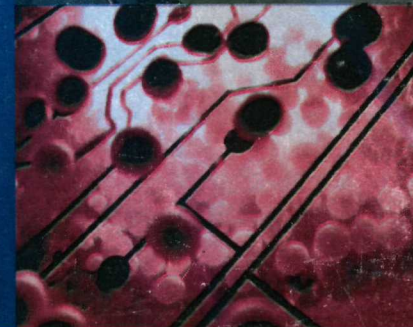
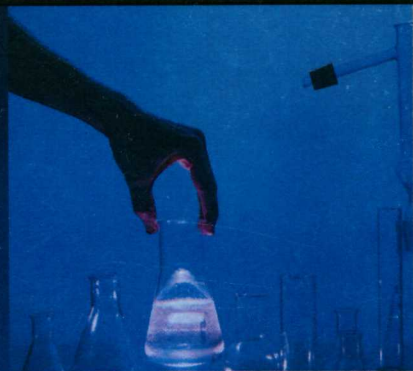


# IMSAIloquium

STUDENT INVESTIGATION SHOWCASE

*APRIL 26, 2007*

**BOLD IDEAS**  
**IMSA20**  
● WORLD-CLASS RESULTS





April 2007

Dear IMSA Friends:

The Student Inquiry and Research Program (SIR) serves as a world-class learning environment that enables students to undertake the challenges and triumphs of the global community of the Twenty-first Century. SIR is an interactive partnership that pairs students with eminent professionals so that our students can actively pursue compelling questions about which they are passionate. This work is shared through presentation and publication, and our students collaborate with other students, scholars, artists, and inventors throughout the world.

This year marks the Twentieth Anniversary of the Illinois Mathematics and Science Academy and the Student Inquiry and Research Program is in its nineteenth year. During that time, our young scholars have numbered over three thousand, and have partnered with renowned professionals in nearly two hundred leading institutions. IMSA students who have benefited from this amazing opportunity continue to make ground-breaking discoveries as they advance in their careers.

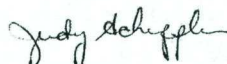
You may note our new name. The name *IMSAloquium*© is a creative derivative of the word *colloquium*, which is defined as “an academic seminar.” In conjunction with IMSA’s 20<sup>th</sup> Anniversary and to better represent and capture the sophistication and quality of the students’ exemplary investigations, *IMSAloquium: Student Investigation Showcase* was developed as the new name for what has previously been termed “Presentation Day.”

As you begin to turn the pages and learn about the extraordinary research work of IMSA’s young investigators, we hope you will begin to see what is possible. As IMSA looks to its third decade and aspires to become “the world’s leading teaching and learning laboratory for imagination and inquiry” and “to ignite and nurture creative, ethical, scientific minds that advance the human condition,”<sup>1</sup> the Academy is strategically positioned to remain an international trailblazer for developing innovative and compassionate leaders who will shape a more just and sustainable world.

Sincerely,



Stephanie Pace Marshall, Ph.D  
President



Judith A. Scheppler, Ph.D  
Coordinator of Student Inquiry & Research



**Illinois Mathematics and Science Academy**  
“A Pioneering Educational Community”

**NINETEENTH ANNUAL IMSALOQUIUM**

April 26, 2007

**TABLE OF CONTENTS**

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Student Abstracts .....	21
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Inside Back Cover – IMSA Map with Room Locations Highlighted	

**Cover and IMSAloquium designer is Hon Lung Chu, IMSA Class of 2007**

The cover design is a collage of images.

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- *Light Explosion* (<http://www.sxc.hu/photo/596376>), uploaded by dlritter
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- *The Blue Marble* (globe\_east\_2048.jpg) [http://visibleearth.nasa.gov/view\\_detail.php?id=2429](http://visibleearth.nasa.gov/view_detail.php?id=2429))

Courtesy of IMSA:

- Images of students and staff.

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**IMSAloquium logo design by Stephanie Chang (IMSA Class of 2007) and Hon Lung Chu**

From the previous page:

1 – Draft IMSA mission statement for its third decade.



## **The World Pays Attention to IMSA's SIR Students**

Students who attend the Illinois Mathematics and Science Academy do not have to wait until they graduate from college to begin to make significant contributions to science, mathematics, the humanities, and the world around them. Through IMSA's Student Inquiry and Research (SIR) Program, IMSA's young apprentice investigators open our eyes to what is possible in fields such as genetics, mathematics, history, computer science, visual arts, biomedical engineering, culture, nanotechnology, science education, economics, particle physics, biotechnology, music, immunology, and many, many more.

A brief listing of highlights of past accomplishments by students participating in Student Inquiry and Research include:

**Publications** in *Nature*, *The Science Teacher*, *Journal of Dispersion Science and Technology*, *Learning and Leading with Technology*, *Meteoritics and Planetary Science*.

**Portraits of Great American Scientists** (2001, Prometheus Books) contains biographies of fifteen American men and women motivated to excel in diverse fields of science. This book was the collaborative student effort of fifteen participants in IMSA's Student Inquiry and Research Program.

**Presentations** at the American Association for the Advancement of Science (AAAS), the National Association of Biology Teachers, the American Society of Microbiology, IEEE Nuclear Science Symposium, the American Chemical Society, American Society of Echocardiography, and the American Society of Cell Biology conferences. Since 1996, 102 IMSA students have participated in the Junior Academy of Sciences at AAAS.

### **Competitions**

Intel Science Talent Search

- 28 semi-finalists since 1989
- 11 finalists since 1989

National History Day Competition

Neuroscience Research Prize

Neuroscience Creativity Prize

Young Epidemiology Scholars

### **2006-2007 Accomplishments**

A few of the accomplishments of IMSA students this year alone include:

4 Siemens Westinghouse semi-finalists

5 Intel Science Talent Search semi-finalists

Intel Science Talent Search finalist

Participation in the Japan Super Science Fair

Participation in the International Science Fair held in Korea

**"Student Inquiry at the Illinois Mathematics and Science Academy"** is among only fifteen high school models in the nation to have chapters in the National Science Teachers Association book, *Exemplary Science in Grades 9-12* (2005, NSTA Press).



## 2006-2007 Student Recognition

Please join us in the Academic Pit, at 12:30, for our Student Recognition Ceremony

**Host: Dr. Leon Lederman, Nobel Laureate and IMSA Resident Scholar**  
**Special Invited Guest: Kristine Cohn, Senior Regional Representative  
of the U.S. Secretary of Education**

**Perry Bradford:** Comparison of DNA in Large Breed Bichons With and Without Hip Dysplasia

Advisor: Dr. Susan Styer, Illinois Mathematics and Science Academy  
*ACT-SO Gold Medal Winner and National Finalist*

**Susan Dittmer:** Dimuon Supersymmetry Search at CDF Fermilab

Advisor: Dr. Jane Nachtman, Fermi National Accelerator Laboratory  
*Intel Science Talent Search Semifinalist, American Junior Academy of Sciences Participant*

**Chaoran (Rachel) Chen:** Analysis of Polybrominated Diphenyl Ethers in Human Placenta

Advisor: Dr. An Li, University of Illinois at Chicago  
*Intel Science Talent Search Semifinalist*

**Zexi J. Fang:** Hydrogen Sensors Based on Ultra-thin Palladium Nanobead Arrays on Porous Anodic Aluminum Oxide (AAO) Substrates

Advisor: Dr. Zhili Xiao, Argonne National Laboratory  
*Illinois Junior Academy of Sciences Competitor\**

**Kathy Huang:** BA-D1: A Novel Treatment for Type 2 Diabetes

Advisor: Dr. Norman Chen, Duke University  
*American Junior Academy of Sciences Participant*

**Philip Kuo:** Searching the DNA Sequence of the Gene Encoding Acetyl-CoA Carboxylase 2 of a Human Subject who Appears to Have Unregulated Fatty Acid Metabolism

Advisor: Dr. Robert Haselkorn, University of Chicago  
*Illinois Junior Academy of Sciences Competitor\**

**Victor Liou:** Effect of Trichostatin A on TGF-beta Induced Type-1-Collagen Synthesis: Possible Mechanism

Advisors: Dr. Asish Ghosh and Dr. John Varga, Northwestern University  
*Siemens Competition Semifinalist, Junior Sciences and Humanities Symposium Regional Finalist, Illinois Junior Academy of Sciences Paper Competition Semifinalist, Illinois Junior Academy of Sciences Competitor\**

**Anthony Yunker:** The Relationship Between Pascal's Triangle and Fibonacci Sequences  
*Illinois Junior Academy of Sciences Paper Competition Semifinalist*



**Karan P. Patel:** Angiogenic Inhibitors and Inhibitors of Histone Deacetylases - A New Way to Block Tumor Growth and Angiogenesis?

Advisor: Dr. Olga Volpert, Northwestern University  
*Illinois Junior Academy of Sciences Competitor\**

**Sophia Pilipchuk:** The Effect of Epigallocatechin-3-gallate (EGCG) on HeLa Cell Proliferation and Viability

Advisors: Dr. Donald Dosch and Dr. Judy Scheppler, Illinois Mathematics and Science Academy

*Illinois Junior Academy of Sciences Competitor\**

**Anastasia Rahlin:** Pseudomonads to the Rescue: Growing OEMs With Oil

Advisor: Donald Dosch, Illinois Mathematics and Science Academy

*American Junior Academy of Sciences Participant*

**Sarah Shareef:** The Response of Oligodendrocytes to Normal Appearing White Matter from Multiple Sclerosis and Control Patients-A Study of the Early Pathology of Multiple Sclerosis

Advisor: Dr. Sara Becker-Catania, Edwards Hines VA Hospital

*Illinois Junior Academy of Sciences Competitor\**

**Mahesh Vidula:** Project Title: The Role of a Common Polymorphism of the Prion Protein in the Propagation of Prions

Advisors: Dr. James Mastrianni and Ms. Suparna Mallik, University of Chicago

*American Academy of Neurology Neuroscience Research Prize Finalist; Intel Science Talent Search Semifinalist; Siemens Competition Semifinalist, American Junior Academy of Sciences Participant*

**Sherry Yu:** Mechanism of Inflammation in Biliary Atresia

Advisors: Dr. Lee Bass, Dr. Tom Giesler, and Dr. Peter Whittington, Children's Memorial Research Center

*American Junior Academy of Sciences Participant, Illinois Junior Academy of Sciences Competitor\**

**Nora Xu:** Modeling of X-Ray Scattering for Nanocrystal Superlattice Multilayer Thin Films Advisor: Dr. Jin Wang, Argonne National Laboratory

*Intel Science Talent Search Finalist, Siemens Award for Advanced Placement*

**Fan Zhang:** The Functional Role Played by the Regulator SspA in *Photobacterium luminescens*: Characterization of Phenotypic Responses to Varying Stresses

Advisor: Dr. Todd Ciche, Michigan State University

*Siemens Competition Semifinalist*

**Lilly Zhu:** Effect of Iron on Pyocyanin Regulation in *Pseudomonas aeruginosa*

Advisor: Dr. Abdul Hamood, Texas Tech University

*Siemens Competition Semifinalist, Intel Science Talent Search Semifinalist*

\* Illinois Junior Academy of Sciences Regional competition was held March 31, after the IMSAloquium abstract book went to press. State competition is May 4 and 5.



ILLINOIS MATHEMATICS AND SCIENCE ACADEMY  
*"A Pioneering Educational Community"*

**IMSAloquium:**  
**Student Investigation Showcase**  
April 26, 2007

**SCHEDULE OF SESSIONS**

8:00 - 9:10 a.m.	Poster Session
9:10 - 9:25 a.m.	IMSAloquium Session 1
9:35 - 9:50 a.m.	IMSAloquium Session 2
10:00 - 10:15 a.m.	IMSAloquium Session 3
10:25 - 10:40 a.m.	IMSAloquium Session 4
10:50 - 11:05 a.m.	IMSAloquium Session 5
11:15 - 11:30 a.m.	IMSAloquium Session 6
11:30 - 12:30 p.m.	Lunch
12:30 - 12:45 p.m.	IMSAloquium Session 7
12:55 - 1:10 p.m.	IMSAloquium Session 8
1:20 - 1:35 p.m.	IMSAloquium Session 9
1:45 - 2:00 p.m.	IMSAloquium Session 10
2:10 - 2:25 p.m.	IMSAloquium Session 11



## POSTER SESSION

### Biochemistry

20921	Ankit Jain, Yousif Kelaita
20974	Philip Kuo
20983	Temitope Okubadejo
21046	Michael Choe
21083	Victor Liou

### Bioengineering

20917	Lisa Thompson
21007	Neelam Balasubramanian, Frances Hardin
21020	Saurabh Kukreti
21032	Siyao Ye
21039	Alex Ma
21041	Vihasa Abraham
21057	Sivaraman Iyer

### Biology

20749	Lynn Jiang
20907	Perry Bradford, Sena Dzakuma
20935	Sophia Pilipchuk
20960	Sonali Jayakar
20972	Bryan Denig
20997	Michael Bryniarski
21001	Ranjani Logaraj
21006	Jing Zhang
21011	April-Hope Wareham
21013	Evelyn Wang
21023	Kenneth Higa
21029	Catherine Gao
21035	Lucia Wu
21061	Namita Gupta, Lara India
21063	Jessica Bubert, Anastasia Rahlin
21071	Alexandra Teller
21079	Theodore Atwood, Connor Dismer, Jonathan George, Joseph Hsu, Aaron Macy, John Seo
21086	Jillian Davenport, Gouthami Rao
21087	Ann Pan
21092	Tianyu Du
21107	Ramakrishna Nalluri
21114	John Froberg
21116	Mivil Abraham
21118	Sandeep Paruchuri
21123	Sonny Song, Joseph Ou
21136	Megan Abel
21143	Jeffery Ding



**Business**

20745	Patricia Whittaker
20870	Abigail Chao
20930	Janelle Peifer, Mary Wang
20936	Sophia Pilipchuk
21043	Tony Liu, Zhe Zhao
21058	Christina West
21095	Fae Rabin

**Chemistry**

20865	Chaoran Chen
20923	Robert Till
21049	Dennis Kriventsov
21077	Michael Schmitt

**Computer Science**

20899	Geoffrey Hotchkiss
21030	Michael McInerney
21038	Jonathon Ronchetti
21103	Chuan Li, Henry Wang
21125	William Boldridge, Yuqing Zhao
21126	Rachel Picher
21183	Daniel (Mac) Nelsen, Kirk Baly, Alex Drummond, Justin Johnson, Jae Kim, Garrett Kinkelaar, Bohao Liu, Xuxuan Liu, Mark Meyer, Illya Nepomnyashachiy, Jason Rock, Christian Sadi, Anil Vaitla

**Economics**

20938	Yangbo Du
20979	Charles Whittaker
20998	Jorge Jeria
21044	Yuren Xie
21073	Ryan Angelotti, Ryan Wang
21165	Jenny Zhao

**Education**

20927	Noelle Kwan, Meng Zhang
20934	Charles Pan
20982	Sulochana Mutha
20995	Claudia Kim
21002	Eric Hultgren
21076	Qi-Yuan Gou
21106	Leslie Garcia
21117	Phoebe Barkan
21142	Jae Kim



**Engineering**

20897	Sean Daugherty, Kimberly Parker
20959	Steven Cai
20978	Paul Dienhart, Fatima Kanchwala
21016	Kai Yang
21022	Hemal Patel
21037	John Myrda, Meredith Rhein
21066	Hon Chu
21069	Birce Onal
21082	Jagannath (Sam) Nayak
21099	Michael Driscoll, Gregory Ver Halen
21100	Michael Driscoll
21112	Amar Rana
21149	David Jordan

**English**

21021	Everett Brokaw
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**Environmental Science**

20970	Claire Herdeman, Yuxi Ji
21056	Aaron Macy, Priyanka Prakash, Kyle Schirmann, Christina West

**Fine Arts**

20992	Joshua Cote
21102	Valerie Young

**History**

21104	Seong-Ah Cho
21108	Jennifer Levey
21109	Ju Lee, Shelton Leung
21113	Mary Kobs
21152	Kenneth Ofodile

**Law**

20945	Tianyin Luo, Gokila Pillai
21009	Sean Mirski
21048	Xavier Watson
21072	Matthew Dabaco, Nicholas Umholtz
21080	Brandon Zhang
21164	Daniela Spencer



**Mathematics**

20918	Scott Powers
21015	Tianli Chen
21026	Sujeeth Bharadwaj, Brian Martin
21031	Jennifer Iglesias
21036	Kathy Huang
21089	Kyle Schirmann

**Medicine**

20829	Sherry Yu
20901	Gaurav Singh
20916	Sharon Zeng
20947	Angela Kao, Annie Liu
21004	Karan Patel
21008	Hyun Soo Sheen
21024	Cristina Thomas
21025	Lindsey Choi
21028	Mackenzie Hovermale, Vineet Mohanty
21042	Karissa Fernandez
21070	Daniel Dean, Vincent Rossi
21074	Jonas Owen, Neha Sarvepalli
21091	Michelle Blomgren
21096	Sivali Boddu
21111	Sarah Trevor
21124	Marissa Ghant

**Neurobiology**

20781	Lorraine Cho
20939	Bharat Kilaru
20944	Yuyang Bai
20946	Sarah Shareef
20953	Andrew Gentile, Monica Kao
20973	Kathryn Schoedel
20980	Stephanie Chang
21027	Francis Lawrence
21064	Karen Song, Jenny Zhang
21075	Adam Novak
21085	Thiran Udawatta
21105	Li-Yan Chang, Nisha Joshi
21115	Tyce Herrman
21121	Nitin Bogulla



**Physics**

19979	Tiernan Evans
19993	Amy Allen
20804	Zexi Fang
20914	Brianna Benson, Theresa Geiger
20937	Parker Schmitt
20971	Forrest landola
21040	Monica Bhattacharya
21062	Justin Johnson
21065	Anita Mehta
21090	Kevin Tao
21101	Susan Dittmer
21110	Shiva Chirumamilla
21120	Stephanie Bian, Je-ok Choi, Yeon (Angela) Suh

**Psychology**

20868	Alexandra Plattos
20869	Min Chen, Soumya Gogula, Chad Stevens
21000	Jessica Dong
21005	Meng Kang
21050	John Li
21054	Alexis Sellars
21084	Chantel Liggett, Sarah McPike
21119	Kunj Amin, Michael Paik
21127	Chelsea Fu
21158	James Almblade
21159	Marissa Fandel

**Social Science**

20905	Julia Balto, Taylor Barnes
20910	Joshua Lee, Elizabeth Ikejimba
20948	Rachel Banke
20950	Crystal Croyl
20981	Wei Luo
21019	Winnie Cheng
21067	Ashima Sarup
21078	Yi Lu
21094	Kelsey Gee, Tony Sheng
21129	Manuel Perez, Josue Pernillo

**Space Science**

20991	Nathaniel Steinsultz
21122	Scott Ogilvie

**Theology**

21097	Sylvia Matlosz
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9:10 - 9:25

Room	Abstract ID	
A-113	20781	<b>Centro-Parietal Abnormalities and Cognitive Dysfunction in Adolescents with Psychiatric Disorders</b> Lorraine Cho, Dr. Teresa Poprawski
A-117	19979	<b>Exploring New Experiments Designed to Measure Theta13.</b> Tiernan Evans, Dr. Maury Goodman
A-119	21054	<b>The Longing for Belonging</b> Alexis Sellars, Dr. Wendi Gardner
A-131	21085	<b>Prospective, Multi-Centered, Controlled Study to Demonstrate the Safety and Efficacy of Peripheral Nerve Stimulation With an Implantable Pulse Generator and the Effect it has on the Treatment of Pain Associated With Chronic Migraine Headaches.</b> Thiran Udawatta, Dr. Mustafa Colpan, Dr. Naureen Monawar, Dr. Konstantin Slavin
A-133	21032	<b>Real-Time Mapping of the Brain Tumor Using Spectroscopy</b> Siyao Ye, Dr. Jianmin Gong, Dr. Xu Li
A-135	21077	<b>Characterization of Heptapeptides to be Used in Nanoscale Biomolecular Valves on Ferroelectric Lead Zirconium Titanate Surfaces</b> Michael Schmitt, Dr. Leonidas Ocala
A-147	20979	<b>Economics and the Housing Market</b> Charles Whittaker, Dr. Casey Mulligan
A-149	21113	<b>An Examination of Dominican History Through Art</b> Mary Kobs, Dr. Jean Kadel
A-151	21022	<b>A Very "Cool" Project: Cryogenic High-Strain Rate Experiments</b> Hemal Patel, Dr. Murat Vural
A-155	21089	<b>Development of a Sentence Similarity Algorithm for Accessing Scientific Literature</b> Kyle Schirmann, Dr. Neil Smalheiser, Dr. Vette Torvik
AcPit A-138	21021	<b>The Glory of Reading: Exploring the Imagination through Catholic Fiction</b> Everett Brokaw, Mr. Michael Casey
B-110	20901	<b>Effects of Visual Versus Manual Guidance on Knee Range of Motion During Body Weight Supported Treadmill Training (BWSTT) Post-Stroke</b> Gaurav Singh, Dr. David Brown
B-116	20973	<b>Effect of Neuronal Protein Kalirin-7 on Learning and Memory</b> Kathryn Schoedel, Dr. Peter Penzes, Dr. Deepak Srivastava
B-133	21086	<b>The Inhibition of HIV-1 Replication by the Inhibition of the LTR Promoter</b> Jillian Davenport, Gouthami Rao, Dr. Donald Dosch
D-103	20865	<b>Analysis of Polybrominated Diphenyl Ethers in Human Placenta</b> Chaoran Chen, Dr. An Li
D-107	21000	<b>Manifestations of Post Traumatic Stress Disorder (PTSD) in Children and Adolescents with High Functioning Autism (HFA) or Asperger's Syndrome (AS)</b> Jessica Dong, Dr. Scott J. Hunter
D-110	20947	<b>HAART Response in Minority Patients in an Urban HIV Clinic in Comparison to Patients in Published, Randomized, Controlled Trials</b> Angela Kao, Annie Liu, Dr. David Pitrak
LectHall B-206	21072	<b>Representation of Indigent Clients in Society Today</b> Matthew Dabaco, Nicholas Umholtz, Ms. Regina Harris



9:35 - 9:50

Room	Abstract ID	
A-113	21002	<b>The Causes of and Solutions to Unethical Writing by Professionals and Students</b> Eric Hultgren, Mrs. Peg Cain, Mr. Mike Robinson
A-117	19993	<b>Neutrino Interactions in the Rock Surrounding the Far Detector</b> Amy Allen, Dr. Maury Goodman
A-121	21057	<b>Estimation of Facet Load Using Laminar Strain Gauges</b> Sivaraman Iyer, Dr. L. Voronov
A-131	21078	<b>Politeness Across Cultures: A Preliminary Sociolinguistic Analysis on French and American films</b> Yi Lu, Ms. Brenda Crosby, Mrs. Willa Shultz
A-133	21070	<b>The Presence of the CTLA-4 +49 A/G Polymorphism in the Plasma and DNA of Caucasian Males With Respect to Abdominal Aortic Aneurysms and Carotid Artery Disease</b> Daniel Dean, Vincent Rossi, Dr. William Pearce, Ms. Vera Shively
A-135	21136	<b>Analysis of Epicardial Invasion in the Late Gestational Heart</b> Megan Abel, Dr. Robert Dettman
A-147	21095	<b>Study of British-American Tobacco Company's Presence in Cambodia and Uzbekistan</b> Fae Rabin, Dr. Robbin Derry
A-149	20910	<b>Para La Gente</b> Elizabeth Ikejimba, Joshua Lee, Dr. Jean Kadel
A-151	21020	<b>Investigation of Optical Biomarkers for Characterization of Alterations in Nanoscale Tissue Architecture in Early Cancer</b> Saurabh Kukreti, Dr. Vadim Backman
A-155	21117	<b>Getting Back the Years You Lost in Elementary School: A Method of Educational Reform</b> Phoebe Barkan, Dr. Robert Kiely
AcPit A-138	20905	<b>Are We What We Say We Are? The Assumptions We Make</b> Julia Balto, Taylor Barnes, Dr. Jim Victory
B-110	20959	<b>Metal Dusting</b> Steven Cai, Dr. Ken Nateson, Dr. Zuotao Zeng
B-116	20944	<b>A Comparison of Brain Volume Changes in Two Different Stroke Patient Groups Undergoing Different Treatments</b> Yuyang Bai, Dr. Todd Parrish
B-133	21099	<b>Designing a Maglev Train</b> Michael Driscoll, Gregory Ver Halen, Dr. David Workman
D-107	21063	<b>Attack of the Clones: An Exploration of Embryogenesis in <i>Arabidopsis thaliana</i></b> Jessica Bubert, Anastasia Rahlin, Dr. F. Bryan Pickett
D-110	20923	<b>Electrochemical Deposition of Lead Chalcogenides onto Aluminum Oxide Templates</b> Robert Till, Dr. Hsien-Hau Wang
LectHall B-206	20953	<b>Development of an <math>\alpha</math>-Mannosidase 2A2 Based Gene Therapy for Glioblastoma Multiforme</b> Andrew Gentile, Monica Kao, Dr. Roger Kroes

**9:35 - 10:15**

Room	Abstract ID
D-103	21102

**Folk Ways in American Culture**  
Valerie Young, Dr. Claiborne Skinner

**10:00 - 10:15**

Room	Abstract ID
A-113	20948

**Preserving Irish Gaelic: Youth and Technology Maintaining a 2,500-Year-Old Language**

Rachel Banke, Mrs. Peg Cain

A-117	21122
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**A Study Concerning the Processes that Power Active Galactic Nuclei**

Scott Ogilvie, Dr. David Steele

A-119	21107
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**SH2 Domain Specificity Using Peptide Arrays**

Ramakrishna Nalluri, Dr. Piers Nash

A-131	21040
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**Neutrino Data Analysis**

Monica Bhattacharya, Dr. Regina Rameika

A-133	21005
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**Cold Sensitivity and Analgesia in Rat Models of Chronic Pain**

Meng Kang, Dr. A. Vania Apkarian

A-135	21112
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**Detection and Tracking of a Nuclear Source With Camera Using an Advance Algorithm**

Amar Rana, Dr. Richard Klann, Dr. Richard Vilim

A-147	20936
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**Global Translation Services: Entrepreneurship Skills in Selling, Pitching, and Presenting a Service**

Sophia Pilipchuk, Mr. Scott Metcalfe

A-149	21019
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**The Story of China and Venezuela: Similarities in Past Political Powers and Economy**

Winnie Cheng, Dr. Jean Kadel

A-151	21006
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**Creation of a Mutated Dcyp33 Gene and Its Effects on Expression Levels of HOX genes in the Drosophila Fruit Fly**

Jing Zhang, Dr. Manuel Diaz

A-155	21031
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**Mathematical Poker**

Jennifer Iglesias, Dr. Mark Fischler

AcPit A-138	21073
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**A Quantitative Analysis of the Ethanol Industry Through Stock Valuation**

Ryan Angelotti, Ryan Wang, Mr. Matthew King

B-110	21096
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**An Attempt to Suppress Endogenous KCNQ1 Current in Xenopus Oocytes Using RNA Interference**

Sivali Boddu, Dr. Daniel Levy, Dr. Sherry Wanderling

B-116	20971
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**Electron Beam Focusing for the International Linear Collider**

Forrest landola, Dr. Michael Syphers

B-133	21100
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**Avoiding the Danger: Robotic Assistance in a Disaster Zone**

Michael Driscoll, Dr. Paul Oh

D-107	20907
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**Comparison of DNA in Large breed Bichons With and Without Canine Hip Dysplasia**

Perry Bradford, Sena Dzakuma, Dr. Susan Styer

D-110	21121
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**Individual Differences in Responding to Pitch-Shifted Auditory Training**

Nitin Bogulla, Dr. Charles Larson, Mr. Han Jun Liu

E-115	21056
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**Sea Urchin Relocation Project**

Aaron Macy, Priyanka Prakash, Kyle Schirmann, Christina West, Ms. Susan Bernal



**10:00 - 10:40**

Room	Abstract ID
LectHall B-206	21084

**Mate Preferences of Varying Sexual Orientations: Synthesizing Evolutionary Theories**

Chantel Liggett, Sarah McPike, Dr. J. Michael Bailey, Dr. Joan Chiao

**10:25 - 10:40**

Room	Abstract ID
A-113	21109

**Investigation of the Biblical Account of Jesus**

Ju Lee, Shelton Leung, Dr. Walter McCord

A-117	21090
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**Searching for Cooling as a Result of Field Emission**

Kevin Tao, Dr. Heinz Busta, Dr. Alan Feinerman

A-119	21036
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**Relations Between the Terms of Interspersion Arrays**

Kathy Huang, Dr. Steve Condie

A-131	21037
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**Theoretical Calculations of Low-Loss Electron Energy Loss Spectra for Andalusite and Tetragonal-Hafnium Oxide**

John Myrda, Meredith Rhein, Mr. Manish Singh, Dr. Christos Takoudis

A-135	21091
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**The Measurement of beta-Cell Mass *In Vivo***

Michelle Blomgren, Dr. Anita Chong, Dr. David Lee

A-147	20870
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**Presenting Effectively and Powerfully**

Abigail Chao, Mr. Scott Metcalfe

A-149	21048
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**Asylum in the United States: Case Studies to Analyze the Process and its Biases**

Xavier Watson, Ms. Beatriz Sandoval

A-151	20749
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**Novel Glucosyltransferases in Oral *Lactobacilli***

Lynn Jiang, Dr. Lin Tao

A-155	21016
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**Analyzing the Forces Within the Bridge**

Kai Yang, Mr. Branson Lawrence

AcPit A-138	20945
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**The Death Penalty Worldwide**

Tianyin Luo, Gokila Pillai, Dr. Sandra Babcock

B-110	21013
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**Characterization of the SIP1 Promoter Region**

Evelyn Wang, Dr. Qingshen Gao, Dr. Xinjiang Wang

B-116	21123
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**The Analysis and Implementation of Live Cell Imaging in the Study of Interactions Between LMP4 and Actin Filament**

Joseph Ou, Sonny Song Dr. Teng-Leong Chew

B-133	20914
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**Genius Divided: A Historical Context for Quantum Mechanics**

Brianna Benson, Theresa Geiger, Dr. David Workman

D-103	20745
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**Bridging Batavia: The Business Factors Behind Downtown Bridge Construction**

Patricia Whittaker, Ms. Britta McKenna

D-107	21058
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**The Birth of the Flexistrip**

Christina West, Dr. David Abler

D-110	21067
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**Ethics in Malpractice**

Ashima Sarup, Dr. Claiborne Skinner

**10:25 - 11:05**

Room	Abstract ID
A-133	21064

**Early Detection of Alzheimer's Disease through High Resolution Magnetization Transfer Using Voxel-Based Morphometry**

Karen Song, Jenny Zhang, Dr. Todd Parrish



**10:50 - 11:05**

<b>Room</b>	<b>Abstract ID</b>	
A-113	21015	<b>Optimal Play Strategy for Pig Dice Game</b> Tianli Chen, Dr. Wei-Hua Ruan
A-117	21062	<b>Production and Behavior of Granular Materials</b> Justin Johnson, Dr. Alan Feinerman
A-119	20918	<b>Evaluating the Effectiveness of Bill James's Win Shares</b> Scott Powers, Dr. Steve Condie, Dr. Michael Keyton, Mr. Robert Sheinkopf
A-131	21152	<b>This Is America: The US since the End of the Second World War</b> Kenneth Ofodile, Dr. Jim Victory
A-135	21101	<b>Dimuon New Physics Search at CDF Fermilab</b> Susan Dittmer, Dr. Jane Nachtman
A-147	20930	<b>Using Science to Make Money</b> Janelle Peifer, Mary Wang, Dr. David Abler
A-149	20938	<b>Promoting Bio-Ethanol in the United States by Incorporating Lessons from Brazil's National Alcohol Programme</b> Yangbo Du, Dr. Joshua Linn
A-151	21001	<b>The Role of MFG-E8/lactahedrin in Intestinal Epithelial Restitution</b> Ranjani Logaraj, Dr. Xiaodi Tan, Dr. Peter Whittington
A-155	21011	<b>The Effect of Building Resistance on Cell Lines Affected by Common Chemotherapy Drugs and Their Production of MRP2</b> April-Hope Wareham, Dr. Susan Styer
AcPit A-138	21119	<b>A Study of Attitude Toward the Tobacco Industry and the Effect of Media Campaigns: A Survey of IMSA Students</b> Kunj Amin, Michael Paik, Dr. Robbin Derry
B-110	21024	<b>Specific Killing of Tumor Cells by Targeting Centrobilin</b> Cristina Thomas, Dr. Qingshen Gao, Dr. Chaozhong Zou
B-116	20980	<b>Age-Dependent Activation of Neuroglia After Status Epilepticus</b> Stephanie Chang, Dr. Sookyong Koh
B-133	21114	<b>The Effect of Dopamine Stimulation on Homer-1 Production in Mouse Neurons</b> John Froberg, Dr. Donald Dosch
D-103	20978	<b>Mixed-Use Urban Design Project</b> Paul Dienhart, Fatima Kanchwala, Mr. Steven Vasilion
D-107	21083	<b>Histone Deacetylase Inhibitor Trichostatin A abrogates Transforming Growth Factor-<math>\beta</math>-Induced Type I Collagen Synthesis: Possible Mechanism</b> Victor Liou, Dr. Asish Ghosh, Dr. John Varga
D-110	20998	<b>The Crucible: Examining Brazil as a New Model for Economic Sustainability in the Face of Climate Change</b> Jorge Jeria, Dr. Claiborne Skinner

**10:50 - 11:30**

<b>Room</b>	<b>Abstract ID</b>	
LectHall B-206	20927	<b>IMSA on Wheels: Electricity and Magnetism DVD</b> Noelle Kwan, Meng Zhang, Mr. William McGrail, Ms. Tracy Miller



**11:15 - 11:30**

**Room Abstract ID**

A-113	21124	<b>A Day in the Life... An Investigation of Medical and Surgical Specialties</b> Marissa Ghant, Dr. Sonja Boone
A-117	21074	<b>Alternative Splicing of the Glucocorticoid Receptor Protein in Multiple Myeloma and its Role in Drug Resistance</b> Jonas Owen, Neha Sarvepalli, Dr. Nancy Krett, Dr. Steven Rosen
A-119	21104	<b>The Japanese Perception of Homosexuality: An Investigation of its History and its Modern Implications</b> Seong-Ah Cho, Mr. Jonathan Besancon, Dr. David Evenson
A-131	21050	<b>What You See in Lucky Charms: A Study on the Properties of Visual Grouping</b> John Li, Dr. Steven Franconeri
A-133	20868	<b>Lapses in Attention as a Measure of Impulsivity</b> Alexandra Plattos, Dr. Harriett de Wit
A-135	21069	<b>Designing a Cryo-Cooler System</b> Birce Onal, Mr. Richard Schmitt
A-147	20935	<b>The Effect of Epigallocatechin-3-gallate (EGCG), a Green Tea Component, on HeLa Cell Proliferation and Viability</b> Sophia Pilipchuk, Dr. Donald Dosch, Dr. Judith Scheppeler
A-149	21087	<b>Therapeutic Application of Mesenchymal Stem Cells in a Rodent Model of Pulmonary Hypertension</b> Ann Pan, Dr. Joe Garcia, Dr. Jenny Harrington, Dr. Liliana Moreno
A-151	20939	<b>HCN Channel Interactors Progress Understanding of Synaptic Control</b> Bharat Kilaru, Dr. Dane Chetkovich
A-155	20829	<b>Mechanism of Inflammation in Biliary Atresia</b> Sherry Yu, Dr. Lee Bass, Dr. Tom Giesler, Dr. Peter Whittington
B-110	21029	<b>Genotyping of Genetically Modified Mice</b> Catherine Gao, Dr. Vilma Band, Dr. C.B. Gurumurthy
B-116	21039	<b>The Effect of Iron Particle Size on Signal Intensity in Magnetic Resonance Imaging</b> Alex Ma, Dr. Debiao Li
B-133	21042	<b>Can Event Free Survival Rates of Children with Hodgkin's Disease Increase?</b> Karissa Fernandez, James Nachman
D-103	20804	<b>Hydrogen Sensors Based on Ultrathin Palladium Nanobead Arrays on Porous Anodic Aluminum Oxide (AAO) Substrates</b> Zexi Fang, Dr. Zhili Xiao
D-107	21079	<b>The Dynamics of Heron Populations in the Danada Forest Preserve</b> Theodore Atwood, Connor Dismer, Jonathan George, Joseph Hsu, Aaron Macy, John Seo, Dr. David Workman
D-110	20960	<b>The Effect of Antiplatelet Drugs on GPIIb/IIIa Receptor Density</b> Sonali Jayakar, Dr. Omer Iqbal

**12:30 - 1:10**

Room	Abstract ID
B-133	21120

**International Linear Collider: A New Initiative for the World of High Energy Physics**

Stephanie Bian, Je-ok Choi, Yeon (Angela) Suh, Dr. Young-Kee Kim, Dr. John Yoh

**12:30 - 12:45**

Room	Abstract ID
A-113	21115
A-119	21127
A-131	21159
A-149	21046
A-155	21028
B-110	21111
B-116	21023
LectHall B-206	20992

**Flourescent Imaging of Neuronal HSP 27**

Tyce Herrman, Dr. Michael Collins

**Stress-Induced Physiological and Psychological Changes in Students at the Illinois Mathematics and Science Academy**

Chelsea Fu, Dr. Soumya Anjur, Dr. David Evenson

**The Use of Facial Perception in Determining Emotions**

Marissa Fandel, Dr. Steven Franconeri

**Examining M07e and THP-1 Cell Line Interactions Through Blocking Peptides and Proteins Adhesion Assays of Fibronectin**

Michael Choe, Dr. William Miller

**Clinical Study of Ica Operon Presence in *Staphylococcus epidermidis***

MacKenzie Hovermale, Vineet Mohanty, Mr. Bill Kabat

**Fluid Recommendations for the First Ten Days of Life for an Infant Born Weighing Less Than 800 g**

Sarah Trevor, Dr. Jonathan Muraskas

**The Importance of Rho GTPase Signaling During Herpes Simplex Virus Type 1 Induced Cell-Cell Fusion**

Kenneth Higa, Dr. Deepak Shukla

**Environmentally Conscious Renovation of Heavy Industrial Workspace**

Joshua Cote, Mr. Ed Crumpley, Dr. Vic Kuchler, Mr. Gary Van Zandbergen



12:55 - 1:10

Room	Abstract ID	
A-113	20934	<b>Global Contact, Changing Japan's Education</b> Charles Pan, Dr. Christian Nokkentved
A-117	21116	<b>Bees and Humans: Education of these Misunderstood Creatures</b> Mivil Abraham, Ms. Carina Eizmendi, Dr. Ronen Mir
A-119	20983	<b>Exploring the Correlation between Genetic Aberrations and Mythology</b> Temi-tope Okubadejo, Dr. Soumya Anjur, Dr. Dennis Czerny
A-131	21143	<b>5ASA Mitigates Stem Cell Activation in Colitis-Induced Cancer</b> Jeffery Ding, Mr. Gery Grimm
A-135	21097	<b>Faith and the Human Experience in the Works of John Paul II</b> Sylwia Matlosz, Mr. Jose Palos
A-149	21142	<b>Sequential Touching as a Viable Analytical Tool</b> Jae Kim, Dr. Amy Booth
A-155	21027	<b>A Literature Review on the Biological Basis of Attention Deficit and Hyperactivity Disorder</b> Francis Lawrence, Dr. David Evenson
AcPit A-138	21094	<b>Crafting an Ideal Leadership Program for Gifted Adolescents</b> Kelsey Gee, Tony Sheng, Dr. Robert Hernandez
B-110	21025	<b>Targeted Fluconazole Prophylaxis for Prevention of Systemic Candidemia in Extremely Low Birth Weight Infants</b> Lindsey Choi, Dr. Brett Galley, Dr. Jonathan Muraskas
B-116	21030	<b>Filtering the Noise of The Internet: Creating An Intrusion Detection System That Will Only Alert on Abnormalities</b> Michael McInerney, Mr. Brian Sea, Mr. Steve Terrell
D-101	21108	<b>Gunpowder's Explosion into Military Technology</b> Jennifer Levey, Dr. Lee Eysturid
D-103	21071	<b>Environmental Enrichment for Primate Housing to Improve Social and Psychological Well-being Using Multi-colored/ Multi-Shaped Toys</b> Alexandra Teller, Dr. Lee Cera
D-110	20950	<b>The Evolution of the Andean Sunken Plaza 3000 B.C.E.-100 B.C.E.</b> Crystal Croyl, Dr. Jonathan Haas
E-115	21106	<b>IMSA on Wheels in Translation</b> Leslie Garcia, Ms. Tracy Miller
LectHall B-206	21118	<b>Development of Supramolecular Structures Combining Hyaluronic Acid With Peptide Amphiphiles for Regenerative Medicine Applications</b> Sandeep Paruchuri, Dr. Helena Azevedo, Dr. Ramille Capito, Dr. Samuel Stupp

1:20 - 1:35

Room	Abstract ID	
A-113	20974	<b>Searching the DNA Sequence for the Gene Encoding Acetyl-CoA Carboxylase 2 of a Human Subject Who Appears to Have Fatty Acid Metabolism</b> Philip Kuo, Dr. Robert Haselkorn
A-117	20946	<b>The Response of Oligodendrocytes to Normal Appearing White Matter from Multiple Sclerosis and Control Patients – A Study of the Early Pathology of Multiple Sclerosis.</b> Sarah Shareef, Dr. Sara Becker-Catania
A-131	21110	<b>A Novel Search for Quark Structure in Collisions at <math>\sqrt{s}</math> of 1.96 TeV</b> Shiva Chirumamilla, Dr. Don Lincoln
A-135	21105	<b>Maladaptive Networks and Higher Phase Synchrony in the Epileptogenic Zone of the Cerebral Cortex</b> Li-Yan Chang, Nisha Joshi, Dr. Vernon Towle
A-149	21082	<b>Magnetic Nanostructures for Use in Biomedicine</b> Jagannath (Sam) Nayak, Dr. Mohammed Aslam, Prof. Vinayak Dravid
A-155	20937	<b>The Efficiency of Neutrinos Observations on the Near and Far Neutrino Detectors</b> Parker Schmitt, Dr. Niki Saoulidou
AcPit A-138	21129	<b>Profiling the Latino Influence in America's 100 Largest Cities</b> Manuel Perez, Josue Pernillo, Dr. Juan Andrade, Mr. Michael Rodriguez
B-110	21041	<b>Image Based Reconstruction and Transport Mechanisms in the Human Brain</b> Vihas Abraham, Prof. Andreas Linninger, Dr. Michalis Xenos
B-116	21038	<b>Network Bandwidth and netLasso</b> Jonathan Ronchetti, Dr. Jason Leigh, Dr. Xinjiang Wang
B-133	20981	<b>Goodbye Versus Gu-Dei-Baai: English Words and Cantonese Imitations</b> Wei Luo, Dr. Alan Yu
D-101	20897	<b>The Physics of Roller Coasters</b> Sean Daugherty, Kimberly Parker, Dr. David Workman
D-103	21035	<b>Effects of Cigarette Smoke Cadmium on the Release of Calcium from Bone in Humans</b> Lucia Wu, Dr. Maryka Bhattacharyya
D-107	20995	<b>Science Explorers Jr.</b> Claudia Kim, Ms. Sarah Pfeifer
D-110	20917	<b>Seeding of Chondrocytes on Copolymer Scaffolds for Tissue Engineering Applications</b> Lisa Thompson, Dr. Guillermo Ameer, Mr. Anand Jagannath
E-115	21076	<b>IMSA on Wheels: Amazing Magnetism Interactive Experience</b> Qi-Yuan Gou, Ms. Tracy Miller
LectHall B-206	20916	<b>Retrospective Chart Review of the Efficacy of Atkins Diet in Treating Intractable Epilepsy</b> Sharon Zeng, Dr. Kent Kelley



**1:45 - 2:00**

<b>Room</b>	<b>Abstract ID</b>	
A-113	21009	<b>A Legal, Social, and Technical Examination of Electronic Medical and Health Records</b> Sean Mirski, Mrs. Ellen Layton, Mr. Mark E. Rust
A-117	21080	<b>Compilation of a Police Database for the Prevention of Police Misconduct</b> Brandon Zhang, Ms. Cathryn Crawford
A-119	21026	<b>Statistics of Teenage Romance Networks</b> Sujeeth Bharadwaj, Brian Martin, Dr. Ezra Getzler
A-131	21158	<b>Mood-Based Perspective in Text Comprehension</b> James Almblade, Dr. David Rapp
A-135	21004	<b>Angiogenic Inhibitors and Inhibitors of Histone Deacetylases - A New Way to Block Tumor Growth and Angiogenesis?</b> Karan Patel, Dr. Olga Volpert
A-149	21065	<b>Exploring the Efficiency of the MINOS Experiment</b> Anita Mehta, Dr. Niki Saoulidou
A-155	20899	<b>Uses of Virtual Machines in the Present and Future</b> Geoffrey Hotchkiss, Mr. Dan Dycus
AcPit A-138	21043	<b>Is Investing a Gamble?</b> Tony Liu, Zhe Zhao, Mr. Mark Musaraca
B-110	21049	<b>Explorations in Organometallic Synthesis</b> Dennis Kriventsov, Dr. Narayan Hosmane, Ms. Josie Wallmuth
B-116	21061	<b>Determining A Familial Relationship From DNA Extracted from Hair Follicles</b> Namita Gupta, Lara India, Dr. Donald Dosch, Dr. Susan Styer
B-133	21008	<b>Potential Alternatives for the Anticoagulation Management of Patients With Heparin-Induced Thrombocytopenia</b> Hyun Soo Sheen, Dr. Walter Jeske, Dr. Jeanine Walenga
D-101	21183	<b>Developing Video Games</b> Kirk Baly, Alexander Drummond, Justin Johnson, Jae Kim, Garrett Kinkelaar, Bohao Liu, Xuxuan Liu, Mark Meyer, Daniel (Mac) Nelsen, Ilya Nepomnyashchiy, Jason Rock, Christian Sadi, Anil Vaitla, Mr. Michael Woodley
D-103	21125	<b>Automatic Information Gathering and its Uses</b> William Boldridge, Yuqing Zhao, Dr. Kristan John Hammond, Dr. Sara Owsley
D-110	21066	<b>Development of a Handheld On-Chip PCR Device for Detection of Microorganisms Relevant to Biodefense</b> Hon Chu, Mrs. Vicki Burgholzer
E-115	20982	<b>Super! Heroes, Heroines, and Villains: Learning Science While Having Fun</b> Sulochana Mutha, Ms. Sarah Pfeifer
LectHall B-206	20991	<b>The Relationship Between Stellar Luminosity and Dark Matter Mass in Galaxy Clusters</b> Nathaniel Steinsultz, Dr. James Annis

2:10 - 2:25

Room	Abstract ID	
A-117	21092	<b>The Proliferation of B-cells and IgE Production</b> Tianyu Du, Dr. Richard Dods
A-119	21164	<b>eBay Inc. v. MercExchange</b> Daniela Spencer, Ms. Milena Spencer
A-131	21165	<b>Outsourcing in Service Industries</b> Jenny Zhao, Dr. Gad Allon
A-135	20997	<b>The Function of VF0087 and VF0556 in Magnesium Dependant Motility of <i>Vibrio fischeri</i></b> Michael Bryniarski, Dr. Karen Visick
AcPit A-138	21103	<b>User Experience in Watson: An Innovative Search Tool</b> Chuan Li, Henry Wang, Dr. Jay Budzik
B-110	21075	<b>Improving the Accuracy of Neural Decoding for Neuroprosthetic Applications</b> Adam Novak, Dr. Nicho Hatsopoulos
B-116	20970	<b>Analyzing Illinois Level Of Compliance With The Clean Water Act's Municipal Stormwater Management Program</b> Claire Herdman, Yuxi Ji, Dr. Cindy Skrukud, Ms. Audrey Wells
B-133	21007	<b>An Investigation of Circumduction in the Gait of Stroke Survivors Walking at Various Velocities</b> Neelam Balasubramanian, Frances Hardin, Dr. Yasin Dhaheer
D-101	20921	<b>The Effects of Artificial Sweeteners on Insulin Production in RINm5F cells</b> Ankit Jain, Yousif Kelaita, Dr. Susan Styer
D-103	21126	<b>Quantifying the Efficacy of Virtual Reality Applications</b> Rachel Picher, Dr. John Boyle
D-107	21149	<b>Holography Unbound: A Novel Interactive Holographic Projection System</b> David Jordan, Dr. David Workman
D-110	20972	<b>Orchids in the Lab: the Effects of Homogenized Banana on the Growth of Two Species of Orchids</b> Bryan Denig, Mrs. Vicki Burgholzer, Ms. Irene Norton
E-115	21044	<b>Why People Choose the Majors That They Do</b> Yuren Xie, Paul Pieper
LectHall B-206	20869	<b>The Discovery of Self Through the Study of Evolving Systems</b> Min Chen, Soumya Gogula, Chad Stevens, Mr. Michael Ososky



**19979**

**Exploring New Experiments Designed To Measure Theta13.**

**Presenter(s)**

Tiernan Evans, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Maury Goodman, Argonne National Laboratory

There are two types of experiments that can measure neutrino oscillation parameters: reactor experiments, such as Daya Bay, Chooz, Double Chooz, and ANGRA; and accelerator experiments such as Minos, T2K, and NOvA. Chooz has set the current limit on  $\theta_{13}$ , at  $\sin^2(2\theta_{13}) < 0.19$  and other experiments are trying to match or improve that limit. Chooz only used one detector, however, and all of the newer experiments will use at least two. Using information presented in the proposals of the aforementioned experiments, I have determined that reactor experiments are more practical than accelerator experiments. In contrast to \$200-\$400 million dollar accelerator experiments, reactor experiments cost between \$5 and \$20 million dollars. This difference in cost is because the size of a detector needed for a reactor experiment is about one thousandth of the size of a detector needed for an accelerator experiment. In addition, I have done work to improve the Neutrino Oscillation website to make it more user friendly. I have also added information about the status of the experiment.

**19993**

**Neutrino Interactions in the Rock Surrounding the Far Detector**

**Presenter(s)**

Amy Allen, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Maury Goodman, Argonne National Laboratory

This investigation focuses on neutrinos, a kind of fundamental particle that travels at nearly the speed of light. The MINOS project studies a beam of neutrinos aimed from an accelerator at Fermilab to a detector in Soudan, Minnesota. Neutrinos can interact to create particles called muons, which also go through the detector. Muons can be positively or negatively charged. Aaron McGowan, a graduate student at the University of Minnesota, is studying neutrino interactions in the rock surrounding the detector. To help him with his research, I am scanning a set of data about these "rock muons." Scanning involves examining an image of each event and categorizing its features. Once they enter the magnetized detector, negatively charged muons follow a path bent towards the center. By looking at the paths of the muons in the detector, we are able to determine what charge they had. One interesting result of the analysis has been the number of positively charged muons we have found. Only about one in every ten muons has had a positive charge. About half of the muons were rock muons, and half had interaction vertices inside the detector.



**20745**

**Bridging Batavia: The Business Factors Behind Downtown Bridge Construction**

**Presenter(s)**

Patricia Whittaker, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Britta McKenna, Batavia Main Street

Have you ever wondered what happens to the economy of a city under construction? What do business owners do when their customers cannot use the front entryway? Starting in February of 2007 the City of Batavia began bridge reconstruction, which at its best interrupts traffic flow on their busiest street, and at its worst blocks the only street that connects both halves of Batavia. Attempting to keep the downtown from falling into economic crisis, Batavia Main Street has prepared various advertising and communication strategies to assist the business community. Through this past year I have been analyzing several different businesses' current advertising campaigns and plans (or lack thereof) for bridge construction. In addition I have helped my advisor, Ms. Britta McKenna, in implementing various programs to keep the downtown viable during this time. From creating a downtown map and bridge information center, to negotiating with local newspapers for free ad space, my investigation has focused on supporting the downtown through this transition. However, the question still remains: will the businesses survive? It is time to identify the impact on business during downtown bridge reconstruction.

**20749**

**Novel Glucosyltransferases in Oral Lactobacilli**

**Presenter(s)**

Lynn Jiang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Lin Tao, University of Illinois at Chicago

It is well known that *Streptococcus mutans* is the primary causative agent of dental caries. With glucosyltransferases which synthesize glucan from sucrose, the bacteria are able to colonize tooth surfaces. During our study of oral lactobacilli, we found some strains adhered to glass surfaces. The aim of this study was to isolate *Lactobacillus* strains that synthesize glucan and analyze their genes. Two types of gtf genes in eight strains were detected by PCR. One type showed 68% homology to *S. mutans* gtfD (encoding Gtf-S), and the other showed 72% homology to *L. reuteri* gtf180 (encoding Gtf-I). DNA analysis suggested that one may synthesize soluble glucan, while the other synthesizes insoluble glucan. Due to their ability to adhere to glass surfaces, these strains may be used to develop a bacterial replacement therapy against the colonization of *S. mutans*.



**20781**

**Centro-Parietal Abnormalities and Cognitive Dysfunction in Adolescents with Psychiatric Disorders**

**Presenter(s)**

Lorraine Cho, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Teresa Poprawski, Edwards Hines VA Hospital

Little previous research has been conducted using quantitative electroencephalography (qEEG) on adolescent populations. This study attempted to establish a correlation between centro-parietal abnormalities, cognitive function, and psychiatric illness in children and adolescents. The sample consisted of 88 psychiatric patients (63 male, 25 female) between the ages of 5 and 20 (mean: 12.32, SD = 3.51), of whom 75 were right-handed, 11 left-handed, and 2 ambidextrous. Awake, eyes-closed EEGs were analyzed for foreground activity, artifact-free epochs of background activity were compared to the normative database using NeuroGuide software, and low-resolution electromagnetic tomography analysis (LORETA) was used to locate deviant activity. Scores from a subset of IQ tests were correlated with the EEG findings. Further testing is required, but a comprehensive, diagnostic approach using qEEG and neuropsychological measures may provide valuable therapeutic data for adolescent psychiatric patients.

**20804**

**Hydrogen Sensors Based On Ultra-Thin Palladium Nanobead Arrays on Porous Anodic Aluminum Oxide (AAO) Substrates**

**Presenter(s)**

Zexi Fang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Zhili Xiao, Argonne National Laboratory

Palladium nanobead arrays that are capable of yielding sensitive hydrogen sensors were sought by making changes in either the nanopore diameter, pore to wall ratio in anodized aluminum oxide (AAO) membranes, or film thickness of the coated palladium. Aluminum foils were converted into aluminum oxide through anodization, by placing the foils in an acidic solution under a positive electric field. Nanoscale pores were then formed in the self-assembled AAO membranes. The said parameters were adjusted by applying different electric fields. Palladium was evaporated onto the substrate at varying film thicknesses and tested for resistivity through an applied current. Commercial AAO, when utilized as the substrate, was found to be capable of detecting hydrogen gas at a variety of concentrations. This is significant because the surface to volume ratio of the wire is high due to the shape of the wire, which will allow a shorter diffusion rate of hydrogen gas.



**20829**

**Mechanism of Inflammation in Biliary Atresia**

**Presenter(s)**

Sherry Yu, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Lee Bass, Children's Memorial Research Center

Dr. Tom Giesler, Children's Memorial Research Center

Dr. Peter Whittington, Children's Memorial Research Center

Biliary atresia (BA) is a neonatal liver disorder, in which bile ducts develop progressive fibrosis, which leads to cirrhosis. In the mouse model of BA, inoculation of newborn mice with the rotavirus creates a disease process that appears grossly and histologically like BA. A hypothesis is that a similarity exists between the rotavirus antigen and the biliary epithelial protein, which accounts for the immune response. Immunofluorescence was used to determine and analyze regions in the bile duct where rotavirus antibody NCDV bound in the mice. As expected, the tissue sections treated with NCDV showed greater fluorescence around the bile duct's perimeter than the controls. We then looked at TGF- $\beta$ , a cytokine that may play a role in the development of BA, using a DAB stain. Significant increase in TGF-  $\beta$  levels was observed between the second and third week of life in the mouse model. These findings may assist in the determination of the immunologic pathogenesis of the mouse model of BA.

**20865**

**Analysis of Polybrominated Diphenyl Ethers in Human Placenta**

**Presenter(s)**

Chaoran Chen, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. an Li, University of Illinois at Chicago

Polybrominated diphenyl ethers (PBDEs), flame retardant chemicals found in many common household objects such as upholstered furniture, carpet, and computers, have been shown to inhibit neurological, hormonal, and reproductive development in animals with potentially especially detrimental effects on infants. In this work, a method has been developed for the analysis of PBDEs in human placenta, the major pathway through which an infant is exposed prenatally to PBDEs. Different extraction techniques, time lengths, and solvents were compared, and 24-hour Soxhlet extraction with acetone:hexane:DCM (45:45:10, v/v), silica gel cleanup, and instrumental analysis on high resolution gas chromatography coupled with low resolution mass spectrometry was determined to be an effective procedure (recoveries were satisfactory). Results of the analysis of 9 PBDE congeners in 5 individual human placenta samples showed that PBDE levels in human placenta from the U.S. are 5 to 45 times higher than those in contemporaneous samples from Japan and Europe. The method developed in this study can be used in future long-term studies on the effects of PBDEs on human development.



**20868**

**Lapses in Attention as a Measure of Impulsivity**

**Presenter(s)**

Alexandra Plattos, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Harriett de Wit, University of Chicago

This study was designed to assess the hypothesis that lapses in attention are a measure of impulsivity. Impulsivity is defined as acting momentarily, without thought or regard to consequences. Problems with attention may result in impulsive behavior. From a simple reaction time test, the deviation from the mode (DM) was used to determine lapses in attention in 109 healthy subjects who participated in four different drug studies. These DM's were then compared to subjects' self reported levels of impulsivity using the Barratt Impulsiveness Scale Version 11 (BIS-11). A high BIS-11 score shows a higher rate of impulsivity. For our study, there was no correlation between the mode and the DM, suggesting that these measure separate processes. A negative correlation of  $r = -.191$  and  $p < .05$  was found between the BIS-11 first order factor, motor impulsiveness, score, and the mode. This shows that those who reported themselves as being more impulsive have a higher number of shorter reaction times. A positive correlation of  $r = .238$  and  $p < .05$  was found between the motor impulsiveness first order and the DM. This indicates that the higher the subjects reported themselves as impulsive, the more likely they were to have longer reaction times. Because longer reaction times suggest lapses in attention, this, correlated with the personality measure of impulsivity, supports our original hypothesis.

**20869**

**The Discovery of Self Through the Study of Evolving Systems**

**Presenter(s)**

Min Chen, Illinois Mathematics and Science Academy

Soumya Gogula, Illinois Mathematics and Science Academy

Chad Stevens, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Michael Ososky, Applied Computer Technology

Humans are a direct result of the constant co-evolution of genes and memes--cultural genes. Technology is a product of memetic evolution and changes at an exponential rate. Soon it will be impossible to measure the rate of technological evolution. Artificial intelligence is a recently developed technology. The rapid growth of artificial intelligence technology overshadows that of genetic evolution. Through detailed discussions of nomenclatural books with our advisor, we have broadened our understanding of the evolution of human beings and acknowledged the advancement in the coalescence between humans and artificial intelligence. This year, we have explored the elements that comprise complex adaptive systems such as evolutionary algorithms, the ability to form schema, and emergence. One major evolutionary algorithm is the particle swarm model, which has practical applications to modeling different groups of human culture. The ability to form a schema allows an agent of a complex adaptive system to respond to its system. Rather than being controlled or pre-planned, complex adaptive systems are emergent and as a result are able to evolve and adapt. The study of evolving systems has allowed us to discover the nature of humans and appreciate the coming age of technology.



**20870**

**Presenting Effectively and Powerfully**

**Presenter(s)**

Abigail Chao, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Scott Metcalfe, Empire Consulting Inc.

As an IMSA student, we are constantly asked to pursue goals in math, science, and technology; however, this leaves out an important part of our society – business. A fundamental part of business is presenting one's ideas or products, but this is a topic often overlooked. In the Selling, Pitching, and Presenting class offered by TALENT, we examined the components of a successful and effective presentation, covering everything from a quick introduction to capture attention to a full product presentation. What makes a product appealing to a customer and how can we, as businesspeople, capitalize on this? What simple presentations techniques will not only make us appear confident and enthused, but also give us the power of persuasion? How can our presentation skills inspire an audience to "know, feel, say, and do"? These are a few of the questions that we explored in Selling, Pitching, and Presenting, and also questions to be examined in this presentation.

**20897**

**The Physics of Roller Coasters**

**Presenter(s)**

Sean Daugherty, Illinois Mathematics and Science Academy

Kimberly Parker, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Workman, Illinois Mathematics and Science Academy

In this inquiry, the different hills, curves, and loops of the average roller coaster were studied to the point where accurate inferences could be made towards the design and construction of a model roller coaster. From this analysis of roller coaster design, a model was designed and built. Starting off at its highest point, the cart follows the staple-shaped track with six wheels, four for the underside and two projected off the sides acting as our turn guide. The interaction between the cart and the track proved to be integral to some of the ideas being investigated in the inquiry. The track design shows that when the cart goes upside down but has enough kinetic energy, it can complete the loop without being held in place by the normal force pressing the cart against the track. As the cart turns, banked curves have been used to transfer energy more effectively. Some of the main problems encountered have been the construction details and friction between the cart and the track. Many innovative designs have been tried in order to overcome these difficulties. An understanding of the principles of mechanical physics, along with how they apply to engineering, has been gained in order to make a superb model roller coaster.



**20899**

**Uses of Virtual Machines in the Present and Future**

**Presenter(s)**

Geoffrey Hotchkiss, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Dan Dycus, Thompson Elite

A virtual machine is, at the core, a computer running within another computer that is as capable as if it was running on a separate machine. Although the concept of virtual machines has been around since the beginning of computing, their implementation into computers has been rough. I have been using VMware Workstation 5.5, a virtual machine monitor, and virtual machines everyday to become more familiar with the performance and uses of them. After looking at the variety of uses companies had for virtual machines, the major effect was a massive drop in the number of computers needed to do the same task. This is good because not only is the hardware being utilized more efficiently, but there is also less that will need to be managed. Another effect is the ability to back up an entire virtual machine on the fly, without downtime. That function increases productivity of the users and the high availability of the server. Thus, virtual machines will be used more in projects requiring many computers or servers as a means to consolidate space and optimize performance on hardware.

**20901**

**Effects of Visual versus Manual Guidance on Knee Range of Motion During Body Weight Supported Treadmill Training (BWSTT) Post-Stroke**

**Presenter(s)**

Gaurav Singh, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Brown, Northwestern University

Stroke is a potentially lethal condition in which the brain is damaged due to the lack of oxygen. This damage can result in hemiparesis, the paralysis of one side of the body. Hemiparesis from stroke affects victims' walking capabilities; victims frequently "walk" with a rigid knee. Our research focused on achieving increased mobility and enhanced independence in hemiparetic patients using body weight supported treadmill training (BWSTT). Within BWSTT were two randomized groups—training with visual guidance versus manual guidance. In the physical guidance group, subjects attempted to take longer strides while a physical therapist attempted to counter the large forces generated by the client's abnormal gait patterns as the patient walked on the treadmill. In the visual guidance group, subjects used a head-mounted visor and attempted to step over a virtual box (while on the treadmill). As subjects in both groups underwent BWSTT, an electrogoniometer was used to measure their knee flexion. Using data from the goniometer, subjects' maximum, minimum, and range of knee flexion were compared within a session and between sessions. Preliminary data indicates that the visual guidance group is improving more than the manual guidance group. This is of particular interest to rehab programs, as these programs may need to reevaluate their methods of treatment. More research will be done in the months following to arrive at a more tenable conclusion.



**20905**

**Are We What We Say We Are? The Assumptions We Make**

**Presenter(s)**

Julia Balto, Illinois Mathematics and Science Academy  
Taylor Barnes, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jim Victory, Illinois Mathematics and Science Academy

IMSA prides itself on being a diverse and culturally accepting community. All of its brochures proudly state that "IMSA strives for students to experience the Academy as a place that welcomes them as individuals and embraces their rich and unique cultural backgrounds." We decided to take a look at how IMSA students' age, gender, and race affect how they perceive other races. Through statistical analysis we hoped to see what kinds of biases IMSA students still hold. Preliminary results suggest that IMSA students do hold some interesting biases towards certain races. For example, females overall tend to hold more preconceptions about other races than males; however, this differs within specific races. Also, there are several characteristics that people attribute to certain races, both positive and negative. While the majority of these characteristics are positive, this can present itself as a problem as students are still judging other students based on the color of their skin. The task now, is to determine what IMSA can do to strive towards its goal of fostering an environment that is relatively free of racial prejudices.

**20907**

**Comparison of DNA in Large Breed Bichons with and Without Canine Hip Dysplasia**

**Presenter(s)**

Perry Bradford, Illinois Mathematics and Science Academy  
Sena Dzakuma, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Susan Styer, Illinois Mathematics and Science Academy

Large breed Bichons are often affected by canine hip dysplasia (CHD). CHD is a malformation of the hip joint involving several genes. In this investigation we will use RAPD PCR to determine if there is a difference in the pattern of DNA between Bichons with and without CHD. We first isolated and amplified DNA from human hair, and examined the DNA using gel electrophoresis. We are currently working on different methodologies to isolate and amplify DNA from dog hairs and saliva. Isolation of DNA has been challenging. The recent changes in methodology were to maximize the amounts of DNA. With the saliva process, we isolated DNA through swabbing the mouth of a dog and soaking it in PCR H buffer. After this process we removed the swab and ran PCR. Our findings may further our knowledge of how CHD can be detected when Bichons are bred and contribute to the development of new technology to correct the gene(s) that cause CHD.



**20910**  
**Para La Gente**

**Presenter(s)**

Elizabeth Ikejimba, Illinois Mathematics and Science Academy

Joshua Lee, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jean Kadel, Illinois Mathematics and Science Academy

A familiar revolution has swung into play in many Latin American countries. More leftist governments are rising into the public eye with aspirations for improving their countries' economic and social hardships. In this study we immersed ourselves in the history and current events of three Latin American countries: Mexico, Chile, and Bolivia, with the objective of forming opinions about whether their leaders would fulfill their promises. Mexico's new president, Felipe Calderón, who won by a mere 1% margin over his leftist opponent, promises to work for economic equality to quiet accusations of electoral fraud. Chile's female leftist president, Michelle Bachelet, will keep secure the already-stable country, enforcing democracy and social equality. But progress is ongoing for Bolivia. In an effort to ameliorate the country's poverty crisis, its current president, Evo Morales, has slowly begun nationalizing its raw materials. Additionally, relations with the United States have been strained due to anti-American movements. Consequently, these three countries have been turning to other foreign nations, like China, for economic and political growth. We believe that the progress of making national changes takes patience, deliberation, and time. The goals leftist leaders set for their countries are reachable, but achieving them takes more effort in attaining than vowing.

**20914**

**Genius Divided: A Historical Context for Quantum Mechanics**

**Presenter(s)**

Brianna Benson, Illinois Mathematics and Science Academy

Theresa Geiger, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Workman, Illinois Mathematics and Science Academy

Though the current standard of quantum mechanics is the Copenhagen interpretation, this was not always the case. Like all scientific theories, it was once controversial. Albert Einstein, among others, never agreed with it. For this project, we set out to discover how the Copenhagen interpretation became so widely accepted. We attacked this question by researching the different interpretations of quantum mechanics and the arguments which favored one over another. Our research has shown that the social, philosophical, and political climates of the 1920s physics community contributed to the direction that the quantum mechanical debates took at the 1927 Solvay conference. We would like to propose the idea that it was an individual scientist's philosophy of physics, not necessarily the raw experimental data, which led him to support or denounce a particular interpretation of quantum mechanics. For example, Einstein's disagreement with the Copenhagen interpretation stemmed from his belief in Spinoza's concept of a rational God—a God who had created a causal Universe. Based on this idea, we believe it is important to study controversial scientific theories in context, for there is no other way to reexamine the assumptions on which they are based.



**20916**

**Retrospective Chart Review of the Efficacy of Atkins Diet in Treating Intractable Epilepsy**

**Presenter(s)**

Sharon Zeng, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Kent Kelley, Children's Memorial Research Center

The ketogenic diet has traditionally been offered as an alternative treatment for intractable seizures, although the biological mechanism behind its anti-epileptic effects is still unknown. A recent study has suggested the Atkins diet, a less restrictive form of the ketogenic diet, may also be effective in treating childhood epilepsy. A retrospective chart review of approximately 2000 epilepsy patients at the Children's Memorial Hospital followed from 9/05-12/06 showed that the Atkin's diet has been used by fifteen patients. Of the fifteen, only eight charts were applicable to our chart review. Patients were subtyped by seizure types and epilepsy syndrome with seizure response characterized by a global impression of the family and physician. Likewise, side effects and global cognitive and behavioral response were characterized by family and physician reports. Subjectively, parents have reported no significant side effects. Of the eight patients reviewed, three gained moderately better seizure control since initiating the Atkin's diet while another three only improved mildly. There was apparently higher efficacy with Myoclonic-Astatic Epilepsy. Future directions include the continued expansion of the clinical cohort and treatment evaluation in mice. From the chart review, we can conclude that the Atkin's diet is safe and efficacious for generalized epilepsy.

**20917**

**Seeding Of Chondrocytes on Copolymer Scaffolds for Tissue Engineering Applications**

**Presenter(s)**

Lisa Thompson, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Guillermo Ameer, Northwestern University

Mr. Anand Jagannath, Northwestern University

One form of tissue engineering makes use of biodegradable polymer scaffolds to grow various types of tissues. These scaffolds must have a highly porous structure to allow for a high cell density and transportation of nutrients to the cells. However, the porosity makes it difficult for the cells to attach to the scaffolds during seeding. We seeded two types of scaffolds using articular cartilage chondrocytes, [fibrous poly (glycolic acid) and poly (1, 8 octanediol citrate)], using two existing techniques (orbital shaking and spinner flask) to determine a more efficient method of seeding polymer scaffolds. The effectiveness of both seeding techniques was evaluated using biochemical assays to measure cell growth. A Pico Green DNA assay was preformed to evaluate cell growth. The constructs were also evaluated with glycosaminoglycan (GAG) and collagen assays which measured the growth of the extracellular matrix. We then viewed the scaffold construct using a scanning electron microscope (SEM). The findings of this study can be used to increase the success of future experiments.



**20918**

**Evaluating the Effectiveness of Bill James's Win Shares**

**Presenter(s)**

Scott Powers, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Steve Condie, Illinois Mathematics and Science Academy

Dr. Michael Keyton, Illinois Mathematics and Science Academy

Mr. Robert Sheinkopf, Illinois Mathematics and Science Academy

For years, the common goal of baseball statisticians has been to find a way to determine, without subjectivity, exactly how good every player is. In 2002, sabermetric pioneer Bill James developed such an algorithm – a complicated statistic known as Win Shares. In calculating Win Shares for just one player, one must incorporate hundreds of individual statistics. In evaluating the effectiveness of this metric, the first step is to gather masses of data from Major League Baseball's official website. Win Shares are then divided between offense and defense based upon runs scored and allowed. Pitching and fielding are subsets of defense, and individual players divide the shares based on their performances. After comparing Win Shares to such awards as Gold Gloves, Silver Sluggers, Cy Young's, and MVP's, it is apparent that the fielding aspect of the algorithm does not correlate well with what contemporary voters believed. Most notably, at shortstop only half of the past gold glovers would be considered "A" fielders. After presenting my findings to the Society for American Baseball Research, I hope that they will be accepted and we will be one step closer to evaluating players more accurately.

**20921**

**The Effects of Artificial Sweeteners on Insulin Production in RINm5F Cells**

**Presenter(s)**

Ankit Jain, Illinois Mathematics and Science Academy

Yousif Kelaita, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Susan Styer, Illinois Mathematics and Science Academy

Diabetes is a life-changing disease which is growing more common among the world's population. To combat this disease, food manufacturers have introduced sugar substitutes to hopefully maintain sweetness but also reduce the insulin response in the body. Current literature, however, contradicts many of the claims made by these manufacturers. Our project hopes to determine if the sugar substitutes create a direct insulin response. Our first endeavor was to find a cell line which would produce insulin in a cell culture. We found RINm5F, which are insulin producing beta cells from the pancreas of a rat, and learned how to do cell counts with a hemocytometer. However, since these cells are adherent, meaning they stick to each other and the plate; we could not get accurate counts of how many cells were in our culture. During this process, we also learned how to create gels for our Western blot and how the blotting process works. We have used these tools and processes to lay the groundwork for the eventual introduction of the different sugar substitutes into our growth medium. Experiments are underway, giving us preliminary evidence as to the effects on insulin production caused by the varying sugar substitutes.



**20923**

**Electrochemical Deposition of Lead Chalcogenides onto Aluminum Oxide Templates**

**Presenter(s)**

Robert Till, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Hsien-Hau Wang, Argonne National Laboratory

There is a current need to better utilize our limited energy or to develop new technology and new materials toward solving our energy crisis. We intend to apply nanoscience and technology to prepare new materials for thermoelectric applications. The lead chalcogenides are semiconductors that can be used to produce electricity using thermal gradients. Theory predicted that when different lead chalcogenides are prepared as one-dimensional nanowires in a multi-layer A-B-A-B fashion, the heat-electricity conversion efficiency can be further improved. Fabrication of lead chalcogenide nanostructures consisted of lead, selenium, tellurium, or sulfur, presents a great challenge. Nanowires are linear, one dimensional nanostructures with unique electromagnetic, chemical, and physical properties and many great technological implications. We've worked on the production of chalcogenic nanowires in an anodized aluminum oxide template via electrochemical deposition. We're working to develop a process that could deposit lead chalcogenides onto the AAOs consistently, especially PbTe, which nobody to date has been able to successfully deposit into an AAO template. Recent results have shown difficulty with deposition. By adjusting parameters during production of the AAO (e.g. voltage of anodization, time in solution, etc.) the size of the pores change. Using a two step anodization process and sputtering Au, this adjusts to find how to best produce nanowires.

**20927**

**IMSA on Wheels: Electricity and Magnetism DVD**

**Presenter(s)**

Noelle Kwan, Illinois Mathematics and Science Academy

Meng Zhang, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. William McGrail, Illinois Mathematics and Science Academy

Ms. Tracy Miller, Illinois Mathematics and Science Academy

The IMSA on Wheels Electricity and Magnetism DVD is an inquiry that combines two projects from last year: Science Is Shocking! And Amazing Magnetism. These projects are elementary and middle school science shows created to ignite younger students' interest in science. In the DVD, there are twenty two demonstrations explaining the concepts of electricity, magnetism, and electromagnetism. With the help of the advisors, the inquiry students, Noelle Kwan and Meng Zhang, learned the steps of producing a DVD, which includes the pre-production, production, and post-production stages. In the first stage, they wrote scripts for each scene with camera and stage directions. They also recruited actors and actresses, collected supplies, and scheduled filming times. During production, IMSA students and staff filmed at various locations throughout the school on I-Days. In the post-production stage, the inquiry students used multimedia software such as Final Cut Pro and DVD Studio Pro to edit the raw footage. Editing includes creating sequences from the scenes, equalizing sound, adding animation and captions by using Adobe Photoshop, and inserting sound effects, transitions, and special effects. This DVD will be the fourth produced by KI and ITL/TVPL, and will be distributed nationwide.



**20930**

**Using Science to Make Money**

**Presenter(s)**

Janelle Peifer, Illinois Mathematics and Science Academy

Mary Wang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Abler, Illinois Mathematics and Science Academy

When operating in the competitive online market, one needs to establish the correct place in the market for one's items. In a market such as eBay, where everything can be found, one needs to make sure that they have comprehensive research for any item that needs to be sold in order to preserve an online business. In this research, we are trying to determine customer satisfaction with an item in relation to the item's price. Instead of luxury items at extremely high prices, or bulk items at bargain prices, we are trying to find a middle path that allows the maximum customer satisfaction. So far our data suggests that our customers are more satisfied with higher priced items. The average satisfaction on a scale of 1 to 10 was about 9 for items above \$25.00, while it was only around 8 for items under \$25.00. With this data, we can infer that in today's global online market people are more satisfied with higher value items. If a business wishes to retain high customer satisfaction rates, it should tend to lean towards more luxury items instead of bargain priced bulk inventory.

**20934**

**Global Contact, Changing Japan's Education**

**Presenter(s)**

Charles Pan, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Christian Nokkentved, Illinois Mathematics and Science Academy

From the beginning of the twentieth century, perhaps no nation has undergone such a complete transformation of social, political, and economic structures as Japan. From the initial influx of western ideas following Japan's globalization, education felt this influence as much as any other institution. Examinations by experts such as Byron K. Marshall and controversy surrounding Japanese professors themselves, such as Saburo Ienaga's history textbook dispute in the 1990's, all reveal an education system strongly influenced by international events. World War I only strengthened the new western ideals, but World War II threw these sudden changes on their heads, as schooling took a sharp turn during the war. American post-war occupation changed the system yet again; the aftermath can still be felt in Japanese schools and universities today. Despite this lack of stability in recent history, the nation's education has been touted as one of the best in the world. While some of this can be attributed to internal reform, the brunt of what makes up Japan's current education comes not so much from native ideas, but from foreign influence in the country, starting even before the beginning of the twentieth century and continuing to present day.



**20935**

**The Effect of Epigallocatechin-3-gallate (EGCG), A Green Tea Component, On HeLa Cell Proliferation and Viability**

**Presenter(s)**

Sophia Pilipchuk, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Donald Dosch, Illinois Mathematics and Science Academy

Dr. Judith Scheppler, Illinois Mathematics and Science Academy

Current and past studies have attributed green tea's ability to act as a cancer-preventative to one of its main components, Epigallocatechin-3-gallate (EGCG). This study investigated the effect of EGCG on cell proliferation and viability of HeLa cells, a cervical cancer cell line. Cells were pretreated with EGCG, with concentrations ranging from 0 to 5 $\mu$ M. Cell concentration and viability counts were performed using trypan blue dye exclusion. The results indicate that the most effective concentration of EGCG used to diminish HeLa cell viability is 0.25 $\mu$ M, while the minimum and maximum concentrations do not have a statistically significant effect on either cell viability or the total cell number. HeLa cells were also tested for caspase-3 expression, an enzyme whose presence indicates that the cell is entering apoptosis, or programmed cell death. Results from the caspase-3 analysis suggest that HeLa cells undergo apoptosis following pretreatment with EGCG. These results support the hypothesis that EGCG is a possible source of natural, rather than synthetic, protection against carcinogenesis.

**20936**

**Global Translation Services: Entrepreneurship Skills in Selling, Pitching, and Presenting a Service**

**Presenter(s)**

Sophia Pilipchuk, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Scott Metcalfe, Empire Consulting Inc.

Struggling to attract global customers to your product or service? Frustrated with your inability to effectively communicate with foreign markets? Then take advantage of my company's quality services! We engage in translation projects which vary from simple documentation to press releases, marketing materials, company reports, and media production. My company is here to serve your needs in the search for global customers: We offer first-rate translation services by a professional team of highly skilled interpreters. The creation of my "company" was conducted for the Total Applied Learning in Entrepreneurship (TALENT) 10-week session entitled "Selling, Pitching, and Presenting". The main focus of this session was becoming acquainted with the entrepreneurship methods used in selling a product or service to attract potential customers. My investigation focused on researching current economic trends in the translation services industry and creating my own company, Global Translation Services, to practice the vital entrepreneurship skills needed to successfully sell a service.



**20937**

**The Efficiency of Neutrinos Observations on the Near and Far Neutrino Detectors**

**Presenter(s)**

Parker Schmitt, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Niki Saoulidou, Fermi National Accelerator Laboratory

Neutrinos are very small, difficult to detect, particles. This experiment will show the necessity for these particles to be highly energized for us to make observations. I will define a variable known as efficiency as the ratio of measurable neutrino events to the total neutrino events. I did all of my measurements in the statistical package, ROOT—ROOT does a great job at plotting histograms. I also used data from a Monte-Carlo simulation to make sure that my histograms were defined correctly. The Monte-Carlo data suggested that there was a certain range of values for energy where efficiency peaked. These results made sense because with very little energy it is hard to measure anything in neutrino events however after a certain amount of energy the neutrino events become more difficult to describe because the detector is not big enough to contain the entire event. When I compared my actual data to the Monte-Carlo simulation I received similar results—there was an energy of peak efficiency, and with very little energy there was nearly no efficiency.

**20938**

**Promoting Bio-Ethanol in the United States by Incorporating Lessons from Brazil's National Alcohol Programme**

**Presenter(s)**

Yangbo Du, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Joshua Linn, University of Illinois at Chicago

Recent consensus linking carbon emissions from fossil fuels with global warming, as well as security implications posed by dependence upon Middle Eastern petroleum, have led to resurgent interest in renewable energy sources, including bio-fuels. Current U.S. energy policy supports increasing the use of bio-ethanol as a gasoline substitute, which Brazil first produced on a large scale in response to the 1970s energy crises. Brazil's National Alcohol Programme stood out among its contemporaries regarding its success at displacing a third of Brazil's gasoline requirements, primarily due to favorable market conditions and government support. The United States has followed Brazil's lead since the early 1990s, when ethanol started gaining popularity as an emission-reducing additive in gasoline. Similar to the Brazilian experience, future progress towards displacing gasoline with fuel ethanol in the U.S. will depend largely upon political support and economic circumstances in the agricultural and energy sectors and markets. Accounting for differences in aggregate gasoline usage and feedstock availability compared to Brazil, the United States would have to speed up commercialization of cellulose ethanol technology in order to achieve a similar degree of success as Brazil, support co-production of biomass derivatives along with fuel ethanol production, and maintain profitability of innovation in the bio-ethanol sector, among other initiatives.



**20939**

**HCN Channel Interactors Progress Understanding of Synaptic Control**

**Presenter(s)**

Bharat Kilaru, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Dane Chetkovich, Northwestern University Feinberg School of Medicine

Hyperpolarization-activated and cyclic nucleotide-gated (HCN) channels, the pacemaker channels, demonstrate concentrations increasing along dendrites such that the highest density of the ion channels are found at the distal tips of the apical dendrites. This localization provides an anti-excitatory response that controls synaptic signaling by preventing excess dendritic excitation. The unique localization suggests the possibility of other channels of similar localization throughout the hippocampus that may assist in the regulation of excitatory synaptic transmission. After completing database searches for hippocampal localizations of voltage-gated ion channels, a visual analysis of the hippocampus' CA1 region found in 38 papers indicated a similar dendritic distribution for three other channels, including Cav3.1, Kv1.3, and Kv1.6. Using the Multiple Em for Motif Elicitation (MEME), the Motif Alignment and Search Tool (MAST), and other sequence analysis tools, the key channels will be studied for common motifs, repeated amino acid sequence patterns. The current findings hint towards the possibility of other channels involved in the regulation of synaptic transmission through interactions with HCN channels, progressing the understanding of the prevention of dendritic hyperexcitability, and knowledge of synaptic control.

**20944**

**A Comparison of Brain Volume Changes in Two Different Stroke Patient Groups Undergoing Different Treatments**

**Presenter(s)**

Yuyang Bai, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Todd Parrish, Northwestern University Feinberg School of Medicine

Stroke is a leading concern for all Americans because it is currently the third leading cause of death and the number one cause of adult disability in the United States. Despite these discouraging facts, my goal is to develop a neuroimaging method for investigating the effectiveness of stroke treatments. This is accomplished by determining how gray matter volume predicts response to therapy, while controlling for total brain volume, age, and type of stroke. First, I prepared each brain image in the correct space and orientation by using SPM 5 (Statistical Parametric Mapping 5). Utilizing VBM (Voxel-Based Morphometry) as a neuroimaging technique, I am then able to statistically compare gray matter differences in two different stroke treatment groups (six in Group A and ten in Group B). Preliminary data show that the gray matter is preserved in Group A, while the gray matter decreases in Group B in the following areas of the brain: bilateral thalamic nuclei, affected primary motor cortex, and the non-affected supplemental motor area. This methodology allows me to predict how a stroke patient responds to a particular treatment.



**20945**

**The Death Penalty Worldwide**

**Presenter(s)**

Tianyin Luo, Illinois Mathematics and Science Academy

Gokila Pillai, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sandra Babcock, Northwestern University Bluhm Legal Clinic

This investigation's goal is to create a website about the death penalty worldwide. We created and used a standard information sheet when gathering data for each country retaining the death penalty. We utilized governmental sites, organizations, like Amnesty and Hands off Cain, and articles pertaining to the death penalty for raw data. Some information found includes: crimes that the death penalty is applicable to, significant law cases, conditions of lawyers and individuals on death row, public opinion, organizations working to gain abolition, arbitrariness of decisions made, clemency processes utilized, etc. Though not all our information is easily obtainable, our immediate focus is to learn about the current situation internationally. Through our research, we have noticed many cultural trends. Because, many Sub-Sahara African countries are still trying to reunite their nation after the terrible atrocities suffered, the death penalty is not an immediate concern. In countries, like China and Taiwan, the death penalty persists because the government, through media and religion, has such control over people's lives that to question it is unthinkable. Through our research, we have gained a better cultural and political understanding of the factors influencing people's perspective on capital punishment.

**20946**

**The Response Of Oligodendrocytes To Normal Appearing White Matter From Multiple Sclerosis And Control Patients – A Study Of The Early Pathology Of Multiple Sclerosis**

**Presenter(s)**

Sarah Shareef, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sara Becker-Catania, Edwards Hines VA Hospital

Multiple sclerosis, the major cause of disability in young adults in America, is a neurodegenerative disease that affects the ability of oligodendrocytes to remyelinate axons. It is thought that the failure of remyelination leads to degeneration of neurons. Scientists believe that the onset of multiple sclerosis is autoimmune in origin; however, the exact cause is still undetermined. The destruction of neuronal axons increases due to the inability of glial cells to respond to the unmyelinated areas within the brain and spinal cords of patients. This project studied the early responses in gene expression of oligodendrocytes to axonal membrane extracted from multiple sclerosis and control patients. Using Real Time PCR, an early (2 hours) and late (12 hours) time point was examined to verify change in gene expression of five different genes, including three transcription factors important to oligodendrocyte health, a structural protein necessary for oligodendrocyte differentiation, and a novel gene with unknown function. Difference in gene expression over time and between the multiple sclerosis and control treated oligodendrocytes was observed. Understanding of the response of oligodendrocytes to the damaged and unmyelinated axons present in multiple sclerosis patients will lead to a better understanding of the early pathology of multiple sclerosis.



20947

**HAART Response in Minority Patients in an Urban HIV Clinic In Comparison To Patients in Published, Randomized, Controlled Trials**

**Presenter(s)**

Angela Kao, Illinois Mathematics and Science Academy  
Annie Liu, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Pitrak, University of Chicago

Using a database of the Adult HIV Care Program at our institution, we identified all who initiated HAART in the past three years with no previous antiretroviral therapy. After grouping patients by starting regimens, with 14 started on ZDV/3TC (Combivir)+EFV and 17 on TDF/FTC (Truvada) +EFV, we compared our outcomes to those of patients enrolled in the published 934 study. The primary endpoints were undetectable viral loads and CD4+Tcell increase at 48 weeks of therapy. We also analyzed differences in the baseline characteristics of our clinic versus those of the 934 study with respect to age, race, sex, baseline viral load, and baseline CD4+ count. Our patients were similar in age, but much more likely to be female and/or African American. The baseline viral loads were similar; however, the starting CD4+ counts were lower. By 48 weeks of therapy, the proportion of patients with complete viral suppression was similar. Results were also similar for the intent to treat analysis (ITT) that considers patients who drop out as failures. The mean CD4+ increase was also comparable. Minority patients in an urban HIV clinic can attain the same benefits of HAART with respect to viral suppression and immune recovery, even though they begin treatment at more advanced stages of disease.

20948

**Preserving Irish Gaelic: Youth and Technology Maintaining a 2,500-Year-Old Language**

**Presenter(s)**

Rachel Banke, Illinois Mathematics and Science Academy

**Advisor(s)**

Mrs. Peg Cain, Illinois Mathematics and Science Academy

The Irish language is the oldest of the Godelic Celtic languages. Early Irish literature is comprised of prolific sagas, poetry, and narratives important to our understanding of the Celtic peoples. Although the Irish are fiercely proud of their language, it has been allowed to die. Twenty-five percent of the population claim to speak Irish, although experts believe only three percent actually can. However, Gaelic is finding refuge in the Gaelscoileanna, all-Irish schools. These children watch cartoons dubbed in Irish such as "Sponge Bob SquarePants" and "Scooby-Doo" shown on TG4, an Irish television station. They have created words including a tldirlíon (the Internet), blog, dlúthdhiósea (compact disks), r-phost (e-mail), and rapcheol (rap music). Gaelic forums such as Daltaí na Gaelige have cropped up on the Internet. Google now allows users to perform searches in Irish Gaelic. People around the world can listen to Irish radio programming online through Radio Teilifís Éireann. The Internet is allowing Irish Gaelic to gain more speakers worldwide. Through communication technologies and young speakers, Irish Gaelic may, at least temporarily, be preserved.



**20950**

**The Evolution of the Andean Sunken Plaza 3000 B.C.E.-100 B.C.E.**

**Presenter(s)**

Crystal Croyl, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jonathan Haas, Field Museum of Natural History

The Peruvian Andes is home to one of the world's great civilizations. Arising on the Pacific coast in the third millennium B.C., and continuing to the great empire of the Inca, civilization thrived in the Andes for over 5000 years. One of the distinctive hallmarks of this 5000 year history is the persistent use of the sunken ceremonial plaza. While the first recorded occurrence of the sunken plaza occurred in the Norte Chico in the third millennium B.C., a similar element is seen as far away as Chiripa, Bolivia, 2900 years later. My research has been centered on the distribution and evolution of the sunken plaza, particularly the sunken circular plaza as associated with religious architecture. There seems to be a continuous relationship in the expansion of the sunken plazas from the Norte Chico to around 100 B.C.E. After 100 B.C.E. in my research, however, there is a lapse in the building of this purely Andean element. The reasons for the non-continuation of this feature is unknown, but may be discovered with more research. Nevertheless, the spread of the sunken plaza may indicate a significant religious or cultural export from the Norte Chico to the rest of the region.

**20953**

**Development of a  $\alpha$ -Mannosidase 2A2 Based Gene Therapy for Glioblastoma Multiforme**

**Presenter(s)**

Andrew Gentile, Illinois Mathematics and Science Academy  
Monica Kao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Roger Kroes, Falk Center for Molecular Therapeutics

Glioblastoma multiforme (GBM) are highly invasive gliomas and are among the most common type of primary brain tumor. Previous studies have shown that the induced expression of certain genes synthesizes key oligosaccharide structures located on the outer cell membrane of glioblastomas. These structures are thought to be critical in glioma invasivity and in the proliferation of cancer cells. Our research this year specifically focused on the development of technologies and techniques necessary to evaluate the effects of  $\alpha$ -mannosidase overexpression in the human glioma cell line U373MG. Through qRT-PCR analyses, we were able to find 30 stable cell lines of U373MG that express the  $\alpha$ -mannosidase gene when transfected. As a precursor to working with  $\alpha$ -mannosidase clones, the techniques of invasion and proliferation assays must be perfected using SIAT7E, a similar cell line transfectant. Tissue culture, a vital component of growing cells, must also be practiced on other cell lines before cultivating mannosidase clones and obtaining results. We are continuing to develop these lab procedures in order to pave the way for the cultivation and analysis of the  $\alpha$ -mannosidase clones.



**20959**

**Metal Dusting**

**Presenter(s)**

Steven Cai, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Ken Nateson, Argonne National Laboratory

Dr. Zuotao Zeng, Argonne National Laboratory

Metal dusting is a carburizing corrosion in the energy and chemical industries. The corrosion occurs at temperatures from 400 to 800°C, when carbon activity is  $>1$ . As a result, energy and repairs worth billions of dollars are wasted annually in the US hydrogen industry alone. We applied X-ray microprobe techniques developed at the Advanced Photon Source to study the local structure of the oxide scales in the corroded and non-corroded areas and to determine the distributions of chemical elements, oxidation states of ions, and crystallographic phases along the oxide scales. We found that the crystallographic phase of the scales in the corroded area was spinel ( $\text{FeCr}_2\text{O}_4$ ), while the major component of the scales at the non-corroded area was  $\text{Cr}_2\text{O}_3$ . We concluded that the corroded areas had spinel. The X-ray near edge absorption spectrum (XNEAS) results indicate that the oxidation state of iron is higher than +2 in spinel. Since the high valence iron in spinel could be reduced by high activity carbon in metal dusting environment, the oxide scale cannot protect alloy from metal dusting corrosion. However, an oxide scale of pure  $\text{Cr}_2\text{O}_3$  can effectively prevent the alloy from corrosion. This study points out a direction from which the metal dusting problem can be solved.

**20960**

**The Effect of Antiplatelet Drugs on GPIIb/IIIa Receptor Density**

**Presenter(s)**

Sonali Jayakar, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Omer Iqbal, Loyola University Medical Center

Platelets play an important role in the formation of a primary haemostatic plug and an eventual clot. There are numerous glycoprotein IIb/IIIa receptors present on the surface of each platelet, which undergo a change after agonist-induced platelet activation. The purpose of this study was to determine the GPIIb/IIIa receptor density both before and after agonist-induced platelet activation. Receptor density was also determined after antagonist-induced platelet inhibition. Blood was drawn from healthy volunteers and centrifuged to obtain platelet-rich plasma. The platelet-rich plasma was used in the AssayMax Human GPIIb/IIIa ELISA assay, which uses a quantitative sandwich enzyme immunoassay technique that detects and measures GPIIb/IIIa receptor density. An increase in the receptor density after agonist-induced platelet activation and a decrease in the receptor density after antagonist-induced platelet inhibition were consistently observed. Use of this assay in patients with heart attack helps determine whether or not a patient is responding to antiplatelet agents. Furthermore, based on the receptor density, it is possible to regulate the dosage of antiplatelet drugs. Use of this assay may also facilitate the identification of new antiplatelet drugs.



**20970**

**Analyzing Illinois Level Of Compliance With The Clean Water Act's Municipal Storm Water Management Program**

**Presenter(s)**

Claire Herdman, Illinois Mathematics and Science Academy  
Yuxi Ji, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Cindy Skrukrud, Sierra Club  
Ms. Audrey Well, Illinois Mathematics and Science Academy

Illinois' water resources are a vital part of the day-to-day life of its citizens, who use water for everything from fishing to swimming to drinking. The United States Environmental Protection Agency (EPA) has established a storm water management program to address pollution problems from urbanized areas' storm water discharges. Working with the Sierra Club, we report on the aspects of the storm water program that have been implemented successfully and areas that still need improvement. We conducted research by reviewing annual reports from ten municipalities and interviewing representatives from the EPA, Illinois EPA, and compliant municipal governments. Our report describes problems with the program's implementation including lack of funding, understaffing, and unaccountability. Examples of good programs from DuPage County, the City of Urbana, and others are described, as well as how others can emulate them. This report provides a detailed list of ways for the state, communities, watershed groups, and individuals to help improve the quality of urban storm water runoff. These recommendations include ensuring that the Illinois EPA reviews every annual report at least once in five years, and encouraging municipalities to share responsibilities to foster a more supportive environment for the program. Come see our presentation to learn how you can improve our water quality!

**20971**

**Electron Beam Focusing For the International Linear Collider**

**Presenter(s)**

Forrest landola, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Michael Syphers, Fermi National Accelerator Laboratory

The International Linear Collider (ILC) will be a pair of linear accelerators (LINACs) that accelerate electron beams and increase their energy to 250 giga-electron volts (GeV) and facilitate the collision of the two beams. The design parameters include the number of focusing magnets and their focal length. The investigation discussed here involves the construction of a computer model of the ILC, and its use as a tool for mathematically determining optimal values of these parameters. Misaligned focusing magnets cause electrons to lose energy through synchrotron radiation, which can increase the beam size, which is detrimental to the operation of the collider. Surveyors can feasibly install magnets in the tunnel environment to an alignment tolerance of 0.25mm, so this investigation considers solutions to compensate for the misalignment. A practical solution for correcting the focusing magnet alignment error is to use additional correction magnets, although this method causes more synchrotron radiation. By using the computer model, the beam focusing system can be optimized; the results of the analysis will be presented.



**20972**

**Orchids in the Lab: The Effects of Homogenized Banana on the Growth of Two Species of Orchids**

**Presenter(s)**

Bryan Denig, Illinois Mathematics and Science Academy

**Advisor(s)**

Mrs. Vicki Burgholzer, Illinois Mathematics and Science Academy

Ms. Irene Norton, Illinois Mathematics and Science Academy

Instead of depending on an unreliable mycorrhizal fungus for germination, commercial orchid growers usually culture seeds *in vitro*. To provide required nutrients, they employ an agar based growing media, and individual growers often have special recipes that they use to improve germination and growth. Kept as trade secrets, very little has been published on these additives, which usually take the form of fruit. Examples include tomato juice, coconut milk, banana pulp, and even pina colada mix. In this study, I used *Dendrobium anosmum (superbum)* 'Emery's Pooter' AM/AOS protocorms and *Phalaenopsis gigantea* seeds as a means to study the effects of the addition of homogenized banana on germination and growth. The seeds were used to determine if the addition of banana affected germination, and the protocorms were employed to see how orchids were affected after germination. By setting up control cultures containing typical Knudson C media and experimental ones with the addition of banana, data was collected regarding growth and germination of these two species. Analysis of data from this study may provide additional knowledge of the effects of complex organic additives on orchid growth. Preliminary data analysis suggests that the addition of banana has no significant effect.

**20973**

**Effect of Neuronal Protein Kalirin-7 on Learning and Memory**

**Presenter(s)**

Kathryn Schoedel, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Peter Penzes, Northwestern University Medical Center

Dr. Deepak Srivastava, Northwestern University Feinberg School of Medicine

Activity-dependent remodeling of dendritic spines plays an essential role in synaptic plasticity and is a crucial part of information processing and storage. Unfortunately, little is known about the biochemical mechanisms of dendritic spine morphogenesis. In this study, we look at the role of neuronal protein Kalirin-7 in the remodeling of dendritic spines and its subsequent effect on memory and learning. We report that the activation of Kalirin-7 in cortical neuronal cells via synaptic activity leads to rapid spine enlargement and increased concentration of AMPA GluR1 receptors, chemical receptors that affect the ability of neurons to communicate, in the spine heads. Additionally, we report that mice, in which the Kalirin-7 gene has been knocked-out, perform poorly in comparison to wild-type mice in acquisition of working and fear memories. These results suggest that Kalirin-7 plays a pivotal role in memory and learning, because activation of Kalirin-7 positively affects spine morphogenesis and increases AMPA receptor content, both crucial elements of synaptic plasticity and communication, and knock-out of Kalirin-7 greatly impairs memory and learning abilities. These results are particularly interesting as they help explain the biochemical mechanisms of memory and learning and provide potential treatment possibilities for memory debilitating illnesses.



**20974**

**Searching the DNA Sequence of the Gene Encoding Acetyl-CoA Carboxylase 2 of a Human Subject Who Appears to Have Unregulated Fatty Acid Metabolism**

**Presenter(s)**

Philip Kuo, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robert Haselkorn, University of Chicago

Acetyl-coenzyme A carboxylase 2 (ACC2) plays a very important role in the fatty acid metabolism of the heart and skeletal muscle tissues. ACC2 sits on the surface of mitochondria, where it catalyzes the carboxylation of acetyl-CoA to produce malonyl-CoA. Malonyl-CoA inhibits the transport of fatty acids into the mitochondria for oxidation. Experiments have shown mutant ACC2 knockout mice have reduced body fat and body weight compared to normal mice, due to lower amounts of malonyl-CoA. We learned of an individual who is always warm, the phenotype expected for a person whose ACC2 is defective. We obtained some of his DNA. Using PCR and gel electrophoresis, I was able to amplify sequences from his ACC2 gene to determine the order of nucleotides of those sequences. When compared to the ACC2 gene sequence from the Human Genome Project, quite a few differences were found. Their effects are still unknown currently. More ACC genes from control individuals will be tested to see if the differences correspond to true mutations or not.

**20978**

**Mixed-Use Urban Design Project**

**Presenter(s)**

Paul Dienhart, Illinois Mathematics and Science Academy

Fatima Kanchwala, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Steven Vasilion, Vasilion Architects

Through the year, we have been working with architect Steve Vasilion on devising how to redevelop a lot in downtown Batavia. This has helped us develop technical, intellectual, and even speaking skills involved in an architect's job. Specifically, we have been working on creating new building designs to fit the needs of the owner of the land, the City of Batavia, and the Batavia Historic Preservation Commission. We began by meeting with the owner and the city official to discuss what ideas would be desirable and feasible for our redevelopment. Based on the information gathered from the meeting, we started designing the buildings on the site. We first laid out the exterior walls, and then designed the interior using the exterior as a framework, learning about building codes and how to use CAD along the way. Eventually, after a bit of negotiation, we settled on a design that the City and the owner both approved. This final design and our methods will be presented at IMSAloquium, along with a three-dimensional model of the site and its surrounding area. In the end, we "junior architects" will end up with a design that suits everyone involved, having learned what steps are involved in an architectural project, and just what an architect's job is like.



**20979**

**Economics and the Housing Market**

**Presenter(s)**

Charles Whittaker, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Casey Mulligan, University of Chicago

Data shows that the number of inhabitants per house seems to be less now than it was twenty years ago and the median house size seems to have increased. One would reasonably assume that as the number of inhabitants per house decreased, the amount of required space would drop, and thus, the square footage of floor area would also decrease, but this doesn't seem to be the case. The goal of this investigation is to use economics to understand such an odd correlation in the housing market. Data obtained from the United States census is currently being analyzed to determine whether income changes in the United States, prices in the housing market and the fluctuation of the United States population correlate with these housing characteristics.

**20980**

**Age-Dependent Activation of Neuroglia after Status Epilepticus**

**Presenter(s)**

Stephanie Chang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sookyong Koh, Children's Memorial Research Center

Brain inflammation is gaining increased recognition for its role in neuron excitability and degeneration. A 2005 study showed that induction of status epilepticus (SE) in rats at postnatal day 15 (P15) results in rapid but transient upregulation of specific inflammatory genes, whereas SE at P30 causes high and significantly sustained upregulation. As the resident immune cells of the central nervous system, microglia mediate the inflammatory reaction to seizure-induced insult. Presently, the maturation of neuroglia in the developing brain is not sufficiently characterized. My investigation examines 1) the baseline expression of microglia and astrocytes in the developing hippocampus, and 2) the age-dependent reaction to SE in terms of neuronal cell death and morphological changes in the neuroglia. Kainic acid (KA) was used to produce SE in P10, P15, P20, P25, and P29 rats, which were perfused 24-48 hours after seizure onset. Localization of activated microglia, astrocytes, and neuron death was achieved through immunohistochemical processing of hippocampal sections. Viewed under a light microscope, microglia and astrocytes of older rats appeared larger and had denser ramifications from the cell body than those of younger rats, yet cell morphology did not differ appreciably between littermate controls which received saline injection instead of KA. These results reveal that neuroglia undergo functional, rather than structural, changes as the brain approaches maturity.



**20981**

**Goodbye vs. Gu-Dei-Baai: English Words and Cantonese Imitations**

**Presenter(s)**

Wei Luo, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Alan Yu, University of Chicago

Languages have different phonological systems, a fact easily demonstrated when one language imitates words from another. Listeners, bound by the constraints and preferences of their native language, can only perceive incoming acoustic signals a certain way. This study examined the limitations of Cantonese sounds in imitating English words. Using an English phrase-learning book for Cantonese speakers, I assembled a corpus of English words transcribed into Chinese characters. These characters, representing Cantonese syllables, are transcribed phonemically using the Jyutping Romanization system. Depending on their individual linguistic abilities, Cantonese speakers can use these characters as a guide to help them pronounce English words. I focused on the adaptation of English consonant sequences in different prosodic positions (e.g., *sk-* in *skill*, *masking*, *ask*) into Cantonese. I then examined the realization of the English clusters with respect to their Cantonese counterparts. My analyses reveal many patterns that shed light on the mechanisms behind linguistic imitation. For example, in a cluster sequence containing a consonant followed by a “t,” a voiceless stop (e.g., t in *stay*), the “t” becomes voiced in Cantonese (i.e., “d”). In this case, Cantonese is restricted by its phonological system and can only imitate words like “stay” as “si-dai.”

**20982**

**Super! Heroes, Heroines, and Villains: Learning Science While Having Fun**

**Presenter(s)**

Sulochana Mutha, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Sarah Pfeifer, Illinois Mathematics and Science Academy

As a part of the Kids Institute's mission to develop and deliver educational experiences that kindle student interest in science, mathematics, and technology, research was conducted to develop a program to expand student enrichment in biology, chemistry, and physics. The process required producing curriculum that would captivate the students because it would compel them to focus on the science aspect of the lesson as well as having fun. The theme “Science of Superheroes, Superheroines, and Supervillains,” was chosen because of its popularity among the targeted age group (3-4 graders) and because it allowed for the integration of concepts from the three branches of science with super figures such as Batman, Superman, Spiderman and others. For example, the background on Mutant X-men can be incorporated into activities about DNA. The curriculum was presented in December as Kids Institute half-day funshops. The verbal feedback from students was very positive and suggests that the activities engaged the students' interest in at least one of the three areas of science. Based on the students' comments from the December program, a new funshop focusing on space and astronauts is being developed to further increase student interest in wide variety of science related topics.



**20983**

**Exploring the Correlation Between Genetic Aberrations and Mythology**

**Presenter(s)**

Temi-tope Okubadejo, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sowmya Anjur, Illinois Mathematics and Science Academy

Dr. Dennis Czerny, Illinois Mathematics and Science Academy

Before the advent of scientific technology, anybody who suffered from genetic mutations was referred to as abnormal, inhuman or a monster and condemned by society. However, now it is known that many characteristics of vampires and werewolves are merely symptoms of diseases. Variegate porphyria, which is only one of the seven types of porphyrias, is a disease characterized by the inability to convert protoporphyrinogen to portoporphyrin, which results in an accumulation of porphyrins, predominantly coproporphyrin and protoporphyrin. The most common symptom is skin disease, which only appears when exposed to sun light. It was believed that the enzyme could be absorbed by the stomach after drinking normal blood. Due to the fact that those who suffered from variegate porphyrias were unable to walk in the daylight and drank blood to overcome their deficiency, it has been insinuated that the disease porphyrias is the origin of vampirism. In regard to werewolves, lycanthropy is the only known disease that is the closest of origin. Lycanthropy is the transformation from human form to animal form. Clinical lycanthropy is a psychiatric syndrome where patients believe they can transform and behave like animals. Eventually they may develop abnormal hair growth and other animal characteristics.

**20991**

**The Relationship Between Stellar Luminosity And Dark Matter Mass In Galaxy Clusters**

**Presenter(s)**

Nathaniel Steinsultz, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. James Annis, Fermi National Accelerator Laboratory

We are studying the mass-luminosity relationship in galaxy clusters using a catalog of clusters from the Sloan Digital Sky Survey. We use the number of galaxies in the cluster (ngals) as an indicator of mass. First we examined the luminosity of the cluster and the brightest cluster galaxy (BCG) against ngals finding that both luminosities scale as power laws; the cluster luminosity linearly and the BCG luminosity to the square root. Next, we looked at the scaling relationship for the four brightest galaxies in the cluster and found power laws similar to the ones found for the BCG. The ratio of the first to second brightest cluster galaxy can be used to determine whether or not the BCG comes from a normal distribution, our data shows that this isn't the case. We measured the BCG light fraction and the distribution of distances to the second brightest cluster galaxy as functions of ngals. Finally, we aim to use these relations to divide up the cluster sample and look to see if these are related to the scatter in the mass-luminosity relationship. These relationships will give us insight into the nature and history of our Universe.



**20992**

**Environmentally Conscious Renovation Of Heavy Industrial Workspace**

**Presenter(s)**

Joshua Cote, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Ed Crumpley, Fermi National Accelerator Laboratory

Dr. Vic Kuchler, Fermi National Accelerator Laboratory

Mr. Gary Van Zandbergen, Fermi National Accelerator Laboratory

In a time when the industrial evolution of humanity is beginning to be recognized as a detrimental ecological and environmental impact to our world, environmentally conscious design is emerging as a leading factor in today's architectural and engineering market places. Creating structures—both standard and environmentally friendly—is much more damaging to the environment than converting existing building space. This case study explores the possibility and feasibility of renovating a heavy industrial workshop into environmentally responsible, profitable, and healthy office space. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ for Commercial Interiors provided a rigorous benchmark of green design for this study. To obtain LEED accreditation points, a mezzanine was designed inside the available space. The mezzanine contains two open areas allowing natural light to reach the most occupants possible. This fundamental design strives to create a connection between the office space and outdoor environment. The industrial lower level workshop, located in Wilson Hall at Fermi National Accelerator Laboratory, is able to sustain both a ground-floor and mezzanine of earth conscious office space, while providing ample opportunities for the achievement of LEED accreditation.

**20995**

**Science Explorers Jr.**

**Presenter(s)**

Claudia Kim, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Sarah Pfeifer, Illinois Mathematics and Science Academy

Science Explorers Jr. is a summer program for third and fourth graders. The main goal of Science Explorers Jr. is to spark and develop a continuing interest in science in elementary school students and the focus of my inquiry was to teach science in a fun and interesting way. An effort was made to include more lessons that incorporated active participation of the students. A broad range of topics was chosen in biology, chemistry, and physics to appeal to a greater number of students. The five topics for this year are Energy and Environment, Ocean Science, Kitchen Chemistry, "Gross" Anatomy, and Engineering. Through field trips during the fall semester and Intersession week, parts of the curriculum were tested on third graders from area schools. The curriculum was then revised to better fit the needs and educational capabilities of the age group. The curriculum for Science Explorers Jr. will be used for two weeks at IMSA and one week at an off-site location in Springfield, Illinois. Feedback about the curriculum will be collected by surveying the campers and used to further improve the program.



**20997**

**The Function Of VF0087 And VF0556 In Magnesium Dependant Motility Of *Vibrio Fischeri***

**Presenter(s)**

Michael Bryniarski, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Karen Visick, Loyola University Medical Center

The formation of flagella in *Vibrio fischeri* is dependent on the presence of magnesium ( $Mg^{2+}$ ). When diguanylate cyclases encoded by *mifA* and *mifB* are disrupted, *V. fischeri* regains most of its motility in the absence of  $Mg^{2+}$ . To further understand the mechanism of  $Mg^{2+}$ -dependent motility, I evaluated two genes predicted to interact with the cyclic di-GMP formed by MifA and MifB. The gene VF0087 codes for a putative phosphodiesterase, which when interrupted should cause a buildup of c-di-GMP and decrease motility in  $Mg^{2+}$  positive and negative media. VF0556 codes for a putative c-di-GMP binding protein. This protein may inhibit flagellar biogenesis in the absence of  $Mg^{2+}$ ; if so, when it is interrupted, there would be increased motility. To confirm these functions, mutants with these genes interrupted were created through recombination. The strain with the VF0087 mutation showed decreased motility on both  $Mg^{2+}$  positive and negative media, supporting the hypothesis. The VF0556 mutant showed no difference from wild type indicating that flagella formation is independent of it. A third mutant missing both VF0087 and *mifB* showed a phenotype almost identical to wild type *V. fischeri*, further supporting the function of it as a PDE. These results are preliminary as the mutations are being confirmed with a Southern blot test.

**20998**

**The Crucible: Examining Brazil As A New Model For Economic Sustainability In The Face Of Climate Change**

**Presenter(s)**

Jorge Jeria, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Claiborne Skinner, Illinois Mathematics and Science Academy

During no other time in history has man become so arrogant and enthralled with his own success. In the crossfire of this crisis, lie the developing nations, who strive for modernity using methods that are fueling climate change. If these countries struggle to achieve economic prosperity in the twenty first century, to what extent can these countries modernize in the face of global climate change? Looking at policies in Brazil, a country whose economic and social dilemmas have always plagued its development, the nation has today expanded to become the leader in ethanol production and is rapidly rising as a global economic force in the world. Almost 80% of Brazilian cars run on a mixture of ethanol and gasoline and the Amazonian rainforest, once deemed an impediment to national expansion now fuels Brazilian economic growth, and can now be retained beneficially with the advent of a carbon credit system. Through examination of policies which were implemented before dilemmas such as planetary oil dependency and a demand for more resources, Brazil has been able to modernize while preparing itself for the inevitable advent of global climate change.



**21000**

**Manifestations Of Post Traumatic Stress Disorder (PTSD) In Children And Adolescents With High Functioning Autism (HFA) Or Asperger's Syndrome (AS)**

**Presenter(s)**

Jessica Dong, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Scott J. Hunter, University of Chicago

Children and adolescents with Autism Spectrum Disorders (ASD) have been found to exhibit higher anxiety levels than typically seen in the general population. Theoretically, abnormal development of frontal and subcortical networks in individuals' brains with Asperger's Syndrome (AS) or High Functioning Autism (HFA) leaves them more susceptible to anxiety. This study aimed to investigate how children who have been diagnosed with HFA or AS may respond differently to stressful situations. Parents of seven children with HFA or AS completed a self-designed questionnaire examining their children's intensity and quality of anxiety symptoms, and a standardized questionnaire, the Behavior Assessment Scale for Children, 2nd Edition (BASC-2) Parent Rating Scale. We quantified their responses and ran correlation analyses on Microsoft Excel between measures of the self-designed questionnaire and the standardized BASC-2 to ensure consistency between the two. We then ran correlation analyses between the subscales to test for relationships between the children's pattern of autistic and anxiety symptoms. The anxiety questionnaire effectively mirrored the BASC-2 anxiety scales. Physical anxiety symptoms did not appear to be good predictors of the intensity and frequency of a child's traumatic experiences, while negative thoughts and anxious behaviors did, as predicted. Results highlight how children with HFA or AS may be more vulnerable to traumatic events than non-affected peers.

**21001**

**The Role Of MFG-E8/Lactahedrin In Intestinal Epithelial Restitution**

**Presenter(s)**

Ranjani Logaraj, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Xiaodi Tan, Children's Memorial Research Center

Dr. Peter Whittington, Children's Memorial Research Center

Milk fat globule-EGF factor 8 (MFG-E8)/lactahedrin is a protein that is involved in many events at the cell surface in animals. Its presence or function in the intestinal epithelium has not been previously investigated. In this study, we demonstrated that lactahedrin is present in macrophages in the gut of mice by using immunofluorescent staining. Next, tests both *in vivo* and *in vitro* were conducted to determine the role of MFG-E8 in intestinal epithelial restitution. MFG-E8 was found to stimulate cell migration in both cases. Cell migration is especially important for repairing damaged tissues when the intestinal epithelium is injured, as can occur during severe systemic inflammation or sepsis. With a sepsis model named cecal ligation and puncture, we demonstrated that intestinal MFG-E8 expression is down-regulated during sepsis by using western blotting. This decrease in lactahedrin exacerbates the problem by impeding the healing process. CLP mice that were treated with recombinant MFG-E8, however, showed enhanced cell migration. This suggests that similar protocols could be developed in the future to stimulate intestinal healing in individuals with sepsis.



**21002****The Causes Of And Solutions To Unethical Writing By Professionals And Students****Presenter(s)**

Eric Hultgren, Illinois Mathematics and Science Academy

**Advisor(s)**

Mrs. Peg Cain, Illinois Mathematics and Science Academy

Mr. Mike Robinson, Associated Press

Unethical writing is evident in schools and professional workplaces around the world. Unethical writing includes libel, plagiarism, and manufactured stories. The relationship between professional journalism and student writers is shockingly similar. Some causes of plagiarism, such as being rushed, trying to improve the quality of a story, or even competing with fellow writers, are comparable with professionals and amateurs. Stress and external competition force people to make decisions that go against the ethics of their job. Though originally writers may receive praise and acclaim for their articles, their reputation will be permanently tarnished if it is found that their articles are fictitious or plagiarized. Since there is a correlation between professional writers and student writers, a solution to one would likely be a solution to the other. Human nature makes for it to be impossible to stop unethical writing, but it can be restricted. Being able to instill proper values and enthusiasm to write into students, as well as educating them about finding source materials will help to ensure that a student's writing is kept ethical. Also, the relationship between students and teachers must be emphasized, as that is a key part of keeping writing ethical. Students must understand the importance and applications of their writing.

**21004****Angiogenic Inhibitors And Inhibitors Of Histone Deacetylases - A New Way To Block Tumor Growth And Angiogenesis?****Presenter(s)**

Karan Patel, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Olga Volpert, Northwestern University Feinberg School of Medicine

Malignant tumors need new blood vessels to grow above 1mm-2mm in diameter. The sprouting of new blood vessels from pre-existing ones, angiogenesis, requires expression of pro-angiogenic genes. Histones regulate this expression. Angiogenic inhibitors cut off blood supply to tumors and stop their growth. We intended to show that pigment-epithelial-derived-factor (PEDF), an angiogenic inhibitor, unleashes the activity of histone deacetylases (HDACs) to block pro-angiogenic genes. We also wanted to determine if valproic acid (VA), a HDACs inhibitor, could make PEDF a more effective inhibitor of angiogenesis. To determine the effectiveness of a PEDF+VA combination, both inhibitors were tested on endothelial cells *in vitro*, and in mice *in vivo*. Mice were implanted with biogel plugs containing angiogenic growth factors. We analyzed the amount of acetylated histones bound to the promoters of pro-angiogenic proteins, the association of histones with the transcription factor NFkB, and the number of new blood vessels penetrating the biogel plugs in untreated mice, and in mice treated with PEDF or with a PEDF+VA combination. Valproic acid is an effective HDAC inhibitor that has some anti-angiogenic properties. However, when combined with PEDF it may decrease PEDF-dependent activity of endogenous HDACs and cause a decrease in PEDF's ability to inhibit angiogenesis.



**21005**

**Cold Sensitivity And Analgesia In Rat Models Of Chronic Pain**

**Presenter(s)**

Meng Kang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. A. Vania Apkarian, Northwestern University Feinberg School of Medicine

In quantifying the impact of pain on organisms' behavior, our study exploits rats' natural preference for darkness by connecting one dark and one white cage, cooling the dark side to 4°C and heating the white side to 35°C, to construct a cold chamber. Spared nerve injury (SNI) rats model chronic pain, while sham rats underwent the same surgical procedures as SNI rats without critical injury to the peripheral nerves. We hypothesize that SNI rats do not prefer the cold side, as it induces extreme pain on the injured paw, cold allodynia, whereas sham rats do. SNI rats show more sensitivity on their injured (left) paw, thus morphine is used to induce analgesia and produce a larger difference in their pain threshold. SNI (n=10) and sham rats (n=10) are given saline, 5 mg/kg, or 10 mg/kg morphine an hour prior to the experiment. With morphine, we predict that the SNI rats will spend more time in the cold side. Rats are kept in the cold chamber for 30 minutes and data is analyzed using Matlab. The cold chamber may be useful in assessing the impact of different types of pain on behavior in changing environments. These experiments are currently underway.

**21006**

**Creation Of A Mutated Dcyp33 Gene And Its Effects On Expression Levels Of HOX Genes In The Drosophila Fruit Fly**

**Presenter(s)**

Jing Zhang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Manuel Diaz, Loyola University Medical Center

Mutations in the myeloid lymphoid leukemia (MLL) gene as a result of chromosomal translocations, can lead to acute leukemias. The MLL protein contains three regions of sequence similarity to trithorax, a transcription regulator of class I homeodomain genes in the Drosophila fruit fly. In one of these regions, the PHD finger region binds another protein: Cyp33, a regulator of MLL function. Similar to the effect of human Cyp33 on the expression of the human HOX genes, overexpression of Dcyp33 on Drosophila cells results in down-regulation of HOX gene expression. This study is intended to examine the effects of a mutated Dcyp33 gene on the expression levels of HOX genes in Drosophila cells. By transfecting the mutant gene in Drosophila embryos, a mutant strain of flies may be created with abnormal development due to the misexpression of the HOX genes. I have created two point mutations within a specific region of the Dcyp33 gene. The next step is to amplify the gene. After cloning and transfecting the new gene into Drosophila cells, it is anticipated that these cells would show increased transcription of the HOX genes. Creating an effective mutation in the Dcyp33 gene would prevent the repression of HOX genes.



**21007**

**An Investigation Of Circumduction In The Gait Of Stroke Survivors Walking At Various Velocities**

**Presenter(s)**

Neelam Balasubramanian, Illinois Mathematics and Science Academy  
Frances Hardin, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Yasin Dhaher, Rehabilitation Institute of Chicago

In today's society, stroke is becoming a prominent medical concern. This is detrimental to the nation's economy because stroke survivors drain the health care resources, as they do not have incomes. Stroke survivors usually suffer partial paralysis, which results in an asymmetrical gait. The asymmetrical gait includes abnormal lateral swing of the affected leg known as circumduction. The purpose of our investigation was to determine a safe walking speed based on the relationship between circumduction based on ankle swing from the sacrum and the velocity of the stroke survivor's gait in hopes that the knowledge could aid stroke survivors to lead safer lives in society. Data was collected from stroke survivors walking at slow and fast speeds in a gait lab. The gait lab is used at the Rehabilitation Institute of Chicago for running investigations using data collected on a platform equipped with a six-camera motion analysis system. This system detects markers on a person's body and translates their position into vector coordinates in space. We learned that increased circumduction while walking leads to an unstable shift in the body's center of mass because it overcompensates for the leg swing, and this results in a greater likelihood of falling.

**21008**

**Potential Alternatives For The Anticoagulation Management Of Patients With Heparin-Induced Thrombocytopenia**

**Presenter(s)**

Hyun Soo Sheen, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Walter Jeske, Loyola University Medical Center  
Dr. Jeanine Walenga, Loyola University Medical Center

Heparin induced thrombocytopenia (HIT) is a disorder in which the platelet count is drastically decreased after the administration of heparin or low molecular weight heparin (LMWH) causing deep vein thrombosis or pulmonary embolism. The purpose of this study was to test the ability of a new anticoagulant BAY 59-7939 (Bayer; Germany) for platelet aggregation in the presence of HIT antibodies. A series of tests were conducted on the BioData Platelet Aggregation Profiler. BAY 59-7939 functions by inhibiting Factor Xa (FXa). Heparin was used as a positive control. Sera collected from patients who had HIT were used as a source of HIT antibodies. Platelet aggregation did not occur with any of the HIT patients' sera, confirming that BAY 59-7939 could be an effective anticoagulant in patients who have HIT. For the second part of the project, HIT studies were conducted using the Beckman Coulter flow cytometer and anticoagulants from Sanofi-Aventis. The LMWH enoxaparin acts by inhibiting both FXa and thrombin after binding to antithrombin (AT); fondaparinux is a very LMWH that only inhibits FXa after it binds to AT; and otamixaban is a FXa inhibitor that does not bind to AT. These studies are in progress.



**21009**

**A Legal, Social, And Technical Examination Of Electronic Medical And Health Records**

**Presenter(s)**

Sean Mirski, Illinois Mathematics and Science Academy

**Advisor(s)**

Mrs. Ellen Layton, Barnes and Thornburg

Mr. Mark E. Rust, Barnes and Thornburg

As humanity becomes increasingly reliant on technology, it is becoming evident that the medical world is no exception. Electronic medical records (EMRs) are gradually becoming more and more popular, and a national electronic health record (EHR) network, with individuals' entire medical histories accessible their whole lives by physicians everywhere, has become a realistic (albeit still optimistic) vision. Accordingly, research was done to discover (using a multi-faced approach) the exact situation of EMRs and EHRs today. The investigation was carried out using a methodology based on the premises of grounded theory research, where large quantities of varying types of information were collected so that general trends could be qualitatively discerned. Results show that legally, many of the barriers to the implementation of a national EHR network are being removed even as legislation is debated and passed that encourages physician use of EHR systems. Socially, despite the relatively low percentages of EHR system use, physicians are displaying more interest in EHR programs as the financial, time, and other benefits become readily apparent. Technically, the major obstacle to EHR implementation, the lack of product interoperability, is being overcome through efforts towards standardization by both the private and public sectors. Accordingly, overwhelming evidence suggests that slowly and surely, America is moving toward a better and more technological medical future.

**21011**

**The Effect Of Building Resistance On Cell Lines Affected By Common Chemotherapy Drugs And Their Production of MRP2**

**Presenter(s)**

April-Hope Wareham, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Susan Styer, Illinois Mathematics and Science Academy

Topoisomerases are enzymes involved in DNA replication. Without them, a cell cannot reproduce and will die. Many chemicals, among them camptothecin and etoposide, inhibit the function of topoisomerases. My plan is to increase resistance to these two chemical poisons in CEM cells. CEM cells are leukemia cells, known for being able to build up a resistance to camptothecin. Healthy CEM cells double in population daily, with the growth tapering off with around 2,000,000 cells per mL. I am currently working to find lethal doses of both camptothecin and etoposide. Once I find this concentration, I will start these cells on a program that increases the amount of the drug given to them weekly, starting just below the lethal dose. I will also look at the amount of MRP2 in the cells, a protein that is known to increase in production when great drug resistance occurs. The results I will get from this experiment can help the scientific community to understand resistance to medications, particularly in cancer patients.



**21013**

**Characterization Of The SIP1 Promoter Region**

**Presenter(s)**

Evelyn Wang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Qingshen Gao, Evanston Northwestern Healthcare Research Institute

Dr. Xinjiang Wang, Evanston Northwestern Healthcare Research Institute

Smad interacting protein 1 (SIP1) is an  $\delta$ EF-1 family protein whose expression is involved in neural crest formation but also plays a putative role in oncogenic transformations: recent studies have identified SIP1 as a direct mediator of E-cadherin downregulation and epithelial-mesenchymal transition (EMT) inducement in human epithelial cell lines. Because loss of E-cadherin in cell-cell junctions is a chief pathological indicator of cancer, SIP1 can affect the BRCA2 pathway, a tumor suppressor gene whose mutations and variations cause an increased risk of breast cancer in women. The objective of this research investigation was to further examine the association between SIP1 and BRCA2. The promoter region of SIP1 was amplified through PCR. Next the DNA fragments will be assessed through gel electrophoresis and DNA sequencing. By determining the genetic sequence of the region, we can predict cell behavior by recognizing the specific areas where BRCA2 enzymes can bind to SIP1 and consequently initiate mesenchymal or fibroblast-like phenotype morphology. Once the SIP1 promoter is isolated, it will be used to make an expression vector, producing luciferase to study the effect of BRCA2 on the SIP1 promoter.

**21015**

**Optimal Play Strategy For Pig Dice Game**

**Presenter(s)**

Tianli Chen, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Wei-Hua Ruan, Purdue University

Pig is a simple dice game in which the objective is to be the first to reach the winning score. At any given time during the game, the player who has the turn must decide whether to roll or to hold. The player's score, the opponent's score, and the player's turn total affect the winning probability and the decision-making process. In order to determine the optimal playing strategy, a system of about 500,000 equations must be solved. This is too large to be computed directly. In the case when the opponent does not play the optimal strategy, the optimal playing policies are different. This results in an even larger system of twice the size. The difficulty is overcome by partitioning the system into smaller subsystems, which greatly reduces the amount of computation. The computation is performed with the method of value iteration using the computer algebra system Mathematica. Winning probabilities depending on the opponent's playing strategy were found. The opponent could be an optimal player, a constant roller, a "hold at 20" player or a random player. But essentially, the opponent's strategy is unknown. Through a comparison of the winning probabilities when assuming the opponent's strategy, it is shown that the probabilities are much the same.



**21016**

**Analyzing The Forces Within The Bridge**

**Presenter(s)**

Kai Yang, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Branson Lawrence, Illinois Mathematics and Science Academy

The bridge, commonly seen throughout the world, has endured thousands of years of revolution. As the field of physics progresses, engineers grasp a firmer understanding of forces that act on a bridge during everyday use. To prevent engineering flaws, engineers must constantly calculate the effects of forces that act upon bridges, such as tension, compression, stress, strain, and so on. To study these forces, many engineers build structural model bridges out of balsa wood to give a representation of the structural integrity of bridge types. Results of this inquiry have lead to a firm understanding on the methods that engineers use to calculate and reduce strain. For example, engineering designs dictate truss bridges are among the strongest bridges. Truss bridges are composed of many triangles which give massive support due to its ability of converting forces in the y-vector to the x-vector. Decreasing the stress on the beams in the y-vector causes bridges to be more efficient and hold a larger weight. My results will have many implications since I will be working with Kids Institute to teach the basics of my bridge to young kids in IMSA workshops.

**21019**

**The Story Of China And Venezuela: Similarities In Past Political Powers And Economy**

**Presenter(s)**

Winnie Cheng, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jean Kadel, Illinois Mathematics and Science Academy

This investigation looked into the many similarities and differences between China and Venezuela to discover the reasons behind the collaboration of two apparently very different but similar nations. Under the rule of Communist leader Mao Zedong, the people of China lived lives focused on agriculture and self-sufficiency. Shedding centuries' old ideas and modernizing in the last few years, China's economy is well on its way to the top. With this climb comes the need to look for allies who are eager to supply raw materials. Venezuela, the fourth-highest exporter of oil, is willing to cooperate with the Chinese. Since the discovery of oil in the early 1900s, the people of Venezuela have been able to provide for themselves. Despite these advancements and seemingly stable economies, both countries have had or still have fluctuating economies and political systems. Both nations have had a problematic past that affect the actions they take today. The civil strife and drastically changing leadership styles in the past have made the people unsure of what is needed in order to achieve stability in the modern world, while making sure most people are doing well and not living in poverty. Even with rising economies and lucrative exports, the poor of both countries are getting poorer while the rich are getting richer.



**21020**

**Investigation Of Optical Biomarkers For Characterization Of Alterations In Nanoscale Tissue Architecture In Early Cancer**

**Presenter(s)**

Saurabh Kukreti, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Vadim Backman, Northwestern University

We are investigating tissue optical scattering properties of fixed specimens of the duodenum, ampulla, and stomach for both healthy patients and those with pancreatic cancer. These properties are explored using the Low Coherence Enhanced Backscattering Spectroscopy instrument (LEBS) which measures the spectral and angular polarization dependence of light backscattered by biological tissues. One of the major advantages of using the LEBS is that this method only requires biopsies from the duodenum, which is adjacent to the pancreatic duct, thus utilizing a "field effect" approach for diagnosis. This is different from the usual process whereby clinicians require biopsies directly from the pancreas to determine the presence of cancerous tissue, a dangerous procedure that may lead to several complications. Using LEBS, biopsies are relatively safer for the patient and can still give clinicians crucial information regarding the pancreas. In this project we compared the optical properties of fixed tissue in comparison with normal living tissue. If optical biomarkers are discovered, then this will simplify the process of LEBS for diagnosis since specimens can be analyzed at a later time after tissue removal. To identify the LEBS optical biomarkers, we are analyzing co-polarized light from backscattering signal. Preliminary data have been obtained on biopsy specimens from ten patients. At present we are examining the data to determine results.

**21021**

**The Glory Of Reading: Exploring The Imagination Through Catholic Fiction**

**Presenter(s)**

Everett Brokaw, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Michael Casey, Illinois Mathematics and Science Academy

Drawing from the previous year's research in Catholic Spiritual Autobiography, this project focused upon Catholic fiction. The initial goal centered on uncovering how truly "catholic" the Roman Catholic imagination can be. Simultaneously, the past two years' research into Catholic literature has assisted in understanding the importance of key questions about reading: Why is reading worthwhile? How do we determine the worth of literature? What can we learn from characters' or authors' experiences? This inquiry utilized the diverse viewpoints of everyone involved—the researchers, authors, characters, and critics—to recognize the universality of Catholic spiritual experience. Approximately thirty works were read and analyzed in one-on-one conversations, occasionally calling upon secondary advisors for additional input. Major authors included Dostoyevsky, Lynch, Greene, L'Heureux, O'Connor, Mauriac, Percy, and multiple other great Catholic writers of our time. Through this in-depth exploration of so many works, the researchers came to see literature as broad sources of entertainment, education, and diverse perspective. Concurrently, the researchers further developed their own ability to assess the value of a given work, and to recognize the inherent bias in recommending and critiquing literature. Literature enthusiasts are encouraged to attend—diverse viewpoints have been vital to this investigation. Book recommendations will be accepted and appreciated!



**21022**

**A Very "Cool" Project: Cryogenic High-Strain Rate Experiments**

**Presenter(s)**

Hemal Patel, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Murat Vural, Illinois Institute of Technology

NASA's new vision has encouraged scientists and engineers to consider the construction of long-term habitats on the moon, a project that would be challenged by harsh conditions on the lunar surface. One of the attributes of the moon that will hinder the design of these habitats are its extreme temperatures, ranging from  $-233^{\circ}\text{C}$  to  $123^{\circ}\text{C}$ . The focus of this project was to develop a cryogenic system that would allow us to perform high-strain rate experiments at temperatures low enough to be found on the moon. This system transports specific amounts of liquid nitrogen to the area where the specimen is to be deformed by the Split-Hopkinson Pressure Bar. The main components of the cryogenic system include a low temperature chamber, a digital temperature controller, and a solenoid valve. The chamber houses the area of impact which is to be cooled, while the temperature controller sets a target temperature for the chamber. The solenoid valve maintains this temperature by allowing specific amounts of liquid nitrogen to flow into the chamber. The entire experimental setup will allow us to characterize the dynamic response of different materials at temperatures as low as  $-200^{\circ}\text{C}$ . Calibration of the cryogenic system had been completed, however preliminary data gathering and analysis is still ongoing.

**21023**

**The Importance Of Rho GTPase Signaling During Herpes Simplex Virus Type 1 Induced Cell-Cell Fusion**

**Presenter(s)**

Kenneth Higa, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Deepak Shukla, University of Illinois at Chicago

An estimated 60% of the U.S. population over the age of 12 is infected with Herpes Simplex Virus Type 1 (HSV-1). Symptoms range from relatively minor cold sores to more severe diseases such as encephalitis and meningitis. HSV-1 is the leading cause of infectious blindness in the U.S. One way the virus spreads is through the fusion of HSV-1 infected cells with neighboring non-infected cells; a process not well understood. Filopodia, thin projections from the cell membrane involved in cell adhesion, are specifically induced by HSV-1 virus-like cells. Rho GTPases are involved in filopodia formation. Our study shows that Rho GTPases play an important role in HSV-1 induced cell-cell fusion. Rho GTPases were specifically localized to points of contact between fusing cells. Alteration of Rho GTPase activity using constitutively active and inactive forms of the proteins significantly affected cell-cell fusion levels. Heparin sulfate and nectin-1, two HSV-1 receptors, are involved in Rho GTPase signaling pathways. Changes in their expression on the cell surface affected Rho GTPase activity and ultimately cell-cell fusion levels. This study allowed us to dissect the HSV-1 induced cell-cell fusion mechanism to further understand how HSV-1 spreads throughout the body.



**21024**

**Specific Killing Of Tumor Cells By Targeting Centrobin**

**Presenter(s)**

Cristina Thomas, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Qingshen Gao, Evanston Northwestern Healthcare Research Institute

Dr. Chaozhong Zou, Evanston Northwestern Healthcare Research Institute

During mitosis within a mammalian cell, two centrosomes function as spindle poles, ensuring accurate segregation of chromosomes. Centrosome amplification, or the presence of more than two centrosomes, is a common characteristic within cancer cells. For this reason, the detection and identification of novel centrosomal proteins is crucial in the study of cancer. Our research focuses on the role of centrobin, a centrosomal BRCA2 interacting protein, in centriole duplication and its nascent implications in cell division. In order to perform this study, a HeLa cell line was established. Centrobin siRNA was subsequently transfected into the cells, allowing for the knockdown of centrobin expression within the cells. A SDS PAGE ensured that the expression of centrobin had decreased. Cell death assays, specifically trypan blue staining, were utilized to identify the effect of centrobin depletion on the viability of cells. Finally, anchorage-independent growth was quantified through the use of soft agar colony assays, signifying whether malignant transformation of the cells had occurred or not. Results indicate that centrobin is necessary for centriole duplication, and decreased expression of centrobin leads to irregular chromosome segregation. Cells with this altered genotype may then undergo apoptosis or continue to proliferate abnormally, ultimately leading to cancer.

**21025**

**Targeted Fluconazole Prophylaxis For Prevention Of Systemic Candidemia In Extremely Low Birth Weight Infants**

**Presenter(s)**

Lindsey Choi, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Brett Galley, Loyola University Medical Center

Dr. Jonathan Muraskas, Loyola University Medical Center

Extremely low birth weight (ELBW) infants (< 1000 grams) are most likely to have immature immune systems, predisposing those infants to complications and/or death. A complication in the early months of the infants' life can be a fungal yeast infection, Candida. This is a common cause of late onset sepsis associated with a high mortality rate. At the Loyola University Medical Center, a retrospective study was conducted to evaluate ELBW infants admitted to the neonatal intensive care unit (NICU) in 1996 to 2000, compared to 2001-2006, with positive Candida cultures and fluconazole exposure. These two groups were evaluated on the basis of risk factors; prolonged antibiotic use (> 2-3 days), skin rash, indwelling catheters: urinary or central IV line, and/or intubation; as well as demographics; gestational age, age of first positive culture, birth weight, sex, and race. Both groups were analyzed to determine if targeted fluconazole prophylaxis would decrease the chances of candidemia in the infants while reducing exposure to fluconazole when compared to the general infant population. As of yet, further analysis must be conducted to draw definitive conclusions, but targeted fluconazole prophylaxis may prove to be beneficial to the ELBW infant population.



**21026**

**Statistics Of Teenage Romance Networks**

**Presenter(s)**

Sujeeth Bharadwaj, Illinois Mathematics and Science Academy

Brian Martin, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Ezra Getzler, Northwestern University

In their 2004 study of the network of romantic attachments at a Midwestern high school, Bearman, Moody, and Stovel conjectured that squares (two boys romantically linked to the same two girls) are suppressed. We reexamine this conjecture by comparing the statistics of random bipartite graphs to the experimental data. Approximate calculations show that random graphs have an average of 0.4 squares, compared to the four squares found in the experimental network; this shows that, contrary to the conjecture, the presence of squares is favored in teenage romance networks. Based on this, we propose to model teenage romance networks by weighting random bipartite graphs by the exponential factor  $e^{Cn}$ , depending on the number of squares  $n$  and a constant  $C$ . Preliminary results show that  $C=2$  gives an excellent fit to the experimental data, for sizes of clusters in the network and distribution of degrees.

**21027**

**A Literature Review On The Biological Basis Of Attention Deficit And Hyperactivity Disorder**

**Presenter(s)**

Francis Lawrence, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Evenson, Illinois Mathematics and Science Academy

This project set out to investigate the origin of Attention Deficit and Hyperactivity Disorder (ADHD) through a literature review. Since Dr. Heinrich Hoffman's "The Story of Fidgety Philip," the infamous denominators of ADHD children were observed. In England, 1902, George Still lectured on a group of poorly behaved students. Now, research is ascertaining the nature of their deviance. The literature attributes ADHD to anatomical variations and chemical imbalances between the normal and affected brain. The culpable structures lead from the frontal cortices to the limbic system. Through fMRI technology, decreases in activity manifest in the pre-frontal cortex (inhibition, decision-making, executive function), the anterior cingulate (regulation of emotion), and the basal ganglia (regulation of attention). The parietal lobe (sensory management) shows increased activity. Chemically, the ADHD brain struggles with a lower supply of the neurotransmitter, dopamine, which Ritalin restores. With an understanding of the biology of normal and dysfunctional brains, I am prepared to construct and conduct empirical experiments. Research produces pragmatic results in all social realms; it will effectuate enhanced treatments and tailored learning strategies. Thus, deeper understanding of ADHD portends propitious advances toward elucidating the phenomenon by which impulsivity, inattention, and hyperactivity manifest in the classroom.



**21028**

**Clinical Study Of Ica Operon Presence In *Staphylococcus epidermidis***

**Presenter(s)**

MacKenzie Hovermale, Illinois Mathematics and Science Academy  
Vineet Mohanty, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Bill Kabat, Children's Memorial Hospital

The ultimate goal of this project is to lead to a real-time PCR assay to identify *Staphylococcus epidermidis* (SEPI) strains that harbor the *ica* operon. SEPI is one of the primary causes of catheter-associated infections in hydrocephalic patients with shunts. The severity of catheter-associated infections is believed to be dependent on the biofilm production capability of certain strains, which enables bacteria to stick to polymeric surfaces. A correlation has been proposed between biofilm production and the presence of a group of genes called the *ica* operon. Our two stage study expounds on this hypothesis. We began by conducting phenotypic assessments of 85 samples of catheter infection SEPI. This consisted of inoculating bacteria and conducting optical density measurements of the bacterial cultures. The assessment revealed that 28 strains produced biofilm while 57 did not. We then performed genotypic assessments of SEPI by first extracting their DNA and probing for the various *ica* components. The preliminary genotypic assays suggested that there is, indeed, a correlation between the presence of the *ica* operon A and biofilm production capability. By combining our results with past results for *ica* genes B, C, D, and R we will be able to identify which genes will be the best targets for the development of real-time *ica* operon PCR assay.

**21029**

**Genotyping Of Genetically Modified Mice**

**Presenter(s)**

Catherine Gao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Vilma Band, Evanston Northwestern Healthcare Research Institute  
Dr. C.B. Gurumurthy, Evanston Northwestern Healthcare Research Institute

In a screen for the cellular interacting proteins of a well known viral oncoprotein Human Papilloma virus E6 (HPV E6), a novel protein hEcd (human ecdysoneless) was identified as an E6 binding protein. In order to study the function of this novel gene, we generated hEcd knockout mice. Genes in eukaryotic animals, such as mice, are normally present in two copies (denoted as +/+). When generating the knockout mice, one copy of the gene was deleted. These heterozygous +/- animals were mated to each other in an attempt to obtain homozygous knockout animals (-/-). After analysis of DNA samples from over 300 pups, no Ecd null (-/-) mice were obtained, indicating homozygous deletion of hEcd most likely led to embryonic lethality. The stage of embryonic death was analyzed by genotyping the embryos harvested from timed-pregnant females from embryonic day 7.5 (E7.5) until day E13.5, which also yielded no -/- embryos. This finding strongly suggests that Ecd is indispensable for prenatal development and that loss of Ecd is lethal to the embryos. As an adjunct to this, further analysis of tissue specific knockouts – gene deletion from specific tissues instead of from the whole organism – may help further understand the function of this novel gene.



**21030**

**Filtering The Noise Of The Internet: Creating An Intrusion Detection System That Will Only Alert On Abnormalities**

**Presenter(s)**

Michael McInerney, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Brian Sea, Illinois Mathematics and Science Academy

Mr. Steve Terrell, Illinois Mathematics and Science Academy

Almost every computer today that is connected to the internet is constantly being scanned for weaknesses by possible intruders. For an organization with a large web presence this scanning increases in frequency and quantity over that of a regular internet user. In order to know what has occurred, the logs of these scans should be reviewed regularly. However, a large number of irrelevant entries often hide a small number of attacks that must be dealt with. To try to solve this problem I first researched computer attacks, then collected data on what the normal "baseline" of attacks on the internet is. I then used this knowledge to create a monitoring system that would see all attacks but instead of simply showing them all would identify "abnormal" ones and bring them to the attention of an administrator. In this presentation I will discuss how some common computer attacks occur as well as present the data I have collected on the normal attack "noise" of the internet. I will then discuss how I attempted to solve the problem of "seeing the water through the flood" or how to identify which attacks are more important than others.

**21031**

**Mathematical Poker**

**Presenter(s)**

Jennifer Iglesias, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Mark Fischler, Fermi National Accelerator Laboratory

We solve and analyze different variants of "mathematical poker," a group of two-person, fixed-sum games that model poker. The games investigate the concepts of bluffing and trapping (also known as sandbagging). The analyses show not only that these strategies are necessary for some optimal strategies but also why they are necessary. We present a way in which to determine the value of the game for each player which requires less algebra. In the most general form this method is simply half the difference between the bluff values for each player added to one half. Each analysis includes insights found when analyzing the game, such as an optimal strategy using trapping can only be employed when the other player has a chance to raise, otherwise trapping hurts the player who employs it. Likewise, bluffing can not be utilized unless the other player has a chance to call after the bet or raise, otherwise it will almost always hurt you. The games analyzed include a simple game where one player only has the choice to check or bet a single amount and the other player may call or fold through allowing discrete bet sizes for the first player up to an unbalanced game in which both players have a chance to bet but only on a single bet size.



**21032**

**Real-Time Mapping Of the Brain Tumor Using Spectroscopy**

**Presenter(s)**

Siyao Ye, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jianmin Gong, Northwestern University

Dr. Xu Li, Northwestern University

Today, cancer remains one of the most deadly diseases known to man. Doctors have many difficulties in treating cancer, especially brain cancer. For brain cancer, the most beneficial factor in the treatment lies in maximal brain resection. However, such a thing is difficult to accomplish, as surgeons require real-time mapping of the brain. Current methods have drawbacks due to sensitivity, cost, or necessary additional surgery. However, the possibility for a new efficient procedure has arisen. Past research projects completed by others shows that colon cancer cells scatter light of a different spectrum than the light scattered by normal colon cells. Given this information, it can be hypothesized that brain cancer cells have the same relationship with normal brain cells. With confirmation of this hypothesis, this project will determine the spectral signature of each type of tissue and aims to create a new system for the real-time mapping of the brain with a millimeter-resolution. Data collected on the effect of subtle tissue changes on the spectral signatures of tissue may allow for even more uses of this system. With such a system, surgeons will be able to more efficiently maximize tumor resection, allowing for better treatment of patients with brain cancer.

**21035**

**Effects Of Cigarette Smoke Cadmium On The Release Of Calcium From Bone In Humans**

**Presenter(s)**

Lucia Wu, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Maryka Bhattacharyya, Argonne National Laboratory

Osteoporosis, mostly affecting post-menopausal women, is characterized by low bone density, ultimately leading to weak bones and sometimes fractures. Past studies of cadmium (Cd) show that the element causes low bone density. High levels of Cd have been found in tobacco leaves that may influence the effect of smoking on bones. A focal point in the current project of evaluating blood cadmium concentration in post-menopausal women is the cigarettes themselves. Research was successfully conducted to find the top smoked brands of cigarettes. These included Marlboro, Newport, and Doral, in that order. While literature values for trends in Cd concentration have been presented, this study investigates the cadmium content in cigarettes of certain brands, including Marlboro, Basic, Parliament, and Camel. Cd content of cigarettes was determined, sampling from several cigarettes in a pack and from packs purchased from different store locations; different cigarette types from each brand were also tested. Using a smoking machine and atomic absorption spectrometry, the amount of the heavy metal will be determined to see if it agrees with the literature data found previously. Thus far, the weights of the quartz filters show a wide range of mainstream smoke content, possibly resulting in varying Cd concentrations.



**21036**

**Relations between The Terms of Interspersion Arrays**

**Presenter(s)**

Kathy Huang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Steve Condie, Illinois Mathematics and Science Academy

An interspersion is an array which has terms from different rows that from some point on, alternate in size. Furthermore, each row and column is an increasing sequence. Each term is denoted by  $a(i,j)$  where the indices  $i$  and  $j$  represents the row and column number, respectively. We proved two relationships between the terms of an interspersion to be true. First, we showed that  $a(i,j+2) - a(i,j)$  is equal to the number of terms in the first and second column which are less than  $a(i,j+2)$ . Furthermore, we found that the minimal value of  $a(i,j)$  was  $i*j$ . In addition, the even first column array was studied. The first row of this particular array consists of the Fibonacci numbers. Each subsequent row begins with the smallest term that is not present in a previous row. The second term is given by  $[a(i,1)*\alpha] + n$  where  $[x]$  denotes the greatest integer function, and  $\alpha$  is the golden ratio. The term  $n$  is equal to 1 when the index  $i$  is even, and  $n$  is equal to 0 when  $i$  is odd. This sequence is called the classification sequence of the even first column array. We proved that  $a(2k,2)-a(2k,1)=a(2k+1,2)-a(2k+1,1)$  for the even first column array.

**21037**

**Theoretical Calculations Of Low-Loss Electron Energy Loss Spectra For Andalusite And Tetragonal-Hafnium Oxide**

**Presenter(s)**

John Myrda, Illinois Mathematics and Science Academy

Meredith Rhein, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Manish Singh, University of Illinois at Chicago

Dr. Christos Takoudis, University of Illinois at Chicago

The semiconductor industry has progressed by miniaturizing transistors, but miniaturization has reached its fundamental limit. A proposed solution is to replace silicon oxide in existing transistors with a high dielectric constant ( $\kappa$ ) material. Aluminum oxide and hafnium oxide are promising high- $\kappa$  materials. Electron energy-loss spectroscopy (EELS) is a technique that can be used to investigate the local structure of materials at sub-nanometer scale with high spatial resolution. It could be useful in studying the interfaces of high- $\kappa$  materials with silicon. In this study, low-loss EELS ( $< 50$  eV) has been used to understand changes occurring in ultrathin aluminum oxide and hafnium oxide films upon thermal processing (annealing). During annealing, detrimental interfacial reactions may cause formation of silicates or phase changes. Density functional theory as implemented in WIEN2k program was used to calculate theoretical low-loss EELS for andalusite and tetragonal-hafnium oxide. Andalusite and tetragonal-hafnium oxide are polymorphs which may form during annealing. The theoretical EELS was used as an aid in the interpretation of experimental EELS for the as-deposited and  $1000^\circ\text{C}$  annealed films. Comparison for hafnium oxide films annealed at  $1000^\circ\text{C}$  indicates formation of silicate at the interface. For the aluminum oxide films there is a *likely* indication of silicate formation.



**21038**

**Network Bandwidth And netLasso**

**Presenter(s)**

Jonathon Ronchetti, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jason Leigh, University of Illinois at Chicago

Dr. Xinjiang Wang, Evanston Northwestern Healthcare Research Institute

Data transfer is getting faster and faster with the advancements of networking and the tools which manipulate it. The utilization of optical lines and switches enables data to be sent at rates in excess of ten gigabits per second. With the use of a program called netLasso, I have tested a wide variety of wired networks, ranging in speeds from one gigabit per second all the way up to an optical network of ten gigabits per second. The user can determine the optimal window size for the maximum speed of a given network from the output of this program. This research into the functionality of high speed optical networks furthers the possible uses and user base. From the results of tests, it seems the fastest speed obtained by a given network averages about 50 megabits short of the named network speed, such as 950 megabits on a gigabit connection. The implications of the results of the tests tend to show that it is becoming easier and easier to connect computers over long distances at extremely high rates of data transfer.

**21039**

**The Effect Of Iron Particle Size On Signal Intensity In Magnetic Resonance Imaging**

**Presenter(s)**

Alex Ma, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Debiao Li, Northwestern University Feinberg School of Medicine

Plaque buildup in the cardiac vessel is a major factor in heart disease. Magnetic resonance imaging (MRI) technology is being developed to image the plaque in a noninvasive manner. In order to optimize the capabilities of the MRI detection of plaque, the best combination of pulse sequence, contrast agent concentration, and contrast agent size must be tested. Pulse sequence varies by T1, T2, and T2\*, and is a controlled setting on the MRI machine. Contrast agents vary by different concentrations, and are controlled when preparing the solution being imaged by the MRI machine. Contrast agents can also be either superparamagnetic particles of iron oxide (SPIO) or ultrasmall SPIO (USPIO). The particle size is varied when preparing the solution. The optimal combination is found by graphing and analyzing the effects of the three variables on signal intensity in MRI. The combination of these three variables that produces the highest signal intensity allows the plaque to be better seen and is the optimal combination. Preliminary evidence shows that higher concentration of agents and larger particle size results in a better signal intensity.



**21040**

**Neutrino Data Analysis**

**Presenter(s)**

Monica Bhattacharya, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Regina Rameika, Fermi National Accelerator Laboratory

The neutrino is a neutrally charged nearly massless particle that was discovered in 1955. Because these particles are so young in the physics world, much elementary research is being conducted regarding their behavior. The aim of the Main Injector Neutrino Oscillation Search (MINOS) is to monitor neutrino oscillation in a beam of neutrinos from Fermilab to a detector in Soudan, Minnesota. In this study, I looked at efficiency and purity statistics of detecting neutrinos by eye scanning and by computer program. It was concluded that it is more accurate to analyze data using the computer program than by eye scanning because the efficiency values for eye scanning for the two types of neutrinos were 84% and 39% and for the computer program 78% and 94%.

**21041**

**Image Based Reconstruction And Transport Mechanisms In The Human Brain**

**Presenter(s)**

Vihab Abraham, Illinois Mathematics and Science Academy

**Advisor(s)**

Prof. Andreas Linninger, University of Illinois at Chicago

Dr. Michalis Xenos, University of Illinois at Chicago

Today, several millions of people suffer from diseases of the central nervous system (CNS) that include stroke, Parkinson's, Alzheimer's disease, and Hydrocephalus. However, the inner complex organization of the CNS hinders the treatment of such diseases. This research provides, through a patient specific approach, insight to the medical community about diseases of the CNS. The first subject was an epileptic patient and the second one was a hydrocephalic patient. The goal is to reconstruct the complex brain geometries for these patients. The substructures of MR or CT images were segmented in ImageJ (for two-dimensional segmentation) or ITK-SNAP (for three-dimensional segmentation). The reconstructed geometry achieved is defined by points and the connectivity between them. The points are then connected, and separated into their respective structures. Further computational fluid dynamic analysis performed on the reconstructed brain geometry makes possible to understand the intracranial dynamics and the interaction of fluids and solids of the human brain with the help of computational fluid dynamics (CFD) tools. We reconstructed the three-dimensional structure of the skull and the three-dimensional structures of cerebrospinal fluid (CSF) pathways-ventricular system and subarachnoid space (SAS)—of two human subjects. This study also reports the three-dimensional CSF motion in the reconstructed structures of CSF pathways for the hydrocephalic patient with the help of CFD tools.



**21042**

**Can Event Free Survival Rates Of Children With Hodgkin's Disease Increase?**

**Presenter(s)**

Karissa Fernandez, Illinois Mathematics and Science Academy

**Advisor(s)**

James Nachman, University of Chicago Children's Hospital

In 1995-1999, the Children's Cancer Group conducted a study on the treatment of Hodgkin's disease. The study compared both event free survival (absence of disease progression, relapse, and toxic death or second cancer) and overall survival rates of children treated with chemotherapy to those of children treated with chemotherapy and radiation therapy. After three years of follow-up, the overall survival rates for the two groups were equal, at about 95%. However, the event free survival rates had a difference of 8.5%, favoring the radiated patients. Further follow-up was necessary to determine late relapses and death from initial relapse, so I looked at data from 4-8 years of periodic follow-up. I found that there were very few late events, and that the overall survival for both groups stayed equal. Since the overall survival rates are very similar and very high, either treatment would be acceptable. My question now is whether the patients that do not need radiation can be separated from the patients that do need it in terms of their particular characteristics.

**21043**

**Is Investing A Gamble?**

**Presenter(s)**

Tony Liu, Illinois Mathematics and Science Academy  
Zhe Zhao, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Mark Musaraca, AG Edwards

People often have the misconception that investing in stocks is a gamble. However, stocks can be a very successful money-earning plan over time. According to historical figures, stocks have outperformed most every other investment option. Assuming all dividends are reinvested, statistics have shown that investing in stocks is one of the few investment techniques that have significantly outpaced inflation, which is about 3% per year. In our on going investigation, we have sought different ways to balance the volatility of the stock market and reduce loses. One way to diversify a portfolio is to cover a wide range of stocks in different sectors so that if one sector is performing badly, another can compensate. Another way to invest into a portfolio over a period of time is to use a disciplined approach of dollar cost averaging. This method entails investing the same dollar amount a specific interval in order take advantage of price fluctuations. We hope to compare a balanced portfolio with ones that are heavily concentrated in one sector to analyze volatility.



**21044**

**Why People Choose The Majors That They Do**

**Presenter(s)**

Yuren Xie, Illinois Mathematics and Science Academy

**Advisor(s)**

Paul Pieper, University of Illinois at Chicago

Have you ever wondered whether economic variables (such as the gross domestic product and the unemployment rate) affect the majors that college students choose? Well, I have and it has been a question to which I was able to determine an answer. This was done to a certain extent, through statistical and economic analysis (for example: t-tests and regressions). My preliminary analyses were based on broad majors like engineering and humanities. I then moved onto specific majors within those categories and also organized my data into subgroups for gender and ethnicity. After collecting all the data from WebCASPAR at [webcaspar.nsf.gov](http://webcaspar.nsf.gov), I used the t-test to compare each major to a market variable in order to see if the data was statistically different from each other. The T-Statistics for every test was well over two, indicating that two sets of data aren't statistically different from each other. Although there are still many more majors and economics variables that I have yet to work with, my analyses up to now hasn't provided any evidence of correlation between majors and economic variables.

**21046**

**Examining M07e And THP-1 Cell Line Interactions Through Blocking Peptides And Proteins Adhesion Assays Of Fibronectin**

**Presenter(s)**

Michael Choe, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. William Miller, Northwestern University

Examining hematopoietic cell line interactions with the extracellular matrix protein fibronectin (FN) gives insight into hematopoietic cell interactions with the nearby environment. Since FN contains multiple cell binding domains for integrins and other adhesion molecules expressed by hematopoietic cells, we hypothesize that the cells interact with several portions of the FN protein. To test this hypothesis, we performed various competition assays with assorted combinations of known blocking peptides to 1) the cell binding domain [linear and cyclic RGD (linRGD and cRGD) peptide] and 2) the CS-1 domain (cyclic LDV (cLDV) peptide) of FN. In addition, the heparin glycosaminoglycan was tested for competition of cell adhesion to the heparin binding domain (HBD). The megakaryoblastic M07e and the monocytic THP-1 cell lines were separately incubated for 30 minutes with combinations of peptides and/or heparin prior to loading onto FN coated surfaces and performing adhesion assays. No significant competition was observed at 100  $\mu$ M with cRGD, and no competition was observed for linRGD (300  $\mu$ M) or cLDV (100  $\mu$ M). However, a combination of cLDV and cRGD each at 100  $\mu$ M completely inhibited M07e and THP-1 cell adhesion to FN. These findings correlate with the presence of  $\alpha 5\beta 1$  and  $\alpha 4\beta 1$  integrins on M07e and THP-1 cells. Interactions with FN may help us understand how primary hematopoietic cells interact with their environment in the bone marrow.



**21048**

**Asylum in the United States: Case Studies to Analyze the Process and its Biases**

**Presenter(s)**

Xavier Watson, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Beatriz Sandoval, Hughes, Socol, Piers, Resnick, Dym, Ltd.

Asylum was created to protect refugees who are unable or unwilling to return to their home countries because of past persecution or a well-founded fear of future persecution on account of one of five grounds. Applying for asylum in the United States is usually confusing, lengthy, and intimidating for the applicant, and often times the applicant knows little or no English and lacks legal representation. Immigration judges, usually from prosecutor backgrounds, and asylum officers, though trained to be impartial, are often biased due to high workloads, bad experiences with false claims, or personal prejudices. By studying previous cases, critically analyzing research, and becoming a first-hand participant in affirmative asylum application processes, defensive asylum and withholding of removal proceedings, the researcher discovers the necessary things to win cases: corroboration of applicants' claims and evidence of country conditions. The researcher also examines the reasons that explain why only one in five asylum claims are grant. By analyzing the correlation between asylum grants and denials and world affairs at the time, the researcher also uncovers reasons that explain why the system places biases on individuals from a country, specifically Palestine, where the asylum grant rate is close to zero granted claims.

**21049**

**Explorations In Organometallic Synthesis**

**Presenter(s)**

Dennis Kriventsov, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Narayan Hosmane, Northern Illinois University

Ms. Josie Wallmuth, Illinois Mathematics and Science Academy

Organometallics is a relatively new branch of chemistry that deals with the interactions between metals and organic compounds. One of the first chemicals to be discovered in this area was ferrocene  $[\text{Fe}(\text{C}_5\text{H}_5)_2]$ . It is remarkable for its unusual sandwich structure, aromatic properties, exceptional stability, and variety of reactions, none of which are fully accounted for by organic or inorganic theory. In this independent study, ferrocene was synthesized from iron (II) chloride and dicyclopentadiene. Cyclopentadiene was created in a cracking distillation from its much more stable dimer in a retro Diels-Adler reaction. Addition of sodium hydride in tetrahydrofuran (THF) resulted in the formation of cyclopentadienylsodium (87% yield). Finally, the ligand was reacted with excess  $\text{FeCl}_2$  in THF, synthesizing ferrocene. This product is currently being analyzed using nuclear magnetic resonance techniques to determine its purity. The cyclopentadiene ligand makes sandwich and half-sandwich structures with many other metals, including cobalt, nickel (triple-decker sandwich), and thallium. Cyclopentadienylthallium was also synthesized from pure cyclopentadiene (82% yield) while the others need to be made from cyclopentadienylsodium.



**21050**

**What You See In Lucky Charms: A Study On The Properties Of Visual Grouping**

**Presenter(s)**

John Li, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Steven Franconeri, Northwestern University

At any given moment in time, our brain must quickly and efficiently process millions of environmental inputs into the visual system. Past research has shown that perception organizes stimulation by grouping elements with similar visual attributes, such as similarity in color or size. To explore the properties used for grouping objects together, we asked observers to rapidly estimate the number of objects in two displays. In one of the displays, pairs of objects had similar features (for example: color or shape), or were connected by lines, or were closer together. If the property causes pairs of objects to be grouped into single units for number estimation, then the subject will underestimate the number of objects in that display. Our results suggest that object alignment, physically connecting objects, and closely positioning pairs of objects have the most influence on number estimation, which indicates that these grouping methods are called upon in a wide visual field. In contrast, pairing objects with color, luminance, shape, did not lead to number underestimation, suggesting that these properties may only lead to grouping for objects in the current restricted focus of attention.

**21054**

**The Longing For Belonging**

**Presenter(s)**

Alexis Sellars, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Wendi Gardner, Northwestern University

The desire to fit in is both innate and imperative to fulfill. If this "longing for belonging," is not satisfied, an individual may possibly suffer both negative physical and mental consequences. However, when belonging needs are unfulfilled, a drive to repair them can yield positive outcomes, because they encourage people to seek greater social connection. In the current research, a social rejection experience predicted increased emotional contagion between the rejected individual and a target. Additionally, the current research demonstrated that, because rejected individuals showed greater emotional contagion, perceived emotional rapport was also increased. Increased social rapport had been demonstrated to lead to later interactions that are smoother, repairing damaged belonging needs to allow for the people to connect more easily, and for everyone to feel as if they "belong." We hope this can even lead to more discoveries perhaps comparing rejection effects and gender or age.



**21056**

**Sea Urchin Relocation Project**

**Presenter(s)**

Aaron Macy, Illinois Mathematics and Science Academy  
Priyanka Prakash, Illinois Mathematics and Science Academy  
Kyle Schirmann, Illinois Mathematics and Science Academy  
Christina West, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Susan Bernal, Illinois Mathematics and Science Academy

About twenty years ago a bacterial virus wiped out almost 99% of the sea urchin population. In the years following, scientists and scuba divers alike noticed that the urchin population was not coming back. Since so many of the sea urchins were destroyed, the population density was not sufficient enough for procreation. Another side effect of the urchin decimation was that the algae eaten by the urchins took over the reefs, killing the fragile balance that is needed to keep the coral reefs healthy. Scientists then started the Relocation Project with Caribbean countries in order to save their waters. This project takes urchins that were grown in protective environments and places them in clusters on sick reefs. Some members of the Scuba club participated in this project over Intersession, harvesting and relocating approximately twenty new sea urchins. Due to these efforts (over many years) the coral reefs are being restored, and the sea urchins are making a comeback.

**21057**

**Estimation Of Facet Load Using Laminar Strain Gauges**

**Presenter(s)**

Sivaraman Iyer, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. L. Voronov, Edwards Hines VA Hospital

The purpose of my investigation is to aid my lab in running range of motion tests on spine samples to determine the effectiveness of artificial intervertebral discs. The spines are optimized, and angle and position measurements are taken beforehand using OptoTrak sensors and computer programs, and measurements are taken after the artificial discs are inserted into the space where the real disc was removed. Flexion, extension, and rotation are achieved through pumps which pump water into bags connected to the spine sample. Devices called strain gauges that measure tension on the lamina are used as an estimate of load on the zygapophyseal joints, or the facets. This is because placing the gauges directly on the facets will damage tendons, compromising the results. Therefore, my investigation focuses on testing individual vertebrae to determine a relationship between laminar strain and facet load. To plot our results, we use an Instron® machine to apply pressure and load versus strain is graphed. Our preliminary data supports our hypothesis that strain increases with increasing load. In addition, it seems to be a linear relationship. Further analysis of the data will allow us to come up with an equation through linear regression.



**21058**

**The Birth Of The Flexistrip**

**Presenter(s)**

Christina West, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Abler, Illinois Mathematics and Science Academy

Have you ever had one or two big plugs take up all the space on your power strip? My invention is a new power strip called the Flexistrip. In my presentation I will show you how the Flexistrip solves all your home or office power problems. Get an inside look at the design, development and uses of the Flexistrip in a filmed commercial. See what it takes to take an idea and make it come to life.

**21061**

**Determining A Familial Relationship From DNA Extracted From Hair Follicles**

**Presenter(s)**

Namita Gupta, Illinois Mathematics and Science Academy

Lara India, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Donald Dosch, Illinois Mathematics and Science Academy

Dr. Susan Styer, Illinois Mathematics and Science Academy

This project utilized many of the techniques used in modern forensic science. These techniques included DNA extraction, polymerase chain reaction (PCR) with multiple DNA primers pairs, and gel electrophoresis. After developing successful PCR protocols for the loci HS2.25, HS4.14, and D17S5, our goal became to compare DNA from anonymous family members using multiple primer pairs (TPA-25, D18S51, D19S253, and the three pairs previously mentioned). We have successfully amplified our own DNA extracted from cheek cells using all six of these primers. Current work is focusing on optimal conditions for DNA extraction from our hair follicles in order to work out conditions for these primers. Our familial studies have begun with four PCRs conducted using anonymous DNA. DNA amplification was only successful using the primer pair TPA-25. The PCRs conducted with D18S51, D19S253, and HS2.25 were unsuccessful. From our preliminary experiments with hair follicle DNA and cheek cell DNA, DNA extraction from hair follicles yields a lower concentration of DNA than extraction from cheek cells. This data will be used to analyze the DNA of anonymous individuals and determine familial relationships between them.



**21062**

**Production And Behavior Of Granular Materials**

**Presenter(s)**

Justin Johnson, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Alan Feinerman, University of Illinois at Chicago

Collections of small macroscopic particles such as sand, known as granular materials, behave in ways that are not well understood. This project has focused both on the production of granular particles, and on the behavior of granular materials under changing effective gravity. A better understanding of granular physics could lead to advancements in the storage, transportation, and use of granular materials like grains, dirt, and sand. Particles have been cut from ~0.1 mm carbon paper using a 10.6 micron carbon dioxide laser. After being cut, the air assist in the laser tends to blow the particles around, making collection difficult. The working solution is to use a vacuum chuck to hold the paper and particles using suction as they are cut. Preliminary results indicate that this is a feasible idea. However, there are still problems with this method. There is a lot of air leakage, and as a result the paper and particles are not always held with sufficient suction. Additionally, after repeated cutting, the pores in the surface of the chuck tend to become clogged with ash from the paper, further reducing the amount of suction that it produces. The second portion of the project involves the study of granular particles under varying gravity conditions. This is achieved by placing the particles in a rotating mechanism and studying their behavior as the rate of rotation changes. The methods for doing this are still being developed, so no data has yet been collected.

**21063**

**Attack Of The Clones: An Exploration Of Embryogenesis In *Arabidopsis Thaliana***

**Presenter(s)**

Jessica Bubert, Illinois Mathematics and Science Academy  
Anastasia Rahlin, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. F. Bryan Pickett, Loyola University

This investigation was designed to test if plant cells in globular stage embryos are developmentally determined to contribute to specific structures in adult plants. An embryonic fate map was constructed using genetic chimeras generated in *Arabidopsis thaliana*. One line contains a ubiquitously expressed cell marker (35S GUS) that turns all cells that contain the gene blue. The other contains a recombinase that randomly removes the GUS gene in cells that undergo heat shock. Lox 3/1 and lox 3/2 GUS expressing lines were pollinated with heat shock recombinase lines HCN 33/44 and HCN 33/12. F1 generation embryos were heat shocked to produce clones. Heat shocked seed was harvested, dried for two weeks, and planted. Germinated seedlings were dipped in X-glucuronide to show the GUS expressing cells, and bleached of their chlorophyll with ethanol. Clones were oriented using clockwise phylotaxy. An analysis of the sector patterns based on the phylotaxy will be presented at IMSAloquium. Because seeds are the basis of the agricultural economy (for example all corn and wheat flour is made from ground seeds) understanding the normal growth of the embryo within each seed may provide information useful in breeding new plants.



**21064**

**Early Detection Of Alzheimer's Disease Through High Resolution Magnetization Transfer Using Voxel Based Morphometry**

**Presenter(s)**

Karen Song, Illinois Mathematics and Science Academy  
Jenny Zhang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Todd Parrish, Northwestern University Feinberg School of Medicine

Alzheimer's disease (AD) is the most common form of neurodegenerative dementia today. It cannot be diagnosed until autopsy. Any improvements in diagnosis such as predicting conversion from mild cognitive impairment or differentiation from primary progressive aphasia (PPA) could lead to a method to identify AD in its early stages. Our study will test a noninvasive imaging method for early detection of AD by comparing scans sensitized to the concentration of macromolecules in the brains of probable AD (PRAD), PPA patients, and normals. Data was acquired using high resolution magnetization transfer (MT) contrast at 3 tesla. The magnetization transfer ratio (MTR), which measures the amount of signal associated with macromolecules, was calculated using a region of interest (ROI) analysis of memory (AD), language (PPA) and visual (control) areas. Preliminary results showed that the MTR of white matter in PPA patients was lower than those of PRAD patients, which was lower than normals, indicating greater white matter loss in PPA. There were no significant changes in MTR of hippocampus, the ROI for AD. However, this may be caused by the low number of patients scanned so far. A larger cohort of patients and additional ROIs may provide an early biomarker for AD.

**21065**

**Exploring The Efficiency Of The MINOS Experiment**

**Presenter(s)**

Anita Mehta, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Niki Saoulidou, Fermi National Accelerator Laboratory

The Main Injector Neutrino Oscillation Search, or MINOS experiment, is a two-detector neutrino experiment taking place in the United States of America. The two detectors are located at Fermilab and at a lab in Soudan, Minnesota. These detectors, made out of steel and scintillator planes, are able to recognize certain types of neutrinos and show the track length of these neutrinos. For my experiment, I analyzed data collected and made histograms, which represent the neutrino energy of the charged and neutral current neutrino interactions, as well as the efficiency of these selected events. By programming these histograms, I was able to see how efficient the detectors are and scan the efficiency events visually and analytically. By visually scanning, I found 59 selected charged current events in 71 total charged current events. Therefore, the visual efficiency was 83%. Analytically, by plotting the histograms and finding the efficiency, we found that there were 84,900 selected charged current events in 140,657 total charged current events. Therefore, I found the efficiency to be 60%. In conclusion, our visual scanning of the efficiencies was higher than our analytical efficiency, which is something commonly seen in high energy physics.



**21066**

**Development Of A Handheld On-Chip PCR Device For Detection Of Microorganisms Relevant To Biodefense**

**Presenter(s)**

Hon Chu, Illinois Mathematics and Science Academy

**Advisor(s)**

Mrs. Vicki Burgholzer, Illinois Mathematics and Science Academy

Improvements were incorporated into a flat-surface polymerase chain reaction (PCR) device in order to create a handheld bacterial detector. Optimization of the device required the shortening of the amplification time and shrinking the size of the entire unit. Working with human DNA, the unit successfully amplified the target gene, TPA25. However, the current protocol required extended cycles at each temperature stage. A ribosomal gene in *E. coli* and *E. faecalis* is currently being tested for use in the amplification process. A Proportional, Integral Derivative (PID) algorithm and rapid PCR protocols with total amplification times of less than 40 minutes were also analyzed. The bacterial detector will allow for high-throughput (i.e. simultaneous detection of many bacterial strains), real-time, sensitive on-site detection of pathogenic microorganisms. Such methods will enable rapid identification in the field for fast counters to bio-hazards.

**21067**

**Ethics In Malpractice**

**Presenter(s)**

Ashima Sarup, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Claiborne Skinner, Illinois Mathematics and Science Academy

Malpractice harms 1.5 million American people per year; lawyers sue, insurance agencies pay, malpractice premiums skyrocket, hospital service quality declines and then the cycle starts over again. Who is at fault - lawyers, insurance agencies, doctors, or patients themselves? Through economic studies, newspapers, journal articles, and interviews, this project sought to assess the situation. Astoundingly, only 5% of doctors are responsible for 54% of medical payouts. In addition, faulty investments of insurance agencies are responsible for a steep increase in premiums - 7.2%. Moreover, ambulance chasers constantly attack doctors; however, only 1% of cases have jury verdicts and 70% of cases do not make it to court. Additionally, society wants to prolong life; this places more pressure on doctors to try to save a life and when a doctor cannot, it creates a brittle relationship between patients and physicians. Many different resolutions were examined and analyzed, including tort reform caps, teaching ethics in the operating room, previously existing regulations, and so forth. It was concluded that all parties are responsible for the situation, thus, reforms need to be made across the board. From there on, different hypothetical reforms were proposed to better aid the situation.



**21069**

**Designing A Cryo-Cooler System**

**Presenter(s)**

Birce Onal, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Richard Schmitt, Fermi National Accelerator Laboratory

The DES camera located in Chile is in need of a cryo-cooling system that can function despite the camera's positioning and heat load. The system we created includes a cryo-cooler, pipes of pumped liquid nitrogen, as well as a heat exchanger to transfer the heat from the camera to the system. This system will cool the camera to 120°K with minimal vibration, minimal weight, and low space requirements near the focal plane. It also minimizes the consumption of liquid nitrogen, which is expensive at the telescope site. The quality of the liquid nitrogen and the pressure placed on it at various points throughout the system has been calculated in order to avoid alternating sections of liquid and gas in the pipes, which creates unnecessary friction. The enthalpy and frictional pressure of the system has been calculated as well. The dimensions of the argon condenser heat exchanger and the eight fins which transfer heat from the camera to the system have been found as well as the amount of heat transferred. With the dimensions and specifications ready, the DES Dark Energy Survey team will be able to test a prototype of the cooling system and build the actual system in order to cool the camera. Once the camera is built with a functional cooling system, scientists will be able to observe and take pictures of supernovas and clusters in an effort to shed light on the mysteries of dark matter.



**21070**

**The Presence Of The CTLA-4 +49 A/G Polymorphism In The Plasma And DNA Of Caucasian Males With Respect To Abdominal Aortic Aneurysms And Carotid Artery Disease**

**Presenter(s)**

Daniel Dean, Illinois Mathematics and Science Academy  
Vincent Rossi, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. William Pearce, Northern University Medical Center  
Ms. Vera Shively, Northwestern University Medical Center

Abdominal aortic aneurysms (AAA) and carotid artery disease (CD) are common vascular diseases in elderly populations. Both AAA and CD are associated with atherosclerosis, and characterized by chronic inflammation. CTLA-4 is a molecule that decreases the inflammatory response of T-cells. Polymorphisms of the CTLA-4 gene seem to impact its function. We genotyped a CTLA-4 single nucleotide polymorphism (SNP) in DNA samples from patients with AAA or CD using polymerase chain reaction (PCR), followed by restriction endonuclease digestion, and gel electrophoresis. These results were then compared to results from a control group obtained from the NUGene DNA bank. It was found that the A/G genotype was present in over 75% of the control patients, whereas AAA and CD patients possessed this genotype just over 55% of the time. The G/G genotype was present in 11.7% of AAA patients and 23.1% of CD patients. The A/A genotype occurred in 31.2% of AAA patients and 15.4% of CD patients. The heterozygous A/G genotype was found in 55.8% of AAA patients while only 15.4% in the CD patients. The respective percentages of the control samples were 7.1% for the A/A genotype, 17.1% for the G/G genotype, and 75.7% for the A/G genotype. Plasma from the patients will be analyzed for the CTLA-4 protein using an enzyme-linked immunosorbent assay (ELISA). We're hoping to see an association between the three possible genotypes, (A/A, A/G, or G/G), and the plasma CTLA-4 level.



**21071**

**Environmental Enrichment For Primate Housing To Improve Social And Psychological Well-Being Using Multi-Colored/ Multi-Shaped Toys**

**Presenter(s)**

Alexandra Teller, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Lee Cera, Loyola University Medical Center

Non-human primates resemble closely to humans in their physiological and behavioral profiles, and therefore, are used in biomedical research protocols. My research has focused on providing environmental enrichment to the rhesus macaques species (*Macaca mulatta*). The goal is to provide an environment in which complex stimuli are available to alleviate abnormal responses by increasing activity as well as provide a modicum of control over their own environment. Previous research indicates monkeys quickly become accustomed to the presence of an enrichment device and their use of it rapidly declines. To address these issues, enrichment objects were selected to vary in their degree of visual and physical complexity. Six female rhesus macaques were arranged in single-animal housing in a separate area to allow videotaping of all interactions the animals have with their toys. As these are intelligent animals, this research will try to alleviate boredom and increase attention span to the toys by changing each toy daily and weekly. Next phases are 1) each week a new toy is presented to the group, each day a new color presented to each rhesus macaque and taken away after 7 hours. On the last day of the study all three colored toys will be presented. 2) Approximately 240 hours of videotape will then be viewed and interpreted for results. This study is designed to develop programs to enrich the environment and improve the psychosocial well-being of primates housed for bio-medical research.



**21072**

**Representation Of Indigent Clients In Society Today**

**Presenter(s)**

Matthew Dabaco, Illinois Mathematics and Science Academy

Nicholas Umholtz, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Regina Harris, Kane County Public Defenders Office

According to the verdict of Gideon vs. Wainwright, competent representation needs to be provided for everyone, including indigent clients. The American Bar Association concluded, in a recent study, that a criminal defense lawyer can only provide competent representation if their caseload is less than 150 felonies, 400 misdemeanors, or 200 juvenile cases a year. The focus of our investigation is to identify if there is an overworking of defense attorneys in society today, and if so, to come up with a logical way to decrease the case load of public defenders without having to use more tax money to pay for more lawyers. Through studying at the Kane County Judicial Center, we have been able to utilize resources that would not have otherwise been easily accessible. By comparing the caseloads of private attorneys and public defenders, we hope to establish either a parallel or differing trend in their representation. We are surveying lawyers, from both the Peoria and the Aurora areas, to find out whether or not they are actually providing competent representation for each of their clients. From the surveys that we have received back, we have been able to identify trends. However, we have not received all of the surveys back yet, so we have not been able to completely analyze all of the data, and therefore reach an ample conclusion. Currently we are receiving the data and analysis is underway to determine whether there is truly a fault in the judiciary system.

**21073**

**A Quantitative Analysis Of The Ethanol Industry Through Stock Valuation**

**Presenter(s)**

Ryan Angelotti, Illinois Mathematics and Science Academy

Ryan Wang, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Matthew King, ADM Investor Services Inc.

Ethanol is a biofuel produced by processing organic plant matter such as corn, sugarcane, and switchgrass. In the United States, the majority of ethanol is produced from corn. Ethanol has gained popularity as an alternative fuel because it is cleaner burning than crude oil, and generally more cost effective than gasoline. However, ethanol's long-term viability is unclear due to a variety of factors. Our project focuses on the valuation of key ethanol producers with regards to their stock prices. We adapted a model to value these companies by forecasting their future earnings potential. Based on our model, we have found that most companies are overvalued due to unreasonably high growth estimates. These estimates reflect the overwhelmingly positive market conditions that existed when most of these companies' stock went public. The cost of ethanol production is highly dependent on commodity prices, specifically corn. We feel that the stock prices do not reflect the inherent volatility of these commodities, which are affected by large amounts of speculation in both the futures and cash market. Recent price movements in the commodity futures market, as well as in ethanol companies' stock have supported our conclusion.



**21074**

**Alternative Splicing Of The Glucocorticoid Receptor Protein In Multiple Myeloma And Its Role In Drug Resistance**

**Presenter(s)**

Jonas Owen, Illinois Mathematics and Science Academy  
Neha Sarvepalli, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Nancy Krett, Northwestern University Feinberg School of Medicine  
Dr. Steven Rosen, Northwestern University Feinberg School of Medicine

Multiple myeloma (MM) is a hematologic malignancy consisting of apoptosis-resistant cells that replicate slowly, creating a challenge for cancer therapy. One effective treatment against MM is the use of glucocorticoids which binds to glucocorticoid receptors (GR) to induce apoptosis. Our lab detected an upregulation of GR-P, a non-functional glucocorticoid receptor isoform, in the intermediate phase of MM resistance. This isoform is caused by alternative splicing. Serine/Arginine (SR) proteins are one of the proteins responsible for alternative splicing. Therefore, we conducted several western blots to see if there was a difference in the amount of SR protein between several cell lines or at different times of Dex treatment (a glucocorticoid). Due to inconclusive data, we shifted the focus of our project to look at whether apoptosis was causing a decrease in GR protein levels. To test this, we inhibited apoptosis with ZVAD (checked for by the cleaving of PARP) and conducted another western blot which indicated that the GR protein level decrease is independent of apoptotic mechanisms and is most likely affected by the Dex treatment.

**21075**

**Improving The Accuracy Of Neural Decoding For Neuroprosthetic Applications**

**Presenter(s)**

Adam Novak, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Nicho Hatsopoulos, University of Chicago

Brain-machine interface (BMIs) technology allows a person's brain to be connected to a computer, which can then interpret the neural firing patterns of the person's brain, and translate them into actions. Such systems could be used to help people overcome paralysis, or let so-called "locked-in" patients interact with the outside world. However, one of the obstacles to the use of BMIs is their relatively low accuracy. My project aims to address this shortcoming by improving the mathematical models, or "filters" which are used in BMIs to translate neural firing into meaningful output. I plan to compare three different filters - the commonly used Wiener filter; a filter which, in the past, has proved very accurate, known as Nonlinear Mixture of Competitive Linear Models; and an experimental filter based on a mathematical technique called dimensionality reduction. My work so far has centered on implementing, testing, and debugging each of these three filters in the MATLAB computational data analysis environment. I plan to run these three filters in a head-to-head competition, to determine which is the most accurate.



**21076**

**IMSA On Wheels: Amazing Magnetism Interactive Experience**

**Presenter(s)**

Qi-Yuan Gou, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Tracy Miller, Illinois Mathematics and Science Academy

This Inquiry continues the work of last year's IMSA on Wheels: Amazing Magnetism project. It aims to interest audience members in science and inquiry about the world around them. The show focuses on magnetism as a means to convey the benefits of adopting science as a facet of everyday life, which include greater knowledge and increased curiosity in the scientific realm. The show has changed into an interactive classroom experience, which consists of presenter-shown demos, followed by mainly self-guided activities that serve as follow up to the first half of the show. The show was presented to seventh and eighth graders at Schaumburg Middle School and Oswego's Science Night. We attained valuable feedback by noting the kids' reactions and previous knowledge. The kids reacted with great enthusiasm to two demonstrations, and mild enthusiasm to two other demos; they also displayed some common knowledge, such that iron is magnetic and that magnets "stick to each other," while a few demonstrated extended knowledge by noting that opposite poles attract, whereas likes repel, and that magnetism is a lot stronger than gravity. This allows me to add, subtract, or change aspects of the show to make it more appealing. "Amazing Magnetism" has also been captured in this year's edition of the IMSA on Wheels DVD.

**21077**

**Characterization Of Heptapeptides To Be Used In Nanoscale Biomolecular Valves On Ferroelectric Lead Zirconium Titanate Surfaces**

**Presenter(s)**

Michael Schmitt, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Leonidas Ocala, Argonne National Laboratory

Research is confirming the feasibility of functionalizing biomolecules to create an electrically-actuated nanoscale valve capable of controlling nanofluidic flow in nanochannels on certain ferroelectric substrates. Using a bilayer resist method, a 100 nm wide channel may be patterned via a 100kV e-beam lithography tool. The TAR-1 heptapeptide was selected through an evolutionary phage display technique for its ability to selectively bind to ferroelectric lead zirconium titanate (PZT) surfaces. TAR-1 is used as the building block for the biomolecular nanovalve. The biomolecular nanovalve becomes rigid through the application of voltage to electrodes patterned on the PZT surface. By binding TAR-1 to points along the nanochannel, such voltage application would theoretically temporarily impede fluid flow in the channel. Current research has characterized the TAR-1 heptapeptide in order to verify its pertinence to the creation of a biomolecular nanovalve on PZT surfaces. The strength of the bond between TAR-1 and PZT surfaces proved strong enough to remain bonded given predicted flow rates. In addition, the PZT surface can be refunctionalized with TAR-1 after TAR-1 detaches due to prolonged flow. Thus, the final model can partially be reconstructed. When constructed, the current model would be durable enough for both lab-on-a-chip and medical drug delivery application.



**21078**

**Politeness Across Cultures: A Preliminary Sociolinguistic Analysis On French And American Films**

**Presenter(s)**

Yi Lu, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Brenda Crosby, Illinois Mathematics and Science Academy

Mrs. Willa Shultz, Illinois Mathematics and Science Academy

In politeness theory, polite forms of speech are used to blunt the force of face-threatening acts (FTA). The use of politeness tactics as social tools is evident in languages and cultures across the world. For example, these tactics are particularly apparent in situations where there is a clear power demarcation, when there is an indisputable superior and subordinate. Such interactions can be viewed through film, an art form that provides a window into different cultures. By controlling for variables such as socioeconomic environment, and gender, analogous scenes in French and American films were found that showed interaction between the police and members of the public. The dialogue was linguistically dissected and analyzed using politeness theory, with particular emphasis on the uses of negative and positive politeness as well as the expression of power. In both cultures, the superior appears to show higher degrees of politeness, a finding contrary to expectation. In addition, both French and American films underlined the difficulty of non-native speakers in successfully navigating FTAs without a cultural awareness of politeness.

**21079**

**The Dynamics Of Heron Populations In The Danada Forest Preserve**

**Presenter(s)**

Theodore Atwood, Illinois Mathematics and Science Academy

Connor Dismar, Illinois Mathematics and Science Academy

Jonathan George, Illinois Mathematics and Science Academy

Joseph Hsu, Illinois Mathematics and Science Academy

Aaron Macy, Illinois Mathematics and Science Academy

John Seo, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Workman, Illinois Mathematics and Science Academy

This paper examines the population dynamics of the Great Blue Heron, (*Ardea herodias*). The proper understanding of population dynamics is important in securing a species' future. Standing at almost 132 cm with a wingspan of 213 cm, the Great Blue Heron is the largest North American heron. To properly document these migratory birds, we have mapped out four distinct groups of nests that have recently been found at the Danada Forest Preserve. Named alpha, beta, delta and sigma, the rookery divisions will be observed in the spring for the returning herons' nesting preferences, mating rituals and care of eggs. We will also note the number of successful nests (nests with chicks) and the corresponding mortality rate among the chicks that are born. The great majority of our information will be collected in the spring and summer of 2007 and submitted to a national database.



**21080**

**Compilation of a Police Database for the Prevention of Police Misconduct**

**Presenter(s)**

Brandon Zhang, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Cathryn Crawford, Northwestern University Bluhm Legal Clinic

My investigation is in the field of legal studies, specifically criminal justice. Under the guidance of my mentor, Cathryn Crawford, at the Northwestern University's Bluhm Legal Clinic, I have accumulated data from various instances of police misconduct. I have been looking through online news articles, court cases, and citizen complaint reports filed against the police or police department and recorded various key points such as the name, age, race, address, and phone number of the victim, the name(s) and star number(s) of the officer(s) involved, what kind of abuse the victim received, whether or not a report was filed with Office of Professional Standards (OPS), and so forth. The nature of the abuses varies greatly from the infringement of rights to violence to a mere lack of service. There are a few officers whose names have repeatedly appeared in numerous complaints, and they are the individuals whom we must pay more attention to. This amassed information has been entered into a police database through Microsoft Access which will be used for future reference by police and lawyers, hopefully helping to prevent future cases from occurring by raising awareness.

**21082**

**Magnetic Nanostructures for Use in Biomedicine**

**Presenter(s)**

Jagannath (Sam) Nayak, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Mohammed Aslam, Northwestern University

Prof. Vinayak David, Northwestern University

Magnetic nanostructures are highly valued for their biomedical applications, which include the ability to image cancer cells and to provide these cells with localized therapy. However, current magnetic nanostructures are hindered by limited magnetic strength and insufficient biocompatibility. This project addresses these two aspects by attempting to 1) replace the core with metals or their alloys to increase magnetic susceptibility and to 2) separate the fluorescent dye and silica into separate shells, preventing the potentially harmful dye from coming in direct contact with the body, thus increasing biocompatibility. Significant progress has been made toward these goals. The advancements include forming a core magnetic structure of FePt,  $\text{CoFe}_2\text{O}_4$ , and  $\text{MnFe}_2\text{O}_4$ , which have a higher magnetic susceptibility; coating the FePt core structures with  $\text{Fe}_3\text{O}_4$ , which contained excess and non-uniform coating; improving the stability of the structures for dye attachment; and coating silica onto the structures, which had excess silica and particle conjugation.



**21083**

**Histone Deacetylase Inhibitor Trichostatin A abrogates Transforming Growth Factor- $\beta$ -Induced Type I Collagen Synthesis: Possible Mechanism**

**Presenter(s)**

Victor Liou, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Asish Ghosh, Northwestern University Feinberg School of Medicine  
Dr. John Varga, Northwestern University Feinberg School of Medicine

Scleroderma is a multi-system disease characterized by the development of skin fibrosis due to excessive production of type I collagen. TGF- $\beta$  has been shown to induce collagen synthesis, as implicated in wound healing. Trichostatin A (TSA) was used to treat skin fibroblasts in this study with the rationale that the drug has been shown to inhibit collagen synthesis. TGF- $\beta$  transduces its signal via Smad dependent, Smad-independent pathways (MAPK pathway), and transcription factors (EGR-1). Previous studies have only suggested that TGF- $\beta$ -induced Smad signaling remains unaffected in the presence of TSA. In this study, I investigated the effect of TSA on TGF- $\beta$ -induced MAP-kinases and EGR-1 signaling as a means of delineating the molecular processes involved in the collagen suppression. This knowledge would possibly give reason to TSA being used as a new treatment for fibrosis. Through fibroblast cell cultures and Western blots, my results reveal TSA does not alter TGF- $\beta$ -induced activation of MAP-kinase, but does abrogate the TGF- $\beta$ -induced expression of the important synthesis regulator EGR-1. I show that the inhibition of collagen is gene specific and neither global nor toxic. It can be concluded that TSA-induced suppression of collagen synthesis is due to altered expression levels of EGR-1. This finding provides for the possibility of using TSA as a potential anti-fibrotic agent for scleroderma.

**21084**

**Mate Preferences of Varying Sexual Orientations: Synthesizing Evolutionary Theories**

**Presenter(s)**

Chantel Liggett, Illinois Mathematics and Science Academy  
Sarah McPike, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. J. Michael Bailey, Northwestern University  
Dr. Joan Chiao, Northwestern University

Like those of other animals, human mate preferences help maximize partners' (hence offsprings') health, intelligence, and fertility. Past research on mate preferences has only focused on heterosexuals. Because non-heterosexuals do not have the same reproductive goals as heterosexuals have, it would be interesting to determine whether their mate preferences varied. Therefore, we created an online survey to examine the similarities and differences in mate preferences of people with varying sexual orientations and/or overall physical and psychological degrees of masculinity/femininity. We asked participants to rate their preferences for different visual cues, including waist-to-hip ratio, for example. Participants also conducted a simulation that measured whether certain personality traits, physical characteristics, or social status is most important to them when choosing a mate. Finally, we created a survey specifically for lesbian participants, which assessed whether they experience their sexuality as inborn or politically driven, for this is an extra variable we need to take into account. Ultimately, we shall compare the evolutionary and psychological explanations for the data we receive in hopes of adding to the current pool of knowledge on human sexuality



**21085**

**Prospective, Multi-Centered, Controlled Study To Demonstrate The Safety And Efficacy Of Peripheral Nerve Stimulation With An Implantable Pulse Generator And The Effect It Has On The Treatment Of Pain Associated With Chronic Migraine Headaches**

**Presenter(s)**

Thiran Udawatta, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Mustafa Colpan, University of Illinois Medical Center at Chicago

Dr. Naureen Monawar, University of Illinois Medical Center at Chicago

Dr. Konstantin Slavin, University of Illinois at Chicago

Migraines and headaches in general plague about 13% of all Americans. Of these 13%, 4 to 5% suffer from chronic daily headaches which are defined as having a headache for 15 or more days/month. Often debilitating, these migraines undermine the quality of life for many people and thus necessitate a treatment to better their lives. After trying many different drugs and treatment therapies, a different approach to migraine headaches, peripheral nerve stimulation may be warranted. After participating patients met the inclusion criteria, they were implanted with Genesis<sup>TM</sup>/Genesis XPTM Pulse generator. These patients were then evaluated in the 52-week time frame in which pain was monitored in response to varied stimulation. Of the 150 patients originally sought for, only two patients have been implanted with the pulse generator and have been under the treatment for two months. Both patients have responded well to the treatment and both have expressed alleviation of pain associated with their migraines. Although the study will require many more patients to collect definitive data, it seems that peripheral nerve stimulation helps palliate the pain associated with migraines. Preliminary results tell us that peripheral nerve stimulation could potentially help many people who suffer from chronic migraines live a better life.

**21086**

**The Inhibition of HIV-1 Replication by the Inhibition of the LTR Promoter**

**Presenter(s)**

Jillian Davenport, Illinois Mathematics and Science Academy

Gouthami Rao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Donald Dosch, Illinois Mathematics and Science Academy

The promoter in the HIV-1 long terminal repeat (LTR) controls the genetic expression of HIV-1 replication. By inhibiting the LTR promoter, the transcription of HIV-1 DNA would not occur, thus resulting in the inhibition of HIV-1 replication. An engineered plasmid, pBMNZneo, has the beta-galactosidase gene of *Escherichia coli* spliced onto the HIV-1 LTR promoter. A SupT1 cell line including this plasmid was obtained to test the effects of natural compounds in the control of LTR transcription. A cell signaling molecule, TNF-alpha, was used to determine how best to stimulate the transcription of the LTR promoter. The TNF-alpha concentration of 0.2 µg/mL proved the best concentration for stimulation. Once the LTR promoter was stimulated with TNF-alpha, Curcumin was used as an organic substance testing for its inhibitory effects. Curcumin has proven to inhibit the beta-galactosidase expression controlled by the HIV-1 LTR promoter. Further experimentation is underway with other natural compounds.



**21087**

**Therapeutic Application of Mesenchymal Stem Cells in a Rodent Model of Pulmonary Hypertension**

**Presenter(s)**

Ann Pan, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Joe Garcia, University of Chicago

Dr. Jenny Harrington, University of Chicago

Dr. Liliana Moreno, University of Chicago

Pulmonary hypertension (PH) is an often fatal disease characterized by increased pulmonary artery pressure and endothelial cell apoptosis. Severe PH leads to death due to right ventricular heart failure. Mesenchymal stem cells (MSCs) are found in bone marrow with the ability to differentiate into connective tissues, in particular, the vascular endothelium, which is needed to repair the damage in PH. Our goal is to test the MSCs that we have isolated and characterized from last year for therapeutic use in rat models of PH. In this study, MSCs are labeled with a fluorescent dye for injection into rats with PH. Echocardiography analysis showed normal heart function at baseline (day zero) with right heart function, and pulmonary pressures in the normal range (10-15mmHg) in all the experimental groups. Three to five weeks from now, animals will be analyzed by echocardiography and by invasive methods for measurements of hemodynamics. We expect MSCs to reverse PH and vascular remodeling. This is a cutting-edge science project since only until recently the potential of these stem cells has been discovered. MSCs promise to have important clinical applications in the treatment of serious common cardiopulmonary diseases. Further data will be provided at IMSAloquium.

**21089**

**Development of a Sentence Similarity Algorithm for Accessing Scientific Literature**

**Presenter(s)**

Kyle Schirmann, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Neil Smalheiser, University of Illinois at Chicago

Dr. Vette Torvik, University of Illinois at Chicago

Biomedical scientists today must access an incredible amount of information. Last September, the US government's main biomedical information portal, PubMed, processed over 71 million queries. How do researchers find citations relevant to their searches? More importantly, how can researchers find several related articles? We created an algorithm to compare the similarity of two sentences, accounting for both semantics and grammar. We investigated different methods for manipulating strings and created a list of important linguistic characteristics. Properties such as word sense, string matching, word frequency, and readability were considered while designing the algorithm. Essentially, our process creates a number between 0 and 1 that describes how likely two sentences are to be related. Using this number, a source sentence may be matched to many target sentences, which can then be ranked by similarity. Multiple sentence comparisons might allow a person to run one-to-many article comparisons. We are presently training our algorithm and coding a proof-of-concept implementation. The result is generally independent of language or subject matter, as the algorithm would simply need to be retrained in either of these environments. Access to electronically-stored information has already revolutionized science, and the ability to rapidly access specific information will speed development even more so.



**21090**

**Searching For Cooling As A Result Of Field Emission**

**Presenter(s)**

Kevin Tao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Heinz Busta, University of Illinois at Chicago

Dr. Alan Feinerman, University of Illinois at Chicago

In the world of vacuum nanoelectronics, two great rivals are entrenched in a titanic struggle. Both rivals perform the same task: they emit electrons on demand. Thermionic emission is particularly hot right now. However, field emission is efficient and very cool. My research has focused on field emission and whether it can cause cooling on the emitters. The hypothesis was this: as electrons tunnel out of the emitter, the work function barrier acts as a semi-filter, keeping cold electrons in while allowing hot electrons to escape. The overall effect is analogous to evaporation. After two arduous years, we now believe that we have evidence of a cooling effect on field emitters. We have perfected the experiment by minimizing heat conductivity and environmental variation. We can consistently measure changes in temperature as small as 0.01 degrees Kelvin. Our experiment shows that in general, the flow of electrons generates heat and there is a linear correlation between electric current and heat produced. However, when the current is low, the small amount of heat produced is constant. This suggests that up to a certain point, the increasing heat caused by an increasing current is balanced by a cooling effect, which is also related to current. The cooling effect is slightly weaker than the heating, so the overall result is weak heating. Various uses for field emitters include flash memory and flat panel displays.

**21091**

**The Measurement of Beta-Cell Mass in Vivo**

**Presenter(s)**

Michelle Blomgren, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Anita Chong, University of Chicago

Dr. David Lee, University of Chicago

Type 1 diabetes results from the loss of beta cell mass due to autoimmune destruction. It has been previously demonstrated that islet cells may be capable of recovering or regenerating under the correct conditions. To study this, a system must be developed. Currently, the method is morphometric analysis after the pancreas has been subjected to immunohistochemistry staining, but this process requires the mice to be sacrificed. A new method, which uses a transgenic mouse with the luciferase gene under the control of the insulin promoter can track insulin secretion *in vivo* by detecting bioilluminescence signals. By using Streptozotocin, a drug that selectively kills islet cells, we plan to induce diabetes in mice and show that the luciferase model can reliably show beta-cell loss and recovery *in vivo*.



**21092**

**The Proliferation of B-Cells and IgE Production**

**Presenter(s)**

Tianyu Du, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Richard Dods, Illinois Mathematics and Science Academy

Inappropriate IgE producing B lymphocytes are responsible for many allergic reactions. To study IgE producing B-cells, background research on B-cell proliferation, IgE production and immunology was necessary. In the body, interleukin-4 (IL-4) produced by antigen specific CD4+ T-cells induce B-cells to switch to IgE production. IgE is a product of the B-cell line, CRL-8033-1 and production can be stimulated with the addition of antigen. The proliferation of these B-cells in culture and the production of IgE depend both on media and antigen stimulation. I have been culturing the cells from CRL-8033-1 for this project. Keeping the cell cultures viable is essential. Seeding  $2 \times 10^5$  cells per 20.0 mL of RPMI worked in keeping the cells viable over long weekends. By varying the amounts of glucose added to plain RPMI, I observed the effect on the general quantity of B-cells after twenty-four hours. By varying the amount of antigen stimulation, I can observe effects on cell proliferation in addition to IgE production. Sensitivity of the cells can be determined by the amount of antigen required to induce a B-cell response. Cell sensitivity can be further determined by observing the relationship between the amount of antigen needed to induce response and the amount of cells present.

**21094**

**Crafting an Ideal Leadership Program for Gifted Adolescents**

**Presenter(s)**

Kelsey Gee, Illinois Mathematics and Science Academy

Tony Sheng, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robert Hernandez, Illinois Mathematics and Science Academy

In order to design the most effective leadership development program for gifted adolescents we had to gain some knowledge on leadership itself. We first referred to the foundational leadership literature that most programs base their curriculum in. From this literature, we moved on to understanding and examining the leadership programs at colleges and universities that gifted adolescents frequently matriculate to—schools identified with the aid of the CAC office's records—and supplemented that data with the research already done by Dr. Hernandez and Adrienne Coleman on schools already equipped with strong leadership programs. We analyzed our data in order to clearly see strategies and to discover commonalities and differences in the fundamental competencies of most programs. We found that these competencies include a basis of past leadership tactics and their relevance in the present, effective verbal and nonverbal communication, group dynamics and community values, and environment and ethics. Based on our analysis, we have developed a set of competencies and strategies that can easily be adapted to leadership programs for gifted adolescents.



**21095**

**Study of British-American Tobacco Company's Presence in Cambodia and Uzbekistan**

**Presenter(s)**

Fae Rabin, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robbin Derry, Northwestern University

The top priority of a business is to sell its product – but when does advantageous leverage turn from thrifty to exploitive? This is not a discussion of the appropriateness of the product but rather an examination of the British American Tobacco company (BATco)'s façade, which was created to ensure themselves greater access to a new market. The focus of this paper will be BATco's disinclination to disclose product risks to developing nations that do not demand health precautions similar to those in the U.S. and Britain. Typically, products are subjected to a series of checkpoints in foreign trade; however, the laws of some countries are more loosely applied than others. As a business, it is in BATco's interest to sell as many cigarettes as they can in all possible markets; however, the risks involved in consuming their product are overlooked in some countries. Both Cambodia and Uzbekistan are developing nations who reap benefits from their BATco vendors such as: tax revenue, creation of jobs, and access to a desirable western product. BATco probably would not have been as successful in these countries if they consistently upheld the U.S. and British laws even while selling and marketing tobacco products abroad. By way of careful timing, lobbies, political connections, and business prowess, BATco has successfully entered the markets of Uzbekistan and Cambodia. Their business practice was not socially responsible because they withheld health risks about their product.

**21096**

**An Attempt to Suppress Endogenous KCNQ<sub>1</sub> Current in *Xenopus* Oocytes Using RNA Interference**

**Presenter(s)**

Sivali Boddu, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Daniel Levy, University of Chicago

Dr. Sherry Wanderling, University of Chicago

KCNQ<sub>1</sub> is a potassium ion channel that binds to MinK proteins and is associated with cardiac arrhythmias such as Long QT syndrome. We used RNA interference to attempt suppression of the endogenous KCNQ<sub>1</sub> channel in *Xenopus* oocytes, so as to allow for heterologous expression of human KCNQ<sub>1</sub> channels. Many scientists use heterologously expressed KCNQ<sub>1</sub> to evaluate the physiological effects of drugs on this cardiac ion channel and could benefit from removing confounding current of endogenous channel. We selected three siRNAs (small interfering RNA or silencing RNA) specific to the *Xenopus* isoform to inject with MinK mRNA. MinK allows for the function of the KCNQ<sub>1</sub> channel that would otherwise be absent. We hypothesized that the knockdown of KCNQ<sub>1</sub> RNA would suppress KCNQ<sub>1</sub>-MinK current measured by two-electrode voltage clamp. Injecting the siRNA either concurrently with or 16 hours prior to injection of the MinK mRNA yielded similar currents as the water-injected controls. Quantitative RT-PCR from injected oocytes showed no reduction of KCNQ<sub>1</sub> mRNA. We conclude that the three siRNAs used were ineffective in knocking down endogenous KCNQ<sub>1</sub> expression.



**21097**

**Faith and the Human Experience in the Works of John Paul II**

**Presenter(s)**

Sylwia Matlosz, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Jose Palos, Illinois Mathematics and Science Academy

John Paul II authored many books, encyclicals, poems, and plays like *The Jeweler's Shop* and *Our God's Brother*, that deal with the universal theme of faith. An examination, as well as a close reading of a selection of these works, was done during this inquiry project in order to follow the spiritual journey within the pages of literature and analyze the twofold descriptions presented in these works. The goal was to produce a better grasp the connection between faith and human experience. Like his poetry's symbols which work on two levels, his plays present, on the first level, the struggles of a group of emblematic characters and, on the second level, show these individuals at a moment of symbolic transition. The poems, like the plays, have a characteristic interiority that offers a poetic reflection intermingled with philosophical reflections that are often identical to the problems discussed in his other books. A precise conclusion was not formed about all of the works, since John Paul II neither offers an exact opinion in all cases nor leans towards a specific solution to the problematic situation; thought reflects on thought but such an investigation does not always accompany an answer.

**21099**

**Designing a Maglev Train**

**Presenter(s)**

Michael Driscoll, Illinois Mathematics and Science Academy

Gregory Ver Halen, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Workman, Illinois Mathematics and Science Academy

As the world oil supplies dwindle we seek new means to transport the masses efficiently, cheaply, and environmentally friendly. In this vein research has been done into magnetic levitation trains (Maglevs) which fulfill the requirements of the transportation needed in the modern day. Thus far we have researched the most well-reputed methods, such as electromagnetic suspension, electrodynamic suspension, and the Inductrack for the construction of Maglev. In the process of our research we have determined which designs are best suited for a demonstration and experimental model for use at IMSA reviewing the advantages and weaknesses of the levitation, propulsion, and building complexity of the methods. We discussed the complexities of the two models and based on the difficulty involved in the Inductrack design we decided to use the non-induction model of the Maglev for scale use. At the present time we are in the process of finding magnets that are best suited for a classroom sized model of a Maglev. In the process of our research we discovered the many benefits of the application of Maglevs in the modern world. We continue to investigate the resources needed to finish the construction of the scale train.



**21100**

**Avoiding the Danger: Robotic Assistance in a Disaster Zone**

**Presenter(s)**

Michael Driscoll, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Paul Oh, Drexel University

In cases where a terrain might be difficult or hazardous for a human to traverse in the attempt to create a map, such as a collapsed building or battlefield, alternative solutions have been sought out. One such alternative is to create a robot that can create a map so that a safe route can be determined and lives saved. Over the summer I worked on the programming and construction of a robot for this purpose. Through constant research and experiments into the robot's abilities we managed to create a basic prototype. I used an E-Maxx RC truck for the body of the robot as it offered many ports to access its motor controls and accept commands. Working with my graduate student we attached a pair of infrared sensors to the truck which would allow it to interpret data in front of it and respond in turn. While the truck lacked the ability to retain data we were well on our way to creating a robot which would eventually assist disaster-relief workers in dangerous terrain.

**21101**

**Dimuon New Physics Search At CDF Fermilab**

**Presenter(s)**

Susan Dittmer, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jane Nachtman, Fermi National Accelerator Laboratory

The Standard Model, the current theory of particle physics, agrees very well with all existing data but is known to be an incomplete theory. Therefore, physicists search for evidence of new physics—events unexplained by the Standard Model, which would give a clue towards the missing pieces of the theory. In this project, an analysis was performed on particle collisions producing two muons, occurring in the Fermilab Tevatron. The collisions were analyzed to isolate new physics events from Standard Model background through comparing the mass sum and sum of transverse momentum distributions of the data with the predictions of the Standard Model. Due to a false signal (a potential overabundance of particles misidentified as muons, called “fake muons,” which could be mistaken for new physics) in the first half of the dataset, a detailed analysis was performed to identify the fakes causing this false signal. The identifying properties of the particles were analyzed with respect to time to determine the characteristics of the overabundant fakes. Once the cause of the false signal is identified, the remaining data may be analyzed for signs of new physics.



**21102****Folk Ways in American Culture****Presenter(s)**

Valerie Young, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Claiborne Skinner, Illinois Mathematics and Science Academy

British immigrants' traditions were the basis for those of Americans. In such locations as the Appalachians and the Ozarks, the physical barrier of mountains limited the amount of influence and change on the British/American culture. As a result, it was well preserved from about 1780 to the 1920's. As modern Americans began to breach the physical barrier of Appalachia, a Folk revival movement was born from these traditions. Folk culture and music appealed to the post war generation, which was ready to defy authority and conformity. The folk culture was based upon the strife of lower classes' struggles and challenged the political messages of "Americanism." Folk revivalists also brought the awaited influence of the ages, modern music, into Folk culture to appeal to the new generations of Folkies. The new rock-ish feel to the music has made the genre popular, but has kept the same traditional influences that make the foundation for this culture.

**21103****User Experience in Watson: An Innovative Search Tool****Presenter(s)**

Chuan Li, Illinois Mathematics and Science Academy

Henry Wang, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jay Budzik, Intellext

Our research involves investigating how people use a computer program called Watson. Watson is an innovative search tool that allows users to find results they look for without having to type words in a search box. It does this by taking words that appear on the user's screen and placing searches on these words on numerous search engines such as MSN, AOL, AltaVista, and so forth. We wanted to find out the usefulness of Watson and how it could affect a regular student's work efficiency and how much benefit it could bring to them. We planned to accomplish this by studying a group of students using their computers with and without Watson, and comparing the results. We did our observations in person. From our research we found that although not all IMSA students found Watson's results to be relevant to their work, some students responded very positively. Most of them agreed that the majority of results showed up quickly and in a user-friendly manner. Based on our research, we will propose a series of revisions to Watson. If they are implemented, we believe that Watson can become an everyday tool for students.



**21104**

**The Japanese Perception of Homosexuality: An Investigation of Its History and Its Modern Implications**

**Presenter(s)**

Seong-Ah Cho, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Jonathan Besancon, Illinois Mathematics and Science Academy

Dr. David Evenson, Illinois Mathematics and Science Academy

Male homosexuality was prevalent in Japan from its introduction in the eighth century BCE up until its decline in the nineteenth century. The attitude of modern Japan towards homosexuality, however, is very different from its historical precedent. Investigation into the literature devoted to this re-emerging history revealed critical pieces of evidence that may offer an explanation. The male homosexuality of Japan's past was a socially condoned institution, and its eventual decline in the 1800s was due more to a general modernization and infusion of Western culture, and cannot be accredited to a successful integration of Christian values. It is most crucial to realize that Japan, as a society, has always emphasized conformity while fearing social ostracism. Synthesizing these facts, two important conclusions can be drawn. The change in the perception of homosexuality occurred as a superficial shift in a Japan that has remained by and large the same for centuries. The static nature of Japanese societal values implies that the modern atmosphere in which homosexuality and other sexual and gender identities exist in Japan, is one where there is a constant struggle to find recognition in the eyes of a nation that deny the very existence of such deviant behaviors.

**21105**

**Maladaptive Networks and Higher Phase Synchrony in the Epileptogenic Zone of the Cerebral Cortex**

**Presenter(s)**

Li-Yan Chang, Illinois Mathematics and Science Academy

Nisha Joshi, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Vernon Towle, University of Chicago

The purpose of this project was to determine whether the epileptogenic zone in the brains of epilepsy patients had significantly higher phase synchrony; a finding of higher phase synchrony would suggest greater communication and coherence between groups of neurons in that area. It was hypothesized that the neurons in the epileptogenic zone would manifest higher interneural phase synchrony than nonepileptogenic zone neurons during interictal, pre-ictal, and ictal periods. Materials in this project included CD archives of patient electrode EEG recordings, the computer program EEGview to process electrode data, and ITKSnap to plot synchrony in 3-D. The phase synchrony analytical feature of EEGview was used to calculate synchrony values and the frequency correlations between electrode channels based on EEG data. Preliminary findings show that the epileptogenic zone demonstrates significantly higher phase synchrony. Identifying the epileptogenic zone in pre-ictal stages using phase synchrony data has the potential to increase knowledge of the mechanism of epilepsy and improve its treatment. Using phase synchrony as an identifying factor for the epileptogenic focus is an important advancement for surgical accuracy in removing the focus.



**21106**

**IMSA on Wheels in Translation**

**Presenter(s)**

Leslie Garcia, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Tracy Miller, Illinois Mathematics and Science Academy

The work completed, over the course of the year, was to gain an understanding on how the IMSA on Wheels (IoW) team as part of the Kids Institute (KI) department of IMSA could change their most recent script, "Science is Shocking" to accommodate those children enrolled in English Language Learners (ELL). Is there a progressive way to introduce ELL students in elementary schools to IoW concepts? This question has been thoroughly investigated in several books by ELL experts and Illinois standards. The audience we targeted is approximately nine to ten years of age. Two shows were prepared, one in English and one in Spanish, for two subgroups. The Spanish version of the show is not all in Spanish; according to the standards of teaching ELL classes, educators should not handicap the learning process of the ELL students. Therefore, a few of the key words have been translated and the students will be taught their English equivalent. Evaluations in the form of educator surveys are given to indicate the improved level of understanding IoW concepts subsequent to the modified show. With these alterations to the IoW show, the influence of the love of science will be spread over language borders.

**21107**

**SH2 Domain Specificity Using Peptide Arrays**

**Presenter(s)**

Ramakrishna Nalluri, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Piers Nash, University of Chicago

The SH2 (Src homology 2) domain is a protein-protein interaction protein subunit important for directing phosphotyrosine (pTyr) signaling pathways. The domain is important to look at for it may have key relevance in cancer because of cell to cell communication. I wanted to compare the domain specificity with previous data based on evolution to understand more about how SH2 domain specificity has diverged over time. By looking at the peptide binding patterns and domain specificity, I have been working on a figure that compares the binding pattern data. To find my data I used a four step process: clone the SH2 domain, make a protein expression of the domain, do a peptide array analysis of the expressed protein, and finally make a computational graph for comparison and analysis. I used the Licor Odyssey Imaging System to analyze the peptide array to find the relative binding strength of the SH2 domain binding with preselected peptides. I then analyzed the data to generate a position specific scoring matrix (PSSM), showing domain specificity at different positions adjacent to the pTyr. After that I can compare the patterns from this data with past intron/exon boundary data to see if peptide arrays do give us a better understanding of the evolutionary diversity of SH2 domains.



**21108**

**Gunpowder's Explosion into Military Technology**

**Presenter(s)**

Jennifer Levey, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Lee Eysturid, Illinois Mathematics and Science Academy

Gunpowder weapons have always been a part of our military might, and have been part of military might in general for some time. However, this was not always the case. After gunpowder was introduced to the western world in the 1320s, there was much experimentation before gunpowder tactics became not only standardized, but effective. Through research, I have seen numerous examples of gunpowder tactics that work, such as those at the battle of Pavia, and those which failed and were thereby discarded, such as those in the battle of Ravenna. For example, at the battle of Pavia, one of the most important battles in northern Italy, the Spanish experimented with their arquebusiers (short-ranged firearms) and sent them out onto the field, instead of using them as defense. It worked exceedingly well. These tactics were developed after the disastrous battle of Ravenna, where a defensive position became their downfall. At Ravenna, the arquebusiers defended a trench and shot at the cavalry, but were attacked by artillery from the side, effectively destroying their protection. By example, I will show how gunpowder weapons and tactics developed between the mid-1320s and the late 1590s, as gunpowder was slowly integrated into the standard military unit.

**21109**

**Investigation of the Biblical Account of Jesus**

**Presenter(s)**

Ju Lee, Illinois Mathematics and Science Academy  
Shelton Leung, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Walter McCord, Moody Bible Institute

The purpose of this research project is to investigate the accuracy of the Biblical accounts of Jesus through analyzing the biblical text, historical accounts, and archaeology. This investigation process was done without anti-supernaturalism and documentary presupposition to verify the validity of the acclaimed Christ depicted in the New Testament. This investigation focused on getting results through research in the arguments against the scriptures. The scriptural support of Jesus is evident through the fulfillment of the prophetic prophecies. The historicity of the New Testament is supported through the written works of the contemporary historians at the time. Archeological findings also imply the accuracy of the credibility and accuracy of the written source describing the world of Jesus. The Pilate inscription and the Caiaphas Ossuary are two archaeological examples in the investigation that indicate the accuracy of the written work of the New Testament. Also an analysis of the resurrection was included in this investigation. The results of this investigation point to the unlikelihood of alternative theories and the increasing possibility of the resurrection. The evidences point to supporting the historicity and reliability of written accounts of Jesus.



**21110**

**A Novel Search For  $pp$  Quark Structure in Collisions at  $\sqrt{s}$  Of 1.96 TeV**

**Presenter(s)**

Shiva Chirumamilla, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Don Lincoln, Fermi National Accelerator Laboratory

The Standard Model of particle physics treats quarks and leptons as point like particles. While ordinary matter is comprised of up and down quarks, the existence of other quarks with similar properties is suggestive of the idea that quarks may contain constituent particles. The heaviest of the quarks copiously produced at the Fermilab Tevatron is the bottom quark, cousin of the down quark. While the Standard Model predicts that bottom quarks are produced most commonly near the proton beamline, theoretical considerations suggest that quark structure would result in an enhancement in bottom quark production uniformly at all angles. Thus a comparison of the angular distribution of bottom quark production might reveal this predicted signature of quark structure. In this study, we compare bottom quark production in the angular region of  $65-115^\circ$  measured from the particle beamline to angular regions nearer the beamline. While work is ongoing, data appears to exclude the quark structure hypothesis. Currently our primary effort focused on quantifying this result.

**21111**

**Fluid Recommendations for the First Ten Days of Life for an Infant Born Weighing Less Than 800 g**

**Presenter(s)**

Sarah Trevor, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jonathan Muraskas, Loyola University Medical Center

The first ten days are a crucial time in a low birth weight infant's life because during that time, the infant is most susceptible to problems. How the fluids are managed in the first ten days of life is experimental and controversial, and no studies have determined universal fluid requirements. My advisor and I are hoping to determine appropriate fluid requirements for the patient infants. I chose infants that weighed less than 800 grams and were gestational age of 25 weeks and 0/7 days. I reviewed twenty years of data (1986-2005) and recorded the weight, fluid intake, urine output, and amount of electrolytes for each day. After recording data for over 400 infants, my advisor and I retrospectively analyzed the medical records. We will average the fluid intake and study the fluctuations of weight and electrolyte content. So far, I have completed recording all of the necessary information from twenty years worth of premature infants, and data analysis is underway. Dr. Muraskas and I hope to publish our findings in an article. We hope that the parents of premature infants learn more about how significant fluid management is, and how even the tiniest fluid alteration can affect their child.



**21112**

**Detection and Tracking of a Nuclear Source with Camera Using an Advance Algorithm**

**Presenter(s)**

Amar Rana, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Richard Klann, Argonne National Laboratory

Dr. Richard Vilim, Argonne National Laboratory

In our time, when unsecured nuclear materials are an increasing threat, the detection and tracking of these materials has become an important national security goal. In this project, we are developing a tool to track a nuclear source. The program does the tracking with distributed radiation detectors and gives out a coordinate point. By using an advance algorithm, the coordinates from the program will be used to pinpoint the source location with an advance webcam. First, the webcam was analyzed for its function and the many ways it can be operated. The best way to operate the webcam was a Linux web-based program. Next, the algorithm would be designed, however, the design will be complicated because of the three dimensional aspects of the case. The camera position was to be determined solely by detector positions. After the algorithm is completed, it will be integrated into the programming, so the webcam will operate automatically along with the rest of the software. To conclude, this project is hoped to bring out some new highlights in nuclear sourcing and detection.

**21113**

**An Examination of Dominican History Through Art**

**Presenter(s)**

Mary Kobs, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jean Kadel, Illinois Mathematics and Science Academy

Art has often been known to connect to the history of the artists' surroundings. Dominican art history can be divided into four main periods: the colonial era, the republic era, the Trujillo era, and the contemporary era. Not surprisingly, the same periods can be used to describe different phases in the country's history as well. Through comparing artworks throughout the Dominican Republic's history to the current events of each one's time of creation, many similarities can be seen. Correlations between art and current events have become even more noticeable in recent decades, as many Dominican artists have begun acting as commentators on the social and political problems that plague their country. For example, the contemporary artist Tony Capellán has created pieces about the prevalence of poverty, lack of education, HIV, and organ trafficking. Likewise, both past and current folk art is a descriptive indicator of many different Dominican origins. Carnival masks, a common form of folk art, show a blend of Taíno, Spanish, and African cultures, as well as the influences of the Dominican cattle industry. By examining and comparing the artworks of various artists to current events, a clearer and more personal understanding of the history of the Dominican Republic can be reached. This presentation will also showcase a few pieces of actual artwork.



**21114**

**The Effect of Dopamine Stimulation on Homer-1 Production in Mouse Neurons**

**Presenter(s)**

John Froberg, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Donald Dosch, Illinois Mathematics and Science Academy

Previous inquiries have studied the effects of dopamine on cell growth and synthesis of certain proteins in mouse neurons. Dopamine stimulation of brain cells is key to understanding the effects of many neurological functions and disorders, including cocaine addiction. These functions and disorders are caused by changes in synaptic plasticity caused by dopamine stimulation. Homer-1 is a protein produced when neurons are stimulated with dopamine; it is responsible for the growth and adaptation of synapses. Using Western blot analysis, it is possible to correlate the level of Homer-1 protein production with the concentration of dopamine used to stimulate the mouse nerve cells. Western blot tests suggest constitutive expression of Homer-1 in the CRL-10225 mouse cell line but with increased production at 5 micromolar concentrations of dopamine. Further Western blots are needed to determine conclusively how dopamine stimulation leads to the production of Homer-1.

**21115**

**Flourescent Imaging of Neuronal HSP 27**

**Presenter(s)**

Tyce Herrman, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Michael Collins, Loyola University Medical Center

HIV coat glycoprotein gp120 and amyloid beta protein have been linked to neurodegeneration in AIDS dementia and Alzheimer's disease, respectively. The Collins laboratory has demonstrated that exposure to moderate ethanol concentrations for 6 days protects brain cell cultures from subsequent gp120 neurotoxicity, a phenomenon called moderate ethanol preconditioning (MEP). One of the protective characteristics of MEP is the production of heat shock proteins HSP70 and HSP27. The goal of my experiment was to see if there was a significant increase of neuronal HSP27 in MEP treated brain cultures versus control cultures. Before the experiment, it was known that HSP proteins were elevated with MEP, but the localization of the proteins was unknown. The results suggest that with MEP, there is a significant increase of neuronal HSP27. The increase of HSP27 is consistent with previous evidence of neuroprotection of brain cells with MEP. This leads to more questions. Do glial cells release HSP27 into the media where it is absorbed by the neurons? Or are the majority of HSP27 proteins made in the neuron? By answering these questions and more, it may become possible to control HSP protein induction and protect brain cells from neurodegenerative proteins like gp 120 and amyloid beta, thereby treating AIDS dementia and Alzheimer's disease, respectively.



**21116**

**Bees and Humans: Education of These Misunderstood Creatures**

**Presenter(s)**

Mivil Abraham, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Carina Eizmendi, SciTech

Dr. Ronen Mir, SciTech

Bees are accustomed to living in many different places, from their natural habitat to human-made beehives. However, bees are commonly misunderstood. People need to be educated about these hardworking and harmless creatures. Toward this end, we decided to build a beehive in which the SciTech guests can always see what the bees are doing. There are many unique and interesting facts about bees; such as that only the larvae that will become the queen bee is fed with "royal jelly," which is specially made. Once the requirements for successfully keeping captive bees were known, a successful hive was designed. The queen bee needs to be kept isolated in an area located at the bottom of the hive, and also the larvae and the honey have to be placed in two different frames. With the completion of the design we ordered the necessary materials and have started the process of building the hive. Once the beehive is complete, we will buy and place the bees in the hive. Once this process is established, and the bees start to thrive in their new environment, we hope that we will be able to educate and entertain the guests about these magnificent creatures. In the end we hope that the bees will thrive in the environment created and at the same time clear misconceptions about them too.

**21117**

**Getting Back the Years You Lost In Elementary School: A Method of Educational Reform**

**Presenter(s)**

Phoebe Barkan, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robert Kiely, Illinois Mathematics and Science Academy

There have been many attempts to pinpoint or develop a definitive method of primary education, and in the field, much splitting has occurred. However, even these specified methods have had serious flaws when implemented, despite extensive research. My inquiry questioned the validity of clear separations between primary educational methods in an attempt to create a more eclectic approach, leading to implications on methods of secondary schooling. By assessing and combining successful elements of established educational systems, elements of home schooling, unschooling, and international methods, a synthesis of applicable methods emerges. Preliminary conclusions have centered around much more individualized methods, with personal lessons and assessment plans to the greatest degree of specificity possible. We should, instead of moving farther and farther towards standardization and baseline expectations, accommodate students as individuals, especially in primary education, and more effectively teach specific subjects: science should be practical and fun, reading should be encouraged but not forced, letting students discover books individually by being read to. Such a system would lead to a much more efficient secondary school system that is able to implement and aid learning without being "radical" and by extension pretentious and unapproachable. Years being wasted under current systems could be reclaimed.



**21118**

**Development of Supramolecular Structures Combining Hyaluronic Acid with Peptide Amphiphiles for Regenerative Medicine Applications**

**Presenter(s)**

Sandeep Paruchuri, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Helena Azevedo, Northwestern University

Dr. Ramille Capito, Northwestern University

Dr. Samuel Stupp, Northwestern University

Nanotechnology offers new solutions for developing technologies in medicine (e.g. tissue engineering and regenerative medicine or synthesis and targeted delivery of drugs). I have learned various aspects of bionanotechnology research, including synthesizing and processing peptide amphiphiles (PA), creating self-assembling gels with the PA, and combining these PA structures with living cells to assess their potential to enhance tissue regeneration. In particular, mixing PA solutions with hyaluronic acid self-assembles into fluid- or gel-filled “sacs.” These sacs provide a more robust system for regenerative medicine applications. I have been working on the initial developmental steps of characterizing the sacs, and the viability of cells cultured within. I was able to ascertain the significant factors for the survival of cells in culture, such as the cytotoxicity of the materials being tested. I monitored the cells after the solution was combined using a fluorescent microscope to ascertain viability, which determined these factors. These trials revealed that a positively charged peptide prevented the binding of cells to the membrane, causing them to die. New PAs now take into consideration the use of these positive peptides and cancel them with peptides that promote cell attachment. From my research, I have learned the potential of combining nonliving, synthetic materials with living organisms and the future of nanotechnology for the development of medical technologies.



**21119**

**A Study of Attitude Toward the Tobacco Industry and the Effect of Media Campaigns: A Survey Of IMSA Students**

**Presenter(s)**

Kunj Amin, Illinois Mathematics and Science Academy  
Michael Paik, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robbin Derry, Northwestern University Kellogg School Of Management

The Philip Morris Tobacco Company has been accused of trying to attract teenage smokers through youth smoking prevention commercials. A study conducted by Anne Landman has claimed that the tobacco company used the "Talk, They'll Listen" campaign, and other youth smoking prevention campaigns, to delay smoking and to increase public good will towards the tobacco company. Conversely, the "TRUTH" campaign produced by the Legacy Foundation uses media tactics that portray smoking as hazardous and as a choice never to be taken. Our study is meant to examine the media campaign by the Philip Morris Company and measure its effectiveness with the "TRUTH" campaign. In an extensive survey of 71 participants, we found that the majority of IMSA students surveyed found the "TRUTH" campaign to be more effective in trying to get teenagers to stop smoking. Also, while more than half of the IMSA students know a family member or friend who smokes, an overwhelming majority of students report that they intend to be nonsmokers when they become adults. We plan to analyze the data using a Mann-Whitney U-Test in order to correlate the data with parallel factors. A closer examination of our results may show a number of patterns between students' opinions of Philip Morris, socio-economic factors, and the effectiveness of how these two campaigns affect student opinions.

**21120**

**International Linear Collider: A New Initiative For The World Of High Energy Physics**

**Presenter(s)**

Stephanie Bian, Illinois Mathematics and Science Academy  
Je-ok Choi, Illinois Mathematics and Science Academy  
Yeon (Angela) Suh, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Young-Kee Kim, Fermi National Accelerator Laboratory  
Dr. John Yoh, Fermi National Accelerator Laboratory

The International Linear Collider is the new initiative for the world of physics. In its design stage right now, physicists are trying to optimize the design by physics and simulation studies. We tried to evaluate the benchmark process of  $e+e \rightarrow ZH \rightarrow Z + \gamma\gamma$  progressively on three levels of simulation: Generator, Fast MC, and Full Simulation, following previous DESY (Deutsches Elektronen Synchrotron) study of Boos et. al., which uses the FastMC approach. We have completed the Generator Level studies, which familiarized us with the Java programs JAS3 and Netbeans along with processes of simulation studies. We analyzed reconstructed clusters from the fully simulated signal and background events, to determine what the signal and background for this  $Z + AA$  process will look like. We will perform several additional "what if" scenarios to determine how the signal and background will vary with different choices of detectors, which would affect many performance aspects. We were successful in separating some of the background and signals, and some isolation. Our results are not very accurate since we have not done a full simulation yet.



**21121**

**Individual Differences In Responding To Pitch-Shifted Auditory Training**

**Presenter(s)**

Nitin Bogulla, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Charles Larson, Northwestern University

Mr. Han Jun Liu, Northwestern University

Auditory feedback is suggested to be an essential factor in monitoring voice fundamental frequency (F0) control. This notion was manifested through a recent study, in which subjects were exposed to increasing or decreasing "training" steps. The aftereffect of the training trials demonstrated that participants adapted to the pitch-shifted modifications by changing their voice pitch production to stabilize voice F0. This investigation explores the cause of this consequential adaptation in individuals. After reporting their musical experience, ten normal subjects were asked to produce vowel sounds in three experimental conditions: Auditory feedback shift up, shift down, and control. In each condition, subjects produced the vowel sound /u/ during the training trials, in which their acoustical feedback was slowly shifted without their awareness. After training trials, the auditory signal was returned to normal. Although we are awaiting analysis, preliminary tests document two subjects with little musical experience adapting to the training trails by compensating for the increased pitch and thus producing a lower pitch. However, the third subject, with several years of vocal training, opposed the stimulus by producing a constant pitch. The results suggest musical experience as a variable to adaptation. However, it is problematic to make such generalized statements from analysis of data from just three subjects. Final analysis from all subjects will unveil other variables.

**21122**

**A Study Concerning The Processes That Power Active Galactic Nuclei**

**Presenter(s)**

Scott Ogilvie, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Steele, Adler Planetarium

Active galactic nuclei, or AGN, are some the strangest and most powerful phenomena in our Universe. AGN occur in active galaxies with a supermassive black hole at their center. AGN contain an incredibly fast-moving jet, powered by the gravitational energy of the black hole, which contains electrons and possibly protons. Photons produced in this jet travel to Earth and can be observed at different wavelengths. This study mostly concerns data at radio, optical, x-ray, and gamma ray energies. By analyzing these light curves, we hope to find a correlation between peaks in the optical and gamma ray data. If correlations are found, they will provide hints as to how this emission is produced. Based on preliminary results, we see weak evidence that optical emission may precede the gamma ray emission by about seven days, and also that it lags behind the gamma ray emission by about twenty-five days. Though neither of these time lags were found to have much statistical significance, they do provide a basis on which to ground further work in the subject. Based on these and future results, we hope to find out exactly what is going on inside these strange phenomena, and how AGN really work.



**21123**

**The Analysis And Implementation Of Live Cell Imaging In The Study Of Interactions Between LMP4 And Actin Filament**

**Presenter(s)**

Joseph Ou, Illinois Mathematics and Science Academy  
Sonny Song, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Teng-Leong Chew, Northwestern University Feinberg School of Medicine

Actin is a stress fiber component found within the cytoplasm of the eukaryotic cell. It was known that Tbx5, a key transcription protein associated with limb/heart/blood vessel development, localized to these filaments from the nucleus where its functions would be regulated. Previously published data have shown that Tbx5 directly associates with an actin-binding protein LMP4. LMP4 binds to the actin filament, thus sequestering Tbx5 to the stress fibers. To better characterize how LMP4 sequester Tbx5 to the stress fibers, we have studied the interaction between LMP and actin using fluorescence recovery after photobleaching (FRAP). To our surprise, our FRAP data illustrated that LMP4 disengages from the actin and then recovers rapidly through rapid turnover. It is therefore unclear how Tbx5 remains localized to the stress fibers if its binding partner exhibits such rapid turnover with actin. The localization hypothesis of the Tbx5 had to be revised. We are performing fluorescence videomicroscopy using a spinning disc confocal microscope to further characterize the interaction between LMP4 and actin at various subcellular regions.

**21124**

**A Day In The Life... An Investigation Of Medical And Surgical Specialties**

**Presenter(s)**

Marissa Ghant, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sonja Boone, Northwestern Memorial Hospital

Within the past decade, the Bureau of Labor Statistics has shown that there has been an increase in the number of people that work in the medical field. The purpose of this project was to determine the daily tasks and medical decision making of medical/surgical specialists. The specialties explored through a shadowing experience were: cardiothoracic surgery, neurosurgery, neonatology, internal medicine, cardiology, psychiatry, infectious disease, and gynecology. The shadowing experience entailed meeting and talking with the physician and most times observing the physician interactions with patients and staff, as well as observing procedures and attending specialty lectures called grand rounds. Doctors in all of the specialties except infectious disease were shadowed. Results of this experience included learning and observing procedures such as ultrasound, gamma knife surgery, pap smears, and EKG's. Diseases such as endometriosis, patent ductus arteriosus, gastroschisis, and congenital heart defects were learned as well. Possible personality traits typical of people in each specialty such as confidence, determination, and low tolerance for mistakes were deduced. A better understanding of core competencies, or what doctors' lives are really like were also examined. With the experiences and results obtained from this project, more people will understand the lives of physicians, as well as possibly acquire an interest in one of the researched specialties.



**21125**

**Automatic Information Gathering And Its Uses**

**Presenter(s)**

William Boldridge, Illinois Mathematics and Science Academy  
Yuqing Zhao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Kristan John Hammond, Northwestern University  
Dr. Sara Owsley, Northwestern University

With excessive information available over the Internet, traditional media (radio, newspapers, television) are giving way to products that target niches. To retain audiences, companies are increasingly interested in automated information aggregation designed to focus on specific interests. We have worked on two projects— News at Seven and lantha. Both utilize page scraping scripts that gather information to present on a user friendly interface. News at Seven uses scripts written in Python to compile web articles. They are read by a 3-D avatar, made from the SDK of Half Life 2, using text-to-speech technology, while webclips run in the background. We extended a pISA to take an movie name (String) and return the title, length, director, and major actors (dictionary of lists) by accessing the source code of Internet Movie Database and locating the information. lantha, our project idea, is a desktop based program that takes a word and finds the definition and usage in a sentence. Although much simpler than News at Seven, information is aggregated with a similar technique: by accessing the source code of webpages and extracting what is useful. Both of these projects help develop independent information gathering.

**21126**

**Quantifying The Efficacy Of Virtual Reality Applications**

**Presenter(s)**

Rachel Picher, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. John Boyle, Fuel Tech

Virtual reality, since its conception more than forty years ago, has been proposed for use in a wide variety of fields. Its applications have ranged from phobia therapy to chemical engineering to the production of cosmetics and more. However, as the hype over virtual reality dies down it is important to think critically about its uses. Which applications have been extremely effective, and which are not quite living up to their expectations? The answers to these questions can be found among the professionals who work with virtual reality in their daily lives. During the course of this inquiry a survey was developed to measure several crucial factors concerning virtual reality, including: frequency of use and satisfaction with a virtual reality system, the capabilities of the system, and the types of work it was used for. The survey was administered to professionals at several sites. The results are being analyzed to find the common traits of effective uses of virtual reality, and how the level of immersion of a virtual reality system affected frequency of use and satisfaction.



**21127**

**Stress-Induced Physiological And Psychological Changes In Students At The Illinois Mathematics And Science Academy**

**Presenter(s)**

Chelsea Fu, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Sowmya Anjur, Illinois Mathematics and Science Academy

Dr. David Evenson, Illinois Mathematics and Science Academy

Cumulative negative stress in adolescents is said to have an adverse effect on their bodies and minds in the long run. Using a survey, this inquiry aims to help the IMSA community to better understand the potential stressors, their mental and physical effects, and the coping mechanisms used by the students. By gaining the insight on how stress impacts the students' learning, their confidence levels, and their desire to excel, we can better help students to succeed and to fully explore and benefit from all that IMSA has to offer. A ten-point scale survey instrument was designed and administered throughout the campus with different student groups. The instrument gathers self-assessed levels of stress from the various stressors, their impact, the effectiveness of the various coping mechanism if used. It includes three open-ended questions to gain more insights on the measurements. Subjects are asked to provide basic demographic data without providing individual identification. Analyses are underway to determine basic descriptive statistics, for example the general student stress levels from various stressors. Analyses of variance will be used to determine whether the different student groups (for example, male versus female, juniors versus sophomores) respond differently to the various stressors and whether they employ different coping mechanisms.

**21129**

**Profiling The Latino Influence In America's 100 Largest Cities**

**Presenter(s)**

Manuel Perez, Illinois Mathematics and Science Academy

Josue Pernillo, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Juan Andrade, United States Hispanic Leadership Institute

Mr. Michael Rodriguez, United States Hispanic Leadership Institute

The United States Hispanic Leadership Institute is an organization whose mission is to empower the Latino community through voter registration and education, leadership programs, and studies about the Latino influence in the United States. We continued USHLI's mission by creating a demographic profile for each of the 100 Largest American Cities. We collected data from the 1990 and 2000 Census Surveys and the 2005 American Community Survey to compare the demographics of the Latino population to those of the White, African American and Asian populations. In order to document the changes that took place, we assessed variables for each city. Some of these variables included: population by race, citizenship status, annual household income, and educational attainment. Chicago is an easy example to highlight the influence of the Hispanic population on city demographics. Latinos make up the third largest racial or ethnic group in Chicago with 778,234 persons (28.8%) after a 3.3% increase from 2000 to 2005. Other cities in the top one hundred tier show similar patterns and are outlined in their respective profiles. We hope to find positive growth in categories such as citizenship status and educational attainment for Latinos in each of the one hundred cities.



**21136**

**Analysis Of Epicardial Invasion In The Late Gestational Heart**

**Presenter(s)**

Megan Abel, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Robert Dettman, Northwestern University Feinberg School of Medicine

The visible effects of heart disease, which affects our society, could be greatly reduced if tissues of the diseased adult heart could be repaired or regenerated. The ability of adult cells to regenerate cardiac tissue was thought to be lost after embryonic development. However, this view is currently being re-evaluated. The goal of this project was to see if epicardial cells from older embryonic hearts undergo changes similar to those that occur in earlier development. We also tested if older cells invade in response to TGF- $\beta$ . Cells were marked with the AdlacZ adenovirus. LacZ+ cells were counted and two variable t-tests and standard deviation tests were performed. We observed a significant decrease in the invasion from E5 (11.45%) to E10 (3.26%) hearts. Cells from E10 did not invade after TGF- $\beta$  treatment (2.18%) as the E5 cells did (30.67%). Indicating that TGF- $\beta$  has no significant affect on the invasion of epicardial cells at that time. We conclude that the ability of epicardium to invade the heart and form blood vessels is significantly reduced by E10. The inability of these cells to respond to TGF- $\beta$  demonstrates that these cells lose the ability to invade after a certain gestational time.

**21142**

**Sequential Touching As A Viable Analytical Tool**

**Presenter(s)**

Jae Kim, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Amy Booth, Northwestern University

One study was used to determine whether sequential touching of objects by infants from ages 14-18 months accurately determines whether they have successfully categorized those objects. Infants were introduced to the experimental task by running the study with familiar categories of objects (e.g., cows). Then the procedure was repeated with novel stimuli. In both cases, the infant first saw 9 objects individually: 3 with a consistent function, 3 with distinct functions, and 3 with no function. Sequential touching was assessed after all the objects had been shown to the infant. During this period, infants were allowed to interact freely with all the items for two minutes, and touches of each object were recorded. Infants' categorization was then tested using a more traditional forced choice measure. The sequential touching results will be analyzed using TouchStat, a probability program that was specifically designed for evaluating this measure. In comparison to the forced choice test results, these analyses should lead to whether or not sequential touching is an effective, and perhaps more sensitive, measure of categorization in infancy.



**21143**

**5ASA Mitigates Stem Cell Activation In Colitis-Induced Cancer**

**Presenter(s)**

Jeffery Ding, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Gery Grimm, Northwestern University

In colitis-induced cancer, oxidative stress correlates with crypt cell proliferation and elevated p53. 5ASA is a potent oxygen radical scavenger shown to reduce dysplasia in ulcerative colitis. I examined effects of 5ASA on inflammation, colitis-induced dysplasia, and intestinal stem cell activation in IL-10<sup>-/-</sup> mice. 100% of IL-10<sup>-/-</sup> mice was fed piroxicam for two weeks (224ppm/320ppm). They should develop colitis and eventually have dysplasia. LD treatment should be relatively ineffective and should not reduce histologic inflammation by much, whereas HD treatment should reduce inflammation significantly. IL-10<sup>-/-</sup> mice develop dysplasia and cancer related to intestinal stem cell activation through PI3K signaling. 5ASA therapy reduced nuclear beta-catenin, p53 levels and the progression of dysplasia and cancer. This suggests that 5ASA treatment alters intestinal stem cell activation in colitis-induced cancer. This may help in explaining the chemo-preventative effect of 5ASA in patients with ulcerative colitis.

**21149**

**Holography Unbound: A Novel Interactive Holographic Projection System**

**Presenter(s)**

David Jordan, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Workman, Illinois Mathematics and Science Academy

Holographic projection is in its infancy, and there are currently very few such devices in the world, none of which can detect tactile interaction. Through a combination of currently available display technologies, it is possible to create a holographic projection device with such capabilities. Using a cathode ray tube (CRT) display outfitted with a mirror array as the projection mechanism, I have been developing a holographic projection system. According to the design I have developed, the CRT projects a series of 2-Dimensional images, which the mirror array forms into the normal vector of the surface. This apparatus scans up and down to complete the 3D image within a set of parabolic mirrors with a hole in the top one, so the image appears to float in thin air above the hole. In addition, by determining the cathode ray at the time light is reflected back, the computer can determine the location of a real object in 3D space, allowing full interactivity with a projected hologram!



**21152**

**This Is America: The US Since The End Of The Second World War**

**Presenter(s)**

Kenneth Ofodile, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Jim Victory, Illinois Mathematics and Science Academy

There are three things that define the decade 2000: the War on Terrorism, technology, and us—specifically the new generation of Americans. These signs all point to a period of radical change in America. It is important that people today understand that their current beliefs, and, therefore, future decisions, are influenced by a historical flow of attitudes and ideas. Through the examination of historical documents and the analysis of films, I have charted a flow of human emotion over a period of sixty years. From that chart I have uncovered the dynamic influence that two generations of Americans have had on American culture since the end of the WWII: The Baby Boomers and Generation X. Now, a new American generation is rising to succeed Generation X and the Baby Boomers. This inquiry, I hope, will inspire the members of this generation to become a part of the changes I predict during the next decade.

**21158**

**Mood-Based Perspective In Text Comprehension**

**Presenter(s)**

James Almblade, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. David Rapp, Northwestern University

Cognitive psychology is a vast field with a number of different issues of interest to researchers. Within this field, text comprehension involves the examination of the cognitive processes that underlie comprehension of texts. In our research project, we tested the influence of mood on text comprehension. Participants were placed in a happy or sad mood using a music-based mood manipulation. Reading times and recall of story events that were inherently happy, sad, or neutral, were examined. From these data, conclusions will be drawn about the processes that occur during reading, and consequently the effect of an individual's mood on text comprehension will become clearer and strongly understood.



**21159**

**The Use Of Facial Perception In Determining Emotions**

**Presenter(s)**

Marissa Fandel, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Steven Franconeri, Northwestern University

The present study explored whether people prioritize information from different facial regions depending on their goals. Subjects performed face memory and emotion detection tasks on a set of face images, while their eye movements were recorded. The faces exhibited different emotions and different magnitudes of emotion. Data from the eye tracker showed which facial region (e.g. left eye, right cheek) subjects prioritized in the images and the total amount of time that subjects viewed each region. Subjects tend to look more to the left side of the face than the right side, and female subjects look at the left side of the face for longer than male subjects. These are intriguing results since left side is actually more emotionally expressive, possibly since it is controlled by the 'emotional' right hemisphere of the brain. We also observed different strategies for viewing different emotions. When using a control of neutral faces, and asking subjects to determine whether the face portrayed a specific emotion, the pattern for observation was typically very similar between neutral and emotional faces. Since the factor of exaggerated or changed features did not affect neutral faces, this showed that subjects did indeed have a set strategy for recognizing certain emotions.

**21164**

**eBay Inc. v. MercExchange**

**Presenter(s)**

Daniela Spencer, Illinois Mathematics and Science Academy

**Advisor(s)**

Ms. Milena Spencer, Winston and Strawn LLP

The case of eBay Inc. v. MercExchange LLC, 126 S. Court 1837 (2006) was brought into court over the matter of patent infringement, and this case moved up the court system to eventually be heard by the Supreme Court. However, the Supreme Court sent the case back with the verdict that the injunction relief granted for the use of the patent did not use the "four-factor test" and therefore, the decision was virtually null and void. Through research with various teachers and my advisor, as well as examining the constitution and other documents that explain the role of property, government, and patents, I sought to discover if the Supreme Court abused its power when they made their decision. After careful examination of Locke, Montesquieu, Adams, and other philosophers that influenced the role of government that is set down in the constitution, as well as examining the different points in United States Constitution, I determined that the Supreme Court had, in fact, overstepped their bounds in the case, and made an erroneous mistake. The Supreme Court had no right to deprive MercExchange of their property, as the constitution clearly sets down that no person may be denied equal protection under the law. These results can be very important in future cases, and may even lead to a reversal of this decision.



**21165**

**Outsourcing In Service Industries**

**Presenter(s)**

Jenny Zhao, Illinois Mathematics and Science Academy

**Advisor(s)**

Dr. Gad Allon, Northwestern University

It is evident in many industries that firms outsource processes linked to the services they offer to the market. There are several reasons why firms would choose the option of outsourcing, one being lower operating costs. Since the service process is out of the service retailers' core competency, outsourcing would be an advantageous decision financially, which relates to possible economics of scale and economics of scope. In our study, we utilized a standard model of an industry, consisting of two service retailers who differentiate themselves on two dimensions, price and waiting time standards. These two retailers may decide to outsource their service provision to one or both of the two service suppliers. The suppliers post their suggested contracts, and from there, the service retailers decide not only which supplier or suppliers they would like to outsource their service process to, but what fraction of the process this supplier is responsible for. With these decisions made, the retailers attempt to maximize their profits by setting price and waiting time standards, while the suppliers compete for the partnership of these retailers; thus resulting in multi-tier competition. Our work revealed that when the number of actions was discretized, a subgame perfect Nash equilibrium was always found to exist. From there, we characterized the equilibrium behavior of the suppliers and retailers and were able to explore the impact various problems had on this equilibrium behavior.



**21183**

**Developing Video Games**

**Presenter(s)**

Kirk Baly, Illinois Mathematics and Science Academy  
Alexander Drummond, Illinois Mathematics and Science Academy  
Justin Johnson, Illinois Mathematics and Science Academy  
Jae Kim, Illinois Mathematics and Science Academy  
Garrett Kinkelaar, Illinois Mathematics and Science Academy  
Bohao Liu, Illinois Mathematics and Science Academy  
Xuxuan Liu, Illinois Mathematics and Science Academy  
Mark Meyer, Illinois Mathematics and Science Academy  
Daniel (Mac) Nelsen, Illinois Mathematics and Science Academy  
Ilya Nepomnyashchiy, Illinois Mathematics and Science Academy  
Jason Rock, Illinois Mathematics and Science Academy  
Christian Sadi, Illinois Mathematics and Science Academy  
Anil Vaitla, Illinois Mathematics and Science Academy

**Advisor(s)**

Mr. Michael Woodley, University of Illinois at Urbana-Champaign

Modern video games are complex pieces of software that require a blending of creativity and technical knowledge. Most games are conceived and created using already existing ideas and tools. We will present a game prototype that shows off our creativity and technical know-how that we are creating by using a set of software tools developed by an IMSA alumnus. With the help of Mike Woodley and Mike Turner from visual3d.net, we can become familiar with the tools of the trade required to excel in this growing industry. A presentation of ideas, scenarios, what a publisher would do for our game, and a summary of the work we did in the short time available to us will be done along with a showing of our demo. This demo should be fully playable, but will have only one scenario/level. Our game is specifically designed to appeal to IMSA students, faculty, and alumni! Come battle terrifying mutant food while you try to "keep your cookies"!



Note – Abstracts noted with an \* have a double time block for presentation.

<b>Abstract Number</b>	<b>Name</b>	<b>Time</b>	<b>Room</b>
21136	Megan Abel	9:35	A-135
21116	Mivil Abraham	12:55	A-117
21041	Vihās Abraham	1:20	B-110
19993	Amy Allen	9:35	A-117
21158	James Almblade	1:45	A-131
21119	Kunj Amin	10:50	AP A-138
21073	Ryan Angelotti	10:00	AP A-138
21079	Theodore Atwood	11:15	D-107
20944	Yuyang Bai	9:35	B-116
21007	Neelam Balasubramanian	2:10	B-133
20905	Julia Balto	9:35	AP A-138
21183	Kirk Baly	1:45	D-101
20948	Rachel Banke	10:00	A-113
21117	Phoebe Barkan	9:35	A-155
20905	Taylor Barnes	9:35	AP A-138
20914	Brianna Benson	10:25	B-133
21026	Sujeeth Bharadwaj	1:45	A-119
21040	Monica Bhattacharya	10:00	A-131
21120*	Stephanie Bian	12:30 – 1:10*	B-133
21091	Michelle Blomgren	10:25	A-135
21096	Sivali Boddu	10:00	B-110
21121	Nitin Bogulla	10:00	D-110
21125	William Boldridge	1:45	D-103
20907	Perry Bradford	10:00	D-107
21021	Everett Brokaw	9:10	AP A-138
20997	Michael Bryniarski	2:10	A-135
21063	Jessica Bubert	9:35	D-107
20959	Steven Cai	9:35	B-110
21105	Li-Yan Chang	1:20	A-135
20980	Stephanie Chang	10:50	B-116
20870	Abigail Chao	10:25	A-147
20865	Chaoran Chen	9:10	D-103
20869	Min Chen	2:10	LH B-206
21015	Tianli Chen	10:50	A-113
21019	Winnie Cheng	10:00	A-149
21110	Shiva Chirumamilla	1:20	A-131
20781	Lorraine Cho	9:10	A-113
21104	Seong-Ah Cho	11:15	A-119



21046	Michael Choe	12:30	A-149
21120*	Je-ok Choi	12:30 - 1:10*	B-133
21025	Lindsey Choi	12:55	B-110
21066	Hon Chu	1:45	D-110
20992	Joshua Cote	12:30	LH B-206
20950	Crystal Croyl	12:55	D-110
21072	Matthew Dabaco	9:10	LH B-206
20897	Sean Daugherty	1:20	D-101
21086	Jillian Davenport	9:10	B-133
21070	Daniel Dean	9:35	A-133
20972	Bryan Denig	2:10	D-110
20978	Paul Dienhart	10:50	D-103
21143	Jeffery Ding	12:55	A-131
21079	Connor Dismar	11:15	D-107
21101	Susan Dittmer	10:50	A-135
21000	Jessica Dong	9:10	D-107
21099	Michael Driscoll	9:35	B-133
21100	Michael Driscoll	10:00	B-133
21183	Alexander Drummond	1:45	D-101
21092	Tianyu Du	2:10	A-117
20938	Yangbo Du	10:50	A-149
20907	Sena Dzakuma	10:00	D-107
19979	Tiernan Evans	9:10	A-117
21159	Marissa Fandel	12:30	A-131
20804	Zexi Fang	11:15	D-103
21042	Karissa Fernandez	11:15	B-133
21114	John Froberg	10:50	B-133
21127	Chelsea Fu	12:30	A-119
21029	Catherine Gao	11:15	B-110
21106	Leslie Garcia	12:55	E-115
21094	Kelsey Gee	12:55	AP A-138
20914	Theresa Geiger	10:25	B-133
20953	Andrew Gentile	9:35	LH B-206
21079	Jonathan George	11:15	D-107
21124	Marissa Ghant	11:15	A-113
20869	Soumya Gogula	2:10	LH B-206
21076	Qi-Yuan Gou	1:20	E-115
21061	Namita Gupta	1:45	B-116
21007	Frances Hardin	2:10	B-133
20970	Claire Herdeman	2:10	B-116
21115	Tyce Herrman	12:30	A-113



21023	Kenneth Higa	12:30	B-116
20899	Geoffrey Hotchkiss	1:45	A-155
21028	MacKenzie Hovermale	12:30	A-155
21079	Joseph Hsu	11:15	D-107
21036	Kathy Huang	10:25	A-119
21002	Eric Hultgren	9:35	A-113
20971	Forrest Iandola	10:00	B-116
21031	Jennifer Iglesias	10:00	A-155
20910	Elizabeth Ikejimba	9:35	A-149
21061	Lara India	1:45	B-116
21057	Sivaraman Iyer	9:35	A-121
20921	Ankit Jain	2:10	D-101
20960	Sonali Jayakar	11:15	D-110
20998	Jorge Jeria	10:50	D-110
20970	Yuxi Ji	2:10	B-116
20749	Lynn Jiang	10:25	A-151
21062	Justin Johnson	10:50	A-117
21183	Justin Johnson	1:45	D-101
21149	David Jordan	2:10	D-107
21105	Nisha Joshi	1:20	A-135
20978	Fatima Kanchwala	10:50	D-103
21005	Meng Kang	10:00	A-133
20947	Angela Kao	9:10	D-110
20953	Monica Kao	9:35	LH B-206
20921	Yousif Kelaita	2:10	D-101
20939	Bharat Kilaru	11:15	A-151
20995	Claudia Kim	1:20	D-107
21142	Jae Kim	12:55	A-149
21183	Jae Kim	1:45	D-101
21183	Garrett Kinkelaar	1:45	D-101
21113	Mary Kobs	9:10	A-149
21049	Dennis Kriventsov	1:45	B-110
21020	Saurabh Kukreti	9:35	A-151
20974	Philip Kuo	1:20	A-113
20927*	Noelle Kwan	10:50 - 11:30*	LH B-206
21027	Francis Lawrence	12:55	A-155
20910	Joshua Lee	9:35	A-149
21109	Ju Lee	10:25	A-113
21109	Shelton Leung	10:25	A-113
21108	Jennifer Levey	12:55	D-101
21103	Chuan Li	2:10	AP A-138



21050	John Li	11:15	A-131
21084*	Chantel Liggett	10:00 - 10:40*	LH B-206
21083	Victor Liou	10:50	D-107
20947	Annie Liu	9:10	D-110
21183	Bohao Liu	1:45	D-101
21043	Tony Liu	1:45	AP A-138
21183	Xuxuan Liu	1:45	D-101
21001	Ranjani Logaraj	10:50	A-151
21078	Yi Lu	9:35	A-131
20945	Tianyin Luo	10:25	AP A-138
20981	Wei Luo	1:20	B-133
21039	Alex Ma	11:15	B-116
21079	Aaron Macy	11:15	D-107
21056	Aaron Macy	10:00	E-115
21026	Brian Martin	1:45	A-119
21097	Sylwia Matlosz	12:55	A-135
21030	Michael McInerney	12:55	B-116
21084*	Sarah McPike	10:00 - 10:40*	LH B-206
21065	Anita Mehta	1:45	A-149
21183	Mark Meyer	1:45	D-101
21009	Sean Mirski	1:45	A-113
21028	Vineet Mohanty	12:30	A-155
20982	Sulochana Mutha	1:45	E-115
21037	John Myrda	10:25	A-131
21107	Ramakrishna Nalluri	10:00	A-119
21082	Jagannath (Sam) Nayak	1:20	A-149
21183	Daniel (Mac) Nelsen	1:45	D-101
21183	Ilya Nepomnyashchiy	1:45	D-101
21075	Adam Novak	2:10	B-110
21152	Kenneth Ofodile	10:50	A-131
21122	Scott Ogilvie	10:00	A-117
20983	Temi-tope Okubadejo	12:55	A-119
21069	Birce Onal	11:15	A-135
21123	Joseph Ou	10:25	B-116
21074	Jonas Owen	11:15	A-117
21119	Michael Paik	10:50	AP A-138
21087	Ann Pan	11:15	A-149
20934	Charles Pan	12:55	A-113
20897	Kimberly Parker	1:20	D-101
21118	Sandeep Paruchuri	12:55	LH B-206
21022	Hemal Patel	9:10	A-151



21004	Karan Patel	1:45	A-135
20930	Janelle Peifer	10:50	A-147
21129	Manuel Perez	1:20	AP A-138
21129	Josue Pernillo	1:20	AP A-138
21126	Rachel Picher	2:10	D-103
20935	Sophia Pilipchuk	11:15	A-147
20936	Sophia Pilipchuk	10:00	A-147
20945	Gokila Pillai	10:25	AP A-138
20868	Alexandra Plattos	11:15	A-133
20918	Scott Powers	10:50	A-119
21056	Priyanka Prakash	10:00	E-115
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21063	Anastasia Rahlin	9:35	D-107
21112	Amar Rana	10:00	A-135
21086	Gouthami Rao	9:10	B-133
21037	Meredith Rhein	10:25	A-131
21183	Jason Rock	1:45	D-101
21038	Jonathon Ronchetti	1:20	B-116
21070	Vincent Rossi	9:35	A-133
21183	Christian Sadi	1:45	D-101
21067	Ashima Sarup	10:25	D-110
21074	Neha Sarvepalli	11:15	A-117
21056	Kyle Schirmann	10:00	E-115
21089	Kyle Schirmann	9:10	A-155
21077	Michael Schmitt	9:10	A-135
20937	Parker Schmitt	1:20	A-155
20973	Kathryn Schoedel	9:10	B-116
21054	Alexis Sellars	9:10	A-119
21079	John Seo	11:15	D-107
20946	Sarah Shareef	1:20	A-117
21008	Hyun Soo Sheen	1:45	B-133
21094	Tony Sheng	12:55	AP A-138
20901	Gaurav Singh	9:10	B-110
21064*	Karen Song	10:25 - 11:05*	A-133
21123	Sonny Song	10:25	B-116
21164	Daniela Spencer	2:10	A-119
20991	Nathaniel Steinsultz	1:45	LH B-206
20869	Chad Stevens	2:10	LH B-206
21120*	Yeon (Angela) Suh	12:30 - 1:10*	B-133
21090	Kevin Tao	10:25	A-117
21071	Alexandra Teller	12:55	D-103

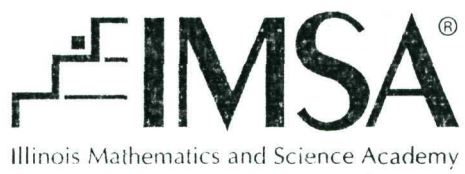


21024	Cristina Thomas	10:50	B-110
20917	Lisa Thompson	1:20	D-110
20923	Robert Till	9:35	D-110
21111	Sarah Trevor	12:30	B-110
21085	Thiran Udawatta	9:10	A-131
21072	Nicholas Umholtz	9:10	LH B-206
21183	Anil Vaitla	1:45	D-101
21099	Gregory Ver Halen	9:35	B-133
21013	Evelyn Wang	10:25	B-110
21103	Henry Wang	2:10	AP A-138
20930	Mary Wang	10:50	A-147
21073	Ryan Wang	10:00	AP A-138
21011	April-Hope Wareham	10:50	A-155
21048	Xavier Watson	10:25	A-149
21056	Christina West	10:00	E-115
21058	Christina West	10:25	D-107
20979	Charles Whittaker	9:10	A-147
20745	Patricia Whittaker	10:25	D-103
21035	Lucia Wu	1:20	D-103
21044	Yuren Xie	2:10	E-115
21016	Kai Yang	10:25	A-155
21032	Siyao Ye	9:10	A-133
21102*	Valerie Young	9:35 - 10:15*	D-103
20829	Sherry Yu	11:15	A-155
20916	Sharon Zeng	1:20	LH B-206
21080	Brandon Zhang	1:45	A-117
21064*	Jenny Zhang	10:25 - 11:05*	A-133
21006	Jing Zhang	10:00	A-151
20927*	Meng Zhang	10:50 - 11:30*	LH B-206
21165	Jenny Zhao	2:10	A-131
21125	Yuqing Zhao	1:45	D-103
21043	Zhe Zhao	1:45	AP A-138









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