

VCU Office of the Vice President for Research and Innovation (OVPRI)

Annual Research Report, 2021

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(Photo of VCU's Monroe Park Campus - VCU sign lit up)

“Shaping the Future

Annual Research Report 2021”

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Note: text in blue is hyperlinked to more content

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(Photo of P. Sriram Rao, Ph.D., Vice President for Research and Innovation)

To view Dr. Rao's 2021 State of the Research presentation, <https://bit.ly/3yz0ntl>

Shaping the future through transformative innovation

VCU is uniquely positioned to shape the future through transformative innovation. Our faculty, staff, trainees and students are a talented and engaged driving force, reflective of our diverse, urban community. We collaborate to bring creative solutions where others see boundaries. Our creativity and innovation are integrated with community values and the entrepreneurial ecosystem that surrounds us. Every day, our faculty researchers shape the future through their teaching and training of undergraduate and graduate students, post-docs and other trainees, as well as through engaging in numerous efforts to enrich the lives of those in our local community and finding new and potential solutions to society's grand challenges.

Among our many ongoing efforts to shape the future that are bearing fruit now the birth of a liver institute late in 2021 has led to VCU's largest donation ever (<https://bit.ly/3Lu8Qlw>) to support treatment and research; and the renaming of a \$100 million initiative to increase diversity in clinical

trials in honor of the VCU Massey Cancer Center's director (<https://bit.ly/3L8rnme>), whose work regarding health equities is nationally recognized, and much more.

The One VCU Research fosters our transdisciplinary culture across our diverse campuses and disciplines to achieve public impact across the region, the state, the nation and the globe. We are built for breakthroughs.

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One VCU Research Strategic Priorities Plan

Shaping the future

The One VCU Research Strategic Priorities Plan (<https://bit.ly/3wrVVtC>) is our blueprint for transformative innovation. Through our inclusive culture of collaboration, engaged community and creativity, we focus on delivering results that make a difference, addressing today's real-world challenges. These are the challenges that are sometimes hard to see clearly, solve easily or make sustainable. This is where we make breakthroughs happen.

We do this by investing in our strengths, our community-partnered success, our transdisciplinary impact areas focused on enriching the human experience, achieving a just and equitable society, optimizing health and supporting sustainable energy and environments.

In 2021, VCU entered the first two-year phase of this university-wide, six-year plan, with investment commitments to advance public impact research priorities. The plan aligns with our mission and our vision as well as the forthcoming recalibration of the university's overall strategic plan.

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The One VCU Research Strategic Priorities Plan

(Logo of the One VCU Research Strategic Priorities Plan: continuous celtic knot with the four initiatives – enriching the human experience, supporting sustainable energy and environments, achieving a just and equitable society, optimizing health – with “transformative innovation” at the center)

One VCU Research fosters our transdisciplinary culture across our diverse campuses and disciplines to produce transformative innovation with public impact. We collaborate to bring creative solutions where others see boundaries. The breadth of our scholarship across disciplines addresses local challenges with our community partners to deliver bold and practical solutions with global implications.

- Enriching the human experience
- Achieving a just and equitable society
- Optimizing health
- Supporting sustainable energy and environments

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The One VCU Research Strategic Priorities Plan

(Photo of people wearing VR headsets playing violins)

VCU research flourishes by changing the game. We are highly creative and passionate about our community, with a great breadth of knowledge. To help facilitate growth of knowledge and research, the OVPRI released four funding opportunities and another joint funding opportunity with the Provost's office:

- Accelerate fund (<https://bit.ly/3MeEOCu>)
- Arts, humanities and social sciences fund (<https://bit.ly/3L8sfr0>)
- Breakthroughs fund (<https://bit.ly/3MeEOCu>)
- Commercialization fund (<https://bit.ly/3l7WlQC>)
- Quest fund (<https://bit.ly/3MeEOCu>)

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Current research rankings

4 School of the Arts (2nd among public institutions)*

13 Pharmacology**

16 Addiction***

17 School of Dentistry**

25 School of Pharmacy**

25 School of Social Work*

26 School of Education*

32 School of Nursing**

58 Among U.S. Public Research Universities****

64 School of Medicine**

*VCU graduate schools ranked in the top 50 by USN&WR

**Blue Ridge Ranking

***NIH RePORTER

****NSF HERD ranking among public universities

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National research rankings

12 in liberal arts and other non science disciplines

33 in health sciences

44 in life sciences

32 in psychology

38 in Department of Health and Human Services funding

50 in biological and biomedical sciences

*NSF HERD rankings within the top 50 of 515 public institutions

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2021 External sponsored funding

Year after year, VCU research breaks our own external sponsored funding records

\$363 million - Sponsored program awards

\$56 million - State awards
\$57 million - Industry awards
\$165 million - Federal awards
\$85 million - Other (foundation, gifts)

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FY2021 Sponsored program areas - up 8% over FY2020

*in millions of dollars

FY2018 - \$271

FY2019 - \$310

FY2020 - \$335

FY2021 - \$363

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Awards by source

Bar chart depicting awards by source (in millions):

NIH, \$93.45

DOD, \$10.29

Other DHHS, \$18.70

University flow through, \$15.26

NSF, \$7.39

US DoED, \$5.94

Other federal, \$5.80

Industry, \$56.57

State, \$55.90

Other, \$85.10

Totaling \$363 million

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Awards by school

Bar chart depicting awards by school (in millions):

Medicine, \$183.41

Wilder, \$2.07

Other (OVPRI, Provost, Finance), \$24.91

Business, \$0.87

Social work, \$1.15

Nursing, \$2.76

CHP, \$4.19

Dentistry, \$4.88

Pharmacy, \$9.36

Engineering, \$31.37

Education, \$35.54

CHS, \$22.34

Arts (including VCUQ), \$40.05

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Clinical research

\$35 million - Up by 26% over previous year

Dotted flow line connecting:

5,732 total active participants enrolled in clinical research

1,015 active clinical studies

650 active clinical trials at VCU/VCUHS

133 investigator-initiated trials

36 VCU faculty-held FDA applications for new drugs/ devices

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Bringing ideas to life - VCU Innovation Gateway

10 years of impact

>\$30 million - licensing revenue

~\$80 million - startup funding

172 licenses / options

48 products to market

1,213 invention disclosures

192 patents issued

60+ startups

>1,540 patents filed

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Shaping the future: notable honors

Honored fellows:

- Supriyo Bandyopadhyay, Ph.D., Jefferson Science Fellow, National Academies of Sciences, Engineering and Medicine
- Barbara D. Boyan, Ph.D., fellow, Orthopedic Research Society
- Krzysztof Cios, Ph.D., fellow, Asia-Pacific Artificial Intelligence Association
- Henry J. Donahue, Ph.D., fellow, Orthopedic Research Society
- Milos Manic, Ph.D., fellow, Institute of Electrical and Electronics Engineers, president-elect, IEEE Industrial Electronics
- Amy Salisbury, Ph.D., fellow, American Academy of Nursing Shelly Smith, DNP, fellow, American Academy of Nursing
- Shawne Soper, DPT, Worthingham fellow, American Physical Therapy Association
- Sarah Spiegel, Ph.D., international fellow, American Society of Biochemistry and Molecular Biology
- Gary Tepper, Ph.D., fellow, International Association of Advanced Materials
- Bennet Ward, Ph.D., fellow, National Academy of Inventors

- Cang Ye, Ph.D., fellow, American Institute for Medical and Biological Engineering

Other honors:

- Dipankar Bandyopadhyay, Ph.D., Outstanding Statistical Applications Award, American Statistical Association
- Sompop Bencharit, D.D.S., Ph.D., distinguished researcher award, American College of Prosthodontists
- David Cifu, M.D., Magnuson Award for Outstanding Achievement in Rehabilitation Research and Development, U.S. Department of Veterans Affairs
- Jose Cortina, Ph.D., distinguished career award, Academy of Management Research Methods Division
- Susan Gooden, Ph.D., president, Network of Schools of Public Policy, Affairs and Administration
- Robert Winn, M.D., inaugural Cancer Health Equity Award, Association of American Cancer Institutes

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Federal career development and recognition awards

National Institutes of Health Research Career Development Awards:

- Caitlin Martin, M.D., (pictured) director of OB/GYN Addiction Services in the Department of Obstetrics and Gynecology, was given a Mentored Patient-Oriented Research Career Development Award (K23) from the National Institute on Drug Abuse
- Frank Raucci, M.D., (pictured) associate professor, Division of Pediatric Cardiology, holds a Mentored Clinical Scientist Research Career Development Award (K08) from the National Health, Lung, and Blood Institute

National Science Foundation Faculty Early Career Development (CAREER) honors:

- Carlos Castano, Ph.D., (pictured) assistant professor, Department of Mechanical and Nuclear Engineering, College of Engineering, received his NSF award from the advanced manufacturing program of the Division of Civil, Mechanical and Manufacturing Innovation (CCMI)
- Catherine Hulshof, Ph.D., (pictured) assistant professor, Department of Biology, College of Humanities and Sciences, received her award from the NSF Division of Environmental Biology
- Fantasy Lozado, Ph.D., (pictured) assistant professor, Department of Psychology, College of Humanities and Sciences, received her award from the NSF Division of Behavioral and Cognitive Sciences
- Jennifer Puetzer, Ph.D., (pictured) assistant professor, Department of Biomedical Engineering, College of Engineering, received an award from the NSF biomechanics and mechanobiology program in the CMMI division

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VCU Notable Honors:

Rosalyn Hobson Hargraves, Ph.D. (pictured next to the NSF logo)

VCU Engineering professor to lead National Science Foundation's Division of Undergraduate Education. (<https://bit.ly/3N5I9om>)

Hargraves will serve at the NSF for up to four years as its director of the Division of Undergraduate Education. She is a professor of electrical and computer engineering in VCU's College of Engineering and is a recognized leader in advancing equity, excellence and inclusion in STEM education.

Arnethea Sutton, Ph.D. (pictured next to a photo of First Lady Dr. Jill Biden)

Among the researchers First Lady Jill Biden, Ed.D., met while visiting the Massey Cancer Center, was Sutton, who spoke about her research on disparate survivorship of minorities with cancer. Sutton, a postdoctoral fellow in the Department of Health Behavior and Policy at the School of Medicine, had a remarkable 2021. In addition to meeting the First Lady, she received a prestigious NIH K99 grant to study health disparities in breast cancer and was declared a "wunderkind," one of the 27 "most impressive doctors and researchers on the cusp of launching their careers" by the news site [STATnews.com](https://www.statnews.com). She is the first from VCU to win this honor.

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VCU Notable Honors:

Arun Sanyal, Ph.D., (pictured)

New Stravitz-Sanyal Institute for Liver Disease and Metabolic Health (<https://bit.ly/3x8hyzG>)

VCU's new Institute for Liver Disease and Metabolic Health, under the leadership of liver disease specialist and researcher Arun Sanyal, will build on the success of VCU's nationally recognized hepatology and liver transplant programs.

The institute will make VCU a global leader in research and education about liver diseases and metabolically driven disorders and in the care for patients with these conditions.

Milos Manic, Ph.D., (pictured)

VCU named National Center of Academic Excellence in Cyber Research (<https://bit.ly/3sxCdeP>)

The National Security Agency and the Department of Homeland Security have designated VCU as a National Center of Academic Excellence in Cyber Defense Research. The CAE program promotes higher education and research in cyber defense to reduce vulnerability in the national information infrastructure.

The designation reflects VCU's highly interdisciplinary approach to cybersecurity research, which includes its computer science, electrical and computer engineering, information systems and homeland security and emergency preparedness departments.

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VCU Notable Honors

A legacy of learning (<https://bit.ly/3waoJrU>)

(Photo of Bill Dewey, Ph.D.)

With a recent renewal, VCU's Department of Pharmacology and Toxicology's T32 training program has secured 50 years of continuous funding from the National Institute on Drug Abuse. Since the grant was initially awarded, it has provided more than 600 student or trainee years of funding, which includes money for tuition, equipment and supplies. Bill Dewey, Ph.D., first secured the T32 grant in 1976 and has been able to renew it every five years since. This funding source has provided over \$24M in support for students and trainees.

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VCU Student research

VCU undergraduate research symposium

(Photos from the event: students and their research posters)

Following COVID's disruption to campus life, including the in-person recognition of student research, VCU earlier this year resumed its undergraduate research symposium. There were 231 presenters, with representation from every department and discipline.

"It was extraordinarily fulfilling to host the return of our annual Symposium for Undergraduate Research and Creativity at VCU after a two-year hiatus during COVID. Research may have faced delays, setbacks and unprecedented challenges during the past two years, but it never stopped at VCU. That's a testament to the perseverance and unbounded passion for inquiry on the part of our students and faculty," Herbert H. Hill, director of undergraduate research and creative inquiry.

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VCUarts Qatar

(Photo of a VCUarts Qatar building)

Shaping the future

VCUarts Qatar contributes to the human, social, economic and environmental development of Qatar and the region by educating creative problem solvers and art makers.

The faculty's influences on their society are significant, through the education they offer as well as through their research measures. Much of their research is relevant not only to their region but also more broadly across many fields: materials science and nanotechnology to artificial intelligence and advancing pedagogy through research.

Read more about the collaboration: <https://bit.ly/3yzlSKG>

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Enriching the human experience

- Modernizing white canes: Cang Ye, Ph.D. (pictured top left). (<https://bit.ly/3l6lpqT>)
- Improv and homelessness: Elizabeth Byland (pictured top right, middle). (<https://bit.ly/3Ck0YQq>)
- Addressing youth violence: Nicholas Thomson, Ph.D. (pictured bottom right); Terri Sullivan, Ph.D. (pictured bottom left). (<https://bit.ly/3l3cFCe>)

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Achieving a Just and Equitable Society

- Combating inequities in lung cancer: Robert A. Winn, M.D. (pictured left). (<https://bit.ly/3yy8N49>)
- Conversations during crisis: Brittany Haupt, Ph.D. (pictured top right). (<https://bit.ly/3PfvY9f>)
- Segregation in education: Genevieve Siegel-Hawley, Ph.D. (pictured bottom right). (<https://bit.ly/3Na2iIN>)

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Optimizing Health

- Fighting the opioid crisis: F. Gerard Moeller, M.D. (pictured left). (<https://bit.ly/3jQlb7l>)
- Tackling sickle cells: Martin Safo, Ph.D. (pictured top right). (<https://bit.ly/3wp5R7d>)
- Treating triple-negative breast cancer: Senthil Radhakrishnan, Ph.D. (pictured bottom right). (<https://bit.ly/3l6BdvY>)

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Supporting Sustainable Energy and Environments

- Renewable hydrogen: Ram Gupta, Ph.D. (pictured left). (<https://bit.ly/3Qce3kz>)
- New space for ecosystem research: VCU Rice Rivers Center (pictured top right). (<https://bit.ly/3PffnT3>)
- Tracking air quality: Stephen Fong, Ph.D. (pictured bottom right). (<https://bit.ly/39banyh>)

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Designation of VCU-wide research institutes and centers

(Photos of Richmond's skyline and VCU's Monroe Park Campus)

Following a review in 2021, nine institutes and centers earned the designation as a university-wide "VCU Research Institute and Center." These facilities were recognized for not only advancing VCU's overall research funding and enterprise, but for fostering increased collaborative research among various schools and colleges and across our campuses and overall impact.

- Center on Health Disparities (<https://healthdisparities.vcu.edu/>)
- Center for Rehabilitation Science and Engineering (<https://pmr.vcu.edu/research/>)
- Center on Society and Health (<https://societyhealth.vcu.edu/>)
- Clark-Hill Institute for Positive Youth Development (<https://clarkhill.vcu.edu/>)
- Institute for Drug and Alcohol Studies (<https://idas.vcu.edu/>)
- Institute for Research on Emotional and Behavioral Health (<http://cobe.vcu.edu/>)
- Institute for Structural Biology, Drug Discovery and Development (<https://bit.ly/3mdFr3l>)
- Institute for Women's Health (<https://womenshealth.vcu.edu/>)
- Partnership for People with Disabilities (<https://partnership.vcu.edu/>)

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Office of the Vice President for Research and Innovation

The Mid-Atlantic Twin Registry (matr.vcu.edu)

(Photos of twins)

Based at VCU, the Mid-Atlantic Twin Registry plays a role in research across many disciplines and topics, including the heredity of alcohol and drug abuse, psychiatric outcomes of bullying victimization, depression in women, childhood behavioral problems and the long-term biological consequences of sexual assault.

With more than 50,000 participants, the Mid-Atlantic Twin Registry is the largest twin registry in the United States and one of the largest in the world. Twins and other multiples who participate offer researchers the opportunity to study “nature versus nurture.”

“As a natural experiment, MATR twins enable us to study the interplay of both nature and nurture, transforming the way we understand complex genetic and environmental influences on mental and physical health,” said Judy L. Silberg, Ph.D., scientific director of MATR.

In addition to pairing twins with researchers, the MATR also supports research projects by carrying out data collection, project coordination, institutional review board submissions and providing grant applications support. Learn more about the MATR online or by emailing matr@vcu.edu.

Read how the registry is supporting cancer research at VCU: <https://bit.ly/3wa26nt>

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(Photo of VCU's Monroe Park Campus - VCU sign lit up)

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- YouTube: [vcuresearch](https://www.youtube.com/channel/UCuresearch)