ABOUT THE **DAVIDSON INSTITUTE**

OUR MISSION

The mission of the Davidson Institute for Talent Development is to recognize, nurture and support profoundly intelligent young people and to provide opportunities for them to develop their talents to make a positive difference.

OTHER PROGRAMS AND SERVICES

Davidson Young Scholars
If you know of a profoundly intelligent student between 5 and 16 years old who could benefit from our FREE, individualized services, visit www.DavidsonGifted.org/YoungScholars.

The Davidson Academy of Nevada
If you would like to study with your intellectual peers, consider The Davidson Academy of Nevada. On the campus of the University of Nevada, Reno, the Academy is a public school offering an individualized learning program for each profoundly gifted student. Please visit www.DavidsonAcademy.UNR.edu.

THINK Summer Institute
If you are searching for a challenging summer educational opportunity, consider the THINK Summer Institute - a three-week residential college program for 13 to 16 year olds. Find out more at www.DavidsonGifted.org/THINK.

Educators Guild
If you are an educator or professional working in the gifted education field and are looking for a place to ask questions, share ideas and connect with other educators who are excited about meeting the needs of gifted students, take a moment to look at www.DavidsonGifted.org/EdGuild.

Davidson Gifted Database
Access free online articles and resources about the gifted population, in addition to gifted education state policies by visiting www.DavidsonGifted.org/DB.

Genius Denied: How to Stop Wasting Our Brightest Young Minds
Learn about this award-winning book that has been praised as "a manifesto for change" for gifted education, in addition to what you can do to help gifted students, by visiting www.GeniusDenied.com.

www.DavidsonGifted.org

SUBMISSION **CATEGORIES**

The Davidson Fellows program is looking for students whose projects are at or close to the college graduate level with a depth of knowledge in their particular area of study.

Science
A project in a specific area of science, such as physics, biology, chemistry, engineering, earth science, space science, environmental science or medicine.

Technology
A project in a specific area of technology, such as robotics, artificial intelligence or computer programming.

Mathematics
A project in a specific area of mathematics, such as calculus, fractals or number theory.

Music
A portfolio that is representative of the applicant's breadth and depth as a composer, classical instrumentalist or other instrumentalist.

Literature
A portfolio displaying a number of literary styles and genres, such as poetry, fiction, nonfiction and drama/screenplay.

Philosophy
A portfolio presenting analyses of fundamental assumptions or beliefs relating to human thought or culture.

Outside the Box
A project that is university graduate-level or comparable that does not fall in the other application categories.

Please visit **www.DavidsonGifted.org/Fellows** for application details.

HOW TO **APPLY**

$50,000, $25,000 and $10,000 SCHOLARSHIPS

HOW TO BECOME A DAVIDSON FELLOW

Applicants must submit:

- A detailed project or portfolio that is considered a significant piece of work as outlined in each category's application.
- Essays about the work, such as why and how the work was pursued, the challenges that were encountered, and a description of why the submission is significant.
- A 10-minute video describing and showing the work.
- Three nominators who are familiar with the applicant's work.

IMPORTANT DETAILS

- Applicants must be 18 or younger as of October 4 of the year they are applying. There is no minimum age to apply.
- The application deadline is the first Wednesday in February.
- Davidson Fellow Scholarships may be used for tuition and related expenses.
- Scholarship money is available for 10 years.

www.DavidsonGifted.org/Fellows

Fellows DAVIDSON

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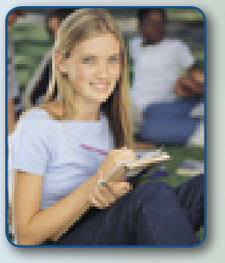
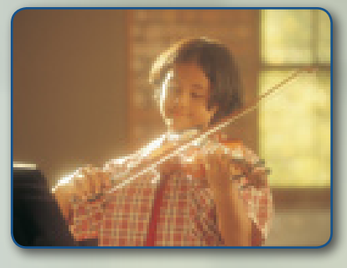
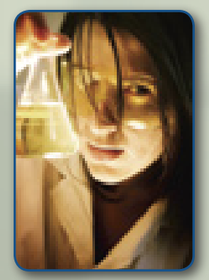






Scholarship

Davidson Institute for Talent Development

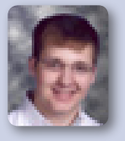
2011 Davidson Fellows

$50,000 Scholarship Recipient

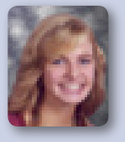
Simone Porter *(Music)*
A 14-year-old young woman from Seattle, Washington, Simone Porter's violin portfolio, *Performance as Soundtrack of Process and Identity*, examines the progression of performance preparation, from the development of technique and interpretation, to the emergence of a professional identity. This process led her to comprehend the transformative, inspirational and transcendent potency music possesses. Through performance, Simone believes music has the potential to aid our society, and help achieve a kinder, more tolerant attitude toward ourselves and our natural environment. Simone was a featured performer on PBS' "From the Top at Carnegie Hall."

$25,000 Scholarship Recipients

Arjun Aggarwal *(Technology)*
A 16-year-old young man from Columbia, South Carolina, Arjun Aggarwal created GNut-III, an Anthropometric Interactive Robot with Vision, Intelligence and Speech. He found the lack of an economically efficient and functional human robot has prohibited researchers from continuing to expand the field of robotics. To counter this, the GNut-III is economically efficient and functional for testing robotic algorithms. In addition to the GNut-III, Arjun has outlined a scattered open source community to work on a standardized platform that could transform robotics in the same way it has transformed computing.



Matthew Bauerle *(Mathematics)*
A 16-year-old young man from Fenton, Michigan, Matthew Bauerle outlined how the Newton direction can be computed by solving a weighted linear least squares problem. When fitting a model to data, such as a line to a set of points, the least squares method is currently the most popular technique. Matthew's work focused on minimizing the ℓ_1 norm of the error which is the sum of the absolute values of the individual errors. Matthew's work has potential in the medical imaging and scanning fields, as well as facial recognition and fluid dynamics simulations.



Marian Bechtel *(Science)*
A 16-year-old young woman from Lancaster, Pennsylvania, Marian Bechtel designed a seismo-acoustic method for detecting landmines. Approximately 70 million landmines plague 80 countries worldwide, claiming one victim every 22 minutes. With Marian's method, two high-sensitivity, non-contact microphones are swept above buried landmines that resonate in response to a remote seismic source. The recorded sound is noise-cancelled in real-time, creating a characteristic, audible null in the noise-cancelled waveform that isolates the mine's location. This efficient and inexpensive method could make important contributions to humanitarian demining.

Benjamin Clark *(Science)*
A 15-year-old young man from Lancaster, Pennsylvania, Benjamin Clark determined the frequency at which M stars form close binary star systems using spectroscopic data from over 39,000 M dwarfs. Using the Sloan Digital Sky Survey (SDSS), Benjamin designed a methodology to use the extremely large, but low resolution and signal-to-noise ratio database, to calculate the close binary fraction. Star formation has long been an open question in astrophysics and this data can be used to test theories of how this process occurs.

Siddhartha Jena *(Science)*
A 17-year-old young man from Bloomfield Hills, Michigan, Siddhartha Jena demonstrated that the immediate effect of elevated cholesterol is dysfunction of active water, oxygen, and carbon dioxide transport by the red blood cells. Using a spectrofluorometer and Zeta Sizer, he showed that exposure of red blood cells to two compounds: ONO-RS-082 and glyburide, results in an amelioration of cholesterol's detrimental effects. Results from his work broaden the understanding of one of the most significant health risks facing our society, and the possible mechanism for its future treatment and management.

Arianna Körting *(Music)*
A 16-year-old young woman from Gates Mills, Ohio, Arianna Körting's portfolio, *Celebration of Life through the Piano*, showcased Haydn, Ginastera and Liszt. Through the piano, she hopes to bring audiences into the lives of the great composers to experience their humor, tenderness and brilliance. She believes music has the power to transform space and time because it has been a constant presence even through the most difficult moments in history. Arianna has been featured on NPR's "From the Top," and started The Animato Project, an interactive program of classical music for elementary school children.

Caleb Kumar *(Science)*
A 15-year-old young man from Blaine, Minnesota, Caleb Kumar developed an algorithm that automates the diagnosis of bladder cancer. Bladder cancer is on the rise with more than 71,000 new cases in 2009. By first identifying indicative bladder cancer cellular characteristics, Caleb programmed morphometric algorithms to quantitatively examine the bladder cell images, and then engineered a Java neural network that differentiates cancerous cells from normal cells based on shape, color and curvature. Caleb's software is accurate, quick and inexpensive compared to current methods, and has the potential to provide faster, cheaper and more precise diagnoses of cytological diseases.

Sunil Pai *(Science)*
A 17-year-old young man from Houston, Texas, Sunil Pai constructed an inexpensive, nanotechnology-based system to determine quantum energies of superoxide. By examining oxygen in the liquid phase instead of the gas phase, his potentiostat system can determine the quantum structure for the electron attachment reaction of oxygen to superoxide. The determination of oxygen's physical properties is essential to fully understanding the role oxygen and many free radicals have in cell processes. This experimentation method may establish other molecular properties that will offer new insights into biological and environmental processes.

Lucy Wang *(Science)*
A 17-year-old young woman from Garnet Valley, Pennsylvania, Lucy Wang developed a predictive model to detect adolescent depression with an overall correct classification of 83.66 percent. Untreated depression is the number one cause of suicide and the third leading cause of death among teenagers. Using factor analysis and logistic regression, she focused on quantifying variables that may lead to adolescent depression, including student self-reported experiences and demographics. Lucy's model will offer a robust instrument for school psychologists to evaluate the risk of future depression.

$10,000 Scholarship Recipients

Cheenar Banerjee *(Technology)*
A 16-year-old young woman from Rochester, Minnesota, Cheenar Banerjee developed a method for emotion detection by computers. It remains a challenge for computers to recognize and respond correctly to the emotional states of an interactive user. After removing some facial detail by converting facial images to black-and-white sketches, Cheenar used fractal analyses to differentiate among emotions using the fractal dimensions. This process has the potential to be simpler, cheaper and more effective than current techniques of emotion detection by computers.

Rebecca Chen *(Mathematics)*
A 16-year-old young woman from Carmel, Indiana, Rebecca Chen studied a generalized version of the Yang-Baxter equation. The Yang-Baxter equation provides a systematic method for discovering braid group representations, important in topology and quantum information science. Using algebraic computations and computer numerical checking, she classified three families of 8x8 matrix solutions to the generalized Yang-Baxter equation. These solutions provide a way to generate braiding quantum gates needed in quantum computing, and contribute to the ongoing effort to build a large-scale quantum computer, bringing advances in fields as far ranging as materials sciences and cryptography.

Jayanth Krishnan *(Science)*
A 17-year-old young man from Mahopac, New York, Jayanth Krishnan developed an approach to infer regulatory mechanisms governing changes in gene expression and identified possible proteins that induce cancer. By creating a web interface that could predict transcription factors for disregulated genes, and mathematical models using MATLAB, he was able to predict proteins that are correlated with certain cancer families. Using this information, he calculated several combinations of drugs, for 60 different cancers, that have the potential to counteract the inducing agents and better guide therapeutics.

Bonnie Nortz *(Literature)*
A 17-year-old young woman from Fairport, New York, Bonnie Nortz's portfolio, *Run and Run and Run*, explores relationships, identity, materialism, oppression and emotion, and covers topics as broad as tourism, grammar, dreams, cartography, winter and even pre-calculus. Her goal was to find the extraordinary in the mundane, the pure in the imperfect and to describe that moment of awakening when everything is just the way it should be. Bonnie hopes to teach others how to go through life with an everlasting energy and curiosity and to appreciate the fantastic emotional and intellectual complexity that comprises our human existence.

Anirudh Prabhu *(Mathematics)*
A 16-year-old young man from West Lafayette, Indiana, Anirudh Prabhu established the first nontrivial analytic lower bounds for odd perfect numbers. The search for odd perfect numbers is one of the oldest unsolved problems in mathematics. Many upper bounds for odd perfect numbers are established, however, no nontrivial analytic lower bounds had been reported prior to Anirudh's work. By narrowing the gap between analytic upper and lower bounds, his work suggests an approach for proving the non-existence of odd perfect numbers and could contribute to data encryption technology.

Shalini Ramanan *(Science)*
A 17-year-old young woman from Richland, Washington, Shalini Ramanan worked with Bisdemethoxycurcumin (BC), a natural dietary component of the spice turmeric, to test its effectiveness in treating cardiovascular diseases. Through cell migration assays and western blot techniques, she found that BC inhibited platelet-derived growth factor (PDGF)-induced vascular smooth muscle cell migration and signaling. Using bioinformatics, she identified target genes connected with signaling pathways. PDGF-stimulated cell-migration and proliferation are key pathological events in a variety of diseases including atherosclerosis and cancer. Her studies may help design and characterize novel drug molecules with clinical applications.

Raja Selvakumar *(Science)*
A 15-year-old young man from Alpharetta, Georgia, Raja Selvakumar, developed the Gastro Microbial Fuel Cell (GMFC). Based on the microbial fuel cell, the GMFC generates electricity using gastrobacteria, to be used to power capsular nanobots. Current lithium ion batteries in biomedical capsular nanobots are not able to sustain power for long periods of time; the GMFC has the potential to solve this problem. The GMFC-powered capsular nanobot can play an important role in treating gastrointestinal diseases through intracellular diagnosis and surgery.

Reylon Yount *(Music)*
A 16-year-old young man from San Francisco, California, Reylon Yount created a yangqin, or Chinese hammered dulcimer, portfolio that has contributed to the preservation of Chinese music, to the introduction of Chinese music to people in the United States, and to the overall interconnection of the music world. His work attempts to take people past the conventional shapes and forms of Western music, helping them appreciate the universality of art. He hopes that such cross-cultural music will build a deeper connection between the East and West, and inspire people to love all music.