$8.9 million
DOE funding at Vanderbilt in FY 2015

Vanderbilt research will help shape the future of American manufacturing

A cutting-edge Vanderbilt lab that studies how materials and machines operate under real-world conditions is playing a key part in the new multistate, $259-million Institute for Advanced Composites Manufacturing Innovation (IACMI) that is being led by the University of Tennessee–Knoxville. The Department of Energy-funded institute is developing cost- and energy-efficient composite materials and technologies for high-production industries, such as automotive manufacturing. Much of Vanderbilt's work for the institute is taking place at the Laboratory for Systems Integrity and Reliability, co-directed by Doug Adams, Daniel F. Flowers Professor and chair of the Department of Civil and Environmental Engineering. Adams serves as technical lead for Nondestructive Evaluation in IACMI's Composite Materials and Process Technology focus area and collaborates with researchers from the University of Tennessee–Knoxville who lead the materials characterization effort. The goal of Vanderbilt's work is to develop in-line diagnostic systems for quality control in composites manufacturing to accelerate the prototyping and scale-up of technologies in carbon fiber production, composites recycling, 3-D printing, and other areas.

Vanderbilt wins ARPA-E award to transform management of smart grid

Vanderbilt researchers are partnering with experts from Washington State University and North Carolina State University on a $3.5 million award from the Department of Energy's Advanced Research Projects Agency-Energy to create software that can control the Smart Grid—a decentralized power system that is more efficient, sustainable, and reliable than America's current electrical power delivery. The novel software infrastructure will be designed to help manage complex power generation and distribution—solar panels in homes and neighborhood power sources rather than power flowing to individual homes from a power company. With power coming from multiple sources, the Smart Grid will require a sophisticated open-source software platform that designers can build upon with “apps”—specific programs to manage tasks that include monitoring where power is going and where it's lost, and switching circuit breakers to protect and optimize energy flows in neighborhoods or local power grids.

Consortium for risk evaluation with stakeholder participation

The Consortium for Risk Evaluation with Stakeholder Participation (CRESPP) is one of the nation's leading independent, interdisciplinary university research groups. Vanderbilt has served as CRESPP's lead organization since 2000. CRESPP's grant was renewed in 2012 under the leadership of Vanderbilt professors David S. Kosson and Charles W. Powers for $40 million over five years. The objective of CRESPP is to advance cost-effective, risk-informed cleanup of the nation's nuclear weapons production facility waste sites and cost-effective, risk-informed management of potential future nuclear sites and wastes. This will be accomplished by seeking to improve the scientific and technical basis for environmental management decisions by the DOE and by fostering public participation in that search.

World's smallest spirals could guard against identity theft

Funded in part by the DOE's Office of Science, Vanderbilt University researchers have fabricated the world's smallest continuous spirals, "nano-spirals," and then used ultrafast lasers at Vanderbilt and the Pacific Northwest National Laboratory in Richland, Washington, to characterize their optical properties. The nano-spirals demonstrate unique responses to polarized infrared light exposure. These optical properties provide the nano-spirals with a unique, customizable signature that would be extremely difficult to counterfeit. Nano-spirals could be embedded in a credit card or identification card and detected by a device comparable to a barcode reader to provide an additional barrier to counterfeitters.

Scanning electron microscope image of an individual nano-spiral.
(Hagland Lab/Vanderbilt)
Partnering with Oak Ridge National Lab

Oak Ridge National Lab (ORNL) is the largest energy national laboratory in the DOE system. Vanderbilt University is one of the UT–Battelle University Partners, a select group of southeastern universities that work closely with ORNL to generate joint appointments, collaborative research, graduate student opportunities, and regional support for ORNL.

At Vanderbilt, students and faculty members collaborate regularly with ORNL. Padma Raghavan, vice provost for research, serves as Vanderbilt’s representative on the UT–Battelle Board of Governors, which oversees management of ORNL.

In 2014, Vanderbilt and ORNL signed a Memorandum of Understanding to allow graduate students at Vanderbilt to pursue research at ORNL and receive support from ORNL. In the pilot program, three students and their advisers have entered into research exchanges with ORNL investigators. Vanderbilt and Oak Ridge also have an agreement with resources to facilitate new research collaborations between the two institutions, which will generate more faculty and graduate student exchanges. Greg Walker, associate professor of mechanical engineering at Vanderbilt, serves as the core university liaison with ORNL.

Peter Cummings, associate dean for research in the Vanderbilt University School of Engineering, held an ORNL joint faculty appointment for seven years. From 2006 to 2013, he was the chief scientist of the Center for Nanophase Materials Sciences and founded the nanoscience center’s Nanomaterials Theory Institute. Cummings is the deputy director and thrust leader in the Fluid Interface Reaction Structure and Transport Energy Frontier Research Center that the DOE established at ORNL in 2009 and renewed in 2014.

Joseph Hamilton, professor of physics at Vanderbilt, worked with both the University of Tennessee and ORNL to establish in 1981 the first joint institute at ORNL, the Joint Institute for Heavy Ion Research (now called the Joint Institute of Nuclear Physics and Applications).