VANDERBILT
Government *and*
Community Relations
Office of Federal Relations

March 15, 2023

The Honorable Bill Hagerty
251 Russell Senate Office Building
Washington, DC 20510

Dear Senator Hagerty,

Vanderbilt University is grateful for Congress' longstanding and bipartisan support for federal investments in scientific research and education and we urge you to continue that support in FY 2024. Last year, Congress enacted on a bipartisan basis the landmark CHIPS and Science Act which recommitted the U.S. to investing in scientific research to ensure our innovation ecosystem is prepared to lead the world in emerging technologies that are key to our national defense. We call on Congress to robustly fund the research, education, and workforce development programs authorized in that legislation as well as other programs that form the basis of the historic government-university partnership that has produced many of the world's greatest medical and technological advances – as well as untold millions of jobs and trillions of dollars in economic growth.

Unless we improve access to higher education and invest in science and technology, America's global economic and scientific leadership will lag our international competitors. According to the National Science Board's 2022 *Science and Engineering Indicators*, "the share of global R&D performed by the United States declined from 29 percent in 2010 to 27 percent in 2019, whereas the share by China increased from 15 percent to 22 percent." A recent analysis of 44 emerging technology areas shows we are losing our position as the undisputed global leader in innovation. We must recommit ourselves to these investments. Ensuring we are globally competitive is also the best counter to undue foreign influence on U.S. research capabilities.

With federal support, Vanderbilt researchers are developing new technologies to detect disease outbreaks; innovating solutions to Army-relevant challenges; advancing our understanding of child brain development; educating future nursing faculty; and improving outcomes for students with learning disabilities. We should not compromise our future by cutting spending in areas that improve human health and security and are critical to our nation's ability to innovate and compete.

We also believe that the federal government, states, and institutions of higher education must work together to ensure that college remains affordable and accessible for all students. Federal student aid, an essential part of this effort, coupled with Vanderbilt's significant institutional commitment that all undergraduate aid packages include no loans, ensure that we attract highly qualified and diverse students regardless of their ability to pay. Our high graduation rates and lower than average debt levels are evidence that our graduates leave Vanderbilt with a world-class education and the means to succeed in their chosen career paths. We urge Congress to continue its long-term commitment to robust federal student aid programs for undergraduate and graduate students. The single most effective step Congress could take to address access to, and affordability of higher education is to substantially increase the maximum Pell Grant.

Vanderbilt relies on partnerships with federal agencies as a force multiplier in providing high-quality education and in continuing the cutting-edge research that improves our lives and those of future generations. We firmly believe that these investments are a prudent and powerful use of federal dollars. Thank you for your continuing support of Vanderbilt and our funding priorities.

Sincerely,

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VANDERBILT
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COMMERCE-JUSTICE-SCIENCE

National Science Foundation

Request

FY 2021 Final	FY 2022Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
$8.49 billion	$8.84 billion	$9.87 billion	$11.31 billion	$11.9 billion

Justification

For FY 2024, Vanderbilt supports $11.9 billion for the National Science Foundation (NSF). Bipartisan majorities established that NSF needs major growth to meet our competitiveness and national security challenges with passage of the CHIPS and Science Act last year. Now Congress must deliver funding for NSF to meet the ambitious mission that the law envisions. NSF funding lags behind authorization levels in the current year, so for FY 2024 appropriations, it is critical that Congress reach at least the FY 2023 authorized level of $11.9 billion to get the Foundation on track for the growth needed to fulfill the law. The full authorization level for FY 2024 is $15.7 billion.

The authorization for NSF included in the CHIPS and Science Act presents an ambition vision for NSF and sets it on a course to advance domestic innovation and keep pace with investments other countries are making in research and development. The legislation authorizes major growth for the new Technology, Innovation, and Partnerships (TIP) directorate, expanded workforce programs, and emerging priorities across the Foundation. Funding is required to meet the growing mission for technology development and expanding the geography of innovation. TIP has the potential to transform regional economies around critical technology areas, but it needs major growth to meet demonstrated demand, ensure many regions can benefit from transformative resources, and build out a full portfolio of programs.

The CHIPS and Science Act affirmed NSF's major role in STEM education at all levels – innovations for K-12 and lifelong learning, undergraduate education, graduate training, and broadening participation programs to augment pathways for the diverse future workforce critical for our future competitiveness. These programs are the most powerful tools to build our domestic talent base and ensure our competitive edge while other nations are increasingly investing in developing their own STEM workforces. The law also authorized significant increases in both the size and number of graduate fellowship and traineeship opportunities available from NSF, as well as authorizing new initiatives to enhance transformative research and scaling of innovations in K-12 teaching and learning. NSF's education and workforce programs need growth to unleash these new initiatives and build better pathways for education research impact, addressing learning loss, and ensure we have the workforce needed to take full advantage of emerging technologies.

NSF investments in numerous technologies – made over decades – positioned U.S. science to be deployed to fight the coronavirus. NSF needs resources to ensure our resilience going forward towards natural disasters, future pandemics, security threats, or other crises. NSF innovations advance forecasting and

modeling, help build more resilient infrastructure, ensure strong design and planning for resilience, and ensure science and technology can continuously evolve to meet emerging needs or challenges.

In mathematics, computer science, the social sciences, and many other fields, NSF is the major source of federal backing. These fields are critical to industries of the future which fuel our economy, and NSF-funded research in these and other areas fuels research at mission-oriented agencies such as the National Institutes of Health, Department of Defense, and Department of Energy.

Even before the launch of the new directorate TIP and other new programs authorized in the CHIPS and Science Act, NSF was unable to fund more than $2 billion worth of research proposals rated "very good or higher" each fiscal year. It is imperative that the rest of NSF see sustainable growth to continue the forefront research to meet key national challenges. New efforts can only be successful when built on a strong foundational research enterprise that supports research, education, and infrastructure to sustain our science and technology ecosystem.

According to the National Science Board's 2022 Science and Engineering Indicators, "the annual increase of China's R&D, averaging 10.6 percent annually from 2010 to 2019, continues to greatly exceed that of the United States, with an annual average of 5.4 percent from 2010 to 2019. Consequently, the share of global R&D performed by the U.S. declined from 29 percent in 2010 to 27 percent in 2019, whereas the share by China increased from 15 percent to 22 percent." Strong support for NSF in FY 2024 will provide crucial resources and attention to advancements in rapidly evolving technologies and is an indispensable element of the federal government's strategy to improve competitiveness and support national security.

NSF at Vanderbilt

Vanderbilt University received over $32 million from NSF in FY 2022. Examples of NSF funding at Vanderbilt include:

- **Promoting commercialization of basic research across the region:** NSF chose Vanderbilt University to lead the new Mid-South Innovation Corps Hub, a group of nine universities that make up a regional coalition of diverse, tech-forward institutions to promote inclusive innovation, spur economic development and prosperity and transform Midsouth metro areas into growth, and commercialization centers for STEM-related technologies. As the lead institution for the Mid-South I-Corps Hub, Vanderbilt will receive up to $15 million from NSF over five years to fund participant microgrants, engage consultants with I-Corps experience, train I-Corps instructors, lead National I-Corps cohorts, publish materials resulting from hub work and create positions to support programming and outputs. The NSF I-Corps program prepares scientists and engineers to explore the potential of their ideas and research beyond the university. I-Corps accelerates the economic and societal benefits of deep technology research and innovation projects that are ready to move toward commercialization. To date, the Vanderbilt I-Corps site has supported more than 300 teams of researchers, including supporting the first-ever team from Meharry Medical College being accepted into the National I-Corps program. Teams have worked on ideas ranging from a 3D-printed hand orthosis for stroke victims, to a hemorrhage control device for use during trauma surgeries and a blockchain-based workforce development platform. Since fall 2017, more than 24 teams of Vanderbilt students and faculty have been accepted into the national I-Corps program, each receiving a $50,000 grant to explore the commercial potential of their research.
- **Supporting early career faculty:** Vanderbilt faculty held 18 active NSF CAREER awards in FY 2022, which serve as NSF's most prestigious awards in support of early-career faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of their organizations. An associate professor of

mechanical engineering received a CAREER award to conduct foundational research in mechanically adaptive robotics which will enable the creation of new-generation industrial robots, transportation systems and devices that can assist and augment humans. An associate professor of civil and environmental engineering received a CAREER award to develop a novel framework that will improve the ability of power and water systems, the internet and other infrastructure to deal with the intermittent nature of renewables and consumer behavior. An assistant professor of physics and astronomy received a CAREER award to pioneer gravitational wave search techniques that will help characterize some of the universe's most mysterious phenomena.

- **Accelerating innovation through partnerships**: The new NSF Convergence Accelerator program seeks to test new models for innovation in government, industry and academia and is designed to speed basic research toward impactful problem solving by bringing together scientists from different fields, business practitioners and nonprofit leaders to holistically understand problems and craft solutions. As part of the program, NSF has awarded a highly competitive Phase II $5 million grant to Vanderbilt to develop technology to detect biological threats and predict disease outbreaks in major U.S. cities. In the first year, the effort will focus on monitoring and predicting mosquito-borne diseases, which affect nearly 700 million people globally each year.
- **Supporting STEM students:** A record 40 Vanderbilt graduate students received NSF graduate research fellowships in FY 2022, bringing the total number of fellows at Vanderbilt to 77. The fellowships provide three years of support and are aimed at aiding individuals who have demonstrated notable potential early in their research careers and in increasing the diversity of the science and engineering workforce. The Research Experiences for Undergraduates program supports active research participation by undergraduate students in any of the areas of research funded by NSF. At Vanderbilt, REU programs have been provided in the areas of Nanoscale Science and Engineering, Chemical Biology, Physics & Astronomy, and Accountability, Behavior, and Conflict in Democratic Politics.

National Aeronautics and Space Administration

Request

	FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
Office of STEM Engagement	$127.0 million	$137.0 million	$143.5 million	$157.8 million	$154.0 million
Science Mission Directorate	$7.30 billion	$7.61 billion	$7.79 billion	$8.26 billion	$9.0 billion
Space Technology Mission Directorate	$1.10 billion	$1.10 billion	$1.20 billion	$1.39 billion	$1.5 billion

Justification

We urge Congress to appropriate $154 million for the Office of STEM Engagement in FY 2024, which will support the National Aeronautics and Space Administration's (NASA) efforts to increase K-12 involvement in NASA projects, enhance higher education, support underrepresented communities, strengthen online education, and boost NASA's contribution to informal education. Space industry representatives have consistently cited hiring as the most serious challenge space companies face. NASA's Office of STEM Engagement serves a vital role in addressing that challenge, by providing scholarships and fellowships for

students pursuing careers in STEM through Space Grant programs, curriculum enhancement, faculty development, and by supporting STEM programs at Historically Black Colleges and Universities and Minority Serving Institutions. By creating unique opportunities for students and the public to contribute to NASA's work in exploration and discovery through authentic learning experiences with NASA personnel, content, and facilities, NASA helps build a diverse future STEM workforce.

Vanderbilt also recommends $9.0 billion for NASA's Science Mission Directorate (SMD). SMD plays a unique and world-renowned role in advancing the understanding of our planet and universe. Missions throughout the solar system and beyond all contribute to a holistic understanding of humanity's place in the universe. The engineering development and scientific research enabling these missions are both groundbreaking and inspirational. Astrophysics missions help answer humanity's most fundamental questions through discoveries of new solar systems and distant galaxies. Micro-gravity research funded through the Division of Biological and Physical Sciences contributes to our understanding of how technology and humans may thrive in low-Earth orbit in the future. This increase will support major SMD missions, like the James Webb Space Telescope and Nancy Grace Roman Space Telescope (formerly WFIRST), as well as funding for individual investigator grant programs, micro-gravity experimentation, new competitive mission opportunities, and the development of high-payoff technologies.

Vanderbilt recommends $1.5 billion for NASA's Space Technology Mission Directorate (STMD). STMD supports the technology advancement that drives exploration and the space economy. The directorate aims to transform the nation's ability to explore space by funding research and development across the aerospace industry, including at universities. Through programs like early-stage innovation grants and graduate student research fellowships, STMD aims to accelerate the development of technologies that will enable the future of space science and exploration.

NASA at Vanderbilt

Vanderbilt University received over $4 million in research funding from NASA in FY 2022. Examples of NASA-funded programs at Vanderbilt include:

- **Conducting scientific exploration that is enabled by access to space**: From space, in space, and about space, NASA SMD supports research that advances our understanding of our planet and universe. Projects funded at Vanderbilt include basic and applied research of new technologies and design techniques for circuits that will have to operate in the cold-temperature and high-radiation environment of space. Researchers are also developing the science case for a new space-based mission — called the Laser Interferometer Space Antenna — that will fundamentally change our understanding of the universe. Different teams are also working with data from Earth-observing satellites to learn about the impact of undersea volcanoes on the planet, understand ice sheets and glacier processes, and improve rainfall calculations.
- **Developing technology that will support the future of space exploration**: With support from NASA's Space Technology Mission Directorate researchers at Vanderbilt are developing early-stage innovations like power transistors that will be able to operate in the challenging lunar environment—where heavy ions from the sun and cosmic rays, combined with very high voltage required to transmit significant power on the moon, sometimes blow holes in power devices. Partnered with General Electric Research, the team is developing silicon carbide power components that could be used for everything from orbital vehicles to lunar rovers to a moon base to an electrical grid on the lunar surface. NASA STMD also support graduate students through a fellowship program; one Vanderbilt graduate student in the interdisciplinary materials science program was awarded a fellowship for his work on identifying the origins of single-photon emitting defects in semiconductor materials with the

advent of quantum technologies. These technologies offer enhanced sensing capabilities, secure communications, and quantum computing for large-scale simulations.

- **Inspiring future STEM careers:** Through NASA's Student Launch Competition, part of the Office of STEM Engagement, students at Vanderbilt participate in a research-based, competitive, and experiential learning project that is built around a NASA mission. The contest gives students an opportunity to gain first-hand experience with proposing, designing, building, and testing a reusable rocket. Vanderbilt students have won the national championship in seven of the past nine years.

DEFENSE

Department of Defense Research

Request

	FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
Soldier Lethality Technology (PE 0602143A)	$125.4 million	$205.17 million	$253.34 million	$104.47	+$10 million for Pathfinder-Air Assault
Defense-wide Basic Research Initiatives (PE 00601110D8Z)	$75.57 million	$76.83 million	$93.69 million	$71.78 million	$99.31 million
Army University Research Initiatives (PE 00601103A)	$97.15 million	$91.98 million	$107.77 million	$75.67 million	$114.24 million
Navy University Research Initiatives (PE 00601103N)	$144.82 million	$174.90 million	$147.38 million	$96.36 million	$156.22 million
Air Force University Research Initiatives (PE 00601103F)	$196.86 million	$187.40 million	$206.19 million	$182.37 million	$218.56 million
DARPA	$3.57 billion	$3.87 billion	$4.06 billion	$4.39 billion	$4.31 billion

Justification

Vanderbilt supports an increase of $10 million in the Soldier Lethality Technology (PE 0602143A) to support the Pathfinder-Air Assault project. This growing partnership between Army Futures Command, Vanderbilt University, and the University of Tennessee System centers on direct collaboration between university researchers and Soldiers for the timely identification of Army-relevant challenges and co-design of solutions incorporating cutting edge, university-based research. The Pathfinder program aims to provide a new pathway for the Army to exploit emerging technology opportunities ahead of peer and near-peer competitors.

We also support funding the Defense-Wide Basic Research Initiatives (PE 00601110D8Z) at $99.31 million in FY 2024. Vanderbilt supports funding Army University Research Initiatives (URI) (PE 00601103A) at $114.24 million, Navy URI (PE 00601103N) at $156.22 million, and Air Force URI (PE 00601103F) at $218.56 million. Finally, we urge Congress to fund DARPA at $4.31 billion.

Defense Science and Technology (S&T), comprised of 6.1 basic research, 6.2 applied research, and 6.3 advanced technology development programs, are the foundation on which the Department of Defense's

(DOD's) game-changing technologies are developed and fielded. In particular, Defense basic research investments contribute significantly to our nation's economic and national security, with DOD relying on these programs, and their innovations, as a force multiplier. Prior investments in Defense S&T resulted in cutting-edge advances that led to dramatic increases in military capabilities – such as radar, lasers, precision-guided weapons, body armor, and GPS; these advances make our military the best-equipped and most effective in the world and have contributed to successful outcomes in conflicts. DOD's basic research investments also support early-career faculty and students who will become the next-generation of scientists and engineers supporting the world's most advanced and innovative workforce.

The Defense Science Board, National Academies, bipartisan House Armed Services Committee Future of Defense Task Force, Center for New American Security, and Council on Competitiveness all recommend robust funding for Defense S&T to sustain long-term U.S. military supremacy. In the era of strategic power competition, now more than ever, it is imperative that the U.S. redoubles its investments in research, development, and training the Defense workforce.

The Defense-Wide Basic Research Initiatives (PE 0601110D8Z) are vital to the overall Defense S&T enterprise. These programs support the strategic investments in basic research that stimulate the long-term scientific discovery needed to maintain the nation's technological dominance. As the battlefronts and rivals' capabilities continue to evolve, new disruptive technologies are essential in quantum information sciences, artificial intelligence, advanced communications, robotics, and other areas that will enable our military to preserve a leading edge and avoid strategic surprise. The program element includes the Minerva Research Initiative – DOD's signature social science basic research program – which funds university-led teams to improve DOD's basic understanding of the social, cultural, behavioral, and political forces that shape the world. Defense-Wide Basic Research Initiatives also include the National Defense Education Program (NDEP) and the National Defense Science and Engineering Graduate Fellowships program, which support vital STEM activities and scholarships for undergraduates and graduates who will become the next generation of scientists and engineers supporting the world's most advanced and innovative workforce.

University Research Initiatives (URI) are DOD's main mechanisms for engaging with the university community and pursuing basic research to further DOD's technical capabilities. Each of the Services include a URI program element, which provides a way for the Services and the Office of the Secretary of Defense to coordinate with each other and better leverage basic research funds in their partnerships with universities. Each Service's URI includes a Multidisciplinary University Research Program (MURI) and Defense University Research Instrumentation Program (DURIP), which enables that Service to fund projects specific to their mission. These programs require robust support to ensure that DOD and universities can adequately support the fundamental research that will serve as the foundation for future technologies necessary to address the complex challenges our military faces.

The Defense Advanced Research Projects Agency (DARPA) is responsible for making the pivotal investments in breakthrough technologies that support our national security. DARPA aims to achieve transformational change in our Defense capabilities, and these investments complement those of the rest of the Defense S&T enterprise.

DOD at Vanderbilt

Vanderbilt University received over $12 million from DOD in FY 2022. Examples of Defense-funded research at Vanderbilt include:

- **Soldiers and researchers creating new model for innovation:** Soldiers from the 101st Airborne Division, the 160th Special Operations Aviation Regiment, and 5th Special Forces Group (Airborne) at Fort Campbell have teamed up with researchers at Vanderbilt University to solve tactical problems to support soldier missions and enable strategic new Army capabilities that benefit national security – and is serving as a model for military-academic collaboration across the country. The Soldier Assistive Bionic Exosuit for Resupply (SABER) – a first-of-its-kind exoskeleton developed in collaboration with Soldiers in the 101st to prevent injuries for those in sustainment and logistics operations – recently advanced to the next step in the Army's tech transition process. Additional, ongoing projects include addressing concerns from the U.S. Army and 160th SOAR on the impact of aircraft's percussive forces on the performance and health of soldiers, developing and fielding an AI enabled wireless device to improve existing radio systems in the field, suppressing the infrared/heat signature of vehicles used by 5th Group, and accelerating foreign language learning for Soldiers in 5th Group. Several teams of transdisciplinary researchers, Soldiers and industry partners are collaborating on additional projects to pioneer technologies that could benefit both soldiers and civilians, advancing the complementary missions of Army Futures Command and Vanderbilt to further modernize the U.S. Army and improve the human condition.
- **Improving artificial intelligence tools for DOD applications:** An assistant professor of computer science in the School of Engineering received a $875,000 DARPA award to seek ways to improve statistical modeling of machine-learning systems' outputs as part of their Artificial Intelligence Exploration Opportunity on Enabling Confidence. The goal is to advance fundamental research and apply the team's cutting-edge tools to critical applications, such as surgical operations. That professor was awarded another grant from DARPA for $1 million to create advanced artificial intelligence programs that will enable machines to learn progressively over a lifetime and share those experiences with each other. The prototype project received the award as part of the agency's Shared Experience Lifelong Learning initiative. The real-world uses of this new technology could include cooperating self-learning autonomous vehicles such as self-driving cars, robotic rescue and exploration systems, distributed monitoring systems to detect emergencies, or cybersecurity systems of agents that monitor large networks.
- **Mitigating the effects of radiation on defense systems:** Vanderbilt's Institute for Space and Defense Electronics (ISDE) has been selected as the Center of Excellence in Radiation Effects by the Air Force. The $5 million, five-year program will develop tools, experimental techniques, theoretical understanding, and models that can be applied to multiple emerging technologies that will be integral to advanced satellite systems, GPS navigation, remote sensing, communications, and other electronics applications. The capabilities developed through the center will contribute to a wide range of DOD programs and systems. The DOD currently funds work on many electronic and photonic systems that have the potential to provide dramatic improvements in space microelectronics, but little is known about how these new systems will perform or survive in extreme environments, particularly those with significant radiation requirements. ISDE is one of the only academic programs directly supporting the DOD in radiation effects for strategic applications and is one of very few programs involved in microelectronics research for space applications. Over the past decade, ISDE has trained more than 150 engineers with master's degrees and Ph.D.'s. These highly trained individuals go on to support our nation's efforts in radiation hardening and microelectronics research. In addition to government and industry positions, many of them have gone on to work in academia, training future generations to create a sustainable workforce.
- **Supporting Vanderbilt students**: Students at Vanderbilt University have been selected for DOD scholarship and fellowship programs including the DOD SMART award, the Barry M. Goldwater Scholarships, the National Defense Science and Engineering Graduate Fellowships, and the David L.

Boren Fellowships. These programs provide Vanderbilt students with opportunities in STEM fields and foreign languages critical to U.S. interests.

ENERGY-WATER

Department of Energy Research

Request

	FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
Office of Science	$7.03 billion	$7.48 billion	$8.1 billion	$8.8 billion	$9.5 billion
ARPA-E	$427.0 million	$450.0 million	$470.0 million	$650.2 million	$570.0 million

Justification

Vanderbilt recommends $9.5 billion for the DOE Office of Science in FY 2024, consistent with the authorized level in the CHIPS and Science Act (P.L. 117-167). Vanderbilt also supports $570 million in FY 2024 for the Advanced Research Projects Agency-Energy (ARPA-E), consistent with the FY 2023 funding level proposed in the Senate Energy-Water Appropriations bill, to ensure the agency can continue investing in university-based research for high-risk projects that are too far from product development to be supported by industry. We are grateful for the robust funding increases Congress has provided to both the Office of Science and ARPA-E in recent years. This level of funding is needed to maintain U.S. competitiveness. Specifically, increased funding is needed accelerate construction of world-class scientific facilities to stay ahead of international competition, support groundbreaking scientific discoveries, advance energy technologies needed for the nation to meet net-zero carbon emissions, develop emerging technologies, and grow a highly skilled and diverse science and technology workforce that is essential for the United States to compete globally.

The United States must maintain its leadership in science, technology and innovation, and the DOE Office of Science plays a pivotal and leading role in addressing this country's energy, national security, and environmental challenges. The Office of Science is the lead federal agency supporting scientific research for energy and the primary sponsor of fundamental research in the physical sciences. Consistent with the authorized funding level in the CHIPS and Science Act, $9.5 billion for the DOE Office of Science is necessary to maintain a trajectory of growth to support the United States' position as the global innovation leader.

DOE's Office of Science plays a vital role in the American scientific ecosystem – a proven model for success in discovery and innovation. DOE Office of Science sponsors research programs vital to American prosperity and security at research universities and national laboratories and helps maintain the U.S. pipeline of science and engineering talent. DOE Office of Science is also unique among federal science agencies, supporting the network of 17 DOE national laboratories and builds and operates the most sophisticated, world-class scientific user facilities used by research universities, industry, and most federal agencies.

Specifically, this funding level is needed to:

- Grow core research at national laboratories and research universities in the physical sciences, biological sciences, advanced materials, geosciences, computing, and engineering to help develop future energy technologies and fully utilize new and updated world-class facilities and cutting-edge instrumentation.

- Prepare the next generation of American scientific and engineering talent through competitively awarded grants and significantly expand existing workforce and education programs, such as the DOE Office of Science Graduate Fellowship and Computational Sciences Graduate Fellowship, while also creating new programs to address the nation's growing workforce needs in STEM and energy industries as well as meaningfully tackle issues of broadening participation and diversity, equity, and inclusion.
- Accelerate the construction and upgrades of world-class scientific user facilities and maximize operations to support the more than 36,000 researchers from academia, industry, and federal agencies that rely on these facilities for their science and engineering pursuits.
- Advance new, strategic investments in innovative high-risk, high-reward research areas, such as quantum science and technology; artificial intelligence and scientific machine learning; genomics, biotechnology, and other convergence science; microelectronics; next-generation communications; accelerator and laser systems; and optical detectors.
- Maintain and grow multi-disciplinary centers focused on addressing scientific grand challenges, such as Energy Frontier Research Centers, Bioenergy Research Centers, Energy Innovation Hubs, and national quantum information science research centers as well as artificial intelligence co-design and microelectronics research centers.

DOE's ARPA-E takes an innovative approach to funding transformative, high-risk and high reward, early-stage energy research in support of American energy security and economic competitiveness. In support of these goals, additional funding is needed to support additional solicitations and additional innovative, potentially game-changing energy technology proposals. As the National Academy's congressionally mandated assessment of ARPA-E found, the agency is making significant progress towards fulfilling its mission of revolutionizing the energy sector and is having a positive effect on the culture of DOE. These findings, along with ARPA-E's willingness to cease funding projects which fail to meet milestones, demonstrate that ARPA-E is generating a tremendous benefit to the nation while acting as model stewards of taxpayer resources. The success of ARPA-E projects demonstrates that funding these additional projects are likely to create jobs, enhance our national energy security and boost economic activity in communities across the country.

Other nations are making significant investments into advanced energy technologies to seize the economic and geopolitical advantages afforded by technological supremacy. The United States must maintain its leadership in science, technology, and innovation, and the DOE Office of Science and ARPA-E play a pivotal and leading role in addressing our country's energy, national security, and environmental challenges.

Finally, *Vanderbilt supports the inclusion of the following report language on behalf of the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) under Defense Environmental Cleanup as part of the Technology Development and Deployment section ($5 million) and the Oak Ridge section ($2 million):*

> *The specific requested report language for Technology Development and Deployment section is "not less than $5,000,000 is to fund the existing cooperative agreement with the Consortium for Risk Evaluation with Stakeholder Participation [CRESP] for independent review, analysis, applied research and educational initiatives to support cost-effective, risk-informed cleanup decision-making." The specific requested report language requested in the Oak Ridge section is "not less than $2,000,000 for CRESP to provide independent academic expertise for waste management and remediation."*

CRESP seeks to advance cost-effective, risk-informed cleanup of the nation's nuclear weapons production sites as well as potential future nuclear waste management sites. CRESP is the only independent academic organization, with 28 years of experience and institutional memory, that provides multi-disciplinary research and analysis for the nation's nuclear waste cleanup and disposal program and interfaces directly with a range of stakeholders. Through the extensive scientific and technical resources available as well as its independence, CRESP adds credibility and builds confidence in decision making. CRESP expertise includes engineering, health physics, communications, law and policy, ecology and economics.

CRESP achieves its objectives through multi-disciplinary strategic analysis, applied research with extensive student engagement, public outreach, and stakeholder communications, independent expert review and education. Throughout, CRESP emphasizes engagement with the full range of stakeholders. CRESP resulted in the nation's first graduate educational program (at Vanderbilt) focused on nuclear environmental engineering to train the next generation of leaders for the nation's nuclear environmental mission. Since 1995, CRESP has included 133 students from 20 universities, with faculty representing 44 multi-disciplinary research areas, and has served 14 DOE sites.

DOE at Vanderbilt

Vanderbilt University received nearly $12 million from DOE in FY 2022. Examples of DOE funding at Vanderbilt include:

- **Partnering with Oak Ridge National Lab (ORNL):** Vanderbilt is one of the UT-Battelle Core University Partners, a select group of seven southeastern universities that work closely with ORNL to jointly appoint faculty with common scientific interests, support collaborative research, train graduate students, and provide regional support for ORNL in the state of Tennessee. Vanderbilt and ORNL are strongly committed to their ongoing research partnership. Current activities by Vanderbilt researchers at ORNL include use of the Spallation Neutron Source, the nanotechnology laboratories, and the TITAN and SUMMIT supercomputers for engineering, chemistry, physics, biochemistry, and cell biology research. These growing collaborations leverage the institutions' complementary strengths and have the potential to drive innovation and address challenges of national importance, including materials research, semiconductors, and energy storage.
- **Innovating biofuels:** A $1.5 million DOE Office of Science grant is supporting Vanderbilt engineers' exploration of the metabolism of a blue-green algae that holds great promise for biofuel production. The team will take a systems biology approach to identify how cyanobacteria, also known as blue-green algae, can be engineered to produce large amounts of lipids, in the form of free fatty acids, which then can be used as a biofuel. The organism's flexibility makes it especially attractive to DOE as a biomanufacturing host because its growth does not compete with production of crops or other food sources. Another team of researchers is also funded by DOE Office of Science and recently has described a novel method for rapidly characterizing the biological impact of genetic editing on bacteria. The new approach enables researchers to take the consequences of specific genetic edits into account as they engineer the production of specific chemicals from bacteria, including green, biofuels.
- **Transforming grid management**: Vanderbilt risk and reliability experts are part of a $3.25 million DOE ARPA-E-funded project to develop new machine learning algorithms that support decision-making in near real-time on how system operators plan and operate the U.S. grid and leverage renewable energy sources, while minimizing the system risk. The goal of the project is a blueprint for an end-to-end, data-driven approach that balances cost by matching the supply level to the demand and minimizes system-level risk.
- **Supporting nuclear clean up:** A third-year graduate student studying nuclear environmental engineering at Vanderbilt University was awarded a prize in the Innovations in Nuclear Technology

R&D Awards competition sponsored by the U.S. Department of Energy's Office of Nuclear Fuel and Supply Chain. The student was part of a team that explored case studies of former nuclear weapons research and productions facilities at the Oak Ridge National Laboratory and the Hanford Site, a former nuclear production complex on the Columbia River in Washington state, as part of the research performed by the multi-university CRESP group.

INTERIOR

National Endowment for the Humanities

Request

FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
$167.5 million	$180.0 million	$207.0 million	$211.0 million	$225.0 million

Justification

Vanderbilt supports $225.0 million in funding for the National Endowment for the Humanities (NEH) in FY 2024. We are grateful that Congress continues to support the Endowment and provided an increase in the most recent spending package. This support allows NEH to help U.S. citizens develop the wisdom, vision, and knowledge required to participate in a thriving democracy. This civics education is a core element of NEH; from the preservation of historical documents to programs that encourage dialogue across the wide array of American experiences, NEH ensures that the general public has the tools necessary for an informed citizenry.

Programs funded by the Endowment stimulate creativity and innovation while developing cultural competencies critical to global leadership and national security. These programs are vital to ensuring that the U.S. can compete successfully in a global economy and advance sound public policy to address the challenges of the 21st century. Our country's long-term success in meeting economic, global, health, and national security challenges depends on our ability not only to invent and develop innovative technologies, but to understand how these new innovations and discoveries impact our society and culture.

NEH at Vanderbilt

NEH is a vital source of funds for humanities scholars and researchers at Vanderbilt who work to better understand and address the social, economic, and political challenges facing the world today. Over the last five years, Vanderbilt received over $3.2 million from NEH; the state of Tennessee received $14 million from NEH over the same period of time. Examples of NEH funding at Vanderbilt include:

- **Collaborating with partners for humanistic excellence:** Vanderbilt's Robert Penn Warren (RPW) Center for the Humanities was awarded a Challenge Grant from NEH in 1989; the $480,000 grant leveraged $1.9 million in matching contributions from the private sector, which has enabled the Center to become a vital part of the university. The Center facilitates interdisciplinary collaboration between the humanities and the social sciences by hosting annual faculty fellows and convening faculty and graduate students to find both short- and long-term ways to support and promote the humanities at Vanderbilt and beyond.
- **Supporting collaborative humanities**: The College of Arts and Science was awarded a $500,000 NEH grant, as part of the American Rescue Plan, that ensures humanities-related groups across the nation could continue their mission during the COVID-19 pandemic. The grant enabled Vanderbilt to

establish the Collaborative Humanities Postdoctoral Program, which funded 10 postdoctoral fellowships in one of three tracks: urban, environmental, or global humanities.

- **NEH Connection Grants:** During the fall 2019 semester, the RPW Center was awarded an NEH Humanities Connections Implementation Grant which was used for classes and programming in the 2020-2022 academic years. This innovative curricular initiative used Vanderbilt's historic Vaughn Home (built in 1875) as a hands-on lab where students can develop skills relevant to non-academic careers in the humanities, such as archival and archaeological research, historic preservation, museum curation, land use and human-centered design, digital humanities, news, and public affairs.
- **Making history more accessible:** Vanderbilt faculty and staff have been awarded NEH fellowships to support their efforts to make history more accessible to the public. A professor of French will use an NEH Digital Humanities Grant to launch the Immersive global Middle Ages Institute for Advanced Topics, a 28-month initiative studying the use of immersive digital technologies for teaching and learning about the Global Middle Ages through in-person and virtual workshops. With a $100,000 Digital Humanities Advancement Grant from the NEH, as well as funding from the National Park Service, Vanderbilt researchers are creating a database of more than 16,000 enslaved and free Black laborers and soldiers who built and defended Nashville's fortifications during the Civil War, serving as a great resource for Tennesseans tracing their ancestry.

LABOR-HHS-EDUCATION

Health & Human Services

National Institutes of Health

Request

FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
$42.93 billion	$44.96 billion	$47.5 billion	$48.26 billion	$50.92 billion

Justification

To continue to advance public health, improve quality of life, and foster innovation and economic growth, Vanderbilt urges Congress to provide $50.92 billion in FY 2024 for the National Institutes of Health (NIH) base. This would be an increase of $3.46 billion over the comparable FY 2023 program level, which would allow NIH's base budget to keep pace with the biomedical research and development price index (BRDPI) and allow meaningful growth of 5 percent. This increased investment would support consequential progress against pressing health challenges, support local economies, enhance global competitiveness, and support career paths for a diverse workforce. Research funded by the NIH saves lives, improves health, and offers hope to people the world-over affected by disease.

As the world's premier public funder of medical research, the NIH plays an important role in our nation's international leadership, and robust annual growth in support for NIH is key not only to improving people's health but also to maintaining our competitiveness in the global economy. Strong growth for NIH provides critical support for the agency's diverse areas of study, which contribute to our ability to treat the wide range of diseases and conditions facing families and communities nationwide. Robust NIH funding further supports our ability to respond to pandemic and endemic viruses – as evidenced by the important role of NIH in responding to the COVID-19 pandemic. However, the U.S. global leadership in the life sciences is increasingly under threat. If present trends continue, China's financial commitment to biomedical research will be twice that of the United States in the next five years (and four times greater as a share of GDP).

Our nation's biomedical research enterprise is also an economic powerhouse, fueling our economy by contributing to economic activity and job creation in every state. Each year, more than 80 percent of the NIH budget goes out in grants to researchers in every U.S. state and Washington, D.C. Every research dollar that leaves NIH results in $2.60 in economic activity. In FY 2021, the research made possible through these grants supported 552,444 jobs. The income generated by these jobs, along with the purchase of research-related goods, services, and materials, when cycled through the economy, produced $94.18 billion in new economic activity, according to a recent report from United for Medical Research. This included over 11,100 jobs in Tennessee supporting over $1.8 billion in economic activity.

Vanderbilt also supports the nascent ARPA-H as we believe we are well-situated to respond to anticipated funding opportunities to address "high potential, high impact" research beyond what is traditionally supported by NIH. As this new entity ramps up its work in targeted research areas and its focus on accelerating the development of commercial products, we strong believe that for ARPA-H to be maximally successful, funding for ARPA-H should supplement, rather than supplant, the essential foundational investment in the NIH. Healthy growth in the foundational research that the NIH supports is key to lifting the vision for the ARPA-H initiative to accelerate the implementation of research findings to improved health.

NIH at Vanderbilt

NIH is the largest source of federal funding for Vanderbilt University, totaling nearly $144 million in FY 2022. Highlights of NIH-supported research and training at Vanderbilt include:

- **Designing new drugs to treat Alzheimer's, Parkinson's and more:** At Vanderbilt, researchers are developing the next wave of state-of-the-art therapeutics to address major diseases—all due to the initial investment in basic research from the National Institutes of Health. Those investments have led to partnerships with leading pharmaceutical companies who are working to commercialize the therapeutics. Diseases these researchers are developing treatments for include Alzheimer's, Parkinson's, Schizophrenia, Charcot-Marie-Tooth disease, and epilepsy.
- **NIH supports high-risk, high-reward research:** Three Vanderbilt scientists, one in Peabody College of education and human development and two in the School of Medicine Basic Sciences, received grants from the NIH High-risk, High-reward Research Program for their unconventional, bold approaches to research that advances knowledge and enhances health. The program supports highly innovative biomedical or behavioral research proposed by extraordinarily creative scientists that will have a significant impact. The grants will be used to develop a noninvasive brain stimulation protocol to treat low reading comprehension in adults; to use structural biology and enzymology to understand how mitochondrial proteins assemble in cells to produce energy and maintain human health; and to determine the mechanisms that drive viral infection by characterizing these molecular processes in cellular environments.
- **Training future researchers**: At Vanderbilt, a significant NIH funding mechanism consists of National Research Service Awards, which include institutional training grants and F (fellowship) awards that support training doctoral students in the biomedical sciences. The Vanderbilt Medical Scientist Training Program, which has been supported by NIH training grant (T) awards since 1976, prepares students for faculty and research positions with an integrated curriculum that features a strong core education in medicine and intensive training in scientific inquiry. Successful completion of the program leads to both M.D. and Ph.D. degrees, preparing the next generation of physician scientists. The Initiative for Maximizing Student Development at Vanderbilt University, which has been supported by NIH awards since 2000, aims to increase the number of Ph.D.'s. awarded to graduate students in biomedical research who are underrepresented in science. Currently, Vanderbilt has 88

individual F awards and 22 institutional training awards, which support more than 250 students and provide more than $12 million in annual funding. Students supported by NIH National Research Service Award fellowships have contributed to an understanding of fundamental biological principles and have discovered therapeutic strategies for treating diseases like Charcot-Marie-Tooth and COVID-19.

- **NIH supporting interdisciplinary, trans-institutional research:** The Vanderbilt Institute for Surgery and Engineering (VISE), supported in part by $30 million in active NIH grants, many of which are R01s, is an interdisciplinary, trans-institutional institute that supports interactions between the university's Schools of Engineering and Medicine to develop methods, devices, algorithms, and systems to improve patient care. The program adapts to contemporary treatment paradigms and strives to develop new understandings of disease and dysfunction by studying the procedure—from brain tumor surgery, neuromodulation implants and robotic surgeries in the lung, prostate, and kidney, to arterial and ablation therapies in the liver, radio-oncological procedures in the breast and eye, and more. Seventy graduate students have earned their doctorates since the program's start, and there are 124 current students engaged in research at VISE. In addition, 42 patents and 21 licenses have come out of this collaborative work. VISE is also supporting an NIH-funded program for engineering Ph.D. students by providing immersive levels of clinical contact.
- **Ground-breaking advancements in human health:** NIH support is allowing Vanderbilt researchers to make the groundbreaking discoveries and innovations that may change the way diseases and health conditions are treated in the U.S.; this year, Vanderbilt researchers used NIH funding to:
    - understand cancer and develop new treatments and therapeutics;
    - understand how the brain works and develops;
    - Improve treatments for mental health; and
    - address inequities in biomedical training and education.

Title VIII

Request

FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
$264.47 million	$280.47 million	$300.47 million	$349.9 million	$530.0 million

Justification

Vanderbilt supports $530.0 million in FY 2024 for the Health Resources and Services Administration's (HRSA) Title VIII nursing workforce development programs. Over the last 50 years, Title VIII programs have helped build the supply of highly educated nurses who are needed now more than ever as our country emerges from the COVID-19 pandemic. We need a significant investment in these programs to increase and continuously reshape our nursing workforce to better respond to emerging healthcare needs, to cultivate a pipeline of advanced practice nurses and nurse faculty, and to address longstanding health inequities. The COVID-19 pandemic has laid bare these pervasive health inequities as well as gaps in care for our most vulnerable patients, including an aging population.

As our population grows, ages, and becomes increasingly diverse, our health professions workforce must adapt to the ever-changing health needs of patients from all backgrounds in communities across the country. Title VIII programs aim to train a more diverse and responsive nursing workforce to provide quality care for patients in rural and underserved communities. These programs also play a critical role in strengthening nursing education and growing our capacity of nursing faculty who are needed to teach

future nurses. Whether developing a new curriculum to address emerging public health crises, such as substance use disorders or mental health concerns, or collaborating with community leaders in training providers to deliver culturally competent care, Title VIII programs help ensure our nursing workforce is at the forefront of meeting the needs of underserved, rural, and vulnerable populations.

The National Academy of Sciences, in *The Future of Nursing 2020-2030* report, suggested that the number of nursing faculty is inadequate to prepare the next generation of nurses. The report noted that faculty shortages contributed to decisions to turn away more than 80,000 qualified applicants to nurse-training programs. As we seek to address the nursing shortage our country is facing, we must address the longstanding issue of a shortage of doctorally prepared nursing faculty. While the Title VIII Nurse Faculty Loan Program is a key mechanism to support future nurse faculty, more must be done.

As part of an infusion of funding to the Title VIII program, we encourage HRSA to stand up a traineeship program that would build a larger pipeline of doctorally prepared nursing faculty which, in turn, will help schools of nursing expand enrollment. Funding would support public and private schools of nursing, such as Vanderbilt, expand doctoral programs that prepare students to pursue careers as academic faculty. Federal traineeship programs exist at other agencies to support doctoral students in a range of STEM fields. A similar approach at HRSA would help meet the need for additional nurse faculty who can meet the increasing demand for professional nurses. Proposed language is as follows:

> *Traineeships to Address the Nursing Shortage and Prepare Academic Faculty – The National Academies of Science, Engineering, and Medicine ("NASEM") recently issued a report that provided recommendation to Congress to ease the nursing shortage in America. The Committee recognizes the urgent need to address the nursing shortage existing in all parts of the U.S. and grow the pipeline of nurse educators to meet the demand to grow the workforce. Therefore, the Committee encourages HRSA to provide new traineeships and fellowships, including stipends, for eligible entities at both public and private institutions to expand opportunities that prepare individuals for careers in nursing.*

Title VIII at Vanderbilt

Vanderbilt University School of Nursing (VUSN) has received $9.9 million in federal Title VIII funding over the last five years. VUSN has received $1.4 million from the Nurse Faculty Loan Program (NFLP) and $1.5 million from the Nurse Education, Practice, Quality and Retention program over the last five years. Highlights of Title VIII funding at Vanderbilt include:

- **VUSN to increase diversity in health care providers:** Funded by a $3.2 million grant from HRSA, VUSN created a scholarship program for family nurse practitioner, nurse-midwifery, and dual nurse-midwifery/FNP master's students to increase diversity in primary health care providers, particularly in medically underserved areas. The program provides economically disadvantaged students from underrepresented racial and ethnic minority backgrounds with scholarships, support, and education tailored for work in rural or underserved areas. The program's intent is to improve primary and maternity care outcomes for vulnerable populations. The program has demonstrated that the diversity of health care clinicians is linked to improved access to care for racial and ethnic minority patients, improved cultural competence of the general health care workforce, greater patient choice, better patient-provider communication, and better educational experiences for students. Student loan debt can be a roadblock for VUSN students to pursue employment at their clinical locations in rural or medically underserved communities.
- **Building future nursing faculty:** VUSN received a $630,278 grant from the HRSA Nurse Faculty Loan Program to support Doctor of Nursing Practice students who are interested in becoming nursing faculty members. The award brings the total funds the school has received from the NFLP program

since 2008 to more than $10 million. Supported by the NFLP, Vanderbilt is responding to the need for increased numbers of doctorally prepared faculty by growing its Ph.D. in Nursing Science program and its DNP program. In the last 10 years, VUSN has produced 490 graduates who have participated in the NFLP.

- **Behavior Health Workforce Education and Training Grant:** VUSN received a $1.5 million HRSA training grant to increase the Advanced Practice Registered Nurse behavioral health workforce in rural and underserved communities. The grant gives trainees a longitudinal clinical experience in an underserved area as well as specialized training in trauma-informed care. During year one, VUSN secured 17 clinical partner sites and 18 students completed the program. Fifty-one percent of the trainees were from rural or underserved communities. The goal is to increase the number of trainees to help address the behavioral health workforce shortage while preparing them for longevity in desperately needed clinical roles.
- **Collaborative Academic Practice program:** VUSN received a $2.6 million HRSA grant to fund its Collaborative Academic Practice trainee program through the Advanced Nursing Education Workforce program. The program focuses on increasing the presence of family nurse practitioners that can meet the physical and behavioral health needs of rural and underserved communities. Students have completed clinical practicums in rural or medically underserved communities. Since its inception, 48 students have completed the CAP program. According to postgraduation survey data, at least 60 percent of the trainees who completed the program are working in primary care settings, with more than half of them in a rural or medically underserved community.

Department of Education

Student Aid Programs

Request

	FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
Pell Grant max	$6,495	$6,895	$7,395	$8,215	$13,000
SEOG	$880.0 million	$895.0 million	$910.0 million	$910.0 million	$1.12 billion
Work-study	$1.19 billion	$1.21 billion	$1.23 billion	$1.23 billion	$1.55 billion

Justification

Vanderbilt recognizes the critical role that federal student aid programs play in making college affordable. *We urge Congress to support the doubling of the Pell Grant maximum award to $13,000 in FY 2024*, which would serve as an important step in reclaiming much of the original purchasing power of the Pell Grant. The Pell Grant program is the single most important tool to enable low-income students to access and afford college. According to Congressional Budget Office, the program provided more than 7 million students with grants last year. However, Pell Grants no longer cover the majority of costs for students attending a four-year institution, and therefore many low-income students must take on higher levels of debt that prevents them from fully contributing to the economy or earning advanced degrees. Most Pell recipients come from households that earn less than $50,000 annually.

We also urge Congress to increase support for other federal student aid programs that provide grants and work study to low- and middle- income students. *Specifically, Vanderbilt supports increasing the Supplemental Educational Opportunity Grants (SEOG) to $1.12 billion and Federal Work-Study to $1.55 billion, to restore the programs to their pre-sequester, high-water marks, adjusted for inflation.* The SEOG program provides targeted, need-based grant aid of up to $4,000 per student to 1.6 million students.

Participating colleges match federal dollars to make more than $1 billion in grant aid available. Over 99 percent of all SEOG recipients are Pell Grant recipients and SEOG recipients have higher need on average than students receiving only Pell Grants. Federal Work-Study has been shown to positively impact a student's ability to afford college and to improve their chances of graduating. Federal and institutional funding for Work-Study helps more than 600,000 students work part-time to help pay their college costs. Studies show that students who work on campus have higher graduation rates.

Student Financial Aid at Vanderbilt

Vanderbilt University is fortunate to be able to offer prospective undergraduate students a need-blind admissions process while meeting 100 percent of all eligible undergraduate students' demonstrated financial need without loans (see here for more information). Our expanded aid initiative, Opportunity Vanderbilt, means that all of an eligible undergraduate student's demonstrated need is met by grants and scholarships in addition to an expected work component – no need-based loans are included as part of a student's aid package. In 2021-2022, 69 percent of our first-year undergraduates received some type of financial assistance and the average need-based financial aid award received by Vanderbilt undergraduates was $58,494, which exceeds the cost of tuition. Vanderbilt's net price in 2021-2022 for first-time freshmen (the average price paid by families when all aid is subtracted) was $27,553. For families with incomes below $40,000, first-year students received a median award of over $85,000 from the university, federal, and state sources; 22 percent of our first-year class was Pell-eligible.

We achieve this through a sizeable commitment of institutional funds dedicated to student aid complemented by federal and state student aid programs. During the 2021-2022 year, we dedicated nearly $200 million in institutional funds for undergraduate financial aid. Thanks to our debt reduction initiative, our graduates are leaving Vanderbilt with a lower debt burden. The graduating class of 2020 had an average indebtedness of $22,808, over $4,000 less than the state average. Our students also find themselves in a position to repay these debts; our three-year default rate from 2016-2018 was 0.5 percent.

Vanderbilt provided our undergraduate, graduate, and professional students with the following amounts of federal aid during the 2020-2021 award year:

- Over $6.8 million in Pell Grants to 1,336 students;
- Over $1.3 million in Federal Supplemental Educational Opportunity Grants to 342 students (excluding the required institutional matching funds);
- $1.7 million in Federal Work-Study to over 530 students (excluding the required institutional matching funds).

Institute of Education Sciences

Request

	FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
IES	$642.46 million	$737.02 million	$807.61 million	$870.87 million	$900.0 million
NCSER	$58.5 million	$60.25 million	$64.26 million	$64.26 million	$71.65 million

Justification

The Department of Education's Institute of Education Sciences (IES) is the primary federal agency supporting high-quality education research that provides the evidence on which to ground education

practice and policy. *Vanderbilt recommends $900.0 million for IES in FY 2024 to advance rigorous education research and $71.65 million for the National Center for Special Education Research (NCSER).* This funding level would enable IES to build on ongoing research and development activities to improve educational outcomes, address added costs for grants and contracts due to recent inflation, and to bolster education research and data infrastructure. Our education system will be stronger in the future if we provide meaningful, sustained support for rigorous education research and evaluation today.

IES is an independent, nonpartisan branch of the Department of Education charged with providing information on the condition and progress of education; educational practices that support learning and improve academic achievement and access to educational opportunities for all students; and the effectiveness of federal and other education programs. IES works collaboratively across its programs to meet this mission through producing high-quality research, trustworthy data and statistics, and developing partnerships between researchers and practitioners to inform evidence-based education policy and practice.

While we are deeply grateful for the increased funding for IES over the past few fiscal years, even with those added resources IES has been forced to curtail funding new research proposals, was unable to run competitions in education research and special education research, and delayed the administration of important statistical surveys due to limited funds. At the same time, the demand for evidence-based strategies to accelerate learning, reverse learning loss resulting from COVID-19, and to support mental health needs of students and educators requires a significant investment in education research. The National Academies of Science, Engineering, and Medicine (NASEM) also found that the IES budget did not appear to be on par with other scientific agencies and that "the modest size seems particularly unwarranted in light of the high degree of success IES has demonstrated in pursuit of its mission."

NCSER is the only federal agency specifically designated to develop and provide evaluations for programs for students with disabilities, but currently has a budget that remains below its FY 2010 funding level of $70 million. Due to limited funding, NCSER did not run competitions in FY 2022 for its annual special education research and training grants. Yet, with funding from the American Rescue Plan, several NCSER research grants are responding to the particular challenges students with disabilities faced in the COVID-19 pandemic, in collaboration with state agencies and school districts. Even with the success that NCSER-supported work has had to improve outcomes for students with disabilities, there are several important areas, such as educators and school-based service providers; access, participation, and successful completion of college for persons with disabilities; and special education financing for which increased investment in NCSER could support.

IES at Vanderbilt

Vanderbilt is one of the major recipients of IES funding nationally and a top recipient of funding from NCSER, receiving $11.2 million from the Department of Education for research last year. Vanderbilt's Peabody College of Education and Human Development is deeply engaged in high-quality research into highly relevant policy areas, including identifying "what works" in the classroom and identifying methods to assess teachers and school leaders. We believe that basing education policy on research and rigorous evaluations will improve education for all students – if sufficient funding is provided so that theory and research findings can be translated into practice. Examples of IES-funded research at Vanderbilt include:

- **Teaching practices for promoting social-emotional competence and addressing challenging behavior:** A five-year, $2.6 million grant from IES was awarded to a Vanderbilt researcher to conduct an initial efficacy study of a system of supports for implementing the Pyramid Model for Promoting Social-Emotional Competence program-wide in early childhood programs. The team will provide data

on the effects on the program, teaching, and child outcomes and the costs associated with the intervention.

- **Evaluating reading interventions:** A five-year, $4 million grant to examine the efficacy of Sound Partners, a reading intervention delivered through cross-age peer tutoring. The project features moderator analyses to examine how socioeconomic status is related to intervention effects on student reading outcomes. Early achievement gaps between children of high- and low-resource families have persisted over a long period of time for several reasons and learning loss for beginning readers resulting from suspended and altered educational opportunities is exacerbated by the pandemic and schooling interruptions and this may make it impracticable for schools to address all the needs of students on their own.
- **Working to improve education and outcomes for students with learning disabilities:** With support from NCSER, Vanderbilt researchers are examining the effectiveness of specific literacy interventions for third- and fourth-grade students with reading difficulties or disabilities. This study is novel in examining the interventions needed for students with or at risk for reading disabilities at the upper elementary level. Its findings will add to the limited research base on intensive interventions for intermediate grade students with significant reading difficulties or disabilities.
- **Measuring the impact of peer network interventions:** A nearly $700,000 Early Career Development and Mentoring award to develop and test the impact of peer network intervention for minimally verbal students with autism. This intervention has the potential to help educators improve students' membership and belonging in their schools and with their peers.
- **Tutoring program promotes patterning skills in preschool students:** Vanderbilt researchers, with support from IES, developed a new tutoring protocol to help preschoolers better recognize patterns, which is a key skill in mathematics. The research team implemented a five-session tutoring initiative that showed promise for improving repeated patterning knowledge. The researchers found that students in the patterning+numeracy tutoring program performed significantly better on a measure of patterning knowledge after the tutoring was completed than the other two groups. The researchers have made the tutoring curricula and protocol available online for educators.

International Education programs

Request

FY 2021 Final	FY 2022 Final	FY 2023 Final	FY 2024 PBR	FY 2024 Vanderbilt Request
$78.16 million	$81.66 million	$85.66 million	$85.66 million	$173.6 million

Justification

Vanderbilt urges Congress to provide $173.6 million for the Department of Education's International Education and Foreign Language programs in FY 2024. International and foreign language education are of heightened importance to U.S. national interests today. Our nation's global economic competitiveness and expanding security threats rely on language, culture and international expertise and skills. This is true in both traditional security areas, as well as in global health, environment, cyber-security, food safety, law enforcement, and more.

Title VI international education programs, including the flagship National Resource Centers (NRCs), are the foundation of international education in the U.S. Other Federal agencies depend on the education infrastructure created and maintained by Title VI; graduates who have benefited from Title VI programs go on to successful careers in these government agencies, including the military, as well as across business

sectors and in academia. Title VI programs educate thousands of students, teachers, policymakers, military and diplomatic officials, faculty, and the general public. They engage in diplomatic missions in areas of strategic importance around the world.

Restoring Title VI to its historic level of funding is vital to ensuring its programs continue to contribute effectively to our national security, global leadership, and economic competitiveness. Increased investments in Title VI would help meet growing national security demands for foreign language and area studies experts by supporting new and existing NRCs, making Foreign Language and Area Studies (FLAS) fellowship stipends equal to NSF graduate fellowship stipends, and increasing the number of FLAS fellowships. Our nation needs a steady supply of graduates with expertise in less commonly taught languages, world regions, and transnational trends.

International Education programs at Vanderbilt

Vanderbilt's Center for Latin American, Caribbean, and Latinx Studies (CLACX) was designated as a Title VI National Resource Center in 2006. The designation was renewed in 2010, 2014, 2018, and again in 2022 with an award of $1.7 million over four years in NRC and FLAS funds. More information on CLACX is here.

In 2022, CLACX was awarded two Title VI grants totaling $1.7 million that will allow for innovation in curriculum and promotion of public awareness about Latin America. The four-year grants redesignate CLACX as a comprehensive NRC for Latin America; the NRC designation is the highest recognition an academic center can receive. As a comprehensive NRC, the center maintains a remarkable concentration of Latin Americanists, with special strengths in Brazil, Central America, the Andes, and Afro-Latin America, and supports programs that educate students, teachers, the private sector, and the general public about Latin America. Supported by the most recent grant, the researchers will launch the CLACX Consortium for Latin American Studies in the South, a regional partnership, with HBCUs and a Hispanic-serving institution, focused on curriculum building and language training related to Latin American studies. The grants will expand opportunities in language and cultural programs to more classrooms, teacher trainings, online workshops, and professional schools.

In addition to being an NRC, CLACX is one of the select graduate programs approved by the Department of Defense for its Foreign Area Officer training. CLACX provides educational seminars, advice, and counsel on Latin America to the U.S. State Department, the U.S. Southern Command, and local and state governments, including the Tennessee State International Development Office. CLACX also advises Tennessee-based businesses seeking to expand to Latin America on the local, political, and economic conditions in the region. CLACX offers instruction, through in-person courses, virtual/distance courses, and FLAS fellowships, in Portuguese and K'iche' Mayan languages. Portuguese is the sixth most spoken language in the world, and Brazil is an emerging global power with the world's ninth largest economy; this has led the U.S. State Department to consider Portuguese a critical language – a language that is critical to national security and economic prosperity. In 2010, CLACX established the first program in the country teaching K'iche' Mayan, which is considered a less commonly taught language and is spoken by about 1 million people today.