



SIEMENS COMPETITION

Math : Science : Technology

National Gold Medal Winners 1999 – 2008

\$100,000 Scholarship

2008

Wen Chyan

Texas Academy of Mathematics and Science, Denton, Texas

(Individual)

“Versatile Antimicrobial Coatings from Pulse Plasma Deposited Hydrogels and Hydrogel Composites”

Mr. Chyan’s Chemistry research of antimicrobial coatings looked to design a specialized coating aimed to prevent nosocomial infections. These infections, which are caused as a side effect of treatment in a hospital, afflict more than two million patients each year and result in more than 100,000 deaths annually. As part of his 360-degree approach to the subject matter, Mr. Chyan examined complex reactions, engaged in assay development, measured silver release kinetics and, finally, tested his proposed coating, showing true expertise on a wide range of topics that have direct applications in the medical field. His mentor for this project was Dr. Richard B. Timmons, of the Department of Chemistry and Biochemistry at the University of Texas at Arlington.

Mr. Chyan is a senior who would like to major in Chemistry or Chemical Engineering once in college. Upon completing his studies, he would like to pursue a position in academia, preferably at a research university where he can continue conducting research and teach at the same time. His various honors in Science include recognition from the U.S. National Chemistry Olympiad, U.S. Biology Olympiad and Texas Science and Engineering Fair. He is the recipient of the Texas Academy of Mathematics and Science Summer Research Scholarship (2008), and also founded a student chapter of the American Chemical Society at the University of North Texas. Mr. Chyan developed an interest in Science with the encouragement of his parents, who are both scientists. At an early age they would take him to tour their laboratories and perform demos. He also composes music and plays piano and violin in his spare time.

Sajith M. Wickramasekara

North Carolina School of Science and Mathematics, Durham, North Carolina

Raleigh, North Carolina

Andrew Y. Guo

North Carolina School of Science and Mathematics, Durham, North Carolina

(Team)

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“A Functional Genomic Framework for Chemotherapeutic Drug Improvement and Identification”

Mr. Wickramasekara and Mr. Guo’s research has the potential to easily identify new chemotherapeutic drugs and greatly improve existing ones. The team’s project combined traditional genetics with cutting-edge computational modeling to streamline the gene discovery process. Their project addresses the need in the field to identify new genes to target for cancer therapy. Their approach has the potential to identify novel treatments that could lead the way to personalized medicine in the future. The team worked on this project with the help of their mentor, Dr. Craig B. Bennett, Assistant Professor, Duke University Medical Center in Durham, NC and their high school advisor, Dr. Myra Halpin, Dean of Science, North Carolina School of Science and Mathematics, Durham, NC.

Mr. Wickramasekara is the team leader and heard about the Siemens Competition in 2006 when seniors from his high school were selected as Regional Finalists. Mr. Wickramasekara is captain of his school's Science Bowl and has participated in various science competitions including the 2008 Intel International Science and Engineering Fair, the North Carolina State Science and Engineering Fair as well as the North Carolina Junior Science Humanities Symposium. He is an Eagle Scout in the Boy Scouts of America and dreams of one day owning his own biotech startup, specializing in personalized medicine.

Mr. Wickramasekara and Mr. Guo co-founded the Student Journal of Research of the North Carolina School of Science and Mathematics; they both serve as Editors of the publication. Mr. Guo is a Science Olympiad winner and Co-Captain of the Quiz Bowl. Mr. Guo’s received First Place State Team in the Goldman Sachs National Economics Challenge. Mr. Guo is the Varsity Tennis Captain and plays Ultimate Frisbee as part of his extracurricular activities. His mother works in the field of genetics and has influenced Mr. Guo by discussing her work and activities at home, which has in turn sparked his interest to study the sciences.

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2007-08

**Isha Himani Jain, Harvard University
Freedom High School, Bethlehem, Pennsylvania
(Individual)**

“Bone growth in zebrafish fins occurs via multiple pulses of cell proliferation”

Isha Jain’s biology research project on zebra fish bone growth adds a new dimension to our understanding of human bone growth and our ability to treat bone injuries and disorders. Ms. Jain was mentored by M. Kathryn Lovine, Assistant Professor and Jake Fugazzatto, Lab Technician, Biology Department, Lehigh University, as well as Ms. Linda Frederick, Science Teacher, Freedom High School.

As a senior in high school, Ms. Jain was a member of the Endocrine Society, American Physiological Society, and American Ceramic Society among others. Her mother's dedication to the profession of medicine sparked her interest for the clinical aspect of research while her father's global research work raised her awareness about the importance of science. Ms. Jain’s awards include first prize in the Undergraduate Research Poster Contest National Educators Workshop and first place Grand Award in Animal Sciences Intel International Science and Engineering Fair (2007). Ms. Jain enjoys Indian classical/modern dance, soccer, skiing, and jewelry making. She plans to study biology and math and aspires to lead a lab focused on those disciplines.

**Janelle Schlossberger, Harvard University
Plainview-Old Bethpage John F. Kennedy High School
Plainview, New York**

**Amanda Marinoff, Dartmouth University
Plainview-Old Bethpage John F. Kennedy High School,
Plainview, New York
(Team)**

“FtsZ Inhibitors as Novel Chemotherapeutic Agents for DrugResistant Tuberculosis”

Janelle Schlossberger and Amanda Marinoff’s chemistry research offers potential medicinal alternatives to current tuberculosis treatments. Their mentors were Mary Lou O’Donnell, High School Research Teacher/Coordinator, Plainview-Old Bethpage JFK High School; Dr. Iwao Ojima, Distinguished Professor and Director for the Institute of Chemical Biology and Drug Discovery, Chemistry Department, Kunal Kumar, Graduate Student, Dr. Bela Ruzsicska, Director of the Analytical Instrumentation Laboratory and Ilaria Zanardi, Senior Research Support Specialist, SUNY Stony Brook.

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As a senior, Ms. Schlossberger, was the President of the Science Honor Society, member of Science Olympiad, editor-in-chief of the district-wide literary and art magazine, and a member of the French Honor Society and National Honor Society. Ms. Schlossberger was a finalist in the DuPont Challenge Science Essay Competition. She has played the piano for 12 years and the violin for 10 years. She is proficient in French and plans to study physics in college.

As a senior, Ms. Marinoff, was the editor-in-chief of her school newspaper and a member of the National Honor Society, French Honor Society, Spanish Honor Society, Science Olympiads and Increase the Peace. She became interested in science when she conducted a science project in 6th grade. Ms. Marinoff also volunteered at an afterschool program for autistic children. Her personal hero is Bono, the lead singer of U2, because he uses his influence as a rock star to make the world a better place. Ms. Marinoff plans to study biology and French in college and aspires to become a doctor with the 'Doctors without Borders'.

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2006-07

**Dmitry Vaintrob, Harvard University
South Eugene High School, Eugene, Oregon
(Individual)**

“The string topology BV algebra, Hochschild cohomology and the Goldman bracket on surfaces”

Dmitry Vaintrob’s project seeks to establish a connection between two different areas of mathematics. This connection may lead to new applications in theoretical physics pertaining to research on string theory and mirror symmetry. With a focus on topological objects in mathematics, Mr. Vaintrob’s work taps into insights which are universal and applicable in any field. His mentor was Pavel Etingof, MIT Professor of Mathematics.

Mr. Vaintrob, a senior, is hoping to translate a lifelong fascination with mathematics into a career teaching on a college level. His project is the latest example of mathematic problem solving that has been encouraged by his parents since childhood. Mr. Vaintrob volunteers in two libraries, in his high school and the mathematics library at the University of Oregon. He is also the organizer of the math club in his school. Mr. Vaintrob is a pianist who enjoys reading classical literature and carrying the Russian tradition of memorizing poetry. He is fluent in Russian, French and English.

**Scott Molony, Boston College
Oak Ridge High School, Oak Ridge, Tennessee**

**Steven Arcangeli, Massachusetts Institute of Technology
Oak Ridge High School, Oak Ridge, Tennessee**

**Scott Horton, University of Virginia
Oak Ridge High School, Oak Ridge, Tennessee
(Team)**

“Linking Supercomputing and Systems Biology for Efficient Bioethanol Production”

Scott Molony, Steven Arcangeli and Scott Horton’s bioinformatics project may one day provide a tool which could enable scientists to genetically engineer bacteria that would cost-effectively turn plant matter into ethanol used to fuel automobiles. The team developed a sophisticated computational systems-biology methodology based on graph theory and statistical theory that could help bioengineers design an efficient ethanol-producing biological system. Their mentors were Dr. Nagiza Samatova, Mr. Chris

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Symons, Dr. Byung-Hoony Park, and Dr. Tatiana Karpinets, all with Oak Ridge National Laboratory.

Scott J. Molony, a senior, is a member of his high school cross-country team, editor-in-chief of the school literary magazine, and a varsity member of the Scholar's Bowl Academic Team. His favorite subjects include Calculus II and Modern European History. Possible college majors include philosophy/theology, Japanese and mathematics. He dreams of a life spent conducting research and teaching.

Steven Arcangeli, a senior, was a finalist in the National Chemistry Olympiad last year. His high school team finished 20th nationally in the National Science Olympiad. Mr. Arcangeli is a member of the National Honor Society, Math Club and Science Club. He expects to major in materials engineering in college. His personal hero is Nick Grabenstein, a fellow student who was a national finalist in the 2005-06 Siemens Competition.

Scott Horton, a senior, became interested in science because of his parents, who both work at Oak Ridge National Laboratory. He was a member of the second place regional team in the Physics Bowl and plans to major in engineering in college. He aspires to work in a laboratory.

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2005-06

**Michael Viscardi, Harvard University and New England Conservatory of Music (Fall 2006)
San Diego, CA (Individual)**

“On the Solution of the Dirichlet Problem with Rational Boundary Data”

Michael Viscardi's math project focused on finding the solution to the Dirichlet problem, originally formulated by the 19th century mathematician Lejeune Dirichlet. He especially liked the problem because it uses complex analysis, one of his favorite subjects. Mr. Viscardi studied the Dirichlet problem with rational data on the boundary of any 2-dimensional domain. In his research, Mr. Viscardi was able to obtain and prove several new results. Potential applications of his work include modeling magnetic fields which generate solar prominences, heat conduction through plates, and 2-dimensional electrostatic fields. Mr. Viscardi's mentor for the project is Prof. Peter Ebenfelt, Department of Mathematics, University of California, San Diego.

Mr. Viscardi participated in the USA Mathematical Olympiad for the past three years and was the National MATHCOUNTS Champion Team Member in 2003. He has played the piano for ten years and the violin for six, and was concertmaster of the San Diego Youth Symphony and San Diego Youth Symphony Philharmonia, as well as first violinist of the San Diego Youth Symphony String Quartet. Mr. Viscardi plans to study mathematics and music in college. His dream job is to be a math professor and concert pianist/violinist/composer.

**Albert Shieh, Harvard University (Fall 2006)
Chaparral High School, Scottsdale, AZ**

**Anne Lee, Stanford University (Fall 2006)
Phoenix Country Day School, Paradise Valley, AZ
(Team)**

“SNiPer: Improved SNP Genotype Calling for Affymetrix 10K GeneChip Microarray Data”

Anne Lee and Albert Shieh have developed a computational tool called SNiPer that may potentially increase the accuracy and genotyping capabilities of the most widely used microarray-based genotyping platform, the Affymetrix array-based GeneChip[®] Mapping 10K Array. This technology holds the promise of allowing researchers to find the genetic basis for a number of genetically inherited diseases such as Alzheimer's, autism and bipolar disorder. The students met and came up with the idea for their project while interning at the Translational Genomics Research Institute. Their mentors

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were Dietrich Stephan (Senior Investigator), David Craig (Associate Investigator), and Matt Huentelman (Postdoctoral Fellow), all of the Translational Genomics Research Institute.

Ms. Lee enjoys acting and reading in her free time. In addition to her schoolwork, she participates in the National Charity League and a peer tutoring program. Ms. Lee plans on majoring in Biology and becoming a scientific researcher in the future.

Mr. Shieh enjoys photography and playing chess. He plans to major in Computer Science and aspires to be an intellectual property lawyer, which would allow him to combine his interest in computers and policy debate.

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2004-05

**Aaron Goldin, Harvard University
San Dieguito High School Academy, Encinitas,
CA (Individual)**

“Autonomous Gyroscopic OceanWave Powered Generator: Invention of a New Energy Conversion Technology”

Aaron Goldin invented an autonomous device – the “GyroGen” – that directly converts ocean wave energy into electricity using the principle of gyroscopic precession. The GyroGen offers a practical alternative to renewable energy generation technology. Mr. Goldin’s invention can be a power source for remote oceanographic research instrumentation and communication, deep-sea exploration and surveillance. It also has practical applications in autonomous gyroscopic wave-powered generators supplying energy to deep-sea hydrogen fuel conversion farms.

Mr. Goldin has won a number of awards, including the first Award (Grand Award) for Engineering at 2004 Intel ISEF, three Organizational Awards, a Governmental Award for the US Coast Guard and first place for Electronics and Electricity at the 2004 California State Science Fair. Mr. Goldin is also an accomplished musician. He has played with the North County Symphony Orchestra, North County Youth Symphony Orchestra and “Band in Black,” a local Jazz Band.

**(Lucie) Yueqi Guo and Xianlin Li, Harvard University
The North Carolina School of Science and Mathematics
Durham, North Carolina
(Team)**

“CpG island methylation of GADD45a is marker of breast carcinogenesis”

Ms. Guo and Ms. Li’s genetics research project examined the effect of DNA methylation, a natural gene silencing process, on breast cancer. In their project the two students demonstrated that breast cancer cell lines exhibit a specific pattern of silencing in the DNA of a particular tumor-suppressor gene, GADD45a. The methylation sites in this gene present potential new biomarkers for methods of early detection as well as treatment of breast cancer, a critical step in the successful treatment of the disease.

Ms. Guo was driven to join the war against cancer when she discovered that women she knew were diagnosed with the disease. She joined a breast cancer research lab during a summer mentorship and became interested in exploring the genetic causes of cancer. Ms. Guo is fluent in Mandarin. She enjoys playing the piano (North Carolina

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AllState), choir, journalism, painting, running, dance and teaching Mandarin. She also enjoys creative writing and published a poem in *Teen Ink Poetry Journals*.

Ms. Li is also fluent in Mandarin. She has won several awards at Science Olympiad, including two gold, one silver and two bronze medals at the Regional Science Olympiad and a bronze medal at the State Science Olympiad. Ms. Li spends her free time volunteering at local libraries and museums, reading, traveling and watching sports. She aspires to be a cardiac surgeon and history teacher.

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2003-04

**Yin Li, Harvard University
Stuyvesant High School, New York, NY
(Individual)**

“Characterizing the Properties of a Translational Regulator Expressed in Mouse Brain”

Yin Li's project seeks to understand memory in the brain. He is studying a class of proteins that might control the capacity of nerve cells to undergo local protein synthesis. It is believed that such a mechanism underlies learning and memory. Research in this area suggests the exciting possibility that local protein synthesis in nerve cells may have physiological functions.

Mr. Li is fluent in Chinese and enjoys reading, gardening, and swimming. He is a member of the National Honor Society and Science Olympiad and has participated in the DuPont Challenge Science Essay contest, the NYC Science and Engineering Fair and the Junior Science and Humanities Symposium. He plans to study neurobiology and molecular biology in college toward the goal of becoming a neurologist.

**Mark Schneider, Yale University
Jeffrey Schneider, Duke University (Fall 2006)
South Windsor High School, South Windsor, CT
(Team)**

“Simulation of the West Nile Virus using STELLA 7.02”

Mark and Jeffrey Schneider's project may help in identifying potential ways to reduce the spread of West Nile Virus and predicting the timing of peak infection season. The brothers developed an analytical model describing the transmission of the West Nile Virus in order to evaluate the factors affecting the propagation of the virus and to establish the effectiveness of various virus control strategies. The team's interest in understanding and controlling West Nile Virus was motivated, in part, by their high susceptibility to mosquito bites.

Mark Schneider plays the piano and enjoys art, writing, reading and baseball. He took top honors in the 2000 Connecticut State Science Fair for research he conducted on the effect of various genres of music on the special temporary reasoning ability of the brain. He is a member of the United Synagogue Youth, and was active in his school's Model United Nations Club, Latin Club and Drama Club. Jeffrey Schneider plays the piano and enjoys chess, baseball and tennis. He also enjoys designing Web sites. He is a member of the United Synagogue Youth, the Math Team, Model United Nations, Latin Club and

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Drama Club. He plans to continue studying the sciences and aspires to become a doctor.

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2002-03

**Steven Byrnes, Harvard University
Roxbury Latin School, Lexington, MA
(Individual)**

“Poset Game Periodicity”

Steven Byrnes’ math project analyzes a class of Two-player games known as poset games. A poset (partially-ordered set) is a mathematical object satisfying a few simple properties, and any poset can be turned into a two-player game. Games such as these are important to a growing field, known as discreet mathematics, for their potential applications in a wide range of computer network issues, such as the use of secure codes and reliable communications across “noisy channels.”

Mr. Byrnes developed a new theorem, the Poset Game Periodicity Theorem. Using his theorem, Mr. Byrnes was able to resolve two open conjectures about a specific poset game called Chomp; proved several results about the computational complexity of calculating g-values in poset games; and gave an efficient (i.e. polynomial-time) winning strategy for a large class of poset games.

Mr. Byrnes, was the only student in the country in 2002 to win both the US Math Olympiad and the US Physics Olympiad. He currently attends Harvard and is studying mathematics in hopes of becoming a professor and researcher.

**Juliet R. Girard, Harvard University
Roshan D. Prabhu, NJ Institute of Technology
William L. Dickinson High School, Jersey City, NJ
(Team)**

“Identification and High Resolution Mapping of Flowering Time Genes in Rice”

Juliet Girard and Roshan Prabhu’s research can potentially help increase yearly rice production and help meet the growing demand for this important food staple. The team identified genes that contribute to early flowering time in rice, a discovery that could lead to increased crop production through earlier and more frequent harvests per year, as well as allow for the growth of rice in regions with shorter growing seasons. Their project, which combines the usually distinct disciplines of experimental biology and computer science, successfully mapped two chromosomal segments and three candidate genes that control early flowering. The two students conducted their research during an internship in the NASA Sharp Plus Program.

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Ms. Girard, who conducted the experimental genetics aspects of the project, plans to study biochemistry, molecular biology and environmental science in college.

Mr. Prabhu, who conducted the computer work, plans to study design and graphic arts, biomedical engineering or computer engineering in college.

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2001-02

Ryan Patterson
Electrical and Computer Engineer, Lockheed Martin Space Systems
University of Colorado at Boulder, Class of 2006 (Electrical & Computer
Engineering)
Central High School, Grand Junction, CO
(Individual)

“The Sign Language Translator”

Ryan Patterson’s project is a modified golf glove equipped with sensors that translate hand movements and displays the characters on a screen the size of a cell phone. This allows another person to read the characters even if they do not understand sign language. The project was inspired when he witnessed a sign language interpreter assisting a hearing-impaired person in a fast food restaurant. He felt there had to be a more effective and economical way of improving independence for the deaf in a hearing world.

Shira Billet, Princeton University
Dora Sosnowik, Barnard College
Stella K. Abraham High School for Girls, Hewlett Bay Park, NY
(Team)

“A Viscometer for Ultra Thin Films”

While seniors at Stella K. Abraham High School for Girls, Shira Billet and Dora Sosnowik were inspired to research and develop their own viscometer, a tool used to measure the viscosity of ultrathin films, after attending a lecture on the subject. Ultra thin films are widely used as lubricants in microelectronics (disk drives and computers) and biological areas (prosthetics). The viscosity of ultrathin films is essential for disk drives and prosthetics to function properly.

2000-01

**Mariangela Lisanti, Stanford University (Graduate School)
Harvard University, Class of 2005 (Physics)
Staples High School, Westport, CT
(Individual)**

"Conductance Quantization in Au Nanocontacts"

Ms. Lisanti's project involved the development of a novel technique for measuring conductance quantization in metallic nanowires. Conductance quantization was also observed for higher multiples of the conductance quantum something that has never been seen before. The understanding of quantum phenomena is crucial in leading to the next generation of electronics where single atoms or molecules will be used to fabricate minute electronic devices. Future applications of this discovery could, for example, create faster and more efficient computers, medical implants that interact with the body and tiny robotic systems for space exploration.

**Christopher Clearfield, University of San Francisco
Harvard University, Class of 2005 (Physics)
Charles Olbert, Columbia University, Class of 2005
Nikolas Williams, University of North Carolina at Chapel Hill, Class of 2005
North Carolina School of Science and Math, Durham, NC
(Team)**

"Discovery of a Pulsar BowShock Nebula in a Nearby Supernova Remnant"

Charles Olbert, Christopher Clearfield and Nikolas Williams analyzed the observations on one of the closest Galactic supernova remnants, the core of an exploded star in the Gemini constellation, using the new NASA Chandra Xray telescope. The trio challenged the scientific explanation, held by their project mentor, that an unidentified region of high-energy within the supernova was a dense cloud of gas. While studying the supernova remnant, the IC 443, they discovered a brand new pulsar wake one of only three such pulsar wakes that have ever been seen.



1999-00

**Lisa Harris, Harvard University, Class of 2004 (Economics)
Dalton School, New York, NY
(Individual)**

"A Novel Assay for Detection of Four Common Cystic Fibrosis Mutations"

While working at the Public Health Research Institute in New York City, this Dalton School senior developed a technique for using a fluorescent DNA probe, called a molecular beacon, to streamline the method of identifying the genetic mutations that cause cystic fibrosis. It is hoped that this method will be used by physicians as a faster and simpler way of assessing the genetic risk of parents passing on cystic fibrosis and other diseases to their children.

**Daniar Hussain, Science Advisor, Frommer, Lawrence & Haug,
Massachusetts Institute of Technology, Class of 2004 (Electrical Engineering and
Computer Science, Minor: Biomedical Engineering)
Steven Malliaris, Yale University, Class of 2009 (Economics)
Massachusetts Institute of Technology Class of 2004 (Mathematics),
New Trier High School, Winnetka, Illinois
(Team)**

"Improvements in Data Storage and Retrieval Methods"

The union of two very different perspectives and personalities provided the perfect combination for a major breakthrough in computer science. The teammates applied the theory of biological evolution and the idea of the survival of the fittest to a computer programming technique known as "hashing". Eventually, they developed an algorithm that enabled new and more efficient ways of organizing and retrieving data.

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