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2015 SIEMENS COMPETITION IN MATH, SCIENCE & TECHNOLOGY
Regional Finalists – University of Texas at Austin

NAME: NEHA NARAYAN
SCHOOL: Friendswood High School, Friendswood, Texas
YEAR: Senior
HOMETOWN: Friendswood, Texas
PROJECT: Magic Potion for Diabetic Infection: The effect of Omega-3 against E.coli infection in Diabetics
FIELD: Biology
MENTOR: Hasna Baidouri, Senior Research Technician, University of Houston

"There is always room for questions!"

Neha Narayan discovered that Omega-3 fatty acids are beneficial in treating diabetic infections. This finding can lead to the prevention of the onset of colon cancer and potentially other diseases. A lot of Neha's family has been subject to the peril of diabetes and she has also often seen a simple sickness turn life-threatening due to their predisposition for diseases. This inspired her to pursue her area of biology research to find a natural remedy for diabetic infection. She hopes to help contribute to the cure for the disease.

Neha's first science project was in fifth grade, studying the melting rates of chocolates. She now admits that she pursued this project only so her mother would buy candy, but she also did gain valuable experience with the scientific method. Neha went on to become the first freshman to make it to the Texas State Science Fair in her high school. She also won HOSA nationals in the Health Education category.

Outside of the lab, Neha also participates in Habitat for Humanity and her school band – she plays piano and flute. She also helps out with her district's Junior High Science Fair, assisting the students in developing methods for their questions and acting as a mock judge before they go to competition.

If Neha could speak with anyone from history, she would ask Mahatma Gandhi how he can maintain calmness in a world of disorder.

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NAME: EDWARD PARK
SCHOOL: Las Cruces High School, Las Cruces, N.M.
YEAR: Senior
HOMETOWN: Las Cruces, N.M.
PROJECT: Bio-battery utilizing extracellular charge transfer of exoelectrogenic bacteria
FIELD: Biochemistry
MENTOR: Young Ho Park, Associate Professor, Mechanical Engineering Department, New Mexico State University

"I found my project can help build a simple and low-cost bio-battery operated by wastewater that can be used in remote areas."

Edward Park's research aims to create simple, low-cost sustainable energy solutions for remote areas. He hopes that his research will pave the way for greater adoption of sustainable and clean energy, especially in places like the Indian reservation in the southwest United States where he lives. Given that many homes do not have electricity because of the distance between them and the steep cost, Edward was motivated to find cost efficient sustainability solutions.

If Edward could speak with anyone from history, he would choose Nikola Tesla because he would like to know how Tesla came up with his innovative idea of wireless communication.

His favorite subject in school is physics because it details the rules of the universe and has a number of practical applications in daily life. He hopes someday to pursue a career in medicine and volunteers in hospitals and clinics to gain experience in the field.

Edward is President of Las Cruces High School's National Honor Society. He is also a violinist and Concertmaster of the Chamber Orchestra.

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NAME: SANJANA RANE
SCHOOL: duPont Manual High School, Louisville, Ky.
YEAR: Senior
HOMETOWN: Prospect, Ky.
PROJECT: Effects of the Environmental Pollutant Acrolein on Renal Fibrosis
FIELD: Biochemistry
MENTOR: Shunying Jin; Research Associate; University of Louisville

"I discovered a novel role of a protein that could be potentially used to detect, as well as treat renal fibrosis preventing progression to end-stage renal disease, which is the incurable total failure of the kidneys."

Sanjana Rane's research has helped discover how a particular protein could be used to detect and treat renal fibrosis. This discovery helps to prevent renal fibrosis from developing into end-stage renal disease, an incurable total failure of the kidneys.

Sanjana first became interested in pursuing medical research when she read a *USA Today* study ranking Louisville, her hometown, as having some of the worst air quality in the United States. She began to look into the dangers of air pollution and learned about the chemical acrolein, which is found in both cigarette and industrial smoke and can cause kidney damage. As Sanjana delved more into the research, she began to focus on how to shift the chemical's influence on the kidneys through using a particular protein as a therapeutic target.

Looking forward in her career, Sanjana is interested in pursuing medicine. In particular, Sanjana would like to practice regenerative medicine to explore how to use stem cells to treat diseases like cancer, multiple sclerosis and ALS.

Beyond academics, Sanjana is the starting outside back for her high school's soccer team. She also mentors kindergarteners at a local elementary school.

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NAME: ANIRUDH SURESH
SCHOOL: St. John's School, Houston, Texas
YEAR: Senior
HOMETOWN: Houston, Texas
PROJECT: Modeling Sharp Jumps in Flux Tube Entropy in the Earth's Magnetosphere
FIELD: Physics
MENTOR: Dr. Richard Wolf, Professor of Physics and Astronomy, Rice University

"I am uncertain about the exact career I aspire to, but I want to make a large-scale, positive impact on this world through math and science."

Anirudh Suresh developed a computational model of auroral arcs in the plasmasheet region of the Earth's magnetosphere. This model could help confirm the driving force behind auroral arc formation and be used in future studies of the magnetospheric substorm. Anirudh was first inspired to pursue his research when he took a family vacation to Alaska in 2012 – fascinated by the combination of the aesthetics of aurorae and the science behind the phenomena.

Jovan's first science project measured what video game induced the greatest increase in heart rate. He found that Madden NFL 2009 increased his heart rate more than any other game. He notes now that he would need more controls for the experiment's results to hold more weight.

Jovan anticipates majoring in applied/computation math and/or applied physics. His favorite subject in school is math because of the logic involved. His parents and a trip to Johnson Space Center first got Anirudh interested in math and science.

Outside of the classroom, Jovan plays the clarinet in his school's wind ensemble and jazz band. He also participates in MIT Launch Clubs, a high school entrepreneurship program, and is a Volunteer Returnee Coordinator for AFS Intercultural Programs for the Texas/Gulf Coast Chapter. Anirudh also founded and leads the Cricket Club, which organizes cricket games at his school.

While Anirudh was presenting a study he performed to evaluate the correlation between obesity and hypertension, Daryl Morey, GM of the Houston Rockets, complimented his work. Getting the thumbs-up from a pioneer of sports analytics was definitely an amazing experience for Anirudh!

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NAME: JOVAN ZHANG
SCHOOL: Los Alamos High School, Los Alamos, N.M.
YEAR: Senior
HOMETOWN: Los Alamos, N.M.
PROJECT: Modeling Gas Flow in Hydraulically Fractured Shale
FIELD: Environmental Science
MENTOR: Dr. Duan Zhang

"I enjoy STEM's usefulness to everyone, every day, everywhere."

Jovan Zhang found that hydraulically fractured shale gas wells could produce longer than previously predicted. With his project, the natural gas industry could use fewer resources to extract natural gas from the ground. Jovan was inspired by the debate over fracking and was determined to find the scientific uncertainty surrounding it; he wanted to see if he could contribute to the knowledge gap. The biggest challenge in carrying out his research was developing a computer code that could run with limited computing resources as well as a limited depth of the mathematical knowledge needed to optimize the code.

Jovan's favorite subject is mathematics because of its rigor and analytical nature. He anticipates applying this passion as a physics and/or aerospace engineering major in college. Jovan's built a KNEX rifle and tested its gravitational drop over a certain distance in order to calculate the shooting velocity for his first science project. Jovan aspires to be an aerospace engineer.

Outside of the classroom, Jovan is a competitive swimmer, is leading a build on his Robotics Team, is on the debate team and participates in science fairs. He is also a member of the National Honors Society and is a Debate Team Novice Leader.

If Jovan could speak with anyone from history, he would like to get an in-depth look at any famous philosopher's ideas.

TEAM COMPETITORS

ARJUN GURU, The Altamont School, Birmingham, Ala.
MAYA GURU, The Altamont School, Birmingham, Ala.
PROJECT: Determination of Activity of Kinases in Muscle-Invasive Bladder Cancer Compared to adjacent Normal Bladder to Identify Drivers of Cancer Growth and Therapeutic Targets
FIELD: Biology
MENTOR: Dr. Christopher Willey, M.D., Ph.D., Associate Professor, Department of Radiation Oncology, University of Alabama at Birmingham

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"We were inspired to work towards finding a cure for metastatic bladder cancer which is generally not curable with currently available treatments."

Arjun Guru and Maya Guru's research, in the first ever study to compare protein kinase activity in bladder cancer compared to adjacent normal bladder, identified multiple kinases that exhibited increased activity, which may represent targets for therapy. In contrast to all other studies in bladder cancer that analyze structural and quantitative alterations, their study identifies functional and more relevant targets for therapy.

ARJUN GURU
YEAR: Junior
HOMETOWN: Vestavia, Ala.

Arjun's favorite part about STEM is the new breakthroughs and innovations that make a difference in people's lives. Arjun contributed to this with this project by identifying new targets for bladder cancer therapy. Arjun loves learning, and his parents fostered his interest in science.

Arjun aspires to lead a career in technological innovation, and anticipates majoring in engineering in college. One of his earliest science-related memories is a childhood family trip to the Johnson Space Center.

Outside of the lab, Arjun teaches algebra to the Math Team at his school – his favorite subject in school is calculus. Arjun also enjoys photography and participates in community service through the Miree Center. He also participates in the Scholars Bowl. Arjun is most proud of becoming a regional finalist in the Siemens Competition as well as being on the winning junior varsity team of the 2015 Scholars Bowl National Tournament in New Orleans. If he could speak to anyone in history, it would be Aristotle, because of his pioneering role in reason and logic.

MAYA GURU
YEAR: Freshman
HOMETOWN: Vestavia, Ala.

Maya Guru completed her first science project in the third grade. She tried to make an egg float on water by adding different amounts of salt to the water. If she were to do it today, Maya would use SI units rather than teaspoons. Maya first became interest in STEM through her parents, and also being interested in how things work.

Outside of the lab, Maya enjoys photography and takes part in community service through the Miree Center. She also participates in the Scholars Bowl. Maya won the Junior Student category in the International SaveWater Photography Competition in 2013.

When Maya was in the second grade, her classroom was A/V hooked up to the International Space Station (ISS) and she got to speak to Tony Antonelli while he was aboard the ISS. If Maya could speak to anyone from history it would be Elizabeth Blackwell, the first female physician in the United States.

TEAM COMPETITORS

PRIYANKA KONAN, Hamilton High School, Chandler, Ariz.
RITIKA BHARATI, Hamilton High School, Chandler, Ariz.
PROJECT: Observing the Capabilities of the R9-caPep Peptide in Inhibiting Growth of Nueroblastoma Cells
FIELD: Biology
MENTOR: Dr. D Page Baluch of Arizona State University School of Life Sciences, Keck Laboratory; Mrs. Debbie Nipar, AP Chemistry/ Honors Science Research Teacher

Priyanka and Ritika set out to revolutionize cancer treatments with their Siemens Competition project. Their research focuses on the potential use for synthesized peptide as a treatment for neuroblatomas, by inhibiting DNA replication in the cells. The findings from their project could one day save lives.

PRIYANKA KONAN
YEAR: Senior
HOMETOWN: Chandler, Ariz.

"I think it is important to do everything we can in order to maximize life and opportunity for the children of the world, and hopefully our research can potentially help accomplish that one day."

Priyanka was first inspired to research possible treatments for neuroblastoma because she saw the devastating effects it has on young children. She found the most challenging part of the project was learning the lab techniques to be able to properly execute each method.

As a National Advanced Placement (AP) Scholar, Priyanka has taken AP STEM courses in Statistics, Computer Science, Biology, Chemistry and Physics. Her favorite subject in school is Statistics because she loves applying mathematical reasoning to real life scenarios.

As much as Priyanka enjoys her advanced science and math classes, there will always be a special place in her heart for the arts. She plays the violin and enjoys Bharatanatyam Indian Classical Dance.

Priyanka hopes to study Biomedical Engineering at Arizona State University, the California Institute of Technology, or Cornell University. In school she is a committee leader in the Sustainability Club as well as a member of the Model United Nations club.

RITIKA BHARATI
YEAR: Junior
HOMETOWN: Chandler, Ariz.

"It fascinates me how we have come so far in the field of innovation and discovery, and yet, we still have such a long way to go."

Ritika has a personal interest in neuroblastomas. Her great-grandmother was diagnosed with a neurodegenerative condition, so Ritika wanted to conduct research to find more about the disease. Understanding the functioning mechanisms of cells at their essence was the most challenging part of the project for Ritika, yet she still found the process rewarding.

As an aspiring neurobiologist, Ritika has taken many Advanced Placement courses such as Chemistry, Multivariable Calculus, and Physics. Her favorite subject in school is Multivariable Calculus because of its connection to Physics. In 2014, Ritika received an honorable mention for the Governor's Innovation Award; a celebration of high achieving students in the science and technology departments throughout the state of Arizona.

Being the oldest of three siblings, Ritika looks to her mother as her role model. In school Ritika participates in the Speech and Debate Club. She also enjoys playing the viola. If Ritika could meet one person it would be Nikola Tesla, the Serbian American inventor best known for his work on the basis of most air conditioning machines.

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TEAM COMPETITORS

ROBERT LUO, Highland Park High School, Dallas, Texas
HELEN ZHANG, Highland Park High School, Dallas, Texas
PROJECT: A Novel Therapy for the Treatment of Acute Myeloid Leukemia
FIELD: Biology
MENTOR: Dr. Mi Deng, Instructor, UT Southwestern Medical Center

"…students should be exposed to a professional science setting early in their development."

Robert and Helen's research identified a new potential target for the treatment of acute myeloid leukemia. The combination of family experiences with cancer and the science of the topic piqued the team's interest in this project. With this project, the world can come one step closer to solving the global problem of leukemia.

ROBERT LUO
YEAR: Junior
HOMETOWN: Dallas, Texas

It took Robert some time to get used to working with live mice in the lab, but after a few weeks, the nervousness went away and he was able to have a little more fun conducting his research! Robert's interest in stem cells was a major influence in the pursuit of this research, as well as his first-year and sophomore year biology teachers. Robert's father, a cardiologist, also helped pique his interest in STEM.

Outside of the lab, Robert participates in Academic Decathlon, tutors underserved children and plays violin in the Dallas Asian American Youth Orchestra (DAAYO). His very first science project was my 8th grade science fair, which sought to determine the effect of different antibiotics and disinfectants on bacterial growth through zones of inhibition.

Robert aspires to be either a physician, computational chemist or a software engineer at a company like Google and he anticipates majoring in chemistry, biology and/or computer science. If he could talk to anyone in history, Robert would sit down with Isaac Newton because of his influence on physics and mathematics, which still holds weight today.

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HELEN ZHANG
YEAR: Senior
HOMETOWN: Dallas, Texas

Helen Zhang anticipates majoring in biology in college and aspires to be a physician-scientist. Her father is a researcher, and he piqued her interest early-on when he discussed the TCGA database and the thorough information it contains regarding gene expression and mortality rates of patients. Helen's interest rose and led her to research any high correlation between the expression of a certain gene and the survivorship rate of cancer patients. She later identified the relationship between LILRB4 expression and AML survivorship rate.

Helen is most proud about becoming a co-author of an article published in *Nature*, as well as achieving ninth place in Policy Debate at the Texas University Interscholastic League State Cross-Examination Debate tournament. She has also been recognized as a National Merit Commended Scholar.

Outside of the lab, Helen co-captains the Highland Park High School Debate Team. She also volunteers at the University of Texas Southwestern Medical Center and participates in taekwondo.

This being said, Helen's favorite school subject is English, because she loves being able to write down her thoughts in their purest form. If she could speak with anyone in history, it would be Alexander Fleming, because he unintentionally discovered a substance that would revolutionize all medicine – she'd ask him about his accomplishment and near-impossible luck.

TEAM COMPETITORS

DAVID XIANG, Westwood High School Austin, Texas
ERIC LI, Clements High School, Sugarland, Texas
AMBER LU, Texas Academy of Math and Science, Denton, Texas
PROJECT: Oriented Hypergraphs and Signed Path generalizations
FIELD: Mathematics
MENTOR: Dr. Lucas Rusnak, Senior Lecturer at Texas State University

The team of David, Eric, and Amber used adjacency, degree and the laplacian matrix to develop formals for hypergraphs – ultimately using the application in modeling networks and systems to improve system and circuit efficiency. The team found a counting formula which has use in neurological modeling.

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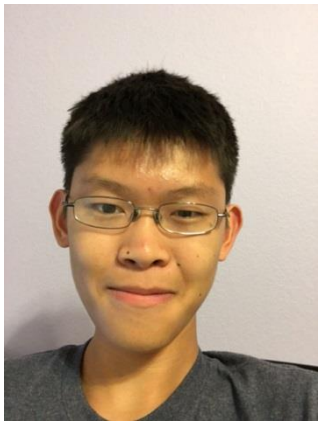

DAVID XIANG
YEAR: Junior
HOMETOWN: Austin, Texas

"For me, what was really exciting about math was the discovery/proof aspect behind it- I think introducing these topics in high school would foster more interest."

David credits his elementary school teachers for inspiring his love for STEM. He was able to look at math as a game and it's excited him ever since. Being a research mathematician is a dream job for David. His plan is to major in mathematics and he plans to apply to the Massachusetts Institute of Technology, Princeton University and Stanford University.

Having a passion for math and science, David has taken multiple Advanced Placement courses including Biology, Chemistry, Calculus and Statistics. David is his school's Salutatorian and qualified for the United States of America Mathematical Olympiad. He is a member of the German Club, Competition Math Club, and plays the cello.

Leonhard Euler, the Swiss mathematician and physicist, is a person David admires for his extreme insight. David has had the opportunity to teach math enrichment courses at a local tutoring center and really enjoyed the experience.

ERIC LI
YEAR: Junior
HOMETOWN: Sugarland, Texas

"I love science and mathematics because they are the foundation of the past, present, and the future, and will never become irrelevant."

Eric began competing in math competitions in the fifth grade and has been hooked ever since. He is a three-time United States of American Mathematics Olympiad qualifier and an American Mathematics

Competition 10 Perfect Scorer. He has received Advanced Placement Scholar with Distinction and is his school's Salutatorian.

Outside of math competitions, Eric plays the piano and cello. He also enjoys running and volunteering his time tutoring at the local middle school. Eric looks to basketball player Kevin Durant as his role model.

Eric speaks both English and Chinese and plans to major in Computer Science. When it comes to college, Eric wants to attend the Massachusetts Institute of Technology. He hopes to work as a computer programmer or start his own business with friends.

AMBER LU
YEAR: Junior
HOMETOWN: Sugarland, Texas

"With my project, the world can count paths."

Amber is a published author in the *Chemistry Journal* and received the Gold Keys in Scholastic Writing and Arts awards for short story and photography. Her first experience with STEM came when she did an egg drop from a high surface in the first grade. She found the different structures that helped cushion the egg to be fascinating.

Marie Curey is the woman who sparked Amber's passion in the STEM field. Amber finds Marie to be a remarkable figure in the name of science and in the name of women.

Outside of STEM related activities, Amber volunteers at the local International Club and at a local pet shelter. She enjoys painting, drawing and playing the piano, and speaks English, Chinese, and Spanish. Amber is the co-chair of Global Issues Summit and a reviewer for a national youth literature magazine.

Amber plans to major in biology and is eyeing several leading colleges on the coasts and in the state of Texas. She aspires to be a neurosurgeon.

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TEAM COMPETITORS

SHOSHANA ZHANG, Texas Academy of Mathematics and Science, Denton, Texas
COLLEEN DAI, Texas Academy of Mathematics and Science, Denton, Texas
PROJECT: A Novel Prediction of Alternatives for Solvents Toxic to Human and Environmental Health through Computational and Statistical Modeling
FIELD: Chemistry
MENTOR: Dr. William Acree, Professor of Chemistry, University of North Texas

"Computer technology, chemistry research, and mathematical calculations are essential to our generation."

Shoshana Zhang and Colleen Dai's research project utilizes a computational chemistry method to identify alternatives to toxins and carcinogens commonly used in industrials settings and products. Identification of these safer alternatives can help improve environmental and human health.

SHOSHANA ZHANG
YEAR: Senior
HOMETOWN: Frisco, Texas

Shoshana Zhang aspires to be a physician-scientist, and anticipates majoring in chemistry and/or computer science in college. She first became interested in STEM early in elementary school, when she took her first science and math courses. Along with being a Siemens Regional Finalist, Shoshana has also co-authored research publications.

Outside of the lab, Shoshana serves as the President of her school's Student Council, President of the Artfelt Association and is a counselor at the Community Youth Leadership Camp. She also practices Chinese brush painting and tutors her classmates in chemistry, biology and calculus. Her mom, a software engineer, is also a continuing source of inspiration for Shoshana.

If Shoshana could speak with anyone from history, it would be with the first human to walk the face of the Earth, because it would give her perspective on how humans came to be.

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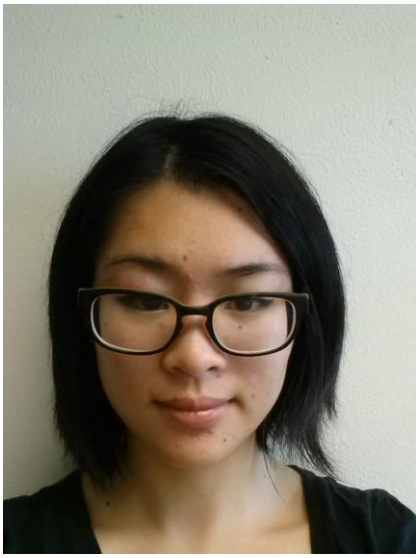

COLLEEN DAI
YEAR: Senior
HOMETOWN: Plano, Texas

Colleen Dai loves computer science because of the hands-on experience, real world applications and continual learning that comes with a mastery of the subject. She anticipates majoring in computer science and/or business in college.

Colleen's first science project involved recording the changes in green algae in a controlled environment. For that project she received honorable mention at a local science fair. Playing with LEGOs as a kid first piqued her interest in STEM.

Outside of the lab, Colleen volunteers at a senior home and mentors juniors at her high school. She also participates in the Dallas Youth Orchestra; she plays piano, oboe, English horn and tenor saxophone.

If Colleen could speak with anyone from history, it would be Alan Turing – she would love to ask him about how to decrease society's fear of the unusual to end social stigmas.