RESEARCH & ECONOMIC DEVELOPMENT AFFAIRS

FY18 ANNUAL REPORT

DSU
Dakota State
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This academic year saw growth in the number of proposals submitted for research and other sponsored programs from 36 in FY17 to 47 in FY18, a 30% increase. DSU proposed $5,189,694 of extramural funding to federal, state, and private agencies, as well as one foreign government (France). Those agencies were somewhat more diverse than in some previous years, though no new precedents were set. NSA, NSF, and SDBoR were the most common target agencies. We had record numbers of submissions for both the BoR Competitive Research Grant (though none were funded) and for the Sanford Data Collaborative grant (where two ideas got traction and one was funded with some influence from the other). Figure 11 shows the variation in funding sources of submitted proposals. Figure 12 shows submitted proposals by college affiliation.

For a sense from whom on campus proposals emerged, Figure 13 shows that DSU faculty and staff sought funding across the academic rank spectrum.
Consistent with prior annual cycles at DSU, we enjoyed a high rate of success regarding our funded proposals. 19 of our 47 submitted proposals (40.4%) have already been funded with another 9 still pending. So far, those successes have garnered $2,018,258 in extramural support. Figure 14 shows the source of funded proposals, and Figure 15 shows college affiliations of funded proposals.

As shown in Figure 16, Faculty at the rank of professor tended to fare better in funding their research or contracted services than did faculty at other ranks. However, assistant faculty showed promise. Generally, through diligent program prospecting and outreach, the Office of Sponsored Programs involves most corners of the campus in funded research proposal development.
Campus faculty support programs provided small cash incentives for students and faculty to conduct disciplinary research. Those programs include the Faculty Research Initiative (FRI), the Student Research Initiative (SRI), and the START (Supporting Talent for Research Trajectories) program. The START program is a new endeavor supported by Academic Affairs that encourages faculty who wish to build research capacity in ways that will garner external funding. Proposals were solicited from across the campus. Proposals were reviewed (blind) by a subgroup of the faculty research committee.

Funding in the amount of $15,791.00 was distributed to eight of the ten submitted proposals to the Faculty Research Initiative (FRI) in 2018. The eight funded proposals are listed below:

“Drawing the Perfect Brain.”
  Tim Orme, Assistant Professor of Animation, College of Arts and Sciences

“What are the Gaps in Mobile Patient Portal? Mining Users’ Feedback Using Topic Modeling.”
  Dr. Cherie Noteboom, Associate Professor of Management Info Systems,
  College of Business and Information Systems

“Challenges in Learning Unified Modeling Language (UML).”
  Dr. Zixing Shen, Associate Professor of Management, College of Business and Information Systems

“Mapping Volatile Organic Chemical (VOC) Emissions One Mile Underground at South Dakota’s Sanford Undergraduate Research Facility (SURF) Using a Network of Consumer Plastics-Based Passive Sampling Devices.”
  Dr. Patrick Videau, Assistant Professor, College of Arts and Sciences

“Genomic Sequencing and Analysis of a Novel Marine Streptomyces Bacterium that Produces a Potent Cellular Toxin.”
  Dr. Michael Gaylor, Associate Research Professor, College of Arts and Sciences

“Deep Learning for Pretest Probability of Coronary Artery Disease.”
  Dr. David Zeng, Assistant Professor / Research of Information Systems,
  College of Business and Information Systems

“Gamified Mars STEM Lab.”
  Dr. Mark Geary, Associate Professor of Education, College of Education

“Gamification in K-8 Math Methods.”
  Dr. Kevin Smith, Assistant Professor of Mathematics Education, College of Education
The Undergraduate Student Mentored Research Initiative (SRI) was modified this year to require co-participation of a faculty member to promote a true collaborative endeavor. Faculty were also compensated for their mentoring roles. A subset of the University Research Committee juried SRI proposals. All proposals were funded, resulting in a total amount funded of $8,000. They include:

“Investigation of Thermal- and Microwave-Included Reaction Products of PAHs as Plausible Biochemical Precursors on the Primordial Earth.”
Bri Pitts
Faculty Mentor Dr. Michael Gaylor, Associate Research Professor, College of Arts and Sciences

“Assessment of Wax Worm Larva as a Model System to Study the Virulence of Virbio coralliilyticus Coral Pathogens”
Xzayana Henderson, Vaille Swenson (+lab costs)
Faculty Mentor Dr. Patrick Videau, Assistant Professor, College of Arts and Sciences

“Are Changes in Respired Volatile Organic Chemicals Indicative of Toxicity in Home Invading Insects Feeding on Consumer Products Containing Toxic Flame Retardant Additives?”
Lucas Leinen, Alexis Vanderwilt (+lab costs)
Faculty Mentor Dr. Michael Gaylor, Associate Research Professor, College of Arts and Sciences

“Defining the amino acids required for a fungal diterpene synthase enzyme.”
Katherine Lemster
Faculty Mentor Dr. Patrick Videau, Assistant Professor, College of Arts and Sciences

“Project Mayflower.”
Justin Jungemann, Dominique Redlin
Faculty Mentor Sandra Champion, Director of Music Programs / Instructor, College of Arts and Sciences

“Gamified Mars Lab Assessment.”
Jacob Geary, Meghan Vogel
Faculty Mentor Dr. Mark Geary, Associate Professor of Education, College of Education
A new internal grant program called Supporting Talent for Research Trajectories (START) focused seed funds from Academic Affairs on new faculty, faculty who may be first-time proposal writers, part of newly formed collaborative research teams, seeking new funding sources, or taking new directions within a given PI’s research portfolio. Funds supported preliminary research efforts leading to at least one confirmed proposal submission for at least $50,000 of extramural funding as a deliverable outcome at the end of the grant period. We were very happy with faculty response to this program and we plan to continue it in the next academic cycle.

Dr. Cherie Noteboom, Associate Professor of Management Info Systems & Dr. David Bishop, Associate Professor of Information Systems, College of Business and Information Systems
Proposal: Project Management in Health Information Technology
External agency: Project Management Institute

Dr. Mark Geary, Associate Professor of Education, College of Education
Proposal: Seeding STEM Education at DSU through the Gamified Mars Learning Lab
External Agency: National Science Foundation

Dr. Josh Stroschein, Assistant Professor of Cyber Security/Network & Security Administration, The Beacom College of Computer and Cyber Sciences
Proposal: Development of a Cyber Security Framework to Enable Cyber Threat Intelligence, Advanced Cyber Threat Research and Industry Collaboration
External Agency: National Security Agency

Dr. Justin Blessinger, Professor of English, College of Arts and Sciences & Dr. Chris Olson Associate Professor, College of Business and Information Systems
Proposal: Disability, Independent Living, and Rehabilitation Research
External Agency: U.S. Dept. of Health and Human Services

Dr. David Zeng, Assistant Professor / Research of Information Systems, College of Business and Information Systems
Proposal: Learning Distributed Representations of Medical Concepts to Summarize the Real-time State of ICU Patients
External Agencies: SDBoR and National Science Foundation

Dr. Joseph Bottum, Associate Professor of Philosophy, College of Arts and Sciences
Proposal: The Daedalus Endeavor
External Agencies: SDBoR, National Science Foundation, Hewlett Foundation
The Office began FY18 with a new director, Dr. Pete Hoesing. Building on a faculty background in music and African studies, he set about preserving DSU’s current strengths while diversifying our sponsored programs portfolio. Faculty/staff engagement across all four college helped to generate a 30% increase in proposal submissions from 36 in FY 17 to 46 in FY18. “Some proposals are still under review,” said Hoesing, “but our aim is to keep as close to possible to our success rates in prior cycles even as we broaden what we do.” With 23 of 47 submitted proposals already funded, that goal remains within reach as the current funding success rate hovers around 49%.

Never content to rest on our laurels though, DSU continues to build capacity for sustainable growth. The OSP will work closely with the new Center for Teaching and Learning (CTL) and a new compliance manager to develop faculty development modules around grantsmanship and regulatory compliance for faculty and students at all career stages. Hoesing’s continued service to the Midwest Section of the Society for Research Administrators International and as a facilitator with the Funding Information Network positions DSU to lead individuals and organizations in the region to more funding for their work.

Meanwhile, the addition of new compliance manager Jayne Valnes in February brings yet more contributions to DSU’s maturing research enterprise. Apart from their work with the CTL, Valnes and Hoesing are working to streamline forms and clarify processes to advance the efficiency of research and sponsored programming at DSU. Valnes has meanwhile recruited new members to the Institutional Review Board and affiliated with the University of South Dakota’s accredited IRB as DSU seeks to develop its compliance program. More finely attuned to compliance issues than ever before, the research office has made progress on several critical fronts ranging from export controls to responsible conduct of research to faculty training and more.

**LEVERAGING NSF OPPORTUNITIES**

The Research Office was well-represented at the initial RII Track-1 proposal workshop in Sioux Falls. As a member of the SD Research Advisory Council, Dr. Mark Hawkes participated in the initial review of proposals by evaluating each using an objective-type rubric. Five finalists were selected for that group. Within those five proposals DSU faculty Dr. Yong Wang and Dr. Stephen Krebsbach were written into two Track-1 proposals. The final version pulled in additional data analytics expertise and proposed a new post-doctoral fellowship. Dr. Pam Rowland, Dr. Josh Stroschein, and Dr. David Zeng all attended the SD EPSCoR NSF CAREER workshop, where they also heard about the RII Track-4 opportunity (also for junior faculty). DSU had broad participation at the NSF Day that SDSU hosted in Brookings: 11 faculty representing all four colleges attended, and many returned with specific ideas about where their proposal-writing could find logical homes within NSF directorates.
STUDENT RESEARCH
DSU RESEARCH SYMPOSIUM

The Annual Research Symposium allows faculty, undergraduate students, and graduate students the opportunity to present their research and scholarly activities to a larger audience. This event includes poster and presentation sessions by students and faculty from all academic disciplines and encourages interdisciplinary discourse, allowing students to learn from each other about a broad range of exciting research topics. The Symposium received an infusion of advocacy and energy with the arrival of Dr. Scott McKay, leading the way to a new location for research poster display, musical guests, and an abundance of refreshments, along with cash prizes. Dr. Will Aylor of SDSU capped off the day with a discussion of Intellectual Property (IP) rights.

2018 SYMPOSIUM GRADUATE RESEARCH WINNERS:

Application of Deep Neural Network for Calculation of Pretest Probability of the Heart Diseases
Student Researcher: Bigyan Khanal
Faculty Mentor: Dr. David Zeng, Assistant Professor / Research of Information Systems, College of Business and Information Systems

Investigating Diabetes Patients Concerns: Evidence from Twitter
Student Researcher: Ahmed El-Noshokaty
Faculty Mentor: Dr. Omar El-Gayar, Professor of Information Systems, College of Business and Information Systems

Protecting IoT from Mirai botnets; IoT device hardening
Student Researchers: Charles Frank, Cory Nance, Sam Jarocki
Faculty Mentor: Dr. Wayne E. Pauli, Professor of Information Systems, The Beacom College of Computer and Cyber Sciences

2018 SYMPOSIUM UNDERGRADUATE RESEARCH WINNERS:

Assessment of Multiple Solvents for Extraction and Direct GC-MS Determination of the Phytochemical Inventory of Mother-in-Law’s Tongue (Sansevieria spp.) Extrafolier Nectar Droplets
Student Researcher: Hope Juntunen
Faculty Mentor: Dr. Michael Gaylor, Associate Research Professor, College of Arts and Sciences

Queuing Theory: Designing a Better Line Student
Researchers: Emily Ortmann, Laura Schuck
Faculty Mentor: Mark Spanier, Assistant Professor of Mathematics, College of Arts and Sciences

Impact of Instructional Intervention on 7th Grade Mathematics Students Understanding of Proportional Relationships
Student Researcher: Jessica Dawson
Faculty Mentor: Dr. Kevin Smith
2018 Symposium Award Winners
2018 Research Symposium Presenters (PDF)
2018 Research Symposium Abstracts (PDF)
Recruitment of high quality students lies at the core of our undergraduate research endeavors. Undergraduate research provides these students with amazing opportunities in working with a faculty mentor, refining their career decisions, and understanding the empirical process. In taking on a more concerted effort to increase and engage undergraduate researchers. We have achieved the following:

- Hired Dr. Pam Rowland to campus-wide undergraduate research initiatives
  - Revolving around natural sciences, mathematics and engineering this esteemed scholarship provides recipients up to $7,500 per year their junior and senior year to help with costs associated with books, fees, boarding and tuition
  - Swenson credits DSU’s excellent science faculty and individual attention made possible by small classes for her success with this award and with scientific research in general. She has presented her work at local, state, and international venues, and she spent her summer researching viruses and cancer cell lines at the Mayo Clinic in Rochester, Minnesota
- Increased participation in DSU Research Symposium
  - 15 undergraduate researchers presented at the symposium
- Provided funding for over 17 students to present at external conferences
- Undergraduate coordinator and a graduate student attended the CUR conference July 1-3, 2018
- Vaille Swenson represented DSU at the Governor Research Day with a poster presentation
- Student Research Incentives (SRIs) were awarded to 6 undergraduate researchers

There is still much for the undergraduate research support system to achieve, which includes raising funds for undergraduate student research support, determining equitable ways for accessing those resources, and encouraging teachers and faculty to invest in the research process. But we are well on our way.

This year’s successes include a peer-reviewed article by Goldwater Scholar Hope Junenten in one international journal, four other student-authored publications in high-impact journals since January of 2018, and an unprecedented invitation for several DSU undergraduate students to participate in the Gordon Research Conference on the Origins of Life. According to their mentor, Dr. Michael Gaylor, the conference is “generally not a venue for undergraduates.” That did not stop Lucas Leinen, Hope Junenten, Vaille Swenson, Briann Pitts, and Alexis Vanderwilt from seizing a rare opportunity to engage in discourse on the origins of life with the broader scientific community.
Madison Cyber Labs (MadLabs) are designed to build on DSU’s current and expanding capabilities as a cyber leader by establishing a center for cyber security and cyber operations research and development in South Dakota.

This R&D hub will stimulate economic development by drawing cybersecurity students and professionals to DSU and by giving them compelling reasons to stay in South Dakota to study and work in a variety of interdisciplinary areas. This economic impact will spread to the state, region, and beyond, as the labs will create partnerships with other regental schools, government agencies, businesses and industry, non-profit groups and international higher education institutions.

THE COMPONENTS OF THE MADLABS:

Resources: Laboratory research space, state-of-the-art hardware and software, faculty expertise, and growing institutional relationships with a wide variety of agencies both public and private

People: Undergraduate and graduate students; faculty; researchers; interns; and other collaborators

Programs: Cyber degrees from the associate to doctoral level, along with other professional development opportunities

Research areas and institutes: Currently there are 11 areas of focus, in defined interdisciplinary and multidisciplinary areas

DSU IT: Infrastructure protection and security R&D relating to the DSU campus IT environment

South Dakota Governor Dennis Daugaard, the South Dakota Board of Regents and Dakota State University announced in August of 2017 that PREMIER Bankcard President and CEO Miles Beacom and his wife Lisa, along with philanthropist T. Denny Sanford, owner of the Sioux Falls-based First PREMIER Bank and PREMIER Bankcard, gifted the university $30 million. This is one of the largest single gifts to higher education in South Dakota history. The transformational gift will fund the construction of the Madison Cyber Labs, scholarships for students, and support for additional faculty and staff.

The gift also leverages additional support. Governor Daugaard has pledged $10 million from the Future Fund to support Dakota State University’s cybersecurity education efforts. In addition, DSU has committed to leverage an additional $20 million in support from federal sources, as well as additional support from private donors.

“I’m excited for the vision created by Dr. Griffiths...and humbled to be able to help this great institution, DSU, as tomorrow’s students, many of them from right here in our region, are perfectly positioned to help fill the workforce gap and protect and defend our citizens and our nation.”

- Miles Beacom
AdapT Lab

The AdapT Lab for Assistive Technology was founded to advance the use of technology to remove barriers, digital and physical, and improve access for all. Current projects are focused on using proximity beacons to provide relevant information for one’s immediate surroundings, and to streamline accessible technologies, such as elevator calls and automatic door openers.

CAHIT

The mission of CAHIT is twofold: First CAHIT intends to research the interplay of “aging in place” and the Internet of Things (IoT). Secondly, CAHIT will address the unique security concerns of connected medical devices, both in the home and in medical institutions. CAHIT will utilize their existing industry partnerships and their strength in information security and information analysis in developing their research proposals.

C-BAR

The DSU Center for Business Analytics Research (C-BAR) is a joint initiative between the School of Business and the Information Systems department to promote the field of analytics through education, applied research, industry projects, and industry collaboration in the form of consulting. One of their primary goals is to provide a quarterly South East South Dakota Economic Analysis Report containing analysis of economic data for local economy and business analytics related topics.

CLASSICS Institute

Established in 2017, the CLASSICS Institute has been charged by Dakota State University with the mission of investigating the ethical, social, and existential condition of humankind, forty years into the computer revolution. The CLASSICS Institute begins with the proposition that the computer revolution has made the humanities more vital than ever. Literature and history, philosophy and theology, political theory and jurisprudence—the great deposit of thought through millennia of human civilization—provide the ground for understanding our current condition.

Cyber Ed and Professional Development Lab

Children in grades K-12 are consumers of technology and spend an increasing amount of time on a variety of devices. Our mission to provide cyber education curriculum and training will increase awareness of key topics such as safety, security, and ethical behavior while helping students become better digital citizens and consumers. For their teachers, the Cyber Ed and Professional Development MadLab will provide the training they need to teach children about cyber security, as well as opportunities for professional development in areas such as reading instruction, classroom management, and the latest technology tools and applications.
CybHER Institute

CybHER’s mission is to empower, motivate, educate, and change the perception of girls and women in cybersecurity. By providing resources for girls from middle school through collegiate programs and into professional careers, CybHER will allow women to foster positive and encouraging relationships within this industry through original and curated content that educates and motivates women. Ultimately, our goal is to increase diversity by introducing more girls to cybersecurity, who will then transition to women in collegiate programs, and finally highly trained professionals.

DigForCE Lab

DigForCE Lab researches, investigates, and trains students, professionals and law enforcement on the newest waves of cyber-attacks. Government agencies, business environments, and private citizens alike are constantly under attack by adversaries both foreign and domestic. The work in this lab will be developing new approaches to identify and investigate attacks while providing cutting-edge resources for partner entities in conducting investigations.

PATRIOT Lab

The PATRIOT Lab aims to test, study, and address security and privacy issues on emerging technologies, such as mobile devices, cloud, social networks, and cyber physical systems, and mitigate the security risks of the Internet of Things.

To achieve the goal:

1. The lab will conduct cutting edge research on emerging technologies to discover vulnerabilities and create innovative and practical approaches to mitigate risks

2. The lab will collaborate with industry partners to develop and commercialize testing procedures, tools, and software products which will lead creating new intellectual property and job opportunities in South Dakota

3. The lab will include both undergraduate and graduate students working on research projects with faculty and security professionals. The students will be trained and prepared for future cyber security challenges

4. The lab will also work closely with the public and the private sectors including K12 in Madison, the South Dakota, and the Midwest to educate and protect our communities