NEWSLETTER

NEW JERSEY ACADEMY OF SCIENCE
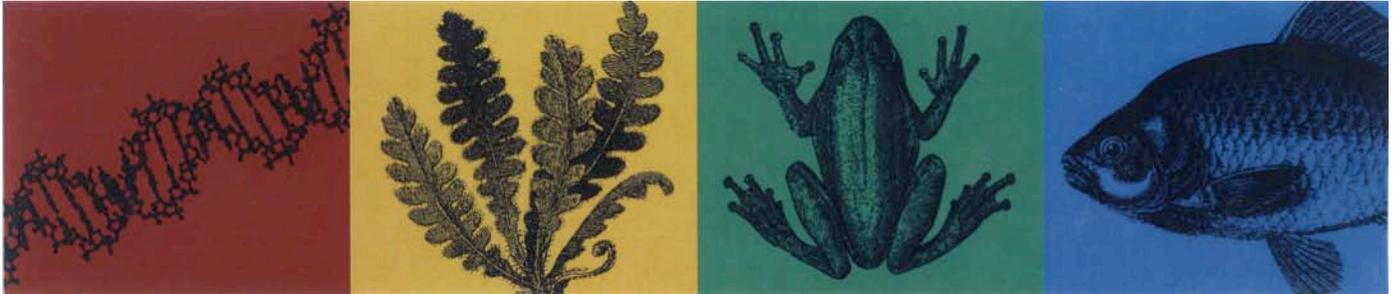
Volume 43, Number 1   Winter Issue 2012

TABLE OF CONTENTS

To all who in 2011 were NJAS members . . . . . THANK YOU.

We now seek your continued support for the valuable work of the Academy and hope that you will renew your membership for 2012.

The New Jersey Academy of Science, an affiliate of the American Association for the Advancement of Science (AAAS), sponsors programs that reach thousands of high school and college students throughout New Jersey. Funding for the Academy's activities in science and science education relies on individual and corporate memberships, and tax deductible contributions made by active members.

The NJAS 57th annual meeting will be held on Saturday April 21, 2012 at Seton Hall University. We hope you will attend, and perhaps consider presenting your research and/or volunteering to serve as a judge for this year's oral and poster student presentations. Visit www.njas.org and the Seton Hall website (http://blogs.shu.edu/njas/) for more annual NJAS meeting details as the meeting nears. Meeting registration information will be online this year and is currently open.

I look forward to working with you to help prepare today's students to be the next generation of scientists, engineers, and decision-makers.

If you have not done so already, please consider renewing your NJAS membership for 2012 by completing the application for membership renewal that is here enclosed. It is especially important that we have your email address, as we are moving the NJAS Bulletin to an electronic format for members. We will continue to print the Bulletin for our Library members, but in an attempt to provide access and reduce our carbon footprint, articles and issues will now be available as pdfs for members.

Lastly, I am appealing to you to become an active member of NJAS. For some individuals, this means membership in the Academy. For others it is participating in the annual meeting, reviewing GIA proposals, judging student presentations or serving on the board. Each of these avenues is appreciated by the Academy. This is your academy and it is only as good as its' members. Please get involved and support the mission and activities of the Academy. If you would like to become more involved, please contact us and we will use your talents to their greatest potential.

Sincerely,

Paul Bologna, Ph. D.
President of NJ Academy of Science (NJAS)

ANNUAL MEETING ANNOUNCEMENT

The NJAS 57th annual meeting will be held on **Saturday April 21, 2012** at Seton Hall University. For meeting information and electronic registration, please visit: http://blogs.shu.edu/njas/. Important dates: **Abstract Submission Deadline-**March 16th; **Registration Closes-**March 30th. Please be advised that Junior academy registrants interested in sharing their research *must* give an oral presentation, while Senior Academy members have the option to give an oral presentation or to present a poster.

There will be *two* keynote speakers for this year's meeting, Dr. Matias Zaldarriaga, Professor of Natural Sciences at the Institute for Advanced Study and Dr. Amitabha Bose, Professor of Mathematical Sciences at New Jersey Institute of Technology.

Lastly, as we are always in need of Judges, if you are able and willing to serve as a judge for Junior or Senior Academy presentations, please contact Mitra Shojania Feizabadi (shojanmi@shu.edu) or Paul Bologna (bolognap@mail.montclair.edu). Your assistance, as always, is greatly appreciated. We look forward to seeing you all at the meeting!

PLEASE JOIN US IN WELCOMING OUR NEW NJAS EXECUTIVE BOARD MEMBERS

SONIA ARORA: TREASURER
Dr. Arora is currently Assistant Professor of Biosciences at Kean University's New Jersey Center of Science Technology & Mathematics (NJCSTM). She is also member of Kean University's Institutional Review Board (IRB) and chair of NJCSTM's curriculum development committee. Prior to joining Kean University, Dr. Arora was NIH's Post-doctoral Fellow in Cancer Biology & Bioinformatics at UMDNJ. She obtained her Ph.D. in Cell & Molecular Pharmacology from Rutgers University, NJ and Masters in Biochemistry from All India Institute of Medical Sciences, India. Dr. Arora has several years of experience in teaching molecular cell biology, biochemistry and pharmacology to both undergraduate and graduate students. Dr. Arora's research interests involve investigating mechanisms of tumorigenesis and developing novel anti-cancer therapies using molecular modeling and cellular biology approaches. She has published extensively in various peer reviewed journals and also holds several drug discovery patents in this field.

MITRA SHOJANIA- FEIZABADI: SCIENCE PROGRAM, ANNUAL MEETING CHAIRMAN
Dr. Shojania- Feizabadi has received her Ph.D. in Biophysics from Virginia Tech and currently holds a position an Assistant Professor in the department of physics at Seton Hall University where she is involved in a broad range of activities including teaching, research, and interdisciplinary collaborative studies. Dr. Shojania Feizabadi focuses on the theoretical and experimental study of microtubule dynamics and cell division.

REBECCA LYDDON: JUNIOR ACADEMY DIRECTOR
Rebecca received her B.S. in Biotechnology from Cook College, Rutgers University in 2005. During her time there, she spent a summer working at Teva Pharmaceuticals in quality control and then worked part-time at Colgate-Palmolive as a Formulations Scientist as part of the Cook College Co-op program. After graduation, Rebecca worked for a year as a microbiology technician for startup in Hoboken testing a novel sterilization process for medical instruments. Since August of 2006, Rebecca has been a Neuroscience PhD student at Mount Sinai School of Medicine where she studies aberrant mRNA editing of neurotransmitter receptors as potential molecular correlates to suicide in the context of psychiatric disease. She expects plans to defend her dissertation in May 2012. Rebecca has participated in the NYAS Afterschool STEM Mentoring Program with middle-school students in Bronx, NY as a part of the NYAS Education Scholar Fellowship program and is committed to community outreach and enhancing science education. She looks forward to bringing her varied experience back home to New Jersey to help inspire and guide young scientists of the NJAS Junior Academy as they begin their own journeys.

Please keep in mind that we still have a number of vacant executive board positions and welcome new members to get involved and join our board. See Page 1 for currently open positions.

Congratulations to those who were awarded top honors at the NJAS 2011 Annual Meeting!

Junior Academy Winners:
Best Student Presentations

Cellular and Molecular Biology
1st Place: **Sanjana Salwi**
                 High Technology High School
2nd Place: **Elizabeth Dente**
                 Bergen County Academies
3rd Place: **Michelle Guo**
                 Bergen County Academies

Chemistry
1st Place: **Hari Ravichandran**
                 High Technology High School
2nd Place: **Lisa Zahray**
                 High Technology High School
3rd Place: **Angela Han**
                 High Technology High School

Computer Science
1st Place: **Jacob Buckman**
                 High Technology High School
2nd Place: **Kevin Karol**
3rd Place: **Stephen Guo**
                 High Technology High School

Physics and Mathematics
1st Place: **Zachary Darby** & **Jeffery Mooneyham**
                 High Technology High School
2nd Place: **Ashwin Iyer**
                 High Technology High School
3rd Place: **Alex Lew**
                 High Technology High School

Psychology and Behavioral Science
1st Place: **Maya Epelbaum**
                 Morristown High School
2nd Place: **Kim Gokberk**
                 High Technology High School
3rd Place: **Emma Korolik**
                 High Technology High School

Health and Medicine
1st Place: Tie: **Catherine Wong**
                 Morristown High School
                 Emma-Tei Kyono
                 Montclair High School
3rd Place: **Janice Sung**
                 Bergen County Academies

Ecology and Environmental Science
1st Place: **Katherine Fullerton**
                 Biotechnology High School
2nd Place: **Jacqueline Corcoran**
                 High Technology High School
3rd Place: **Justin Forman**
                 High Technology High School

The 1st and 2nd place Junior Academy Winners have been nominated to the National AJAS Meeting.

Senior Academy Winners:
AAAS Best Student Presentation:
     Luke Diglio, Montclair State University

Best Graduate Presentation:
     Luke Diglio, Montclair State University
2nd Place Graduate Presentation:
     Maria Madsen, Montclair State University

Best Undergraduate Presentation:
     Beatrice Markiewicz, Fairleigh Dickinson
                 University

Best Graduate Poster:
     Caitlin Ament, Montclair State University
2nd Place Graduate Poster:
     Kristen Kwasek, Montclair State University

Best Undergraduate Poster:
   Mashhood Sheikh, William Paterson University
2nd Place Undergraduate Poster:
     Michael Newby, Seton Hall University

Ecological Society of America, Mid-Atlantic Chapter Winners:
Best Student Oral Presentation: **John Furry**
2nd Place Oral Presentation: **Peter Houlihan**
3rd Place Oral Presentation: **Andrew Parsekian**

Best Graduate Poster: **Michael Lloyd**
2nd Place: **Rachel Curtis**
3rd Place: **Julie Charbonnier**

Best Undergraduate Poster: **Ashley Jones**
2nd Place: **Emily Boward**
3rd Place: **Thomas Duchak**

ABSTRACTS OF THE WINNING JUNIOR ACADEMY ORAL PRESENTATIONS

Cell and Molecular Biology

Distribution of phototransduction retinal proteins and photoreceptor differences in ventral vs. dorsal hemiretina of the *Pantodon buchholzi*

SANJANA SALWI
High Technology High School, Morganville, NJ, 07751, USA

This purpose of this experiment was to examine the distribution of phototransduction retinal proteins of the *Pantodon buchcholzi*, a surface fish with a rare tripartite visual field: the ventral hemiretina views into the air while the dorsal hemiretina views into the water. The hypothesis was: the structural and molecular organization of the aerial and aquatic halves of the Pantodon retina is different. However, the aerial half may resemble the aquatic half more than a fully aerial vertebrate retina (the cow eye was chosen as the model system). To examine the proteins, immunostaining with a primary antibody and then a secondary fluorescent-tagged antibody was used on cyroprotected sections of the Pantodon retina. Then, immunoreactive proteins were detected under a Zeiss Axio Observer microscope. The presence of several proteins known to be involved in the vertebrate (bovine) retinal signal transduction were tested in the Pantodon retina and the relative distribution between the ventral Vs dorsal retina was examined. Positive staining obtained for: rod outer segment guanylate cyclase type 1 (ROSGC1) and S100B. Structural differences were observed between the two halves. Positive staining indicated that the aerial and aquatic halves of the Pantodon retina are structurally different yet use similar distribution of signaling pathways that are very different from that of the vertebrate (bovine) aerial retina.

The benzoin complex: A new frontier for skin care

ELIZABETH DENTE
Bergen County Academies, Hackensack, NJ, 07632, USA

The synergistic activity and anti-aging properties of the organic compound benzoin and the antioxidant olive fruit extract have never before been observed. Benzoin, synthesized from benzaldehyde, is the primary component of bitter almond oil, which has been claimed to have anti-itching, anti-inflammatory, and antioxidant effects on the skin. However, the ability of Benzoin to have anti-aging properties on the skin has not been scientifically proven. In addition, olive fruit extract has been shown to exhibit antioxidant activity, which can prevent the oxidative damage done to skin over time. The matrix metalloproteinase (MMP) enzyme family, specifically MMP-9, is involved in the degradation of skin over time. When the activity of MMP-9 is inhibited, the skin can maintain a healthier, youthful structure. It is hypothesized that if the concentration of benzoin and olive fruit extract is introduced in human keratinocytes (HaCaT), the levels of MMP-9 in these cells will decrease in a dose-dependent manner. A spectrophotometer will be used to assay the levels of MMP-9 in the cells. A p-value of less than .05 will represent statistically significant results. Viability results show that concentrations less than .1% Benzoin were nontoxic, with the aforementioned concentration being toxic to 5.8% of the cells. Viability results also showed that a combination of Benzoin (less than .1%) and olive fruit extract (less than .002%) cause the cells to proliferate by 82.1%. These results show that Benzoin and olive fruit extract can decrease the levels of MMP-9 in HaCaTs. Further results involving MMP-9 are pending.

A spicy solution to Alzheimer's disease: The effect of cinnamon on β-amyloid.

MICHELLE GUO
Bergen County Academies, 200 Hackensack Avenue, Hackensack, NJ 07601, USA

Alzheimer's disease (AD), is a neurodegenerative disorder characterized by neurofibrillary tangles and a buildup of β-amyloid (Aβ) plaques in the brain. In AD patients, neuronal insulin resistance leads to the accumulation of Aβ, which disrupts normal synaptic function and causes neuroinflammation. Type 2 diabetes (T2D) shows connections to AD in insulin resistance. T2D patients are treated with insulin sensitizers for insulin resistance. Although insulin has been shown to decrease Aβ production, previous *in vitro* studies have shown that metformin, an insulin sensitizer, increases intracellular Aβ production. It was hypothesized that using cinnamon, an herbal insulin sensitizer, would have less severe effects on Aβ *and that Cinnamon cassia* extract (CE) would inhibit the formation of Aβ protein. Observations were conducted on N2a-695 mouse neuroblastoma cells expressing human β-amyloid precursor protein. CE at 60 µg/mL and 30 µg/mL with 0.25 µM insulin, and metformin at 10 mM, were used to treat N2a-695 cells. An ELISA was performed to quantify Aβ and Student t-tests were performed. Aβ production of cells treated with metformin was 210% greater ($p < 0.05$) when compared to untreated cells. Cells treated with CE produced less Aβ than cells treated with metformin, and 30 µg/mL CE decreased Aβ. Cinnamon may be activating insulin pathways and mediating glucose metabolism. In summary, cinnamon shows down-regulatory effects on Aβ generation and could be a potential treatment for AD.

Chemistry

A novel method of automated electrolysis data collection.

HARI RAVICHANDRAN
High Technology High School, Lincroft, NJ, 07738, USA

One of the problems that researchers face while conducting electrolysis experiments is the automation of data collection. The objective of this study is to completely automate the collection of gas volume data during electrolysis by the use of gas pressure as a proxy for deriving gas volumes. A gas pressure sensor was connected to the top of a Hoffman Electrolysis Apparatus. During electrolysis, this sensor collected pressure data at fixed time intervals, while a webcam took pictures of the volume markings on the Hoffman Apparatus. Both the pressure data and the pictures were stored in a computer. Quadratic regression models ($v = b * p + c * p^2$, where $v =$ volume, $p =$ pressure, b and c are model parameters) were derived for both hydrogen and oxygen. The model parameters were significant ($p < .0001$) with R-squared values of 0.996 denoting an excellent degree of fit. Therefore, the gas pressure sensor and the model can be used to make accurate predictions of the gas volume inside the Hoffman Apparatus, saving researchers time and energy.

The effect of different types of wood on the tarnishing of silver.

LISA ZAHRAY
High Technology High School, Lincroft, NJ, 07738, USA

The purpose of this study is to investigate whether there is a significant difference in the effect of tarnish on silver pieces when exposed to different types of wood. The British Museum uses a test called the Oddy Test to determine whether or not a material is suitable to be kept in proximity to silver, but this test only gives qualitative data. Quantifying the data would be useful for consistency in the test results. The student researcher used an alternate version of the Oddy Test, which involved putting jars each containing a small amount of water, three silver pieces, and either pine, oak, maple, or no wood (used as a control group), into an oven for four weeks. This accelerated the oxidation process. Before and after pictures of each silver piece were taken in the same lighting, and the gray value of the photograph was analyzed to produce quantitative data representing the change in color the tarnish on each silver piece caused. The student researcher found that there is a significant difference among the different types of wood used. Both maple and pine are significantly different than the control group, while oak is not significantly different than the control group.

Mechanistic study of sulforaphane induced cytotoxicity

ANGELA HAN
High Technology High School, Lincroft, NJ, USA

This study was to determine whether Sulforaphane, an isothiocyanates (ITCs) compound, induced cytotoxicity through the thiol mechanism. Within this study, acetylcysteine (NAC) acted as "bait," serving as a false thiol target for Sulforaphane. The hypothesis states that NAC will protect the cancer cell from Sulforaphane induced cytotoxicity. In the experiment, four levels of Sulforaphane concentrations (0 µM, 2.2 µM, 6.6 µM, and 20 µM) without NAC and with the presence of 3 mM of NAC were tested. After the cancer cells were added into different levels of Sulforaphane solutions, the solution was incubated, and tested for the percentage of surviving cells through MTT Assay. The data was collected and analyzed. In order to analyze the results of the experiment, one tail, independent t-test was performed. The p-value of the t-test is 3.46649E-05 for 2.2 µM level, 7.18588 E-15 for 6.6 µM level, 1.06081E-13 for 20 µM level of Sulforaphane. Because the results are all smaller than the alpha value of 0.05, the results support the hypothesis. It was concluded that the percentage of cancer cell survival was higher in the presence of NAC under Sulforaphane induced cytotoxicity than without the presence of NAC.

Computer Science

Comparison of biometric keystroke analysis methods.

JACOB BUCKMAN
High Technology High School, 765 Newman Springs Road, Lincroft, NJ 07738

The purpose of this study is to determine which characteristic of typing is most unique and will yield a better biometric: times in between keystrokes or length of time keys are held down. The hypothesis is that there will be a significant difference between the accuracy of each. The student researcher wrote the software to collect the data from subjects in Java, and analyzed the data using MATLAB. Each human subject was tasked with entering his or her password fifteen times. Later, subjects entered the passwords of fifteen other users. Once all the data had been acquired, the False Acceptance Rate and False Rejection Rate curves of each account were computed, and the Expected Error Rate determined from their intersection. A t-test performed on the data yielded a result of .18. Using an alpha value of .05, the student researcher concluded that there was no significant difference between the accuracies, as both were very high.

Expanding the capabilities of information processing: Recognizing transpositions of music through a comparison of extracted compositional relationships
KEVIN KAROL
26 Poplar Ave, Fair Haven, NJ, 07704, USA

This project examined the ability for computers to process data on levels somewhat similar to those of human thought through the recognition of transposed music. This ability to recognize files which the human mind perceives as "the same song" though they are entirely different in their basic components, is achieved through the use of metadata files that contain information about the gestaltic structure of the piece. Data were gathered from a MIDI music file and then compared to a previously constructed database in order to identify if it was a transposition of a previously analyzed song. The experiment showed that through abstraction of higher features, such as analysis of melodic arcs, it was possible to identify a transposed version of a song that would not have been identifiable in a standard music database.

Musical note recognition and conversion
STEPHEN GUO
High Technology High School, Lincroft, NJ, 07738, USA

Millions around the world play music, whether recreationally or professionally. Musicians are often unable to recognize out-of-tune notes or wrong rhythms without an instructor. A solution is presented to both fix tune and rhythm during practice and provide musicians with an accessible source of sheet music. The program, written on Matlab, uses digital signal processing and detection techniques to analyze a musical note. The inputted tempo is used to determine the duration of each type of note (quarter, eighth, etc.). The audio file is then separated into thousands of sample blocks and a Hann Window function reduces the edge effects. Each block is analyzed through a Fast Fourier Transform. A peak detection algorithm with harmonic exclusion then determines the fundamental frequency. The frequency and the duration are used to create a musical symbol representing each note, which is arranged on the musical scale to form sheet music. The program also provides the possibility of a music tutoring program. By comparing the converted and actual sheet music, the program can identify errors, allowing the student to immediately correct mistakes. The program will also be effective regardless of the speed of music, making it a beneficial asset to musicians of all skill.

Physics and Mathematics

The design and creation of a brain controlled wheelchair
ZACHARY DARBY and JEFFERY MOONEYHAM
High Technology High School, Lincroft NJ, 07738, USA

In the field of medicine, no integration of technology and medicine shows more promise than devices that use brain functions to control devices. These devices offer relief to the handicapped who would otherwise be dependent on others. BCIs, brain computer interfaces, are rapidly developing, becoming increasingly smaller and more compact with each iteration. There are many different BCIs, ranging from brain controlled limbs to brain controlled equipment. The purpose of this research project is to discover a cost efficient and effective way to construct a brain controlled wheelchair through the use of commercially sold devices. The Emotiv Epic Headset was used in conjunction with Arduino microprocessors and a normal laptop, running Windows, to take input from brain signals and convert them into power for the motors of a mockup wheelchair. This resulted in a semi-functional control of a mockup wheelchair through the use of one's brain. In the future, further refinement of this technology will allow disabled people to create an effective brain controlled wheelchair for an inexpensive amount.

Detecting defective solar panels in a solar array through the use of infrared sensors
ASHWIN IYER
High Technology High School, Lincroft, NJ, 07738, USA

The purpose of this study was to identify a defective solar panel in a solar array through the use of an infrared sensor. The student researcher found an article that stated that defective solar panels do not produce as much heat as working solar panels. The hypothesis was that there will be a significant difference between the temperatures of the defective solar panel versus the temperature of the working solar panels. The student researcher built the solar array and tested the temperatures of each solar panel at regular intervals during a 6 hour period during the day. The student researcher discovered that there was no significant difference between the temperatures of defective solar panels versus the temperatures of non-working solar panels

Study of propagation patterns of quantified substorm events
ALEX LEW
High Technology High School, Marlboro, NJ, 07746 USA

This study attempted to more accurately describe and predict the behavior of substorm events in the magnetosphere region. Substorm events are caused by solar events and can interfere with satellites and other

communications. The researcher attempted to construct a prediction model for substorm events based on previously gathered data. To do this, data from the Polar Experiment Network for Geospace Upper-atmosphere Investigations network and from the THEMIS and LANL satellites was gathered and analyzed. The data consisted primarily of electron flux measurements at 3 channels: 0.5-1 KHz, 1-2KHz, and 2-4KHz. The data showed that for a small fraction of events, simultaneous enhancements of ground signals and electron flux measurements occurred. The researcher determined that these events were characterized by particle injections reaching the field lines at high altitudes near the open-closed field line boundary. The rest of the events followed the expected pattern of the electron flux enhancement occurring first, and then the ground signal enhancement occurring after a time period determined by the original point of injection.

Psychology and Behavioral Science

Improvements in Tennis Accuracy through Progressive Muscle Relaxation and Mental Imagery

MAYA EPELBAUM
Morristown High School, Morristown, NJ, 07960, USA

Cognitive specific mental imagery is a training mechanism that can be used to enhance sports performance by imagining mastery of specific skills. Progressive muscle relaxation is a means by which muscles are tensed and released in a prescribed order. The purpose of this study was to examine the influence of mental imagery, progressive muscle relaxation, and their combined therapies on the accuracy of the tennis serve. Sixteen subjects who met study specific selection criteria were enrolled. Subjects were divided into four groups: control group 1, mental imagery test group 2, progressive muscle relaxation test group 3, and a combination of mental imagery and progressive muscle relaxation test group 4. Prior to all testing sessions, the experimental groups were exposed to five minutes of mental imagery, seven minutes of progressive muscle relaxation, or both of the techniques. Subjects in all groups participated in four, 1-hour sessions, one week apart, comprised of 60 trials each. It was hypothesized that if the experimental group was exposed to mental imagery or progressive muscle relaxation techniques prior to testing then there will be a significant increase in overall level of performance accuracy in relation to the tennis serve. Qualitative and quantitative data was recorded on the accuracy of the tennis serve and analyzed using the t-test.

Nooks versus textbooks as most distracting to students

KIMBERLEY GOKBERK
High Technology High School Lincroft, New Jersey 07738, USA

School systems are always looking for new advancements in technology to make learning easier and at the same time enjoyable. One way that teachers are trying to make this happen is by using eBooks instead of textbooks. However, there are many questions to ponder, such as if reading from a digital device will make the students more distracted. This experiment was conducted to find out if students would be more distracted when using the Barnes & Noble Nook than when using an old-fashioned book to read from. It was hypothesized that the time it takes to read a Nook as the medium will be significantly longer than the time it takes to read a book as the medium. The subjects read from a hardcover book for one trial and from the same eBook on the Nook for another trial. To determine what the subject read from first, the book or the Nook, was randomly and evenly distributed among all twelve subjects. The book is Outliers by Malcolm Gladwell and the subjects read from the first chapter for this experiment. When reading for each trial, the subjects were in a quiet environment. The overall time it took subjects to read from each type of book was used to approximate how distracted the subject was. Mean reading time with the Nook was significantly greater than that of the traditional book. The p-value of 0.036 was less than the alpha of 0.05. The results show that the time it took to read a Nook as the medium was significantly longer than the time it took to read a book as the medium.

The effect of question phrasing on the memory of second-graders

EMMA KOROLIK
High Technology High School, 765 Newman Springs Road, Lincroft, NJ 07738, USA

The student researcher hoped to address the problem of poor accuracy in law enforcement interviews of minors, specifically children between the ages of seven and eight. She attempted to determine if the phrasing of a question will determine whether or not the subjects will answer the question correctly. The researcher filmed a short video of a non-threatening, non-violent incident and composed a questionnaire comprised of nine yes/no questions and nine open-ended questions related to the video. She then showed the video to the subjects and, afterwards, handed out the questionnaire. The number of correct responses for each type of question were counted and compared. The student researcher found that there was a significant difference between the number of correct responses to open-ended versus yes/no questions. The number of correct responses to yes/no questions far exceeded the number of correct responses to open-ended questions.

Health and Medicine

Design and application of a cell phone-compatible wireless stethoscope using Bluetooth protocol and the GSM network

CATHERINE WONG
Morristown High School, Morristown, NJ, 07960, USA

The field of telemedicine, in which telecommunication networks are used to deliver healthcare services remotely, is increasingly favorable due to global advances in telecommunication technologies. Telemedicine is an especially favorable approach to providing medical services for subjects living in impoverished, rural, or underserved areas without immediate access to quality healthcare. Cell phone attachments can allow for remote care over a cellular network, thus providing subjects access to expert care not otherwise available. The purpose of this experiment is to design and test a wireless stethoscope prototype compatible with any ordinary cell phone over the GSM network. Using Bluetooth technology, the proposed design allows for remote auscultation from a subject's cell phone to a physician's cell phone in a remote location. A prototype was created by combining and modifying the auscultation piece of a traditional stethoscope with a Bluetooth earpiece. The prototype was tested through 10 subjects previously diagnosed with cardiopulmonary disorders that can be determined through auscultation. Subjects underwent both traditional and remote examinations, and were evaluated using an adapted version of a standard 27-item examination form. Quantitative data was analyzed for statistical significance using the t-test and the accuracy of remote and traditional examinations was compared.

Proliferation of glial cells: the role of ASIC and BK channel interaction

EMMA-TEI KYONO, ALEX WALTON, JEWEL OGLESBY, RYAN NINTZEL, JENNIFER C. GUERCIO, JUDE MELE, AND ELENA PETROFF
Montclair High School, 100 Chestnut Street, Montclair NJ, 07043, USA

Gliomas, the most common brain cancer (12,000 new cases in the US annually), carry a poor prognosis, 10-36 months after detection, due to fast growth and invasive migration. Normal glial cells express Acid Sensing Ion Channels (ASICs) and Big K^+ (BK) channels. ASICs interact with and inhibit BK channels at normal brain pH; acidic pH disrupts this interaction. BK channels potentiate cell proliferation, and their blockers inhibit glioma cell growth. We hypothesize that ASICs function as endogenous inhibitors of glial cell growth through inhibition of BK. Disruption of this interaction at acidic pH at the site of trauma may lead to increased proliferation of glia and tumor growth. We tested this hypothesis by growing isolated mouse glial cells at the normal pH of 7.4, at the low pH of 7 to mimic the conditions of brain injury, and in the presence of 200 nM of the specific BK channel blocker charybdotoxin at both pH conditions. Cell growth at pH 7 was significantly increased compared to normal pH conditions. Charybdotoxin inhibited glial growth at both pH conditions. These results support our hypothesis, establish the role of ASIC-BK channel interaction in glial proliferation, and move towards developing novel treatments for glioma tumors.

Sirtified Cancer: The Effect of NAD on Sirtuin3 in Apoptosis

JANICE SUNG
Bergen County Academies, Hackensack, NJ, 07601, USA

Sirtuin3 (Sirt3) is a NAD-dependent deacetylase that is found in metabolically active tissues. Currently, the role of Sirt3 in apoptosis and its intracellular localization remains unclear. This experiment investigated the effect of exogenous NAD on adenocarcinoma cells (MDA-MB-231). Cells treated with concentrations of NAD (0.25-20 mM) displayed a dose-response relationship in an MTS cell-viability assay. At 15mM and 20mM, exogenous NAD suppressed MDA-MB-231 cell viability ($p < 0.05$). Furthermore, a Sirt3 fluorescent assay detected levels of Sirt3 in MDA-MB-231 and at 20mM, there was significant up-regulation of Sirt3. Earlier literature reported conflicting results regarding the role of Sirt3 as an apoptotic-mediator. Therefore, the activation of caspase 3/7, 8, and 9, which are indicators of apoptosis, was measured. At 15mM and 20mM, statistically significant caspase activity directly correlated with the increase in Sirt3 levels and the decrease in cell viability, thus demonstrating the pro-apoptotic function of Sirt3. Additionally, a superoxide dismutase assay measured antioxidants levels in relation to Sirt3. Results are pending. Mitochondria were isolated to study the intracellular localization of Sirt3, and a Sirt3 ELISA was performed. Results are pending. This study suggests the potential use of exogenous NAD in breast cancer treatment and elucidates the mechanism of Sirt3.

Ecology and Environmental Science

Copper contamination: An analysis of how copper affects the germination and root architecture of *Arabidopsis thaliana*

KATHERINE FULLERTON
Biotechnology High School, Freehold, NJ, 07728, USA

The purpose of this experiment was to determine how copper affects the root architecture and germination of wild-type *A. thaliana*. Copper is an essential nutrient to plants, but is only required in trace amounts and plants are

sensitive to changes in copper concentration. It was predicted that when exposed to copper concentrations that exceeded 0.5μM, that there would be a decrease in root growth and germination of *A. thaliana* seedlings. Plants were grown on MS media and transferred to media that contained specific copper concentrations (from 0-100μM) to determine the effect on root architecture (root length and root hair density). To test germination plants were germinated directly on media containing copper. Overall, the data showed a consistent trend that peaked at 1.0μM, and then decreased for the root length, germination, and root hair density. However, the root hair density data and the root length data after 5 days contained more variation than the other parameters. The data collected did not support the original hypothesis; the germination and root growth started to decrease after being exposed to copper concentrations that exceeded 1.0μM, not 0.5μM as predicted. The lower concentrations were beneficial to the growth of the plants up to 1.0μM.

Comparison of moisture absorption of *Rudbeckia fulgida* and *Rudbeckia hirta*

JACQUELINE CORCORAN
High Technology High School, Lincroft, NJ, 07738, USA

Today's environment suffers from effects, such as water pollution, erosion, and wildlife habitat damage, of stormwater, precipitation that overflows from structures and travels to lakes and streams. The purpose of this experiment was to test the amount of moisture absorption of *Rudbeckia hirta* and *Rudbeckia fulgida*, two very similar plant species, to determine if one can easily replace the other to optimize the efficiency of a rain garden, a stormwater receptor. The hypothesis was that there is a significant difference in the amount of moisture absorption of *Rudbeckia fulgida* and *Rudbeckia hirta*. 24 plants of each were planted in pots with organic soil and given eight weeks to grow in outdoors. Afterwards, 12 plants of each species were randomly selected. These plants were given 100 milliliters of water, massed on a calibrated balance scale, and set outside for 24 hours. After this period, the plants were massed on a calibrated balance scale. The final mass subtracted from the initial mass was the amount of moisture absorbed. A two tailed, independent t-test with an alpha of 0.05 was performed, obtaining a p-value of 0.3450. There was no significant difference in the amount of moisture absorption of *Rudbeckia fulgida* and *Rudbeckia hirta.*

The effect of wind on plant phototropism.

JUSTIN FORMAN
High Technology High School, Lincroft, NJ, 07738, USA

Few studies exist pertaining to the effects of mechanical stimuli on phototropism. Because phototropism is essential to plant life, it is important to fully understand the phenomenon. The purpose of this experiment was to test the effects of constant wind on phototropism. Twelve marigold seedlings were exposed to constant wind provided by a fan on low speed, and 12 marigold seedlings were not exposed to wind. Each group of seedlings was arranged in 2 rows of 6. Light was provided by a lamp hanging perpendicularly from the horizontal. The seedlings were rotated through each position in the two rows to ensure equal exposure to the light. At the end of a 2-week period, the student researcher measured the angle at which each plant was growing from the horizontal (i.e. the phototropic angle) with a protractor. Using a two-tailed, independent t-test, a p-value of 0.009 was obtained. The value was lower than the alpha of 0.05. Based on this, the student researcher concluded that there was a significant difference between the phototropic angles of the wind-subjected seedlings and the non-wind-subjected seedlings. This result, however, may have been affected by varying sources of error such as non-uniform plant size and mass.

THE BULLETIN: CALL FOR MANUSCRIPTS

Congratulations to our 2011/12 NJAS Grant-In-Aid (GIA) Winners

The NJAS GIA program accepts research proposals from high school students each fall. Senior scientists evaluate and review the science/math proposals. Top-ranking proposals are funded up to $150 provided the student completes the project and presents their work at the annual NJAS spring meeting. Visit www.njas.org in the fall for full program details for the next round of the GIA program.

Catherine Wong 1st Place

"Design & Evaluation of a Cell Phone Compatible Wireless Stethoscope w/ECG"
The Science Academy at Morristown High School

Zachary Liu 2nd Place

"Comparison of Horizontal and Vertical Bubble Tank Methods of Cupric Chloride PCB Etching"
High Technology High School

Jessica Danus 3rd Place

"Evaluation of Dehydration and Fluid Replacement in Female High School Basketball Players"
The Science Academy at Morristown High School

Emma Pallarino 4th Place
"Groups, Rows & Semicircular Desk Arrangements in Elementary School Classrooms Impact on Task Learning Behavior"
The Science Academy at Morristown High School

Danielle Nagidi 5th Place (Tie)
"Post Environmental Impacts of Oxybenzonein on Daphnia Pulex"
The Science Academy at Morristown High School

Team of Sureet Batth, Michelle Arias & Michael Boateng 5th Place (Tie)

"Brain Focus during Auditory Activity"
Hightstown High School

Vivian Chang 6th Place
"Influence of Antioxidants on Cellular Proliferation"
High Technology High School

Special thanks to the high school teachers sponsoring the students' work:
Gretchen Contreras, Hightstown HS
Erin Colfax, Science Academy at Morristown HS
Therese Flynn, North Hunterdon HS
Benjamin Greene, Summit HS
George Mellors, Somerville HS
Mike Roche, High Technology HS

New Jersey Academy of Science

Kean University
1000 Morris Ave. STEM Bldg. Suite 5-13
Union, New Jersey 07083
Phone (908) 737-7203
Fax (908) 737-7205

NJAS 2012 MEMBERSHIP APPLICATION

Name Prefix: *Please circle one ➜ (Dr., Ms., Mrs., Mr., Honorable, Emeritus, etc.)*

First Name: *Initial:*   *Last Name:*

Primary Organization/Company:

Organization/Company-Address:

Title: *Field/Specialty:*

Website:

Your Mailing-Address/PO Box:

City-Town: *State:*

Zip Code: *Country:*

Work Phone: *Cell Phone:*

Fax: *Other Phone:*

Work Email: *Other Email:*

●●●

(Please select and Check one Type of Membership)

_____	$40	**Professional or Regular Member**
_____	$15	**Emeritus or Retired Member**
_____	$15	**Graduate Student**
_____	$15	**Undergraduate Student**
_____	$15	**High School Student**
_____	$250	**Lifetime Member (1 payment)**
_____	$500	**Corporate or Organizational Member (yearly)**
_____	$1000	**Corporate or Organizational Sponsor (yearly)**
_____	$2500	**Corporate or Organizational Benefactor (yearly)**

Make checks payable to: New Jersey Academy of Science

Send to: Kean University/NJAS
            1000 Morris Ave. STEM Bldg. Suite 5-13
            Union, New Jersey 07083

New Jersey Academy of Science

Kean University
1000 Morris Ave. STEM Bldg. Suite 5-13
Union, New Jersey 07083

Phone (908) 737-7203

Fax (908) 737-7205

NJAS 2012 MEMBERSHIP RENEWAL APPLICATION

Name Prefix: Please circle one ➔ (Dr., Ms., Mrs., Mr., Honorable, Emeritus, etc.)

First Name: *Initial:*   *Last Name:*

Primary Organization/Company:

Organization/Company-Address:

Title: *Field/Specialty:*

Website:

Your Mailing-Address/PO Box:

City-Town: *State:*

Zip Code: *Country:*

Work Phone: *Cell Phone:*

Fax: *Other Phone:*

Work Email: *Other Email:*

●●

(Please select and Check one Type of Membership)

_____	$40	**Professional or Regular Member**
_____	$15	**Emeritus or Retired Member**
_____	$15	**Graduate Student**
_____	$15	**Undergraduate Student**
_____	$15	**High School Student**
_____	$250	**Lifetime Member (1 payment)**
_____	$500	**Corporate or Organizational Member (yearly)**
_____	$1000	**Corporate or Organizational Sponsor (yearly)**
_____	$2500	**Corporate or Organizational Benefactor (yearly)**

Make checks payable to: New Jersey Academy of Science

Send to: Kean University/NJAS
              1000 Morris Ave. STEM Bldg. Suite 5-13
              Union, New Jersey 07083