

**Contact:**

Milena Perez Schmidt  
Dentsu Communications  
212-660-6787  
[mperez@dcinyc.com](mailto:mperez@dcinyc.com)

Lauren Espin  
Siemens Foundation  
732-590-2182  
[lauren.espin@siemens.com](mailto:lauren.espin@siemens.com)

**RESEARCH THAT HELPS COMPUTERS IDENTIFY EMOTION IN THE HUMAN VOICE  
AND SHEDS LIGHT ON STAR FORMATION CAPTURES YEAR'S HIGHEST  
SCIENCE HONOR FOR HIGH SCHOOL STUDENTS IN  
2010 SIEMENS COMPETITION IN MATH, SCIENCE & TECHNOLOGY**

**\$100,000 Winners of Nation's Premier Science Research Competition for  
High School Students Announced at The George Washington University**

**Benjamin Clark of Lancaster, Pennsylvania, Wins \$100,000 Individual Prize;  
Akash Krishnan and Matthew Fernandez of Portland, Oregon, Win \$100,000 Team Prize**

WASHINGTON, DC, December 6, 2010 —The year's highest science honor for high school students today was awarded to astrophysics research on star formation and computer science research on identifying emotion in the human voice in the 2010 Siemens Competition in Math, Science & Technology, America's premier science research competition for high school students.

The Siemens Competition, a signature program of the Siemens Foundation, is administered by the College Board. The twelfth annual awards were presented this morning at The George Washington University, host of the 2010 Siemens Competition National Finals.

Benjamin Clark, a 15-year-old senior at Penn Manor High School in Millersville, Pennsylvania, won the \$100,000 Grand Prize in the Individual category for research that sheds new light on how stars are born. Akash Krishnan and Matthew Fernandez, juniors at Oregon Episcopal School in Portland, Oregon, will share the \$100,000 Grand Prize in the Team category for developing a computer algorithm to more accurately detect emotion in the human voice.

"These students inspire us all with their passion and commitment to serious scientific research," said Thomas McCausland, Chairman of the Siemens Foundation. "As America focuses on reinvigorating math and science education, they remind us of what is possible when young people are challenged to do science at the highest level."

Six individuals and six teams competed at the National Finals this weekend after winning one of six regional competitions in November. They presented their research to a panel of judges comprised of nationally renowned scientists and mathematicians headed by lead judge Dr.

Thomas D. Jones, a scientist, author, pilot and former NASA astronaut. Today's \$100,000 winners will ring The Closing Bell™ at the New York Stock Exchange in January.

### **The Winning Individual**

Benjamin Clark won a \$100,000 college scholarship for his project, *The Close Binary Fraction: A Bayesian Analysis of SDSS M Dwarf Spectra*.

"Determining the fraction of stars that, unlike our own Sun, have a companion star is important to understanding how stars form and has implications for the number of planetary systems in the Milky Way," said competition judge Marla Geha, Assistant Professor of Astronomy and Physics, Yale University. "This incredible young scientist has quantified the fraction of low mass stars with close companions, a major piece of work and a significant step in our understanding of star formation."

Using individual spectra from approximately 40,000 low mass M dwarf stars observed by the Sloan Digital Sky Survey (SDSS), Mr. Clark used sophisticated statistical and numerical simulations to demonstrate that binary stars make up 3% of the M dwarf star population. His work is a step towards a more thorough understanding of how stars and planets form. Mr. Clark's mentor was Dr. Cullen Blake, Department of Astrophysical Sciences, Princeton University.

Benjamin Clark is a National Merit Semifinalist, Model United Nations head delegate and a member of the National Honor Society. Active in the Boy Scouts of America, he has participated in the USA Mathematical Olympiad, USA Physics Olympiad, Princeton University Mathematics Competition and Pennsylvania Math League. Mr. Clark plans to major in physics/astrophysics and pursue a career at a major research institution.

### **The Winning Team**

Akash Krishnan and Matthew Fernandez will share a \$100,000 college scholarship for their project, *The Recognition of Emotion in Human Speech*.

"The team built a computer algorithm that allows us to listen to an auditory signal from a human, analyze it and assess the emotional state of the speaker," said competition judge Gert Lanckriet, Department of Electrical and Computer Engineering, University of California, San Diego. "It can help identify, for example, if the speaker is angry, sad, bored, anxious or happy. They came up with a strong creative idea and brought it from theory into practice."

The team was inspired by the movie *I, Robot*, in which a robot can sense when its user is under stress. Using an emotional speech database with 18,215 files and five emotions (anger, positive, neutral, emphatic, rest), the team developed, trained and tested a classification engine to determine emotions from an input signal. The team achieved a 60% accuracy rate in identifying emotions versus 41% with a previous award-winning system. Their work has a broad range of applications, from autism research to computer games and lie detection.

"Their work could even be used to enhance cell phone technology," said Dr. Lanckriet. "With cell phones today most encoding is designed to ensure words are understood, but the

emotional background of the conversation may be lost. Their work could help ensure the emotion comes through.”

Mr. Krishnan and Mr. Fernandez have been working together as a team since the seventh grade. Dr. Bevin Daglen served as their mentor on the project. While continuing to improve on methods used in their study, the team has filed for a patent and is developing a device designed to help autistic children identify and interpret emotions they are hearing. The students indicate they have also had interest in their project from the US government.

Mr. Krishnan is a veteran of numerous science competitions. He placed first in his district’s First Lego League competition for four years running, was a semifinalist in the 2010 Oregon Computer Science Competition, and was awarded Best of Fair with Mr. Fernandez in the Intel ISEF Competition. He plans to pursue computer science and electrical and mechanical engineering in college. He speaks Telegu, plays the piano and clarinet, and has a black belt in Okinawan-style karate.

Mr. Fernandez is captain of his school’s Lemelson-MIT Inventeam and cross country team. A member of the Association of Computing Machinery (ACM), he has won awards in the Aardvark Science Expo, Northwest Science Expo and Intel ISEF Competition, and was invited with Mr. Krishnan to Portugal to attend the European Union Contest for Young Scientists. Mr. Fernandez plans to pursue engineering and computer science in college.

### **National Finalists**

Six individuals and six teams competed at the Siemens Competition National Finals. The remaining National Finalists were awarded the following scholarships:

#### Individuals

- \$50,000 scholarship – Nevin Daniel, Port Jefferson Station, New York (Chemistry)
- \$40,000 scholarship – Connie Liu, Aurora, Colorado (Biology)
- \$30,000 scholarship – Allen Yuan, Farmington Hills, Michigan (Mathematics)
- \$20,000 scholarship – Andrew Liu, Palo Alto, California (Bioengineering)
- \$10,000 scholarship – Caelan Garrett, Fairfax, Virginia (Computer Science)

#### Teams

- \$50,000 scholarship – Jeffrey Shen, Youkow Homma and Lyndon Ji, Carmel, Indiana (Mathematics)
- \$40,000 scholarship – James Pinkerton, Chevy Chase, Maryland, and Rafael Setra, Silver Spring, Maryland (Mathematics)
- \$30,000 scholarship – Santhosh Narayan, Munster, Indiana, Nikhil Mehandru, Roslyn, New York, and Sonya Prasad, Roslyn Heights, New York (Materials Science/Nanoscience)
- \$20,000 scholarship – Sitan (Stan) Chen, Suwanee, Georgia, and Tianqi (Tim) Wu, Lilburn, Georgia (Mathematics)
- \$10,000 scholarship – Benjamin Zhou and Zhongshi (Sam) Wang, Norman, Oklahoma (Biochemistry)

## **The Siemens Competition**

The Siemens Competition was launched in 1998 to recognize America's best and brightest math and science students. Every fall, America turns its eye to the brilliant young scientists competing in the Siemens Competition. 2,033 students registered to enter the Competition this year for a record number of 1,372 projects submitted. 312 students were named semifinalists and 94 were named regional finalists, representing 36 states. Entries are judged at the regional level by esteemed scientists at six leading research universities which host the regional competitions: California Institute of Technology, Carnegie Mellon University, Georgia Institute of Technology, Massachusetts Institute of Technology, University of Notre Dame and The University of Texas at Austin. Winners of the regional competitions are invited to compete at the National Finals in Washington, DC.

Follow the Siemens Foundation on Twitter ([www.twitter.com/sfoundation](http://www.twitter.com/sfoundation)) and Facebook ([www.facebook.com/SiemensFoundation](http://www.facebook.com/SiemensFoundation)) for updates throughout the 2010 Siemens Competition. Visit [www.siemens-foundation.org](http://www.siemens-foundation.org) for a webcast of the National Finalist Awards Presentation.

## **The Siemens Foundation**

The Siemens Foundation provides more than \$7 million annually in support of educational initiatives in the areas of science, technology, engineering and mathematics (STEM) in the United States. Its signature programs include the Siemens Competition in Math, Science & Technology, Siemens Awards for Advanced Placement, and The Siemens We Can Change the World Challenge, which encourages K-12 students to develop innovative green solutions for environmental issues. By supporting outstanding students today, and recognizing the teachers and schools that inspire their excellence, the Foundation helps nurture tomorrow's scientists and engineers. The Foundation's mission is based on the culture of innovation, research and educational support that is the hallmark of Siemens' U.S. companies and its parent company, Siemens AG. For more information, visit [www.siemens-foundation.org](http://www.siemens-foundation.org).

## **The College Board**

The College Board is a mission-driven not-for-profit organization that connects students to college success and opportunity. Founded in 1900, the College Board was created to expand access to higher education. Today, the membership association is made up of more than 5,900 of the world's leading educational institutions and is dedicated to promoting excellence and equity in education. Each year, the College Board helps more than seven million students prepare for a successful transition to college through programs and services in college readiness and college success — including the SAT® and the Advanced Placement Program®. The organization also serves the education community through research and advocacy on behalf of students, educators and schools. For further information, visit [www.collegeboard.com](http://www.collegeboard.com).

***B-roll and photos of winners available at  
<http://inr.synapticdigital.com/siemens/Competition-2010>***

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