



Vermont Genetics Network

2018

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VGN Researcher Awarded NIH AREA Grant

**Northeast Regional IDeA Conference
Highlights**

**VGN Graduate Creates
Opportunities For New Students**

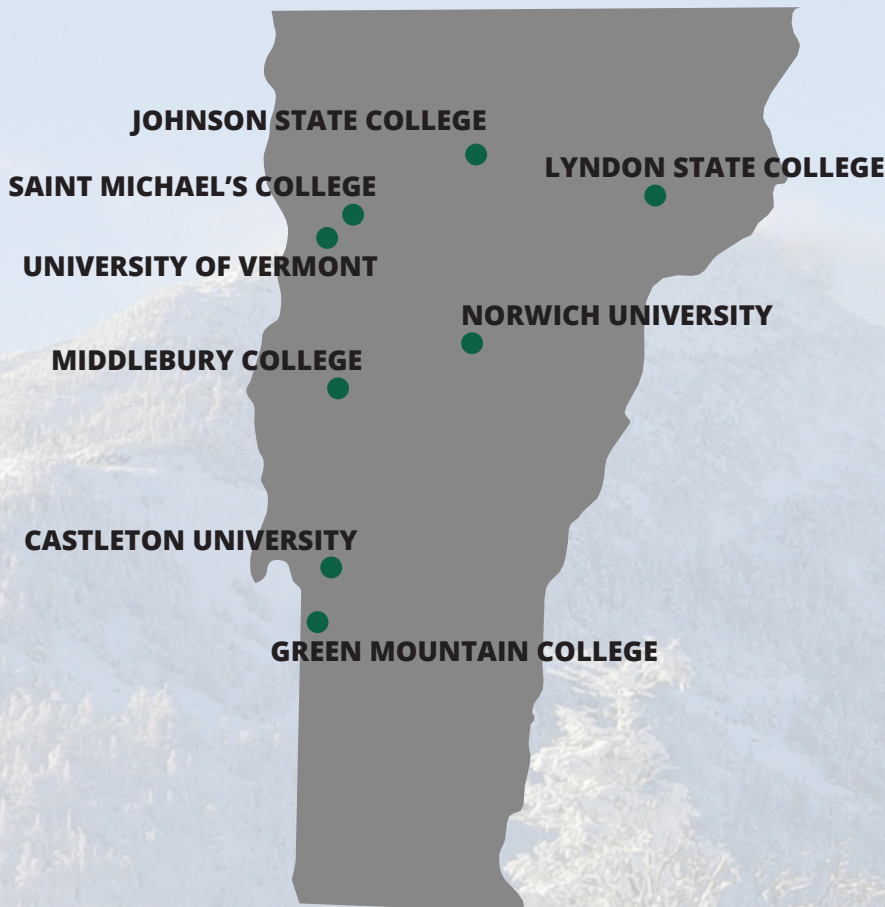
New STEM Course Engages Students

**VGN Student Gains Coveted
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VGN Students Present Research Abroad

About the Vermont Genetics Network

The Vermont Genetics Network (VGN) is in its third phase of funding with a five-year \$17.8 million award from the IDeA Networks of Biomedical Research Excellence program of the National Institute of General Medical Sciences at the National Institutes of Health. The mission of VGN is to build human and physical infrastructure in Vermont for biomedical research. At the lead institution, the University of Vermont, we have developed state-of-the-art facilities for Proteomics and Bioinformatics to provide to researchers across Vermont the resources they need to carry out world class research and compete for federal funding. To address workforce development and its diversity, we build cultures of research by supporting faculty and student research at our Baccalaureate Partner Institutions: Castleton University, Johnson and Lyndon State Colleges, Middlebury College, Norwich University, Saint Michael's College and Green Mountain College. We also work with students in college lab classes throughout Vermont in order to bring state-of-the-art research resources into their education, including at the Community College of Vermont and Landmark College.



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.

Cover Photo: Northern Star Coral by Eric Heupel

 Castleton University

Green Mountain College



Former VGN Student Pays It Forwards

Little did Ryan Joy know seven years ago that, with one decision made as an undergraduate student at Johnson State College (JSC), he had just altered his entire career. Joy had applied to attend a bioinformatics workshop through the Vermont Genetics Network (VGN).

That workshop led him to Dr. Elizabeth Dolci, who encouraged him to apply through VGN to attend a Genome Annotation Workshop co-hosted by the University of Delaware. It was there that he had his first exposure to cutting-edge science technology, which ignited a deeper interest in research.

With the continued help of JSC faculty, Joy won a coveted VGN summer internship to work in Dr. Bryan Ballif's lab at the University of Vermont in 2011. There he studied differential protein expression in the development of mice, which later turned into his senior thesis project. A native Vermonter, Joy recounts, "It was a fantastic way to get research training."

While it pushed him out of his comfort zone, he was happy for the experience to utilize research equipment not available on his home campus. At the end of the summer, Joy mentioned an interest in graduate school, an idea that was wholly supported by Dr. Ballif.

Upon graduating, Joy joined the Ballif lab as a Master's student to study how proteins regulate neuron development in the eye. He credits the

Vermont Genetics Network for developing his interest in developmental biology and for creating the network that helped him enter a graduate degree program. During that time, while working as a teaching assistant, Joy discovered that he "loves sharing science with people." It was no surprise then when the Community College of Vermont (CCV) hired him in 2016 as an instructor.

It all came full circle for Joy when he accepted the position of Coordinator of Academic Services at CCV and became the VGN's key collaborator. As the person now responsible for overseeing all science lab classes at the main Winooski campus and for online courses, Joy is excited to replicate his own experience by "increasing CCV student engagement with VGN so that we can have more students involved in research."



Ryan Joy at the CCV Winooski Campus

Save The Date

4/11/2018 - VGN Career Day

8/15/2018 - VGN Annual Retreat

Find These Stories And More Online

<https://vgn.uvm.edu/Magazine>

Major NIH Grant to Fund Kirshenbaum's E-cigarette Study

"E-cigarettes initially were developed as a cessation tool for tobacco dependence, but now it appears they are also a tool for introducing young adults to other tobacco products," says Ari Kirshenbaum of the Saint Michael's College Psychology Department faculty, who has received a \$365,865 grant from the National Institutes of Health to support his research on the abuse potential of E-cigarettes in young adults.

"The idea is that we don't know how much abuse is going to be inspired by these products, so the key thing may be to find out if the E-cigarettes are dependence-producing on their own," he said, explaining how his work focuses on the psychological consequences of nicotine delivered via electronic cigarettes (E-cigarettes; vaping) such as effects on attention, cognition and emotion.

This is the first NIH grant received by the Psychology Department and Neuroscience Program at Saint Michael's and will support three years of research in Kirshenbaum's long-established psychopharmacology laboratory. The research proposed in the grant will involve exposing young adults to small amounts of nicotine via E-cigarettes. In doing so, it will help to reveal the abuse potential of these devices, and also help to further the scientific understanding of what makes nicotine a dependence-producing drug.

Kirshenbaum said young adults are especially vulnerable to E-cigarette abuse because they are commonly seen as healthier, riskless alternatives to other tobacco products, and marketing campaigns by E-cigarette manufacturers specifically target young adults. He says that a disturbing trend shows that young people are being "introduced to nicotine by E-cigarettes and then they graduate to other tobacco products -- and that is not a good situation."

"Our basic hypothesis is that nicotine results in a myriad of behavioral and psychological effects that contributes to its dependence -- but as of now those effects are rather unclear," he said, specifically in relation to E-cigarette vaping technology.

"It's a fine line, because you want to be able to use E-cigarettes as a cessation tool, but need to be careful about how we market it and how it's available so it doesn't become an introduction to the tobacco world," he said. "Today you can go to tobacco store on Church Street and buy E-cigs -- but if it's really a cessation tool, why not have it be available just at pharmacy with a prescription? So that might be a way to go."

For many years Kirshenbaum's research was funded by the Vermont Genetics Network (VGN), which he said is designed to launch scientists toward the more competitive grants such as this latest one from NIH. Kirshenbaum's recent grant is awarded through the National Institute on Drug Abuse within NIH, which funds less than 11 percent of applications under the Academic Research Enhancement Award program.

Kirshenbaum said that as the first NIH grant for the Saint Michael's Psychology Department that he is aware of, in a way this represents a milestone -- "and with the excellent faculty we have here now, I think we can expect to see more."



Dr. Ari Kirshenbaum

Adapted from Mark Tarnacki's article.

Used with permission.

<https://www.smcvt.edu/news/2017/july/major-grant-to-fund-kirshenbaum-e-cigarette-study.aspx>

Intern Wins Her Place In Research Program

Shavonna Bent realized one of her dreams this past year when she won a highly sought-after spot in the Woods Hole Oceanographic Institution (WHOI) summer research program.

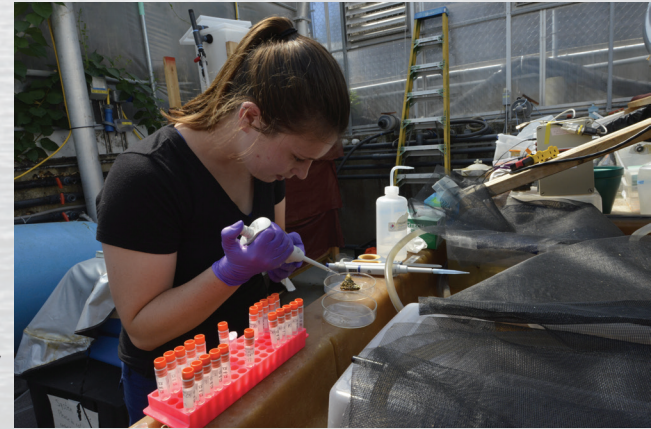
Bent, a senior Biology major at Johnson State College (JSC), was a high school student vacationing with her family in the Cape Cod area when a research vessel caught her eye. When she returned home and discovered it was run by the WHOI, she set her sights on one day becoming a researcher at the renowned institution.

With her determination and the guidance of JSC professors Drs. Elizabeth Dolci and Les Kanat, Bent successfully applied to the organization's National Science Foundation Research Experience for Undergraduates program. During 11 weeks, she attended scientific and professional development seminars, and investigated the production of the Reactive Oxygen Species superoxide in the Northern Star Coral (*Astrangia poculata*).

Superoxide can be both beneficial and harmful to coral health, playing a role in everything from immune defense to bleaching. Therefore, studying the regulation of superoxide is an important step in understanding the functioning of coral reefs.

Bent is returning to WHOI during her winter break to continue working on this research project where she will use genetic analyses to identify bacteria that live in the mucus layer on the coral to assess whether they also contribute to superoxide production. Ultimately, she hopes this will lead to a scientific publication.

"I learned that I definitely want to have a PhD and that research is fun no matter where you do it," says Bent of the experience. After graduating, she hopes to continue to pursue her dreams of becoming a biological oceanographer by enrolling in a joint PhD program through WHOI and the Massachusetts Institute of Technology.



Shavonna Bent at WHOI
(photo credit: Kenneth Kostel)

VGN Invests in Lab Upgrades

This past year the Vermont Genetics Network contributed \$250,000 to support the renovation of research laboratory spaces at Green Mountain College (GMC) and Lyndon State College (LSC). With each school receiving \$125,000 and providing some level of matching funds, the spaces have been outfitted with the latest technologies to conduct cutting-edge molecular research.

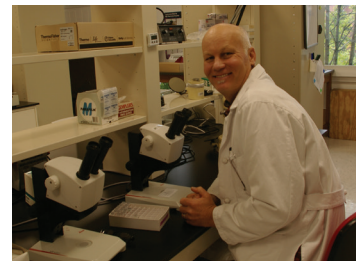
At GMC, two updated labs were completed in spring 2016. The main space holds two new lab benches that accommodate 16 people and two American Disabilities Act compliant workstations. New flooring was designed to withstand chemical spills and a heating unit was installed for improved temperature control. Attached is a second, temperature-controlled lab necessary for using their quantitative PCR instrument.

In addition, a think tank room was finished in summer 2017 to which students have 24-hour access. "This room is a space for planning research experiments, holding meetings and studying. We installed a wall-to-wall white board for designing experiments, and a table designed in-house with sustainable harvested wood," describes Dr. William Landesman.

Similarly, LSC's renovation was completed in August 2016. The space, to be used for faculty and senior undergraduate research projects, has been fitted with new flooring, electrical, gas and air. Additionally, the lab has new workstations, storage areas, sinks and eye-wash stations, a fully functional ventilation hood and ceiling-mounted articulating snorkel hoods.



GMC Labs



LSC Labs



UVM President Tom Sullivan



NERC

North East Regional



Vermont US Senator Patrick Leahy





NERIC 2017

DeA Conference



L to R: Dr. Ralph Budd, Dr. Judith Van Houten, Senator Patrick Leahy



The Vermont Genetics Network and the Vermont Center for Immunobiology and Infectious Diseases hosted the Northeast Regional IDEa Conference (NERIC) in Burlington, VT August 16-18, 2017. This biennial meeting brought together over 300 scientists and students from across five states (VT, NH, DE, RI, ME) to share their advances in biomedical research. With several key staff in attendance from the National Institutes of Health and an impassioned speech delivered by Vermont US Senator Patrick Leahy, NERIC highlighted the importance of continuing to develop the region's biomedical workforce.



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JSC students present research at World Congress in Qatar

The importance of undergraduate research was highlighted when Johnson State College (JSC) students Heather Murphy, Shayna Bennett, and Shavonna Bent, along with professor Dr. Elizabeth Dolci, traveled to Doha, Qatar, in November 2016 to take part in the First International World Congress on Undergraduate Research.

How did this trip all come about? A recent JSC graduate suggested the students attend the conference, which prompted them to submit a joint abstract on their research.

According to Bent, their projects focused on profiling the characteristics of the aquatic bacterial community at the Vermont Asbestos Group mine. "Our question was fairly simple; how have humans impacted [the aquatic bacterial] community in comparison to other nearby sites? Our team asked if the bacteria isolated were resistant to heavy metals, resistant to antibiotics and if any produced antibiotics. We found that a few isolates did display all three characteristics. Moving forward we would like to determine levels of heavy metals and antibiotics that the bacteria are resistant to, and if they produce any novel antibiotics," said Bent.

The group received travel funds through the Vermont Genetics Network, JSC and the National Science Foundation's START grant. The conference, which featured students from the Middle East, the United States, Australia and Europe, took place at Qatar University. Murphy said that they prepared a poster for their presentation, and were allowed a one-hour time slot to present and to take questions from their audience.



Adapted from Connie O'Hearn's article. Used with permission.

<https://www.basementmedicine.org/campus-community/2017/03/09/jsc-students-present-research-at-world-congress-in-qatar/>

When asked if it was a positive experience, everyone agreed that the trip was exceptional. "It showed me how similar students are regardless of where they come from and what culture they come from," said Dolci.

According to Murphy, conferences such as these also provide undergraduate students with the necessary experience they need. "If a student wants to go to graduate school, undergraduate research is key," said Murphy.

The second World Congress on Undergraduate Research is scheduled in Oldenburg, Germany on May 23-25, 2019.

Consortium Unites Tick Researchers Across Vermont

Those who like to explore and hike across the Green Mountain State are all too familiar with the post-outing tick check to protect oneself from threats, such as Lyme disease. And rightly so, as Bradley Tompkins, an infectious disease epidemiologist with the Vermont Department of Health confirms "the number of tick-borne diseases in the state has been increasing over the last 10 years."



In an effort to gather information and resources to help inform the public, Tompkins organized an inaugural conference of tick and tick-borne disease professionals in March 2017. This "meeting of the minds" was meant to bring experts across the state together to identify areas of overlap for potential collaboration and to determine directions for future surveillance of tick populations.

Of the 14 attendees, three were VGN-funded researchers: Dr. David Allen from Middlebury, Dr. William Landesman from Green Mountain College, and Dr. Alan Giese from Lyndon State College. Dr. Landesman found participating in the conference beneficial to meet other researchers in Vermont and to hear what everyone's particular skills are. For example, he learned of a new method to extract DNA from the ticks he collects.

Another example of how this conference helped researchers to network came from combining datasets from Dr. Giese's work with that of the Vermont Agency of Agriculture to determine the prevalence of disease in the state's blacklegged tick population. Over 60% of the ticks collected through these efforts tested positive for at least one disease, information that is now publicly available through the Vermont Department of Health's website.

In order to build on this momentum and continue to open the lines of communication between academia and state government, Tompkins is setting a date for next year's conference. Anyone who would like more information can contact him directly at bradley.tompkins@vermont.gov.



Course Engages Tomorrow's STEM Researchers

Imagine you are in the second semester of your undergraduate career when your professor walks into the classroom and hands you a clump of soil and tells you to get bacteria from the sample. Naturally, your eyes widen in surprise! That is exactly the reaction Associate Professor of Biology, Dr. Preston Garcia laughingly describes when discussing the Small World Initiative (SWI) course he began teaching at Castleton University in Spring 2017.



Dr. Preston Garcia

Garcia first heard about SWI when reading his University of Connecticut alumni magazine. Founded by the renowned microbiologist Jo Handelsman at Yale University, the SWI program aims to inspire students to pursue scientific research by taking a hands-on approach and having them discover new antibiotics from soil bacteria. Since 2012, the SWI course has been implemented in more than 250 schools across 38 states, Puerto Rico and 14 countries.

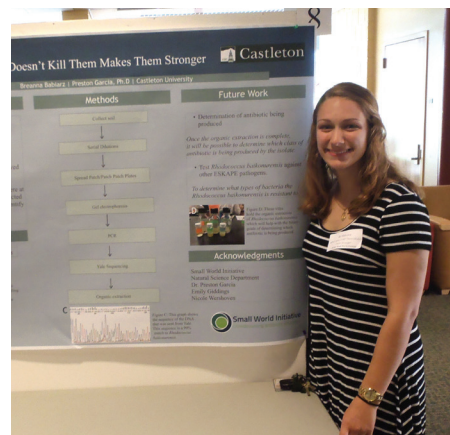
Recognizing the national concern of high attrition rates, Garcia saw the SWI course as a way to retain science majors, which is one of the program's goals. Having been accepted to and attended an instructor training during the 2016 summer break, he found great flexibility in adapting the SWI curriculum to meet the needs of Castleton University. In the end, every one of the 12 students in his first cohort, including 11 freshmen, managed to successfully isolate and identify antibiotic-producing bacteria.

Many of the SWI students attended the VGN Career Day where they enjoyed the experience and took notes on how to create and present a research poster. All of the students presented their project at both the campus-wide Castleton Scholars Celebration and Natural Sciences Department Science Fair.

In addition, nine of those students applied for summer research internships, including positions funded by the Vermont Genetics Network. Garcia accepted three rising sophomores into his own lab and during their training he heard the phrase "Oh, like how we did this in SWI" more than once! Having already been exposed to a hands-on research experience through SWI, the students were familiar with the scientific process and other basic skills, like how to keep lab notebooks, make serial dilutions and use a pipette.

By the end of their summer internship all three students asked if they could be Garcia's teaching assistant for his SWI course offered again in Spring 2018! Next year Garcia would like to access more of the SWI resources, such as the online soil sample database, and even begin analyzing some of the antibiotic compounds as part of the organic chemistry courses offered at Castleton University. Overall, SWI provides a great student learning experience while helping to address a global health threat.

If you would like more information about SWI, you can visit their web page at <http://www.smallworldinitiative.org/> or contact Dr. Preston Garcia who serves on the SWI Outreach Committee at Preston.Garcia@castleton.edu.



WELCOME NEW VGN FACES



Dr. Fan Zhang

Dr. Fan Zhang is VGN's Bioinformatics Core Director and Research Associate Professor of Biology. He joins us from the University of North Texas Health Science Center where he worked as a Research Assistant Professor for five years. Dr. Zhang provides bioinformatics support for all faculty in our network, and can help with experimental design, data analysis, and manuscript and grant preparation.

Dr. Tabitha Finch

Dr. Tabitha Finch is VGN's Professional Development and Education Coordinator. Prior to joining VGN, she studied the evolution of the African elephant and worked in informal science education in Alabama and Zambia. Dr. Finch assists funded faculty and students with their research and training needs.



Meg Rebull

Meg Rebull is VGN's Administrative Coordinator. She joins us from the University of Colorado Cancer Center where she worked for 17 years in behavioral health prevention. Meg coordinates among the VGN office, UVM, NIH, and our baccalaureate partner institutions to keep all the parts of our enterprise moving forwards.

VGN CORE UPDATES

PROTEOMICS CORE

It has been 11 years since the inception of the VGN Proteomics Facility! Here are some highlights from our work:

- Provided expertise to more than 100 network investigators.
- Supported more than 40 federal and non-federal awards.
- Helped investigators publish their findings in more than 120 peer-reviewed publications.
- Incorporated proteomics into 11 courses and laboratory curricula at UVM and partner institutions.

News:

Catrina Hood, a recent graduate from Colby Sawyer College, joined us recently as our Proteomics Facility technician.

We are excited to announce that we will be installing another upgraded version of the Q-Exactive in winter 2017!

Learn more at <https://vgn.uvm.edu/proteomics>

BIOINFORMATICS CORE

2017 has brought fresh changes and new faces to the VGN Bioinformatics team. Dr. Fan Zhang joined as the new director. Other highlights include:

- The Core supported four new awards, and provided five support letters to UVM Faculty for grant applications.
- Seven manuscripts published and four under review featuring bioinformatics analyses by our staff.
- A new collaboration with Dr. Michaela Reagan from Maine Medical Center Research Institute to assist her study of multiple myeloma.
- A new collaboration with Anna Schmoker from Dr. Bryan Ballif's Lab (UVM) for her project focused on signaling mechanisms in vertebrate central nervous system development.

Learn more at <https://vgn.uvm.edu/bioinformatics>

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 2018. 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 8 Pilot and 3 Project Awards to our BPI faculty. In addition, we have funded 14 Small Awards. 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 2018 Pilot and Project proposals and funding new and exciting research!

Good luck to all of the applicants!

J. VanHouten

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

VGN 2017 HIGHLIGHTS



VGN's faculty member for Faculty Development, Dr. Jim Vigoreaux, part of team awarded \$300,000 NSF grant to explore how the maker movement can be used to engage undergraduate biology students



Castleton University's Dr. Preston Garcia submitted successful grants to purchase \$65,900 of new equipment



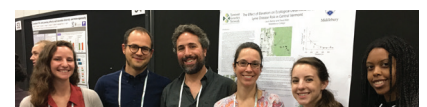
Dr. Joe Latulippe from Norwich University presented his VGN funded research at the Society for Mathematical Biology conference in Salt Lake City, UT

Middlebury College students Emma Moskovitz and Anthony Turcios presented their research from Dr. Michael Durst's lab at the Optical Society of America conference in Washington, DC



Dr. Lesley-Ann Giddings from Middlebury College delivered a research seminar to the University of Tennessee

Drs. Allison Neal (Norwich University), William Landesman (Green Mountain College) and David Allen (Middlebury College), along with their students, presented at the Ecological Society of America conference in Portland, OR



Vermont Genetics Network
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Vermont Genetics Network

TITLES OF OUR CURRENT FACULTY FUNDED RESEARCH

David Allen, PhD - Middlebury College "Effect of Elevation and Forest Area on *Ixodes* Density and *Borrelia* Infection"

Amanda Crocker, PhD - Middlebury College "Mapping the Neuronal Circuitry and Molecular Mechanism Underlying Nociception in *D. melanogaster*"

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

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

Ruth Fabian-Fine, PhD - Saint Michael's College "Co-transmission and Activity Induced Changes in Central and Peripheral Neurons"

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

Lesley-Ann Giddings, PhD - Middlebury College

"Induction of Cryptic Genes in Rare Antarctic *Marinobacter* for the Production of Novel Secondary Metabolites"

Leslie Johnson, PhD - Johnson State College "The Causes and Consequences of Perceived Postpartum Weight-bias"

William Landesman, PhD - Green Mountain College "Ecosystem, Tick Microbiome and Blood Meal Source as Drivers of Lyme Disease Risk"

Joe Latulippe, PhD - Norwich University "A Mathematical Model for Calcium Regulation in an Alzheimer's Neuron"

Allison Neal, PhD - Norwich University "Vermont Trematodes: Diversity, Interactions and the Risk of Cercarial Dermatitis"

Christine Palmer, PhD - Castleton University "Diet Specialization and Gut Microbiota in Neotropical Katydid"

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