



Office of Research and Sponsored Programs

2022 Annual Report



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ASSOCIATE DIRECTOR

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Pam Moser, MPH, CIP (Retired June 2022)

Jeanie Baird, MPA, CIP (Effective June 2022)

ASSISTANT DIRECTOR

Stephen L. Williams, CRA

HUMAN RESEARCH PROTECTION SPECIALIST

Jocelyn Pagel

BUSINESS SERVICES SPECIALIST

Elisa Burton

MISSION

Wake Forest University's Office of Research and Sponsored Programs supports the Associate Provost for Research and Scholarly Inquiry in building faculty research programs of nationally recognized excellence. We assist faculty in their pursuit and management of sponsored activities; work to assure ethical research achievement, especially involving human subjects, in compliance with all relevant laws and regulations; protect the university's interests; and acknowledge and publicize faculty distinction.

CREDITS

The Office of Research and Sponsored Programs gratefully acknowledges photographs by WFU photographer Ken Bennett.

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From The Executive Director

Dear Researchers,

As we all adjust to the new normal, research continues to flourish at Wake Forest University. In FY22, investigators were awarded \$13.6M, approximately \$1M more than in FY21. Although slightly fewer proposals were submitted, 145 vs 153, we requested 80 percent more, the most ever in a single year. The Health and Exercise Science Department faculty contributed to over half of the total amount requested.

We celebrated another milestone last year when three of our junior faculty received prestigious National Science Foundation Faculty Early Career Development Program (NSF CAREER) awards. Abbey Bourdon, Mathematics; Erin Henslee, Engineering; and John Lukesh, Chemistry, were honored. Details about these projects can be found in the following pages.

During 2021-2022, our staff changed. In June, Associate Director Pam Moser retired; since beginning in that position in 2007, she was responsible for significant improvements to WFU's human protections program. Jeanie Baird, former Human Protections Specialist, was selected to fill Pam's role. She then led a search for her former position.

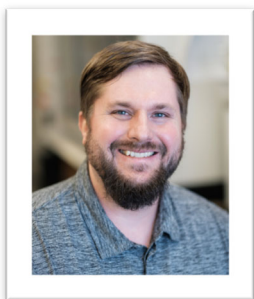
Outside the office itself, Kerri Bolow, Grants Accounting, decided to move back home to New England, where she became Assistant Controller at her alma mater, the University of Massachusetts Amherst. April Poteat briefly left the Reynolda campus for Wake Forest University Health Sciences but returned to take Kerri's place. LuAnne Sledge was hired to replace April as Senior Analyst, Postaward Accounting and Reporting, in Financial Services. Long-time staff member Melissa Doub, who became the Grants and Contracts Manager (GCM) for both Chemistry and Engineering, left WFU. Crystal Reid, GCM for Computer Science, Mathematics, and Statistics, and Psychology, also left.

Congratulations to ORSP Assistant Director Stephen Williams, who renewed his certification (Certified Research Administrator) and was selected to serve a three-year term on the Board of Directors of the Research Administrators Certification Council.

Sincerely,

Lori Gabriel, CRA, Executive Director

Featured Projects



CHEMISTRY

John Lukesh, Assistant Professor of Chemistry, has received a prestigious National Science Foundation 5-year Faculty Early Career Development Program (CAREER) award to develop *New Chemical Tools for Investigating the Biological Significance of Hydrogen Sulfide and Hydrogen Selenide*.

While hydrogen sulfide (H₂S) and hydrogen selenide (H₂Se) are toxic pollutants, they have recently been recognized as biologically active gases endogenously expressed in mammalian systems. In this emerging area of study, we lack a comprehensive understanding of their biological functions, cellular targets, production, metabolism, and steady-state concentration.

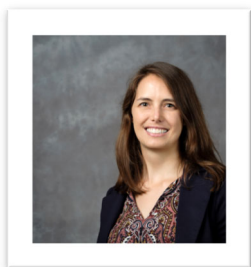
This project is designed to develop new chemical tools that can detect and deliver H₂S and H₂Se under biologically relevant conditions. Objective 1 exploits a novel approach to access a series of donors that release H₂S via a heretofore unknown mechanistic pathway. This versatile donor platform can sharply target delivery and self-report its release of H₂S in a cellular environment; both attributes will transform the field of H₂S chemical biology.

Objectives 2 and 3 will leverage these tools with small molecule donors and reaction-based probes specific to H₂Se to define its potential signaling pathways, including its ability to promote oxidative posttranslational modifications in both isolated and cellular proteins. Results will unlock a new frontier in molecular and redox signaling.

ENGINEERING

Courtney Di Vittorio, Assistant Professor of Engineering, has received an award from the National Aeronautics and Space Administration (NASA) for *Quantification of Historic and Future Changes in Atlantic Coastal Marshes and Implications for Global Ocean Modeling*.

Tidal marshes are invaluable for coastal protection, water filtration, biodiversity, commercial fisheries, and carbon and nutrient storage. With global warming, sea level



rise, and increased storm frequency and intensity, these essential oceanic ecosystems are diminishing. According to decadal US Wetland Status and Trends Reports (Dahl, 2005, 2011), coastal wetlands have declined by approximately 20,000 acres (0.9%) along the Atlantic Coast and 140,000 acres (4%) along the Gulf Coast in the past two decades. The consequences of marsh losses extend beyond their areal extent, especially in terms of the carbon and nutrients they transfer to coastal ocean ecosystems. One of the key findings of the Second State of the Carbon Cycle Report (SOCCR-2; Cavallaro et al., 2018) is that tidal wetlands and estuaries account for approximately 10 percent of coastal ocean carbon uptake. Carbon enters the ocean when coastal marshes become submerged, but currently this flux is not included in the global ocean-climate models used to inform conservation policy.

This project will use satellite data sources to quantify the area of marsh lost across the US Atlantic and Gulf coasts since 1982. Loss maps based on the full database of Landsat imagery will be combined with land and tidal elevation data to estimate future losses associated with alternative climate change scenarios. They will also be used to measure the associated carbon and nutrient fluxes into the ocean and to support development of more accurate representations in Goddard Institute for Space Studies (GISS) Model E, which allows simulation of various earth system eventualities.



Erin Henslee, Assistant Professor of Engineering, has received a prestigious National Science Foundation CAREER award in support of her outstanding research and teaching. Her project, *Investigating the Cellular Electrome as a Biomarker in Red Blood Cell Physiology and Pathology*, is designed to identify an interconnected electrome, or the complete set of ionic currents in a cell, and its role in red blood cells (RBCs).

A cell's electrical properties contain vital information about its functions, but current methods can measure them in only a few cells, require skilled technicians, and do not consider interactions of the various electrical currents present in a cell.

Dielectrophoresis (DEP) shows promise; its ability to measure membrane capacitance, membrane conductance, and cytoplasmic conductivity has been established. The proposed project will elucidate how these properties reflect mechanistic processes in RBCs. Moreover, in preliminary experiments, Dr. Henslee's laboratory linked two

other electrical parameters to DEP output—membrane potential (VM) and an extracellular zeta-potential; they were all once thought unrelated. Collectively, these data point to an interconnected cellular electrome, with an explanatory power potentially comparable to that of the genome and proteome. It will be used to assess a number of RBC phenomena including eryptosis and oxidative stress, important processes in malarial infection, and sickle-cell disease. Once established, the proposed electrome also has potential applications in drug discovery and cancer and stem-cell research.

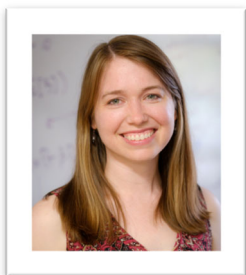
In bridging engineering, biophysics, and the biosciences, the study will require the deliberate integration of education in nurturing a transdisciplinary research group. Undergraduates will be recruited through the work-study program, such student organizations as the Society for Hispanic Professional Engineers and the Society of Women Engineers, and Wake Forest's Undergraduate Research and Creative Activities Center (URECA). Dr. Henslee will also leverage her roles as branding councilor for the AES (Advancing Electrokinetic Science) Electrophoresis Society and education co-chair of The Science of Winston-Salem outreach program to develop a series of educational videos on electrokinetics and micro-electromechanical systems (MEMS) to make the field more accessible and applicable to potential undergraduate student researchers and industry partners.

MATHEMATICS AND STATISTICS

Abbey Bourdon, Assistant Professor of Mathematics and Statistics, has won the National Science Foundation's prestigious CAREER award to lead advances in research and teaching.

Her project, *Exceptional Points on Modular Curves*, examines several well-known classification problems and open conjectures in the field of arithmetic geometry.

Today, systems of polynomial equations have applications ranging from cryptography and computer science to mathematical biology, but they been a central theme in mathematics for thousands of years. One approach to understanding the solution set of such systems dates back to the Greek mathematician Diophantus (ca. 210-295 CE). It seeks only those solutions with coordinates that are integers or rational numbers. When polynomial equations



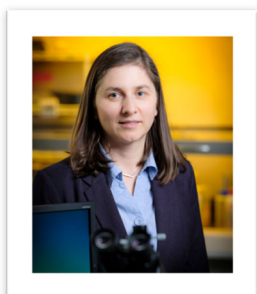
define an algebraic curve, these rational solutions often sit inside a larger, finite set called the set of isolated points of the curve and can be thought of as unexpected solutions to the system of equations. The objective here is to develop new tools to identify when these solutions occur.

Of particular interest are systems of equations that parametrize mathematical objects called elliptic curves, which are ubiquitous in modern number theory. They have far-reaching applications, both in theoretical mathematics—for example, the proof of Fermat's last theorem—and information security, as the basis of a cryptosystem commonly used to secure web browsing. In this context, the unexpected solutions described above correspond to elliptic curves with surprising arithmetic properties.

The award will support research opportunities for graduate students and postdoctoral fellows as well as a research training program for incoming Master's degree students and early undergraduates.

PHYSICS

Oana Jurchescu, Baker Family Professor of Physics, and her partners at the University of Kentucky and Princeton University have been awarded a 1.5-year Special Creativity extension from the National Science Foundation for the project *DMREF: Collaborative Research: Organic Semiconductors by Computationally Accelerated Refinement (OSCAR)*.

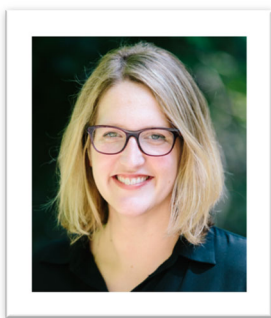


Designing Materials to Revolutionize and Engineer Our Future (DMREF) is NSF's contribution to a larger federal initiative "to deploy advanced materials at least twice as fast as possible today, at a fraction of the cost" (<https://beta.nsf.gov/funding/opportunities/designing-materials-revolutionize-and-engineer-our-future-dmref>). To that end, it supports interdisciplinary teams who integrate theory, experiment, and computation.

OSCAR's key mission is to design organic semiconductor (OSC) paradigms to shorten the path from concept to commercialization, especially the lengthy optimization process for new materials with "on demand" functions. Advances in

OSCs require (1) fundamental knowledge of molecular and material synthesis, property optimization, and device design processes; (2) a multiscale physicochemical understanding of the connections among molecular structure, micro- and macroscopic properties, and OSC performance; and (3) computational exploration of the considerable chemical design space afforded by synthetic organic chemistry, enabled by recent advances in data science and machine learning.

“With support from this extension, we hope to break into real applications like X-ray detectors,” Professor Jurchescu told Wake Forest News reporter Kim McGrath. “We will develop lightweight, flexible sensors that could greatly improve the quality of healthcare through better, lower-cost dose monitoring during radiation diagnostics and therapy” (see <https://news.wfu.edu/2022/03/08/physics-professor-brings-first-nsf-special-creativity-award-to-wfu/>).

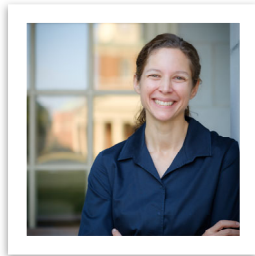


WFDD

Emily Blacklin McCord, News Director, WFDD, has received two awards, a Report for America (RFA) *Newsroom Host Grant* and Kate B. Reynolds Charitable Trust funding for *Bilingual Communications to Increase Health Insurance and Public Benefit Enrollment among Latinx Communities in Forsyth County*.

Working with La Noticia, a publishing company headquartered in Charlotte that serves the Piedmont Latinx community, WFDD programming is providing reliable, timely, and critical information on COVID-19: dispelling myths about vaccines, identifying resources, and relating personal experiences. The first award helps to support a reporter who creates Spanish and English written content, along with photos, videos, and multimedia when possible, shared by both outlets. The reporter aims to produce one in-depth story a week in both languages. As the pandemic evolves, the scope will broaden to include general healthcare. Both organizations use audio and digital platforms to increase awareness of, access to, and participation in, services, especially those for the underserved.

Fellowships and Awards



SOCIOLOGY

Catherine Harnois, Professor of Sociology, has been awarded a fellowship from the University of Essex to conduct research *Assessing Intersectional Interviewer and Mode Effects in Reports of Discrimination*.

Understanding social discrimination is vital for understanding, analyzing, and addressing inequality. In 2009, the Institute for Social and Economic Research at the University of Essex launched Understanding Society, a longitudinal study interviewing all members of 40,000 households every year to gather their responses to a range of social, economic and behavioral questions and any changes over time. Such large-scale surveys are powerful tools for defining the extent of discrimination and its myriad effects on individuals, communities, and societies. However, respondents' answers to questions about discrimination can be shaped by survey mode and, in face-to-face interviews, by interviewer characteristics and degree of concordance with respondents in salient social categories.

Prof. Harnois's research couples an intersectional, social psychological theoretical framework with multivariate statistical analyses of Understandings Society data to investigate how and to what extent the mode of data collection and interviewer characteristics shape reports of specific and general forms of discrimination among diverse social groups. Findings will help researchers to interpret survey research and to design surveys that better reflect diverse groups' perceptions of discrimination. These contributions will help communities and policymakers to understand the pervasiveness of discrimination and to assess how it changes over time and in response to specific policies and events.

Professional Development

INTERNAL AWARDS

The Office of Research and Sponsored Programs assists the Vice Provost for Research and Scholarly Inquiry in coordinating and administering internal award programs. In FY22 there were two deadlines for Pilot Research Grants and one for Collaborative Pilot Grants. A total of \$38,471 was awarded for Pilot Research Grants, which was supported entirely through gifts from the ZSR Foundation.

The office also manages matching/cost share funds. In FY22 \$121,784 was provided for sponsored project cost share, open-access publishing, high speed computing equipment, start up, and other initiatives.

PROFESSIONAL DEVELOPMENT

In FY22, the office spent nearly \$49K hosting and coordinating virtual and in-person professional development workshops and events as well as faculty and staff professional development, research awards, and prizes. Supported programs and events include:

Creative Research Activities Development & Enrichment Program (CRADLE)

Responsible Conduct of Research Training for Graduate Students

Building Research Success at Wake Forest University

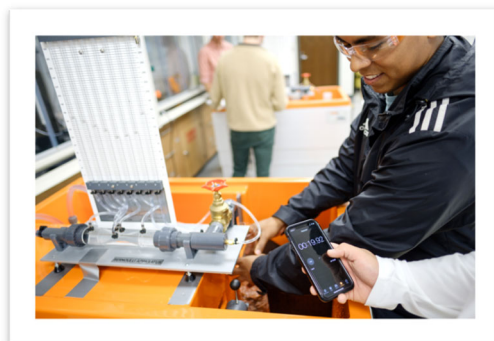
Winning Grants Seminar Parts I and II

ACC InVenture Prize Competition

NSF CAREER Proposal Discussion

Centers & Institutes Retreat

Quality Circle Training



Human Research Protection

ORSP provides administrative support to the Institutional Review Board (IRB) under federal Department of Health and Human Services (DHHS) regulations 45CFR §46.

In FY2022, the IRB reviewed 111 new applications in the following categories: 1 full-board, 3 expedited, 2 exempt, and 105 flex, the same process as an exempt/expedited review but overseen by only one IRB member. It processed 283 amendments (283), 3 continuing reviews, and 286 annual updates. The average number of active applications increased 7.65% from 2021 to 394 per month, and April witnessed the highest number in office history (415).

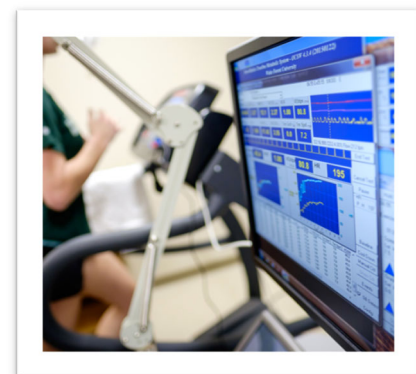
As we emerged from the pandemic, many new applications returned to in-person research methodologies. In most currently active studies, both virtual and in-person procedures are approved, eliminating the need for amendments.

Our human research portfolio includes very few federally funded projects, but this year, we hit an all-time high of 16 approved studies.

In May 2022, eIRB along with other systems shared with Atrium Wake Forest Baptist migrated from physical servers to a cloud-based system. The transition occurred over a weekend and was seamless to end users. We continue to make improvements to eIRB, both programmatically and in terms of application content. We anticipate our eIRB software will be upgraded early in 2023.

The close of the fiscal year also brought administrative staffing changes. Pam Moser served ORSP as Associate Director of the Human Research Protections Program for nearly 15 years. She finished her career and retired at the end of June. Jeanie Baird was selected to replace her as Associate Director, and Jocelyn Pagel assumed her previous role as Human Subjects Protection Specialist.

We are excited about and ready to assist in the future growth of human subjects research at Wake Forest University!



Funding Highlights

In FY22, Wake Forest University received \$13.6 million in support for research and other scholarly activities, not including the awards for scholarship in the social sciences and humanities. Faculty and staff submitted 145 proposals, requesting just over \$92 million.

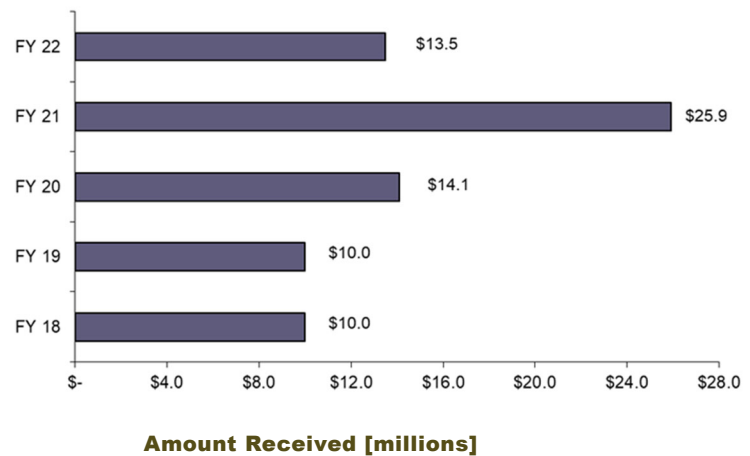
Federal grants accounted for 84% of all funding. The Biology Department received the highest amount, followed closely by Engineering. Faculty in the Health and Exercise Science Department submitted the most proposals and requested the most dollars. In fact, HES researchers requested more funding in FY22 than did all departments in FY21.

The following faculty and staff received their first grants at WFU this year:

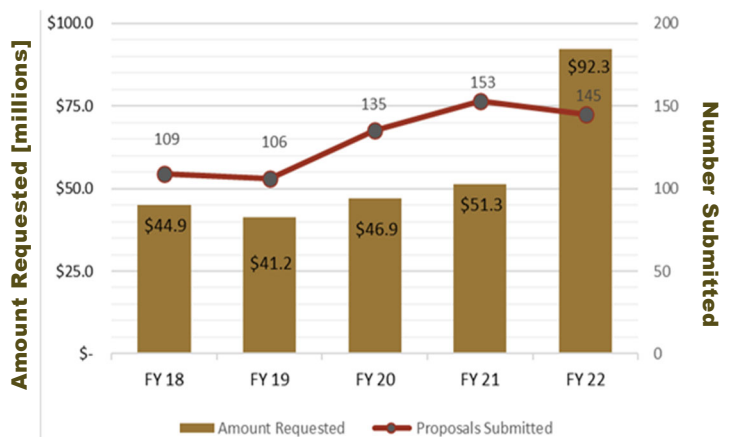
- Glen Marrs, Biology
- James Pease, Biology
- John Lukesh, Chemistry
- Troy Stich, Chemistry
- Minghan Chen, Computer Science
- David Johnson, Counseling
- Allison Matthews, Divinity
- Tommy Leung, Economics
- Tricia Clayton, Engineering
- Courtney Di Vittorio, Engineering
- Abbey Bourdon, Mathematics and Statistics
- Jon Gemmer, Mathematics and Statistics
- Mason Garrison, Psychology
- Anthony Sali, Psychology
- Brittany Battle, Sociology
- Catherine Harnois, Sociology
- David Sikkink, Sociology

The statistics that follow summarize Reynolda campus sponsored research activity for FY22. Graphs represent funding processed through the Office of Research and Sponsored Programs, not gifts nor fellowship awards made to individual faculty. Awards represent authorization to spend as opposed to research expenditures.

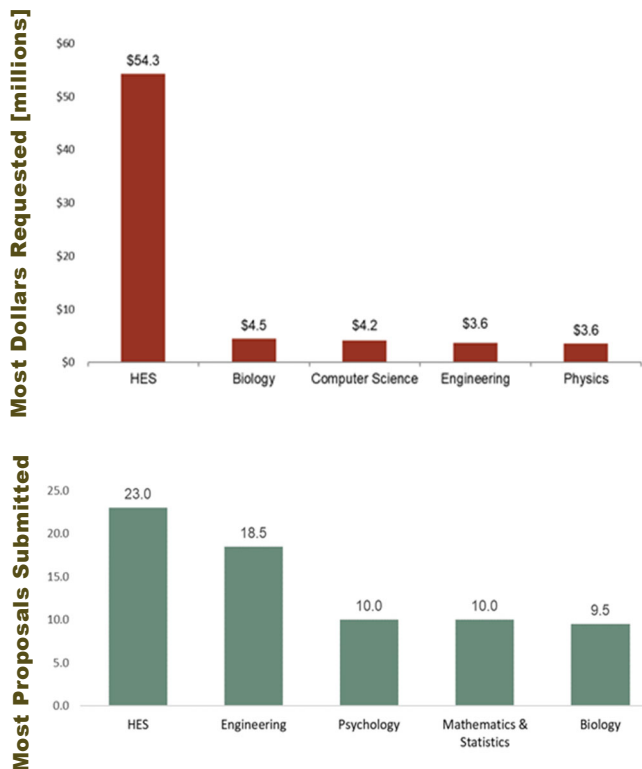
AWARDS BY YEAR: 2018-2022



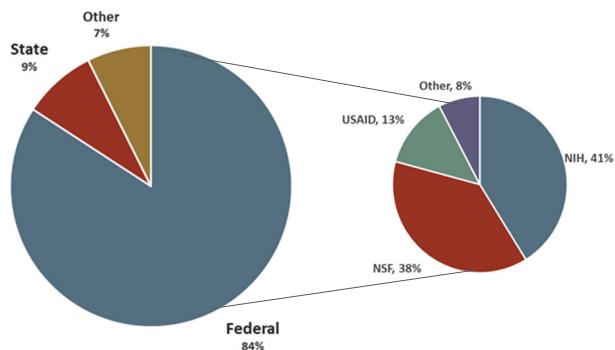
PROPOSALS BY YEAR: 2018-2022



PROPOSALS BY DEPARTMENT



FUNDING SOURCES



Department/Center	Awards	Amount	New Awards	Amount
Biology	6	2,465,335.23	3	1,399,394.00
Engineering	14	2,069,953.53	8.5	1,529,085.12
Health & Exercise Science	13	1,317,060.62	2.5	572,257.00
Mathematics & Statistics	10	1,005,436.18	8	972,400.00
Provost Office	2	984,662.00	2	984,662.00
Center for Energy, Environment and Sustainability	1.5	825,666.01		
Physics	6.5	800,411.47	2	196,821.00
Chemistry	6.5	751,745.08	2.5	646,948.00
Psychology	10	714,556.10	5	468,345.00
Translational Science Center	2	676,488.50	1	345,711.00
Center for Functional Materials	3	587,159.62	1.5	236,288.00
Computer Science	5	557,318.00	2	283,085.00
Economics	3	193,640.00	3	193,640.00
Sociology	4	175,247.40	3	167,657.40
WFDD	2	135,000.00	2	135,000.00
Center for Molecular Signaling	.5	125,349.00		
Divinity	1	90,095.50	1	90,095.50
English	1	58,005.00	1	58,005.00
Communication	1	19,667.00		
Counseling	2	4,755.00	2	4,755.00
Bioethics	1	4,173.06		
Philosophy	1	4,173.06		
Politics	1	2,500.00	1	2,500.00



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