

GLOUCESTER MARINE GENOMICS INSTITUTE

MARCH 2018

Dear Friends,

2018 is off to a terrific start with action across every GMGI program. Our research team is concluding the genome study of the local North American lobster. The Gloucester Biotechnology Academy students have completed their two semesters of lab training and are now immersed in their paid internships. The next Academy class is in formation. Finally, and thrillingly, the construction of our research institute on the harbor is underway—we will occupy our new space by end of 2018. We are excited to share all this with you!

Chris Munkholm, COO

RESEARCH INSTITUTE

GMGI Heads to the Waterfront

On February 2, a group of stakeholders gathered to break ground on a new building at 417 Main Street, on Gloucester's inner harbor, nestled between Steve Connolly's Seafood and Rose's Marine.

GMGI will be the building's lead tenant, with corporate headquarters and research laboratories occupying approximately 6,000 sf of the first floor of the building, situated on the harbor's edge, offering an inspiring sightline out towards Gloucester's harbor and its gateway to the ocean beyond.

The showcase inside the building will be the research laboratories, outfitted with the specialized, state of the art equipment needed to bring genomics science to the study of marine life. This world class research facility, with a strategy built exclusively on marine biotechnology, will also have a tank room with plumbing to provide ocean water to the housed specimens.

With deep gratitude we thank Mass Life Sciences Center for awarding a \$2.6M capital grant to fund the customized build out for the GMGI space and purchase of research equipment.

We are committed to developing science programs with a primary focus on translational research that connects to human health as well as projects that bring the best science to fishery research. The new facility will expand our research efforts and enable the GMGI science team to form collaborations with marine and biotechnology institutes the world over.

Our future newsletters will keep you informed on the building's progress as well as events in celebration of GMGI's move to the waterfront.

Meanwhile, you can also drive by the site, either via terrestrial or marine frontage!



A rendering of the new GMGI research institute on Gloucester's Inner Harbor

Lobsters in the Lab

On a chilly morning in December the crew of the F/V Miss Trish were busy hauling up lobsters to deliver to Steve Connolly Seafood on the Gloucester waterfront. Little did they know that four of these lobsters would be sacrificed for science instead of on the dinner plate.

Sequencing the whole genome of the lobster is a major research project at GMGI. The lobster has long been considered one of the most demanding genomic puzzles to solve due to its high percentage of repetitive sections of the sequence. Working in collaboration with Dovetail Genomics and Tufts University, the completion of the genome is within reach. The data from these last four lobsters will answer some remaining questions.



Lab Technician Jennifer Polinski prepares a lobster for the study.

The American Lobster has characteristics that have fascinated scientists for decades. They are reported to be long-lived animals, perhaps living as long as 100 years. They also possess a well-defined nervous system, which has made important contributions to our understanding of the neural circuitry for sensory perception and motion control. With the genome sequence solved, scientists will be able to study these characteristics through their associated genes.

The genome can also be used by fishery scientists to expand understanding of population structure and dynamics, and reveal genes associated with susceptibility to disease and adapted to environmental change.

The DNA sequencers at GMGI are now humming away, churning out great volumes of genomic information on these fascinating creatures. We thank the four lobsters for giving their lives to science! Many new breakthroughs are anticipated, greatly expanding knowledge of their specie's biology and life history.

EDUCATION

Semester Three: Internships in Biotech Labs

Academy students test their new lab skills in real world biotech labs

In mid-February, Academy students completed their second semester with a final and advanced experiment known as Transformation. The first semester began by extracting genetic material from cod, and in the second semester students transferred a cod gene into bacteria. Instructors looked on with pride as the students demonstrated their new-found skills. Their teachers enjoyed knowing the students were now ready for the next phase of the Academy lab immersion education, the 12-week internships in real world biotech labs.

This year more than a dozen companies in Boston and on the North Shore have partnered with the Academy to provide these important 12-week paid internships, during which the students will be placed in a variety of biotech labs and mentored by professionals. This year's internships have been provided by organizations including Cell Signaling Technologies, Lariat, Dana Farber Cancer Institute, Synlogic, Launchworks, New England BioLabs, MIT and others.

During these internships students will add to the skillset they developed at the Academy and build a network of contacts in the industry. Our Internship Liaison, Neil Glickstein, will periodically check in with the students and their mentors to help maximize this enriching experience. Neil, along with the rest of the Academy staff, will also help students with their job search strategy. Most of the graduates of the preceding class are now working in labs across Cape Ann, Boston and Cambridge.

While our teaching lab now seems quiet without the enthusiastic company of the students, we are thrilled to know they are exceling in their internships. We look forward to reuniting in May for graduation!



Louie Tzioumas, interning at Adeptrix



Sara Corchado, interning at MIT

An Interview with Barton Slatko, Senior Scientist at New England BioLabs, Inc.

GMGI: You're well known among GMGI staff, but could you please introduce yourself to those who may not know you?

My name is Barton Slatko and I am a Senior Scientist at New England Biolabs, Inc (NEB). I've been at NEB for about 34 years. My research interests are human and animal parasitology, mechanisms of symbiosis and technology development. I also have a strong interest in teaching. I came to NEB on sabbatical from Williams College to become more versed in molecular biology (I was trained as a geneticist) and take techniques back for teaching and research. In those days, recombinant DNA and sequencing and associated techniques were really in their infancy and I felt training students would be a high priority for my lab and the College as well. As it turned out, I fell in love with the science, the approaches and people at NEB and gave up my position at Williams to join NEB, thanks to the offer from president and founder, Don Comb. I have been fortunate to still be involved in teaching a several levels as part of my role at NEB.

GMGI: You've been involved with the Gloucester Biotechnology Academy for some time now. How did you first hear about the program?

Several events transpired at the same time to key me in to the Academy. First, I had known several of the principals in GMGI due to our overlapping science interests. Second, GMGI came to NEB and spoke about their future plans, which I thought was very intriguing. Third, I met John Doyle and his energy, enthusiasm and abilities quickly hooked me into the program and fell in line with my long-standing interest in teaching. As the program was being developed we worked a bit on curriculum with another scientist at NEB, Andy Gardner, who also has an interest in teaching.

GMGI: Since then, how has your involvement changed and grown with the program?

John Doyle and his team have done an amazing job with the Academy and we are in communication about approaches, experiments and equipment and reagents that NEB can provide. Thanks to our CEO Jim Ellard and our HR group, we have been supportive of the program and able to provide internships for several students each year. I try to attend the open houses and "meet and greet" the students, which I find interesting and worthwhile. I also attend the GMGI day-long events, when I can, as

they are truly examples of great science on the North Shore. It has been exciting to see the program mature.

GMGI: This year, you will be taking one of the Academy students as your intern. What do you expect to get out of the experience? And on the flip side, what do you think your intern can expect to get out of their experience in working with you and at NEB?

I consider the internships a two-way street where we will all be learning and experiencing the lab environment that the students have been trained for. None of the experiments are "canned" and we will be moving our research program forward with their help. I expect that the internship will be exciting for them, give them a taste of trials and tribulations of research in a group lab setting and be a positive experience as it moves them to their future endeavors. I realize the time commitment on my part but I think at the end of the internship we will be excited to see how far we have progressed.

GMGI: What advice do you have for the Academy students who will be graduating in 3 short months?

Graduating from any program and stepping out into the "real world" can be intimidating. They should recognize that we have all had to do it also. But I know, because of my involvement in the program, that they are well trained at many levels and ready. My main advice is simply be who you are, rely on what you have learned and even not-learned. Bear in mind that no matter what has been taught to you, there is even more out there to discover. Don't be afraid to ask questions and use your knowledge and experience to frame the projects.

I'd like to leave Academy students with a quote from an inscription on Hopkins Gate at Williams College: "Climb High, Climb Far, Your Goal The Sky, Your Aim, the Star." Congratulations to all of you for your hard work, diligence and willingness to take a leap of faith at the Academy.



Gloucester Biotechnology Academy Begins Search for the Class of 2019

The official search for next year's entering class kicked off with the Academy's January Open House, held at our modern teaching lab in Blackburn Center. Attendees were invited to hang out, ask questions, talk with current students, graduates and teachers -- and learn about this unique educational program that leads students to professional careers as biotech lab technicians. Over 50 guests participated, including prospective students and parents, teachers, school administrators, scientists from local biotechnology companies, families of current students, alumni of the program and curious community members. It was a great gathering and a wonderful turn out!

Wearing their lab coats, current Academy students confidently led most of the informational tours of the laboratory, enthusiastically describing their lab experiments and plans for starting their internships. Prospective students and parents had a chance to ask questions and get a genuine student perspective on this education experience. It became obvious to staff that our current students would be our best assets as they shared their new-found excitement for science.

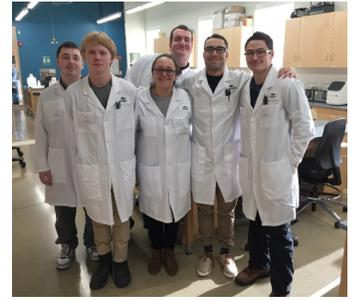
Following the open house arrangements were made with surrounding high schools to allow interested students to shadow a current student for one day in the laboratory to see what hands-on training is all about. 10 students signed up to shadow! **CONTINUED**

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Special Information Event for Gloucester High School Students

In addition to the Open House, Gloucester Biotechnology Academy hosted a special event for more than 20 Gloucester High School students who came over by a bus kindly provided by GHS. During their two-hour visit, students had a tour of the lab where they got to perform a crude DNA extraction experiment and enjoy a Q&A pizza lunch to learn about the Academy biotech training program. The GHS students left invigorated with a new curiosity about biotechnology.

The Academy is now accepting applications for the class of 2019. If you are interested in applying you are welcome to contact the Education Director, John Doyle at john.doyle@gmgi.org for more information. The application form for the 2018-2019 school year is currently available on our website.



A group of current Academy students await the Open House attendees

CREW UPDATE

Meet Andrey Ptitsyn
GMGI's Director of of Bioinformatics

When I was a kid, I wanted to go out to the seas in ships. I grew up in a small town about the same size as Gloucester, only landlocked in the Ural Mountains which divided Europe and Asia. The largest body of water was a small river that a chicken could safely cross. I read books about distant ports, great adventures, and dangerous expeditions, which led me to study sails and navigation, geography, and biology.

One day, I took a train to Novosibirsk University, one of the most prominent centers of learning and research of modern Biology. Alas, my new college was even farther from any sea. In fact, almost as far as you can get: nearing the center of the largest landmass on this planet -- Asia.

After graduation, I started a research career and went to visit distant lands. Each time, I took a plane or drove a car. I lost my connection to the ocean, but the ocean seemed to have a different idea. It started chasing me. Time after time, when I looked for a new job, I found it near the ocean. When I moved to higher ground in Colorado, the ocean came to me in a test tube. One of the projects I worked on was dealing with the molecular physiology of Antarctic seals adapting to deep diving. It had surprising parallels to altitude hypoxia, for which the Rocky Mountains are famous.

This work intrigued me and I began looking into genomes of marine critters more often. Now, at GMGI, this is all that I do. As a computational biologist, I assemble and interpret genomes from small pieces of DNA sequences. Each genome tells a long fascinating story of its origin, relatives, ages of struggle, adaptations, and wins over

perils of disease and extinction. Our best sequencing machines can read one DNA word or phrase at a time. Sometimes the machine reads one DNA word a thousand times over and misses the next sentence completely. My job is to piece the stories together by matching words and letters in DNA code.

Have you noticed that a huge, old lobster tastes as good as small one? The reason might be that the lobster doesn't show any sign of senescence on the cellular level. They live over a hundred years and die from infections (if not in the kitchen) but never get senile or have cancer. Perhaps we could pick up a trick or two if we knew how to read the story.

GMGI is the place where we learn to ask the right questions and comprehend the answers that the ocean gives us. We don't go out to the sea in ships -- at least not very often yet. However, we are at the water's edge with the tools to harvest information from beneath the waves, just like the generations before us.

Today, we bring home knowledge of marine life, and it is that knowledge which moves the economy much like cod, clams, and lobsters did before. But we still tell tall tales about sea monsters just like old salts. If you ask.



GMGI NEWS & UPDATES

Thursday, February 22nd: Science Director Andrea Bodnar gives talk at Rockport Rotary Club in Rockport

Thursday, March 15th: Gloucester Biotechnology attends GHS Career Night for prospective students in the community

Friday, March 16th: Education Director John Doyle gives presentation at the Oyster Awareness event at Maritime Gloucester

Saturday, March 17th: Rolling admission period begins for the Gloucester Biotechnology Academy Class of 2019

Friday, April 6th: GMGI hosts Essex County Community Foundation Lunch and Learn session on GMGI's mission

Monday, April 16th: Gloucester Biotechnology Academy begins one-week pilot of school vacation science camps

Thursday, May 24th: Gloucester Biotechnology Academy graduates the Class of 2018

Wednesday, June 20th: Happy Birthday to us! GMGI celebrates 5 years as an organization

Contact us for more information.

GLoucester Marine Genomics Institute is a non-profit enterprise that is: performing research focused on fisheries and marine science to foster the local economy, launching a training academy for Cape Ann youth to provide a trained biotech workforce, and establishing Gloucester as a worldwide scientific hub.