University.

Dr. Wulfert joined the University at Albany's Department of Psychology in 1988. She served as Director of the Clinical Doctoral Program (2001-03) and as Chair of the Department (2003-07). Dr. Wulfert is a highly regarded teacher and federally funded researcher with a distinguished career as a clinical psychologist.

Dr. Wulfert is the recipient of the University's Excellence in Teaching Award (1997), the Chancellor's Excellence in Teaching Award (1998), and the University's Excellence in Academic Service Award (2002). For many years, she has been very involved in faculty governance, has served as Chair of the University Senate (2001-02), and also has chaired or served on numerous Senate Councils, committees, and task-forces.

Lieutenant Commander Steve Bravo

Lieutenant Commander (LCDR) Steve Bravo is a commercial and technical leader for General Electric’s Renewables Commercial Operations team. He graduated from the U. S. Naval Academy in 2003 with a bachelor’s degree in ocean engineering, and received his master’s degree in Project Management from the University of Maryland, College Park. LCDR Bravo has held positions as a product manager for GE’s Power Generation and Renewables businesses, as well as the Junior Officer Leadership Program. Bravo has been assigned to various positions within the Navy: Personnel and Assistant Administration Officer with TACRON 21 (2011), Operations Officer for the Weapons Department of the Farragut Technical Analysis at the Office of Naval Intelligence in Washington, DC, and Air Logistics Officer and Tactical Air Control Watch Officer for the Amphibious Readiness Group (2
Art in Science Winner Chosen by Mr. Danny Goodwin, Associate Professor of Photography and Related Media

Mr. Danny Goodwin’s photographic, video and installation work has been seen in numerous solo and group exhibitions in the US and Europe, including galleries and museums in New York City, California, Belfast, Ireland; Washington, D. C., Belfast, Ireland; London, U.K.; Brussels, Belgium; and Oslo, Norway. Goodwin is a 2005 Fellowship recipient of the New York Foundation for the Arts (NYFA). His publication credits include Influence Magazine, Details Magazine, i-D Magazine, Pierogi Press, The Brooklyn Rail, The New York Daily News, The Washington Post, The Seattle Times, The Ft. Worth Star-Telegram and The Albany Times Union. He is Associate Professor and Head of Photography and Related Media in the Department of Art and Art History at the University at Albany, State University of New York. Previous academic appointments include Purdue University and the Cooper Union School of Art. He received an M.F.A. in Combined Media from Hunter College in 1992 and a B.F.A. in Photography from the School of Art at the University of North Texas in 1989.

The Art in Science Competition: How Science Research Inspired the Winner’s Art

Fariha Fawziah
10th Grader
Manhattan Center For Science and Mathematics

Inspiration: Fariha’s artwork was inspired by Fatou Waggeh’s Science Research Project titled: West African Anthropology. Fatou is a student in Ms. Evelyn Wing’s science research course

Anthropology is important because it sheds light on history and exposes us to different traditions and cultures. My artwork expresses West Africa's culture, including the enrichment in their jewelry and fashion as well as its local villages. Additionally, my artwork conveys the beauty and artistry of their culture. The inspiration for my artwork was based on Fatou Waggeh's research on West African Anthropology. She is investigating their genetic diversity and how that can be better represented by using improved DNA analysis techniques. Traditionally, regions of West Africa have been under represented and so Fatou is also studying ways increase sampling from these areas. My artwork is an attempt to blend the different regions together in order to reflect how a single person's DNA is a combination of various villages in West Africa.

Announcement of the American Chemical Society Scholarship for Best Paper in Chemistry by Dr. Craig Westphal*, Chair-Elect of the Eastern NY Section – ACS

Dr. Craig Westphal received his undergraduate education in Chemistry from Wittenberg University in Ohio followed by a Ph.D. in Analytical Chemistry from the George Washington University in Washington, DC. He has previously held scientific roles at DuPont and Chemours in corporate R&D roles, and is currently a senior manager at SABIC where he leads a team of analytical chemists in a corporate technology and innovation role. He is passionate about science and technology, and creating career development opportunities for the future scientists.

* Dr. Westphal is standing in for Dr. Siddhardtha Jain, Chair of the Eastern New York Section of the American Chemical Society. Regrettably, Dr. Jain is unable to present the ACS Scholarship for Best Paper in Chemistry. Thank you Dr. Westphal for agreeing to present this award.
We are honored this year to have Dr. Melinda Larsen as our keynote speaker.

Melinda Larsen, Ph.D. is an Associate Professor in the Department of Biological Sciences at the University at Albany, SUNY. Dr. Larsen obtained her B.S. in Biology from the University of Utah in 1993 and her Ph.D. in Cell Biology with David R. Rowley from Baylor College of Medicine in 1999. She completed her postdoctoral training with Kenneth M. Yamada at the National Institutes of Health in Bethesda, MD, from 1999-2006. Her core research interests are in understanding the molecular mechanisms driving salivary gland organ formation and in applying these mechanisms to stimulate salivary gland regeneration in therapeutic approaches. Over the past 10 years, she has supervised 14 graduate and 24 undergraduate students working in on these projects. Dr. Larsen is the author of more than 50 research publications. Her research is funded by two grants from the National Institutes of Health with her primary work being funded by the National Institute for Dental and Craniofacial Research. Dr. Larsen was awarded the Salivary Researcher of the Year Award in 2013 by the International Association for Dental Research. In 2014, she was awarded the President’s Excellence in Research Award by the University at Albany, SUNY and in 2016, she was awarded the Chancellor’s Award for Excellence in Scholarship by the State University of New York system.

Tonight Professor Larsen will speak about “Salivary Gland Morphogenesis and Regeneration”
Workshop
Statistics:
Your Data Tell a Story:
How Statistics Helps You Write a Story
By Mrs. Sabine Goetz Erickson
Wednesday, March 8th
(11:00 – 12:00 p.m.)

Sabine Goetz Erickson grew up in Huntsville, Alabama where the Marshall Space Flight Center is located. Her late father, an immigrant from Germany, worked on both NASA’s Saturn V and Space Shuttle Main Engine projects. It was her father, a true German rocket scientist, who inspired Mrs. Erickson to become a math teacher. She earned her B.S. in Mathematics from Birmingham-Southern College and her MA in Math Education from the University of Alabama at Birmingham, and spent over 14 years teaching in Jefferson County, Alabama. Mrs. Erickson served as math team coach and department chairperson there and taught courses ranging from Algebra I to AP Calculus. After moving to upstate New York with her family, she is currently teaching UHS Statistics and College Algebra at Burnt Hills-Ballston Lake High School. Mrs. Erickson is focused on introducing new technology into her classroom, specifically the TI Nspire graphing calculator with Navigator wireless system. Mrs. Erickson was named to the New York State Master Teacher program for STEM teachers in 2015, and believes that STEM education in the United States is more important than ever in our high-tech, data-driven world.
Undergraduate Admissions Tables (Outside Ballroom)

Your choice of college will affect a lot more than the next four years of your life.

This decision will lay the foundation for the person you become—the way you think and question, the friendships and connections you make, and the career path you pursue.

That is why we have provided you the opportunity to meet with UAlbany Undergraduate Admissions advisors. UAlbany is a university that provides academic excellence at a great value, a strong foundation to support its students and prepare them for academic and career success, and valuable, lasting connections among fellow students, faculty and alumni.

You will also find admissions flyers and materials from the following colleges and universities: Siena College, Union College, and Rensselaer Polytechnic Institute (RPI).

To request more information, visit www.albany.edu/admissions
Speaker Judges, Moderators, & Recorder

Speaker Judges:

Behavioral Sciences  
PAC, Main Theatre
- Dr. Sylvia Roch, Department of Psychology, University at Albany
- Dr. Paulo Forni, Department of Biological Sciences, University at Albany
- Dr. Greg Lnenicka, Department of Biological Sciences, University at Albany
  Moderator: TBA
  Room Supervisor: Abigail Jensky, UHS Scheduling/Curriculum and Evaluation

Biomedical Sciences  
PAC, Studio Theatre
- Dr. Cara Pager, Department of Biological Sciences, University at Albany
- Dr. James Castracane, College of Nanoscale Science and Engineering, SUNY Polytechnic Institute
- Mr. Richard Cole, Research Assistant Professor, School of Public Health, University at Albany
  Moderator: TBA
  Room Supervisor: Pierre Brown, UHS Secretary

General Biology & Environmental Science  
PAC, Recital Hall
- Dr. Scott Miller, Atmospheric Sciences Research Center, University at Albany
- Dr. Wendy Turner, Department of Biological Sciences, University at Albany
- Dr. Louise-Anne McNutt, Institute for Health and Environment, University at Albany
  Moderator: TBA
  Room Supervisor: Elizabeth Bastian, UHS Curriculum and Evaluation

Molecular and Cellular Biology  
Campus Center 375
- Dr. Haijun Chen, Department of Biological Sciences, University at Albany
- Dr. Pan Li, Department of Biological Sciences, University at Albany
- Dr. Robert Asuna, Department of Biological Sciences, University at Albany
  Moderator: TBA
  Room Supervisor: Elana Stein, UHS Assistant Director/Curriculum and Evaluation

Physical Sciences  
Standish Board Room
- Dr. Matthew Szydagis, Department of Physics, University at Albany
- Dr. Tim Lance, Department of Mathematics, University at Albany and NYSERNet
- Dr. Jan Halamek, Department of Chemistry, University at Albany
  Moderator: TBA
  Room Supervisor: Karsten Bischoff, UHS Registration and Enrollment

Final Session Judges  
Ballroom
- Dr. Bruce Dudek, Department of Psychology, University at Albany
- Dr. Eric Eisenbraun, College of Nanoscale Science and Engineering, SUNY Polytechnic Institute
- Dr. Ben Szaro, Department of Biological Sciences, University at Albany
- Dr. George Robinson, Department of Biological Sciences, University at Albany
  Moderator: Dr. Donald Orokos, JSHS Co-Director & Professor of Biological Sciences, University at Albany
  Recorder: TBA
**Poster Judges**

<table>
<thead>
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<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
<th>Session 6</th>
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<tr>
<td>Vincent LaMantia</td>
<td>Dhruv Patel</td>
<td>Petar Gajic</td>
<td>Mayara Oliveira</td>
<td>Chilubakwenda Mwenso</td>
<td>Diana Lalitsasivimol</td>
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<td>Kristen Forehand</td>
<td>Diana Nikolyan</td>
<td>Alex Puma</td>
<td>Cassandra Kane</td>
<td>Javier Vilcapoma</td>
<td>Melanie Lolier</td>
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<td>Molly MacIssac</td>
<td>Ben Dempsey</td>
<td>Elise Frejie</td>
<td>Thomas Banco</td>
<td>Mary Pham</td>
<td>Danisha Nandigma</td>
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<td></td>
<td>Narsrallah Mohamad</td>
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<td>Matthew Cacciola</td>
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*Poster judges are University at Albany undergraduate Students majoring in a science related subject*
Campus Map
To Session Room Locations

Campus Center:
Session: Molecular & Cellular Science – CC375, 3rd Floor
Session: Posters – Assembly Hall, 2nd Floor

Performing Arts Center:
Session: Behavioral Science – Main Theater, 1st Floor
Session: Biomedical Science – Studio Theater, Basement
Session: General Biology & Environmental Science – Recital Hall, 2nd Floor

Science Library:
Session: Physical Science – Standish Room, 3rd Floor
16 | P a g e

Speaker Sessions
(1:00 – 4:30 p.m.)

Behavioral Science
PAC Main Theatre

1:00 – 1:17 p.m.
The Effect of Stimulant Medications on the Academic Behaviors of Children and Adolescents with ADHD.
Paul Soden
Blind Brook High School, Rye Brook, NY 10573
Teacher: Dr. Michele Sugantino / Mentor: Dr. Peter Acker, Northeast Medical Group

Attention Deficit Hyperactivity Disorder (ADHD) is a neurological condition that causes various characteristic behaviors that are known to cause academic struggles in patients. Stimulant medications are often used as treatment to increase a patient’s academic potential. Although a great deal of research has gone into proving the effectiveness of simulants in treating these behaviors, this study aimed to investigate the correlation between treatment type and the increase in positive academic behaviors in ADHD patients. In order to determine this, a questionnaire was distributed to ADHD patients that discerned their academic behavior before and after treatment, which was described using adjectives. Each patient’s Composite Academic Index scores (CAIS scores), which assigned +1 point to positive adjectives and -1 point to negative adjectives, was then calculated. Following an Analysis of Covariance (ANCOVA), it was determined that, while controlling for ADHD Severity, the alternative medication group had higher average CAIS scores. This demonstrates that alternative medications are more effective in inspiring new and positive academic behaviors than stimulant medications, thus increasing patients’ academic potential to a greater extent than stimulant medications.

1:30 – 1:47 p.m.
Identifying Protective and Risk Factors Associated with Behavioral Misadventure in High Sensation Seeking Adolescents
Michelle Morgenthal
Byram Hills High School, Armonk, NY 10504
Teacher: Mr. David Keith / Mentor(s): Dr. Daniel Keating, Dr. Edward Huntley, and Dr. Meghan Martz; University of Michigan Institute of Social Research

This study examines a cohort of vulnerable adolescents, due to their high sensation seeking tendencies. The goal is to characterize protective and risk factors associated between youth high in sensation seeking and low in behavioral misadventure (HSS/LBM) in contrast with those high in sensation seeking and high in behavioral misadventure (HSS/HBM). A data analysis was conducted, drawing on a subsample of data derived from wave one of the Adolescent Health Risk Behavior Study (N = 2017) at the University of Michigan. A modified version of the Brief Sensation Seeking Scale (mBSSS) and the Behavioral Misadventure Scale (BMS) were used in our study to identify both groups. ANCOVA and MANCOVA were used to contrast the groups across demographics, protective factors, and risk factors. Race was a significant demographic factor, with Caucasians more likely to be in the HSS/HBM group than African Americans or Asians. BMI was identified as a protective factor against unsafe risk participation. Physical Activity was found to act as a significant risk factor. Contradicting previous research, Supportive Family Context, Pubertal Timing, School Engagement, Peer Influence, Socioeconomic Status, and Religiosity had null effects on the placement of adolescents in the groups.
Maternal Behavior Initiating Early Life Adversity and the Subsequent Neural and Behavioral Effects on Pups
Hannah Brown
Dobbs Ferry High School, Dobbs Ferry, NY 10598
Teacher: Ms. Erica Curran / Mentor(s): Mr. Joseph Pascale, Albany Medical College

Parental maltreatment can be classified in many different ways, and arise in various conditions. Whatever the abuse may consist of, early life adversity can cause significant alterations, both behaviorally and neurochemically, to the children who experience it. The purpose of this study was to utilize an animal model to answer the questions: 1) Which maternal behaviors are indicative of abuse or neglect, and what environments do these behaviors tend to arise in? 2) How does early life adversity affect a pup’s behavior in social interactions? 3) How do levels of C-fos, a stress hormone, vary with different qualities of attachment? Thirty-six videos of mothers interacting in a cage with their young pups were scored for specific behaviors, such as in and out of the nest, eating, or drinking. The conditions of both cages were the same in terms of size, food, and water, though the control group cage contained a sufficient amount of bedding while the experimental facility contained little to no bedding. In addition to this observation, two pups who had experienced abusive attachments were observed social interactions later in life to determine how the abuse affected their behavior. Furthermore, the brains of sixteen pups who had experienced maltreatment were stained for C-fos. Levels of the hormone in each brain were counted to determine the neurological effects of abuse and neglect.

In conclusion, mothers in cages with less bedding were more abusive and neglectful in that while they were physically with their pups more, they paid less attention to their care. Additionally, pups who had experienced abusive attachments behaved inadequately in social situations, though no large difference could be seen between C-fos levels in the brains of pups who experienced abusive attachments and those who did not.

The Effect of 3D Organ Models on Education
Sarah McKinsey
Harrison High School, Harrison, NY 10528
Teacher: Mr. Randy Gunnell / Mentor: Ms. Allison Blunt, Harrison High School

Learning anatomy has been a big part of the high school curriculum for years, this includes learning organ systems and organs individually. New methods are being invented to help students with their understanding of anatomy; one of these new technologies is 3D printed models. Experiments are being performed to determine if 3D printing really is a valuable method of learning the body, it was hypothesized that they would see a noticeable difference in the learning of students who are exposed to accurate 3D models. Data was taken by comparing groups of students who learned from 2D images and students who learned from 3D models. It was shown that providing a 3D model as opposed to the classical 2D model of instruction was beneficial in improving student understanding of anatomy, but not the students understanding of organ function. This paper will detail the results of comparing 3D models with 2D images and a methodology for comparing 2D images with 3D models and how it will impact the future. Further study will include analyzing how helpful 3D models are in high school curricula.
Quantifying the Effects of Transcranial Direct Current Stimulation on the Five Senses  
Nicole Gomez  
Fox Lane High School, Bedford, NY 10549  
Teacher: Ms. Stephanie Peborde Burke / Mentor: Dr. Marom Bikson, Biomedical Research Lab at the City College of the City University of New York

Transcranial Direct Current Stimulation (tDCS) is a neuromodulation technique that is used to study the brain–behavior relationship and to induce beneficial effects on motor, cognitive and affective functions. tDCS helps many patients in need of medical attention such as schizophrenia, depression, and other neuropsychiatric disorders. However, the side effects of tDCS stimulation cause many to experience discomfort. The side effects taken into account are affecting and altering the tactioception (touch), gustaoception (taste), ophthalmoception (sight), hearing (audioception), olfacoception (smell). The study aimed to investigate how three specific electrode montages and temperature of electrode sponges could affect the sensory receptor level. Electrode montages are determined locations of electrodes during the use of tDCS and the Motor Cortex Supraorbital(M1SO), Cathode Vertex and Chin electrode montage(VxCc), and the Anode Vertex and Chin (VxCa) were tested. Electrode sponges at 3°C-5°C and 25-35°C were tested. It was hypothesized that M1SO would yield the lowest intensity in side effects regarding five senses while VxCc would yield the highest intensity in side effects. During tDCS sessions, 25 subjects reported on each of the five primary sensations and quantified the intensity on a visual analog scale (VAS). The relationship between tDCS montage and the participants’ report on each sensation was statistically significant while the temperature of sponges reported to have an insignificant change on the side effects. The overall highest reported intensity was during the VxCc montage stimulation. This research can improve the effectiveness of the protocols and comfort with transcranial electrical stimulation in laboratories and clinics.

The Effect of Different Methods of Drug Education Programming on Young Adults  
Emily Hicks  
Pawling High School, Pawling, NY 12564  
Teacher: Ms. Gillian Rinaldo / Mentor: Dr. Kara Neunzig, Putnam Community Services in affiliation with Putnam Hospital Center

The use of heroin and prescription drugs is a rising epidemic in the Dutchess County Area. Abuse of prescription drugs is commonly found in young adults from the ages 18 to 25, and are the most cited drug found in overdose cases. Many youth obtain drugs from friends or peers who were prescribed the drug due to a medical condition such as ADHD. In many cases, use of these prescription drugs can lead to use of other drugs, such as heroin, once a stronger substance satisfies the addiction. Heroin is a central nervous system depressant that relieves pain. In the past, drug education programing has been unsuccessful at reducing the risk and use of drugs. Attitudes of students toward drug education programing has not been studied in Dutchess County. This study aimed to explore which method of drug education presentation would have the most effect on students’ attitudes: a live presentation, video presentation, audio presentation, and written transcript. Results showed that the live method of presentation caused the most change in the student’s attitudes whereas video had the least effect on the students’ attitudes. This information can help to develop the first truly successful drug education program for adolescents.
Comparison of Social Factors Versus per Capita GDP
Sophie Smith
Saratoga Springs High School, Saratoga Springs, NY 12866
Teacher: Ms. Fran Lohnes / Mentor: Dr. Necip Doganaksoy, Siena College

Gross Domestic Product (GDP) is a measure of the final domestic goods produced over one year in a given country. GDP reflects the production capabilities of a country, often signifying their economic sophistication. Economic prosperity is believably associated with social progress, stimulating the analysis of GDP versus social factors, as seen in this study. The variables compared to per capita GDP throughout this study were life expectancy, the percentage of females in the labor force, the percentage of women in the national parliament, internet users, mobile cellular subscriptions, high-tech exports, electric power consumption, access to improved water sources and primary education enrollment. Using accessible data from 2003, 2008, and 2013, the associations between these variables and GDP along with the variables which demonstrate the most differentiation among these country clusters were analyzed. Using the techniques of clustering and partitioning, the groupings of similar countries remained fairly consistent over the years. Throughout this analysis, GDP was consistently associated with internet users and mobile cellular subscriptions for the selected countries.

Ending Epidemics: With a Worm
Joseph Raphael
Briarcliff High School, Briarcliff Manor, NY, 10510
Teacher: Ms. Melissa Carnahan / Mentors: Dr. David Kaplan, Dr. Adrian Li and Dr. Nina Dinjaski, Laboratory of Biomedical Engineering, Tufts University

More than 17 million people die annually due to preventable infectious diseases. While science has developed amazing, life-saving antibiotics, these medications require constant refrigeration that is often unavailable in underdeveloped countries that lack the technology to support this “cold chain.” When better antibiotic stabilization techniques are developed, millions of lives will be saved.
My review of literature identified preliminary research indicating that the silk fibroin from the Bombyx mori silkworm has properties that could stabilize antibiotics from heat. My study bridged the gap between this preliminary finding and real world conditions that would occur during both antibiotic transport and storage in underdeveloped countries.
Beta-sheet crystalline structures of silk fibroin are physically able to intersperse with tetracycline. When the microscopic antibiotic is trapped inside silk's β-sheet structures, the medication is unable to speed up its movement and degrade. It is this physical reaction combined with the silk's robust mechanical strength that renders the medication heat stable.
My research tested if these same silk stabilization properties would protect tetracycline against ultraviolet (UV) light, a common climatic condition. The results indicate that while the silk stabilized antibiotics during heat exposure, UV light degraded antibiotic potency. In fact, it was observed that greater/longer UV exposure caused decreased potency in silk embedded antibiotics.
The research findings will ultimately enable us to utilize this scientific data in the field. We are now one step closer to making the cold chain a method of the past.
The Development of a Novel Two-Stage Hollow Fiber Filter to Reduce Pain on Injection of a Propofol Emulsion: A Feasibility Study

Conor Collins
Monroe Woodbury High School, Central Valley, NY 10917
Teacher: Mr. Jon Decker/ Mentor: Dr. Gregory Collins, Nephros, Inc.

Propofol is the most common anesthetic agent used in the United States, but 60% of the time patients feel pain on injection (Jalota et al. 2011). This pain is hypothesized to be from the free propofol in the aqueous phase (Doenicke et al. 1996). The aim of this study was to develop an adsorptive material filter that could reduce the free propofol. Hollow fiber membranes were selected as the adsorptive material. After different substances were compared to propofol, toluene was selected as a substitute for propofol, which is difficult to obtain without a prescription. Toluene was dissolved in water and a test dust added to create a two-phase mixture to simulate an injectable propofol emulsion. A two-stage hollow fiber membrane filter was designed to reduce the free toluene. After filtration, free toluene was measured using dialysis tubing and a spectrophotometer. A 28-33% reduction of free toluene was observed. Propofol may be more readily adsorbed due to its reduced solubility in water compared to toluene, which may lead to more effective hydrophobic binding and a greater reduction. The results were successful in proving the feasibility of the reduction of free propofol using a two-stage hollow fiber membrane filter.

Bacterial and Eukaryotic Microbes as Sources of Immune-Potentiating Small RNA

Eliana Johnston
Ossining High School, Ossining, NY 10562
Teacher: Ms. Valerie Holmes / Mentor: Dr. Carl V. Hamby, New York Medical College

The common cold and influenza have tremendous impacts, despite vaccinations. Short RNA strands derived from intergenic, non-coding regions of eukaryotes and prokaryotes have been recognized to prevent similar diseases in several organisms (not humans). Although previous research has concluded that small RNA (sRNA) ingestion by some animals prior to disease exposure offers significant immune protection, very little is known about the underlying mechanisms behind this phenomenon. This study investigated the effects of exposure to environmental stressors such as acidity, salt concentration, and lyophilization on sRNA release from both bacteria and yeast. The results show that the release of these sRNA is pH dependent and L. casei has a greater sRNA yield than S. cerevisiae (p<0.005). RNA sequencing revealed that sRNA released by L. casei, are encoded from a relatively limited subset of genetic loci including ribosomal RNA (rRNA), transfer RNA (tRNA), intergenic regions and some protein coding loci. These findings support earlier studies done in several different animal models that showed that ingestion of bacterial sRNA could protect animals from natural and experimental exposures to disease. Therefore, this research may provide the basis for utilizing harmless bacteria for the prevention of seasonal infectious diseases such as the common cold and influenza in humans.
Mechanisms of Neuroprotection by N-methyl-D-Aspartate Glutamate Receptor Modulators in an In-Vitro Model of Ischemic Stroke

Brianna Cauthen
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo, Ms. Valerie Holmes / Mentor(s): Dr. Patric Stanton, New York Medical College

Glyx-13, a novel antidepressant, is a functional partial agonist modulator on the NMDA receptor (NMDAR). Glyx-13 protects delayed neuronal death after stroke, but the mechanisms behind its neuroprotective abilities are unclear. This research sought to determine which NR2 variants are necessary for Glyx-13 to protect hippocampal neurons from oxygen glucose deprivation (OGD), and whether other NMDAR modulators show similar neuroprotective potential. Glyx-13 alone, Glyx-13 analogs, and co-applied NR2 selective antagonists, were applied to Sprague Dawley hippocampal slice cultures after OGD. 10μM Glyx-13 reduced neuronal death by 52% when applied immediately post OGD (p<.05), while the Glyx-13 analog, NYX, was neuroprotective by 60% (p<.001) and 80% in the CA1 region. The NR2A selective antagonist reduced Glyx-13 neuroprotection while the NR2B selective blocker attenuated Glyx-13 ability to protect hippocampal neurons. These findings provide new insight into the potential neuroprotective use of Glyx-13 and its analogs by indicating that these drugs normalize NMDAR activity after ischemic insults. In addition, Glyx-13 demonstrates neuroprotection by modulating both NR2A and NR2B-containing NMDARs. Development of new therapeutics for the treatment of post-stroke brain damage should focus NMDAR subtypes. Furthermore, these results contribute to the elucidation of the role of NMDA modulators in mitigating neuronal death after stroke.

Characterization of New B7 Immune-Checkpoints in the Tumor Microenvironment of Human Carcinoid and Pancreatic Neuroendocrine Tumors

Sarah Jacobson
Pelham Memorial High School, Pelham, NY 10803
Teacher: Mr. Steven Beltecas / Mentor: Dr. ZiQiang Yuan, Albert Einstein College of Medicine

The B7 family and their receptor the CD28 family are the major immune checkpoints that regulate T cell activation and function, making these pathways very attractive therapeutic targets. Two recently discovered members of the B7/CD28 family, B7x and HHAL2, have shown that they inhibit T cell proliferation and cytokine production in the presence of TCR signaling. Expression of costimulatory and coinhibitory molecules at the appropriate times and locations positively and negatively control the priming, growth, differentiation, and functional maturation of a T cell response. My study sought to characterize the role and molecular mechanisms of immune checkpoints in PNETs, and specifically, to test if the loss of the newly identified immune checkpoint proteins allow for T-cell activation and prevent the formation of PNETs. This study determined that B7x and HHAL2 serve to inhibit responses against PNETs and GI carcinoid tumors within the tumor microenvironment and found that B7x and HHAL2 are expressed significantly more in PNETS then they are in normal tissue. This research will help develop new immunotherapies for GI carcinoid tumors and PNETs for the treatment of PNETs, as well as shed light on the possible role of immune checkpoint proteins in the pathogenesis of PNETs.
Reconsidering the Geometry of the Liver Lobule
Gaurab Banerjee
Shaker High School, Latham, NY 12110
Teacher: Mr. Nathaniel Covert / Mentor: Dr. James Michaelson, Harvard Medical School/Massachusetts General Hospital

The liver is composed of functional subunits known as lobules. Liver damage is contingent upon the type of disease/toxin and the geometric zone of the liver lobule which is damaged. Thus, it is important to understand the primary shape of the lobule. Each liver process only occurs at a certain distance (zones) from the center of the lobule. Each liver disease only causes necrosis in certain zones. This study examines the validity of the widely accepted hexagonal prism lobule model. MicroCT was used to scan pig liver. Then, 3D Slicer was used to create three-dimensional models of the liver lobules. Graphical results displayed that the current accepted shape/vasculature of liver lobules is incorrect. Furthermore, a one sample t-test (p<.001) suggested that the mean number of faces on a lobule is not 8, as would be expected in a hexagonal prism. With a 95% confidence, we suggest that the liver lobule is a rhombic dodecahedron with 12 faces, not a hexagonal prism as was previously believed. By providing an accurate shape for the liver lobule and suggesting a divergence from the currently accepted vasculature, this data will assist in understanding targets for medical therapies of liver diseases.

Modulation of Thyroid Cancer Stemness by TGF-B and Metformin
Sidharth Anand
Yorktown High School, Yorktown, NY 10598
Teacher: Mr. Michael Blueglass / Mentor(s) Dr. Raj Tiwari, New York Medical College, Dr. Robert Bednarczyk, New York Medical College

Thyroid cancer is the most prevalent endocrine malignancy at large today. Of the approximately 500,000 people affected with the disease, roughly 20-30% have a form of recurrent disease caused by cancer stem cells (CSCs). These cells are resistant to traditional therapies including chemotherapy and surgery, and a CSC specific therapy does not yet exist. This study aimed at testing two molecules to see how CSCs could be modulated or regulated to inhibit recurrences. One such molecule was the anti-diabetic drug metformin, known to have anti-tumor properties and the other was TGF-β, a cytokine known to interact with cancer cells. Two thyroid cancer cell lines were tested- a papillary cell line TPC-1 and an anaplastic cell line 8505c. Assays were run to measure cell viability as well as the expression of two markers of cancer stem cell characteristics, CD44 and Vimentin. Results indicated a cancer-specific effect by these two molecules. Metformin showed potential as a therapy to decrease CSC characteristics in the papillary cell line, but indicated the need for further testing with adjuvant molecules in the anaplastic cell line. TGF-β did not produce conclusive results in either cell line, indicating the need for further study to fully elucidate its effects.
**Effects of Interseeded Cover Crops on Field Corn based on Weed Biomass, Corn Yield, and Ground Cover**

Alison Mann  
Mamaroneck High School, Mamaroneck, NY 10543  
Teacher: Mr. Guido Garbarino / Mentor: Dr. Michael Davis, Willsboro Research Farm

In this study, the impact of cover crops (plants established on farm plots to return nutrients to the soil and prevent erosion) on corn yield was tested. Corn is a main crop that needs multiple nutrients to grow—particularly nitrogen, phosphorus, and potassium—which are stored and sometimes produced by cover crops. Generally, cover crops occupy fields for an entire growing season, reducing profits for farmers. To address this issue, a method called interseeding (planting cover crops in between rows of main crops) is being introduced to allow farmers to grow cover crops and main crops simultaneously. I tested the impact of three cover crops: annual ryegrass, tillage radish, and a three-way clover mix consisting of white, red, and yellow blossom sweet clover, on corn yield, cover crop ground cover, and weed presence. With more ground cover, there is reduced soil erosion, lower weed biomass and higher corn yield. Often, cover crops become competitive with main crops. Therefore, these findings are valuable as they demonstrate that cover crops can prevent weeds and erosion without competing with the main crop.

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**Mitigating the Detrimental Effects of Elevated CO₂ and Soil Nutrient Depletion on Global Food Sources: How Nutrient Availability Impacts the Yield and Nutritional Composition of the Tomato Fruit**

Ben Radhuber  
Ossining High School, Ossining, NY 10562  
Teacher: Ms. Valerie Holmes & Mr. Angelo Piccirillo / Mentor: Dr. James Lewis, Fordham University

Manipulating soil nutrients in order to mitigate the detrimental effects of elevated CO₂ and soil nutrient depletion on crops is crucial to food security and overall human health. However, attempts should also be made to produce crops with minimal fertilizer as part of a strategy to lower greenhouse gas emissions and reduce eutrophication. This controlled study examined the effects of nutrient availability on the yield and nutritional composition of one of the most integral foods in the human diet—the tomato fruit (*S. lycopersicum*)—in preparation for a changing climate. Two tomato cultivars (n=60) were grown in a greenhouse in five different limited soil nutrient treatments. Levels of chlorophylls and total carotenoids were extracted from mature fruits and measured spectrophotometrically. Soil nutrient availability was found to affect both the yield and nutritional composition of each cultivar. Results suggest that N and P infusion in the soil maximized tomato fruit yield in both cultivars, and that Zn is less important to tomato fruit yield (p<0.0001). Results also suggest that while K and P significantly increases carotenoid levels in both the grape (p<0.0001) and cherry (p=0.0001) tomatoes, Zn is essential for maximizing chlorophyll production (p<0.01). Additional results indicate that cherry tomatoes may be more tolerant to nutrient-poor soil than grape tomatoes (p<0.0001). These novel findings have substantial global public health implications, as strategically manipulating soil nutrients to maximize crop quantity and quality as atmospheric CO₂ levels inevitably rise is essential to food security.
2:00 – 2:17 p.m.

Interleukin 22 Counteracts Corticosteroid Inhibition of Small Intestinal Organoid Growth: Implications as a Potential Novel Graft-Versus-Host Disease Treatment

Lorenzo Muranelli
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo & Ms. Valerie Holmes / Mentors(s): Dr. Alan Hanash & Dr. Marco Calafiore, Memorial Sloan-Kettering Cancer Center

Allogeneic hematopoietic stem cell transplant (AHSC) is a common therapy for hematologic malignancies, but is often associated with a severe complication: graft-versus-host disease (GVHD). GVHD occurs when transplanted donor cells attack tissues in the recipient, initiating an immune response. Standard treatment includes corticosteroids to alleviate inflammation and pain; however, corticosteroids have their own adverse side effects. The present study attempted to elucidate if corticosteroids may impair the growth of the small intestinal (SI) organoids, reminiscent of normal SI crypt structure, as a model of the effects of corticosteroids on intestinal tissue in vivo. In addition, this study sought to determine the effects of a combined corticosteroid treatment with the cytokine Interleukin 22 (IL-22), which has been identified as a promoter of SI regeneration. Organoids were cultured ex vivo from mice and treated with corticosteroids, IL-22, or a combination of both. Findings revealed that organoids treated with corticosteroids had a dose-dependent decrease in size (p<.001), indicating growth inhibition. Moreover, IL-22 counteracted this inhibition and augmented organoid size in the presence of corticosteroids (p<.0001); this remained consistent in the duodenum, jejunum, and ileum of the SI (p<.05). The present study provides novel evidence for the protective effects of IL-22, which in combination with corticosteroids can potentially treat GVHD patients.

2:30 – 2:47 p.m.

The Use of Cell Competition to Regulate Bilateral Symmetry in Drosophila Through the Ligand Spatzle

Aishwarya Govindarajan
Pawling High School, Pawling, NY 12564
Teacher: Ms. Gillian Rinaldo / Mentor: Dr. Laura Johnston, Columbia University Medical Center

The regulation of bilateral symmetry through mediation of various molecules is essential for normal development. Bilateral symmetry involves the symmetrical development of paired appendages, on polar sides of the organism’s body. Symmetry is suspected of being regulated through induction of cell competition. Cell competition requires cells of higher fitness to promote appendage growth, in strict regulation of the transcription factor *Myc*. Cell competition is an end-result of cellular communication. In cellular communication, a receptor, or an intracellular molecule, sends a signal to an extracellular ligand. Signals transmitted are amplified through a biochemical cascade/pathway. Transmission of this signal allows for a larger cellular response to occur. In some cases, this response is cell competition. In this research, the ligand Spatzle was investigated to determine its role in cellular competition and regulation of bilateral symmetry in the developmental process of *Drosophila*. Results showed that while Spatzle does not conserve symmetrical area of wings, the length of the wings maintained. It is currently unknown why this occurs, and genetic properties of Spatzle must be further investigated. Information discovered in this research can be used to further investigate diseases that affect the symmetrical growth of appendages in humans as well as other organisms.
3:00 – 3:17 p.m.

DNA Discordance in Scarlet Macaws (*Ara macao*)

James Chandler  
Pelham Memorial High School, Pelham, NY 10803  
Teacher: Mr. Steven Beltecas / Mentor: Dr. Matthew Aardema, The Sackler Institute for Comparative Genomics, at The American Museum of Natural History.

The Scarlet Macaw is a parrot species inhabiting a region stretching from Southern Mexico to Northern Brazil, and is divided into two subspecies: *Ara macao cyanoptera* in the north and *Ara macao macao* in the south. Local researchers have noted that *Ara macao cyanoptera* has conservation related concerns, as many countries in Central America have noted population decline of the Scarlet Macaw. The species as a whole, however, is classified as least concern, as the majority of the South American population is healthy. This study utilized captively bred macaw sample from Costa Rica to investigate DNA discordance, wherein mitochondrial and nuclear DNA yield different results. This is because many genetic studies of the past twenty years relied upon mitochondrial DNA alone, and now may have questionable accuracy. This study concludes that DNA discordance is present in Macaw samples. In the process, this study produced some genetic observations that justify a more robust conservation effort for the northern subspecies of Scarlet Macaw.

3:30 – 3:47 p.m.

Potential Allelopathic Effects of *Fallopia japonica* on the Growth of Gametophytes of *Atrichum angustatum* and *Thuidium delicatulum*

Jessica Palmeri  
Rondout Valley High School, Accord, NY 12404  
Teachers: Dr. Ticknor, Mr. Sicheri / Mentor: Dr. Erik Kiviat, Bard College

Japanese knotweed (*Fallopia japonica*), an ornamental native to East Asia, has become widespread in Europe and North America, and due to its highly aggressive nature, has become recognized as one of the world’s most invasive species. Studies have shown it to reduce species richness by 66 to 86 percent and demonstrated its ability to produce negative allelopathic effects on the germination and growth of many vascular plants. To date, however, no studies have investigated the allelopathic effects of knotweed on non-vascular plants. Therefore, the aim of this study was to determine the effects of Japanese knotweed allelochemicals on the gametophyte growth of two non-vascular plants; star moss (*Atrichum angustatum*) and delicate fern moss (*Thuidium delicatulum*). Both moss species were exposed to aqueous rhizome extracts from Japanese knotweed in concentrations of 0%, 10%, 25%, 50%, and 75% for a total of nine days. All concentrations resulted in significant biomass losses (*p*<0.05), with the greatest losses occurring in the groups exposed to the 50% and 75% concentrations which lost over 80% of their initial biomass.
Transient Visual-Evoked Potentials as a Novel Biomarker for Autism and Phelan-McDermid Syndrome
Lauren Singer
Scarsdale High School, Scarsdale, NY 10583
Teacher: Mr. Jeremy Szerlip / Mentor: Dr. Alex Kolevzon, Seaver Autism Center at Mount Sinai Hospital

1 in 68 individuals is diagnosed with an Autism Spectrum Disorder. Currently, autism diagnosis is based solely on behavioral assessment; no objective, medically-based biomarkers have been identified. A biomarker is a biological characteristic that can be accurately measured and indicates a specific medical state. An autism biomarker could help diagnose children who are difficult to evaluate because of language or cognitive impairment, and could also assist in diagnosing children earlier in life, even during infancy. This is critical because early intervention is highly effective in helping children with autism gain valuable skills. This study used a tool called transient visual-evoked potentials (tVEP) to examine excitatory and inhibitory signaling in the brains of typically-developing children (TD), children with idiopathic autism (iASD) and children with Phelan-McDermid Syndrome (PMS), a subtype of autism caused by deficiency of the SHANK-3 gene. Differences in signaling patterns could be the basis of a biomarker. As hypothesized, children with idiopathic autism showed smaller amplitudes in tVEP waveforms than typically developing children. Children with PMS showed even smaller amplitudes than children with iASD. Additionally, children with a SHANK-3 deletion showed smaller amplitudes than children with a SHANK-3 point mutation.

Blood-Brain Barrier Permeability in Endothelial-Specific Rab7+/- Mice with Experimental Autoimmune Encephalomyelitis
Zachary Gold
Ardsley High School, Ardsley, NY 10502
Teacher: Mrs. Diana Evangelista / Mentors: Dr. Dritan Agalliu and Julian Smith, Columbia University Medical Center

Multiple Sclerosis (MS) is a neurodegenerative disease characterized by T cell infiltration past the blood-brain barrier (BBB). It is thought that Rab7, a small GTPase, promotes the degradation of junction proteins that are responsible for sealing the BBB from T cell infiltration. In order to assess whether BBB integrity would be maintained by a reduction in the expression of Rab7, Rab7+/- mice with experimental autoimmune encephalomyelitis (EAE), an animal model of MS, were evaluated. These mice exhibited improved BBB protection, as indicated by decreased CD4+ T cell infiltration past the BBB (51.542±7.537 cells vs. 89.438±15.313 cells in WT, p<.05). This decrease in BBB permeability was associated with an observed protection of the junction proteins β-catenin, ZO-1, and cavin 2. Further, a decreased BBB permeability was associated with a decrease in percent demyelination (18.814±1.363% in 34.613±7.664% in WT, p<.05) as well as an overall reduction in peak clinical score severity (3.7±0.9 mice vs 0.9±0.5 in WT EAE mice, p <.01). Thus, genetic reduction of Rab7 in EAE mice was shown to be associated with reduced BBB permeability and decreased severity of EAE-associated symptoms.
Mutations in the ACVR Type I Receptor that Drive Fibrodysplasia Progressiva are Also Found in Certain Tumors
Jacqueline Marie Contento
Briarcliff High School, Briarcliff, NY 10510
Teacher: Mr. Michael Inglis / Mentor: Dr. Dana M. Alessi Wolken, Regeneron Pharmaceuticals

Fibrodysplasia Ossificans Progressiva (FOP), a skeletal disease characterized by heterotopic ossification (HO), is caused by ACVR1 mutations, most commonly the R206H mutation. ACVR1 mutations have also been identified in patients with Diffuse Intrinsic Pontine Glioma (DIPG), a terminal pediatric brain cancer. Unlike the wild-type receptor, the R206H mutant receptor signals in response to Activin, an atypical ligand. Thus, my project investigates whether the mutations associated with cancers have similar signaling profiles compared to mutations that drive FOP. First, the variants were introduced into ACVR1 and transfected into HEK293 cells with a BRE luciferase reporter, allowing Smad1/5/8 signaling to be measured. After two cell sorts, BRE luciferase assays were performed using WT and R206H as controls. All lines overexpressed ACVR1 but to different degrees, seen through a Western Blot and Flow Cytometry. Results showed that all FOP mutations signaled through pSmad1/5/8 in response to Activin A/B. All but one of the cancerous mutations (D185G) responded to Activin A/B, suggesting a similar mechanism as in FOP. DIPG cancer tumors have increased phosphorylation due to ACVR1 mutations, which may aid abnormal cell growth. An Activin A blocking antibody may serve as a therapeutic for FOP and DIPG patients.

New Frontiers in Toxicogenomics Based on Fused Regularization and Rank Restricted Machine Learning
Alexander Paskov
Edgemont High School, Scarsdale, NY 10583
Teacher: Ms. Maria DeCandia / Mentor: Dr. Julian McAuley, Computer Science Department, University of California, San Diego

The single most important code that we have today is DNA. Decoding it holds the promise for revolutionizing our ability to understand human health and treat or altogether prevent cancer, diabetes, Alzheimer’s, and countless other diseases. To help achieve this reality, I propose and efficiently apply a novel machine learning framework based on a windowed N-Gram representation of DNA coupled with Fused Regularization that leverages location information of genetic variations. My “codebreaking” approach to DNA differs significantly from past efforts in that it requires no external biological expertise or manual hand tuning of features. Instead, I utilize a feature representation and machine learning methods that automatically identify patterns and signals in the data. I apply this approach to data from the DREAM Toxicogenetics Challenge, whose goal was to analyze human sensitivity to toxic compounds. My best method improves the accuracy of the winning DREAM Challenge method by 87% on average and shows that genotype data contains enough information for predicting cytotoxicity. As such, my methods present a fundamental advance in our ability to work with genomic data, and can be applied to a wide variety of DNA-based machine learning tasks.
Predicting Protein Turnover Using Genome-Scale Protein-to-mRNA Concentration Ratios
Adriana Scanteianu
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo, Ms. Valerie M. Holmes / Mentor: Dr. Marc Birtwistle, Icahn School of Medicine at Mount Sinai

The quantification of intracellular protein concentrations is crucial for accurate cell-fate predictions, which facilitate diagnoses and treatment of cancer, prenatal development, and neurodegenerative diseases. Research has long depended on transcriptomic data to approximate protein levels; however, this approach fails to account for post-translational regulatory mechanisms, resulting in inaccurate predictions of protein concentrations: mRNA concentrations vs. protein turnover $R^2$~0.1. This research explored a recently developed method of estimating protein turnover using gene-specific ratios of protein-to-mRNA concentrations to account for translation and protein degradation rate constants. GTEx and HPM databases were used to access 14 post-mortem adult human tissue characterizations in “steady-state,” and subsequently generate gene-specific protein to mRNA concentration ratio averages across tissues. Ratio averages (n~14,000) were then used in combination with tissue-specific mRNA concentrations to determine protein concentrations per gene. Results indicated that ratios are variable genome-wide, yet remain relatively constant across different tissues. Pairwise analysis revealed that variation in gene-wise ratios corresponded in most pairs of tissues (mean $R^2$=0.59, P<.005), and phenotypically distinct tissues (e.g. cerebral tissue types) could be identified from low pairwise correlations. These results were validated by calculation of ratios and predictions of protein concentrations in healthy breast MCF10A and glial U87 cell lines using experimental data. Overall, findings showed increased accuracy of protein turnover predictions in large-scale and experimental data: expected vs. actual protein turnover $R^2$~0.6 (P<.005), thus advancing biological simulation technology that can identify disease onset and optimal treatment.

Isolation of a High Affinity DNA Aptamers for Cyclosporine A Using the Capture-SELEX Method
Nikhil Shah
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo & Ms. Valerie Holmes / Mentor: Dr. Nenad Milosavic Columbia University Medical College

This research employed a novel Capture-SELEX method to isolate and characterize the structure of high affinity aptamers for Cyclosporine A (CsA), an immunosuppressant drug frequently used to treat a wide variety of immune-system related conditions, from Graft versus Host disease to Rheumatoid Arthritis. Previous research has yet to use the Capture-SELEX method to isolate aptamers for CsA, or quantitatively measure the affinities of aptamers already isolated for CsA. After cloning, eight aptamers were found to have a common sequence ATAG. After qualitatively comparing the affinities of the eight aptamers, three novel aptamers were found to have the highest affinity within the family and the most promise for CsA detection. Quantitative affinity analysis, represented by Kd, showed one aptamer, Csa-28, to have a Kd of approximately 9.014nM, which is significantly below the concentration of CsA in the blood (1.247 µM to 3.325 µM). This indicated that Csa-28 is an extremely viable candidate for aptamer-based CsA detection. The identification and isolation of these aptamers can provide a novel molecular tool that can be used to develop aptamer-based Therapeutic Drug Monitoring and aptamer-based electrochemical assays for CsA.
**3:30 – 3:47 p.m.**

**Autism and Genetics: The Role of AUTS2 in the Pathology of Developmental Disabilities in In Vitro Neurodevelopment**

Katie Miles  
Sleepy Hollow High School, Sleepy Hollow, NY 10591  
Teacher: Ms. Janet Longo-Abinanti / Mentor(s): Dr. Aris Economides and Dr. Ge Zhou, Regeneron Pharmaceuticals

It is estimated that 1 in 6 children in the United States are affected by a developmental disability. These afflictions can range in severity, on the more severe side being Autism, Intellectual disability, and developmental delay, all of which can be characterized by motor, speech cognitive and behavioral dysfunctions with impairment in growth and development of the central nervous system. This study focused primarily on autism, focusing on an associated gene, AUTS2*, and the development of autism. AUTS2’s function has not been established and therefore the goal of this study was to test the effects of a AUTS2 mutation on neurodevelopment from human stem cells. The mutation in the gene was created with a technology called CRISPR editing, which allows for a site-specific mutation on the genome. This cell line was then compared to a cell line with no mutation. Both were differentiated into neurons to see how development would be affected. Immunostaining, image-J quantification, RNA sequencing and western blots were done to analyze the cells and cell expression proteins. The results show differences in cell morphology, number and size of cells, and neuron marker expression. These indicate the irregularities of neurons from the mutated AUTS2 lineage, and its implications in developmental disabilities.

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<thead>
<tr>
<th>Physical Science</th>
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**Swift XRT and UVOT Investigation of Low-Mass X-Ray Binary 1RXS J180408.9-342058**

Audrey Saltzman  
Byram Hills High School, Armonk, NY 10504  
Teacher: Mr. David Keith / Mentor: Dr. Jon Miller, The University of Michigan

The radii of neutron stars are difficult to determine, and there is little consensus regarding the correct models for neutron star spectra. Here, the spectra of observations taken by the *Swift* X-ray Telescope (XRT) of the neutron star in the low-mass X-ray binary (LMXB) 1RXS J180408.9-342058 were analyzed. Using the spectral continuum method, a determination of radius was attempted. The spectra were best modeled using a blackbody to account for thermal emission and a power law to account for the inverse Compton effect. The model parameter values and the radius are reported for each of the observations, providing a longer term look at the star’s outburst behavior. Because the color correction factor is unknown, a physically realistic radius could not be calculated; therefore, the minimum and maximum color correction factor for each observation were determined using realistic radii from the literature. An analysis of UV wavelengths was also conducted using data from the *Swift* Ultraviolet/Optical Telescope (UVOT). This study is one of the first to trace the UV and X-ray thermal evolution simultaneously for a LMXB with a transient neutron star. In one of the clearest detections to date, the UV flux was determined to be due to reprocessed emission.
Using an Inertial Navigation System (INS) and a Laser Range Finder (LRF) to Create a Novel Electronic Navigational Aid (ENA) for the Blind

Isabelle Chong
Byram Hills High School, Armonk, NY 10504
Teacher: Mr. James Gulick / Mentor: Dr. Yao Wang, New York University Tandon School of Engineering

The current navigation aid of choice for the blind is the white cane, which, although lightweight and easy to acquire, has a limited range and requires extensive training to use. While Electronic Navigational Aids (ENAs) have been developed to improve upon the white cane, the need for certain environmental conditions and preconfigured infrastructure in some approaches (e.g., radio frequency identification and structured light) remains an issue. My objectives were to (1) design the conceptual and mathematical methodology of an ENA for device location and obstacle detection without the use of preconfigured infrastructure, (2) build an ENA by combining a Laser Range Finder (LRF) and an Inertial Navigation System (INS), (3) code a real-time algorithm for obstacle detection and Kalman filtering in C++, and (4) test my ENA’s functionality from both an engineering and human subjects standpoint to obtain quantitative and qualitative feedback. The completed ENA can detect obstacles within a six meter range without preconfigured infrastructure, raising an alarm to the user through sound and haptic feedback if an obstacle has been detected. This device has the potential to provide a robust alternative method of blind navigation in the future.

The Development of an Unmanned Aerial Vehicle for Use in Silo Inspection:

Samantha Boyea
Greenwich Central High School, Greenwich, NY 12834
Teacher: Mrs. Nicole Dixson / Mentor: Mr. Glenn Saunders, Rensselaer Polytechnic Institute

Small scale farms are responsible for producing 70% of food worldwide. Of this food produced a large amount is stored in structures called silos. Silos are agricultural containment vessels often cylindrical in shape that are mainly used for the storage of grain and silage. Inspections are performed in order to ensure the integrity, stability, and safety of the structure. However, these inspections require human risk due low oxygen conditions and the presence of dangerous gases such as nitrogen dioxide within the silo. In order to remedy this, a drone, or UAV could be employed to enter and inspect the silo when it is unsafe for a farmer to do so. The first step in constructing a UAV capable of accomplishing this objective would be to construct a lightweight yet durable frame made of carbon fiber. The drone will use first person view (FPV) in order to inspect both the interior and exterior of the silo. In order to more easily interpret the location of the drone when out of sight a radio telemetry sensor will be used to allow key flight data, such as speed, to be seen by the operator. The UAV was able to successfully transmit location data.
2:30 – 2:47 p.m.

**Solar Powered UV-c Treatment for Bacteria in Storm Water Overflow**

Megan Ploch  
Pelham Memorial High School, Pelham, NY 10803  
Teacher: Mr. Steven Beltecas / Mentor: Mr. William Saksen and Dr. Chengyue Shen at HDR Engineering

After a heavy rainfall, beaches are closed and swimming is prohibited. Sewers fill to capacity and are unable to handle the combined sanitary and storm water, thus causing water to overflow directly into local bodies of water making it unsafe for public use. The purpose of this study is to determine whether solar powered UV-c light is an effective disinfectant in treating bacteria from storm water overflow prior to the discharge into receiving water. The study is also to determine whether or not solar power would be an effective power source for the UV-c light, making the entire system completely sustainable. Treating the pollutants caused by sewage overflow can dramatically help sustain recreational waters. I first tested my apparatus in a controlled environment. The device was connected to secondary effluent from a local wastewater treatment plant, where the flow rates were monitored. After UV-c light was determined to be a successful treatment method, the light was connected to a mechanical float switch. A solar panel with a 12-volt battery was used for storage. The intention is to decrease the amount of colonies enough to meet the federal limit of 104 coliform forming units for marine bathing.

3:00 – 3:17 p.m.

**Thiol-ene Reaction Kinetics for the Formation and Modification of Polyethylene Glycol (PEG) Hydrogels with Tissue Engineering Applications**

Annling Wang  
Scarsdale High School, Scarsdale, NY, 10583  
Teacher: Mr. Dylan Prendergast / Mentor(s): Dr. Guohao Dai, Rensselaer Polytechnic Institute

As organ transplantation continues to fall short as a widely accessible treatment for patients with degenerative tissue, tissue engineering has come to light a therapeutic alternative with high potential. Tissue engineering, in the most general terms, is a process modeled after embryonic development that is able to yield fully functionalized tissue. During this process, cells are incorporated onto three-dimensional scaffolds, where they are introduced to a range of bioactive molecules from which they receive biological cues. In this study, the thiol-ene reaction used in the formation and modification of polyethylene glycol (PEG) hydrogels was characterized.

An Ellman’s Assay was used once more to track the thiol-ene reaction’s speed and efficiency in the attachment of tripeptide RGD under varying photoinitiator and UV-light conditions. Most significantly, the results indicated 2,2-Dimethoxy-2-phenylacetophenone (DMPA) to be an ineffective photoinitiator when used in conjunction with the thiol-ene click reaction. The second photoinitiator, Lithium phenyl-2,4,6-trimethylbenzoylphosphinate (LAP), however, was observed to work efficiently even at concentrations as low as .5mM. These findings serve to bolster the PEG hydrogel as an excellent candidate for scaffolding biomaterial, a critical element of the tissue engineering process.
3:30 – 3:47 p.m.

High Performance Cellulose Nanocrystal-Based Ultrafiltration Membranes for Treating Oil-Contaminated Water

Vincent Li
Spackenkill High School, Poughkeepsie, NY 12603
Teacher: Ms. Amy Matts / Mentor: Dr. Benjamin Hsiao, Stony Brook University

Oil leaks from pipelines and wells contaminate drinking water for millions of people worldwide. Major problems with commercial ultrafiltration (UF) membranes used to treat oil-contaminated water, such as PAN400 and PS35, include limited separation efficiency and fouling by oil, which decreases permeation flux and energy efficiency over time. In this study, I designed and developed novel three-layer UF membranes based on cellulose nanocrystals (CNCs) prepared by sulfuric acid hydrolysis of wood pulp. CNCs offer many desirable properties, including high hydrophilicity, high surface-area-to-volume ratio, great mechanical strength, and facile green synthesis using abundant biomass. To fabricate the CNC-based membranes, I prepared CNCs and cast them onto an electrospun polyacrylonitrile (PAN) / non-woven polyethylene terephthalate (PET) nanofibrous scaffold. I employed transmission electron microscopy (TEM) and scanning electron microscopy (SEM) to analyze CNC dimensions and membrane morphology. During an oil/water separation test, the CNC-based membranes exhibited 4-5 times higher flux than PS35 and 60-90% higher flux than PAN400, with high oil rejection of 98% to above 99%. Additionally, the CNC-based membranes showed more stable flux, demonstrating their anti-fouling ability. Ultimately, CNC-based membrane filtration represents a sustainable, high performance, and cost-efficient approach to purify oil-contaminated water. This research was supported by the Simons Foundation.

4:00 – 4:17 p.m.

Bio-Inspired Airfoil Modifications and Their Effects on Wind Turbine Noise and Power Output

Mark Worsley
Somers High School, Lincolndale, NY 10540
Teacher: Mr. William Maelia / Mentor: Dr. Daniel Shannon, United Technologies Corporation

Although wind turbines are powerful sources of green energy, they have an important drawback: they produce a loud pounding aerodynamic noise while spinning, which serves as a deterrent to the construction of wind turbines near homes and businesses. The objective of this study is to develop a quiet bio-inspired wind turbine blade equipped with modifications that mimic natural noise reducing features: trailing edge serrations, which mimic owls' wings; leading edge tubercles, which simulate whale flippers; and artificial canopies, which replicate forest canopies. A model wind turbine fitted with interchangeable 3D printed blade assemblies was spun in an anechoic chamber and a wind tunnel at various wind speeds and angles of attack to measure the effect of each modification on sound levels and energy production. While a combination of the three modifications did not reduce overall noise levels, they shifted the frequency intensity spectra away from the 20-200 Hz range, which is the low frequency noise thought to be most responsible for human annoyance. Additionally, the tubercles improved power output at 8° and 12° angle of attack by 50 percent, while all other blade modifications exhibited similar efficiencies to the control blade. Since the novel bio-inspired modifications were validated as practical and quiet wind turbine blade enhancements, they may allow for the increased construction of wind farms and thus improve the green energy infrastructure available to communities.
CONGRATULATIONS TO THE 2017 PARTICIPANTS
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Ask us about our Science, Technology, Engineering and Math (STEM)-based programs.

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Poster Sessions
Campus Center Assembly Hall
(4:30 – 6:00 p.m.)

Session 1:

1. The PAT Protein Family: A Genomic Analysis of the Evolutionary Origins and Evolved Molecular Characteristics
Kruti Sutaria
Ardsley High School, Ardsley, NY 10502
Teacher: Mrs. Diana Evangelista / Mentor: Dr. Valerie Clerin, Pfizer Pharmaceuticals

2. Sulfamethoxazole and Ciprofloxacin Resistance in Benthic Microbial Stream Communities
Kaveri Gowda
Briarcliff High School, Briarcliff Manor, NY 10510
Teacher: Ms. Melissa Carnahan / Mentor: Dr. Emma Rosi-Marshall, Cary Institute of Ecosystem Studies

3. Exploring Alopecia: The Examination of Sexual Dimorphisms, the Appearance of Lesional/Non-Lesional Patches in Alopecia Areata Patients, and the Identification of Select Genes of Interest
Jamie Begleiter
Byram Hills High School, Armonk, NY 10504
Teacher: Mrs. Stephanie Greenwald / Mentor: Dr. James Chen, Columbia University Medical Center

4. The Effect of an Unknown Distance on Race Performance
Angela Castronuovo
Carmel High School, Carmel, NY 10512
Teacher: Ms. Nicole Monaco / Mentor: Mr. Patrick McGinn, Carmel High School

5. Design of a Secure Symmetric Key Block Encryption Algorithm Using Reversible Partitioning Cellular Automata
Federico Reyes Gómez
Edgemont High School, Scarsdale, NY 10583
Teacher: Ms. Maria L. De Candia / Mentor: Mr. Lorenzo Bivens

Session 2:

1. Species-Specific of Coccolithophores’ Growth Rates and Calcifications to Various Light Intensities: A Comparative Study of the Specials Emilania huxleyi and Coccolithus pelagicus
Yasamin Bayley
Byram Hills High School, Armonk, NY 10504
Teacher: Mr. David Keith / Mentor(s): Dr. Glen Wheeler and Professor Colin Brownlee, Marine Biological Association of the United Kingdom

2. The Distribution of Fishers in Westchester County
Jared Ortega
Carmel High School, Carmel, NY 10512
Teacher: Dr. Lois Barish / Mentor: Dr. Chris Nagy, Head of Research at the Mianus River Gorge
3. The Effect of Various Substrates on the Size and Reproductive Health of *Crassostrea virginica* and on Reef Diversity in the Hudson Raritan Estuary
Claire Hotchkin
Horace Greeley High School, Chappaqua NY 10514
Teacher: Dr. Trudy Gessler / Mentor: Dr. Allison Fitzgerald, Professor of Biology, New Jersey City University

4. Neutrophil-Endothelium Interactions in Metabolic Syndrome
Melanie Anaya
New Rochelle High School, New Rochelle, NY 10801
Teacher: Mr. Jeff Wuebber / Mentor: Mr. Gregory Joseph

5. Acculturation Alters the Interpretation of Specific Emotions Conveyed through Facial Expressions
John Kim
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo, Ms. Valerie Holmes / Mentor: Dr. Maria Gendron, Northeastern University

6. Larval Caffeine Consumption Alters Adult Sleep in Wild-Type *Drosophila melanogaster*
Eric Jess
Saratoga Springs High School, Saratoga Springs, NY 12866
Teacher: Ms. Fran Lohnes, Mr. Peter Robinson / Mentor: Dr. Christopher G. Vecsey, Skidmore College

Session 3:

1. Criminal Personality: The Difference between Criminals and the Lawful
Emily Schalkham
Carmel High School, Carmel, NY 10512
Teacher: Ms. Nicole Monaco / Mentor: Ms. Maureen Karoglanian, Carmel High School

2. Magnetic Resonance Spectroscopy Quantifiable Metabolite Differences in Civilian and Military Subjects
Justin Keller
Horace Greeley High School, Chappaqua NY 10514
Teacher: Susan Moore / Mentor: Dr. Alexander P. Lin, Center for Clinical Spectroscopy, Brigham and Women’s Hospital

3. Upstream Target Regulation of miR-34 in Response to Global Ischemia
Ana Acevedo
New Rochelle High School, New Rochelle, NY 10801
Teacher: Mr. Jeff Wuebber / Mentor: Dr. Jee-Yeon Hwang, Albert Einstein College of Medicine

4. Protective Effects of Therapeutic Hypothermia on Neuronal Survival Using a Fruit Fly Model
Mark Zhinin
Ossining High School, Ossining, NY 10562
Teacher: Mr. Angelo Piccirillo / Mentor: Dr. Richard Zeman, New York Medical College
5. The Evaluation of Head Accelerations in Men’s Varsity Lacrosse
David Friedman
Sleepy Hollow High School, Sleepy Hollow, NY 10591
Teacher: Mrs. Michele Zielinski / Mentor: Dr. Mark Herceg, Westchester Country Department of Community Mental Health

6. Investigation on the Dispersion of Particulate Matter in Synthetic Turf when Impacted
Eitan Laredo
Somers High School, Lincolndale, NY 10540
Teacher: William Maelia / Mentor: Mr. Jim Laredo, IBM TJ Watson Research Center

Session 4:

1. High Mass Planet Spiral Shocks as a Source of Infrared Emission from Protoplanetary Disks
Blake Hord
Dobbs Ferry High School, Dobbs Ferry, NY 10522
Teacher: Ms. Erica Curran / Mentor: Dr. Wladimir Lyra, California State University at Northridge

2. The Role of TGF-β Signaling in Astrocyte-Motor Neuron Interactions in ALS
Jackson Mingle
John Jay High School, Hopewell Junction, NY 12533
Teacher: Dr. Linda Burke / Mentor: Mr. Silas Maniatis, New York Genome Center

3. Investigating the Effects of Video Games on Spatial Ability and Persistence in Adolescents
Gregory Vutera
Ossining High School, Ossining, NY 10562
Teacher(s): Mr. Angelo Piccirillo, Mrs. Valerie Holmes / Mentor: Dr. Valerie Shute, Florida State University

4. Extraction of Ethanol from Food Waste as an Alternative Fuel
Dawn Kershaw
Pawling High School, Pawling, New York 12564
Teacher: Ms. Gillian Rinaldo / Mentor: Dr. Lawrence Pratt, CUNY Medgar Evers College

Unnas Hussain
Shaker High School, Latham, NY, 12110
Teacher: Mr. Nathaniel Covert / Mentor: Dr. Carl Ventrice Jr., SUNY Polytechnic Institute

6. Implementation of a Trilateration-Based Beacon System Using Ultrasonic Distance Measurements for Robotic Localization
Nathan Reynolds
Somers High School, Lincolndale, NY 10540
Teacher: Mr. William Maelia / Mentor: Dr. Scott Reynolds, Tavish Design, LLC
Session 5

1. The Effect of Nadir Hematocrit During Cardiopulmonary Bypass for CABG Surgery on Quality of Care, Specifically Acute Kidney Injury
   Simrit Uppal
   John Jay High School, Hopewell Junction, NY 12533
   Teacher: Mrs. Ann Marie Lipinski / Mentor: Dr. Donald Likosky, University of Michigan Hospital

2. CD16 Expression by Natural Killer Cells is Heightened in a Model of Infantile Spasms
   Lior Raz-Farley
   Ossining High School, Ossining, NY 10562
   Teacher: Mr. Angelo Piccirillo / Mentor: Dr. Libor Velisek, New York Medical College

3. Comparative Transcriptome Analysis of Adult MSCs and Multipotent Adult Stem Cells Using RNA-seq
   Andra Sullivan
   Pawling High School, Pawling, New York 12564
   Teacher: Ms. Gillian Rinaldo / Mentors: Dr. Paul Lucas & Ms. Jessica Black, New York Medical College

4. Meta Analysis of Altered Gait Dynamics in MPTP Induced Experimental Parkinsonism
   Prachi Mishra
   Shaker High School, Latham, NY, 12110
   Teacher: Mr. Nathaniel Covert / Mentor: Dr. Supriti Samantaray, Medical University of South Carolina

5. Cracking the Complex: New Insights into the Interactions Between FSFG Repeats and NTF2 in Nuclear Pore Complex
   Ryan Stasolla
   Westlake High School, Thornwood, NY, 10594
   Teacher: Mr. Lawrence McIntyre, Westlake High School / Mentor: Dr. Samuel Sparks, Albert Einstein College of Medicine

6. A Multidimensional Approach to Understanding the Mechanism Behind Sympathetic Nervous System Remodeling in Beige Fat
   Anisha Duvvi
   Yorktown High School, Yorktown Heights, NY 10598
   Teacher: Mr. Michael Blueglass / Mentor(s): Dr. Paul Cohen, Mr. Jingyi Chi, The Rockefeller University

Session 6:

1. Immediate and Transient Alterations in Brain Function Induced by Repetitive Firearm Recoil
   Jonathan Sinopoli
   Burnt Hills - Ballston Lake High School, Burnt Hills, NY 12027
   Teacher: Mrs. Regina Reals / Mentor: Mr. Linden Wyatt, University of Rhode Island

2. Europium Doped Silica Nanoparticles for Enhanced Luminescence of Cancer Detection
   Karina Heaton
   John Jay High School, Hopewell Junction, NY 12533
   Teacher: Mrs. Ann Marie Lipinsky / Mentor: Mr. Edwin C. Pratt, Memorial Sloan Kettering Cancer Center
3. Visualization Mitigates the Performance Anxiety of Springboard Diving Athletes
Alec DeCaprio
Ossining High School, Ossining, NY 10562
Teacher: Mr. Angelo Piccirillo / Mentor: Dr. Bradley Scott, Middlebury College

4. WNT Pathway Modulation and GSK-3 Inhibition Promote Myelination in Preterm Rabbits with Intraventricular Hemorrhaging
Ehsan Ahmed
Pelham Memorial High School, Pelham, NY 10803
Teacher: Mr. Steven Beltecas / Mentor: Dr. Praveen Ballabh, Albert Einstein College of Medicine

5. The Effect of TiO2 on the Surface Temperature of Turf Fields
Ethan Wilens
Sleepy Hollow High School, Sleepy Hollow, NY 10591
Teacher(s): Michelle Zielinski, Janet Longo-Abinanti / Mentor: Mr. Vincent Cook, Pocantico Hills School District

6. Polymers to Detect Strain: Novel Methods to Develop Multiresponsive Mechanochromic Polymer Systems
Emily Huang
Yorktown High School, Yorktown Heights, NY 10598
Teacher: Mr. Michael Blueglass, Ms. Rachel Koenigstein / Mentor(s): Dr. Luyi Sun, Songshan Zeng, University of Connecticut, Institute of Materials Science

GENERAL NATIONAL JSFS INFORMATION

On behalf of the research offices of the military, the Academy of Applied Science is pleased to announce the 55th National Junior Science & Humanities Symposium (JSHS), scheduled April 26-30, San Diego, California. The National JSHS will bring together 230 high school students who qualify for attendance by submitting and presenting original scientific research papers in regional symposia held at universities nationwide. Approximately 130 adult leaders, high school teachers, university faculty, ranking military guests, and others attend and join in encouraging the future generation of scientists and engineers and celebrating student achievement in the sciences.

The primary aims of JSHS are to promote original research and experimentation in the sciences, engineering, and mathematics at the high school level, and publicly recognize students for outstanding achievement. By involving talented students and their teachers in affiliated symposia, and by recognizing students’ research endeavors through scholarships and other awards, JSHS aims to encourage continued interest and participation in the sciences and ultimately to widen the pool of trained scientific and engineering talent prepared to conduct research and development vital to our nation.

Participation
All regional symposia student finalists are invited to present their research at the 55th National JSHS. The top two regional delegates are invited to compete for military-sponsored scholarships by presenting their research in oral sessions held on Friday. All other regional delegates are invited to present their research in poster sessions held on Thursday. Sessions will be organized by disciplines that are designated by the students during the registration process (abstract and paper submission). All sessions will be held at the Hyatt La Jolla.

Visit http://www.jshs.org for program highlights and scheduled activities.
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Edmund Optics
University at Albany
# Schools Participating in the 32nd Annual Upstate New York Junior Science and Humanities Symposium

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We wish to extend a special thanks to our volunteers for contributing their time and talents to make the Upstate New York Junior Science and Humanities Symposium the best experience it can be!

**Sub-regional Directors:** The students who are presenting their original research at the Upstate NY JSHS are finalists from two sub-regional events that are held during January and February in New York State. The sub-regional directors who make these symposia possible are:

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<th>Eastern JSHS</th>
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<td>Ann Marie Lipinski</td>
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<tr>
<td>Burnt Hills–Ballston Lake High School</td>
<td>John Jay High School</td>
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**Additional Symposium Assistance:** Special thanks to all the students and teachers who have volunteered to help. The Symposium would not run smoothly without everyone’s generous help and consideration. Thank you to all the judges and moderators and to everyone else who helped with registration and AV equipment.
The University in the High School Program at the University at Albany was established in 1983 within the former College of Humanities & Fine Arts, now part of the College of Arts & Sciences. The UHS Program was originally designed as an innovative way to provide students in Capital Region high schools with the opportunity to earn University at Albany credit for advanced study in the foreign languages. The Program has since expanded to include course offerings in over 30 subject areas.

UHS Program courses provide students with the academic challenges of college-level curricula during their final year(s) of high school. As a "bridging" experience to college, UHS courses can help students begin to develop the skills and experience necessary for academic success in higher education. Enrollment in UHS courses may provide future opportunities to students, such as the ability to enroll in higher-level college courses or to complete a four-year degree in a shorter amount of time.