UNIVERSITY OF SOUTH DAKOTA
SANFORD SCHOOL OF MEDICINE

BASIC BIOMEDICAL SCIENCES

2020
The Division of Basic Biomedical Sciences at the Sanford School of Medicine creates an environment of innovative and interdisciplinary research aimed at examining human disease.

As an undergraduate, graduate or medical student, students learn in both the classroom and in the research laboratory. This learning environment helps students understand the human organism and translate that knowledge into diagnostic and therapeutic development.

Students study under faculty who have a wide breadth of research and teaching interests. Through discovery, education and service, our faculty develop novel approaches for diagnosing, managing and treating disease.
DEANS

WILLIAM MAYHAN, PHD
Dean BBS
Professor

STEVE WALLER, PHD
Associate Dean BBS
Associate Professor

DEAN’S OFFICE STAFF

PAM BERNARD
Accounting Assistant

SARA BIRD
Body Donation Program Manager

JAMIE CUKA
Senior Secretary

ANDREA JAHN
Management Analyst

MIKE OLSON
Fabrication Technician

WENDY PEDERSON
Graduation & Education Coordinator

DIANE PENFIELD
Financial Assistant

JACKIE RUBIDA
Human Resources Assistant

ACADEMIC FACULTY

DENISE ARRICK, MS
Instructor

EDWARD BAGU, BVM, PHD
Assistant Professor

STEPHEN BAMBAS, MA
Instructor

DANIEL BIRD, PHD
Assistant Professor

BRUCE CUEVAS, PHD
Assistant Professor
**FACULTY/STAFF**

**RESEARCH FACULTY**
- **Lee Baugh, PhD**
  Associate Professor
  CBBRe/CGBH

- **Brian Burrell, PhD**
  Professor
  CBBRe/USD N3

- **Michael Chaussee, PhD**
  Associate Professor
  CBBRe/USD N3

- **Victor Huber, PhD**
  Associate Professor
  SD BRIN

- **Barb Goodman, PhD**
  Professor
  SD BRIN Director

- **Joyce Keifer, PhD**
  Professor

- **Curt Kost, PhD**
  Associate Professor

- **Yi-Fan Li, PhD**
  Associate Professor

- **Pasquale Manzerra, PhD**
  Assistant Professor

- **Douglas Martin, PhD**
  Professor

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**ACADEMIC SUPPORT STAFF**
- **Bill Hansen**, Mortician
- **Bob Hansen**, Mortician
- **Dana Hansen**, Teaching Lab Specialist
- **Shannon Hirsch**, Teaching Lab Coordinator

- **Charles Lockard**, Gross Anatomy Lab Assistant
- **James Lusk**, Gross Anatomy Lab Assistant
- **Megan Mead**, Lab Teaching Assistant

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**SCOTT DRUECKER, MS**
Assistant Professor

**Jane Gavin, MS**
Assistant Professor

**Gerald McGraw, EDD, MPAS, MBA, PA**
Assistant Professor

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BBS GRADUATES

JARED AILTS, MS, 2020 Spring  
CASEY FINNICUM, PHD, 2020 Spring  
Research Scientist at Avera Institute for Human Genetics  
ERIC FOGARTY, MS, 2020 Spring, Sioux Falls  
EARVIN GRINAGE, MS, 2020 Spring  
RACHEL LAUFMANN, MS, 2020 Spring  
Nursery Research Associate, AgReliant Genetics, LLC  
MITCH PATRICK, MD, PHD, 2020 Spring  
University of Iowa, General Surgery  
KYLE ROESSLER, MS, 2020 Spring  
NEERAJ TIWARI, PHD, 2019 Fall  
Postdoctoral Fellow, Sanford Health, Sioux Falls
RESEARCH/CORE SUPPORT STAFF

SRIVISHNUPRIYA ANBALAGAN  
Research Associate II

KIMBERLEY ANDRES  
CBBRe Program Assistant II

RYAN ANTONY  
Research Associate I

TAYLOR BOSCH  
Functional Imaging Core Manager

EDUARDO CALLEGARI  
Proteomics Core Facility Director

LUCI DRAPEAU  
BRIN Assistant Program Director

DONIS DRAPEAU  
Diversity & Pipeline Coordinator

SAMUEL DRUMMER  
Research Associate I

JESSICA FREELING  
Physiology Research Core Director

JIZHI GE  
Research Associate III

ANDREA HERRERA  
Postdoctoral Research Fellow

AUDREY JOB  
Lawrence Brothers Camp Director

EMILY KABEISEMAN  
Research Associate III

KIRSTEN KIM  
Research Associate II

ZACHARY KING  
Research Associate III

DAMON LEADERCHARGE  
Assistant Program Coordinator NAHSP

XUEFEI LIU  
Research Associate III

YANYING LIU  
Research Staff Scientist

DANIELA PAEZ  
Research Associate II

VINCENT PETA  
Postdoctoral Research Fellow

RAUSHAN POTTS  
Research Associate III

PARTHA SAHA  
Postdoctoral Research Fellow

SANAM SANE  
Postdoctoral Research Fellow

MONICA SATHYANESAN  
Research Associate III

JAMIE SCHOLL-BUSHMAN  
Research Associate III

REKHA SRINIVASAN  
Research Associate II

JACK STERNBURG  
Research Associate Ii

KALPANA SUBEDI  
Research Associate II

TIFFANY VOSS  
Research Associate I

PENGLONG WU  
Exchange Researcher

EXTERNAL RESEARCH FACULTY

DR. MICHELE BAACK  
Associate Professor of Pediatrics

DR. JOHN BRANNIAN  
Professor of OB/GYN

DR. INDIRA CHANDRASEKAR  
Assistant Professor of Pediatrics

DR. GARETH DAVIES  
Professor of Psychiatry

DR. PILAR De LaPuente  
Assistant Professor of Surgery

DR. ERIK EHLI  
Associate Professor of Psychiatry

DR. RANDY FAUSTINO  
Assistant Professor of Pediatrics

DR. XUESHENG FENG  
Associate Professor of Neurosciences

DR. KEVIN FRANCIS  
Assistant Professor of Pediatrics

DR. EMILY GRIESE  
Assistant Professor of Pediatrics

DR. KURT GRIFFIN  
Associate Professor of Pediatrics

DR. KEITH HANSEN  
Chair, OB/GYN

DR. MICHAEL KARETA  
Assistant Professor of Pediatrics

DR. LANCE LEE  
Associate Professor of Pediatrics

DR. KEITH MISKIMINS  
Professor of OB/GYN

DR. DAVID PEARCE  
Professor of Pediatrics

DR. LOUISIAN PILAZ  
Assistant Professor of Pediatrics

DR. STEVEN POWELL  
Associate Professor of Internal Medicine

DR. KYLE ROUX  
Associate Professor of Pediatrics

DR. PATRICK RONAN  
Associate Professor of Psychiatry

DR. TIMOTHY SOUNDY  
Chair, Psychiatry

DR. WILLIAM SPANOS  
Associate Professor of Surgery

DR. KAMESH SURENDRAN  
Associate Professor of Pediatrics

DR. JIANNING TAO  
Assistant Professor of Surgery

DR. PAOLA VERMEER  
Assistant Professor of Surgery

DR. PETER VITIELLO  
Associate Professor of Pediatrics

DR. JILL WEIMER  
Associate Professor of Pediatrics
2019 FACULTY AWARDS & PROMOTIONS

Faculty Awards and Selected Appointed Offices
1. Eyster Kathleen, Class of 1958 Basic Science Faculty Award, USD Sanford School of Medicine Alumni Relations Council
2. Eyster Kathleen, Professor Emeritus, Division of Basic Biomedical Sciences, USD Sanford School of Medicine
3. Li Yifan, 15 Years of Service, Basic Biomedical Sciences, USD Sanford School of Medicine
4. Li YiFan, The Chester McVay Award for Excellence in Teaching and Research, USD Sanford School of Medicine
5. Manzerra Pasquale, 15 Years of Service, Medical Student Affairs, USD Sanford School of Medicine
6. Miskimins Robin, Professor Emeritus, Division of Basic Biomedical Sciences, USD Sanford School of Medicine
7. Percy William, Professor Emeritus, Divisions of Basic Biomedical Sciences, USD Sanford School of Medicine
8. Rezvani Khosrow, 10 Years of Service, Basic Biomedical Sciences, USD Sanford School of Medicine
9. Wang Xuejun, Awarded Fellowship, International Society for Heart Research
10. Wang Xuejun, Chair, Award Committee, American Physiological Society, Cardiovascular Section
11. Yutrzenka Gerald, Associate Professor Emeritus, Division of Basic Biomedical Sciences, USD Sanford School of Medicine

Faculty Promotions
1. Sathyanesan Samuel, Professor, Basic Biomedical Sciences
Undergraduate Service Teaching

Enrollments. Last year saw variable enrollments in our undergraduate service courses. Online courses were challenged to make the required enrollments and many sections were canceled before the Fall and Spring semesters started. Of course, COVID-19 changed our delivery format at the mid-point of the Spring semester and cost us an entire week of instruction. Courses such as BIOL 430 (Biochemistry), ANAT 411 (Human Gross Anatomy) and PHGY 420 (Human Physiology) are part of the Medical Biology curricular options and continue with solid enrollments.

Of special note and concern are our courses offered at USD Community College for Sioux Falls. These courses have small enrollments. These courses include Anatomy and Physiology (PHGY 220/220L and PHGY 230/230L) and Basic Microbiology (MICR 230). Similarly, our Rapid City ‘face to face’ courses also struggle to make the necessary enrollments to be delivered.

This past winter, BBS collaborated with Academic Affairs to develop a memorandum of understanding with Southeast Technical College (SETC) in SF. BBS has agreed to allow students completing their LPN training at SETC and are interested in obtaining a BSN from USD to enroll in our Basic Microbiology (MICR 230) and Basic Microbiology Lab (MICR 232). In addition, working carefully with SETC nursing, we are developing as specific course in Human Physiology (to be numbered later) that combined with SETC’s anatomy course will be considered equivalent to USD’s Human Anatomy and Physiology two-semester courses (PHGY 220/220L and PHGY 230/230L). This course will likely have a significant enrollment beyond SETC students as many students that have taken Anatomy only and Physiology only courses find they must take USD’s sequence because of concerns in equivalency.

Planning for the fall delivery of courses during the COVID-19 pandemic was challenging. Several of our service courses have enrollments that required innovative course delivery. We have successfully navigated the start of the fall semester and are starting plans for the Spring 2021 semester.

Currently our Continuing and Distance Education faculty are Assistant Professors Jane Gavin and Gerald McGraw and Instructor Stephen Bambas. Gavin and Bambas teach exclusively anatomy and physiology courses while McGraw is also able to teach our microbiology courses. To manage our large microbiology enrollments, BBS has worked with SDSU for 9 credit hours of Dr. Randall Warren. In this arrangement, Dr. Warren teaches three sections of Basic Microbiology (MICR 230), including the section at CC-SF. Ms. Gavin has informed me that she anticipates retiring at the end of 2021. This will be a significant blow to our online presence as her sections are popular among the undergraduate student advisors and students.

COVID-19 caused the undergraduate researchers to leave BBS laboratories after Spring Break. The decision was made to allow them to perform research during the summer session in BBS laboratories only if this could be done remotely. The decision regarding fall semester in-lab research will be made September 21. We wish to assess student adherence to COVID-19 protocols before allowing them to return to our research laboratories.

Key points for the undergraduate service teaching mission for BBS:

- Enrollments in our undergraduate service courses continue to fluctuate making scheduling and workload determinations difficult.
- One of our strongest online educators (Jane Gavin) will likely retire at the end of 2021. A replacement is being groomed at this time.
- Opportunities for undergraduate research has been negatively impacted by COVID-19 and it is still unclear when they will be allowed to return.
- It is still unclear how successful planning for the return of students to USD during the COVID-19 pandemic has been and will be moving forward. Fingers are crossed.
BBS GRADUATE EDUCATION

Graduate (MSc, PhD and MD/PhD) Training

The MSc and PhD program. The Division’s Graduate Committee has had a busy year. Among its major accomplishments is a reassessment of our core curriculum for PhD students and development of a more comprehensive graduate student handbook. The Graduate Committee visited with the Divisions faculty and students to assess the content and value of the core courses Foundations 1 and Foundations 2. Changes have been recommended for both courses and are being implemented. The program has encountered difficulties with recruitment of international students related to new regulations and COVID-19.

In the fourth year of existence, the MSc Plan B program continues to show solid student enrollments and success. The MSc Plan B program attracts students interested in seeking admission to professional training programs and for who additional training may improve their opportunities. Among the courses typically taken by our MSc Plan B students are Human Physiology (PHGY 730), Human Gross Anatomy (ANAT 511), Pre-Professional Pharmacology (PHAR 730), Immunology (MICR 518), Research, Neurobiology (BIOL 530), Teaching in the Basic Sciences (CPHD 704), and Responsible Conduct of Biomedical Research (CPHD 727).

USD’s response to COVID-19 did impact the graduate research mission. Both undergraduate and graduate student researchers were unable to perform research for most of the Spring semester. Graduate students gradually returned to the research lab late Spring/early Summer with clear instructions to wear face coverings, maintain as much physical distancing as possible, follow the proper hand washing/sanitizing and sneeze/cough protocols.

MD/PhD Student Progress. The MD/PhD program continues to work on areas of concern in cooperation with Medical Student Affairs and leaders from Pillar 1 and 2. This year the MD/PhD Coordination Committee implemented the new student handbook. Notably, this new handbook established firm deadlines for the transition from the research phase to Pillar 2 and established a process to provide the MD/PhD students during their research phase with ongoing and meaningful clinical experiences. The MD/PhD student clinical experiences were disrupted with the COVID-19 occurrence but are tentatively scheduled to resume mid-September.

Key points for the Graduate Education Mission of BBS

- The Master’s Plan B program continues show strong growth and success.
- The graduate education program responded quickly and successfully to the COVID-19 challenges this Spring and Summer. There was disruption, but we are optimistic it was minimal.
BBS GRADUATE EDUCATION

Funding for BBS Graduate Students comes primarily from BBS, Avera, and Sanford Research. Nine BBS grants and fellowships were also used to fund 13 BBS students in 2019-2020. Students funded by the USD N3 grant receive an increased stipend of $34,000 annually for two years.

Two BBS Graduate Students are currently funded by their own fellowships.

**Anderson, Ruthellen (Elle)**, MD/PhD Student in Dr. Francis’ lab, Sanford Research.
Regulation of pluripotent stem cell differentiation by sterol metabolism, National Institutes of Health - NIH, $50,000.00 annually (2/20/2018-2/19/2023).

**Paulsen, Riley**, PhD Student in Dr. Burrell’s lab, BBS.
Conserved activity-dependent regulation of endocannabinoid signaling, Graduate Research Fellowship Program (GRFP), National Science Foundation, $46,000 annually (9/1/19-8/31/2024).

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**BBS Graduate Education**

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**BBS Graduate Program**

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*New degree in FY16, many move on to other medical programs after one year.

Fall 2016 (FY17) saw a large influx of PhD and non-thesis master students, and we are seeing this trend again as we head into FY21. In FY20, multiple graduate students matriculated into other Health Affairs professional programs (MD, OT, PT and PA.) Although it appears grad student numbers declined in FY20, the current number of graduate students is still well above the 10-year average for the BBS program despite lower enrollment numbers in FY20 (for unknown reasons.)

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**BBS Graduate Student Enrollment**

- # PhD
- # MD/PhD
- # MS Thesis
- # MS Non-thesis
- FY Total

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**BBS Graduate Program**

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**BBS Graduate Student Enrollment**

- # PhD
- # MD/PhD
- # MS Thesis
- # MS Non-thesis
- FY Total
**PRECLINICAL EDUCATION**

**Medical (Pillar 1) Training**

Basic Biomedical Sciences with strong collaborations from our clinical colleagues continues to provide Pillar 1 students with strong preparation for Step 1 and Pillar 2. All courses in Pillar 1 continue to refine their schedules and content in a thoughtful and appropriate manner. The Pillar1 course directors continue to meet weekly to discuss student performance and course operations.

Notable changes made to the Pillar1 curriculum this year was the switch to exclusively remote delivery of content starting with the fourth week of the Nervous Systems course. Despite this challenge, the Gastrointestinal-Hepatobiliary course and the Blood Heme Lymphatics Systems course were delivered successfully. Unfortunately, the transition to remote only required these three courses to not offer the customized National Board Examinations. Starting with the Cardiovascular System block, course delivery has returned to a face-to-face format with some modifications. Faculty presenting content are asked to live Zoom the presentation and to allow for remote participants to ask questions. Presentations requiring attendance are asked to allow Zoom attendance as an option to in-person attendance. Students attending any presentation live are required to wear face coverings and to maintain appropriate physical distancing.

Human Gross Anatomy, a component of Medical Foundations 1, has increased the use of PPE during the laboratory experience and uses a staggered laboratory experience schedule. With this schedule and using enhanced PPE, no more than two students work with the donor for up to one hour each lab day. There are three teams of two working on each donor. Teams are rotated as the first team is the dissection team for that day. Human Gross Anatomy has also supplemented course content with a VH Dissector, a software program that allows the student to observe a dissection like what is being done in the laboratory. Although data is preliminary, student academic performance is only slightly lower than previous years.

At the direction of the Medical Education Committee, the grading scale for Pillar 1 was changed. The bottom of the C range was lowered from 75% to 70.5% and the breaks between C to B were changed from 81% to 80.5%, and B to A were changed from 91% to 90.5%. This makes the Pillar1 grading scale like the Pillar2 and 3 scales.

USD recently activated the automatic (machine driven) transcription system on both Zoom and Panopto. As such, the Pillar1 course directors requested that the 24-hour delay in release of Panopto be discontinued. Panopto is now released upon processing, usually within two to three hours of the end of the lecture.

The Pillar1 course directors are engaging in a thoughtful conversation regarding possible curricular reform.

**Key points for the Medical Education mission of BBS**

- The COVID-19 disruption of medical education was minimal.
- The Pillar1 course directors are discussing possible curricular changes.
BBS STUDENT EMPLOYMENT AND OUTREACH

The BBS faculty members mentor many Medical Student Researchers throughout the year with funding from grants and SSOM Medical Student Research funds.

- Developmental Research Program for Medical Students (DRPMS) – NIH T35 grant
- Medical Student Summer Research Program (MSSRP) – SSOM Med Student Research funding

BBS employs and supports over 100 undergraduate USD students each year in a variety of programs. Students work as mentors, camp counselors, administrative assistants, teaching lab assistants, and research lab assistants. Many complete research projects and present their research at conferences, IdeaFest, or as a thesis in the Honor’s Program. Funding for undergraduates comes from a variety of sources:

- Basic Biomedical Sciences / Laboratory Science Fees / PI Grants
- BioSNTR Undergraduate Summer Research Opportunity – SD EPSCoR
- Council for Undergraduate Research and Creative Scholarship (CURCS) – Gallagher Center for Experiential Learning & Education Abroad (GC) at USD
- Center for Brain and Behavior Research (CBBRe) – Center supported by BBS/SSOM/ORSP/USD
- Healthcare Careers Camp – SD Department of Health grant
- Inclusive Science Initiative (ISI) – Howard Hughes Medical Institute grant
- Lawrence Brother’s Science Camp Counselors
- Native American Healthcare Scholars Program (NAHSP) – HHS Diversity Pipeline grant
- SD BRIN Undergraduate Research Fellows Program (SD BRIN) – NIH grant
- Summer Program for Undergraduate Research in Addiction (SPURA) – NIH grant
- USD UDiscover
- USD Workstudy
- Volunteers

BBS engages a multitude of High School and Middle School students in various programs, camps, and mentee opportunities across the state.

- Healthcare Careers Camp – SD Department of Health grant
- Lawrence Brother’s Science Camp
- Native American Healthcare Scholars Program (NAHSP) – HHS Diversity Pipeline grant
- SD BRIN Research Apprentice Program (SD BRIN) – NIH grant

Student Groups:

- AISES American Indian Science & Engineering Society
- BGSO BBS Graduate Student Organization
- CGSO CBBRe Graduate Student Organization
- PreMed Society
# BASIC BIOMEDICAL COURSE LIST

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<tr>
<td>UHON 498</td>
<td>Undergrad/Research/Scholarship</td>
</tr>
</tbody>
</table>

### STUDENTS TAUGHT (2019-2020)

<table>
<thead>
<tr>
<th>Students</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td>Medical Students</td>
</tr>
<tr>
<td>15</td>
<td>MD/PhD Students</td>
</tr>
<tr>
<td>31</td>
<td>Graduate Students</td>
</tr>
<tr>
<td>26</td>
<td>Occupational Therapy</td>
</tr>
<tr>
<td>33</td>
<td>Physical Therapy</td>
</tr>
<tr>
<td>26</td>
<td>Physician Assistant</td>
</tr>
<tr>
<td>&gt;3000</td>
<td>Undergraduates</td>
</tr>
</tbody>
</table>

- **ANAT 411**: Human Gross Anatomy
- **ANAT 511**: Human Gross Anatomy
- **ANAT 711**: Human Gross Anatomy
- **ANAT 712**: Human Embryology
- **ANAT 732**: Advanced Neuroanatomy
- **BIOC 310**: Biological Chemistry
- **BIOC 430**: Principles of Biochemistry
- **BIOC 530**: Principles of Biochemistry
- **BIOC 730**: Principles of Biochemistry
- **BIOC 752**: Molecular Biology of the Gene
- **BIOC 754**: Proteins and Enzymes
- **BIOC 761**: Metabolic Regulation
- **BIOC 763**: Methods Biochemical Analysis
- **BIOL 430**: Neurobiology
- **BIOL 530**: Neurobiology
- **CPHD 400**: Research in Basic Sciences
- **CPHD 498**: Undergrad Research/Scholarship
- **CPHD 601**: Intro to bioinformatics
- **CPHD 610**: Experimental Design and Analysis
- **CPHD 620**: Foundations Cardiovascular Sci
- **CPHD 630**: Advanced Cardiac Biology
- **CPHD 640**: Neural Reg Cardiovasc Function
- **CPHD 702**: Signal Transduction
- **CPHD 704**: Teaching in The Basic Sciences
- **CPHD 710**: Hallmarks of Cancer I
- **CPHD 711**: Hallmarks of Cancer II
- **CPHD 713**: Modern Approaches Cancer Biol
- **CPHD 714**: Novel Topics in Cancer Biology
- **CPHD 720**: Foundations I
- **CPHD 721**: Foundations II
- **CPHD 727**: RCR
- **CPHD 730**: Adv Cardiovasc Pharmacology
- **CPHD 740**: Protein Quality Control
- **CPHD 792**: PQCD Journal Club
- **CPHD 792**: Grant Writing
- **CPHD 792**: Heat, Shock Protein
- **CPHD 792**: Developmental Biol of Ds
- **CPHD 792**: Mech of Ds
- **CPHD 792**: Genetics of Human Disease
- **CPHD 792**: Heat Shock Proteins
- **CPHD 790/890**: Seminar
- **CPHD 792**: Human Molecular Journal Club
- **CPHD 792**: GPCR & Cardiovascular Diseases

- **STUDENTS TAUGHT (2019-2020)**
- **ANAT**: 411 Human Gross Anatomy
- **ANAT**: 511 Human Gross Anatomy
- **ANAT**: 711 Human Gross Anatomy
- **ANAT**: 712 Human Embryology
- **ANAT**: 732 Advanced Neuroanatomy
- **BIOC**: 310 Biological Chemistry
- **BIOC**: 430 Principles of Biochemistry
- **BIOC**: 530 Principles of Biochemistry
- **BIOC**: 730 Principles of Biochemistry
- **BIOC**: 752 Molecular Biology of the Gene
- **BIOC**: 754 Proteins and Enzymes
- **BIOC**: 761 Metabolic Regulation
- **BIOC**: 763 Methods Biochemical Analysis
- **BIOL**: 430 Neurobiology
- **BIOL**: 530 Neurobiology
- **CPHD**: 400 Research in Basic Sciences
- **CPHD**: 498 Undergrad Research/Scholarship
- **CPHD**: 601 Intro to bioinformatics
- **CPHD**: 610 Experimental Design and Analysis
- **CPHD**: 620 Foundations Cardiovascular Sci
- **CPHD**: 630 Advanced Cardiac Biology
- **CPHD**: 640 Neural Reg Cardiovasc Function
- **CPHD**: 702 Signal Transduction
- **CPHD**: 704 Teaching in The Basic Sciences
- **CPHD**: 710 Hallmarks of Cancer I
- **CPHD**: 711 Hallmarks of Cancer II
- **CPHD**: 713 Modern Approaches Cancer Biol
- **CPHD**: 714 Novel Topics in Cancer Biology
- **CPHD**: 720 Foundations I
- **CPHD**: 721 Foundations II
- **CPHD**: 727 RCR
- **CPHD**: 730 Adv Cardiovasc Pharmacology
- **CPHD**: 740 Protein Quality Control
- **CPHD**: 792 PQCD Journal Club
- **CPHD**: 792 Grant Writing
- **CPHD**: 792 Heat, Shock Protein
- **CPHD**: 792 Developmental Biol of Ds
- **CPHD**: 792 Mech of Ds
- **CPHD**: 792 Genetics of Human Disease
- **CPHD**: 792 Heat Shock Proteins
- **CPHD**: 790/890 Seminar
- **CPHD**: 792 Human Molecular Journal Club
- **CPHD**: 792 GPCR & Cardiovascular Diseases
In FY20,

- BBS promised $896,000 in one-time or short-term support to our research and scholarly missions to ensure all faculty in the Division had access to development opportunities, travel, research necessities, and funds for publication fees, as this assistance encourages continued grant proposal submissions that lead to future grant funding.

- BBS received 31 external funding awards in the amount of $9.00 million, which represents 88 percent of the Sanford School of Medicine's external grant income and 46 percent of USD's total grant income.

- SD BRIN continued its support of the USD Libraries with a contribution of $516,851 in year 18 of funding. The fifth round of this five-year, $16.9M SD BRIN grant is being awarded by NIH in September 2020, and it includes additional support of the libraries.

- BBS faculty, graduate students, and medical students contributed to and published:
  - 1 Book Chapter & 39 Articles/Editorials

- BBS hosted nine prominent, external researchers and three internal USD researchers to present talks in the BBS Faculty Seminar Series. Many more speakers were scheduled; however, the series was cancelled in early March due to the pandemic. Additionally, BBS invited multiple faculty candidates to give presentations and meet the faculty, staff, and students of BBS during their interviews which resulted in two new faculty hires for BBS. And in August 2019, CBBRe held its two-day, annual research symposium which highlights presentations from four expert, external researchers, multiple internal USD faculty, and graduate students that are members of CBBRe.

- **Press releases and Special Presentations:**
  - The collaborative research efforts of Dr. Lisa McFadden and Dr. Rick Wang (Chemistry) were featured in the Sioux City Journal, "USD Researchers Working on Breakthrough Treatment for Meth Overdose". This collaboration is through CBBRe.
  - Graduate Student and USD-N3 Fellow, Marie Severson, was featured in the Winter 2020 SD EPSCoR Quarterly Update. Marie participates in research under the mentorship of Lisa McFadden exploring the possibility of nanoparticles reducing the neurotoxicity of methamphetamines.
  - Dr. Lee Baugh, PhD, was featured in the Sioux City Journal, “Novel Concussion Diagnostic Technique in the works at USD.”
  - Dr. Michael Chaussee, PhD, was featured in the Yankton Press & Dakotan, “USD Microbiologist Finds Possible Antibiotic Alternative.”
  - Donis D. Drappeau, SSOM Diversity Pipeline Coordinator, traveled to the Pachanga Casino Resort in Temecula, California, for the American Indian Science & Engineering Society (AISES) Native Financial Cents Ambassador Training. She was chosen to be an ambassador for financial literacy and delivered the Native Financial Cents Curriculum to at least 50 Native youth.
  - The Proteomics Core Facility staff, Dr. Eduardo Callegari and Maria Daniela Paez, B.S., were invited to teach two international Proteomics courses at two universities in South America. Travel was sponsored by an international grant related to Bioremediation, National Scientific and Technology Council Research from Argentina, and SD BRIN.
SCHOLARSHIP

Three BBS graduate students (Bethany Freer, Hannah Wollenzein and Raegan Skelton) made the final round of the 3 Minute Thesis competition hosted by the USD Neuroscience, Nanotechnology and Networks (USD-N3) program. This competition challenges graduate students to consolidate their ideas and research discoveries so they can be presented concisely to a non-specialist audience.

Graduate Research Assistants, Brittany Bamberg and Rachel Rucker, were selected as recipients of the 2019 Undergraduate Research Excellence Awards for their respective work "The Effects of In Utero Exposure to Alcohol" under the mentorship of Dr. William Mayhan, PhD, and "Diacylglycerol Lipase: Does Mutation of the Catalytic Region Influence Membrane Localization?" with Dr. Brian Burrell, PhD.

The Summer Program for Undergraduate Research in Addiction (SPURA) selected seven students to participate in a remote, 12-week multi-disciplinary summer research program. Each student received a $4,800 stipend and the faculty mentors received $1,000 to support the student’s research project or the student’s travel to a meeting to present their work in the future, if possible. This summer program is funded by a National Institute on Drug Abuse (NIDA) R25 research grant.

SD Biomedical Research Infrastructure Network (SD BRIN) offers an Undergraduate Research Fellows (UGF) Program which selected 51 student researchers from across the state to participate in this opportunity to learn and grow as a scholar under the guidance of a research mentor from a participating SD institution. Salary support is paid by the home institution to the fellows, as is the $2000 to the laboratory of the mentor for supplies.

SD BRIN’s summer 2020 online convocation was held virtually with abstracts, videos, and poster discussions for the 51 under graduate research fellows only due to the pandemic. Typically, this symposium brings together undergraduate students involved in the NSF EPSCoR RII Track-1 project, the South Dakota Biomedical Research Infrastructure Network (SD BRIN), and the other research experiences for undergraduates in South Dakota.
COLLABORATIONS

DAKOTA CANCER COLLABORATIVE ON TRANSLATIONAL ACTIVITY (DaCCoTA)
https://med.und.edu/daccota/
The DaCCoTA grant is supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number U54GM128729.
• The goal of DaCCoTA is to bring together researchers and clinicians with diverse experience from across the region to develop unique and innovative means of combating cancer in North and South Dakota.
• We believe advances in cancer treatment will come from broad approaches by collective groups of clinical and basic researchers who are focused on conducting clinical/translational research.

GREAT PLAINS IDeA-CLINICAL & TRANSLATIONAL RESEARCH (GP IDeA-CTR)
https://gpctr.unmc.edu/
Great Plains IDeA-CTR is a collaborative effort between nine regional institutions to build an effective system and infrastructure to transform and advance clinical and translational research (CTR) across Nebraska, Kansas, North Dakota, and South Dakota. The IDeA-CTR strives to provide training, education and mentorship; tools and resources; and funding to regional researchers.
• Funding from the National Institutes of Health (NIH) and a commitment to the motto that “together we are better”, the GP IDeA-CTR Network was formed to uphold the NIH’s nationwide effort to improve the health of all Americans, and to provide approaches to overcoming the issues endemic to our part of the country.

CENTER FOR GENETICS AND BEHAVIORAL HEALTH
https://www.usd.edu/cbbre/center-for-genetics-and-behavioral-health
The Center for Genetics and Behavioral Health is funded by a five-year, $3.4 million grant from the State of South Dakota Governor’s Office for Economic Development.
• The Center for Genetics and Behavioral Health studies the genetic and environmental influences that interact with other biological, psychological and behavioral factors to impact post-traumatic stress disorder (PTSD).
• The center is a partnership between the Center for Brain and Behavior Research and the Avera Institute for Human Genetics.
• The Center for Brain and Behavior Research faculty bring their expertise in stress, trauma and addiction from the molecular to the behavioral level, and uses resources in place at USD for psychological assessment, behavioral testing, bioinformatics and functional brain imaging. The Avera Institute for Human Genetics brings expertise and research on clinically relevant genetic variants and how these relate to psychological and health outcomes.
CBBRe promotes innovative basic to translational research that addresses problems in neurology, neuropsychology and psychiatry. Funding for CBBRe has historically come primarily from SSOM and BBS to support an administrative assistant, pilot funds for research, student travel awards for professional meetings and/or training opportunities, the annual Center for Brain & Behavior Research Symposium, outreach activities, and student recruitment efforts.

However, external state and federal funding has been acquired to help CBBRe grow and support their staff and additional programs and research opportunities for students, faculty, and staff.

**CENTER FOR BRAIN AND BEHAVIORAL RESEARCH CBBRe**

Co-Directors, Brian Burrell Ph.D. (BBS) and Lisa McFadden Ph.D. (BBS)

Awarded SPURA - Summer Program for Undergraduate Research in Addiction, U.S. Department of Health & Human Services, National Institutes of Health – NIH.

- This National Institute on Drug Abuse (NIDA) funding supports undergraduate research training (R25), awarded at $86,000 annually for 5 years during round 1 (2014-19); round 2 awarded at $93,000 annually for 5 years (4/15/19 – 2/29/24).
- This multi-disciplinary summer research program gives USD undergraduate students an opportunity to conduct high-quality, mentored, hypothesis-driven research in fields related to substance use, abuse and related or underlying mental health issues.

**CENTER FOR GENETICS AND BEHAVIORAL HEALTH**

Lee Baugh Ph.D., Director

Awarded Governor’s Office for Economic Development: Center for Genetics and Behavioral Health Grant

- A five-year grant for $3.4 million beginning in July, 2017
- A collaboration between CBBRe and the Avera Institute for Human Genetics.
- Studies the genetic and environmental influences that interact with other biological, psychological and behavioral factors to impact post-traumatic stress disorder (PTSD)

**SUPPORT OF THE HUMAN FUNCTIONAL IMAGING CORE**

Lee Baugh Ph.D., Director

Awarded

- MRI: Acquisition of Transcranial Magnetic Stimulation Instrumentation to Advance Understanding of the Brain, National Science Foundation, $103,871.00 (9/1/2017-8/31/2018)
- Great Plains IDeA-CTR, National Institutes of Health - NIH, University of Nebraska Medical Center, $112,000.00 (5/1/2018-6/30/2018)
  - In 2018 the Great Plains IDeA CTR-COBRE at UNMC provided $100,000 to purchase a Transcranial Electric Stimulation Device and High Definition Electroencephalography.
NEUROSCIENCE, NANOTECHNOLOGY AND NETWORKS PROGRAM (USD-N3)
Co-Directors, Dr. Brian Burrell (BBS) and Ranjit Koodali (Grad School Dean)
Awarded NRT: USD Neuroscience and Nanotechnology Network, National Science Foundation, $2,943,561.00 (9/15/2016-8/31/2021)

- The USD Neuroscience, Nanotechnology & Networks Program (USD-N3) offers a new, team-based training approach to prepare graduate students for diverse career paths in STEM professions. The program emphasizes microtracks - a series of non-science courses that will prepare you for careers in:
  - Biotechnology
  - Scientific writing and editing
  - Government and public policy
  - Education

- Key Program Features
  - Participate in research aimed at developing nanotechnology-based tools to better understand the function of and develop treatments for the brain
  - Receive tuition and stipend support, including an annual stipend of $34,000 for two years during training
  - Discover opportunities for local and national internships
  - Connect with mentors in neuroscience and chemistry
  - Develop professional skills, including career planning and public speaking
  - Receive support for student research projects and travel to professional meetings
  - Supplement science coursework through courses from the Beacom School of Business. These courses can be applied to a future Master of Business Administration at USD

- Students may apply through:
  - The Department of Chemistry
  - The Division of Basic Biomedical Sciences
  - The Department of Biomedical Engineering
  - The Department of Biology

As a result of the USD-N3 training grant, CBBRe students attend the annual NRT meeting where they have had an opportunity to present their research and discuss graduate student training experiences with students and faculty from other NRT-funded institutions as well as NSF staff.
SD BIOMEDICAL RESEARCH INFRASTRUCTURE NETWORK (BRIN)

Barb Goodman Ph.D., Director
http://brin.usd.edu/home


- IDeA Networks of Biomedical Research Excellence (INBRE): statewide institutional networks that work together to leverage existing research resources and increase the quality of scientific rigor among faculty at research and undergraduate institutions to better prepare students for careers in biomedical science.
- SD BRIN has been funded by the National Center for Research Resources (NIH) since 2001. BRIN provides resources to researchers throughout South Dakota by supporting core facilities in proteomics, genomics, DNA sequencing and genotyping, and bioinformatics. Several of its core facilities are housed at USD. BRIN also allows students to participate in research, particularly through the Undergraduate Research Fellows Program.
- SD BRIN continues to provide funding for the USD library for the 20th year straight. Starting in 2002 BRIN provided $82,000, and this amount has increased 3-10% annually.

BRIN STUDENT RESEARCH PROGRAMS

UNDERGRADUATE RESEARCH FELLOWS (UGF)
This program provides each research fellow with an opportunity to spend 10 weeks working and learning in the hands-on environment of research labs at a SD BRIN partner institution. SD BRIN research fellows are paid $4,000 for the 10 week period. This program is designed to challenge researchers and to give them an in-depth understanding of biomedical research.

SD BRIN Research Opportunity Sites

<table>
<thead>
<tr>
<th>Augustana College</th>
<th>Sanford Research/USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avera Research Institute</td>
<td>South Dakota State University</td>
</tr>
<tr>
<td>Black Hills State University</td>
<td>University of Sioux Falls</td>
</tr>
<tr>
<td>Dakota Wesleyan University</td>
<td>University of South Dakota</td>
</tr>
<tr>
<td>Mount Marty College</td>
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LAWRENCE BROTHERS SCIENCE CAMP
Founded in 2002 by the descendants of USD alumni brothers Ernest O. and John Lawrence. E.O. won the Nobel Prize in Physics in 1939 for his invention of the cyclotron and John is known as the Father of Nuclear Medicine. A broad theme is chosen for the week-long residential camp that includes physical science, chemistry, life science, mathematics and health sciences. The goal of the camp is to inspire middle school students in science and give them hands-on opportunities to conduct experiments designed to challenge them and show them that science is fun.

RESEARCH APPRENTICE PROGRAM
The Research Apprentice Program or RAP was started at USD in 1989 by a grant supplement from the National Institutes of Health to Dean Robert Talley. The program introduces 5-8 disadvantaged high school students to research by having them work with USD researchers for five weeks during the summer. Research options include survey work in psychology and social work and work in a chemistry, biomedical science, or biology laboratory and are arranged by the program. RAP fellows also participate in the career and social opportunities of the simultaneous Upward Bound program which supports their room and board and activity expenses. The program has been offered at USD every summer since 1989.
SD BRIN RESEARCH CORE FACILITIES

PROTEOMICS
Eduardo Callegari, Ph.D., Director, USD
The SD BRIN Proteomics Core Facility provides state-of-the-art proteomics services to researchers from South Dakota and the region. Since 2002, the USD PCF has been providing proteomic analyses, as well as collaborating in the training of the use of common equipment such as the scanner, spot cutter, imaging software, technique and protocol issues, and sample preparation. Our goal is to provide all South Dakota researchers with the capability to rapidly analyze and identify protein expression patterns in their experimental systems.

BIOINFORMATICS
Department of Biomedical Engineering, USD
The USD Biomedical Engineering Department is committed to developing production quality software while giving students a valuable research experience. The department offers students opportunities for involvement in bioinformatics research at both the undergraduate and graduate levels. Students are involved in developing the infrastructure necessary to carry on bioinformatics research by creating software solutions that fit the needs of researchers.

WESTCORE
Shane Sarver Ph.D., Director and Cynthia Anderson Ph.D., Associate Director
The Western South Dakota DNA Core Facility (WestCore) was established at Black Hills State University as part of the South Dakota Biomedical Research Infrastructure Network (SD BRIN) in 2004. We provide critical infrastructure that enhances research, education and training in the biomedical sciences. WestCore supports research activities across the SD-BRIN network by providing services to our South Dakota academic institutions, as well as to investigators at public and private agencies & institutions nationwide. WestCore is currently supported in part by NIH IDEA Program Grant 2 P20 GM103443 from the INBRE Program of the National Institute for General Medical Sciences.

UNIVERSITY OF SOUTH DAKOTA LIBRARIES
Any faculty member or student from participating SD BRIN institutions may access anything physically located at USD Libraries or the SD BRIN-sponsored science databases at any time. SD BRIN supports current databases and their availability to faculty and students at participating PUIs: Augustana College, Black Hills State University, Dakota Wesleyan University, Mt. Marty College, Oglala Lakota College, Sinte Gleske University, Sisseton Wahpeton College, University of Sioux Falls and USD Basic Biomedical Sciences. University Libraries will support research and collaboration by providing SD BRIN librarians with reference support, training and assistance in accessing databases.

BBS RESEARCH CORE FACILITIES
https://www.usd.edu/medicine/basic-biomedical-sciences
Neuroimaging Core (CBBRe)
Proteomics Core (BRIN)

BEHAVIORAL CORE
Jamie Scholl, Core Manager
Behavioral assessment in animal models is often a necessary component for answering research questions effectively. The Behavioral Core provides a range of paradigms to measure discrete and varied forms of behavior, which can then be related to underlying physiological processes. Our modular equipment and software allows either automated or experimenter-based recording to facilitate rapid acquisition of data.

IMAGING CORE
Scott Pattison, Ph.D., Assistant Professor
With a range of digital imaging microscopy systems, the Imaging Core offers various optical microscopes for slide and cellular biological imaging. All USD and USD-affiliated researchers may use the facility at no charge. External rates may apply for outside entities. Data and image storage is the responsibility of the researcher.

PHYSIOLOGY CORE
Jessica Freeling, M.S., V.T., LATG, Core Director
The physiology core facility provides basic and biological researchers with a central resource for creating models of animal physiology and pathophysiology. While our main focus is exploring the effects of cardiovascular disease and cancer in rodents, we can provide support to any aspect of animal research. We offer both invasive and non-invasive techniques for collecting in vivo physiological data.
There are a variety of students who benefit from the generous gift of whole body donation. These students include our future doctors, occupational therapists, physical therapists, physician’s assistants, nurses, pre-med students, a select grouping of undergraduate students and students enrolled at institutions participating in our Education Outreach Program. Currently our Educational Outreach Program institutions include Briar Cliff University, Lake Area Technical College, Northern State University, Northwestern College, Presentation College and South Dakota State University.

The Body Donation Memorial Service is held each September at the Lee Medicine & Science Building on the USD campus. Families of the previous year’s donors are invited to attend the service, light a candle for their loved one, and listen to music and reflections from select students. The service is followed by a reception which is attended by all first year MD, OT, PT, and PA students as well as other cohorts. In addition, we invite students and faculty from our partner institutions. In light of Co-VID 19, we will be sharing a video memorial service to honor our 2019 donors and their families. We hope to resume our traditional memorial services September 17, 2021 and will host families of our 2019 and 2020 donors.
COMMITTEE MEMBERSHIPS

ADMINISTRATIVE COUNCIL:
Scott Druecker, MS, Chair, Faculty Council
Pasquale Manzerra, PhD, Assistant Dean, Medical Student Affairs and Admissions
William Mayhan, PhD, Dean, BBS
Steve Waller, PhD, Associate Dean, BBS

ADMINISTRATIVE STAFF:
William Mayhan, PhD, Dean, BBS

ADMISSIONS COMMITTEE:
Pasquale Manzerra, PhD, Assistant Dean, Medical Student Affairs and Admissions (Chair)
Denise Arrick, MS, BBS
Bruce Cuevas, PhD, BBS
Michael Chaussee, PhD, BBS

FACULTY COUNCIL:
Scott Druecker, MS, BBS (Chair)
Joyce Keifer, PhD, BBS
Gerald McGraw, EdD, BBS
Samuel Sathyanesan, PhD, BBS
Hongmin Wang, PhD, BBS

FACULTY DEVELOPMENT COMMITTEE:
Daniel Bird, PhD, BBS
Curtis Kost, PhD, BBS
Samuel Sathyanesan, PhD, BBS

MD/PHD ADMISSIONS STANDING COMMITTEE:
Pasquale Manzerra, PhD, Assistant Dean, Medl Student Affairs and Admissions (Chair)
XJ Wang, MD, PhD, Director, MD/PhD Program
Robert Morecraft, PhD, BBS
Yifan Li, PhD, BBS
Steve Waller, PhD, Grad Program (Advisory)

MEDICAL EDUCATION COMMITTEE:
Lee Baugh, PhD, Pillar 1 Subcommittee Representative
Bruce Cuevas, PhD, Pillar 1 Subcommittee Representative
Victor Huber, PhD, BBS
Daniel Bird, PhD, Director Pillar 1 (Advisory)

MEDICAL STUDENT RESEARCH COMMITTEE:
Yifan Li, PhD, BBS
Keith Weaver, PhD, BBS
Samuel Sathyanesan, PhD, BBS

NOMINATING COMMITTEE:
Barbara Goodman, PhD, BBS (Chair)
J. Scott Pattison, PhD, BBS

PROMOTION AND TENURE COMMITTEE:
Brian Burrell PhD, BBS
Victor Huber, PhD, BBS
Joyce Keifer, PhD, BBS
Samuel Sathyanesan, PhD, BBS
Keith Weaver, PhD, BBS

RESEARCH COMMITTEE:
Doug Martin, PhD, BBS
Samuel Sathyanesan, PhD, BBS
Hong Zheng, MD, BBS
William Mayhan, PhD, Dean, BBS (Advisory)

STUDENT FINANCIAL AID COMMITTEE:
J. Scott Pattison, PhD, BBS
Curtis Kost, PhD, BBS
Steve Waller, PhD, BBS

STUDENT PROGRESS AND CONDUCT COMMITTEE:
Michael Chaussee PhD, BBS
Scott Druecker, MS, BBS
Samuel Sathyanesan, PhD, BBS
Hongmin Wang, PhD, BBS
Hong Zheng, MD, BBS

GRADUATE COMMITTEE:
Lee Baugh, PhD, BBS
Daniel Bird, PhD, BBS
Keith Weaver, PhD, BBS
Steve Waller, PhD, Grad Program (Advisory)

HEALTH AFFAIRS MEDICAL INFORMATICS COMMITTEE:
Denise Arrick, MS, BBS
J. Scott Pattison, PhD, BBS
Reagan Skelton, PhD Student

UNIVERSITY SENATE:
Scott Druecker, MS, BBS
Lisa McFadden, PhD, BBS
Hongmin Wang, PhD, BBS
2019 ACTIVE BBS GRANTS

1. Anderson Ruthellen (Elle), Regulation of Pluripotent Stem Cell Differentiation by Sterol Metabolism, National Institutes of Health – NIH, $50,016.00 (2/20/2019-2/19/2020)

2. Baugh Lee, Consortium for Genetic Influences on Behavioral Health, South Dakota Governor’s Office of Economic Develop, $782,683.00 (7/1/2019-6/30/2020)

3. Baugh Lee, Great Plains IDeA-CTR, National Institutes of Health – NIH, University of Nebraska Medical Center, $73,382.00, (7/1/2019-6/30/2020)


6. Bushman Jamie, Gut Microbiota and Immune Markers in Psychological Health, National Institutes of Health – NIH, University of Nebraska Medical Center, $14,700.00 (7/1/2018-6/30/2020)

7. Chaussee Michael, Development of Novel Vaccines and Antibodies/Assays to Improve Human/Animal Health, South Dakota Governor’s Office of Economic Develop, South Dakota State University – SDSU, $100,550.00 (7/1/2019-6/30/2020)


11. Li Yifan, The Role of Pro-BDNF/Mature-BDNF Balance in Skeletal Muscle Inactivity-Induced Capillary Regression, National Institutes of Health – NIH, $363,132.00 (7/1/2019-6/30/2020)


13. Mayhan William, Dakota Cancer Collaborative on Translational Activity, National Institutes of Health – NIH, $69,678.00 (9/1/2019-8/31/2020)

14. Mayhan William, Dysfunction of the Cerebral Microcirculation by In Utero Exposure to Alcohol, National Institutes of Health – NIH, $330,750.00 (9/1/2019-8/31/2020)


16. Paulsen Riley, NSF GRFP: Conserved Activity-Dependent Regulation of Endocannabinoid Signaling, National Science Foundation – NSF, $138,000.00 (9/1/2019-8/31/2024)

2019 ACTIVE BBS GRANTS

18. Rezvani Khosrow, AKT/mTOR Pathway in Obesity and Colorectal Cancer: Molecular Interconnections and Potential Clinical Applications, National Institutes of Health – NIH, University of North Dakota, $160,000.00 (9/1/2019-8/31/2020)

19. Rezvani Khosrow, AKT/mTOR Pathway in Obesity and Colorectal Cancer: Molecular Interconnections and Potential Clinical Applications, National Institutes of Health – NIH, University of North Dakota, $351,236.00 (10/1/2018-8/31/2019)

20. Rezvani Khosrow, UBXN2A Represses Migration and Invasion of Colorectal Cancer Cells, National Institutes of Health – NIH, $73,500.00 (4/8/2019-3/31/2020)


26. Zheng Hong, Novel Target Mechanism (Renal Denervation) to Reduce Sodium Retention in Chronic Heart Failure, National Institutes of Health – NIH, University of Nebraska Medical Center, $193,830.00 (8/15/2017-4/30/2020)

2019 PUBLICATIONS


2019 PUBLICATIONS


2019 PUBLICATIONS


