Whether you say, “Good things happen in threes!” or “Jamais deux sans trois!” you would be correct if you were discussing the collaborative research of Dr. Bryan Ballif of the University of Vermont, and Dr. Lionel Arnaud of the French National Institute of Blood Transfusion. Together, the two have uncovered the biochemical and genetic bases of three rare blood types in just over a year. Their latest find was recently posted online at the *EMBO Molecular Medicine* journal, solving a 60-year-old blood riddle, and promising to provide immediate assistance to health-care professionals should they encounter the rare but vexing blood type called, “Vel-negative.”

In the early 1950’s, “Mrs. Vel” suffered an acute, severe rejection of transfused blood. This rejection was because after a previous transfusion she developed a potent antibody against some unknown molecule found on the red blood cells of most everyone in the world, but not found on her own red blood cells. She developed the antibody because her immune system considered this unknown molecule to be foreign, just as it would any foreign molecule on the surface of a bacterium. Using the antibody made by Mrs. Vel, and antibodies subsequently found in additional Vel-negative patients, clinicians found that Mrs. Vel was not unique. Indeed it is estimated now that over 200,000 people in Europe and a similar number in North America are Vel-negative! This means that many as 1 in 50 is a carrier for Vel negative blood.

Until now, the only way to determine if someone were Vel negative or positive would be tests using antibodies made by previously identified Vel-negative persons. Arnaud and coworkers in Paris used such a precious, but highly limited antibody to purify the corresponding protein from the surface of human red blood cells. Although the little protein didn’t reveal its identity easily, Ballif eventually identified the protein using a high resolution mass spectrometer funded by the Vermont Genetics Network. When first identified, the protein was only a predicted protein based on the human genome. It has since been called Small Integral Membrane Protein 1 (SMIM1). Arnaud’s team tested the SMIM1 gene of 70 Vel-negative individuals and found that the loss of the SMIM1 protein expression on red blood cells was due to a deletion in the gene encoding SMIM1. Arnaud’s team further developed DNA-based methods that could be conducted in less than a few hours to quickly and precisely identify both patients and blood donors having the Vel-negative blood type. For those rare Vel-negative individuals in need of a blood transfusion, this is a clinically-acceptable and potentially life-saving time frame.

It is common in today’s “post-genomics era” to discuss the concept of “personalized medicine” where doctors treat us based on our individually-unique biological makeup. Interestingly, the science of blood transfusion has been attempting personalized medicine since its inception given that its goal to personalize a transfusion by making the best match possible between donor and recipient. Identifying and making available rare blood types such as Vel-negative blood brings us closer to a goal of personalized medicine; even if you are that rare one person out of 2,500 that is Vel-negative we now know how to rapidly type your blood and find blood for you should you need a transfusion.

Follow the link below to read more:

http://www.uvm.edu/~uvmpr/?Page=news&storyID=15687

1Ballif BA, Helias V, Peyrard T, Menanteau C, Saison C, Lucien N, Bourgouin S, Le Gall M, Cartron JP and Arnaud L. Disruption of SMIM1 defines the Vel blood type. EMBO Molecular Medicine (in press)


I am pleased to provide you with an update on VGN as we move into our tenth year of INBRE funding. We are very excited to announce that three of our Baccalaureate Partner Faculty members have received external funding. Dr. Joanna Ellis-Monaghan of Saint Michael’s College is part of a team that received $2 million from The National Science Foundation to develop cutting-edge nanomaterials for improving the manufacturing of advanced materials, biofuels, and other industrial products. Drs. Mark Spritzer and Catherine Combelles of Middlebury College have each received R15 research grants through the National Institutes of Health AREA program. Dr. Spritzer will investigate the effect of testosterone replacement on the spatial working memory of hypogonadal aged male rats. Dr. Combelles will determine the effects of endocrine-disrupting compounds on the oocyte and the ovarian follicle, the structure that nurtures the developing oocyte. Congratulations to our funded faculty!

On Nov. 15th, the VGN held in partnership with Vermont EPSCoR our Grant Writing Workshop at the Doubletree Hotel in South Burlington, VT. The guest host was Dr. Robert Porter who ran several workshops on writing successful grants and identified a number of grant programs targeted to faculty at Predominantly Undergraduate Institutions. This workshop is a new requirement for those who wish to apply for VGN Project or Pilot awards.

VGN students and their advisors made our 13th Annual Career Day a great success. We gathered on April 16th at the Doubletree Hotel. Dr. Janet Murray, VGN Outreach Director, organized a panel of four speakers who told us about their individual career paths. The panelists included W. Scott Buck- ley, General Manager of ENPRO; Laurie W. Leclair, MD, Associate Professor, Pulmonary Disease & Critical Care Medicine, University of Vermont; Irene R. Rainville, PhD, LGC, Genetic Counselor, Dana Farber Cancer Institute, Harvard University; and Justin Meyette, Senior Technician, Research & Development, Haematologic Technologies, Inc. The undergraduate students presented their VGN research in posters and the top poster prizes were awarded to Emily Lobacz and Will Tinney from Norwich University and Melissa Childs from Middlebury College. Congratulations!

Our most important annual event, the 13th Annual Retreat, was held on August 13th at the Doubletree Hotel. Our invited speaker this year was Dr. Melissa Harrington, Professor of Biology, Delaware State University and Director of the Delaware Center for Neuroscience Research. Dr. Harrington inspired us with her description of her path to successful funding and program building. We came away ready to persevere in proposal submissions. Preceding Dr. Harrington’s talk, Drs. Kevin Fleming of Norwich University, Ian Balcom of Lyndon State College, and Preston Garcia of Castleton State College made presentations about their research. Our other VGN investigators presented posters on their research progress.

Please help me welcome new staff to VGN. Christine Dornbierer is our new Program Manager and Nelson Vila-Santana is our new Laboratory Technician in the Microarray Facility. Congratulations to our BPI faculty who submitted meritorious applications for five project awards and ten pilot awards. Please see the box on page 16 for the PI names and project titles. I wish you all another successful and productive year and thank you for making VGN a success.
Stephen Higgins, PhD has been awarded a five-year $11.5 million Institutional Development Award (IDeA) Center of Biomedical Research Excellence (COBRE) grant from the National Institutes of Health (NIH). The Vermont Center on Behavior and Health (VCFBH) studies the relationships between personal behaviors and risk for chronic premature death. This grant supports research projects led by five outstanding UVM junior faculty that include studies of weight control in breast cancer patients and overweight pregnant women; an intervention to increase cardiac rehabilitation participation in Medicaid patients; a study of heart disease risk in women with breast cancer; and a study of the origins of obesity and heart disease risk in childhood psychiatric syndromes. The VCFBH integrates an interdisciplinary group of accomplished senior scientists, promising junior investigators, and distinguished advisors and collaborators to establish a center of excellence in an area of clinical research that is vitally important to U.S. public health. The Center is led by UVM faculty with Dr. Higgins serving as Director and Philip Ades, M.D., as Associate Director and is one of only three in the nation addressing the important challenge of behavioral health from a behavioral economics perspective.

For more information visit the VCFBH website http://www.uvm.edu/medicine/behaviorandhealth/

Welcome Nelson Vila-Santana to the VGN Microarray Core Facility

Please welcome Nelson Vila-Santana to the Vermont Genetics Network as the new Microarray Lab Technician! Nelson is a recent graduate from Green Mountain College with a BS degree in Biology. Nelson joins the VGN with a variety of undergraduate research experiences in the molecular biology field including two summers of National Science Foundation funded REU internships at Rocky Mountain Biological Laboratory and Boyce Thompson Institute of Cornell, and three years working with Dr. Natalie Coe studying Beech Bark Disease to better understand why some trees are resistant and others susceptible. This research project entailed collecting samples in the field and extracting nucleic acids and protein back in the lab. Nelson also worked with Carol Shaw at Green Mountain College studying the incidence of canine parvovirus in fisher cats. His new role as lab tech in VGN's Microarray Facility is to assist investigators with their projects by providing quantitative and qualitative analysis support for nucleic acid samples on both the Agilent 2100 Bioanalyzer and 2200 Tapestation requiring downstream molecular studies. Nelson also provides full support for target preparation of samples for microarray analysis and data generation. In his spare time, Nelson enjoys outdoor activities most, especially hiking and cycling.

Feel free to stop by the facility to welcome Nelson to the VGN team!

Catherine Combelles, PhD, Awarded NIH R15 Research Grant

Catherine Combelles, PhD (Biology) has been awarded an R15 research grant through the National Institutes of Health’s AREA (Academic Research Enhancement Award) program. This grant will support work to determine the effects of endocrine-disrupting compounds on the oocyte and the ovarian follicle, the structure that nurtures the developing oocyte. Because the health of adults, neonates, fetuses, and embryos all depend upon normal oocyte development, the findings will help to provide a foundation for improving female reproductive health. The grant supports research at Middlebury, the University of New Hampshire, and Emory University, including supplies and travel to conferences as well as Catherine’s 2015-16 academic leave. At least 15 undergraduates will be involved in this research over the next three years.

VGN is now on Facebook & Twitter!

You can find us at:
http://www.facebook.com/VermontGeneticsNetwork

Find out more about upcoming events, check out the latest Outreach pictures and learn about our current grant opportunities.

@VTGeneticsUVVM

Find out more about upcoming events and learn about current award opportunities.
Vermont Genetics Network hosted its 13th Annual Career Day on April 16th at the Doubletree Hotel in South Burlington, Vermont. Undergraduate students and faculty from UVM, CCV, and our 7 Baccalaureate Partner Institutions; (Castleton State College, Green Mountain College, Johnson State College, Lyndon State College, Middlebury College, Norwich University and Saint Michaels College) attended this event that highlighted undergraduate research and a career panel presentation.

Congratulations to VGN Career Day Undergraduate Poster Award Winners

The evening began with student poster presentations. Undergraduate students who received funding form VGN for INBRE Project Year 9 presented posters describing their research projects. Students who were supported by VGN funded faculty researchers were also invited to share their work. Three VGN judges chose two winning posters from the VGN funded students. An 8GB flash drive was awarded to each winner.

Emily Lobacz and Will Tinney from Norwich University with the poster entitled “Improved Novelty P300 in Health Veterans: Evidence for Efficacy of Military Training or Resilience?” Emily and Will conducted their research in the laboratories of Dr. Kevin Fleming and Dr. Carol Bandy.

Melissa Childs from Middlebury College with the poster entitled “The Effect of Sexual Experience on Cell Proliferation in the Hippocampus of Adult Male Sprague-Dawley and Long-Evans Rats.” Melissa conducted her research in the laboratory of Dr. Mark Spritzer.

VGN Career Panel

After a complimentary buffet dinner, Dr. Janet Murray, Director of Outreach for VGN, welcomed the guests and introduced the panel of speakers. The presentations focused on the individual career paths that each panelist took to arrive at their current careers.

Laurie W. Leclair, MD, Associate Professor, Pulmonary Disease & Critical Care Medicine, University of Vermont

Justin Meyette, Senior Technician, Research & Development, Haematologic Technologies, Inc.

Irene R. Rainville, PhD, LGC, Genetic Counselor, Dana Farber Cancer Institute, Harvard University

W. Scott Buckley, General Manager, ENPRO

Emily Lobacz and Will Tinney from Norwich University with the poster entitled “Improved Novelty P300 in Health Veterans: Evidence for Efficacy of Military Training or Resilience?” Emily and Will conducted their research in the laboratories of Dr. Kevin Fleming and Dr. Carol Bandy.

Richard A. Galbraith, MD, PhD

New UVM Vice President for Research

Dr. Richard Galbraith joined the UVM/ Fletcher Allen faculty in 1995 as Professor of Medicine. He has served as the Program Director of the General Clinical Research Center and Chief of Clinical Pharmacology in the Department of Medicine, and Associate Dean for Patient Oriented Research. Since 2007, he has been the Director of the Center for Clinical and Translational Science at UVM. In 2012, Dr. Galbraith was named Associate Dean for Research in the College of Medicine at the University of Vermont, and in February 2014 was appointed Interim Senior Associate Dean for Research. Dr. Galbraith received his M.D. and completed training as an Internist at King’s College, London. He received a multidisciplinary PhD in Molecular and Cellular Biology from the Medical University of South Carolina and served on their faculty prior to relocating to Rockefeller University in New York. There he served as the Director of the General Clinical Research Center and Rockefeller University Hospital.

A leader in UVM’s Faculty Senate, Galbraith was an elected member of the Faculty Senate Research, Scholarship and Creative Arts Committee and has served as its chair for the last eleven years. He was instrumental in the establishment of the Center for Clinical and Translational Science as a Matrix Center and the creation of the Clinical and Translational Science graduate degrees. Dr. Galbraith has also prepared cross-college grant applications that have drawn on his leadership and acumen in consensus building and inclusivity across multiple constituencies and disciplines.

Dr. Galbraith took the post of UVM Vice President for Research on July 1, 2014. He succeeds John Evans, PhD, who served as Interim Vice President for Research.
Proteomics Facility Update

By Ying Wai Lam, PhD — Director, VGN Proteomics Facility

It has been almost eight years since the VGN Proteomics facility was established as the only facility that provides proteomics services in the state of Vermont. We have been serving our network of investigators with the goal of providing the latest technology and comprehensive expertise to enhance research capacities and to establish an educational environment for sharing experience and knowledge in proteomics. Some of our exciting achievements over the years are highlighted below:

Since its inception in 2006, the facility has analyzed over 15,000 samples (Fig. A), and has helped investigators publish their findings in more than 70 peer-reviewed publications (Fig. B). More than 20 federal (e.g., NIH, DOD) and non-federal grants have been awarded to our collaborators with our proteomics support.

We have provided expertise to more than 100 network investigators (from > 10 UVM departments and BPIs) as well as outside users. Upward trends are observed in user numbers, including faculty, staff, undergraduate and graduate students (Fig. C). We have featured some of their successful stories in this newsletter as well as previous issues – feel free to check them out at http://vgn.uvm.edu/proteomics.

In addition to presenting proteomics modules with the Outreach Core to BPI undergraduate students, the facility has been working closely with 8 BPI faculty to develop new projects by leveraging our proteomics expertise. Drs. Hinkle, Lamos and Wuorinen spent some time this past summer at the facility to further develop their VGN funded projects and to generate preliminary data for extramural funding applications.

We have established our reputation and impact beyond the state of Vermont over the years by collaborating with researchers from institutes in multiple states (e.g. Jackson Laboratories; Dartmouth Medical School, University of Cincinnati; University of Connecticut; University of Mississippi; University of Massachusetts; Johns Hopkins University, Miami University; MD Anderson Cancer Center; Stanford University, Albert Einstein Medical School, and Brigham Young University) as well as in foreign countries (e.g. Europe and Argentina). Some of these collaborative efforts have been presented at national and international meetings, as well as in publications.

Specifically, we have enhanced our capacities in the following areas over this past year:

Establishing Proteomics Workflows. We have developed a number of sample preparation workflows to characterize the networks of protein expression, post-translational modifications (e.g., phosphorylation, acetylation) and protein interactomes in complex protein mixtures. In order to enrich students’ learning experience, we are now offering closely supervised opportunities to interested individuals to carry out these experiments as well as to operate the sophisticated mass spectrometry instrumentation.

Data Analysis. To efficiently handle increasingly complicated proteomic analyses, we have been working closely with the Bioinformatics Core to build new software capabilities that are housed in our Data Processing room (MLS 133). Many undergraduate and graduate students have mentioned that they benefited from analyzing their own data and enjoyed the dynamic interactions with the facility personnel.

Undergraduate Student Training. The facility has been working with several faculty from the departments of Biology, Plant Biology and Biochemistry at UVM. These faculty have successfully incorporated proteomics into their courses and laboratory curricula (PBIO 187, BIOC 207, BIO 205) aimed at equipping future scientists with state-of-the-art proteomics knowledge. Facility personnel have also given guest proteomics lectures on specific topics for a number of undergraduate and graduate UVM and BPI courses.

Our future goals are to continue providing cutting-edge expertise to network investigators as well as developing and strengthening our interactions with BPI faculty. We will be focusing on developing methodologies to target areas that represent the frontiers in proteomics applications and the future needs from our investigators. As we are exploring new collaboration opportunities with network investigators, we would love to hear from you about your research project! We want to help you solve challenging problems and will work hard to develop the best strategies to answer your proteomics questions. We look forward to working with you soon!

VGN Funded Student Named Prestigious Goldwater Scholar

Katherine Schutt, a 2014 graduate of Saint Michael’s College, has been named a 2013 Goldwater scholar. The Goldwater Scholarship is designed to foster and encourage outstanding students to pursue careers in the fields of mathematics, the natural sciences, and engineering. It is regarded as the premier undergraduate award in these fields. One of 271 Goldwater Scholars recognized in 2013, Ms. Schutt received a $7,500 scholarship to cover the costs of tuition, fees, books, and room and board. “Katie is the first Goldwater Scholar to be named at Saint Michael’s - and we are very pleased with her accomplishment,” said Shane Lamos, Associate Professor of Chemistry. Ms. Schutt was designated a scholar based on her academic achievement and the strength of her research proposal “Using chemical syntheses to understand and outline complex disease pathways.” She has extensive experience in chemical research having spent a summer as a Gianni Research Fellow in the lab of Professor Lamos working on a project titled “Proteomic hydrophobicity tag for enhanced electrospray mass spectrometry.” Katie began graduate school at Dartmouth College in the fall of 2014 in the Geisel School of Medicine.
Judith Van Houten, George H. Perkins Professor of Biology and University Distinguished Professor, has been named the inaugural recipient of the President’s Distinguished University Citizenship and Service Award for her consistent and outstanding record of service over time to the University community.

Since her arrival in 1980, Van Houten has provided countless hours of service to the university, State of Vermont and the nation in her role as a University Distinguished Professor, state director of the Vermont Experimental Program to Stimulate Competitive Research (EPSCoR), and director of the Vermont Genetics Network INBRE program. Her efforts have had a significant impact on UVM’s research mission through the building of cyber infrastructure, establishment of core facilities, hiring of faculty across five colleges, mentoring of students and colleagues, and the support of entrepreneurial ventures by UVM faculty.

“This award was created to acknowledge exceptional service by faculty members who are true university citizens and for their significant contributions to institutional building at the university,” said UVM President Tom Sullivan, who announced the creation of the award in January of 2014. “I can’t think of a more worthy candidate than Professor Van Houten, whose unparalleled service to this institution has enhanced its national reputation, helped countless numbers of people affected by her research, and enriched the lives of the dozens of students she’s mentored over the years.”

Faculty letters of support emphasized Van Houten’s record of service in administration and mentoring. As chair of the Biology Department she worked to increase the size of the graduate program, expanded funding, improved retention and developed new and innovative course offerings. She also served as Associate Dean of the College of Arts and Sciences and on numerous committees, including as chair of the Biology Department’s Committee on Graduate Affairs; College of Arts and Sciences Strategic Planning subcommittee on Faculty Success; the UVM Presidential Search Committee; and President’s Advisory Committee.

Van Houten’s unparalleled fundraising ability has resulted in $78M in infrastructure building grants funded through NSF and NIH grants. These grants do not include the awards for her own research, which amount to $7.7M. For the IDeA Program in Vermont, Dr. Van Houten has raised $40.7M in funds for the Vermont INBRE Vermont Genetics Network.

“I am very honored to receive this award for service and citizenship,” said Van Houten. “Whether at the department, college, university, state or national level, my service has always been to the benefit of UVM and the State of Vermont. Service is never accomplished alone of course. Therefore, I would like to acknowledge all of the talented people I work with who make my service for UVM and my profession possible. I am eternally grateful to all of them. We continue to work together on a number of projects and hope to bring UVM’s prominence at NSF and other federal agencies to a new level. Our work with UVM’s very talented faculty is moving us toward this goal of increased research and STEM education success.”

Under Van Houten’s leadership, Vermont EPSCoR and VGN were responsible for bringing high-bandwidth connectivity to UVM, resulting in the creation of Northeast Cyberinfrastructure Consortium (NECC), which brought together five states and the first R&E network in Vermont. The network provided needed capacity and the means for UVM’s research to flourish. It drew the attention of the Office of Technology and Science Policy and Lawmakers on Capitol Hill who asked Van Houten to testify about NECC.

“Dr. Van Houten has had a transformational impact on UVM’s research enterprise and the institution’s growth as a high research activity university,” wrote nominator Kelvin Chu, Associate Professor of Physics, who called Van Houten’s NECC creation “truly catalytic.” “Her leadership and sustained commitment to UVM, at the department, college and university level, has helped the institution’s ability to support scholarship of the faculty, as well as training and education for its students.”

Van Houten was recommended to Sullivan by a nomination committee comprising faculty members appointed by deans and the Faculty Senate. She will receive $2,500 and have her name displayed on a plaque in the Waterman Building.

Former Vermont Genetics awardee and Saint Michael’s Professor of Mathematics Joanna Ellis-Monaghan and Saint Michael’s College collaborator Dr. Greta Pangborn (Computer Science) are part of a team of 10 experts working on a project to develop self-replicating nanoscale origami. The project team learned August 1, 2013, that it has been awarded $2 million from the National Science Foundation to pursue their work. The investigators are focusing on “the application of origami folding to structural DNA nanotechnology, with the goal of identifying and selecting the useful configurations, copying them to produce more, and evolving the configurations over successive generations to optimize desirable features,” according to the press release issued by CalTech. “Given current trends in the field, being able to build materials in 3D is a very important next step,” Si-ping Han, a CalTech postdoctoral scholar wrote in the press release.

**Important, wide-ranging potential applications for the research**

Expectations for this complex collaborative research effort range from environmental cleanup to human therapies. Ellis-Monaghan, a mathematician working in applied graph theory will use tools from graph theory and origami mathematics to formulate provably optimal strategies and automated algorithms for designing self-assembling DNA nanostructures and their origami folds. She and Dr. Pangborn will be working closely with each of the labs to develop accurate general mathematical problem formulation for the various processes and also to meet to design challenges for specific structures targeted by the labs.

Ellis-Monaghan is most excited because this application will have a notable impact on the direction of mathematical investigations, with the mathematics not only informing the original DNA design problems but also eventually diverging from the original stimulus to problems of independent mathematical interest.

“Nanotechnology and biomolecular computing, especially when discrete structures and interconnections are involved, are necessarily and naturally rich sources of new problems, problems that do not necessarily follow directly from current mainstream work in graph theory and origami mathematics and hence will take the fields in new directions,” Ellis-Monaghan said.
We are pleased to announce that Graham Walker, PhD, has joined our VGN External Advisory Committee. Dr. Walker received his PhD from the University of Illinois at Urbana-Champaign in Chemistry and Biochemistry. He is an American Cancer Society Research Professor and HHMI Professor in the Department of Biology at the Massachusetts Institute of Technology. For the past 38 years, he has worked on how cells respond to DNA damage from environmental agents, with a particular emphasis on how such DNA damage causes mutations.

Graham Walker, PhD joins VGN External Advisory Committee

Dr. Walker’s lab was the first to clone and sequence the mismatch repair genes mutS and mutL, whose human homologs have been implicated in Lynch Syndrome (Hereditary Non Polyposis Colon Cancer) and in responses to DNA damage.

Dr. Walker has mentored 35 PhD students and 65 postdoctoral fellows, 39 of whom became professors at universities in the USA and around the world. He has also been active in undergraduate education, including being in charge of the MIT undergraduate program in biology for 22 years.

UVM Alum Awarded Fulbright Research Grant

Peter Doubleday ’13, a biological sciences major who spent four years working under Professor Bryan Ballif in the Biology Department. Using mass spectrometry Doubleday has focused his research on the cell biology of brain development and breast cancer. Doubleday has received several research grants while at UVM (including the APLE and URECA awards), and has presented his work at university research conferences as well as at the Human Proteome Organization's 11th World Congress. Peter's work on brain development was recently published (Proteomes. 2014, 2:197-207). During his time at UVM, Doubleday volunteered in the “Art from the Heart” program at Fletcher Allen Hospital where he gave pediatric patients and himself an artistic outlet. He is also an active outdoorsman.

Doubleday was a UVM biological science major who spent four years working under Professor Bryan Ballif in the Biology Department. Using mass spectrometry Doubleday has focused his research on the cell biology of brain development and breast cancer. Doubleday has received several research grants while at UVM (including the APLE and URECA awards), and has presented his work at university research conferences as well as at the Human Proteome Organization’s 11th World Congress. Peter's work on brain development was recently published (Proteomes. 2014, 2:197-207). During his time at UVM, Doubleday volunteered in the “Art from the Heart” program at Fletcher Allen Hospital where he gave pediatric patients and himself an artistic outlet. He is also an active outdoorsman.

A Hope, Maine native, Doubleday credits his success in the classroom and in the lab to the mentors he had at UVM. Doubleday credits Ballif, visiting scholar Karen Hinkle and the Vermont Genetics Network proteomic research group for helping him apply for a Fulbright and as great mentors outside of the classroom.

Taking advantage of a Fulbright and as great mentors outside of the classroom. He credits his success in the classroom and in the lab to the mentors he had at UVM. Doubleday credits Ballif, visiting scholar Karen Hinkle and the Vermont Genetics Network proteomic research group for helping him apply for a Fulbright and as great mentors outside of the classroom.

Proteomics Facility Use Highlight

Nearly one third of the world’s population is infected with the single-celled protozoan parasite Toxoplasma gondii. Although most infections are subclinical, acute toxoplasmosis can be life threatening during pregnancy and in immunocompromised individuals. T. gondii uses a unique form of substrate-dependent gliding motility to travel to and egress from the host cells it invades, to migrate across biological barriers and to spread through tissues of the infected host. Parasites that cannot move are avirulent.

Gliding motility is powered by a myosin motor complex that lies just beneath the parasite plasma membrane. The central component of the motor complex is an unconventional class XIVa myosin, TgMyoA. How the parasite regulates the activity of its TgMyoA motor to produce the complex forms of motility observed in vitro and in vivo is unknown. Previous high-throughput screening efforts in Dr. Gary Ward's lab in UVM's Department of Microbiology and Molecular Genetics identified several small molecules that dramatically enhance parasite motility. Qing Tang, a PhD student in the Ward lab at the time, set out to determine how these small molecules enhance motility in order to provide new insight into parasite motility mechanisms.

Tang discovered that the motility enhancers cause an increase in parasite intracellular calcium levels, leading to a calcium-dependent increase in TgMyoA phosphorylation. Next, in collaboration with Drs. Bin Deng and Bryan Ballif of the VGN Proteomics Facility, she identified several phosphorylation sites on TgMyoA from enhancer-treated parasites. These data, together with phosphoproteomics results from groups in California and Australia, identified nine unique phosphorylation sites on TgMyoA. Using a quantitative phosphoproteomics approach, Tang and Ballif showed that Ser21 accounts for ~70% of the TgMyoA phosphorylation; the bulk of the remainder is found on Ser20 and Ser29, with only trace levels detected on the other six sites.

Tang then mutated these nine phosphorylation sites in various combinations, focusing on Ser20/21/29. Mutation of the major sites of TgMyoA phosphorylation altered parasite motile behavior upon enhancer treatment, and parasites expressing a non-phosphorylatable mutant myosin egressed from host cells more slowly in response to treatment with calcium ionophore. These data demonstrated for the first time that calcium-dependent TgMyoA phosphorylation contributes to the regulation of motility-based processes in T. gondii.


Collaboration with Ballif and members of the VGN Proteomics Facility also played an important role in a second recent paper from the Ward lab, in which lead author Jacqueline Leung teased apart the mechanism of action of a small molecule inhibitor of T. gondii motility and invasion (PLOS ONE 9 [2014]: e98056).
Since the opening of the Vermont Genetics Network Microarray Facility in November 2003, the core has made a tremendous impact on enhancing the science research capabilities for the investigators within the network that we serve. Facility staff have provided microarray related services to over 150 investigators resulting in over 50 publications. We recently implemented two new GeneChip types, completed an internal facility research project on expression and splice variant analysis, developed a new quantification service for nucleic acids, and acquired and implemented a new platform to provide state-of-art qualitative assessments for nucleic acids, all in support of research within our network.

The facility staff continuously strives to acquire, implement, develop and refine new methodologies or approaches that will provide the most accurate, reproducible, high quality data back to the investigators we serve. This past year the facility staff explored the ability of a newly designed genechip, the Human Transcriptome Array v2.0, to provide high-resolution expression and splice variant results. This new array as illustrated in figure I, by probe design, is marketed to serve as an alternative approach or validation tool for RNAseq experiments since it contains >6.0 million distinct probes covering coding and non-coding transcripts. 70% of the probes on this array cover exons for coding transcripts, and the remaining 30% of probes on the array cover exon-exon splice junctions and non-coding transcripts. To test the utility of its ability to serve as an alternative approach to RNA-seq, the facility staff subjected the same total RNA to both technologies. The goal was to compare expression and splice variant results from GeneChip HTA 2.0 and RNASeq data from three samples each of healthy human mesothelial cells in culture, LP9-C1, and healthy mesothelial cells treated with asbestos, LP9-A1 (Total RNA and RNA-seq results were kindly shared by Dr. Arti Shukla). For GeneChip HTA 2.0 sample preparation, we also chose to compare two target preparation methods, NuGEN Ovation Pico WTA V2 with the Encore Biotin Module versus Affymetrix’s GeneChip WT PLUS with the WT Terminal Labeling Kit, on identical RNA samples.

Figure II summarizes the differential expression profiling for gene level analysis using RefSeq database and demonstrates congruence for many transcripts between HTA vs RNA-seq. qPCR validation studies will ascertain if sample target preparation influences the sensitivity of detection. A Mouse Transcriptome Array genechip recently was released in the Summer of 2014 to assist in investigators who require this level of analysis and use mouse as the model organism.

We at VGN proudly announce the acquisition of an Agilent 2200 TapeStation to assist with service requests for quantitative and qualitative analysis of nucleic acids. The platform is similar to the bioanalyzer, but uses a different approach for separation employing gel based tapes vs microfluidics. These gel tapes are usable until all sample wells have been run, making it a more economical analysis. Currently, the staff is running nucleic acid qualitative assessment request on both instruments and testing “challenging sample types” on both to ascertain which ones will be advantaged by deployment on a specific platform.

Figure III shows examples of the same RNA run on the two platforms; Bioanalyzer (top trace, A) and TapeStation (bottom trace, B) that show very similar RNA integrity. We are pleased to announce we now offer a new service for Nucleic Acid quantification that will enhance molecular studies for many researchers within our network. Starting October 1st, 2014, the VGN Microarray Facility started accepting samples for accurate fluorescent quantitation on the Qubit fluorometer. Why fluorescence vs UV absorbance? Many downstream techniques such as qPCR and next generation sequencing require precise quantification. Contaminants in samples such as salt can shoulder into the
UV 260 wavelength and falsely contribute to the quantitation, this is especially exacerbated by low recovery samples. Also, UV absorbance wavelength readings can not distinguish between DNA or RNA. Fluorescent dyes combined with a standard curve allows accurate quantification distinguishing between RNA, DNA, and void of contaminants contributing to the fluorescent read out. To access this service after October 1st, please submit a service request through your iLabs account and drop samples off in the designated freezer in 305 HSRF.

Lastly, there have been some staffing changes within the Microarray Facility. Meghann Palermo, Research Laboratory Technician, left the facility August, 2014 to pursue a graduate degree in secondary science education. Meghann provided excellent technical and intellectual support for all projects accessing the facility and we wish her well in her new endeavor. Nelson Vila-Santana replaced Meghann as the new microarray laboratory technician in July, 2014 and now provides support for microarray projects in collaboration with the core manager and bioinformatics teams. Please feel free to stop by the facility to meet Nelson and welcome him to the Vermont Genetics Network and the university community.

One of the goals of my lab is to understand how bacteria respond to eukaryotes, particularly in the context of pathogenic bacteria responding to their host. Most of this work uses the opportunistic pathogen, \textit{Pseudomonas aeruginosa}, and its response to compounds present in its infection site, the mammalian lung. To understand the response to a host, we globally measure the changes in gene expression in the presence and absence of the host or host-derived compounds. The resulting data on all transcripts (the transcriptome) is then used to predict potential signaling pathways that can be further dissected using classical and molecular genetics.

This work is dependent on the VGN Microarray facility and we have run upwards of 60 \textit{P. aeruginosa} transcriptome arrays in the last five years for our research, and have published data incorporating more than a dozen arrays for faculty with whom I collaborate (1, 2). Recently we have used microarrays to define the genes directly regulated by a specific virulence-regulating transcription factor using a combination of mutants and small molecule analogs of the inducing compound (3). The scope and utility of our analysis was well-received and the article was chosen for a commentary in the Journal of Bacteriology (4). Using a similar, but less intensive strategy, we have used array studies to examine transcript changes in response to the host-derived molecules choline, sarcosine, carnitine, and sphingosine. The first three compounds are parts of manuscripts in preparation. For the last compound on the list, sphingosine, we showed that its detection is important for normal \textit{P. aeruginosa} survival in the mouse lung and the genes identified in the study suggested a mechanism for bacterial survival of sphingosine-dependent killing in the host (5).


VGN is currently in the final year of the INBRE 2 award. As we look to the future we see that the needs of our BPI faculty and their students have evolved over the years and we have adapted to these changes with the sun-setting of the VGN Outreach Core and the establishment of the VGN Professional Development and Education (PDE) Core.

The mission of the PDE Core is two-fold: a) work with network faculty at our BPIs to help them become competitive for extramural funding through support of research projects and publishing, training in grant writing, mentoring including the creation of Faculty Development Plans (FDPs), assistance with development of technical skills, and integration of research into the classroom; and b) integrate undergraduate students into research in order to inspire a diverse group of students to enter biomedical careers and assist faculty in their research.

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The Outreach Core has always provided research advice and help with research skills for BPI faculty and their students. As shown in the figure, the requests for Outreach Core services for research (advice and training) have grown in INBRE 2, as well as requests for teaching support outside of the teaching of modules. In addition, there have been increasing requests from faculty for training that the modules cannot provide, which primarily is in statistics and experimental design for psychologists and human physiologists.

Therefore, we will make our outreach more strategic by moving away from modules to targeted custom assistance to faculty in support of both research and curriculum development. This will include the addition of a Biostatistician to the PDE Core in the near future.

The PDE core will work with the BPI coordinators to organize professional development events including an annual fall Grant Writing Workshop and a spring session featuring varied topics. The 2015 professional development event will focus on Individual Development Plans (IDPs) that will become mandatory for VGN funded faculty during the next award phase. Creation of the IDPs will bring together research goals including, resources, publication goals and grant submission targets; teaching responsibilities; and professional development objectives. This document will be shared with the faculty member’s research advisor and the PDE Core Director, Janet Murray. The FDPs will help delineate the resources from the PDE Core and other cores that can be utilized for faculty researchers to reach their goals. Specialized workshops or consultations can be organized with VGN personnel to train faculty and their students. A priority will be placed on generating data for publication and grant submissions.

Review of the IDPs will also generate areas that can be targeted for future annual professional development events to better serve our network faculty.

The PDE Core will continue to assist BPI faculty to incorporate protocols or faculty research into the classroom and will support undergraduate research projects at our BPIs. Priority will be given to those students working with VGN funded faculty. The PDE Core will continue to organize an annual research symposium for VGN funded undergraduate research and their faculty advisors. This symposium is open to all network students, including other BPI undergraduates conducting scientific research that are funded through other mechanisms. The symposium is held yearly as part of VGN’s Career Day.

In the next award phase, VGN funded students will work with Dr. Murray to create Individual Development Plans (IDPs). Students will create a myIDP account at the Science Careers site of AAAS (http://myidp.sciencecareers.org/Home/About) and use the structured planning tool to explore, define, and pursue their career goals.

The PDE Core will also collaborate with the Community College of Vermont (CCV) and new network member Landmark College to enhance curriculum and promote research opportunities for undergraduates to increase diversity in the biomedical workforce.

For more information contact: PDE Core Director Janet Murray. (mail to: Janet.Murray@UVM.edu)
The Vermont Genetics Network (VGN) hosted its 13th Annual Retreat on Wednesday, August 13, 2014 at the DoubleTree Hotel in South Burlington, Vermont. The day began with a brief networking session.

Dr. Judith Van Houten, VGN Director, opened the program by welcoming all of the guests and invited speakers. She also gave a special thanks to all VGN staff, faculty, researchers and representatives from the BPI Institutions for their hard work in submitting our application for renewal to the NIH. The following faculty members from VGN’s partner colleges spoke about their VGN funded research:

- Dr. Van Houten then introduced the keynote speaker, Melissa Harrington, PhD, Professor of Biology, Delaware State University and Director of the Delaware Center for Neuroscience Research. Dr. Harrington discussed the changes that have occurred at Delaware State University to support faculty and undergraduate research. She talked about some of the obstacles that faculty encountered during this transition, a topic that Dr. Harrington addressed that specifically resonated with VGN faculty. She discussed strategies for a balance between teaching and research; seeking out a niche to promote one’s competitiveness at a smaller institution. Perhaps the most important part of her message was the importance of persistence when pursuing outside funding. Many of our faculty commented at how encouraging they found her presentation.

- In the afternoon a business and grants manager’s meeting was held with Nicholas Brightman of the University of Vermont’s Sponsored Project Administration. He discussed the momentous application VGN submitted for our renewal that totaled almost $20 million, including F&A and institutional support. The university has a new subaward process that includes an internal audit focusing on risk. Additional certifications need to be in place with each awardee prior to budget approval and the start of research. The Office of Management and Budget at the federal level issued a uniform guidance regarding subaward risk assessment that can be found here http://www.whitehouse.gov/sites/default/files/omb/financial/grant_reform/proposed-omb-uniform-guidance-for-federalfinancial-assistance.pdf. Immediately following this meeting, the Internal Steering Committee met to discuss VGN’s progress during the past year.

During the buffet lunch, The Baccalaureate Partner Institutions (BPI) Coordinators met to discuss ideas and plans for the upcoming years along with expanding the VGN mentoring program and new ideas for the Professional Development Seminars. After lunch, other attendees networked and visited the posters that were presented by the BPI faculty who received VGN funding last year. There were 11 posters presented from many different disciplines.

Janet Murray, PhD, Director of VGN Outreach, closed the retreat by thanking all invited guests for attending. She also thanked the other faculty members and students who presented posters and gave presentations about their VGN research.
The VGN Course Enhancement Award was established in 2013 to acknowledge the work of our BPI faculty to incorporate materials from VGN funded research or outreach into their courses. All BPI faculty, past or present, are welcome to be considered for this award by submitting a short summary of how VGN materials or resources were used for course enhancement. Each year VGN considers the submission and makes up to two awards at our annual retreat in August. These awards support faculty travel to a national science or education conference.

Natalie Coe PhD, Green Mountain College – 2013 award winner

Dr. Coe has worked with VGN Outreach to incorporate Microarray, Proteomics and Bioinformatics modules into the curriculum. These modules have been adapted as 1 credit courses offered concomitantly with Biochemistry or Genetics. Recently, the experimental design of the Microarray and Proteomics modules have been modified to integrate GMC faculty research.

BIO/CHE 4016: Microarray accompanies the Biochemistry course. In this course students learn a variety of standard as well as advanced laboratory techniques. Weekly lectures complement the hands-on laboratory portion to effectively couple theory with practice. Students are taken through basic microarray data analysis to generate an expression profile. Students use this profile to examine the biological mechanisms associated with their experimental design and generate further experimental hypotheses. In BIO 4019: Proteomics, undergraduates are exposed to proteomics technology using hands-on laboratory experiences. Students extract and quantify total protein, perform 2D gel analysis and determine protein identification using Mass Spectrometry (MS) at the UVM Proteomics Core Facility. The MS data is processed and students examine their results using bioinformatics tools to further understand the biological implications of the results. BIO 4017: Bioinformatics is an introduction to data mining concepts, and the principal data bases of bioinformatics and structural biology/chemistry. Data mining is now an established tool for predicting structure and understanding function in genomics and proteomics. This course enables students to access and analyze sequence and structure data, create and edit images of molecules, and present results in several formats.

Dr. Coe used her award to attend “Transforming STEM Education: Inquiry, Innovation, Inclusion and Evidence” organized by Project Kaleidoscope within the Association of American Colleges and Universities. Oct. 31 – Nov 2, 2013, San Diego, CA.

Ian Balcom PhD, Lyndon State College and Elizabeth Dolci PhD, Johnson State College – 2014 award winners

Dr. Balcom studies pharmaceutical biodegradation in ecological reactors. His research has impacted undergraduates through VGN supported internships and has led to many independent study programs for undergraduates including two senior research thesis projects. He has used his research to enhance two courses at Lyndon State.

Introduction to Environmental Science – ENV 1080: Students in ENV 1080 are primarily non-science majors completing a general education graduation science course requirement. The central concepts underlying the VGN-funded research in my lab are directly related to important current issues in environmental science. Specifically, the concept of ecosystem services is a core theme of this course as well as the Pilot grant. Utilizing ecological processes to solve anthropogenic problems is explored in detail in the course as a vehicle to explore the negative and severe environmental issues through a solutions-focused lens. In my experience a sustained focus on environmental issues directly often causes emotional disengagement from the environment. Therefore doom and gloom environmental science courses frequently backfire with respect to student engagement. Being an introductory level course, it is not appropriate to delve too deeply into the experimental design, or scientific processes being employed in this project. However, the broader themes and concepts, as well as the presence of a model ecological reactor system in the classroom/lab have had a significant impact on the students of this course. Furthermore, the increase research activity resulting from this funding has elicited increased attention on the sciences in general from non-science majors.

Introduction to Environmental Chemistry CHE 2020: This course has benefited the most from this project. From water testing methods, ecosystem services and applied ecological design the ecological reactor system has provided both a source of samples in mid winter, as well as a system to explore important concepts in environmental chemistry such as the chemistry of natural waters, fate and transport of in aqueous systems, bioaccumulation and biodegradation of pollutants, etc. Furthermore, a major component of the course is to examine environmental loops impacted by anthropogenic activities. The focal area and concept of the VGN grant served as the vehicle by which these issues were explored. We continually revisited the grant in discussions as well as used samples from the reactor to explore important concepts in the lab.

In the fall of 2014 Dr. Balcom will teach “Environmental Toxicology” in which techniques central to his research project will be introduced to his students.

Dr. Dolci has offered all the VGN outreach modules at JSC. She specifically focused her submission on the curricula change and research engagement of students due to integration of the Microarray Module into her Genetics Course BIO-3220 described below.

“The microarray module has been a very successful and positive experience for our students over the last ten years. Students get direct exposure to a genuine “hands-on” research experience where they actually gain “ownership” of a project. In several cases, students have secured summer research jobs and internships as a result of this opportunity. The microarray module has also significantly impacted my own research project.

Initially, we offered the module as designed by VGN exposing Saccharomyces to an acute exposure of the environmental contaminant, dimethyl sulfide. The two (or three) offerings were highly successful and demonstrated that JSC students had the potential both intellectually and in the lab to successfully carry out an extended, complex experiment. Our students needed additional background information prior to each laboratory session, and I was able to provide this in class prior to each laboratory.

In the last two genetics classes, the experimental design was modified and addressed a question directly related to my research project. My research focuses on microbial community structure at the Vermont Asbestos Group (VAG) mine located in Lowell/Eden, Vermont. The mine ceased function in 1993, but contains over 26 million tons of tailings waste piles (i.e. mountains). The tailings contain significant amounts of heavy and transition metals along with asbestos. Erosion into the local watershed has prompted action by the state of Vermont and EPA. I have been interested in examining whether these contaminants leach from the tailings, enter the local environment, and consequently impact the
biota particularly the microbial communities. The microarray module afforded us the opportunity to investigate this issue. I exposed a mixture of mine tailings and water to several freeze/thaw cycles (i.e. mimicking seasonal changes in Vermont.) Tailings were removed by filtration and Saccharomyces cerevisiae were exposed for 24 hr to media prepared either in the tailings filtrate or dH2O. Students isolated RNA from these cultures and processed the samples for microarray. They found that the filtrate from VAG mine waste tailings promoted a stress response in Saccharomyces cerevisiae with over 760 genes being differentially expressed (p < 0.5 and >1.5 fold change). To complete the project each student investigated a biochemical pathway that was impacted by the exposure. One of the students in the class is carrying out a more comprehensive analysis of these changes in a summer project supported by VGN funds.

The outreach modules expand exposure of our students to the scientific community. We have only two full time biologists at JSC so our students have limited contact with practicing scientists. The outreach faculty provide a unique opportunity for students; they are engaging and very approachable for discussion.

The University expands its six-year relationship with FirstLight

FirstLight Fiber, a facilities-based telecommunications service provider operating in Upstate New York and Northern New England, announced today that the University of Vermont (UVM) will expand its relationship with FirstLight to include a 10 Gbps connectivity upgrade. The continuation of this mutually beneficial relationship, which began in 2006, is due in part to the North East Cyberinfrastructure Consortium (NECC) grants UVM received through its Vermont EPSCoR and Vermont Genetics Network (VGN) programs supported by the National Science Foundation and the National Institutes of Health to support the efforts for multi-gigabit speeds and reliable, scalable fiber connectivity in the region. Access to “Tier 1” city infrastructures is a common goal for both the educational institution and the State of Vermont, and this grant makes it possible for UVM to leverage the power of the Internet and operate a world-class network.

VGN Bioinformatics Core and BPI Research Spotlight:

Microbial community profiling of the Vermont Asbestos Group Mine using next generation sequence data
(Dr. Elizabeth Dolci, Johnson State College)

BY HEATHER DRISCOLL, MS
VGN BIOINFORMATICS CORE

Dr. Elizabeth Dolci and her student researchers at Johnson State College have been studying microbial communities at the inactive Vermont Asbestos Group (VAG) Mine on Belvidere Mountain in Lowell, Vermont with funds from a 2014 VGN Project Award. Using a variety of culture-dependent and culture-independent methods the Dolci Lab seeks to understand the taxonomic composition of VAG mine microbes and how they function in this heavily stressed mine environment. Elevated levels of asbestos fibers and high concentrations of magnesium, nickel, chromium and arsenic have been recorded at several sites within the mine area. One culture-independent method they have employed in their research is whole metagenome massively parallel sequencing (MPS) of environmental DNA extracted from the VAG mine pit pond water. DNA from eight water samples collected from three water column layers at three locations in the pit pond was sequenced on an Illumina HiSeq 2000 sequencer generating over 6 million short DNA paired-end reads, each 200 base pairs long.

During the summer, Dr. Dolci, Erika English (recent JSC Graduate), and Shayna Bennett (VGN Student Research Awardee and JSC sophomore), in collaboration with VGN Bioinformatics Core (VGN BC), analyzed this large metagenome dataset and interpreted the results. VGN BC performed a taxonomic analysis using a similarity-based approach. Specifically, results from a BLAST-like search using NCBI’s nr database were used as input to MEGAN, an interactive metagenomics software, which then uses the lowest common ancestor (LCA) algorithm to classify the reads/BLAST-like results into taxonomic groups. The VGN BC also performed a functional analysis of the data in the software HUMAnN. HUMAnN used VAG mine DNA reads to identify over-represented functional pathways using KEGG classification.

Taxonomic and functional profiles for all samples were shared with Dr. Dolci, Erika, and Shayna through a project-specific space created by the VGN BC using Confluence (see Team Collaboration Space article in this newsletter for more), where results files can be visualized and downloaded for further analysis. All are using MEGAN to interactively explore these results and to compare taxonomic profiles for samples from each of three layers in the water column (surface, thermocline, and hypolimnion). The project space also gives Dr. Dolci a venue in which to interpret research results, share ideas, and write collaboratively both with her students and with the VGN BC. Currently, the VGN BC is working with the Dolci Lab to write a manuscript of these research results for publication.

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Sharing data, working drafts and technical information among collaborators working together on a research project is often tedious and occasionally difficult. Large data files present problems of storage and transfer. Small files, such as manuscript drafts, often have several revisions, which require some form of version control. This is commonly implemented by simply renaming files that are emailed between colleagues. While functional, this method is far from ideal. Sharing technical details for several different aspects of a project can be cumbersome. Involving students in collaborative research projects can present challenges in these areas.

The Vermont Genetics Network Bioinformatics Core has implemented a web-based system for projects that overcomes many of these problems. Investigators working with the Bioinformatics Core (BC) receive a web site, or space, specific to their project. This site contains all information related to the project. On the surface this project space looks like any other web site. The sites are based on Confluence team collaboration software. They provide a way for all members of a research project to contribute to the project. Active participation in all phases of the research project helps keeps students engaged.

Three major areas of each project space help overcome obstacles to student involvement: collaborative writing, data repository and knowledge base.

**Collaborative Writing:** In the collaborative writing space investigators, students and core facility staff write and edit in a web-based document. Only one version of the document is ever active. All editing tools are web-based and real time. All members of a project can contribute and edit to the same document, alleviating the need to keep multiple file versions. It also eliminates the need to email documents among authors. This fully featured system includes automatic change archiving. All authors can see all changes made by others. All changes can be rolled back or saved. Real time editing and single document control also contribute to quick turn around of edits and drafts. This flexible system allows students to view work in progress and directly contribute to the writing process.

**Data Repository:** All data files associated with each project are made available through the same project site. From simple file lists to tables of files and file browsers, all are easily reached through the web-based project space. Behind this web-based font, each space is directly connected to the BC storage archive. The BC stores and maintains all data associated with all collaborative projects. In this way, investigators who work with the BC need not store large data files locally. In addition, since all data is easily accessed through the web-based project space, investigators can share data with colleagues by simply providing a link to the data they wish to share. Storing and sharing large data files is a common problem investigators often face at small institutions. The data repository features of each project space make storing and sharing very large files simple. This in turn enables students to be actively involved without the need for specialized equipment or technical training.

**Knowledge Base:** All information about each project is stored and maintained in a project knowledge base. This includes questions asked and answered through email, background information on a project, meeting agendas and outcomes, and all other information. As new questions are posed or answered they are incorporated into the project space. In this way, all team members can access the same information. While seemingly simple on the surface, this centralization of project information enables students to quickly find answers to their questions or provide answers for others. New team members can quickly come up to speed or get the details of what has been done so far. All team members, and the core facility staff, are thus kept up to date on all aspects of a project. Again, this engages students and makes them active participants in research projects.

By providing tools to overcome obstacles to student involvement the BC hopes to engage more students in research projects with investigators in the VGN network.

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**UVM Graduate Selected to Participate in NIH Visit Week**

Sierra Bruno, a recent UVM grad with a degree in Biology and member of the College of Arts and Sciences Dean's List, was selected to participate in the annual NIH Visit Week, July 21-25, 2014. Vermont Genetics Network provided Sierra with a travel scholarship to attend the program. Sierra was selected through a competitive process based on her accomplishments and interest in a health/research career. The week-long program exposed American Indian/Alaskan Native students to a variety of activities that included visits to NIH labs and the NIH Clinical Center, science lectures, career workshops and attend a lecture by Dr. Francis Collins, Director of the NIH. “My time at NIH was amazing. It really opened my eyes to all of the wonderful opportunities science has to offer. All of the people that I met were very helpful and genuinely interested in helping make my career goals become a reality. I would urge anyone interested in the science field to look at all of the research opportunities that the NIH has to offer.”
VGN Funded UndergraduateAccepted in to AmericanSociety for MicrobiologyResearch Fellowship Program

Congratulations to ChristopherVilla, a seniorbiology major atCastleton StateCollege who wasaccepted into the2014 AmericanSociety for MicrobiologyUndergraduate Research Fellowship (URF) Program to conduct independentmicrobiology under the direction of Assistant Professor of Biology, Dr. Preston P. Garcia. Christopher was one of only 28 students toreceive this fellowship nationally. The program is designed to assist Chris in his pursuit of a career in microbiological research and to provide him with a rewarding research experience. The award is for a minimum of 10 weeks of summer research beginning in June 2014, with a stipend payment of $4,000 as well as up to$1,000 for travel to the 2015 ASM General Meeting in New Orleans. During the summer of 2013, his research was funded through the Vermont Genetics Network, also under Dr. Garcia’s mentorship.

Chris has been a valuable member of the Natural Sciences Department at Castleton since his freshman year when he first became a laboratory assistant as part of his work-study. He has continued his work for the department as a teaching assistant for the Microbiology course. Chris completed two full years of independent research, and made an oral presentation of his research data at UVM during the Medicago/Sinorhizobium workshop in October 2013. Chris is currently working on investigating the role of multiple two-component regulatory systems in the bacterial symbiont Sinorhizobium meliloti. He utilizes genetic recombination techniques to create new strains, which contain in-frame deletion mutations of the genes comprising these two component systems. His current work focus on determining the unique phenotypes associated with each strain. The primary experiment completed this summer involved the evaluation of competition assays, where two mutant strains are co-inoculated on a single Medicago sativa (alfalfa) plant to determine if these genes provide an symbiotic infection advantage. Chris will graduate in May. He plans to enroll in graduate school in the fall to pursue his Ph.D. in Microbiology.

VGN - ProfessionalDevelopment Event

April 18th, 2015 Saint Michael’s CollegeTopic – Individual Opportunity Plans for FacultySpeaker – Robert J. Milner, PhD, Associate ViceProvost for Professional Development and Professor ofNeurology at the University of MassachusettsMedical School (UMMS).

Dr. John Evans Awarded forResearch Excellence

John N. Evans, PhD, University of VermontProfessor of Molecular Physiology and Biophysics Emeritus of the College of Medicine was recently honored for his contributions to building research excellence at UVM and across Vermont.

Judith Van Houten, PhD, University Distinguished Professor, Director of the Vermont Genetics Network and Vermont Experimental Program to Stimulate Competitive Research (EPSCoR) program, presented Evans with a plaque commemorating the honor on June 9, 2014.

Evans also serves as President of the Vermont Technology Council, an organization that works to foster technology-enabled companies in Vermont by integrating the efforts of the private, public and academic sectors. A member of the UVM faculty since 1976, he has held numerous leadership positions, most recently as Interim Vice President for Research, and also including Dean of the College of Medicine, Special Advisor to the President of UVM. Dr. Evans has broad experience in the areas of intellectual property, technology transfer, company start-ups, government and business relations, and economic development. Prior to serving in an administrative capacity, he had a distinguished career as a biomedical researcher with numerous publications and honors. Congratulations Dr. Evans!

Dr. Milner has a long-standing interest in the professional development and education of individuals at all stages of academic careers. His background as a basic science researcher in neuroscience and as a former department chair provides a wealth of experience and knowledge about the challenges of advancing an academic career. At UMMS, Dr. Milner is responsible for designing, implementing and evaluating professional development programs for faculty, including the Junior Faculty Development Program, and programs on mentoring, promotion and tenure, teaching and learning, and leadership. Dr. Milner received his doctoral degree from The Rockefeller University, completed postdoctoral training at The Salk Institute, and held faculty positions at Salk, the Research Institute of Scripps Clinic, and Penn State College of Medicine before moving to UMMS in July 2010. At Penn State College of Medicine, he directed the Office of Postdoctoral Affairs, co-directed the Junior Faculty Development Program, co-directed the Intercollege Graduate Program in Neuroscience, and taught courses in neuroscience, professional development, and ethics. Dr. Milner received the Distinguished Educator Award from the Penn State College of Medicine in 2007. He is also the 2009 recipient of both the Graduate Program Leadership Award from Penn State’s Graduate School and the Faculty Mentorship Award from the Penn State Hershey Postdoctoral Society. His current scholarship focuses on faculty development and mentoring.
VGN Project Award Winners

Megan Doczi, PhD, Norwich University: "Developmental Regulation of Kv1.3 Channels in Neurons of the Avian Hypothalamus."

Elizabeth Dolci, PhD, Johnson State College: "Microbial Community Structure of the Vermont Asbestos Group Mine."

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

AnGayle Vasiliou, PhD, Middlebury College: "Thermal Decomposition of Biomass: Molecular Pathways for Sulfur Chemistry."

Amy Welch, PhD, Johnson State College: "Comparative Effectiveness of Biofeedback vs. Exercise for Stressed Students."


Ethan Guth, PhD, Norwich University: "Mechanistic Investigation of the Bacterial-specific Amidotransferase GatCAB."

William Landesman, PhD, Green Mountain College: "Linking Borrelia burgdorferi Loads with Lyme Disease risk in Rutland County, VT."

Darlene Olsen, PhD, Norwich University: "Modeling RNA-seq Data with a Bayesian Model for Zero-inflated Count Data."


Clarissa Parker, PhD, Middlebury College: "Genome-wide Association for Ethanol Sensitivity in the DO Mouse Population."

Kathryn Sperry, PhD, Castleton State College: "Using "negative acknowledgment” to Restore a Rape Victim’s Credibility in Court."

Elizabeth Wuorinen, PhD, Norwich University: "Exercise Effects on Adipocytokines/Inflammatory Mediators-changes in Proteome."

VGN Pilot Award Winners

Ian Balcom, PhD, Lyndon State College: "Microbial Ecology of Pharmaceutical Biodegradation in Ecological Reactors."

Preston Garcia, PhD, Castleton State College: "Evaluation of Sinorhizobium Meliloti Competitiveness in Medicago Nodulation."

William Landesman, PhD, Green Mountain College: "Linking Borrelia burgdorferi Loads with Lyme Disease risk in Rutland County, VT."

Darlene Olsen, PhD, Norwich University: "Modeling RNA-seq Data with a Bayesian Model for Zero-inflated Count Data."


Clarissa Parker, PhD, Middlebury College: "Genome-wide Association for Ethanol Sensitivity in the DO Mouse Population."

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Elizabeth Wuorinen, PhD, Norwich University: "Exercise Effects on Adipocytokines/Inflammatory Mediators-changes in Proteome."

VGN Student Award Winners

Shayna Bennett, Johnson State College: "Microbial Community Structure of the Vermont Asbestos Group Mine."

Katelyn Leavey, Castleton State College: "Evaluation of Sinorhizobium Meliloti Competitiveness in Medicago Nodulation."

Benjamin Mansky, Middlebury College: "Genome-wide Association for Ethanol Sensitivity in the DO Mouse Population."

Kelsey McKay, Castleton State College: "Evaluation of Sinorhizobium Meliloti Competitiveness in Medicago Nodulation."

Heather Murphy, Johnson State College: "Microbial Community Structure of the Vermont Asbestos Group Mine."