

## SUBMISSION CATEGORIES

Davidson Fellows are outstanding young people who demonstrate the development of their talents with a prodigious piece of work in one of the following submission categories:

### 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 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 talent as a composer, vocalist, classical instrumentalist or other instrumentalist.

### Literature

A portfolio displaying a number of literary styles and genres.

### 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 and completed with the supervision of an expert or experts.

Davidson Fellows are awarded scholarships of \$50,000, \$25,000 or \$10,000 and are recognized for their achievements at a special awards reception in Washington, D.C.

Davidson Fellows are encouraged to make a personal commitment to support others in the development of their talents by serving as role models and mentors to other profoundly intelligent young people.

## WHO SHOULD APPLY

Davidson Fellow applicants are individuals who recognize wisdom in the adage, "It's the journey, not the destination." They are passionate about their work and value the opportunity to learn. If you see these qualities in yourself and have been pursuing the development of your talents for an extended period of time, we encourage you to apply.

### 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 15-minute DVD, narrated by the applicant, describing and showing the work.
- Three nominating forms: one from a mentor and/or supervising scientist; one from a teacher, tutor or school administrator; and one from a professional in the field who is familiar with the applicant's work.
- A statement of commitment that, if named as a Davidson Fellow, the applicant and a parent/guardian will attend the awards reception in Washington, D.C. in September.

Applicants must be under the age of 18 as of October 1 of the year in which they are applying.

To download an application, please visit [www.DavidsonFellows.org](http://www.DavidsonFellows.org).

The Davidson Institute must receive Davidson Fellows applications by 5 p.m. Pacific Standard Time on the first Wednesday in March.

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## ABOUT THE 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](http://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](http://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](http://www.DavidsonGifted.org/THINK).

#### Educators Guild

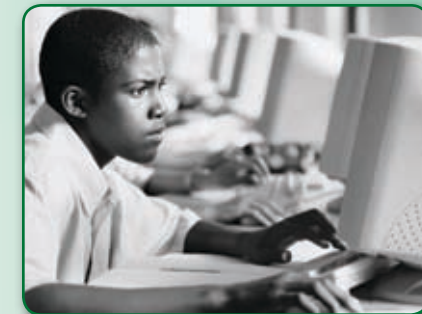
If you are an educator or professional working in the gifted education field and are looking for a place to ask questions, share ideas and connect with other educators who are excited about meeting the needs of gifted students, take a moment to look at [www.DavidsonGifted.org/EdGuild](http://www.DavidsonGifted.org/EdGuild).

#### 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](http://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](http://www.GeniusDenied.com).



## \$50,000 Scholarship Recipients



**Melody Lindsay** (*Music*)

A 17-year-old young woman from Honolulu, Hawaii, Melody Lindsay believes we celebrate mankind's best achievements through music. In her portfolio, *Harping Around the World: Cultural Leadership for the 21st Century*, she draws on her experience as a harpist to connect with audiences. She is particularly interested in inspiring young people to discover and pursue their own passion for classical music. Melody has performed on and serves as a Cultural Ambassador for NPR's "From the Top" and was a Focus on Youth Performer for the ninth and 10th World Harp Congresses.



**Jason Karelis** (*Science*)

A 17-year-old young man from East Setauket, New York, Jason Karelis studied an enzyme called MenD that plays a role in the biosynthesis of a lipid called menaquinone in *Staphylococcus aureus*, the bacterium that causes staph infections. Menaquinone is an electron carrier crucial to *S. aureus*. Jason constructed a mutant strain of *S. aureus* with a disrupted MenD gene and observed its growth on media only with menaquinone added, evidence that MenD is vital for *S. aureus*. Staph infections are a major public health concern and Jason's work provides a platform for a new class of antibiotics.



**Roman Stolyarov** (*Science*)

A 16-year-old young man from Addison, Texas, Roman Stolyarov designed and produced an omnidirectional dielectric mirror for visible light using a unique one-step fabrication process. The mirror is composed of 12 ultrathin alternating layers of two chalcogenide glasses, which were deposited by thermal evaporation onto a transparent silicon dioxide glass substrate. Simulations show that doubling the number of alternating layers would produce near perfect reflectivity, a phenomenon impossible for silvered mirrors, given their inherent losses in the visible spectrum. Roman's process will allow for rapid manufacturing of wavelength specific mirrors with applications in radar filtration and fiber technologies.



**Aditya Palepu** (*Technology*)

A 17-year-old young man from Oakton, Virginia, Aditya Palepu developed a pattern classification algorithm that extracts linear and Gaussian relationships from raw data using a bottom-up approach. Given any data set, all possible models are generated, iteratively weeded down, and refined to better fit the data. This algorithm is effective on benchmark Iris data and synthetic distributions, and was designed so the model library can be expanded to more data sets. Aditya's work has applications in facial/object recognition, data mining, trend analysis, and was used to classify a Washington, D.C. crime database revealing the clustering of criminal activity.



**Nicole Rhodes** (*Literature*)

A 17-year-old young woman from Vancouver, Washington, Nicole Rhodes created a portfolio, *The Dictionary of Distance*, to explore different facets of distance in writing. She considers the space between the author and the work, the distance between a piece's narrator and characters, and the space separating characters and other elements to determine how distance alters memory. Through this examination, Nicole is able to analyze the writing process, the writer's perspective and the final written product. Her portfolio includes a variety of forms, styles and subjects, united in this investigation.



**Amy Levine** (*Literature*)

A 16-year-old young woman from North Potomac, Maryland, Amy Levine examines the shades of gray between black and white in her literature collection, *Grayscale Unraveled*. She demonstrates how life choices that have the greatest impact initially do not appear to be choices at all, but have the potential to be the most transformative. Amy's portfolio explores the small yet important events that determine who we are and how we live, while breaking down the black and white decisions people make to show the grayscale that describes the world.



**Doreen Xu** (*Philosophy*)

A 16-year-old young woman from Indianapolis, Indiana, Doreen Xu explores the foundation of evil in her philosophy portfolio, *The Roots of Evil*. She delves into the human psyche to examine several distinct sources of evil, concluding that all human evil is caused by frustrated human desire. Doreen explores this newly defined dimension of evil with an enlightened perspective, fostering a new method of viewing evil. She hopes this will allow evil to be more effectively combated, leading to a more progressive and harmonious global society.



**Rahul Pandey** (*Science*)

A 17-year-old young man from Rochester, Michigan, Rahul Pandey created a negative index refraction lens made of metamaterials. Metamaterials have the unique property to bend electromagnetic waves of a certain frequency backward, so an image is possible on the opposite side of a lens. He modeled the energy flow of negative index materials in terms of lens geometry, refractive index, focal length and source distance, finding a linear relationship with  $n = -1$ . Rahul's work has applications in stealth technology, antenna elements, radio frequency signal switching, and lenses that do not adhere to the diffraction limit.



**Eric Sherman** (*Science*)

A 15-year-old young man from Ephrata, Pennsylvania, Eric Sherman developed a technique that allows scientists to identify potential bone marrow donors in one percent of the time and for six percent of the cost of traditional techniques. Using polymerase chain reaction and cycle sequencing, he sequenced the genes that determine a person's Human Leukocyte Antigen (HLA) type. Eric then wrote a computer program to analyze the DNA sequence and return possible HLA matches. This technique can potentially be used to identify donors for other transplantable organs, such as kidney, liver and lung, creating the opportunity to save hundreds of lives and millions of dollars each year.



**Yael Dana Neugut** (*Science*)

A 17-year-old young woman from Teaneck, New Jersey, Yael Dana Neugut studied arsenic metabolism and renal function in an arsenic-exposed population in Bangladesh. She found that the association between urinary excretion of arsenic metabolites and creatinine is likely due to their shared metabolic pathway, and that creatine may be an effective way to prevent and treat long-term exposure to arsenic. More than 100 million people worldwide are chronically exposed to high levels of arsenic and are at risk of serious diseases, such as cancer and heart disease. A randomized trial of creatine supplementation is currently underway in Bangladesh.



**Sarina Zhang** (*Music*)

A 13-year-old young woman from San Diego, California, Sarina Zhang strives to show the beauty and emotional value of classical music in her portfolio, *Reaching Out to the World with the Magic of Music*. Through performance, she strives to connect with her audience, moving them with the simple truth of classical music. A pianist and cellist attending The Juilliard Pre-College Division, she has been featured on NPR's "From the Top," performed at Carnegie Hall and toured internationally with the San Diego Civic Youth Orchestra.



**Fiona Wood** (*Science*)

A 17-year-old young woman from North Haven, Connecticut, Fiona Wood explored the brain's ability to perceive and measure interval time using late-spiking (LS) neurons. She created the first biophysically realistic computational model of an LS neuron, and used it to construct neural networks that can accurately and realistically encode time. For all animals, an ability to perceive and measure time is essential for a wide variety of tasks. Fiona's work can lead to better understanding of brain diseases in which interval time encoding is impaired, such as Parkinson's, Huntington's and schizophrenia.

## \$25,000 Scholarship Recipients



**Erika DeBenedictis** (*Science*)

A 17-year-old young woman from Albuquerque, New Mexico, Erika DeBenedictis researched methods of identifying low-energy paths for spacecraft. By carefully planning the route a spacecraft will take, it is possible to reduce the amount of fuel needed by utilizing the natural gravity and motion of planets in the solar system. Erika developed an itinerary-based algorithm to reach specified destinations, which streamlines the process of finding low-energy paths. Such orbits are particularly useful for heavy spacecraft, in which self-propulsion is especially difficult. Use of low-energy paths would allow these spacecraft to reach previously impractical destinations.



**Allison Ross** (*Outside the Box*)

A 16-year-old young woman from Mercer Island, Washington, Allison Ross created a portfolio, *African and Western Heroes' Journeys in Literature: An Exemplification*. Against the backdrop of August Wilson's fiction and the constructs of Joseph Campbell's Hero's Cycle, she explores the relationship between classical Western and African hero mythologies. Allison investigates the derivations, common motives and cultural differences between the two traditions, offering original narratives and critical analysis. Through this work, Allison hopes that others will share her enthusiasm for exploring themes that unite our heritages.



**Connie Kim-Sheng** (*Music*)

A 17-year-old young woman from La Crescenta, California, Connie Kim-Sheng seeks to convey the insights of classical composers in her portfolio, *Inspired by Beauty: Piano Masterworks*. Her performance of pieces by Bach, Beethoven, Chopin, Debussy, and Ginastera provide musical texts that illuminate the span of human feeling and experience, demonstrating a multitude of complex harmonies. Connie has performed on NPR's "From the Top," and for audiences in Sydney, Australia; Calgary, Canada; and Los Angeles. Through her music, Connie hopes to encourage greater respect for cooperation and pluralism in society.



**Darren Zhu** (*Science*)

A 17-year-old young man from Winston-Salem, North Carolina, Darren Zhu worked to develop more efficient data storage technologies by exploring nanofabrication methods for spintronics. Spintronics, or spin-based electronics, are inherently more powerful than electronics, as they exploit electron spin and subsequently are more sensitive than integrated circuit technology. He incorporated molecular self-assembled monolayers (SAMs) into spintronics and performed surface analyses to find that isocyanide-based SAMs are a viable candidate for implementation in nanoscale spintronics fabrication. Darren's work has strong applications in nanotechnology, specifically in the field of nanolithography.



**Nolan Kamitaki** (*Science*)

A 16-year-old young man from Hilo, Hawaii, Nolan Kamitaki designed a computer simulation to determine how viral characteristics and medical supply distribution patterns affect an epidemic's spread across a social network. Starting with a particle-based simulation to analyze basic interaction rates, he moved to a small world network, modeling an epidemic's spread across a population. Nolan's findings showed that children, due to their greater degree of social connection, are most useful for prevention and are the most effective recipients of medical processes.



**Anshul Samar** (*Outside the Box*)

A 15-year-old young man from Cupertino, California, Anshul Samar seeks to make learning a side effect of fun with his project, *Igniting Interest in Chemistry with Elemento Chemistry Card Game*. In *Elemento*, players battle with their element army, activate reactions, create compounds, and conquer opponents using black holes and slippery bases. Anshul hopes that by introducing young people to chemistry in a fun and interactive manner, they will discover a passion for science and pursue it throughout their lives.



**Prithwis Mukhopadhyay** (*Science*)

A 16-year-old young man from Woodbury, Minnesota, Prithwis Mukhopadhyay researched the molecular mechanism by which carrageenan may induce premalignant cell transformation. Carrageenan is an FDA-approved food additive found in dairy products, processed meats, dog food, infant formula and cosmetics. Using mammary epithelial cells, he found carrageenan reduced Arylsulfatase B (ASB) activity and increased sulfated glycosaminoglycans (sGAG), especially chondroitin sulfate, which induced cell migration and pre-malignant transformation. Prithwis' work shows how carrageenan influences breast cancer cell proliferation and migration.