$1.6 million
NASA funding at Vanderbilt in FY 2016

Vanderbilt CubeSats launch to space

NASA selected a miniature satellite designed by a team led by Vanderbilt's electrical engineering faculty to fly as auxiliary payloads aboard rockets, the first of which was launched on Oct. 8, 2015. Two more launches are planned. The Vanderbilt project—RadFxSat (radiation effects satellite project)—is a partnership between the university’s Institute for Space and Defense Electronics and the Radio Amateur Satellite Corporation in Silver Spring, Maryland. These miniature satellites, also known as CubeSats, provide an unprecedented opportunity to test the billions of calculations Vanderbilt researchers have conducted on the ground using computers. These projects also expose a new generation to the exciting discoveries where electrical engineering and computer science intersect with space exploration.

Detector has applications for planetary science, planetary defense, and asteroid mining

Scientists from Vanderbilt and Fisk universities, NASA’s Jet Propulsion Laboratory, and the Planetary Science Institute have developed a gamma-ray spectroscope which can provide planetary scientists with details about the chemical composition of the asteroids, comets, moons, and minor planets in the solar system, improving our understanding of how the solar system formed. The spectroscope could become a tool for planetary defense, because it can determine whether objects crossing Earth’s orbit are made from rock or ice.

All objects in the solar system are bombarded by cosmic rays. High-energy particles strike the exposed surfaces and produce a secondary shower of particles, including neutrons. The neutrons collide repeatedly with the atoms in the material, producing gamma rays, a form of electromagnetic radiation. A gamma-ray spectroscope records the intensity and wavelengths of the gamma rays coming from a surface. This spectrum can be analyzed to determine the concentration of many rock-forming elements and precious metals. The technology may have applications for asteroid mining by enabling the detection of precious metals material hidden within the asteroids.

The project is a product of the Fisk-Vanderbilt Master’s-to-Ph.D. Bridge Program, which aims to increase the number of underrepresented minority students in the science, technology, engineering, and mathematics disciplines.

Vanderbilt student aerospace team takes home top prize at NASA competition

In 2016, the Vanderbilt Aerospace Design Lab (VADL) won NASA’s eight-month Student Launch competition for a fourth year in a row, beating 40 other university teams to secure their victory. The Student Launch competition is a NASA-conducted and aerospace industry-evaluated engineering design challenge built around a NASA mission. The contest involves payload and rocket designs, project reports and design reviews, outreach activities, and website design, followed by a grand finale launch in April. The design lab not only won the overall championship, but also collected awards for payload design and project review at the NASA competition. In addition to participating in the launch contest, the Vanderbilt team conducts educational and outreach activities such as visits to local middle and high schools to teach physics and engineering topics to students, while also answering the students’ questions about science, careers in engineering, and going to college. Many of the VADL members who have graduated are pursuing aerospace careers in either industry or academia.

Mechanical engineering grad student wins space research fellowship

Graduate student Darren Tinker has been selected by NASA for its 2016 class of Space Technology Research Fellows. Tinker is a second-year graduate student in mechanical engineering. His research—An Additively Manufactured Torch Igniter for Liquid Propellants—is funded up to $74,000 for one year, and the award may be renewed for up to three additional years. Under the NASA fellowship, Tinker will design a 3D-printed torch igniter that is hypothesized to act as a suitable replacement for igniters machined out of wrought metal stock.
Tennessee Space Grant Consortium

Vanderbilt is the lead institution for the Tennessee Space Grant Consortium (TSGC), which has approximately 14 affiliate institutions from around the state. The goal of the Space Grant Consortium is to inspire more students to pursue careers at NASA or in STEM fields. TSGC provides scholarships and fellowships to undergraduate and graduate students at each of the affiliated institutions. At Vanderbilt, TSGC also supports Vanderbilt Student Volunteers for Science as they tutor students in the community. Students from schools across Tennessee, affiliated or not, may receive financial assistance through TSGC to attend summer programs at NASA centers.

Extreme Universe Space Observatory

NASA has awarded $4.4 million to a collaboration of scientists at U.S. universities, including Vanderbilt, and NASA's Marshall Space Flight Center to help build a 2.5-meter ultraviolet telescope called the Extreme Universe Space Observatory for deployment on the International Space Station in 2017. The telescope will study the energy spectrum and the nature and origins of cosmic rays. U.S. institutions will use the NASA grant to build lasers, flashers, and monitoring equipment that will be used to calibrate the telescope's optics from twenty locations around the globe as the space station passes overhead.

Planet-finding mission

A team of Vanderbilt astronomers is playing a key role in the planet-seeking space telescope that NASA has approved and scheduled for launch in early 2018. The $200 million spacecraft will perform the first space-borne, all-sky survey for planets circling the brightest stars. Professor of Physics and Astronomy Keivan Stassun is a co-principal investigator on the project. He and his team are selecting the specific stars that the project will target in its search for subtle, periodic dips in brightness that occur when a planet transits across a star's face.