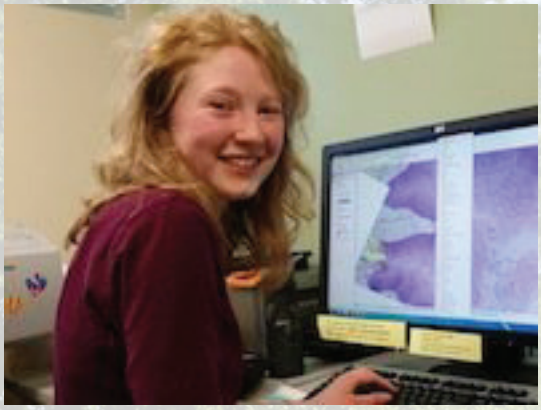
Vermont Genetics Network

Winter 2017

INSIDE

Dr. Ruth Fabian-Fine
Saint Michael's College
VGN Researcher

Johnson State College Student Awarded an REU Internship



Shayna Bennett ('17)

Johnson State College recently experienced another first in its developing culture of research. Last spring, Shayna Bennett ('17) received word of her acceptance into the Applied ResearCH In ModEling and Data-Enabled Science (ARCHIMEDES), one of the National Science Foundation's Research Experiences for Undergraduates (REU) programs in Applied Mathematics. Located at the University of California at Merced, ARCHIMEDES, introduced students to new mathematical modeling and programming techniques in order to assess real-world problems. They applied computational tools to solve research questions, analyzed data, and ultimately translated the results into scientific context.

Shayna, a double major in mathematics and environmental science spent nine weeks working on a team with four other students and two faculty mentors. Their project used differential equations to model the spread of an invasive species. Specifically, the team looked at the spread of Japanese Knotweed on two spatial scales, one being the spread of the rhizome network of a single plant over time and the other being the spread of the plant population over the New England and Great Lakes regions. Their results at the rhizome level were compared to a published paper that used a 3D random walk method to model the same process and observed a close relationship between the two over time. At the population level, the team compared their calculated spread over time to field data and saw a similar spread pattern.

Shayna noted the impact of this experience on her learning, "Johnson State has been great in giving me a broad understanding of science and math. From my last three years there I built a strong foundation and the REU this summer let me move to the next level: application. Working on a research project requires critical thinking and unlike a class, there is no way around it. This summer I found myself stretched to not just learn and apply techniques in mathematics that I was unfamiliar with, but to look out into the literature and the real world to understand a new process in enough depth that I could avoid - biases and misconceptions in my model. I had to be objective, thorough, and have a clear understanding of exactly what I should expect to see if my model was doing what I wanted it to do. There were no answers in the back of the book anymore. Practicing this process was an invaluable learning experience."

Japanese Knotweed - Angus MacAskill, Flickr

Before starting the REU program Shayna wanted to pursue a PhD in applied mathematics or mathematical ecology. After experiencing research in this discipline she is still committed to this path. However, there is one caveat. Shayna points out, "I found I don't enjoy spending all my time working on the computer and debugging models. I need to be out in the field understanding first-hand what I am trying to model. The real world experience gives me a way of gaining the level of understanding I need to model the phenomenon well and brings me back to my roots as a scientist."

Spending a summer at a research institution was an enlightening experience for Shayna, "The classes undergraduates have to take become so much more tangible after talking with fellow students doing research in the fields of, for example, material engineering, biochemical engineering, applied mathematics, robotics, and bioinformatics. The undergraduate experience for math and science majors doesn't seem to be complete until after this experience. It is almost as if this experience brings you as a student up to a level of understanding far above class work and it is very hard to come back down when the summer ends."

CCV Undergraduate Bridget Kimsey Attends NIH Visit Week For Native American Students

By Bridget Kimsey

This past July, the National Institutes of Health held its annual NIH Visit Week for Native American students. The week is a summer enrichment program designed to expose First Nation students to the NIH biomedical research, and healthcare careers. To attend, Native students throughout the country are nominated and apply for the program. Welcomed are rising high school seniors, students enrolled in Tribal colleges, and undergraduate college students at all levels. Nine students were chosen for this year.

Bridget Kimsey (right) with former secretary of the Agency of Commerce and Community Development Patricia Moulton (left)

I feel thankful to have been accepted and through the generous support of Vermont Genetics Network, I received the funding to go. It was a full, stimulating, educational, and rewarding week.

I am a registered member of the federally recognized tribe-Delaware Tribe of Indians. My Lenape (Delaware) father was a scientist for Johns Hopkins University. While completing my first degree at NYU in New York City, I lived within the American Indian Community House for 6 years. Elders there nudged me over time into what has become my current field. I am a complementary alternative medicine (CAM) practitioner. Working inside the field since 1998, I began working primarily on medical cases within a team approach starting in 2008. I am also a 2016 recipient of a VT-EPSCoR Native American Scholarship that was awarded in August 2016.

I am currently pursuing a second degree in STEM from CCV with hopes to get my PhD in the future. My career objective is to focus on research and bring new and sound approaches to research in CAM medicine.

In moving along this path, visiting the NIH this summer was a truly supportive and invigorating week. The curriculum included-NIH Clinical Center tour; extensive library tour and briefing on the NIH; meetings with many different program heads; science career workshops; interactions in selected NIH laboratories and clinical research settings; professional networking; briefing about NIH internship opportunities; attending the graduate school fair and meeting with other Natives in different positions at the NIH and in the government.

I really enjoyed getting to know other fellow Native American science majors-coming from Hawaii, South Dakota, Arizona, Texas, and California. I was impressed by the NIH's firm commitment in developing the personal and professional life of those they mentor, educate, and employ. It was inspiring to hear how doctors often commented that they felt they had landed their dream job. It was great to meet the doctors behind research I had just read about and to hear interesting backstories. A theme I repeatedly heard was the twisting paths that individuals took to their current path and the importance of multiple mentors.

Bridget Kimsey E-RYT, LCMT, MMP, has been in the healing arts and sciences for about 20 years. She holds credentials in yoga, massage, medical massage, Reiki, and physics based energy medicine work. She currently has her private practice at Timberlane Medical Center and works with different organizations including UVM and the Vermont Dept. of Health. For more information or questions, please visit www.bridgetkimsey.vpweb.com

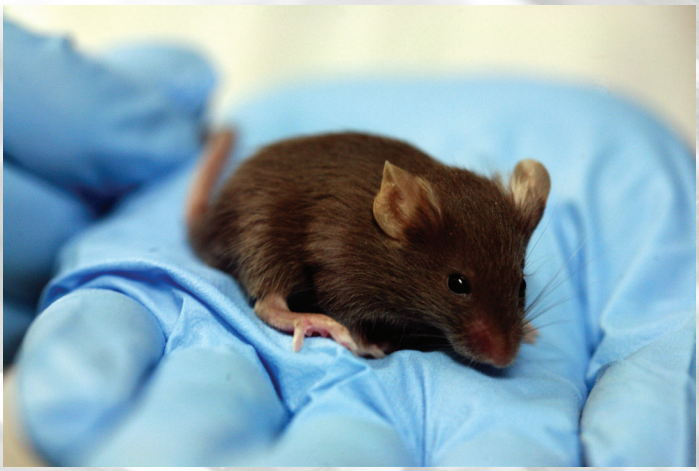
Clarissa Parker PhD, Middlebury College, Awarded an NIH AREA Grant From the National Institute on Drug Abuse

Clarissa Parker PhD

Clarissa Parker from Middlebury College has been awarded a research grant from the National Institute on Drug Abuse through NIH's R15 AREA program. The grant provides three years of funding to support a project titled "Genome-Wide Association for Affective Withdrawal in Outbred Mice." The goal of this work is to use a highly recombinant mouse population to map genes in mice associated with the behavioral and physiological traits that characterize drug withdrawal. Her underlying hypothesis is that mouse genes involved in amphetamine withdrawal, or other members of their genetic networks, may influence drug use disorders in humans and may provide novel targets for pharmacologic intervention.

Negative mood states that characterize drug withdrawal are partly under genetic control and have been associated with craving and relapse to drug use in humans. Mice can be used to model aspects of the negative mood states associated with drug withdrawal and offer a powerful tool for elucidating the genetic architecture of both diseases and normal behavioral and physiological traits. However, genomic studies in mice have lagged behind those in humans. Genome-wide association studies identify genes associated with diseases and other traits---and have revolutionized the field of human genetics. Unfortunately, progress in mouse genetics has been less sucessful. This is because mouse genetics has traditionally focused on crosses between inbred strains that make it difficult to pinpoint specific genes associated with a trait. Dr. Parker's method takes advantage of the superior mixing that is present in outbred mouse populations to identify genes using two steps: genotype-by-sequencing, which sequences about one percent of the mouse genome; and RNA sequencing, which identifies only genes turned "on" in a particular tissue, such as the brain.

This project will facilitate student research at Middlebury College by providing summer salary for six students conducting research in Parker's laboratory. Approximately two to four additional students will work on components of the proposed experiments for course credit each year (theses or smaller projects). In the process of accomplishing this goal, Middlebury students will obtain meaningful training in the discipline of behavioral genetics, learn cutting-edge molecular and quantitative genetic techniques, utilize mice as models of psychiatric disorders, and gain a deep understanding of the neurobiology underlying drug use disorders.



Importantly, the methods proposed in Dr. Parker's grant are generally applicable to any quantitative trait and have the potential to vastly accelerate the process of gene identification. If one understands the pathways linking genetic variation and expression to neuronal function and behavior in mice, then it may be possible to target specific molecules to prevent and treat drug use disorders in humans.

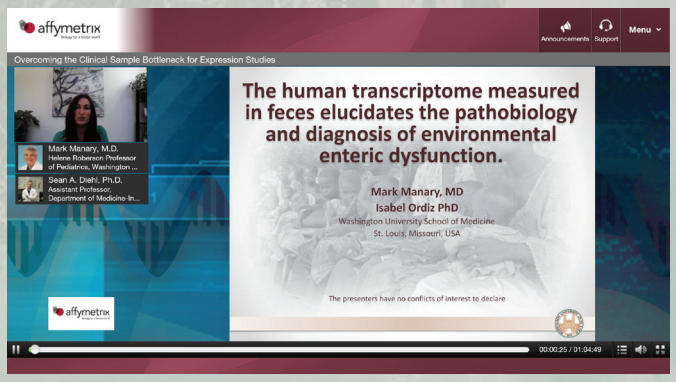
The VGN Microarray Core Support of Dr. Sean Diehl's Research to Understand Immune System Differences in Malnourished Children

The AGTC VGN Microarray Facility continually strives to provide comprehensive support for all projects requiring microarray approaches. The facility staff works collaboratively with both the VGN Bioinformatics Core and Molecular Bioinformatics Shared Resource teams to provide integrated project support from experimental design through data analysis. This past year the facility implemented two new genechips (Clariom S and Clariom D) including one with a new probe design (Clariom S). They also added the ability to request single sample qualitative assessments of nucleic acids, and completed a challenging sixty genechip project that required extensive workflow development and optimization. This assisted Dr. Sean Diehl, an assistant professor in the Department of Medicine-Infectious Diseases and associate director for research for the Vaccine Testing Center at the University of Vermont College of Medicine.

Sean Diehl PhD

Dr. Diehl's research project aims are to better understand the behavior of the immune system in malnourished children. The design for this study was to profile the transcriptomes and compare gender matched controls to samples from malnourished children in Bangledesh, using the Human Transcriptome Array that, by probe design, mimics a RNA-seq project. The project was presented to the microarray facility as whole blood mixed with Trizol reagent at incorrect ratios, and in some cases stored for extended periods at -80˚C. Testing was performed in the microarray facility to ascertain what method would provide the highest recovery of intact total RNA. While the NanoDrop spectrophotometer readings appeared to indicate sufficient recoveries, the target preparations were unsuccessful.

Suspecting insufficient total RNA loading into target preparations, the Qubit fluorometer was implemented. This led to successful target preparations combining a new workflow with small recovery samples quantified by fluorometric approaches. As a result, all new project samples require quantification via fluorometry. The project completion was advantaged by implementation of a new target preparation kit developed recently by Affymetrix called WT Pico kit that allows sample inputs as low as 170pg/ul. The data is currently being analyzed by the VGN Bioinformatics Core. At a webinar presentation on October 4, 2016, Dr. Diehl presented the work from the facility optimizing his project workflow. The webinar discussed how novel transcriptome profiling assays can generate robust expression data to help identify RNA biomarkers from challenging samples such as feces and whole blood as well as explain the importance of choosing the optimal technology to obtain reliable data from rare samples thereby preserving material for future use.



Webinar Link: http://www.labroots.com/webinar/overcoming-clinical-sample-bottleneck-expression-studies

Middlebury College's Dr. Vasiliou - Successful Young Investigator and Undergraduate Mentor

AnGayle Vasiliou PhD

AnGayle (AJ) Vasiliou (Chemistry and Biochemistry) has received a National Science Foundation grant through the Research in Undergraduate Institutions (RUI) and an Undergraduate New Investigator grant from the American Chemical Society Petroleum Research Fund. The proposed work seeks to answer questions regarding the reaction mechanisms for the thermal decomposition of sulfur compounds encountered in petroleum and biofuels, which is currently poorly understood and in some cases completely unknown. This knowledge gap prevents any progress in refinery cleanup methodology, and the proposed work could lead to technology improvements in current desulfurization processes for both petroleum and biomass refineries. A total of twelve Middlebury undergraduates will be working with AJ on the NSF and PRF projects.

The other place AJ truly loves to invest her time is the Summer Posse immersion program, a two-week session held on campus involving the training and preparation for the incoming STEM Posse before they arrive on campus in the fall.

Posse recruits outstanding student leaders in Atlanta, Boston, Chicago, D.C., Houston, Los Angeles, Miami, New Orleans and New York, and sends them in teams (posses) to some of the most selective colleges and universities in the country. Middlebury has hosted a new Posse group from New York each year since 1999. In the fall of 2012, the College added a second Posse group from Chicago. In the fall of 2015, through an extended partnership with The Posse Foundation, Middlebury College started offering full-tuition scholarships annually to 10 urban students pursuing careers in science, technology, engineering, and math (STEM).

The Posse Foundation is one of the most comprehensive youth leadership development and college access programs in the country.

"My major academic role is to design and teach a chemistry lab that will simulate a realistic college experience for the students. This past summer (2016) the lab was focused on spectroscopy and kinetics. This is one activity of many in the two-week program, but I'm very grateful to be part of such a wonderful program". The lab that was designed and completed by the STEM Posse students for the summer immersion program has since been incorporated into Middlebury's regular General Chemistry II lab series.

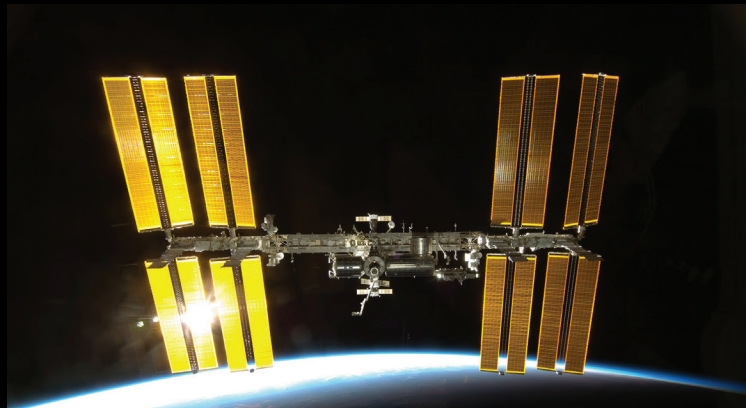
Landmark College Undergraduate Student Matthew Bavelock Isolates Unique Phage that Targets a Bacteria Isolated from the International Space Station

Matthew Bavelock

Matthew Bavelock, a student in his final year of the Associate's in Science degree program at Landmark College, participated in a Vermont Genetics Network at-large undergraduate summer internship this year. He worked in the laboratory of Matthew Wargo, PhD, at the University of Vermont in Burlington where he was involved in a study investigating biofilms (bacterial communities). In a post-antibiotic era, we need different ways to eliminate bacteria. Bacteria in biofilms are particularly difficult to fight, because the biofilm provides protection. One promising technique for eliminating biofilms is to use bacteriophage (viruses that prey on bacteria), called phage therapy.

Bacteriophage, are viruses that infect and kill bacteria. There are ten bacterial species Dr. Wargo and his lab are currently working on that were isolated from a bacterially infected potable water reclamation system on the International Space Station (ISS). Finding and isolating phage that prey on these ten bacteria could be a practical way to reduce bacterial burden in the water treatment system.

Dr. Wargo's project involved isolating bacteriophage from a variety of water sources in the Burlington, VT area and testing the bacteriophage's ability to lyse bacteria previously isolated from the space station. Matt isolated a previously unknown phage that specifically infects and lyses the bacterium *Sphingomonas paucimobilis.* This discovery may provide scientists with a way to target these bacteria within biofilm communities.



Saint Michael's College - McCabe and Fabian-Fine Receive 150K Educational Award from the George I. Alden Trust

Ruth Fabian-Fine PhD

Dr. Ruth Fabian-Fine is a neuroscientist who spends her time with spiders investigating mechanosensory—the ability to sense pressure or vibrations. She joined the Biology Department at Saint Michael's College in the fall of 2015. Dr. Declan McCabe, the chair of the biology department, is an ecologist who explores aquatic ecosystems, its inhabitants, and how they are influenced by pollutants. Fabian-Fine spends her days peering through a fluorescent microscope localizing neurotransmitters in dissected sensory organs while McCabe is often seen in urban and rural streams—net in hand—taking a census of invertebrates. At first glance, Fabian Fine's and McCabe's research does not appear to have much in common but a closer look reveals that these two professors share a personality trait; they are both natural collaborators. McCabe has been an integral part of Vermont EPSCoR since 2008 and has worked closely with collaborators at UVM and throughout the state. Fabian-Fine is a team builder with vision. In her first year as a faculty member she developed a highly productive research program from scratch and by the closing bell of the school year, she had hired five research students and been awarded two grants from VGN. Given that both McCabe and Fabian-Fine have deep records of working productively with other scientists, perhaps it is not surprising that these two individuals came together last winter to successfully write a grant to the George I. Alden Trust, a non-profit that supports the development of undergraduate education.

Declan McCabe PhD

The biology department at Saint Michael's College has seen enormous growth in the last fifteen years by almost doubling the number of majors from 129 to 235 and by increasing the number of full time faculty from 9 to 14. With Fabian-Fine's initiative and McCabe's experience, this dynamic duo saw the potential in this expansion and set out to create opportunities for more collaborative learning and research by applying for a grant for shared equipment. The grant was successful and Saint Michael's College was awarded $150,000 from the Alden Trust which Saint Michael's College matched with an additional $150,000. To better image samples, these funds are being used to create a facility complete with microscopes, sample processing equipment, and computer workstations for analysis. The molecular fields are gaining a real-time PCR machine to study population genetics and to more accurately measure gene expression. The physiologists are expanding their measurement capacity with new equipment, a 3D scanner, and software. Fabian-Fine and McCabe saw an opportunity to collaborate on a grant and the net result is expanded research and teaching opportunities for almost the entire biology faculty.

Central American Hunting Spider

Johnson State College Undergraduates P

From Left to Right: From left to right: Katie Bora, Shayna Bennett, Marcelle Leahy (wife of P. Leahy), Senator Patrick

Four undergraduates from Johnson State College traveled to Washington, D.C. last April to present their research before members of Congress, Congressional staff, representatives from federal grant agencies, and other researchers at the prestigious annual "Posters on the Hill" sponsored by the Council on Undergraduate Research. The project of Shayna Bennett, Heather Murphy, Shavonna Bent, and Katie Bora was one of only 60 selected from over 350 applications submitted by undergraduates across the U.S.

The students, under the mentorship of Dr. Elizabeth Dolci, investigated bacterial response to human-induced stress at the Vermont Asbestos Group mine. The mine, no longer in operation was the second largest asbestos mine in the United States, operating from the early 1900s to 1993. Today the site is characterized by 28 million tons of mine tailings, elevated concentrations of heavy metals, water reaching a pH of 9, and biological disturbances including physical deformities in fish. The students screened 23 bacterial mine isolates for heavy metal resistance, antibiotic resistance, and antibiotic production. They found that 26% of the bacteria exhibited resistance to two or more antibiotics, produced one or more antibiotics, and tolerated elevated levels of the heavy metal, cadmium. Resistance to six or more antibiotics was expressed in 13% of the bacteria and 78% produced at least one antibiotic. This scope of resistance and antibiotic production may provide insight into bacterial response to human degraded environments. The research has been funded by VGN pilot and project awards to Liz Dolci; Shayna, Heather, and Shavonna received VGN student summer support.

The two-day "Posters on the Hill" meeting featured participation in a White House Office of

Present Research at Posters on the Hill

Leahy, Shavonna Bent, Heather Murphy, Elizabeth Dolci (photo courtesy of the Office of Senator Patrick Leahy.

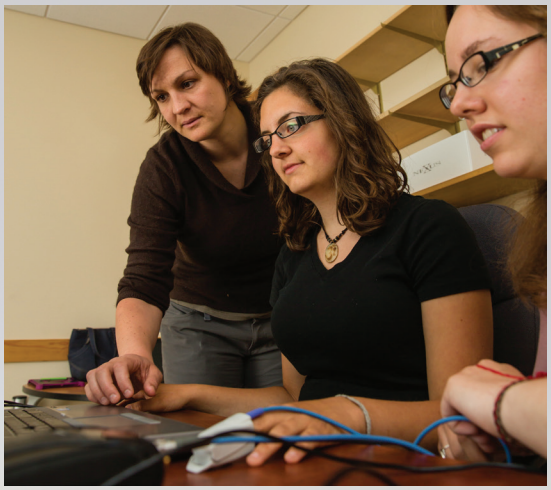
Science and Technology Policy Young Professional Panel where students were introduced to young scientists who were serving as advisors on federal science policy. Meetings with Senator Patrick Leahy and staff members of Senator Sanders and Representative Peter Welch were highlights of the event. Vermont's lawmakers had the opportunity to learn from four, first generation college students, the value of research experiences in undergraduate education. The event culminated with an evening poster session at the U.S. Capitol where the students presented their research findings to an audience of congressional staff, government officials, and other academics. They had an opportunity to meet and discuss their research experiences with Dr. Krishan Arora, the INBRE program director. Ms. Bennett described the significance of the event - "Going to Posters on the Hill made me realize that important people making decisions in Washington care and want to listen to our voice and what we are finding."

Travel to Washington was supported by a National Science Foundation's Scholarship in Science, Technology, Engineering, and Mathematics (S-STEM) grant to Johnson State College, the College's student government, and the President's Fund for Excellence in Teaching and Learning.

The experience was valued by all four students. To quote Ms. Bent, "My experience with Posters on the Hill was a formative part of my education at Johnson State College. Interacting with other undergraduate researchers expanded my view of the depth and breadth of research that is performed across many disciplines."

Amy Welch PhD, Johnson State College, Presents Her Research at the 2016 Stress and Anxiety (STAR) Society Annual Meeting in Croatia

By Amy Welch



Left to Right: Amy Welch PhD, Emily Sokolowski, Melissa Rixon

This summer, with VGN support, I traveled to Zagreb (Croatia) to present a paper at the Stress and Anxiety Research (STAR) Society Annual Meeting. The trip was a great success and involved a number of firsts for me: my first time attending a 'STAR' conference, my first trip to Croatia, and my first time presenting at an international conference with undergraduate students as co-authors. The conference was hosted by the University of Zagreb, the oldest and biggest university in South-Eastern Europe with 75,000 students! My immediate reaction upon arrival was that the City is modern, vibrant, and boasts some beautiful architecture. However, there were also pockets of evidence that the country is still recovering from war, 20 years on. I also noticed a prevalence of war-related references and topics throughout the conference, which points to the widespread and long-lasting impact of war on the psychological health.

My presentation, titled "Randomized Controlled Trial of Exercise and Biofeedback Interventions in Highly Stressed Adults: Preliminary Findings of Psychological Effects", detailed some early findings from my VGN-funded research program. The project involved comparison of a 4-week aerobic exercise intervention to a 4-week biofeedback-assisted diaphragmatic-breathing intervention in adults with high stress levels. We sought to identify whether these two markedly different stress-management strategies, one active and one passive, differed in psychological, physiological and behavioral markers of effectiveness. The results showed that both 4-week interventions were effective at improving psychological health of the stressed adults that completed them. However, some differences were evident: the breathing intervention seemed to be slightly more effective for improving negative variables (stress & depression), whereas only exercise improved the positive psychological variable (life satisfaction). This pattern corroborated the differences in psychological effects we found in an acute intervention study we recently published (Meier & Welch, 2016), in which a 10 minute self-paced exercise bout increased feelings of 'energy' (a positive emotional state characterized by high arousal), and a 10 minute of diaphragmatic breathing with biofeedback increased calmness. In that study, both strategies reduced state anxiety, with a slightly larger effect seen for the breathing protocol. It appears these strategies can have similar effects in both the short and long-term.

My undergraduate coauthors, Emily Sokolowski and Melissa Rixon were fundamental in getting this project started, and their input on research design (particularly protocol development and pilot-testing) helped to shape the nature of the interventions. However, it's imperative that I acknowledge the significant input from all the excellent students that have worked with me as VGN-funded research assistants in the Behavioral Medicine Lab over the last 3 years. They all worked hard to maintain a strict schedule of recruitment, data collection and effective intervention delivery. This time-consuming study would undoubtedly never have seen the light of day without them!

Meier, N. F., & Welch, A. S. (2016). Walking versus biofeedback: a comparison of acute interventions for stressed students. Anxiety, Stress, & Coping, 29(5), 463-78. Doi: 10.1080/10615806.2015.1085514.

SAVE THE DATE

VGN Annual Career Day
DoubleTree Hotel, South Burlington, VT
Wednesday, April 12, 2017

VGN Professional Development Seminar
Middlebury College
Saturday, April 22, 2017

New England Regional IDeA Conference (NERIC)
Sheraton Hotel and Conference Center,
South Burlington ,VT
August 16, 17 and 18, 2017

Landmark College receives $650,000 from NSF for STEM Scholarship and Support

The National Science Foundation (NSF) awarded Landmark College $650,000 over five years for "Access to Innovative Education: STEM Opportunities for Students with Learning Disabilities" (AIE-STEM). The program launched this September with five students, each of whom will receive up to $10,000 in scholarship support. The purpose of the grant is to remove financial barriers to STEM education for qualifying students with financial need. In addition, the grant will provide an array of supports geared toward student success.

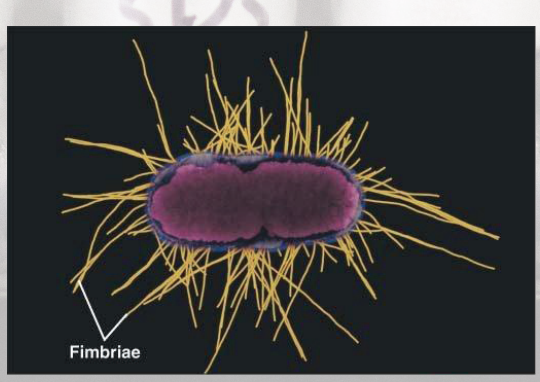
"The program was designed for college learners who have dyslexia, ADHD, ASD, and other profiles," said Dr. Michelle Bower, chair of the Mathematics and Computer Science Department. Bower co-directs the grant program with Abigail Littlefield, a professor in the Natural Science Department. "We are so excited to work with students for whom a program like ours may have been out of reach financially," said Bower. "There's talent out there, and we look forward to mentoring more students who will go on to make contributions to STEM."

The Laboratory of Keith Mintz PhD at UVM, with the VGN Proteomics Core, Identifies Proteins Necessary for Fimbrae Secretion and Biofilm Development in the Oral Pathogen *Aggregatibacter actinomycetemcomitans*

The cell envelope of Gram-negative bacteria is an essential structure required for cellular maintenance, protection from environmental stressors, and interactions with other microorganisms or eukaryotic tissues. Three physiochemically distinct but contiguous compartments compose this structure: the inner membrane, a phospholipid bilayer adjacent to the cytosol; the periplasm, a viscous aqueous compartment containing the peptidoglycan cell wall; and the outer membrane, an asymmetric bilayer composed of lipids and lipopolysaccharide exposed to the extracellular environment. Each compartment contains conserved proteins of general cellular functions and proteins exclusively associated with the specific organism.

Standing Left to Right: Yan Xing, David Danforth, Kenneth Smith, Keith Mintz
Kneeling Left to Right : Richard Voogt, Thomas Freeman

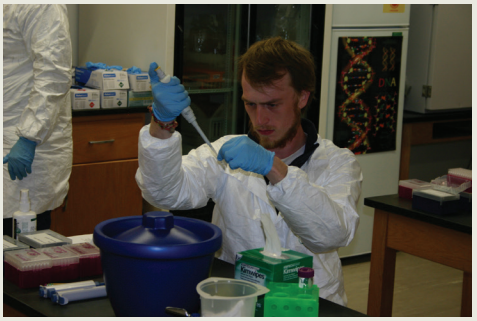
The loss of a conserved inner membrane protein, morphogenesis protein C (MorC) from the oral pathogen *Aggregatibacter actinomycetemcomitans*, dramatically changes the morphology and physiological properties of the outer membrane of the bacterium. To elucidate the role(s) of MorC in maintaining membrane morphology and function, we, in collaboration with the VGN Proteomics Facility, under took a proteomic approach to quantify differences in the membrane proteome of the wild type and isogenic *morC* mutant strains. Membrane proteins were extracted, differentially labeled and a multidimensional protein identification technique (MudPIT), utilizing ion exchange chromatography coupled with analysis by mass spectrometry, was employed. 665 proteins were identified from the wild type strain including surface adhesins, porins, lipoproteins, numerous influx and efflux pumps, multiple macromolecular transporters, and components of the type I, II and V secretion systems. 107 proteins with unknown function were associated with the cell envelope. Surprisingly, only 12 proteins were found in lesser (10) or greater abundance in the membrane preparation of the *morC* mutant strain compared with the wild-type strain. One protein (TadB) was associated with the secretion of fimbriae, hair-like protein projections required for biofilm formation. Subsequent investigation into the fimbriae production demonstrated that MorC influences fimbriae formation and altered the microcolony formation required for biofilm development in the oral pathogen *A. actinomycetemcomitans.*



Fimbriae

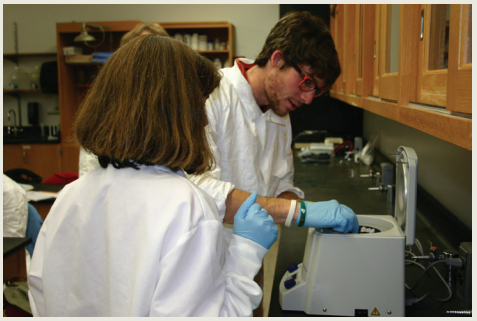
Castleton University to Invest $3.6 Million in STEM Facilities

Castleton University has committed to investing roughly $3.6 million to renovate and modernize the Jeffords Science Center after acquiring a $1 million investment from the State of Vermont.

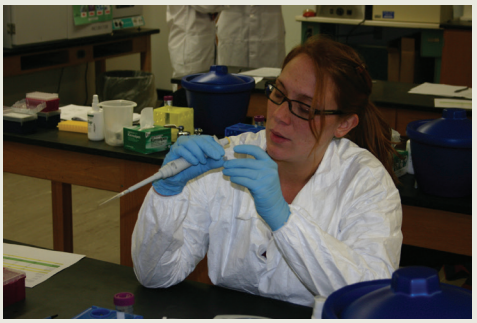


The Castleton STEM Improvement Project includes funds from the Capital Adjustment Bill funded from the State paired with a match from the University totaling $1.5 million which will be combined with other funding sources for renovations and expansion of their science laboratories.

“In order for our students to be competitive in the job market or in graduate school, they need research experience as undergraduates to develop many laboratory and critical thinking skills necessary for success” said David Wolk, President of Castleton University.



Over the last six years, the Natural Sciences Department has won more than $750,000 in grant funding from agencies such as the NSF, the Vermont Genetics Network (VGN), VT EPSCoR and NEWRnet for active research. The majority of these funds have gone to student-faculty research where students and faculty work side by side on new and innovative research. “Undergraduate research is an essential component of an education in STEM majors” said Tim Grover, PhD, Natural Sciences Department Chair.



Five students from the Natural Sciences Department presented the results of their research at the Northeast Section meeting of the Geological Society of American last spring. Four other students presented research at a career day event sponsored by the Vermont Genetics Network.

Introducing Rachel Green

Rachel Green comes to the VGN team after five years of program oversight and federal grants management experience at the Vermont Department of Health. While there, she served as the PI on the Medicare Rural Hospital Flexibility Grant Program (FLEX) and the Small Rural Hospital Improvement Program (SHIP), and contributed to various other grants and programs that sought to increase affordability and access to high quality healthcare in rural Vermont. Prior to working at the Health Department she served as a research assistant at Columbia University Mailman School of Public Health. Rachel holds a Masters in Public Health from Tulane University and a Bachelor's in Anthropology from Stony Brook University.

Contributions & Credits

- Cover Photo: Brian MacDonald, St. Michael's College
- Japanese Knotweed background (Pg2): By Peter bankers (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons from Wikimedia Commons
- NIH Building background (Pg3): By Chris Spielmann (Photographer) [Public domain or Public domain], via Wikimedia Commons from Wikimedia Commons
- Bangledesh Map (Pg4): By Jacques Descloitres, MODIS Land Rapid Response Team, NASA/GSFC (Cropped from Visible Earth) [Public domain], via Wikimedia Commons from Wikimedia Commons
- Posse Logo: Posse Foundation
- Spider (Pg7): Brian MacDonald, St. Michael's College

VGN In The News

WCAX - "Tracking Vt. ticks to study Lyme disease" (William Landesman PhD) video clip (shortlink here)

Saint Michael's College - "The Perils of Sensory Overload" (Ruth Fabian-Fine PhD) newsletter (shortlink here)

Vermont Public Radio - "Researchers Dissect Ticks, Searching Their DNA For Clues To Disease" (Charlie Delany, Alan Giese PhD) audio/text (shortlink here)

Vermont Public Radio - "Laugh, Baby, Laugh" (Gina Mireault) audio/text (shortlink here)

VGN Publications

Meier, N. & Welch, A.S. (2015). Walking vs. Biofeedback: A comparison of acute interventions for stressed students. Anxiety, Stress & Coping. doi:10.1080/10615806.2015.1085514

Smith, K., Lanningham-Foster, L., Welch, A., Campbell, C. (2015). Web-Based Behavioral Intervention Increases Maternal Exercise but does not Prevent Excessive Gestational Weight Gain in Previously Sedentary Women. Journal of Physical Activity and Health.

Balcom IN, Driscoll H, Vincent J, Leduc M. Metagenomic analysis of an ecological wastewater treatment plant's microbial communities and their potential to metabolize pharmaceuticals. F1000Res. 2016 Jul 28;5:1881. doi: 10.12688/f1000research.9157.1. eCollection 2016. PubMed PMID: 27610223; PubMed Central PMCID: PMC4995686.

Castro-Gomes V, Bergstrom HC, McGuire JL, Parker CC, Coyner J, Landeira-Fernandez J, Ursano RS, Palmer AA, Johnson LR (2016). Dendritic organization of lateral amygdala neurons in fear susceptible and resistant mice. *Neurobiology of Learning and Memory* 127: 64-71.

Mireault GC, Crockenberg SC, Sparrow JE, Pettinato CA, Woodard KC, Malzac K. Social looking, social referencing and humor perception in 6- and-12-month-old infants. Infant Behav Dev. 2014 Nov;37(4):536-45. doi: 10.1016/j.infbeh.2014.06.004. PubMed PMID: 25061893; PubMed Central PMCID: PMC4262602.

Deng L, Kabeche R, Wang N, Wu JQ, Moseley JB. Megadalton- node assembly by binding of Skb1 to the membrane anchor Slf1. Mol Biol Cell. 2014 Sep 1;25(17):2660-8. doi: 10.1091/mbc.E14-04-0896. PubMed PMID: 25009287; PubMed Central PMCID: PMC4148255.

Leung JM, Tran F, Pathak RB, Poupart S, Heaslip AT, Ballif BA, Westwood NJ, Ward GE. Identification of T. gondii myosin light chain-1 as a direct target of TachypleginA-2, a small-molecule inhibitor of parasite motility and invasion. PLoS One. 2014 Jun 3;9(6):e98056. doi: 10.1371/journal.pone.0098056. PubMed PMID:24892871; PubMed Central PMCID: PMC4043638.

Wyffels J, King BL, Vincent J, Chen C, Wu CH, Polson SW. SkateBase, an elasmobranch genome project and collection of molecular resources for chondrichthyan fishes. F1000Res. 2014 Aug 12;3:191. doi: 10.12688/f1000research.4996.1. PubMed PMID: 25309735; PubMed Central PMCID: PMC4184313.

Caballero MC, Alonso AM, Deng B, Attias M, de Souza W, Corvi MM. Identification of new palmitoylated proteins in Toxoplasma gondii. Biochim Biophys Acta. 2016 Apr;1864(4):400-8. doi:10.1016/j.bbapap.2016.01.010. PubMed PMID: 26825284; PubMed Central PMCID: PMC4857766.

Tacoma R, Fields J, Ebenstein DB, Lam YW, Greenwood SL. Characterization of the bovine milk proteome in early-lactation Holstein and Jersey breeds of dairy cows. J Proteomics. 2016 Jan 1;130:200-10. doi: 10.1016/j.jprot.2015.09.024. PubMed PMID: 26391770; PubMed Central PMCID: PMC4859431.

Weir ME, Mann JE, Corwin T, Fulton ZW, Hao JM, Maniscalco JF, Kenney MC, Roman Roque KM, Chapdelaine EF, Stelzl U, Deming PB, Ballif BA, Hinkle KL. Novel autophosphorylation sites of Src family kinases regulate kinase activity and SH2 domain-binding capacity. FEBS Lett. 2016 Apr;590(8):1042-52. doi: 10.1002/1873-3468.12144. PubMed PMID: 27001024; PubMed Central PMCID: PMC4844773.

FROM THE DIRECTOR

In December, we will send a request for applications to faculty members and students for our next round of funding that will begin in June of 2017. We provide faculty $75,000 for project awards and $25,000 for pilot awards. Our undergraduate student research awards will give students the opportunity to work at their home institutions or other outreach partners within Vermont or our Northeast INBRE colleges. This past year we funded 6 Pilots and 10 Project awards to our BPI faculty. We have currently funded 6 small awards for up to $5K. These small awards have a rolling application deadline and can be broadly utilized for equipment purchase, facility use, course release, as well as other research needs. We are looking forward to the new crop of 2017 pilot and project proposals and funding new and exciting research!

Good luck to all of the applicants!

Judith Van Houten, PhD
Director, Vermont Genetics Network
University Distinguished Professor
University of Vermont

Internal Steering Committee

BPI Members

Robert Cluss, PhD
Professor of Chemistry & Biochemistry
Middlebury College

Natalie Coe, PhD
Associate Professor of Biology
Green Mountain College

Elizabeth Dolci, PhD
Professor and Chair of Environmental & Health Sciences
Johnson State College

Alan Giese, PhD
Associate Professor of Natural Sciences
Lyndon State College

Tim Grover, PhD
Professor and Chair of Natural Sciences
Castleton University

Karen Hinkle
Associate Dean of Biology
Norwich University

Mark Lubkowitz, PhD
Professor of Biology
Saint Michael's College

UVM Faculty

Ralph Budd, MD
Professor of Medicine
Director, Immunobiology Program

Christopher Francklyn, PhD
Professor of Biochemistry
Adjunct Professor, Microbiology & Molecular Genetics

Stephen Higgins, PhD
Professor and Vice Chair, Psychiatry

Charles Irvin, PhD
Professor of Medicine, Pulmonary Medicine

Susan Wallace, PhD
Professor and Chair, Microbiology & Molecular Genetics

Administration

Joseph Byrne, PhD
Assoc. VP for Academic Affairs (Norwich)

Richard Galbraith, MD, PhD
VP for Research (UVM)

Thomas Vogelmann, PhD
Dean, College of Agriculture and Life Sciences (UVM)

External Advisory Committee

Chair, Carol Newlon, PhD
Emeritus Professor
Department of Microbiology & Molecular Genetics
Rutgers New Jersey Medical School

Peter Bruns, PhD
Professor of Genetics Emeritus, Cornell University, and Vice President retired, Howard Hughes Medical Institute (HHMI)

Graham Walker, PhD
American Cancer Society Professor, HHMI Professor
Department of Biology
Massachusetts Institute of Technology (MIT)

George Witman, PhD
Professor, Cell and Developmental Biology
University of MA Medical School

About VGN

VGN is designed to provide the equipment and technology necessary to enhance the competitiveness for national funding for genetics research and to enhance and continue to build a culture of research throughout the state of Vermont. We are committed to future generations of research scientists therefore we support student and faculty research at Baccalaureate Partner Institutions (BPIs). Our goal is to bring about sustainable changes in how we in Vermont carry out research and educate our next generation of scientists and doctors.

VGN is funded by the National Institute of General Medical Sciences as part of the **National Institutes of Health initiative IDeA Networks of Biomedical Research Excellence (INBRE)** under award number P20-GM103449.

Vermont Genetics Network
University of Vermont
120A Marsh Life Science Building
Burlington, VT 05405

Vermont Genetics Network

RESERVED FOR ADDRESS LABEL

CURRENT TITLES OF OUR FACULTYS' FUNDED RESEARCH

David Allen, PhD/Middlebury College: "Elevational Gradient in Black-legged Tick Density and *Borrelia-infection*"

Brian Bradke, PhD/Norwich University: "Clinical Computerized Tomography for Assessing Vertebral Fracture Risk"

Ian Balcom, PhD/Lyndon State College: "Plant-promoted Micropullutant Removal in an Ecological Wastewater Treatment Plant"

Amanda Crocker, PhD/Middlebury College: "Molecular Mechanisms Underlying Plasticity and Diversity in Neural Circuits"

Michael Dash, PhD/Middlebury College: "Metabolic Consequences of Synaptic Plasticity"

Megan Doczi, PhD/Norwich University: "Localization of Insulin-sensitive Kv1 Channels During Hypothalmic Development"

Michael Durst, PhD/Middlebury College: "High-Speed 3D Multiphoton Fluorescence Imaging with Temporal Focusing Microscopy"

Glen Ernstrom, PhD/Middlebury College: "Genetic Analysis of Neurotransmitter Release in *C. elegans*"

Ruth Fabian-Fine, PhD/Saint Michael's College: "Effects of Overstimulation on Sensory Neurons and the CNS"

Preston Garcia, PhD/Castleton University: "Model of Dual Regulation Control of a Modified Catabolite Repression System"

Alan Giese, PhD/Lyndon State College: "Metagenomic Assessment of the Microbiome of the Black-legged Tick"

Leslie Johnson, PhD/Johnson State College: "More than"baby weight": The Expression and Experience of Postpartum Weight Bias"

William Landesman, PhD/Green Mountain College: "Patterns and Mechanisms of *Borielia burgdorferi* Loading in *Ixodes scapularis*"

Joe Latulippe, PhD/Norwich University: "A Mathematical Model of Synaptic Plasticity in Neurons"

Dagan Loisel, PhD/Saint Michael's College: "Immune Genetic Diversity and Infectious Disease in Wild Vermont Bobcats"

Christine Palmer, PhD/Castleton University: "Improving Casual Gene Prediction from GWAS"

Clarissa Parker, PhD/Middlebury College: "Genome-wide Association and eQTL mapping in the DO Mouse Population"

AnGayle Vasiliou/Middlebury College: "Sulfur Chemistry: Molecular Mechanisms to Human Health"

The VGN links resources at the University of Vermont to its partner institutions, which include:

Castleton University
Green Mountain College
Johnson State College
Lyndon State College
Middlebury College
Norwich University
Saint Michael's College
Community College of Vermont*
Landmark College*

NIH reminds us that "IDeA Investigators being funded through one of the IDeA initiatives are expected to apply for and receive independent research funding." VGN's mission is to provide the resources for researchers in our partner institutions to develop their research and submit competitive proposals to support their research into the future.

* Outreach Partners