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IGERT: Predoctoral Training in Functional Genomics of Model Organisms

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Final Report for Period: 12/2010 - 11/2011
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Principal Investigator: Hutchison, Keith W.
Award ID: 0221625
Organization: University of Maine
Submitted By:
Hutchison, Keith - Principal Investigator
Title:
IGERT: Predoctoral Training in Functional Genomics of Model Organisms

Project Participants

Senior Personnel

Name: Knowles, Barbara
Worked for more than 160 Hours: Yes
Contribution to Project:

Name: Hutchison, Keith
Worked for more than 160 Hours: Yes
Contribution to Project:

Post-doc

Graduate Student

Undergraduate Student

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

Other Collaborators or Contacts

Activities and Findings

Research and Education Activities:

Findings:

Training and Development:

Outreach Activities:

Journal Publications

Books or Other One-time Publications

Web/Internet Site

Other Specific Products

Contributions

Contributions within Discipline:

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Conference Proceedings

Categories for which nothing is reported:

Organizational Partners
Activities and Findings: Any Research and Education Activities
Activities and Findings: Any Findings
Activities and Findings: Any Training and Development
Activities and Findings: Any Outreach Activities
Any Journal
Any Book
Any Web/Internet Site
Any Product
Contributions: To Any within Discipline
Contributions: To Any Other Disciplines
Contributions: To Any Human Resource Development
Contributions: To Any Resources for Research and Education
Contributions: To Any Beyond Science and Engineering
Any Conference

Final Report

Award ID: 0221625
Final Report for Period: 2002 - 2012
Institution: University of Maine
Title: Predoctoral Training in Functional Genomics of Model Organisms

Research Accomplishments

Research Achievements

IGERT 0221625 - Predoctoral Training in the Functional Genomics of Model Organisms: This IGERT grant funded an effort to build an educational and research infrastructure around the newly emerging field of Functional Genomics. It was ambitious in that included faculty and students from the basic biological, computational, and physical sciences ,and engineering at the University of Maine. Faculty were drawn from ten different departments plus one on-campus research unit. It also included faculty from two independent research institutions, The Jackson Laboratory, in Bar Harbor and the Maine Medical Center Research Institute, in Portland. These latter institutions brought enormous research potential in the area of functional genomics into the program but little experience in graduate education. The University of Maine faculty had little representation in the area of genomics but extensive research in the physical sciences and engineering and in the computational sciences, together with experience in interdisciplinary research and, of course, graduate education. The program was also an experiment in collaboration over distance as the three institutions are physically well separated from each other. At one point the reach of the program also included biophysicists located in Heidelberg, Germany.

Because of the breadth of the program, it was not framed to address a limited number of relatively focused research questions. Rather it was framed to use the technologies and concepts of functional genomics to address any biological question. The range of research projects went human tumors to model organisms such as the laboratory mouse or zebrafish, to genome based detection systems for red tide, to completely artificial membrane systems. The sole requirement for students in the program is that they develop a research project based the support and expertise of two mentors (twinning), one of whom came from a biological discipline and the other, from the computational or physical sciences or engineering. As a result, the research successes of the program are not those of a program integrated around a specific scientific question but rather they are the successes of individual students working on individual research projects the required an interdisciplinary approach. The successes highlighted are drawn from two of the more active areas of research, one being computational biology-bioinformatics. The second one involves research in the area of high resolution spectroscopy and microscopy.

Computational Biology: Jesse Salisbury: Probe-Level Analysis of Expression Microarrays Characterizes Isoform-Specific Degradation during Mouse Oocyte Maturation. Microarray design includes multiple probes that span some or all of a transcript. The probes on a chip will show individual variation in intensity of signal depending variables such as the thermodynamic

stability of the probe-target interaction, competition by and for other sequences by the probe and also by the target (such as ability to form secondary structural with in the target molecule). Expression of an individual gene, then, is determined by averaging the results of the entire probe set. That is, all probes that hybridize to a specific transcript. What Jesse realized and developed an R package for is that with as few as three technical replications he could analyze the individual probes, setting the value of results from one condition a "1" and looking at the comparison probes. What he found, in existing microarray datasets is that many transcripts showed a consistent difference between the sample sets along the length of the transcript, up to a point and then one or the other sample would show a relative decrease in level on the 3' end of the transcript. This decrease suggested a loss of the 3' end of the transcript in one sample. In some cases, this loss was associated with alternative poly adenylylation sites. However, in other cases the loss was associated with putative microRNA processing sites. Jesse isolated mRNA and used quantitative PCR to confirm his results on several genes. Though microarray-based experiments are on the decline because of next generation sequencing technologies, there is a large body of microarray data that can be mined using the computational tools Jesse has developed.

Jill Recla: Identification Of Novel Pain Sensitivity Candidate Genes Using A Systems Genetics Approach. Ten percent of adults suffer from severe chronic pain, costing the United States an estimated $100 billion annually in healthcare expenses, lost income, and lost productivity. It is the most common symptom for which patients seek medical care, central to conditions such as low back and cancer pain, arthritis, migraine, neuralgias, neuropathies, and chronic widespread pain syndromes. Current pharmacologic treatment strategies for chronic pain management are far from optimal, often providing only minimal relief and carrying significant health risks with long-term use. Human pain sensitivity varies widely between subjects, presenting additional challenges to the adequate prevention and treatment of acute and chronic pain. Understanding which genes function in, and condition the shift from, acute to chronic pain, as well as which genes affect inter-individual variability in pain sensitivity, is essential to developing improved prevention and treatment options for both acute and chronic pain. Jill's approach to this was to use whole genome scanning of DNA from the Diversity Outbred mouse panel for genes related to chronic pain. The Diversity Outbred mice is a large panel of mice generated by crossing mice from existing inbred strains to re-randomize the haplotypes. The intent was to establish a panel of mice with known genotypes that mimic the human population with regard to levels of heterzygosity and heterogeneity. Jill analyzed these strains of mice with regard to their response to pain stimulus (hot plate). Her work include haplotype association mapping analysis using an inbred strain panel of laboratory mice, then using this information for the genetic linkage mapping in the Diversity Outbred mice. Her preliminary results suggest a role for Hydin acute pain response. Hydin is an example of the power of genome wide association studies as it would not have been predicted to be involved in pain. It is a protein involved in cilia movement and in the brain it is involved in circulation within the ventricles. The protein gets its name from an association with hydrocephaly. Analysis of behavioral responses in humans is made difficult by the level of genetic variability among individuals. Jill's work was not only directed toward potentially finding genes not previously known to be involved in pain perception but also to provide evidence of the ability of the computational algorithms to detect pain genes with the greater genetic noise of the Diversity Outbred mice. Jill's work has led to the award of a DOD grant entitle "Systems Genetics of Chronic Pain."

Spectroscopy and Microscopy: Andrew Doyle: Non-Classical Export Of Signal Peptide-Less

Proteins Studied Via Sum Frequency Spectroscopy And Biochemical Techniques. The secretion of a variety of growth factors occurs early in the initiation of angiogenesis, restenosis, and certain cancers. Proteins destined to be secreted typically contain a signal peptide which allows them to utilize the endoplasmic reticulum/Golgi apparatus classical release pathway. Several signal peptide-less (SPL) proteins have been discovered and shown to be secreted during cellular stress without the direction of a signal peptide. Including Fibroblast growth factor 1 (FGF1). In his research Andrew employed a variety of techniques to study the behavior of the FGFl protein and its release complex with regard to their interaction with the plasma membrane. Experiments were performed to determine how FGFl is able to bind to the plasma membrane and in what form it is able to permeate it. These experiments along with a mutation analysis identified a critical phospholipid binding domain within FGFl. Tertiary structure analysis discovered that, unlike classically transported proteins, FGFl is able to pass through the cell membrane in a locked tertiary state. To further understand the biophysics underlying non-classical transport events sum frequency generation vibrational spectroscopy (SFS) was employed. SFS involved probing the surface of a membrane with to lasers of different wavelengths. The reflected wavelength is not a simple sum of the two wavelengths but is related to the surface characteristics. Since SFS requires a flat membrane Andrew's first work involved building lipid layers on a flat surface. Utilizing this technique FGFl was seen to induced deformation of a model membrane was observed providing the first evidence recorded of such interactions via SFS. Since the ultimate goal is to measure the movement of the FGF1 across the member Andrew also worked on the design and characterization of hydrogel supported lipid bilayer substrates which provide a better physiological model for study of the transport process. This hydrogel system is now being utilized by another student in the same research group. Andrew's work did not give us the ultimate picture of the movement of SPL proteins across the membrane. It did, however, result in a technical breakthrough that will allow following students to advance the research toward understanding.

Kristin Gabor: Localization-Based Super-Resolution Light Microscopy to Study the Role of Caveolae in Viral Infection. Kristin has not yet defended her thesis but her work will certainly be one of the major research achievements of the program. Fluorescence microscopy is an essential and flexible tool for the study of biology, chemistry, and physics. It can provide information on a wide range of spatial and temporal scales. However, since the inception of light microscopy, diffraction has limited the size of the smallest details that could be imaged in any sample using light. Because much of biology occurs on molecular length scales, interest in circumventing the diffraction limit has been high for many years. Novel, advanced imaging tools such as sub-diffraction limit fluorescence microscopy techniques are well suited to dissect the high complexity and molecular mechanisms of biological processes at nanoscopic scale. Kristin's research has been involved in the development and application of such tools as fluorescence photoactivation localization microscopy (FPALM) to study the intricate relationship of host-virus interactions at the single particle level using the zebrafish as a model system. Lipid rafts and caveolae have been linked to immune signaling and the entry and exit of virus during infection. Super-resolution microscopy can be used to elucidate the involvement of these lipid raft nanodomains in the process of viral infection. FPALM is a novel super-resolution imaging techniques that can be used to investigate intricate host-virus interactions at the single molecule level. In these studies, using an interdisciplinary approach of advanced imaging physics and immunology the knockdown of caveolin-1 resulted in zebrafish embryos with increased mortality and viral burden in response to snakehead rhabdovirus (SHRV) infection. In addition, FPALM revealed no evidence for co-localization of caveolin

with virus. Together these results are one of the first indications to suggest that SHRV does not use caveolin nanodomains for viral entry.

Educational Accomplishments

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The IGERT funded program was founded on the recognition that the field of functional genomics, and its more recent iteration, systems biology, are inherently interdisciplinary, requiring skill sets not only in the traditional biological sciences but those drawn from the computational sciences, the physical sciences and engineering. Faculty involved in this work recognized that one of the impediments to the research was the "language barrier". We therefore sought to set up a program that would not necessarily produce students who were individually capable of doing multi-disciplinary research but who were able and comfortable working across disciplinary lines. Further, because genomics-based expertise is not always contained at one institution, we sought to establish an educational model that would allow student to learn and work at geographically dispersed sites, using Internet-based technologies for communication, including not only courses but committee meetings or any meeting, generally.

The program started with a core curriculum that included general courses in bioengineering, computational biology and genomics. The final course was a course in grant writing. Because of budget constraints none of the topic courses had a laboratory. Over time the bioengineering course was replaced by use of a course with a lab component that was part of the regular engineering curriculum. The genomics course has evolved into a hands-on course analyzing genomic data using both existing packages and teaching the student the R statistical programming language. This has improved the course greatly but it is not what one would consider as standout teaching achievement.

There are two highly successful components of our traing strategy. One of these is the twinned mentorship, with students having two mentors, one from the biological side of their research project and one the non-biological side (computational, physical sciences or engineering), with the thesis dependent upon the expertise of both mentors. It is not a requirement that the role and impact of the mentors be equal. Part of what has made this a successful component is that it has generated research collaborations where none had existed. Thus it has advanced the science of genomics. Part of the reason for the success is that it has required the student to find a research path that in nearly every case was different than the general direction of research in the laboratories of the mentors. Thus it really was a student-generated research project. The twinning strategy does have a downside in that not all faculty in the program were comfortable

with a shared student working on research somewhat different than their own. However, for those faculty who embraced it, it worked very well, indeed.

The grant writing course, however, has been a course with major impact, partly in ways that were not expected. The format of the course is to have a student write a full, single investigator grant. They can use either an NSF format or the NIH R01 format. They start with the writing of their specific aims page and the proposal is based on their anticipated research project. We also let PhD students who are not part of the IGERT-funded program to take the course. The students start by formulating their hypothesis so as to define the direction of their research. For the IGERT-funded students this was when they often had to come up with a project that was going to be different than the work in their mentors labs and they had to learn to negotiate the path they'd chosen between their mentors. Students would write their specific aims with its brief background, stated hypothesis and specific aims that would test the hypothesis. Each students work was then read by all the other students in the course as well as the instructors (most years there was more than one). The class met twice a week and at each meeting the students would discuss each others writings. All student comments were made first before the faculty would add their opinions. Over the course of the semester the student comments evolved from noting typos to giving critical and valuable comments on the science. The Specific Aims page, for most students, took a third or more of the semester to write. This let them know, among other things, that a grant proposal is not something that is simply tossed off, but one that requires a lot of thought and effort. From the Specific Aims, the grant writing process would proceed through background, significance, preliminary data, experimental design, expected outcomes and pitfalls. Most years we also had them work on budgets. Each section was subjected to critical review by the entire class, and each student was expected to contribute likewise to the review of their classmates' grants.

In the end the students had a research proposal that they had to defend before their committee. For some, it was also used to obtain a fellowship to provide support once their IGERT funding ran out. For some, it was used instead by their mentors as the basis of a PI-based proposal to support the student's research. These results would be success enough. However, what really made this course a success was how it fostered the development of interdisciplinary communication. The IGERT-supported students were each on novel research projects drawing the full range of faculty interests. In addition there were students in the course coming from other degree programs. And so the students had to learn to write for a diverse set of reviewers, ones with expertise and background outside the area of research the student was working in. No statement could be considered intuitively obvious. And they had to learn to read grants from disciplines outside their own which broadened their overall knowledge and perspective. Our program is interdisciplinary. If such a course were set up as part of a single department PhD program my recommendation is that it be opened to other departments to provide this opportunity to learn beyond one's discipline.

One other element of our teaching structure that must also be consider a success is our the ability to incorporate multiple institutions into the teaching (and research) paradigm, primarily through the use of videoconferencing technology. Our students are comfortable learning and presenting using this technology. It is used for classes and for meetings. Indeed, many faculty attend committee meetings, including the comprehensive exam and the thesis defense using videoconferencing facilities. The success of this educational structure is evident by the fact that it was built into the successor to the IGERT-funded Functional Genomics PhD program. The University of Maine established the Graduate School of Biomedical Sciences which has degree

programs in Molecular and Cellular Biology, Neuroscience, Toxicology, Bioengineering and Functional Genomics. It includes not only the original three institutions, University of Maine, The Jackson Laboratory and the Maine Medical Center Research Instititute, but also the Mt. Desert Island Biological Laboratory, the University of Southern Maine and the University of New England College of Osteopathic Medicine. It uses the same overall structure, though each degree track has its own curriculum. It is possible only through the extensive use of videoconferencing and other distance education technologies. And it is funded by the State of Maine through the University of Maine. It is the ultimate statement of the educational achievement of the IGERT-funded Functional Genomics PhD program.

Major Trainee Accomplishments

The trainees of the program have been very successful during their graduate careers. We supported 32 students in all, although some for only a short period. In the first years of the program we lost six students to attrition, largely due to the fact that the program and concept was so new the students had no peer group to act as a support base. This was particularly true for those students at the research institutions who lacked an entire campus graduate students from other programs to interact with. Once we increased the interaction among the IGERT-funded students by monthly face-to-face and videoconferenced meetings and once the population reached a critical mass the attrition rate has dropped to near zero. The students therefore have been progressing through the curriculum, presenting their research at scientific meetings, publishing their work in peer reviewed articles, passing their qualifying exams and successfully defending their theses. The time to thesis completion is more than five years which we attribute to the complexity of developing and completing an interdisciplinary project. In sum, the students have to date produced 39 peer-reviewed publications a rate of nearly two publications per student. And several of the students are still in their first three years of their graduate career and only beginning to produce research results that will one day be published. Below are two students whose achievements call for special recognition. One has recently completed her PhD and is currently holding a post-doctoral postion at The Jackson Laboratory. The other has past her qualifying exam but still will have one or two more years before completion of her thesis. By then I expect her list of achievements to have expanded even more.

Dr. Jill Recla recently completed her PhD work and defended her thesis in the Fall of 2011. Her research is featured in the Research achievements section of this Survey. In brief, she used a genome-wide association approach to determine the genetic causes of chronic pain. The work involves collaborations with statisticians, informaticists and geneticists. As part of her project she was involved in the development of new software to analyze the output of two large genetic projects in the lab mouse. The Collaborative Cross was supposed to provide the experimental animals for her study but delays in getting the strains ready for analysis forced her to choose a different path. So she adapted and made use of the Diversity Outbred mice, a set of mouse strains better able to mimic the complexity of human genetics. Her work led to the discovery of a potential new gene involved in pain perception, Hydrin and her work is being prepared for publication. The presentation of her work and other related work has caught the attention of the pain research world and she has been cited by LeadDiscovery. She was invited to write and

has published two reviews as single author, an achievement rarely seen for someone at the graduate student level (Recla J.M. [2010] New and emerging therapeutic agents for the treatment of fibromyalgia: An update. Journal of Pain Research. 3:89103.) and (Recla J.M. [2010] Recent developments in the management of post-traumatic pain. European Neurological Journal. June; 2: 73-82). Her work was also the basis of an article in the Feb. 2010 edition of the Jackson Laboratory's quarterly magazine, Search. To support her work, both as a graduate student and now a post-doc, Jill, together with her mentor Dr. Carol Bult, wrote and received a research grant from the Dept. of Defence, entitled "Systems Genetics of Chronic Pain". Jill is not the first student obtain funding for her work but she is the first student in the program to do so as a co-PI.

Karen Dowell is in the middle of her graduate student career, having successfully passed her qualifying exam. Karen came into the program as a non-traditional student. That is, she had been out of academic settings, working in the corporate world (PeopleSoft) and even running her own business for a time. Karen's thesis project is on exploring the molecular mechanisms that dictate mouse and human stem cell fate using Bayesian network machine learning techniques and dynamic data visualization tools. To do this, she had to first establish a "gold standard" of genes and gene products involved in stem cell growth and development. Part of this effort included improving text mining algorithms to glean as much information as possible from the literature. This set of highly curated data was then used to train a Bayesian network to explore existing mouse and human expression data. Her aim was to identify core, conserved cell fate pathways shared among mouse and human embryonic and adult stem cells. Her work is also directed toward finding inappropriately activated self-renewal mechanisms in cancer stem-like cells. Because of the enormity of the datasets and the outputs Karen is also involved in the development of new visualization tools to better represent the data. At this point, Karen has primarily been in the tool-building phase though the publications will be coming soon as will public availability of the computational tools. One significant aspect about Karen's achievements is that she was awarded a two-year Predoctoral Fellowship in Informatics by the Pharmaceutical Research and Manufacturers of America (PhRMA) Foundation. The title of Karen's grant is: "StemNET: Exploring Stem Cell and Cancer Biology Through Bayesian Network Machine Learning." PhRMA Informatics awards are intended to support career development for scientists engaged in cutting-edge research in information technology. PhRMA Informatics awards are rarely given to students not at a medical school. Recently Karen presented at the 7th Fraunhofer Symposium on Text Mining in Bonn, Germany. This event was a forum for publishers, pharmaceutical and biotech professionals, and academic and government scientists to discuss trends and challenges in text mining research. The focus of her talk was "ProMiner at MGI: implementing dictionary-based named entity recognition solutions for mining biomedical literature." It is part of Karen's thesis work because of the need to rapidly cull the bioinformatics literature for information used to curate her stem cell database. It should be noted that Karen represents a second generation IGERT student. Her primary mentor, Matt Hibbs, was funding by an IGERT grant when he was a graduate student at Princeton. He is now a faculty member at The Jackson Laboratory.

Accomplishments from the International Component

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The international component was not a required element at the time that our IGERT grant was submitted and funded. Therefore, our international component occurred on an ad hoc basis.

At the time our IGERT-funded PhD program was getting off the ground a parallel research structure, also initially funded by NSF, was being developed. It involved many of the same people from the same three institutions in Maine, but also included scientists from University of Heidelberg. The entity was named the Instititute of Molecular Biophysics and its focus initially was on high resolution microscopy and spectroscopy. The student who took advantage of this relationship was Andrew Doyle (see Research achievements). Andrew spend time in Germany not only using their instruments to get data, he learned the workings of the Sum Frequency Spectroscopy instrument so that when he returned he could help his mentor, Dr. David Neivandt, build one.

The most significant component of the international relationship, however is the weekly seminar series/lab meeting. This series takes place early in the morning east coast time and makes use of the same videoconferencing infrastructure that was developed for teaching our courses and for holding meetings within Maine. Students, postdocs and faculty will make a presentation of their recent results or of a recent relevant research article. Students therefore have an opportunity to develop a relationship with peers and faculty in Europe. And whereas Andrew is the only one to go to Heidelberg, the opportunity is still there. It is significant that even though the funding for the IMB has largely disappeared the weekly meetings are still held.

IGERT Project Personnel and Trainees

Principal Investigator(s)

Name: Keith W. Hutchison
Project Years Active: 2008-2009, 2009-2010, 2011-2012

Name: Barbara B. Knowles
Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008

Co-Principal Investigator(s) or Trainee/Associate Advisor(s)

Name: Susan Ackerman
Project Years Active: 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010
Role in Project: Trainee/Associate Advisor

Name: Kate M. Beard-Teasdale
Project Years Active: 2003-2004, 2004-2005, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Peter Brooks
Project Years Active: 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Carol J. Bult
Project Years Active: 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Robert W. Burgess
Project Years Active: 2003-2004, 2004-2005, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Alexander V. Chervonsky
Project Years Active: 2003-2004, 2004-2005
Role in Project: Trainee/Associate Advisor

Name: Gary A. Churchill
Project Years Active: 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Tatyana V. Golovkina
Project Years Active: 2003-2004, 2004-2005
Role in Project: Trainee/Associate Advisor

Name: Julie Gosse
Project Years Active: 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Joel H. Graber
Project Years Active: 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Mary Ann Handel
Project Years Active: 2003-2004, 2004-2005, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Clarissa Henry
Project Years Active: 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012

Role in Project: Trainee/Associate Advisor

Name: Samuel T. Hess
Project Years Active: 2005-2006, 2006-2007, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Matthew Hibbs
Project Years Active: 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Keith W. Hutchison
Project Years Active: 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2011-2012
Role in Project: Co-PI and Trainee/Associate Advisor

Name: Carol H. Kim
Project Years Active: 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Lucy Liaw
Project Years Active: 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Volkhardt Linder
Project Years Active: 2002-2003, 2003-2004, 2004-2005, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Kevin Mills
Project Years Active: 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: David J. Neivandt
Project Years Active: 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009
Role in Project: Trainee/Associate Advisor

Name: Timothy P. O'Brien
Project Years Active: 2003-2004, 2004-2005, 2006-2007
Role in Project: Trainee/Associate Advisor

Name: Leif Oxburgh
Project Years Active: 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Rosemary Smith
Project Years Active: 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Rebecca Van Beneden

Project Years Active: 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Calvin Vary
Project Years Active: 2010-2011, 2011-2012
Role in Project: Trainee/Associate Advisor

Name: Joseph Verdi
Project Years Active: 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011
Role in Project: Trainee/Associate Advisor

Trainees

Name: Jacquelyn J. Ames
Total number of months funded: 23
Project Years Active:
2009-2010 Project Year - Trainee supported for 9 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 2 months

Name: Kyle J. Beauchemin
Total number of months funded: 26
Project Years Active:
2009-2010 Project Year - Trainee supported for 9 months
2010-2011 Project Year - Trainee supported for 12 months
2011-2012 Project Year - Trainee supported for 5 months

Name: Cynthia L. Browning
Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Patrick Carlson
Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Christopher J. Demers
Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Karen G. Dowell
Total number of months funded: 17
Project Years Active:
2008-2009 Project Year - Trainee supported for 0 months

2009-2010 Project Year - Trainee supported for 11 months
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Andrew W. Doyle
Total number of months funded: 24
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 12 months

Name: Janice Duy
Total number of months funded: 40
Project Years Active:
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 4 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Teressa J. Egeler
Total number of months funded: 12
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
Date left the IGERT project: 06/2006
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Unknown

Name: Karen S. Fancher
Total number of months funded: 37
Project Years Active:
2002-2003 Project Year - Trainee supported for 11 months
2003-2004 Project Year - Trainee supported for 12 months
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 2 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Kristin Gabor
Total number of months funded: 36
Project Years Active:
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 12 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Michelle F. Goody

Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Jeremy L. Grant
Total number of months funded: 22
Project Years Active:
2008-2009 Project Year - Trainee supported for 0 months
2009-2010 Project Year - Trainee supported for 11 months
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 5 months

Name: Justin A. Guay
Total number of months funded: 43
Project Years Active:
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 7 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

Name: James A. Hagarman
Total number of months funded: 6
Project Years Active:
2004-2005 Project Year - Trainee supported for 6 months
Date left the IGERT project: 01/2005
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left to pursue other academic interests

Name: James V. Harriman
Total number of months funded: 36
Project Years Active:
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 0 months

Name: Valerie Johnson
Total number of months funded: 12
Project Years Active:
2006-2007 Project Year - Trainee supported for 12 months

Name: Erik L. McCarthy
Total number of months funded: 42
Project Years Active:
2006-2007 Project Year - Trainee supported for 6 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months

2009-2010 Project Year - Trainee supported for 12 months

Name: Rachel K. Palmer
Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Emily Patek
Total number of months funded: 12
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
Date left the IGERT project: 06/2006
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left to pursue employment

Name: Kevin A. Peterson
Total number of months funded: 30
Project Years Active:
2002-2003 Project Year - Trainee supported for 12 months
2003-2004 Project Year - Trainee supported for 12 months
2004-2005 Project Year - Trainee supported for 6 months
Date left the IGERT project: 01/2005
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left to pursue other academic interests

Name: Sarah M. Peterson
Total number of months funded: 6
Project Years Active:
2010-2011 Project Year - Trainee supported for 6 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Jill M. Recla
Total number of months funded: 36
Project Years Active:
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 12 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Christian D. Richard
Total number of months funded: 8
Project Years Active:
2010-2011 Project Year - Trainee supported for 5 months
2011-2012 Project Year - Trainee supported for 3 months

Name: Jennifer A. Rochira
Total number of months funded: 35*
Project Years Active:

2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 2 months
2008-2009 Project Year - Trainee supported for 0 months
2009-2010 Project Year - Trainee supported for 0 months

Name: Penny L. Russell
Total number of months funded: 23
Project Years Active:
2002-2003 Project Year - Trainee supported for 11 months
2003-2004 Project Year - Trainee supported for 12 months
Date left the IGERT project: 06/2004
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left to pursue employment

Name: Jesse L. Salisbury
Total number of months funded: 35
Project Years Active:
2003-2004 Project Year - Trainee supported for 11 months
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 0 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months
2009-2010 Project Year - Trainee supported for 0 months

Name: Kathy J. Snow
Total number of months funded: 39*
Project Years Active:
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 6 months
2009-2010 Project Year - Trainee supported for 0 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

Name: Kathleen J. Thornton
Total number of months funded: 25
Project Years Active:
2003-2004 Project Year - Trainee supported for 11 months
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 2 months
Date left the IGERT project: 08/2005
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left due to family and/or economic constraints

Name: Sarah B. Vincent

Total number of months funded: 18
Project Years Active:
2003-2004 Project Year - Trainee supported for 6 months
2004-2005 Project Year - Trainee supported for 12 months
Date left the IGERT project: 08/2005
Left IGERT with a terminal master's degree: No
Reason for stopping the pursuit of the Ph.D.: Left due to family and/or economic constraints

Name: Yong H. Woo
Total number of months funded: 33*
Project Years Active:
2004-2005 Project Year - Trainee supported for 12 months
2005-2006 Project Year - Trainee supported for 12 months
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 0 months
2008-2009 Project Year - Trainee supported for 0 months

Name: Kira A. Young
Total number of months funded: 45
Project Years Active:
2006-2007 Project Year - Trainee supported for 12 months
2007-2008 Project Year - Trainee supported for 12 months
2008-2009 Project Year - Trainee supported for 12 months
2009-2010 Project Year - Trainee supported for 9 months
2010-2011 Project Year - Trainee supported for 0 months
2011-2012 Project Year - Trainee supported for 0 months

* The total number of months funded has been adjusted to account for the change in reporting period that happened in the 2006-2007 project year. Due to the changes in the reporting period there was a 3 month overlap between the 2005-2006 and 2006-2007 project years.

Publications, Presentations, and Patents

Journal Articles in Refereed Publications

Graziani, Irene; Bagala, Cinzia; Duarte, Maria; Soldi, Raffaella; Kolev, Vihren; Tarantini, Francesca; Kumar, Thallapuranam K S.; *Doyle, Andrew W.; Neivandt, David J.; Yu, Chin; Maciag, Thomas; and Prudovsky, Igor. (2006) Release of FGF1 and p40 synaptotagmin 1 correlates with their membrane destabilizing ability, Biochemical and Biophysical Research Communications, 349, 192-199.

Su, Y Q.; Sugiura, K; *Woo, Yong H.; Wigglesworth, K; Kamdar, S; Affourtit, S; and Eppig, J T. (2007) Selective degradation of transcripts during meiotic maturation of mouse oocytes, Dev Biol., 302(1), 104-17.

*Woo, Yong H.; Wright, S M.; Maas, S A.; Alley, T L.; Caddle, L B.; Kamdar, S; Affourtit, S; Forman, O; Akeson, E C.; Shaffer, D; Bronson, R T.; Morse III, H C.; Roopenian, D; and Mills, Kevin. (2007) The nonhomologous end joining factor Artemis suppresses multi-tissue tumor formation and prevents loss of heterozygosity, Oncogene, Mar. 26, 2007, 1-11.

*Rochira, Jennifer A.; Gudheti, M V.; Gould, T J.; Laughlin, R R.; Nadeau, J L.; and Hess, Samuel T. (2007) Fluorescence Intermittency Limits Brightness in CdSe/ZnS Nanoparticles Quantified by Fluorescence Correlation Spectroscopy, Journal of Physical Chemistry C, 111, 1695-1708.

Lorenzen, M D.; Doyungan, Z; Savard, J; and *Snow, Kathy J. (2005) Genetic linkage maps of the red flour beetle, Tribolium castaneum, based on bacterial artificial chromosomes and expressed sequence tags, Genetics, 170(2), 741-7.

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*Fancher, Karen S.; Deveau, S A.; Compton, S T.; and Eppig, J T. (2005) High incidence, early onset of histiocytic sarcomas (HS) in mice with Hertwig's anemia, Exp Hematol, 33(10), 1118-29.

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*Salisbury, Jesse L.; Hutchison, Keith W.; and Graber, Joel H. (2006) A multispecies comparison of the metazoan 3'-processing downstream elements and the CsF-64 RNA recognition motif, BMC Genomics, 2006(7), 55.

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*Dowell K.G., McAndrews-Hill M.S., Hill D.P., Drabkin H.J., Blake, J.A. (2009) Integrating text mining into the MGI biocuration workflow. Database, Vol. 2009: bap019; doi:10.1093/database/bap019.

*Doyle, A W.; Graziani, I; Bagala, C; Duarte, M; Soldi, R; Kolev, V; Tarantini, F; Kumar, T K S.; Neivandt, D J.; Yu, C; Maciag, T; and Prudovsky,I. (2006) Release of FGF1 and p40 synaptotagmin 1 correlates with their membrane destabilizing ability,

Biochemical and Biophysical Research Communications, 349, 192-199.
*Doyle, A.W., Fick, J., Himmelhaus, M., Eck, W., Graziani, I., Prudovsky, I., Grunze, M., Maciag, T., Neivandt, D.J. (2004). Protein deformation of lipid hybrid bilayer membranes studied by sum frequency generation vibrational spectroscopy. Langmuir, 20, 8961-8965.
*Fancher K., Naxerova K., Bult C. J., Peaston A., Knowles B. B., Kasif S., Kohane I. S. (2008). Analysis of gene expression in a developmental context emphasizes distinct biological leitmotifs in human cancers. Genome Biol. 9(7):R108. Epub 2008 Jul 8.
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*Fancher, K.S., Dorward, A.M., Duffy, T.M., Beamer, W.G., Walt, H. (2005). Early neoplastic and metastatic mammary tumours of transgenic mice detected by 5-aminolevulinic acid-stimulated protoporphyrin IX accumulation. Br. J. Cancer, 93, 1137-1143.
*Gabor, KA. Gunewardene, MS., Santucci, D., and Hess, ST. Localization-Based Super-Resolution Light Microscopy. Microscopy Today. 2011 (4):12-16.
*Gabor, KA., Stevens, CR., Pietraszewski, MJ., Gould, TJ., Lam, SH., Gong Z., Hess, ST., and Kim, CH. Super Resolution Microscopy Reveals that Caveolin-1 is Required for Antiviral Immune Response.
*Gabor KA, Gudheti MV, Gould TJ, Gunewardene MS, Verkhusha VV, Zimmerberg J, Gosse JA, Kim CH, and Hess ST. Statins modulate influenza through hemagglutinin-actin interactions.
*McCarthy, E. (2008). Nrk2b Regulates Cell Adhesion and is Required for Muscle Morphogenesis in vivo. Developmental Cell
*McCarthy, E.L., Bickerstaff, L.E., da Cunha, M.P., Millard, P.J. (2007). Nucleic acid sensing by regenerable surface-associated isothermal rolling circle amplification. Biosens Bioelectron., 22, 1236-1244.
*McCarthy, E.L., Egeler, T.J., Bickerstaff, L.E., Pereira da Cunha, M., Millard, P.J. (2006). Detection and identification of IHN and ISA viruses by isothermal DNA amplification in microcapillary tubes. Anal. Bioanal. Chem., 386, 1975-1984.
*Peterson, K.A., Burgess, R.W., Johnson, M.J., Roix, J.J., Welsh, I.C., O'Brien, T.P. (2004). Evidence for a conserved function in synapse formation reveals Phr1 as a candidate gene for respiratory failure in newborn mice. Mol. Cell. Biol., 24, 1096-1105.
*Peterson, K.A., King, B.L., Hagge-Greenberg, A., Roix, J.J., Bult, C.J., O'Brien, T.P. (2002). Functional and comparative genomic analysis of the piebald deletion region of mouse chromosome 14. Genomics, 80,172-184.
*Recla J.M. and Sarantopoulos, C.D. Combined use of pregabalin and memantine in fibromyalgia syndrome treatment: a novel analgesic and neuroprotective strategy?, Med Hypotheses. 2009 Aug; 73(2): 177-183.
*Rochira J.A., Cowling R.A., Himmelfarb J.S., Adams T.L., Verdi J.M. Mapping of

NRAGE Domains Reveals Clues to Cell Viability in BMP Signaling. Apoptosis 2010; 15(1):63-70. (DOI:10.1007/s10495-009-0427-6)
*Rochira J.A., Matluk N., Karaczyn A.A., Adams T.L., and Verdi J.M. The Role of NRAGE in NF-kB Activation Through the Non-Canonical BMP Pathway. BMC Biology 2010; 8(7). (DOI:10.1186/1741-7007-8-7)
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*Rochira, J. A., Matluk, N., Karaczyn, A. A., Adams, T. L., & Verdi, J. M. (2009). The Role of NRAGE in NF-?B Activation Through the Non-Canonical BMP Pathway. Oncogene.
*Rochira, J. A.; Gudheti, M V.; Gould, T J.; Laughlin, R R.; Nadeau, J L.; and Hess, Samuel T. (2007) Fluorescence Intermittency Limits Brightness in CdSe/ZnS Nanoparticles Quantified by Fluorescence Correlation Spectroscopy, Journal of Physical Chemistry C, 111, 1695-1708.
*Rochira, J.A., Bani-Yaghoub, M., Kubu, C.J., Cowling, R., Nikopoulos, G.N., Bellum, S., Verdi, J.M. (2007). A switch in numb isoforms is a critical step in cortical development. Dev. Dyn., 236, 696-705.
*Salisbury, J. L.; Hutchison, K W.; and Graber, J H. (2006) A multispecies comparison of the metazoan 3'-processing downstream elements and the CsF-64 RNA recognition motif, BMC Genomics, 2006(7), 55-70.
*Salisbury, J., Ackert-Bicknell, C.L., Horowitz, M., DeMambro, V.E., Horton, L.G., Shultz, K.L., Lecka-Czernik B, Rosen CJ. (2007). A chromosomal inversion within a quantitative trait locus has a major effect on adipogenesis and osteoblastogenesis. Ann. NY Acad. Sci., 1116, 291-305.
*Salisbury, J., Brockman, J.M., Singh, P., Liu, D., Quinlan, S., Graber, J.H. (2005). PACdb: PolyA Cleavage Site and 3'-UTR Database. Bioinformatics, 21, 3691-3693.
*Salisbury, J., Graber, J.H., Hutchins, L.N., Blumenthal, T. (2007). C. elegans sequences that control trans-splicing and operon pre-mRNA processing. RNA. 13:1409-1426.
*Snow, K J., Lorenzen, M D.; Doyungan, Z; Savard, J; (2005) Genetic linkage maps of the red flour beetle, Tribolium castaneum, based on bacterial artificial chromosomes and expressed sequence tags, Genetics, 170(2), 741-7.
*Snow, K.J., *Ames, J., Hasham, M.G., Donghia, N.M., Coffey, E., Maynard, J., Wilpan, R.Y., He, Y., King, B.L., and Mills, K.D. (2010). Widespread genomic breaks generated by activation-induced cytidine deaminase are prevented by homologous recombination. Nat mmunol 11, 820-826.
*Snow, K.J., Kim, S., Huang, L.W., Ablamunits, V., Hasham, M.G., Young, T.H., Paulk, A.C., Richardson, J.E., Affourtit, J.P., Shalom-Barak, T., Bult, C.J., Barak ,Y. (2007). A mouse model of conditional lipodystrophy. Proc. Natl. Acad. Sci. USA, 104, 16627-16632.

*Snow, K.J., Wright, S.M., Woo, Y., Titus, L.C., Mills, K.D., and Shopland, L.S. (2011). Nuclear positioning, higher-order folding, and gene expression of Mmu15 sequences are refractory to chromosomal translocation. Chromosoma 120, 61-71.
*Thornton, K., *Vincent, S., Shopland, L.S., Lynch, C.R., *Peterson, K.A., Kepper, N., Hase, J., Stein, S., Molloy, K.R., Kreth, G., Cremer, C., Bult, C.J., O'Brien, T.P. (2006). Folding and organization of a contiguous chromosome region according to the gene distribution pattern in primary genomic sequence. J. Cell. Biol., 174, 27-38.
*Woo, Y H.; Wright, S M.; Maas, S A.; Alley, T L.; Caddle, L B.; Kamdar, S; Affourtit, S; Forman, O; Akeson, E C.; Shaffer, D; Bronson, R T.; Morse III, H C.; Roopenian, D; and Mills, Kevin. (2007) The nonhomologous end joining factor Artemis suppresses multi-tissue tumor formation and prevents loss of heterozygosity, Oncogene, Mar. 26, 2007, 1-11.
*Woo, Y. and Churchill, Gary A. (2005) Experimental design for three-color and four-color gene expression microarrays, Bioinformatics, 21(Suppl 1), i459-67.
Woo, Y. H., Wright, S. M., Alley, T. L., Shirley, B. J., Akeson, E. C., Snow, K. J., et al. (2009). Complex oncogenic translocations with gene amplification are initiated by specific DNA breaks in lymphocytes. Cancer Res, 69(10), 4454-4460.
*Woo, Y., Affourtit, J., Daigle, S., Viale, A., Johnson, K., Naggert, J., Churchill, G. (2004). A comparison of cDNA, oligonucleotide, and Affymetrix GeneChip gene expression microarray platforms. J. Biomol. Tech., 15, 276-284.
*Woo, Y., Cui, X., Affourtit, J., Shockley, K.R., Churchill, G.A. (2006). Inheritance patterns of transcript levels in F1 hybrid mice. Genetics, 174, 627-637.
*Woo, Y., Mrug, M., Zhou, J., Cui, X., Szalai, A.J., Novak, J., Churchill, G.A., Guay-Woodford, L.M. (2007). Overexpression of innate immune response genes in a model of recessive polycystic kidney disease. Kidney Int., 73, 63-76.
*Woo, Yong H.; Su, Y Q.; Sugiura, K; Wigglesworth, K; Kamdar, S; Affourtit, S; and Eppig, J T. (2007) Selective degradation of transcripts during meiotic maturation of mouse oocytes, Dev Biol., 302(1), 104-17.

Publications - Refereed

Hasham, M.G., Donghia, N.M., Coffey, E., Maynard, J., Snow, K.J.*, Ames, J.*, Wilpan, R.Y., He, Y.,
King, B.L., and Mills, K.D. (2010). Widespread genomic breaks generated by activation-induced
cytidine deaminase are prevented by homologous recombination. Nat Immunol 11, 820-826.

Snow, K.J.*, Wright, S.M., Woo, Y., Titus, L.C., Mills, K.D., and Shopland, L.S. (2011). Nuclear
positioning, higher-order folding, and gene expression of Mmu15 sequences are refractory to
chromosomal translocation. Chromosoma 120, 61-71.

Journal Articles in Refereed Publications
Recla J.M.* and Sarantopoulos, C.D. Combined use of pregabalin and memantine in fibromyalgia syndrome treatment: a novel analgesic and neuroprotective strategy?, Med Hypotheses. 2009 Aug; 73(2): 177-183.

Dowell K.G.*, McAndrews-Hill M.S., Hill D.P., Drabkin H.J., Blake, J.A. (2009) Integrating text mining into the MGI biocuration workflow. Database, Vol. 2009: bap019; doi:10.1093/database/bap019.
Rochira J.A.*, Cowling R.A., Himmelfarb J.S., Adams T.L., Verdi J.M. Mapping of NRAGE Domains Reveals Clues to Cell Viability in BMP Signaling. Apoptosis 2010; 15(1):63-70. (DOI:10.1007/s10495-009-0427-6)

Matluk N., Rochira J.A.*, Karaczyn A.A., Adams T.L., and Verdi J.M. The Role of NRAGE in NF-kB Activation Through the Non-Canonical BMP Pathway. BMC Biology 2010; 8(7). (DOI:10.1186/1741-7007-8-7)

5a. Journal Articles in Refereed PUBLICATIONS

Wright, S. M., Woo, Y. H.*, Alley, T. L., Shirley, B. J., Akeson, E. C., Snow, K. J.*, et al. (2009). Complex oncogenic translocations with gene amplification are initiated by specific DNA breaks in lymphocytes. Cancer Res, 69(10), 4454-4460.

Naxerova K., Bult C. J., Peaston A., Fancher K.*, Knowles B. B., Kasif S., Kohane I. S. (2008). Analysis of gene expression in a developmental context emphasizes distinct biological leitmotifs in human cancers. Genome Biol. 9(7):R108. Epub 2008 Jul 8.

Rochira, J. A.*, Cowling, R. A., Himmelfarb, J. S., Hess, S. T., & Verdi, J. M. (2009). Fluorescence Resonance Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis. Biophysical Journal Abstracts Issue, 96(3), 69a.

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McCarthy, E.* (2008). Nrk2b Regulates Cell Adhesion and is Required for Muscle Morphogenesis in vivo. Developmental Cell

Ackert-Bicknell, C.L., *Salisbury, J., Horowitz, M., DeMambro, V.E., Horton, L.G., Shultz, K.L., Lecka-Czernik B, Rosen CJ. (2007). A chromosomal inversion within a quantitative trait locus has a major effect on adipogenesis and osteoblastogenesis. Ann. NY Acad. Sci., 1116, 291-305.

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that control trans-splicing and operon pre-mRNA processing. RNA. 13:1409-1426.

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*Peterson, K.A., King, B.L., Hagge-Greenberg, A., Roix, J.J., Bult, C.J., O'Brien, T.P. (2002). Functional and comparative genomic analysis of the piebald deletion region of mouse chromosome 14. Genomics, 80,172-184.

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Mikaelian, I., Blades, N., Churchill, G.A., *Fancher, K., Knowles, B.B., Eppig, J.T. and Sundberg, J.P. (2004). Proteotypic classification of spontaneous and transgenic mammary neoplasms. Breast Cancer Res., 6, R668-679.

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Journal Articles in Non-Refereed Publications

Journal Articles in Non-Refereed Publications
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Conference Publications

Conference Publications
Gabor, K. A.*, Gudheti, M. V., Mlodzianoski, M. J., and Hess, S. T. The Effect of Probe Concentration on Giant Unilamellar Vesicles. In the Biophysical Society's 53rd Annual Meeting. Boston, MA. March 2009.
Gabor, K. A.*, Gudheti, M. V., Mlodzianoski, M. J., and Hess, S. T. The effect of probe concentration on giant unilamellar vesicles. In Maine Biological and Medical Sciences Symposium. Bar Harbor, ME. April 2009.
Gabor, K. A.*, Stevens, C. R., Shim, J., Hess, S. T., and Kim, C. H. Fluorescently labeled Rhabdovirus and High Resolution Microscopy in Danio rerio. In The American Society for Microbiology's 109th General Meeting. Philadelphia, PA. May 2009.
Gabor, K.A.*, Stevens, C.R., Pietraszewski, M.J., Gould, T.J., Hess, S.T., and Kim, C.H. Super-resolution microscopy reveals that caveolin-1 is critical for effective immune response to viral infection. Keystone Symposia: Cell Biology of Virus Entry, Replication, and pathogenesis. Taos, NM. February 16-21, 2010.

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Gabor, K.A.*, Stevens, C.R., Pietraszewski, M.J., Gould, T.J., Hess, S.T., and Kim, C.H. Super-resolution microscopy reveals that caveolin-1 is critical for effective immune response to viral infection. Keystone Symposia: Cell Biology of Virus Entry, Replication, and pathogenesis. Taos, NM. February 16-21, 2010.

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Gabor, K. A.*, Gudheti, M. V., Mlodzianoski, M. J., and Hess, S. T. The Effect of Probe Concentration on Giant Unilamellar Vesicles. In the Biophysical Society's 53rd Annual Meeting. Boston, MA. March 2009.

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Conference Presentations

*Fancher, Karen S.; Churchill, Gary A.; and Knowles, Barbara B. "Retrotransposon Over Expression in Ductal Carcinoma in Situ." Paper presented at MaineTech 2005, Augusta, ME, USA. May 09, 2005, .

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*Fancher, Karen S. "Tumor Progression in a Mouse Model of Breast Cancer." Paper presented at October is Breast Cancer Awareness Month, Bar Harbor, ME, USA. October 28, 2005, The Jackson Laboratory.

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*Rochira, Jennifer A. and Ackerman, Susan. "Genetic and Physical Mapping of nmf291 Mutation on Mouse Chromosome 11." Paper presented at Fall Meeting, Bar Harbor, ME, USA. November 01, 2004, The Jackson Laboratory.

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*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at 32nd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 15, 2005, MDI Biological Laboratory.

*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at Maine Technology Exposition, Augusta, ME, USA. April 10, 2005, Maine Technology.

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*Woo, Yong H. and Churchill, Gary A. "Experimental design for three-color and four-color gene expression microarrays." Paper presented at ISMB 2005, Detroit, MI, USA. June 25, 2005, International Society for Computational Biology.

*Woo, Yong H.; Churchill, Gary A.; and Mills, Kevin. "Lymphomagenesis in Mice Deficient for Non-Homologous End-Joining Factors." Paper presented at 33rd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 28, 2006, MDI Biological Laboratory.

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*Woo, Yong H.; Churchill, Gary A.; and Mills, Kevin. "Microarray: A Tool for Detecting Gene Expression Changes and DNA." Paper presented at 3rd Annual Functional Genomics Meeting, Orono, ME, USA. August 19, 2005, The University of Maine.

*Snow, Kathy J. and Mills, Kevin. "Nuclear architecture and 3D organization of translocation donor and target loci during B cell development and in tumorigenesis." Paper presented at 32nd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 28, 2006, MDI Biological Laboratory.

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*Salisbury, Jesse L.; Graber, Joel H.; and Hutchison, Keith W. "Comparative analysis of metazoan 3'-processing downstream elements and the CstF-64 RNA binding domains." Paper presented at 2006 IGERT Project meeting, Arlington, VA, USA. May 15, 2006, National Science Foundation.

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Gould, T J.; *Rochira, Jennifer A.; Gudheti, M V.; Bewersdorf, Joerg; and Hess, Samuel T. "A Quantitative Comparison of the Photophysical Properties of Select Organic Dyes and Quantum Dots with Fluorescence Emission in the 500 - 600 nm Range." Paper presented at 51st Annual Meeting of the Biophysical Society, Baltimore, MD, USA. March 03, 2007, Biophysical Society.

*Rochira, Jennifer A.; Nikopoulos, George N.; cowling, Rebecca A.; Himmelfarb, Joshua S.; Anderson, Tamara L.; and Verdi, Joseph. "NRAGE as a Target for the Development of Novel Treatments for Medulloblastomas." Paper presented at 34th Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 27, 2007, Mount Desert Island Biological Laboratory.

*Harriman, James V. and Graber, Joel H. "Comparison of Protein-Protein Interactions and Correlated SNP Variation in the Mouse Genome." Paper presented at Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 27, 2007, MDI Biological Laboratory.

Conference Presentations

*Ames J, Caron J, Brooks P (2011). Regulation of Tumor Progression and Metastasis by the Novel XL313 Cryptic ECM Element. Presentation. 2011 MMCRI Research Fellows Seminar Series, Scarborough, ME.

*Ames J, Roth J, Contios L, Brooks P (2010). Role of XL313 Cryptic Type 1 Collagen Epitope in Angiogenesis and Tumor Progression. Poster. 3rd Annual Meeting of the Graduate School of Biomedical Sciences, Orono, ME.

*Ames, JJ, Nugent, DP, Contois, L, Caron, JM and Brooks, PC (2011). Regulation of Inflammation and Tumor Growth by the Novel XL313 Cryptic ECM Element. Poster. 102nd Annual American Association of Cancer Research Meeting, Orlando, FL.

*Ames, JJ, Nugent, DP, Contois, L, Caron, JM and Brooks, PC (2011). Regulation of Tumor Progression by the Novel XL313 Cryptic ECM Element. Presentation. 38th Maine Biological and Medical Sciences Symposium, Bar Harbor, ME.

*Beauchemin, K.J., Maser, R.S., Walker, K., Wright, S., Shanholtzer, J., (April 2011). Aging Telomerase Deficient B6 mice develop cell-intrinsic myeloproliferative disease and display abnormal myeloid composition in the lung, 38th AnnualMaine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory.

Beauchemin, K.J., Recla, J.M., Bogue, M.A., Grubb, S.C., Maddatu, T.P., Bult, C.J. In

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*Dowell K.G., McAndrews-Hill M.S., Hill D.P., Drabkin H.J., Blake J.A. (2009) Integrating ProMiner into the MGI biocuration workflow. Abstract for oral presentation, Fraunhofer SCAI Symposium on Text Mining, Bonn, Germany, 2009
*Dowell, K.G. and Hibbs M.A. 2010. A Systems Approach to Understanding Stem Cell Self Renewal Mechanisms. Abstract for poster presentation, 37th Maine Biological and Medical Sciences Symposium (MBMSS), Bar Harbor, ME.
*Dowell, K.G. and Hibbs M.A. 2010. A Systems Approach to Understanding Embryonic Stem Cell Self Renewal Mechanisms. Abstract for poster presentation, International Conference on Intelligent Systems for Molecular Biology (ISMB), Boston, MA.
*Duy, J., and Connell, L. University of Maine, Orono, ME. (2007). Fast and Accurate Detection of Alexandrium Species Using Peptide Nucleic Acid Probes and Surface Plasmon Resonance, Fourth Symposium on Harmful Algae in the U.S. Woods Hole, Massachusetts.
*Duy, J., Connell L., Smith R.L. University of Maine, Orono, ME. (2008). Development of a Direct Detection Method for Potato Wart Fungus, Synchytrium endobioticum, Northeast Potato Technology Forum, Fredericton, New Brunswick, Canada
*Fancher K. (2008, June). Colony Management and Breeding Schemes and Making sense of mouse nomenclature, background effects and the importance of genetic stability. Presented at the Mouse Genetics Resources Seminar, Biogen Idec, Cambridge, MA.
*Fancher K. (2008, October). Maintaining Efficient and Stable Mouse Colonies. Presented at The Jackson Laboratory Seminar at Bristol-Myers Squibb, Waterbury, CT.
*Fancher K. (2008, October). Mouse nomenclature, background effects and the importance of genetic stability, Cre-lox technology in mouse models of disease research, and Cancer models. Presented at Cre, Mouse Genetics, and Cancer Seminar Series, Tufts University, Boston, MA.
*Fancher K. (2008, October).Colony Management and Breeding Schemes, Making sense of mouse nomenclature, background effects and the importance of genetic stability, How to find mouse models, and Cre-lox technology in mouse models of disease research. Presented at Cre, Mouse Genetics, and Colony Management Series, MASS Medical School, Worcester, MA.
*Fancher, K. S.; Churchill, Gary A.; and Knowles, Barbara B. "Retrotransposon Over Expression in Ductal Carcinoma in Situ." Paper presented at MaineTech 2005, Augusta, ME, USA. May 09, 2005.
*Fancher, KA. (2007). Nuclear Architecture of Tumor Cells. Jackson Laboratory, Institute for Molecular Biophysics seminar.
*Fancher, KA. (2008). Consequences of Tumorigenesis on Chromatin 3D Organization. Institute for Molecular Biophysics. The Jackson Laboratory, Bar Harbor ME.
*Fancher, Karen S. "oral presentations." Paper presented at Knowles Lab Meeting, Bar Harbor, ME, USA. April 26, 2006, The Jackson Laboratory.
*Fancher, Karen S. "oral presentations." Paper presented at Knowles Lab Meeting, Bar Harbor, ME, USA. December 20, 2005, The Jackson Laboratory.
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*Fancher, Karen S.; *Woo, Yong H.; Churchill, Gary A.; and Knowles, Barbara B. "Retrotransposon Over Expression in Ductal Carcinoma in Situ, a Potential Early Marker of Tumorigenesis." Paper presented at 33rd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 28, 2006, MDI Biological Laboratory.
*Fancher, Karen S.; *Woo, Yong H.; Churchill, Gary A.; and Knowles, Barbara B. "Genetic Changes throughout Tumor Progression in a Mouse Model of Mammary Cancer." Paper presented at 5th Annual Timberline Symposium on Epithelial Cell Biology--Dpithelial Cancer: Regulation by intrinsic and microenvironmental factors, Mount Hood, OR, USA. February 04, 2006.
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*Gabor KA, Gudheti MV, Gould TJ, Gunewardene MS, Verkhusha VV, Zimmerberg J, Gosse JA, Kim CH, and Hess ST, Statins modulate influenza through hemagglutinin-actin interactions. (2011) at 38th Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME
*Gabor, K. A., Gudheti, M. V., Mlodzianoski, M. J., and Hess, S. T. (2009, April). The effect of probe concentration on giant unilamellar vesicles. Poster session presented at the University of Maine Graduate Student Expo, Orono, ME.
*Gabor, KA. and Hess, ST., Biological Applications of Fluorescence Photoactivation Localization Microscopy (2011) at Microscopy and Microanalysis, Nashville, MD
*Gabor, KA., Gudheti, MV., and Hess, ST., Effects of Probe concentration on membrane properties of giant unilamellar vesicles (2009) at 53rd annual meeting of the Biophysical Society, Boston, MA
*Gabor, KA., Stevens, CR., Pietraszewski, MJ., Gould, TJ., Hess, ST., and Kim, CH., Super-resolution microscopy reveals that caveolin-1 is critical for effective immune response to viral infection (2010) at Keystone Symposia: Cell Biology of Virus Entry, Replication, and pathogenesis, Taos, NM
*Gabor, KA., Stevens, CR., Pietraszewski, MJ., Gould, TJ., Lam, SH., Gong Z., Hess, ST., and Kim, CH., Super Resolution Microscopy Reveals that Caveolin-1 is Required for Antiviral Immune Response. (2011) at 2nd Annual North Atlantic Zebrafish Research Symposium, Halifax, Nova Scotia, Canada.
*Gabor, KA., Stevens, CR., Shim, J., Pietraszewski, M., Hess, ST., and Kim, CH., Caveolin-1a and caveolin-1b plays a pivotal role in Clearance of Snakehead Rhabdoviridae Infection (2009) at Graduate Research Expo, Orono, Maine
*Guay JA, Fang J, Adams D, Larman B, Wojchowski D, Oxburgh L. (2007). The Role of Death Associated Protein Kinase 2 in Ischemic Kidney Damage. Poster. 34th Maine Biological and Medical Sciences Symposium, Mount Desert Island, ME.
*Guay JA, Parry EM, Meredith MM, Fekete FA. (2005). Characterization of mercury- and antibiotic-resistant Bacillus strains isolated from Maine soil environments. Poster. Abstracts of the Northeast Microbiology: Physiology, Ecology, and Taxonomy Meeting, Blue Mountain Lake, NY.
*Guay JA, Wojchowski D, Oxburgh L. (2008). Localization and Characterization of an Inducer of Cell Death in the Mouse Kidney. Poster. 35th Maine Biological and Medical

Sciences Symposium, Mount Desert Island, ME.
*Harriman, JV. and Graber, JH. "Comparison of Protein-Protein Interactions and Correlated SNP Variation in the Mouse Genome." Paper presented at Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 27, 2007, MDI Biological Laboratory.
*Recla, J. (2008, May). U2 and the Mouse Brain: An Intriguing Mechanism of Cerebellar Neurodegeneration. Presented at the First Annual Graduate School of Biomedical Sciences Meeting, UMaine, Orono, ME.
*Recla, J. (2009, May). From Mouse to Man: Toward an Individualized Approach to Chronic Pain Treatment. Presented at Research Week Grand Rounds, Togus Veterans Affairs Medical Center.
*Recla, J.M. (2007). Putative dormancy-regulating gene identification and expression profiling in Populus trichocarpa using bioinformatic techniques. 48th Annual Short Course in Medical and Experimental Mammalian Genetics. The Jackson Laboratory.
*Recla, J.M. (May 2010). From Mouse to Man: Toward an Individualized Genetic Approach to Chronic Pain Treatment. Maine Association of Psychiatric Physicians (MAPP) Education Session, Portland, ME.
*Recla, J.M. (September 2010). In-silico haplotype association mapping in mice identifies candidate genes for human chronic pain susceptibility. 3rd Annual Meeting of the Graduate School of Biomedical Sciences, The University of Maine.
*Recla, J.M. (September 2010).In-silico haplotype association mapping in mice identifies candidate genes for human chronic pain susceptibility. JAX-MDIBL Joint Scientific Symposium, Mount Desert IslandBiological Laboratory.
*Recla, J.M. From Mouse to Man: Toward an Individualized Approach to Chronic Pain Treatment. Research Week Grand Rounds, Togus Veterans Affairs Medical Center (May 2009).
*Recla, J.M.*From Mouse to Man: Toward an Individualized Genetic Approach to Chronic Pain Treatment. Maine Association of Psychiatric Physicians (MAPP) Education Session, Portland, ME (May 2010).
*Recla, J.M., Bult, C.J. (October 2010). Haplotype Association Mapping with EMMA Correction Server: A Practical Guide (workshop). Genomic and Proteomic Approaches to Complex Heart, Lung, Blood, & Sleep Disorders, The Jackson Laboratory.
*Recla, J.M., Bult, C.J. Haplotype Association Mapping with EMMA: A Practical Guide (workshop). Genomic and Proteomic Approaches to Complex Heart, Lung, Blood, & Sleep Disorders, The Jackson Laboratory (August 2009).
*Recla, J.M., Churchill, G.A., Bult, C.J. (August 2010).Locus-specific In-silico Haplotype Association Mapping in Mice IdentifiesCandidate Genes for Human Chronic Pain Susceptibility. 13th World Congresson Pain (SIG: Validity and Quality of Animal Models for the Measurement ofPain), Montreal, Quebec, Canada.
*Recla, J.M., Churchill, G.A., Bult, C.J. (May 2010). Locus-specific In-silico Haplotype Association Mapping in Mice Identifies Candidate Genes for Human Chronic Pain Susceptibility. NSF IGERT 2010Project Meeting, Washington, D.C.
*Recla, J.M., Churchill, G.A., Bult, C.J. Locus-specific in-silico haplotype association mapping in mice identifies novel candidate genes for human chronic pain susceptibility. Spring Pain Conference, Grand Cayman (May 2010).
*Recla, J.M., Churchill, G.A., Bult, C.J. Locus-specific In-silico Haplotype Association Mapping in Mice Identifies Genes Associated with Human Chronic Pain Susceptibility. 2nd Annual Meeting of the Graduate School of Biomedical Sciences, The University of

Maine (September 2009).
*Recla, J.M., Jia, Y., Ackerman, S. A deletion in one of the U2 small nuclear RNA genes causes neurodegeneration. Eukaryotic mRNA Processing, Cold Spring Harbor Laboratory (August 2009).
*Recla, J.M., Jia, Y., Ackerman, S. A deletion in one of the U2 small nuclear RNA genes causes neurodegeneration. HHMI Scientific Meeting - Neurobiology: From Cells to Systems, Janelia Farm Research Campus (December 2009).
*Recla, J.M., Philip, V.M., Robledo, R.F., Bult, C.J., Chesler, E.J. (April 2011). Diversity Outbred mice: Implications of population characteristics on genetic studies of murine pain sensitivity. 38th AnnualMaine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory.
*Rochira J. A., Cowling R. A., Himmelfarb J. S., Hess S. T., and Verdi J. M. (2008, December). Fluorescence Resonant Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis. Presented at the Maine Medical Center Research Institute Open House, Scarborough, ME.
*Rochira J. A., Cowling R. A., Himmelfarb J. S., Hess S. T., and Verdi J. M. (2009, March). Fluorescence Resonant Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis.Poster presented at the 53rd Meeting of the Biophysical Society, Boston Convention and Exhibition Center, Boston, MA.
*Rochira J. A., Hess S. T., and Verdi J. M. (2008, December). NRAGE Interactions in BMP-Mediated Apoptosis. Oral presentation at the Maine Medical Center Research Institute, Scarborough, ME.
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*Rochira JA, Cowling RA, Himmelfarb JS, Hess ST, and Verdi JM. (2008) Fluorescence Resonance Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis. 35th Maine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory, Salisbury Cove, ME.
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*Rochira, JA , Manasa V. Gudheti, Ryan Laughlin, Jay L. Nadeau, and Samuel T. Hess. (2005). Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications. Department of Physics and Astronomy, The University of Maine, Orono, ME. Department of Biomedical Engineering, McGill University, Montreal, Quebec, Canada and the Institute of Molecular Biophysics,The Jackson Laboratory, Bar Harbor, ME.
*Rochira, JA . (2006). 50th Annual Meeting of the Biophysical Society, Salt Lake City Convention Center, Salt Lake City, Utah. Poster presentation.
*Rochira, JA . (2006). Frontiers in Biomembranes: Experiments and Theory Symposium.

Institute for Molecular Biophysics, University of Maine/The Jackson Laboratory/Maine Medical Center Research Institute, Bar Harbor, ME. Poster presentation.
*Rochira, JA, Travis J. Gould, Manasa V. Gudheti, Joerg Bewersdorf, and Samuel T. Hess. (2007). A Quantitative Comparison of the Photophysical Properties of Select Organic Dyes and Quantum Dots with Fluorescence Emission in the 500 600 nm Range. 51st Annual Meeting of the Biophysical Society, Baltimore Convention Center, Baltimore, MD. . Poster presentation.
*Rochira, Jennifer A. and Ackerman, Susan. "Genetic and Physical Mapping of nmf291 Mutation on Mouse Chromosome 11." Paper presented at Fall Meeting, Bar Harbor, ME, USA. November 01, 2004, The Jackson Laboratory.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at IGERT Monthly Meeting, Orono, ME, USA. April 15, 2006, The University of Maine.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at Frontiers in Biomembranes: Experiments and Theory Symposium, Bar Harbor, ME, USA. March 02, 2006, Institute for Molecular Biophysics, University of Maine.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at 50th Annual Meeting of the Biophysical Society, Salt Lake City, UT, USA. February 12, 2006, Biophysical Society.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at 3rd Annual Functional Genomics Meeting, Orono, ME, USA. August 19, 2005, The University of Maine.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at Microscale Bioengineering, Orono, ME, USA. May 05, 2005, The University of Maine.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at Graduate Research Exposition, Orono, ME, USA. April 26, 2006, The University of Maine.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at Maine Technology Exposition, Augusta, ME, USA. April 10, 2005, Maine Technology.
*Rochira, Jennifer A. and Hess, Samuel T. "Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications." Paper presented at 32nd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 15, 2005, MDI Biological Laboratory.
*Rochira, Jennifer A. and Verdi, Joseph. "The Role of NRAGE in Neural Apoptosis." Paper presented at Hess Lab Meeting, Orono, ME, USA. April 12, 2006, The University of Maine.
*Rochira, Jennifer A. and Verdi, Joseph. "The Role of NRAGE in Neural Apoptosis."

Paper presented at Center for Regenerative Medicine, Scarborough, ME, USA. August 23, 2005, Maine Medical Center Research Institute.
*Rochira, Jennifer A. and Verdi, Joseph. "The Role of NRAGE in Neural Apoptosis." Paper presented at Student IGERT monthly meeting, Orono, MA, USA. December 15, 2005, The University of Maine.
*Rochira, Jennifer A.; Gould, T J.; Gudheti, M V.; Bewersdorf, Joerg; and Hess, Samuel T. "A Quantitative Comparison of the Photophysical Properties of Select Organic Dyes and Quantum Dots with Fluorescence Emission in the 500 600 nm Range." Paper presented at 51st Annual Meeting of the Biophysical Society, Baltimore, MD, USA. March 03, 2007, Biophysical Society.
*Rochira, Jennifer A.; Nikopoulos, George N.; cowling, Rebecca A.; Himmelfarb, Joshua S.; Anderson, Tamara L.; and Verdi, Joseph. "NRAGE as a Target for the Development of Novel Treatments for Medulloblastomas." Paper presented at 34th Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 27, 2007, Mount Desert Island Biological Laboratory.
*Rochira, Jennifer A.; Nikopoulos, George N.; cowling, Rebecca A.; Himmelfarb, Joshua S.; Hess, Samuel T.; and Verdi, Joseph. "The Role of NRAGE in BMP Mediated Apoptosis and Its Physical Properties as Revealed by Fluorescence Correlation Spectroscopy." Paper presented at 4th Annual Meeting of the NSF - IGERT Functional Genomics Ph.D. Program, Orono, ME, USA. July 14, 2006, University of Maine.
*Salisbury, J. L.; Graber, J. H.; and Hutchison, K. W. "Comparative analysis of metazoan 3'-processing downstream elements and the CstF-64 RNA binding domains." Paper presented at 2006 IGERT Project meeting, Arlington, VA, USA. May 15, 2006, National Science Foundation.
*Snow, K. J. (2008, December). Chromosome Positioning and 3-D Folding Is Disrupted in Progenitor B Cell Lymphoma Nuclei. Invited Minisymposium Speaker at the 48th Annual Meeting of the American Society for Cell Biology, San Francisco, CA.
*Snow, K. J. (2009, April). Effects of Translocation on Chromosome 3D Structure, Nuclear Position and Gene Expression in Progenitor B Cell Lymphoma Invited Speaker. 36th Maine Biological and Medical Sciences Symposium. April 17-18, 2009. Mount Desert Island Biological Laboratory, Salisbury Cove, ME.
*Snow, K.J. (2011). Nuclear positioning, 3D gene clustering, and gene expression of Mmu15 sequences are refractory to translocation in NHEJ-deficient mouse lymphomas. Poster presented at the Keystone Symposia Conference, Genomic Instability and DNA Repair, Keystone, CO.
Snow, K.J. (2010). Dangerous Liaisons: Mapping Translocation Junctions in Progenitor B Cell Lymphomas. Presented at University of Maine, GSBS Annual Meeting.
Snow, K.J. (2010). Effects of Translocation on Chromosomal 3D Structure, Nuclear Position and Gene Expression in Progenitor B-cell Lymphoma. Presented at the JAX-MDIBL Scientific Symposium.
*Snow, Kathy J. "3D Localization of Translocation Donor and Target Loci During B Cell Development." Paper presented at Mills Lab Group Meeting, Bar Harbor, ME, USA. April 27, 2006, The Jackson Laboratory.
*Snow, Kathy J. "Examining Conserved Noncoding Sequences in the Gene Desert Adjacent to Dach1." Paper presented at 3rd Annual Functional Genomics Meeting, Orono, ME, USA. August 19, 2006, The University of Maine.
*Snow, Kathy J. and Mills, Kevin. "Nuclear architecture and 3D organization of

translocation donor and target loci during B cell development and in tumorigenesis." Paper presented at Graduate Research Exposition, Orono, ME, USA. April 22, 2006, University of Maine.
*Snow, Kathy J. and Mills, Kevin. "Nuclear architecture and 3D organization of translocation donor and target loci during B cell development and in tumorigenesis." Paper presented at 32nd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 28, 2006, MDI Biological Laboratory.
*Woo, Y. H.; Churchill, G. A.; and Mills, K. "Microarray: A Tool for Detecting Gene Expression Changes and DNA." Paper presented at 3rd Annual Functional Genomics Meeting, Orono, ME, USA. August 19, 2005, The University of Maine.
*Woo, Yong H. and Churchill, Gary A. "Experimental design for three-color and four-color gene expression microarrays." Paper presented at ISMB 2005, Detroit, MI, USA. June 25, 2005, International Society for Computational Biology.
*Woo, Yong H.; Churchill, Gary A.; and Mills, Kevin. "Genome Aberrations and Lymphomagenesis in Mice Deficient for Nonhomologous End-Joing Factors: Ligas IV and Artemis." Paper presented at Immunology Hematology Interest Group, Bar Harbor, ME, USA. March 28, 2006, The Jackson Laboratory.
*Woo, Yong H.; Churchill, Gary A.; and Mills, Kevin. "Genome Aberrations and Lymphomagenesis in Mice Deficient for Nonhomologous End-Joing Factors: Ligas IV and Artemis." Paper presented at Student Research Meeting, Scarborough, ME, USA. March 22, 2006, Maine Medical Center Research Institute.
*Woo, Yong H.; Churchill, Gary A.; and Mills, Kevin. "Lymphomagenesis in Mice Deficient for Non-Homologous End-Joining Factors." Paper presented at 33rd Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME, USA. April 28, 2006, MDI Biological Laboratory.

Conference Presentations

Recla, J.M.*, Bult, C.J. (October 2010). Haplotype Association Mapping with EMMA Correction Server: A Practical Guide (workshop). Genomic and Proteomic Approaches to Complex Heart, Lung, Blood, & Sleep Disorders, The Jackson Laboratory.

Recla, J.M.* (September 2010).In-silico haplotype association mapping in mice identifies candidate genes for human chronic pain susceptibility. JAX-MDIBL Joint Scientific Symposium, Mount Desert IslandBiological Laboratory.

Recla, J.M.* (September 2010). In-silico haplotype association mapping in mice identifies candidate genes for human chronic pain susceptibility. 3rd Annual Meeting of the Graduate School of Biomedical Sciences, The University of Maine.
Recla, J.M.* (May 2010). From Mouse to Man: Toward an Individualized Genetic Approach to Chronic Pain Treatment. Maine Association of Psychiatric Physicians (MAPP) Education Session, Portland, ME.

Recla, J.M.*, Philip, V.M., Robledo, R.F., Bult, C.J., Chesler, E.J. (April 2011). Diversity Outbred mice: Implications of population characteristics on genetic studies of murine pain sensitivity. 38th AnnualMaine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory.

Recla, J.M.*, Churchill, G.A., Bult, C.J. (August 2010).
Locus-specific In-silico Haplotype Association Mapping in Mice Identifies Candidate Genes for Human Chronic Pain Susceptibility. 13th World Congress on Pain (SIG: Validity and Quality of Animal Models for the Measurement of
Pain), Montreal, Quebec, Canada.

Recla, J.M.*, Churchill, G.A., Bult, C.J. (May 2010). Locus-specific In-silico Haplotype Association Mapping in Mice Identifies Candidate Genes for Human Chronic Pain Susceptibility. NSF IGERT 2010 Project Meeting, Washington, D.C.

Maser, R.S., Walker, K., Wright, S., Shanholtzer, J., Beauchemin, K.J.* (April 2011). Aging Telomerase Deficient B6 mice develop cell-intrinsic myeloproliferative disease and display abnormal myeloid composition in the lung, 38th AnnualMaine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory.

Snow, K.J. (2011). Nuclear positioning, 3D gene clustering, and gene expression of Mmu15 sequences are refractory to translocation in NHEJ-deficient mouse lymphomas. Poster presented at the Keystone Symposia Conference, Genomic Instability and DNA Repair, Keystone, CO.
Snow, K.J.* (2010). Dangerous Liaisons: Mapping Translocation Junctions in Progenitor B Cell Lymphomas. Presented at University of Maine, GSBS Annual Meeting.
Snow, K.J.* (2010). Effects of Translocation on Chromosomal 3D Structure, Nuclear Position and Gene Expression in Progenitor B-cell Lymphoma. Presented at the JAX-MDIBL Scientific Symposium.

Ames, JJ*, Nugent, DP, Contois, L, Caron, JM and Brooks, PC (2011). Regulation of Tumor Progression by the Novel XL313 Cryptic ECM Element. Presentation. 38th Maine Biological and Medical Sciences Symposium, Bar Harbor, ME.

Ames, JJ*, Nugent, DP, Contois, L, Caron, JM and Brooks, PC (2011). Regulation of Inflammation and Tumor Growth by the Novel XL313 Cryptic ECM Element. Poster. 102nd Annual American Association of Cancer Research Meeting, Orlando, FL.

Ames J*, Caron J, Brooks P (2011). Regulation of Tumor Progression and Metastasis by the Novel XL313 Cryptic ECM Element. Presentation. 2011 MMCRI Research Fellows Seminar Series, Scarborough, ME.

Ames J*, Roth J, Contios L, Brooks P (2010). Role of XL313 Cryptic Type 1 Collagen Epitope in Angiogenesis and Tumor Progression. Poster. 3rd Annual Meeting of the Graduate School of Biomedical Sciences, Orono, ME.

Presentations

Recla, J.M.* From Mouse to Man: Toward an Individualized Genetic Approach to Chronic Pain Treatment. Maine Association of Psychiatric Physicians (MAPP) Education Session, Portland, ME (May 2010).

Recla, J.M.*, Churchill, G.A., Bult, C.J. Locus-specific in-silico haplotype association mapping in mice identifies novel candidate genes for human chronic pain susceptibility. Spring Pain Conference, Grand Cayman (May 2010).

Jia, Y., Recla, J.M.*, Ackerman, S. A deletion in one of the U2 small nuclear RNA genes causes neurodegeneration. Eukaryotic mRNA Processing, Cold Spring Harbor Laboratory (August 2009).

Recla, J.M.*, Bult, C.J. Haplotype Association Mapping with EMMA: A Practical Guide (workshop). Genomic and Proteomic Approaches to Complex Heart, Lung, Blood, & Sleep Disorders, The Jackson Laboratory (August 2009).

Recla, J.M.* From Mouse to Man: Toward an Individualized Approach to Chronic Pain Treatment. Research Week Grand Rounds, Togus Veterans Affairs Medical Center (May 2009).

Beauchemin, K.J.*, Recla, J.M.*, Bogue, M.A., Grubb, S.C., Maddatu, T.P., Bult, C.J. In silico haplotype association mapping in lung-related quantitative trait loci using an imputed snp dataset in mice. 37th Annual Maine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory (April 2010).

Jia, Y., Recla, J.M.*, Ackerman, S. A deletion in one of the U2 small nuclear RNA genes causes neurodegeneration. HHMI Scientific Meeting - Neurobiology: From Cells to Systems, Janelia Farm Research Campus (December 2009).

Recla, J.M.*, Churchill, G.A., Bult, C.J. Locus-specific In-silico Haplotype Association Mapping in Mice Identifies Genes Associated with Human Chronic Pain Susceptibility. 2nd Annual Meeting of the Graduate School of Biomedical Sciences, The University of Maine (September 2009).

Dowell, K.G.* and Hibbs M.A. 2010. A Systems Approach to Understanding Stem Cell Self Renewal Mechanisms. Abstract for poster presentation, 37th Maine Biological and Medical Sciences Symposium (MBMSS), Bar Harbor, ME.

Dowell, K.G.* and Hibbs M.A. 2010. A Systems Approach to Understanding Embryonic Stem Cell Self Renewal Mechanisms. Abstract for poster presentation, International Conference on Intelligent Systems for Molecular Biology (ISMB), Boston, MA. (In press.)

Dowell K.G.*, McAndrews-Hill M.S., Hill D.P., Drabkin H.J., Blake J.A. (2009)

Integrating ProMiner into the MGI biocuration workflow. Abstract for oral presentation, Fraunhofer SCAI Symposium on Text Mining, Bonn, Germany, 2009

5h. Conference Presentations (unpublished talks, posters, etc.)

Gabor, K. A.*, Gudheti, M. V., Mlodzianoski, M. J., and Hess, S. T. (2009, April). The effect of probe concentration on giant unilamellar vesicles. Poster session presented at the University of Maine Graduate Student Expo, Orono, ME..

Snow, K. J.* (2008, December). Chromosome Positioning and 3-D Folding Is Disrupted in Progenitor B Cell Lymphoma Nuclei. Invited Minisymposium Speaker at the 48th Annual Meeting of the American Society for Cell Biology, San Francisco, CA.

Snow, K. J.* (2009, April). Effects of Translocation on Chromosome 3D Structure, Nuclear Position and Gene Expression in Progenitor B Cell Lymphoma Invited Speaker. 36th Maine Biological and Medical Sciences Symposium. . April 17-18, 2009. Mount Desert Island Biological Laboratory, Salisbury Cove, ME.

Fancher K.* (2008, June). Colony Management and Breeding Schemes and Making sense of mouse nomenclature, background effects and the importance of genetic stability. Presented at the Mouse Genetics Resources Seminar, Biogen Idec, Cambridge, MA.

Fancher K.* (2008, October).Colony Management and Breeding Schemes, Making sense of mouse nomenclature, background effects and the importance of genetic stability, How to find mouse models, and Cre-lox technology in mouse models of disease research. Presented at Cre, Mouse Genetics, and Colony Management Series, MASS Medical School, Worcester, MA.

Fancher K.* (2008, October). Mouse nomenclature, background effects and the importance of genetic stability, Cre-lox technology in mouse models of disease research, and Cancer models. Presented at Cre, Mouse Genetics, and Cancer Seminar Series, Tufts University, Boston, MA.

Fancher K.* (2008, October). Maintaining Efficient and Stable Mouse Colonies. Presented at The Jackson Laboratory Seminar at Bristol-Myers Squibb, Waterbury, CT.

Recla, J.* (2008, May). U2 and the Mouse Brain: An Intriguing Mechanism of Cerebellar Neurodegeneration. Presented at the First Annual Graduate School of Biomedical Sciences Meeting, UMaine, Orono, ME.

Recla, J.* (2009, May). From Mouse to Man: Toward an Individualized Approach to Chronic Pain Treatment. Presented at Research Week Grand Rounds, Togus Veterans Affairs Medical Center.

Rochira J. A.*, Cowling R. A., Himmelfarb J. S., Hess S. T., and Verdi J. M. (2008, December). Fluorescence Resonant Energy Transfer Reveals Critical Binding Domains of

Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis. Presented at the Maine Medical Center Research Institute Open House, Scarborough, ME.

Rochira J. A.*, Hess S. T., and Verdi J. M. (2008, December). NRAGE Interactions in BMP-Mediated Apoptosis. Oral presentation at the Maine Medical Center Research Institute, Scarborough, ME.

Rochira J. A.*, Hess S. T., and Verdi J. M. (2009, January). NRAGE Interactions in BMP-Mediated Apoptosis. Institute for Molecular Biophysics meeting. Presented at the Maine Medical Center Research Institute, Scarborough, ME, with University of Maine at Orono (Orono, ME), The Jackson Laboratory (Bar Harbor, ME), University of Hiedelburg (Hiedelburg, Germany), A-Star (Singapore), and McGill University (Montreal, Quebec, Canada).

Rochira J. A.*, Cowling R. A., Himmelfarb J. S., Hess S. T., and Verdi J. M. (2009, March). Fluorescence Resonant Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis.Poster presented at the 53rd Meeting of the Biophysical Society, Boston Convention and Exhibition Center, Boston, MA.

Travis J. Gould, Jennifer A. Rochira*, Manasa V. Gudheti, Joerg Bewersdorf, and Samuel T. Hess. (2007). A Quantitative Comparison of the Photophysical Properties of Select Organic Dyes and Quantum Dots with Fluorescence Emission in the 500 600 nm Range. 51st Annual Meeting of the Biophysical Society, Baltimore Convention Center, Baltimore, MD. . Poster presentation.

Jill Recla*. (2007). Putative dormancy-regulating gene identification and expression profiling in Populus trichocarpa using bioinformatic techniques. 48th Annual Short Course in Medical and Experimental Mammalian Genetics. The Jackson Laboratory.

Karen Fancher*. (2007). Nuclear Architecture of Tumor Cells. Jackson Laboratory, Institute for Molecular Biophysics seminar.

Guay JA*, Fang J, Adams D, Larman B, Wojchowski D, Oxburgh L. (2007). The Role of Death Associated Protein Kinase 2 in Ischemic Kidney Damage. Poster. 34th Maine Biological and Medical Sciences Symposium, Mount Desert Island, ME.

Janice Duy* and Laurie Connell University of Maine, Orono, ME. (2007). Fast and Accurate Detection of Alexandrium Species Using Peptide Nucleic Acid Probes and Surface Plasmon Resonance, Fourth Symposium on Harmful Algae in the U.S. Woods Hole, Massachusetts.

Rochira JA*, Nikopoulos GN, Cowling RA, Himmelfarb JS, Anderson TL, and Verdi JM. (2007). NRAGE as a Target for the Development of Novel Treatments for

Medulloblastomas. 34th Maine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory, Salisbury Cove, ME.

Karen Fancher*. (2008). Consequences of Tumorigenesis on Chromatin 3D Organization. Institute for Molecular Biophysics. The Jackson Laboratory, Bar Harbor ME.

Guay JA*, Wojchowski D, Oxburgh L. (2008). Localization and Characterization of an Inducer of Cell Death in the Mouse Kidney. Poster. 35th Maine Biological and Medical Sciences Symposium, Mount Desert Island, ME.

J. Duy*, L. Connell, R.L. Smith University of Maine, Orono, ME. (2008). Development of a Direct Detection Method for Potato Wart Fungus, Synchytrium endobioticum, Northeast Potato Technology Forum, Fredericton, New Brunswick, Canada

Rochira JA*, Cowling RA, Himmelfarb JS, Hess ST, and Verdi JM. (2008) Fluorescence Resonance Energy Transfer Reveals Critical Binding Domains of Neurotrophin Receptor-Interacting Melanoma-Associated Antigen Homolog in Bone Morphogenetic Protein-Mediated Apoptosis. 35th Maine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory, Salisbury Cove, ME.

Jennifer A. Rochira*, Manasa V. Gudheti, Ryan Laughlin, Jay L. Nadeau, and Samuel T. Hess. (2005). Fluorescence Correlation Spectroscopy Reveals Intermittency and Improved Photobleaching Resistance of CdSe/ZnS Quantum Dots for Biological Applications. Department of Physics and Astronomy, The University of Maine, Orono, ME. Department of Biomedical Engineering, McGill University, Montreal, Quebec, Canada and the Institute of Molecular Biophysics, The Jackson Laboratory, Bar Harbor, ME.

Guay JA*, Parry EM, Meredith MM, Fekete FA. (2005). Characterization of mercury- and antibiotic-resistant Bacillus strains isolated from Maine soil environments. Poster. Abstracts of the Northeast Microbiology: Physiology, Ecology, and Taxonomy Meeting, Blue Mountain Lake, NY.

Jennifer A. Rochira*. (2006). 50th Annual Meeting of the Biophysical Society, Salt Lake City Convention Center, Salt Lake City, Utah. Poster presentation.

Jennifer A. Rochira*. (2006). Frontiers in Biomembranes: Experiments and Theory Symposium. Institute for Molecular Biophysics, University of Maine/The Jackson Laboratory/Maine Medical Center Research Institute, Bar Harbor, ME. Poster presentation.

Outreach Activities

Title: From Mouse to Man: Toward an Individualized Genetic Approach to Chronic Pain Treatment.
Media Outlet/Organization: Maine Association of Psychiatric Physicians (MAPP)
Activity Date: 04/30/2010
Description: Jill Recla, an IGERT trainee, gave a "lay" talk on her work using the lab mouse and a large genetic cross to study the genetics of chronic pain. This work was presented to the Maine Association of Psychiatric Physicians.

Title: New Approaches to Graduate Education
Media Outlet/Organization: Kennebec Valley Chapter of the UMaine Alumni Association
Activity Date: 04/22/2008
Description: A presentation made to alumni and potential donors to UMaine about the IGERT-funded PhD program and how it is changing graduate education and fostering new research areas on campus.

Title: Presenation to High School Biology and Physics Classes
Media Outlet/Organization: Kingsford High School - Kingsford, MI
Activity Date: 12/19/2008
Description: In Kingsford, Michigan, Jill Recla presented to the Kingsford High School advanced biology and AP physics classes on the use of inbred mice in biomedical research.

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