SIEMENS | Foundation

2017 SIEMENS COMPETITION IN MATH, SCIENCE & TECHNOLOGY
Regional Finalists – University of Texas at Austin

CHARLES HUTCHISON
SCHOOL: St. Andrew's Episcopal School, Ridgeland, MS
YEAR: Senior
HOMETOWN: Jackson, Mississippi
PROJECT: "Kinetics and Thermodynamics of Deeply-Supercooled Liquids"
FIELD: Chemistry
MENTOR: Udayan Mohanty, Ph.D., Boston College

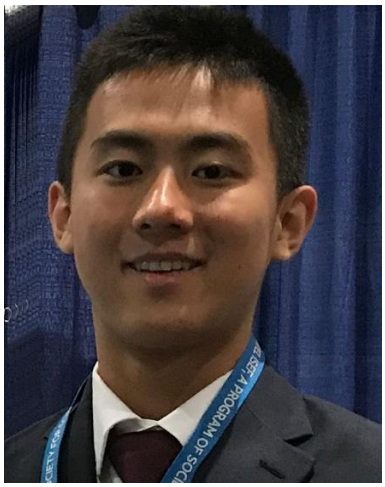
"I am most passionate about learning more about the world through STEM--whether that means learning more about previously conducted research in a classroom setting or doing the research myself."

Charles set out to study how liquids behave at such cold temperatures that they start to become glass. Through this research, he developed a model that can predict the behavior of these liquids, which could benefit the use of these materials in optical materials and electrolytes.

This project reflects Charles' interest in the theoretical side of STEM research and his desire to take poorly understood systems and create mathematical explanations. He hopes one day to be a professor at a research university.

In addition to his work in chemistry, Charles is the president of both his Quiz Bowl team and the Latin Club. He plays clarinet and competes on his cross country and track teams.

SIEMENS | Foundation



KENNETH JIAO
SCHOOL: Indian Springs School, Indian Springs Village, AL
YEAR: Senior
HOMETOWN: Birmingham, Alabama
PROJECT: "Retain CHD7, an Epigenetic Regulator, in the Nucleus to Combat Breast Cancer Metastasis"
FIELD: Biology
MENTOR: Lizhong Wang, Ph.D., University of Alabama at Birmingham School of Medicine

"The thing that excites me the most about STEM is the rapidly increasing number of new research techniques that are more time and cost efficient. For example, in my research, I got to use the CRISPR/Cas9 gene editing technique that was invented only a few years ago."

Ken discovered a new gene which can be targeted to reduce breast cancer cells from spreading to other parts of the body. He decided to study breast cancer metastasis after hearing stories of lives ripped apart by the vicious disease and having his own family experience a breast cancer scare a few years ago. His mom was diagnosed with a breast tumor, and while he and his family were waiting for the test results to come back, he "felt the patients' vulnerability and their families' desperation. Luckily for Ken's family, the tumor was benign but the experience inspired him to want to help create a future where nobody is vulnerable from breast cancer.

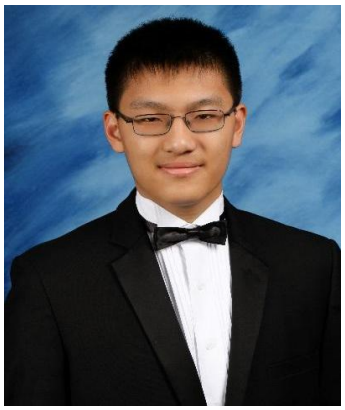
With his innate curiosity for figuring out how things worked which led him to the laboratory, Ken says that his thirst for research stems from his desire to make a positive impact on humanity through medicine.

At school, his favorite subject is Multivariable Calculus because it forces him to think about concepts in new abstract ways. He serves on student government and founded his school's Science Olympiad Team where he has serves as co-captain.

Ken is most proud of receiving 3rd Place Grand Prize at the Intel International Science and Engineering Fair and guiding his school's chess team as its captain to first place at the Alabama Scholastic State Championships twice.

Outside of the classroom and laboratory, Ken is an avid chess player ranked 28th in Alabama. He has run cross country for his high school's varsity team all four years, qualifying three times for the state championship. Ken plays basketball and football with friends, listening to rapper Kendrick Lamar's music, and he devours books, especially Agatha Christie novels. Ken is a fan of University of Alabama's Crimson Tide football team. He would like to be a physician scientist so he can take his research in laboratories and directly apply it to patients.

SIEMENS | Foundation



MICHAEL MA
SCHOOL: Plano West Senior High School, Plano, TX
YEAR: Senior
HOMETOWN: Plano, TX
PROJECT: "New Results on Permutation Pattern-Replacement with a Generalization of Erdős-Szekeres"
FIELD: Mathematics
MENTOR: William Kuszmaul, Stanford University

"Ever since I was young, I've enjoyed math—particularly because there's always one right answer."

For Michael's project, he generalized a classical result in combinatorics, a branch of mathematics concerned with counting finite sets of things and all the different ways of arranging them. The classical result in combinatorics has been cited over 1300 times.

He's enjoyed math since he was young—particularly appreciating its "rigor and concreteness." Michael also enjoys physics and chemistry because he appreciates having an intimate understanding of the way the world works, and these fields of study serve as explanations. He hopes to be a cybersecurity software engineer someday.

Michael is most proud of achieving the Gold Medal in the Asian Pacific Mathematics Olympiad and the Silver Medal in the Romanian Master of Mathematics. He also plays chess and basketball.

SIEMENS | Foundation

ABHISHEK MOHAN
SCHOOL: Texas Academy of Mathematics and Science, Denton, TX
YEAR: Senior
HOMETOWN: Irving, TX
PROJECT: "Identification of a Polymeric Silver(I)-Based Protein Corona Biointerface for Versatile Delivery of Targeted Nanotherapeutics *in Vitro*"
FIELD: Chemistry
MENTOR: Mohammad Omary, Ph.D., University of North Texas

"The most interesting aspect about STEM is the fact that its solutions come in multiple forms and are forever unfinished. This freedom of continual innovation is why I want to be on the forefront of technologies that have the potential to solve global problems."

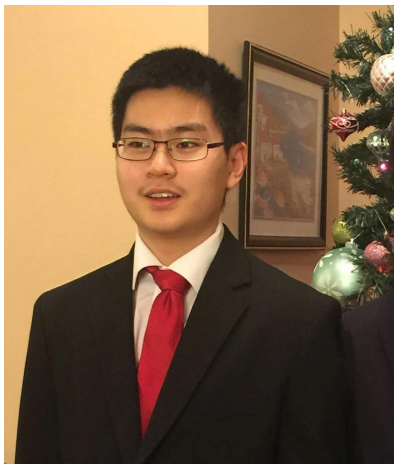
Abhishek discovered a potentially effective use of silver nanoparticles for improved therapeutics. His research indicates that these nanoparticles could provide a more versatile method of delivering drugs to targeted regions throughout the human body, and supports a framework for future developments.

He is most passionate about contributing his ideas and efforts to foster positive change, whether it be through scientific research or community outreach, and enjoys discovering creative solutions to challenging problems. At the 2017 Intel International Science and Engineering Fair, Abhishek received a special award for Innovation in Water Technology. He was also a two-event Finalist and Award Winner at the 2017 Business Professionals of America National Leadership Conference.

Outside of school, Abhishek is an Eagle Scout, and enjoys playing tennis and basketball. He serves as an Engineering & Innovation Docent at the Perot Museum of Nature and Science, where he leads exhibit sessions, trains new volunteers, and manages STEM camps. He is also a Co-Chair of the Irving Youth Action Council, in which he directs service initiatives and youth-focused programs.

Abhishek hopes to one day become an entrepreneur in the engineering field.

SIEMENS | Foundation



GEORGE WANG
SCHOOL: Oklahoma School of Science and Mathematics, Oklahoma City, OK
YEAR: Senior
HOMETOWN: Tulsa, OK
PROJECT: "Ab Initio Calculations of Possible Hypercarbon in Ionic Hydrocarbon Compounds and Prediction of Stable Pyramidal Tropylium Trication with Heptacoordinate Carbon"
FIELD: Chemistry
MENTOR: Bin Wang, Ph.D., The University of Oklahoma and Fazlur Rahman, Ph.D., Oklahoma School of Science and Mathematics

"I am most passionate about making new scientific discoveries and inventions."

George and his mentors identified a unique, stable pyramidal structure, which has a carbon atom bonded to seven atoms. The molecular structure they found may help explain the chemistry and reaction process of organic molecules, which are still not fully understood. He was inspired by his mentor, Dr. Bin Wang, to perform quantum-mechanical calculations of molecules and solids in his research. His research advisor, Dr. Fazlur Rahman, inspired him to study hypercarbon compounds.

George hopes to be a scientist or an inventor when he grows up and use science and technology to improve students' access to education. He qualified for the USA Mathematical Olympiad, and he earned an honorable mention in the USA Physics Olympiad. He is currently the Vice President of the Chinese American Association of Tulsa and has been named a 2017 Research Science Institute Scholar.

Outside of school, George plays piano. He also enjoys traveling, hiking, and running.

SIEMENS | Foundation

TEAM COMPETITORS

BRANDON CHEN, Plano West Senior High School, Plano, TX
ANDREW LU, Westwood High School, Austin, TX
CLAIRE ZHOU, Clements High School, Sugar Land, TX
PROJECT: "Determining Criteria for Positroid Flats"
FIELD: Mathematics
MENTOR: Suho Oh, Ph.D., Texas State University

Brandon, Andrew, and Claire investigated mathematical structures used to model particle and wave interactions, which are traditionally studied in x-ray design and quantum computing.

BRANDON CHEN
YEAR: Junior
HOMETOWN: Plano, TX

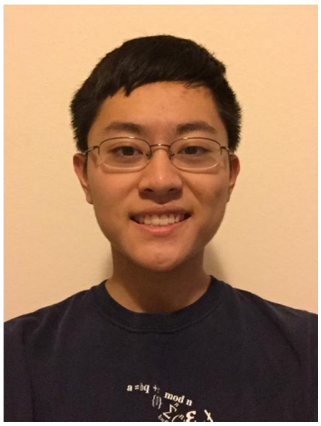
"I have a deep passion for math and believe that my mathematical pursuits will help me establish a good work ethic in the future."

From an early age, Brandon has been fascinated by math. When he was in preschool, his teacher gave him arithmetic worksheets and he was hooked. He now wants to sharpen his math skills and learn more about artificial intelligence (AI) and how AI uses math to make decisions.

Brandon brings his passion for math to almost everything he does. He has been running a math club at his local elementary school to give younger students an opportunity to develop an interest in mathematics. He is a USA Junior Math Olympiad qualifier and is vice president of his school's physics club. When he grows up, Brandon would like to leverage his math skills in the business world.

When he is not in the lab or working through math formulas, Brandon plays percussion in the Greater Dallas Youth Orchestra and participates in Business Professionals of America.

SIEMENS | Foundation



ANDREW LU
YEAR: Senior
HOMETOWN: Austin, TX

"I would like to contribute to the building of a more sustainable and enlightened society."

In elementary school Andrew was introduced to math and chess and has grown to love how the two are closely linked together. He is most interested in the theoretical development of machine intelligence and its potential use in other fields. In the future, Andrew would like study artificial intelligence.

Andrew is the former president of Westwood High's chess club and the current president of his school's math honor society. He is a U.S. Chess Federation National Master and a USA Mathematical Olympiad qualifier. In addition, Andrew helps train his local middle school's MATHCOUNTS team. Outside of the classroom, Andrew loves to play the piano and ultimate Frisbee.

Andrew's favorite sports figure is world chess champion Magnus Carlsen because of his genius and genuine excitement for the game.

SIEMENS | Foundation

CLAIRE ZHOU
YEAR: Junior
HOMETOWN: Sugar Land, TX

"I am most passionate about exploration. Whether it's math, science or a new city, I love to journey to new places and see what the world has to offer."

With chemist parents, Claire's interest in math and science was piqued at a very young age. After joining a math team in fifth grade, she fell in love with participating in math and science events because of the community they create. Today, Claire teaches math to local middle school students and takes part in training a MATHCOUNTS team in hopes that she can share her knowledge and help them develop enthusiasm in STEM. At school, she is involved in National Honor Societies for science, math and Spanish. Claire earned first place at this year's Math Prize for Girls competition at MIT and is a two-time USA Junior Math Olympiad qualifier.

Outside of the classroom, Claire loves to dance. She has trained in ballet, contemporary, and Chinese dance for over ten years and is a national dance competition winner. She also enjoys art and playing the piano.

Claire is inspired by actress Emma Watson because of her perseverance and her positive impacts on the world through her humanitarian efforts.

SIEMENS | Foundation

TEAM COMPETITORS

SAHIL PATEL, Texas Academy of Mathematics and Science, Denton, TX
STEVEN SUN, Texas Academy of Mathematics and Science, Denton, TX
PROJECT: "Design and Simulation of a Novel Concentric Cone Antihydrogen Gravity Experiment"
FIELD: Physics
MENTOR: Carlos Ordonez, Ph.D., University of North Texas

Sahil and Steven designed a proof of concept for a concentric cone antihydrogen experiment which operates at experimentally achievable temperatures. This research brings us closer to answering one of the greatest unsolved mysteries in the field of physics: "Does antimatter fall up or down?" If antimatter is found to fall up, then the finding would disprove Einstein, solve the enigma of both dark matter and dark energy, provide an explanation for the imbalance between ordinary matter and antimatter, and moreover lead to a single, comprehensive theory of everything that fully explains and links together all physical phenomena in the universe.

SAHIL PATEL
YEAR: Senior
HOMETOWN: Irving, Texas

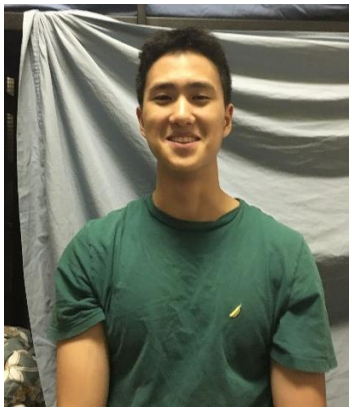
"The sharing and spreading of one's own knowledge onto others is the most fulfilling and enlightening experience, transcending any such number of awards or honors."

Sahil has always had an affinity for physics due to its ability to profoundly astound and inspire him with its wonders. His interest in STEM was initially sparked by various television shows like "Cosmos: A Spacetime Odyssey" and "Through the Wormhole with Morgan Freeman" and was further fostered by his middle school science teachers.

Sahil was invited to represent the United States at the 11th International Olympiad on Astronomy and Astrophysics. He also founded and currently serves as president of his own educational nonprofit organization "Link" which connects underprivileged sister schools with those that have more resources to provide donations and teaching and further educational enrichment for all.

He is proud of tutoring a student named Malachi in physics, from basic classical mechanics to advance quantum physics. Sahil views this mentorship as a learning opportunity for himself as well. Sahil enjoys a variety of extracurricular clubs, including but not limited to Science Bowl, Computer Science Organization, and Business Professionals of America. He also plays the clarinet as both a member of the concert and marching band and is an active member of his school's varsity ultimate Frisbee team.

SIEMENS | Foundation



STEVEN SUN
YEAR: Senior
HOMETOWN: Katy, Texas

"Research is learning at the edge of scientific knowledge for not only yourself but society as a whole."

Steven's love of science was sparked by the scientific handbooks and encyclopedias his parents gave him as a child. He has a vast fascination with the field of artificial intelligence and the sweeping implications it could have on society in the future.

Physics has always been Steven's favorite area of research and he was drawn to his mentor's lab because of its focus on antimatter, which could revolutionize the field of physics if not the world itself. Their research has the potential to change the way we think about the universe and how it functions from a physics perspective.

The lab's use of computers attracted Steven who has always been interested in algorithms and designing code. In order to run their team's experiment, Steven and Sahil had to use Wolfram Mathematica code to simulate their research

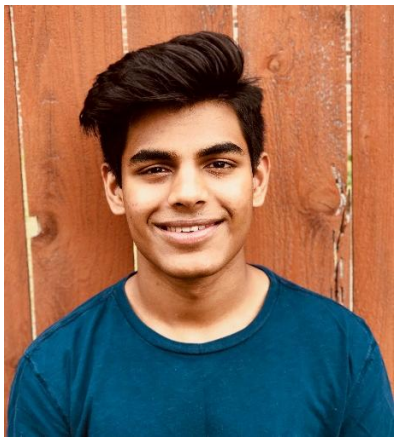
Steven has played the piano since he was 5 years old and has competed in various state competitions early in his high school years. He's also very passionate about weightlifting and hopes to eventually be accepted into his university powerlifting team. Outside of the research field, Steven is fluent in Chinese and enjoys literature to broaden his horizons.

SIEMENS | Foundation

TEAM COMPETITORS

KSHITIJ SACHAN, Plano East Senior High School, Plano, Texas
YESH DOCTOR, Plano East Senior High School, Plano, Texas
PROJECT: "Site-Specific Integration of Large DNA Fragments: Evaluating and Redesigning Genome Editing Systems"
FIELD: Biology
MENTOR: Leonidas Bleris, Ph.D., and Seth Lawson, University of Texas at Dallas

Kshitij and Yesh designed a new technology that allows scientists to replace genes that have mutations with a new copy. This project could have numerous applications in biotechnology and medicine, and could lead to the treatment and cure of dangerous disease-causing mutations, such as those that cause cancer and Duchenne's Muscular Dystrophy.



KSHITIJ SACHAN
YEAR: Senior
HOMETOWN: Plano, Texas

"I am most passionate about biology research. Every day I get the opportunity to change millions of lives through my work."

Growing up, Kshitij tended to shy away from math and science. Although those subjects came naturally to him, he couldn't see himself as a doctor or researcher. That sentiment changed, however, once he reached high school and began working in a bioengineering lab. Kshitij realized the enormous impact that science has on people's lives and soon enrolled in STEM classes. As he reached upper-level courses, his passion for math and science grew. Now, Kshitij wants to major in applied mathematics and biology when he goes to college.

Kshitij often finds himself daydreaming about the ribonucleic proteins and TALE nucleases in his research. The papers he reads on gene editing and correcting for genetic mutations are nothing short of science fiction novels, and their discoveries are groundbreaking. Kshitij believes that gene editing will revolutionize science and medicine, and become one of the most important innovations in human history. He predicts that in the future, eliminating genetic diseases will be as simple as when we go to the pharmacy and purchase medicine to treat an infection or high blood pressure.

An accomplished flautist, Kshitij has performed twice as a soloist at Carnegie Hall and was accepted into the Texas All-State Band as a sophomore. He has also pursued science outside of the classroom, coming

in second place for cellular/molecular biology in the Intel Science and Engineering Fair, and was a gold medalist in the International Sustainable World (Engineering, Energy, Environment) Project Olympiad.

Kshitij enjoys listening to Lin Manuel Miranda's musicals, "Hamilton" and "In the Heights," and rooting for the Dallas Cowboys.

YESH DOCTOR
YEAR: Senior
HOMETOWN: Plano, Texas

"I think what I most enjoy about STEM is that we get to be more than just problem solvers, we become problem preventers."

From an early age, Yesh was interested in science and engineering. When he was in elementary school, he spent his weekends experimenting on old household appliances and any electronics he could get his hands on. He also watched his mom battle a mysterious and complex disease, which many doctors refused to treat because her case was so unique. Because of this, Yesh wants to practice personalized medicine as a physician, and use information about a person's genes, proteins, and environment to prevent, diagnose and treat disease.

Yesh's two proudest accomplishments include placing second for cellular/molecular biology in the Intel Science and Engineering Fair, and winning a gold medal for his International Sustainable World Energy, Engineering, and Environment Project in health and disease prevention.

Outside of school, Yesh is an avid drum player with a charity band and has a second-degree black belt in Tae Kwon Do. His favorite band is the jazz ensemble Snarky Puppy, and he roots for all the Dallas sports teams.

SIEMENS | Foundation

TEAM COMPETITORS

CHELSEA WANG, Fossil Ridge High School, Fort Collins, CO
RACHEL LI, Spackenkill High School, Poughkeepsie, NY
JAINIL SUTARIA, Ardsley High School, Ardsley, NY
PROJECT: "Synthesizing and Characterizing Novel Gelatin and Pluronic F127 Hybrid Hydrogels as a Barrier Membrane for Guided Bone Regeneration Following Periodontitis"
FIELD: Materials Science
MENTOR: Miriam Rafailovich, Ph.D., Stony Brook University

Chelsea, Rachel and Jainil developed a novel gel compound that can be used to help regenerate the bone surrounding the root of teeth that has been damaged or degraded due to periodontitis, an infection of the gums that damages and destroys soft tissue and bone.

CHELSEA WANG
YEAR: Senior
HOMETOWN: Fort Collins, CO

"My favorite part about STEM is the power it gives to us as individuals. STEM doesn't discriminate on the grounds of background or age; it gives every person an equal ability to discover something that could change our world, as long as that person has the creativity to find a new solution to the problem."

As a young kid, Chelsea's fascination with science began with making baking soda and vinegar volcanoes and her favorite days were the ones spent at the science museum. As she's grown, she has seen her family members suffering from periodontitis, the painful infection of the gums that damages teeth and she saw an opportunity to apply her love of science to a problem that afflicted those close to her.

Chelsea is the president of her school's Science Olympiad team and a two-time national medalist, finishing 3rd and 4th at the Science Olympiad National Tournament, and she works actively to engage elementary and middle school-aged kids involved in STEM. She serves as secretary of the Science National Honor Society and secretary of the Future Business Leaders of America and won the State competition for Global Business.

Chelsea plays the violin and is on her high school's golf team. Her favorite book is *The Great Gatsby,* and she enjoys listening to the music of American rapper Kendrick Lamar. She looks up to Malala Yousufzai for her strength and courage in the face of adversity. She hopes to pursue a M.D./Ph.D. degree in college and become a neurologist.

SIEMENS | Foundation

RACHEL LI
YEAR: Junior
HOMETOWN: Poughkeepsie, NY

"What I like most about STEM is that it is everywhere around us; the opportunities are bountiful and the possibilities endless. With research in particular, I'm excited by the continuous quest towards understanding and improving the world."

From middle school biology to AP chemistry class to college-level computational neuroscience courses she takes at the Columbia Science Honors Program, Rachel has always been fascinated learning about everything from biological processes to molecular interactions, and deep neural networks. She recognizes science's ability to solve problems in the world around her and to end people's suffering. Because her uncle suffered tooth loss from dental disease, Rachel was inspired to research ways to help people with periodontitis.

Rachel is actively involved in her school's Science Olympiad team since the 7th grade, placing in events such as Materials Science, Chemistry Lab, Rocks and Minerals, and Invasive Species at both the state and invitational levels. Apart from her scientific endeavors, Rachel enjoys playing the violin, piano, and tennis as well as volunteering in her local community. She has been accepted into Area All-State and All-State Orchestras and was selected as Junior High All-County Concertmaster two years in a row.

Rachel is also on her school's varsity tennis team, winning second place in the Mid-Hudson Athletic League Singles Championship. She helps organize and lead a team to host her local community's Annual Chinese New Year Celebration, with the goal to give back to her community and promote Chinese culture. Rachel looks up to her older brother, Vincent, who inspires her to always be the best version of herself.

SIEMENS | Foundation

JAINIL SUTARIA
YEAR: Senior
HOMETOWN: Ardsley, NY

"I'm drawn to STEM because of its endless nature. STEM symbolizes the multiple levels of infinite, where there's always an infinite number of things to learn about the infinite topics that are out there."

Jainil has been involved in STEM and doing research his entire life. His first project was an invention in his elementary school's "Young Inventors" program, where he created a pen with ink, pencil graphite and an eraser all in one tool. He has followed his interest in STEM and has twice won silver medals at the International Genius Olympiad. He also founded, and is president of, his school's robotics club, and is a co-president of "Ardsley Innovates," a club aimed at teaching the novelties of technology to students.

Jainil plays percussion in his school's jazz band and wind ensemble and has played in the All-County and Area All-State bands. He has also earned All-League and All-Section honors for fencing, and he competed at the Junior Olympics for fencing in 2017.

He speaks Gujarati, French and Hindi, enjoys watching the Yankees play and looks up to his mother, father and older sister.

SIEMENS | Foundation

TEAM COMPETITORS

DAVID YUE, Texas Academy of Mathematics and Science, Denton, TX
CAL ROTHKRUG, St. Mark's School of Texas, Dallas, TX
PROJECT: "Innovative High-Performance Polymer-Blended Mixed-Matrix Membranes (PB-MMMs) with Heterogenous Triadic Compatibilizers — Small Organic Molecules, Metal Organic Frameworks, and Carbon Nanotubes — for Effective Gas Separation"
FIELD: Chemistry
MENTOR: Masih Tajik, University of Texas at Dallas

David and Cal developed a cheap and useful device that can filter and recycle harmful gases before they are released into the atmosphere. This could be applied to reduce air pollution and possibly help minimize the effects of climate change caused by pollution related to human activities.

DAVID YUE
YEAR: Junior
HOMETOWN: Plano, TX

"Ever since I was young, I always loved flipping through the pages of Curious George. His inquisitive behavior and quest to satisfy his curiosity has grown with me throughout the years. Even today, in the field of science and math, Curious George's spirit of inquiry inspires and drives my passion for discovery in these fields."

David was first inspired to pursue this research when he visited his grandparents in Asia as a young child. While there, he realized that the air pollution was so bad, people had to wear masks when walking outside, and the air was so hazy that it was hard to see where people were walking. David's passion for addressing environmental problems was solidified when he saw firsthand how Hurricane Harvey destroyed homes, buildings and people's lives.

Since he was young, David has been interested in how things work. His credits his parents with fostering his interest in science, and he considers Curious George his role model because of his inquisitive nature.

David's own curiosity has led him to be engaged in many subjects and activities. He is captain of the robotics team, heads his school's debate team, and participates in Quiz Bowl and other school activities. He's also a musician; he enjoys playing the guitar and drums -- which he taught himself to play -- and

singing. For fun, he plays basketball, table tennis, golf, and squash. Outdoors, David enjoys fishing and hiking, and indoors, his favorite TV shows include Sherlock and The Office.

David is no stranger to the world of STEM. As a middle-schooler, he won first place in the Broadcom MASTERS competition. He also won the national grand prize in the Verizon Innovative App Challenge, for which he created an app to aid learning for dyslexic students.

CAL ROTHKRUG
YEAR: Senior
HOMETOWN: Dallas, TX

"STEM is all about taking the available resources and coming up with something new. It's something that can truly make a difference, no matter how small the strides or contributions."

Cal's favorite subject is physics because it allows him to apply his interests in math to real-world problems. Cal likes the hands-on nature of STEM work and aspires to work either as a scientific researcher or in research and development at a company.

He is editor-in-chief of the *Scientific Marksman*, his school's science magazine, and is president of the Classics Club; Cal can actually speak Latin! He enjoys Ovid's works including *Metamorphoses* and *Ars Amatoria*, which he describes as "saucy" but meaningful and revealing of Roman culture.

Cal's interests aren't limited to academics. He swims and plays water polo. He's also an accomplished musician, having recently achieved all-state in viola, which he has been playing for eight years.