GSBSE Strategic Plan
10/28/2015

Introduction

Even though Maine is a rural state with only 1.3 million citizens and three principal urban centers, it has a robust biomedical research community that includes three universities (University of Maine, University of New England, and University of Southern Maine) and three private research institutions (Jackson Laboratory, Mount Desert Island Biological Laboratory, and Maine Medical Center Research Institute). In order to capitalize on this strength and to expand the research and training opportunities in Maine, in 2006 these research institutions partnered to form the Graduate School of Biomedical Science & Engineering (GSBSE) with the University of Maine as the degree granting institution. The formation of the GSBSE was mandated by then Governor Baldacci in his State of the State address of January 2005. Initial funding for the GSBSE was directly from the State, Governor Baldacci later stipulated that base funding was to be permanently allocated from the UMaine Maine Economic Improvement Fund (MEIF). The GSBSE offers a Ph.D. in Biomedical Science, a Ph.D. in Biomedical Engineering, and a PSM in Bioinformatics. Currently the GSBSE has 42 Ph.D. students, 2 PSM students, and greater than 150 principal investigators across the constituent units, many of whom are leaders in their fields. The GSBSE has graduated 32 Ph.D. and 2 PSM students to date who have had remarkable success in obtaining positions as postdoctoral research fellows, or as professionals in non-profit or industry settings.

During the first year GSBSE Ph.D. students perform rotations in three separate laboratories located at two or more of the participating institutions. At the commencement of the second year students select their dissertation mentor from the principal investigators who advised their rotations. GSBSE Ph.D. students are supported with a $23,000 stipend, tuition, fees and half of the cost of health insurance for the first 2 years of the program. At the beginning of the student's third academic year (usually September), the mentor becomes responsible for providing the student's complete stipend, tuition, fees, and half of the cost of health insurance. All GSBSE coursework is delivered by distance education modalities, enabling student participation remotely.

The GSBSE is led by a Director (who is a tenured faculty member of the University of Maine), who is supported by a Special Assistant. The Director receives guidance, and advice from a Steering Committee comprising a representative from each participating institution, along with a representative of the University of Maine Graduate School. In addition, an External Advisory Board with representation from the medical profession, academia and industry serves to provide counsel and perspective regarding scientific direction and curricula, assists in identifying and securing external funding, aids in networking for students and faculty, and serves an advocacy role both internal and external to the University.

In Fall 2014 the Faculty of the GSBSE approved a mission and a vision statement for the GSBSE; these are:
Mission

The University of Maine Graduate School of Biomedical Science and Engineering (GSBSE) is a statewide education and research consortium dedicated to the training and professional development of graduate students in biomedical science and engineering. The program provides an innovative multidisciplinary and personalized learning environment that prepares its students for successful careers in diverse professional fields that are critical for Maine and the nation’s future.

Vision

The Vision of the GSBSE is to train the next generation of Biomedical Scientists and Engineers to make fundamental discoveries and breakthroughs leading to significant scientific advancements and improvements in human health and wellbeing. By doing so, the GSBSE will be internationally recognized for the quality of its graduates and program.

With the GSBSE approaching its 10th anniversary, the leadership determined that it should enter its second decade in a thoughtful and considered fashion, as such it undertook the development of a five-year (AY 15-16-AY 20-21) Strategic Plan. In order to develop the plan, the External Advisory Board and the Steering Committee jointly identified five elements that they determined were critical to the future success of the GSBSE, these elements were: 1) Recruitment and Diversity, 2) Academic Preparation and Delivery, 3) Professional Development of Students and Faculty, 4) Grantsmanship/External Funding Capacity, and 5) Building the Endowment and Resources. Sub-committees were subsequently formed for each element, co-chaired by a member of the External Advisory Board and the Steering Committee. The sub-committees (staffed with Faculty and Students as appropriate) developed draft sections of the Strategic Plan for review by the full membership of the two committees. Revised sections were subsequently submitted to the Director for editing and assembly into a Draft Strategic Plan, attached. The Draft Strategic Plan was reviewed by the full Faculty and Students of the GSBSE; feedback was incorporated prior to a formal vote of adoption in November 2015.
Recruitment and Diversity

Overview

Having a diverse population of students and faculty, and the different perspectives that they bring, enriches the student experience and the quality of collaboration. The need to promote diversity and opportunity within the GSBSE is critical as the student population currently includes suboptimal diversity. It is also important to try and balance the needs and priorities specific to the state of Maine with those of the nation (including priorities outlined by the National Institutes of Health and the National Science Foundation with respect to diversity in the workforce).

For the past decade, Maine's median household income has remained below the national average. One in eight Mainers lived below the poverty line in 2010, according to recently released U.S. census data. The State now has seven census tracts (population areas or neighborhoods) with more than 40% of residents in poverty. That compares to just two such tracts, known as “extreme poverty tracts,” a decade ago. Extreme poverty tracts include three areas of Lewiston with poverty rates as high as 67 percent and two neighborhoods in Portland with poverty rates as high as 55 percent. As of October 2011, a record high 45.9 percent of Maine school children were eligible for the free/reduced meals program. More than half of all school-age children were eligible for free/ reduced lunch in nine of the state’s counties. Lower socioeconomic status is one of the recognized barriers for students going on to pursue higher education, including graduate education in the biomedical and behavioral sciences.

While Maine has historically been fairly homogeneous in its racial composition (95.4% white) its demographics over the past decade reflect a changing state that presents new opportunities for engaging students who are typically underrepresented in the sciences. According to US Census Data, between 2000 and 2010 the number of people of Hispanic/Latino origin grew 81% from 9,260 to 16,935 (1.4%) and the African-American population more than doubled (1.3%). The Lewiston-Auburn area has a population of approximately 7,000 Somalis, accounting for nearly 10% of its total population. Many arrived in the U.S. either as refugees or were born in the U.S. as children of refugees. Now, almost 9% of Lewiston’s population identifies as black or African-American, a rate higher than any other city in the state and more than seven times the state average. Coupled with the recent increase in immigrants from Central Africa (Burundi, Rwanda, and the eastern region of the Democratic Republic of the Congo), this trend of changing demographics is steadily spreading in most of Maine’s larger cities including Portland and Auburn. The changing picture of Maine reflected in census data trends clearly substantiates the need for its colleges and universities to adapt, and provide targeted services for prospective first-generation college goers from a diverse demographic. Strong partnerships exist and are emerging between the community colleges, the state University system, the private colleges and universities, and the research institutes. The GSBSE program, along with INBRE and COBRE efforts, have laid a strong foundation for facilitating the recruitment and retention of underrepresented groups in Maine to progress from a community college degree, through a baccalaureate, and onto doctoral training and entry into the workforce.

Appendix 1 provides anonymous demographic information for the current GSBSE student population. The student body is 57% female; 43% male and of the 36 students who chose to specify their ethnicity, 72% are White and 28% are Asian. There are no African-American or Hispanic/Latino students from the group that chose to specify their ethnicity; 18% chose not to specify. The vast majority of GSBSE students are from the USA (75%) with 43% from Maine and 55% from New England. Of the 33 students identifying as American only two come from west of Michigan. The high representation of Maine students may explain some of this lack of racial/ethnic diversity. Located in one of the least diverse of all states it is very important that the GSBSE actively recruits minority racial/ethnic candidates. Diversity
in terms of socio-economic and first generation to attend college must also be considered, although such data is not currently available for the GSBSE cadre.

Goals

Develop and implement a comprehensive recruitment and retention strategy for the GSBSE program that will significantly increase the number of students enrolled and graduating in the program who meet the NIH criteria for being underrepresented in the biomedical and behavioral sciences.

Strategies

There are some relatively easy steps that can be taken to ensure the GSBSE is capitalizing on the reach we have through the partner institutions. First, each participating institute should include a link, prominently on their website, to the GSBSE homepage or to a portion of their own site outlining GSBSE involvement and student research. We should leverage resources and contacts from EPSCOR, COBRE and INBRE to attract students (Patricia Hand offered to help arrange this re: INBRE). Faculty and students attending conferences/workshops, or giving seminars, should be active ambassadors for the program with a focus on recruitment. The GSBSE should make contacts at private colleges and community colleges that generally have a higher percentage of students who are underrepresented in the biomedical and behavioral sciences, compared to the University of Maine baccalaureate programs. There should be some level of interaction between GSBSE faculty/students and undergraduate/high school students to promote the program before a career path is chosen.

While emphasizing the unique quality of this interdisciplinary program, outreach efforts must focus outside of New England as well.

One recommendation to attract diverse students would be to recruit more diverse faculty. While this committee does not have ethnicity data for participating GSBSE faculty, we do feel that African-American and Hispanic/Latinos are underrepresented. The following suggestions would aim to increase diversity among the GSBSE by targeting both national and international potential students:

National initiative:

- Advertise in historically minority (Black/Hispanic) colleges within the US.
- Offer a scholarship to underrepresented minority in sciences (incentive to PIs from NIH grants).
- Target the communities of the greater Portland area and Lewiston/Auburn.
- Secure an advisor (faculty or admin) at each GSBSE site to guide, advise and offer support to international and underrepresented minority students in the program.
- Ask Alumni who moved to other states with more diversity (e.g. North Carolina) to advertise for the GSBSE program (maybe sponsor a dinner with a current GSBSE official, a current student and the alumni from another state at their current institution).
- Offer a funded spot for US minority for each cycle of admission.
- Work with minority associations to recruit students in their community (i.e. ACLU...).
International initiative:

- Include more information on the website: Cost of living in Maine, lifestyles offered by Portland, Bangor, Bar Harbor, information on visas for international students and successful current and past student origins.

- Reach out to the international student body and their home university to create partnership and a potential funded exchange/internship student program.

- Work with high schools that have a strong international student population (e.g., Thornton Academy and private schools throughout the Northeast.

- We have a faculty who travel all over the world/US for conferences, we could facilitate a direct recruitment into their labs if they meet with a potential student or train them to recruit more applicants.

Note: Feedback from the committee included that international students have had lower success rates in the GSBSE program. This should be investigated to determine possible root causes and perhaps a focus on international recruitment should be deferred until the issue is addressed.

Grants:

A variety of grants exist to aid in the recruitment and funding of minority candidates, a sample is provided in Appendix 2. The GSBSE should pursue such funding mechanisms to increase diversity in the student pool.

**Benchmarks**

1. **Year 1**
   - Pending approval of the overall GSBSE strategic plan, convene a working group that will continue to meet, discuss, develop and oversee a comprehensive plan for increasing diversity in the GSBSE program.

   - Have each partner institution add a GSBSE link to their website and use social media to increase the visibility of the program to a diverse group of potential applicants.

   - Reach out to programs that have had success with recruitment of underrepresented groups to learn about their approaches. Potentially attend a workshop on this topic to network and learn best practices.

   - Reach out to community college systems in Maine and New England and get them engaged in our strategic planning process, while also building connections to their science programs (GSBSE faculty giving seminars, hosting community college faculty for research experiences and workshops, providing summer research opportunities for community college students in GSBSE labs and at the research institutes, invite them to key events such as research symposia, Maine SfN, etc.
2. **Year 2**
   - Have GSBSE faculty/students present research/recruit at public and private universities across US and internationally. (In addition to normal meetings/focus on recruitment; may have travel grants for this purpose).
   
   - Apply for minority funding grants (either to fund recruitment or candidates).

3. **Year 3**
   - Have 1-2 years of baseline data on the number of underrepresented students in GSBSE and set a goal of increasing the number by 20% by years 3/4 (this includes 20% increases in populations of both lower socioeconomic status and first generation college students).
   
   - Have recruited 2-4 students identifying as Hispanic, African American, Native American and Pacific Islander.
   
   - Have observed an increase in minority applications of 25% compared to 2015 academic year.

4. **Year 4**
   - Have added 2 graduate student positions which increase diversity in the GSBSE student pool.

5. **Year 5**
   - Have a total of 4 graduate student positions which increase diversity in the GSBSE student pool.

**Required Resources**

Since this effort may make use of the UMaine advertising/marketing department we do not expect for significant expenses due to updating the GSBSE website or producing promotional materials. Adding links to the partner institution websites can be performed by their IT staff/web hosts and that cost should be incurred as overhead at each institution.

The largest source of cost may be the time and effort required to research and apply for grants to create funded positions for minority candidates. Faculty effort for mentoring and recruitment may include some travel costs but this could be highly variable based on destination and number of faculty and trips (approximately $5,000).

Recruitment of faculty underrepresented in the biomedical and behavioral sciences across the various GSBSE partner institutions may be challenging. If this is a high priority, then we need to find some sort of incentive funding for encouraging the partner institutions to coordinate (e.g., funds for enhancing startup packages).
Academic Preparation and Delivery

Overview

Curriculum is the foundation of a graduate program and embodies the educational and training goals of the program. The unique features of the GSBSE that must be reflected in its curriculum are the cross-disciplinary nature of the program, the focus on building individualized programs of study, the inclusion of engineering juxtaposed with biomedical sciences, and the desire for entrepreneurship.

The current core is acceptable in overall concept. However, it needs to be brought into greater alignment with the unique features of the program described above and needs improvement in content, especially with respect to the foundations course. Beyond the core, the curriculum should be personalized, with that being described as a major and unique strength of the program.

Below, the primary aspects of the curriculum are defined and projected:

Foundations Course: Currently, the hallmark of the curriculum is a one-semester “foundations” course that is comprised of four 1-credit modules that can be taken independently. It is widely admitted by both faculty and students that the course does not cover “foundations,” but is instead a “topics in ….” course, with the choice of topics often driven by little more than the roster of faculty members able and willing to participate. This is unsatisfactory for both faculty and students and does not do tribute to the potential of the GSBSE program.

Other Core Material: In addition to the Foundations Course, entering students are required to take both an ethics class and a class in computational biology/statistics.

The ethics class should provide emphases on both ethical conduct of research and ethical dilemmas posed by modern biomedical research advances. Departments on the Orono campus are producing several classes that have more appropriate Biomedical content than the previous class (INT 601), which currently provides a generic overview. In addition, other campuses (JAX, MMCRI, and MDIBL in preparation) offer their own ethics classes that can be assigned U Maine course numbers. In this not-distant scenario, students will have several appropriate and convenient options to satisfy this requirement according to their geographical location, in order to take advantage of discussion and other reinforcing aspects of ethics courses.

A Computational Biology/Biostatistics course will also be required, and should be tailored to the needs of the individual student. Such a requirement seems highly appropriate in today’s biomedical research environment. Currently, this requirement is most often satisfied by taking Math 500. The requirement could also be satisfied by a more intensive computational course for those students entering this area, or a more statistics oriented course for students likely to be handling biological data, albeit not on an “-omics” scale.

Electives: Additional course work should be electives selected at the recommendation of the first-year mentoring and thesis committees, and personalized for each student. Some may be more engineering oriented, some more genetics, etc. The breadth of the program (biomedical sciences and engineering), the multiple sites, and the diversity of faculty research not only make it a challenge to define a single course of study appropriate for everyone, but also make tailored course work a unique feature, strength and benefit of the program. The current requirements are for 30 credits to graduate, which include thesis research credits, with most students taking at least 20 credits of course work.
Goals

Foundations Course: The proposed objective is to replace the current “foundations” course with a two-semester introduction to the most important underpinnings of modern biomedical sciences coupled with concurrent engineering applications and projects. By comparison to the current course, this would be a more integrated course that provides foundational background material in biomedical sciences for all students and highlights the unique strengths of the GSBSE program by having a running theme of engineering applications throughout. Two 2-credit modules per semester over the first two semesters of the program are proposed; it is anticipated that each GSBSE student will be required to take all 4 modules, in order. The extent to which this foundations course can be coordinated with the GSBSE Professional Science Master’s (PSM) in Bioinformatics program, particularly the Genetics and Stats/Comp Bio modules, is reflected in the proposed schedule of course offerings. The proposed modules are:

- Fall: Genetics, Statistics/Computational Biology.
- Spring: Biochemistry, Molecular Medicine and Physiology.

Each module will couple basic foundational lecture material (with textbooks) in the area with the development of a project incorporating engineering approaches and methods in addressing a relevant biological question and/or application. The foundation material will purposely not be either a “deep dive” or an overview of faculty research topics; it will be at an introductory level with emphasis on experimental and problem-solving thinking. It will utilize textbooks, lectures and other material. For the engineering application in each module, students will not be required to “build” a project, but each student will, according to individual skills and background in engineering, write a proposal or mini-review integrating an aspect of the basic biology of each module with an appropriate modern engineering application. In this manner all students will gain important training in both fundamental concepts and cross-disciplinary thinking, and some will be propelled into undertaking new, entrepreneurial ventures. This latter goal may overlap with the Innovation Engineering program at U. Maine and would provide additional opportunities for integration between existing programs. The modules will reflect both the uniqueness and the strengths of the GSBSE. Each module will be staffed by a single faculty member to lead the foundational lecture material and an engineer (or engineering team) to work with students individually to develop level-appropriate projects.

Other Core Material: In summary of points #1 and 2, we do not recommend major changes in the core curriculum. However the re-vamped and improved Foundations course described above will better meet the needs of the students, and likewise, there should be flexibility in options for an ethics course and a computational/statistics course appropriate to the interests and needs of each student.

Electives: Changing the graduation requirements in the University is probably a Herculean feat and not altogether necessary. Most students are currently taking well in excess of the needed credit hours. The emphasis of a graduate program should be on research experience and training in critical thinking, problem solving, etc., not on coursework. Rather than taking courses of modest relevance through the GSBSE, students should also be encouraged to take external courses at Cold Spring Harbor, Woods Hole, etc., to gain more specialized knowledge. Courses such as the grant writing course should be strongly encouraged, but not required. While this course can be very helpful leading up to the prelim exam at the end of the second year, the increasingly diverse job market for Ph.D.’s should be considered, and NIH- or NSF-style grant writing may not be appropriate for all career paths.
Strategies

1. Overhaul the Foundations course to be one year, more foundational, with appreciation of engineering applications as a theme throughout. This process should be conducted during AY 2015-16 and the re-vamped course first offered in AY 2016-17.

2. Identify a Coordinator for the Foundations course, and the instructors for each of the 4 modules; develop the specific curriculum for the course. This should be accomplished by March 2016.

3. Ensure that the first-year mentoring committee and thesis committees are engaging in thoughtful interaction with each student to develop individualized programs. This should be ongoing; by AY 2017-18, we should see evidence of diversity and individuality in student programs.

4. Continue to offer and update computational biology/biostatistics course offerings. This should be ongoing, with new courses encouraged by AY 2017-18.

5. Encourage external advanced specialty courses. Ongoing.

6. Highlight the personalized curriculum available as a feature of the program. Interaction with Development and Recruiting.

Benchmarks Year 1: Foundations course development:
- Appointment, by the Director, of 4 Foundations course leaders, with one designated as Coordinator, Fall 2015.
- 4 meetings of leaders, Winter 2015-16.
- Presentation of course syllabus to faculty by March of 2016.
- Detailed syllabus completed, June 2016.
- Course launched, September 2016.

Achieve consensus within the First-Year Mentoring and Curriculum Committees on wording the description and expectations for the personalized program of study beyond the core curriculum by January 2016 for presentation to faculty and June 2016 for inclusion in requirements and advertising.

Benchmarks Year 2: Foundations course development:
- Course evaluations December 2016 and May 2017.
• Foundations Course v.2 launched September 2017.

• Course leader rotation established, November 2017.

• Curriculum Committee assess the need for new biostatistics course, January 2017.

• Curriculum Committee prepare list of external courses to meet elective requirements, June 2017.

Benchmarks Year 3: Conduct evaluation of Foundations course:

• Any needed changes (Foundations Course v.3) to be instituted in September 2018.

• Curriculum Committee update requirements and electives, June 2018.

Benchmarks Year 4&5: Meetings of Curriculum Committee 1/semester:

• Evaluation of Foundations course & any other arising issues

Required Resources

To be determined. The Foundations course would benefit greatly from participation of teaching assistants to provide mentoring, especially in engineering applications. Also to be discussed is whether the 4 Foundations Course Leaders should be reimbursed, especially for the first year when the curriculum is developed “from scratch.” On the one hand, this might be a slippery slope and become something expected annually; but, on the other hand, it is a lot of work to launch a new course. Another form of compensation would be to provide stipend support for a GSBSE graduate student in the course leader’s laboratory.
Professional Development of Students and Faculty

Overview

The GSBSE is a unique multi-institutional program that includes a diverse group of students, faculty and institutions, each with their own strengths and areas of opportunity for further development. The GSBSE recognizes the compelling need to provide students and faculty with opportunities for professional development that will complement and extend those elements directly focused on research and career training resulting in job acquisition and/or creation.

GSBSE has initiated professional development training for students, which includes two workshops annually in the time period of the monthly student meetings. Students suggest topics for these workshops. Recent offerings have been How to Find a Postdoctoral Position and Resume Preparation. Other offerings are available through the University’s graduate school, and at partner institutions where the students are located. The professional development of faculty is primarily institution-specific, although workshops are available annually in Maine for topics such as grant writing. It is essential that this current status be evaluated by an independent entity and a roadmap of metrics be implemented to measure the effectiveness of the proposed steps for the next 5 years.

Goals

The primary goal of the 5-year plan described below is to create a GSBSE-wide program for professional development of students and faculty that 1) makes students world-class independent researchers, enhancing critical thinking and learning to apply it to other fields; 2) builds on the strengths of established programs in our GSBSE network and amplifies the intellectual, tactical and strategic capabilities by externalizing the conducted research for technology and eventually product commercialization; 3) creates new opportunities for students and faculty to enhance their knowledge of critical elements associated with a successful career in engineering, science and technology that translates into jobs via hands-on training and mentorship; and 4) becomes an acknowledged engine of greater economic growth of the State of Maine.

Strategies

Recommendation 1. Enhance Knowledge of Careers that Intersect with Basic Research (see Appendix 3 for additional information)


Benchmark Year 1: Determine guidelines for rotations outside our current network of institutions – for the site of the rotation, the mentor and the student.

Benchmark Year 2: Create directory of institutions/entities that would be excellent candidates to provide this opportunity. This entails researching the possibilities and refining the list of top candidates.

Benchmark Year 3: Create MOU with these institutions/entities.

Benchmark Year 4: Place students in 4th rotation.
Benchmark Year 5: Based on the knowledge gained, revise and refine the 4th rotation process.

Strategy 1.2. Create opportunities for students and faculty to learn about the diversity of careers in science.

Benchmark Year 1: Determine the online tools and seminars that can be disseminated; e.g. new techniques and technologies seminar.

Benchmark Year 1: Determine which seminars faculty and students can take to enhance the R&D&C culture at GSBSE and make list for approval.

Benchmark Year 2: Collaborate with partner institutions to leverage existing courses, e.g., JAX to leverage their course “The Whole Scientist”.

Benchmark Year 2: Organize a seminar on creating optimal career development plans that are “living” documents.

Benchmark Year 3: Organize an annual mixer(s) for biotech/pharma/biomed products and faculty (faculty presentations developed at the Foster Center).

Benchmark Year 4: Track and encourage the collaboration (formalized via MOU’s or even informal) between faculty and students.

Recommendation 2. Enhance our collective ability to communicate

Strategy 2.1. Improve students’ ability to articulate

Benchmark Year 1: Offer seminar for image processing; how to make figures.

Benchmark Year 2: Organize seminar for effective CV and resume formatting and interviews for academic vs. industry/biotech jobs.

Benchmark Year 4: Create training mechanism for students to learn how to present their research in a TED talk format.

Benchmark Year 5: Coordinate exchange of content, expertise, workshop material and knowledge-base with Alan Alda Center of Communicating Science at Stony Brook (http://www.centerforcommunicatingscience.org/).

Strategy 2.2. Improve faculty’s ability to articulate

Benchmark Year 3: Offer seminar on Adobe figure creation software and use of grant creation software such as Adobe InDesign.
Benchmark Year 4: Create training mechanism for faculty to learn how to present their research in a TED talk format.

Benchmark Year 5: Coordinate exchange of content, expertise, workshop material and knowledge-base with Alan Alda Center of Communicating Science at Stony Brook (http://www.centerforcommunicatingscience.org/).

Strategy 2.3. Improve students’ ability to access career information

Benchmark Year 2: Implement seminar on how to find post-doc opportunities (inclusive of biotech and industry market analysis), inclusive of finding private sector job opportunities and how to apply for them.

Benchmark Year 3, 4, 5: Implement annual seminar series on other careers (grants management, intellectual property law, editorial career, work with private foundations, core facility director, biomedical device/service sales, consulting [non-science]).

Benchmark Year 5: Implement a mentor network which will bring to bear the value of Ted Talks, Twitter (lab and personal), Facebook, Linked-in, ResearchGate, Lab Webpage Design, Blogging, networking skills.

Recommendation 3. Improve knowledge of research administration

Strategy 2.1. Improve knowledge of faculty and students to lead labs and implement best practices.

Benchmark Year 2: Implement annual seminar series that will include one or more of the following topics:
- Sponsored programs (pre and post award).
- Budgets and finances.
- Administration (how is your institution run? Where does $$ come from and go to?).
- Compliance and lab safety.

Strategy 2.2. Improve laboratory setup and management

Benchmark Year 1: Implement annual seminar series that will include one or more of the following topics.
- Infrastructure management and organization.
- Managing personnel (including conflict resolution, hiring, firing).
- Time management and effective leadership of meetings.
- Mentoring for faculty members and other members of the laboratory via dedicated efforts.
Required Resources

None identified.
Grantsmanship \ External Funding Capacity

Overview

The ability of the GSBSE to competitively obtain external funding through grants and industry sponsors/partners will be critical for the future success of the program. Financial constraints will limit the number of training slots, recruitment ability, and flexibility for mentors. Major expenditures are student stipends and administrative costs. Since 2006, funding for student stipends has been allocated from the UMaine Maine Economic Improvement Fund (MEIF). Through MEIF, the state of Maine invests ~$400,000 annually to support students for the first two years of the program. During these two years, students receive $32,000 for stipend, tuition, fees, and insurance. This investment supports ~5 students to enter each year. In the third year of the program until completion, financial support is the responsibility of the mentor. Administrative costs of GSBSE are covered by a combination of partner contributions ($70,000/year calculated based on number of students performing thesis research at that institution) and support from UMaine. A request has been submitted to UMaine to provide financial support for GSBSE as an Emerging Area of Distinction to double the number of annual incoming students to 10.

Two common forms of external federal or foundation grants to support predoctoral fellowships are institutional predoctoral training grants (i.e. NIH T32), and individual predoctoral fellowship (i.e. NSF graduate research fellowship program, NIH F31, private foundations). To be competitive for these opportunities, we need to show outstanding strength in: 1) training program and environment, 2) quality of training program leaders and mentors, 3) quality of trainees, and 4) training record.

Our grant funding landscape is changing, and we need to adapt to be successful. First: The NIH granting priorities are evolving from basic research to therapeutic utility. Thus, organizations such as NSF that fund basic science are being stretched. Second: Defense related funding (DARPA, DITRA) is shifting focus to warrior recovery (not super soldier). Major universities (the competition) are establishing new organizational structures to meet this changing environment. For example, consortium approaches are growing – granting agencies see the strength in bringing together multiple laboratories with expertise in different disciplines.

Goals

Increase the amount of external funding entering GSBSE through individual predoctoral fellowship awards, institutional training awards, individual investigator awards (i.e., RO1’s) or industry partnerships. This will be accomplished through 1) strengthening and improving our competitiveness in traditional funding mechanisms, and 2) developing competitiveness in novel funding mechanisms to meet the changing biomedical funding landscape.

Strategies for building infrastructure to enhance Individual Predoctoral Fellowships (IPF) applications

- Set expectation that students will apply for appropriate fellowship (policy).
- Formal teaching – grant writing course.
- Identification of fellowship opportunities – centralized resource, utilize resources of the UMaine Grants Office (Fiona Jensen).
• Peer/faculty review of applications – grant writing group.

• Standard templates for administrative pieces (training program, facilities, resources, etc, contacts for each institution).

• Have resource of successful fellowship applications (one currently available at MMCRI for funded MMC fellowships).

Benchmark 1: Aggregate data centralized including -number of applications, number of awards, funds brought in through fellowships (Year 1).

Benchmark 2: Establish a peer process for the identification of funding opportunities (go beyond standard consultants)(Year 1).

Benchmark 3: Formal grant writing seminar established, Peer/faculty review prose established (year 2).

Benchmark 4: Pre-doctoral candidates submit grant/funding proposal (end of year 2?) using new system (Year 2-5).

Strategies for building infrastructure to enhance institutional training grants (ITG) submissions

• Upgrade in program evaluation (via UMaine education group?).

• Upgrade in tracking past students (LinkedIn group, etc.).

• Increase success in mentor funding (collaborative research, peer review groups).

• Stronger branding for GSBSE (what is unique?).

Benchmark 4: Aggregate data centralized including- number and quality of applicants, training grant eligible applicants (how many are underrepresented), acceptance rate, academic record, publications, positions post-graduation, grant funding post-graduation; (Year 1).

Benchmark 5: Develop plan for underrepresented groups (consider economically disadvantaged, first to college populations, etc., partner with Upward Bound and other like groups, consider diversity to include non-traditional students, i.e. second careers, returning to education); GSBSE core faculty should present 2 to 3 suggestions for ITG proposals. (Year 2).

Benchmark 6: GSBSE begins the process of preparing for and Institutional Training Grant submission. Internal champions discussion followed by discussions to identify external funding agency champion (Year 3).

Benchmark 7: Submitted 1 ITG utilizing new approach (Year 3-5).

Novel Funding Mechanisms

Strategies for a step-wise approach to navigate changing grant landscape

Focus on establishing a multi-disciplinary/consortium leveraging existing strengths of the GSBSE. This should be done utilizing a stepwise approach. The initial approach should target inter-departmental
efforts. Test case could be UMaine (existing research efforts at UMaine should provide access to necessary breadth).

- Novel approach needs to examine the new grant landscape and better understand the specific calls being made by the granting agencies.

- Develop a strategy to write competitive proposals. This will require flexibility in laboratories often requiring the expansion of their particular focus. It should be understood that primary interests can often be bootstrapped to work being performed to meet proposal objectives.

- Establish relationships with Maine and wider biotechnology community, allowing in for participation in SBIR proposals.

- Establish new relationships with academic institutes and biotech industry outside of Maine to expand our collaborative possibilities.

- Present approach and preliminary results to Jackson Labs, USM, UNE, MDIBL, MMCRI and establish an inter-institutional approach. Participation by any one of these institutions in this effort can be accelerated based on the desire of any of the sister institutions.

**Benchmark 8:** Generate Scientific Report on Grant Status for UMaine’s GSBSE Faculty (Year 1).

- Summary Grant Statements (in order of priority): i) Active grants, ii) Grant Submissions, iii) Terminated grants but PI still maintains active research efforts in area.

- Generate list of current and pending Intellectual Property (RO1 to published patents).

- It is critical that GSBSE understands it core scientific and technical strengths and design a grant strategy that can take full advantage of them.

- Competition is high and success rates are declining for traditional grant approach where individual PI’s or graduate students respond to basic “grant calls”. GSBSE needs to create new pathways to funding.

- The implementation of this plan relies on leveraging existing infrastructure (Grant Development Office) to take the following steps.

**Benchmark 9:** Establish UMaine GSBSE scientific grants coordinator position with following functions (Year 2):

- Initially this is a scientific /salesman position that will work closely with a group of consultants that have experience with various funding mechanism.

- Working with consultants the coordinator will generate a document detailing the novel funding mechanism and present to faculty, research faculty and graduate students.

- Proposal concepts will be generated by i) the researchers themselves; and ii) the coordinator and consultants and approved by research faculty identified.
• Proposal concepts will be presented to GSBSE leadership for input and approval. The method of interaction to be determined by UMaine Office of Research.

• Proposals will still be written by researchers themselves.

• Research team responsible for proposal will have access to the coordinator and consultants for guidance and review.

• The coordinator’s job description will change as the program matures. The goal will be to eliminate the need for a formal consulting board use of outside consultants.

• Ultimately the coordinators job should be to i) assist in generating proposals that meet a specific grant calls; ii) work with granting agencies lobbying for the generation of new calls that fit the GSBSE’s scientific strengths.

**Benchmark 10:** Identify and appoint a grants coordinator (Year 3).

**Benchmark 11:** Identify External Consultants (when possible reach into already established relationships) to work with grants coordinator (Year 1).

• Consultants should cover i) Maine’s Biotechnology community; ii) senior faculty (emeritus?) with established record of grant funding; iii) individual with an establish track record within the DOD and DOE (non-NIH/NCI); and iv) external individual with track record across board range of NCI/NIH/NIST SBIR/contracts.

• Not consulting companies, but real scientists with current and real life experience.

**Benchmark 12:** Submit 1 proposal using a “novel funding mechanism”. (Year 2).

**Benchmark 13:** Grants Coordinator submitted yearly plan to GSBSE Faculty Board for the submission of set number of proposals (Year 4-5).

**Required Resources**

To be determined.
Building the Endowment and Resources

Overview

One of the primary limiting factors of enrollment growth within the Graduate School of Biomedical Sciences and Engineering (GSBSE) is fellowships to support incoming students and to provide bridge support between external grant projects. With over 150 participating faculty spread across the cooperating institutions, there is ample capacity to admit and support additional GSBSE students provided that they are supported by GSBSE through the initial two years.

Endowments represent the most stable method of providing a continuing graduate fellowship, but at an estimated cost of $32,500 per fellowship for stipend, tuition, and health insurance, an endowment of about $650,000 would need to be raised for each fellowship offered. It is noted that currently the GSBSE has an endowment of approximately $580,000, so adding to this principal would be advantageous. A more expedient method of raising funds to support graduate fellowships is through direct contributions that are renewed each year. These direct fellowships permit the donor to see the impact of his/her/their contribution. However, this strategy depends upon cultivating a pool of donors (broadly defined) who are capable of providing continuing financial support and who are committed to the importance of the GSBSE to the state’s future. Foundation and training grants specific to research within the GSBSE will also provide fellowship support for a fixed length of time.

Goals

To develop resources to support an additional five graduate student fellowships in the Graduate School of Biomedical Science and Engineering, thereby raising the incoming cohort to ten students by FY 21 (5 MEIF supported and 5 supported by new funding).

Strategies

1. Establish a GSBSE Development Committee to coordinate fundraising activities, including development of printed and electronic materials. The Development Committee will work with Elizabeth Erickson, the GSBSE Development Officer on a fundraising strategy. The Development Committee will also work with the GSBSE Director on the design of the printed GSBSE annual report.

2. Begin fundraising by identifying businesses and nonprofits that benefit from the research and skilled employees generated through the GSBSE. The Biotechnology Association of Maine (BAM) may provide an efficient means of identifying many of these companies. In addition, cultivate individuals whose philanthropic interests align with the GSBSE.

3. Continue relationships with GSBSE graduates as they progress in their careers and establish an alumni scholarship with monthly salary donations. Remind potential donors to ask their employers about matching funds for any contributions that are made.

4. Create a GSBSE Faculty scholarship with monthly salary donations. The contributions could be pre-tax if done through the payroll office or post-tax if done through direct contributions. Either way, the donations are tax-deductible.

5. Identify external funding opportunities through foundation and training grants.

Benchmark Year 1: Raise at least the $23,000 stipend cost for one fellowship.
**Benchmark Year 2:** Complete fundraising for two full fellowships ($65,000) with at least 2 year continuing commitments.

**Benchmark Year 3:** Raise total of two-year fellowship commitments to $97,500 (3 fellowships). Additional support through training or foundation grant. Develop a corporate investment partner.

**Benchmark Year 4:** Raise total of two-year fellowship commitments to $130,000 (4 fellowships).

**Benchmark Year 5:** Identify large endowment source (estate gift) to provide one continuing named fellowship, in addition to the 4 through continuing commitments.

**Required Resources**

None identified.
### Appendix 1

**Current Demographics for GSBSE students (2014)**

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Appendix 2

Grant Opportunities to Enhance Diversity in the Student Body

- Many originate from the RISE (R25) program at NIH to promote underrepresented minorities in graduate biomedical education. [http://www.nigms.nih.gov/Training/RISE/Pages/default.aspx](http://www.nigms.nih.gov/Training/RISE/Pages/default.aspx)

- Initiative for Maximizing Student Development (R25) – Funding for activities with a primary focus on research experience, skills development and mentoring of underrepresented minorities in biomedical fields. [http://grants.nih.gov/grants/guide/pa-files/PAR-14-121.html](http://grants.nih.gov/grants/guide/pa-files/PAR-14-121.html)


- We would strongly consider reaching out to Dr. Blake at UT Health Science Center where their Graduate School of Biomedical Science received a $1.6 million grant to support 7 minority candidates a year for five years. [http://uthscsa.edu/hscnews/singleformat.asp?newID=3928](http://uthscsa.edu/hscnews/singleformat.asp?newID=3928)

- The MARC Undergraduate Training in Academic Research Grant provides support for minority undergraduates that have intentions of pursuing graduate education in the biomedical health fields. Attracting theses students either during or after their undergraduate study would improve diversity. [http://www.nigms.nih.gov/Training/MARC/Pages/USTARAWards.aspx](http://www.nigms.nih.gov/Training/MARC/Pages/USTARAWards.aspx)

- There are many more available from groups supporting various underrepresented minorities (ACLU, etc.).

- Promoting Native American and Hispanic students to pursue graduate education. [http://sacnas.org/](http://sacnas.org/)
Appendix 3

Addendum for Professional Development of Students and Faculty, Recommendation 1

Create a database list which contains the below information augmented further.

- Key learning that also needs to be established: Critical evaluation of the commercial viability of your ideas (is this R01 grant really going to lead to a new therapy?)
- 4th rotation - Entrepreneurship
- Connect and participate in the Foster Center: [http://foster.target.maine.edu/](http://foster.target.maine.edu/)
- Partner up with Innovation Engineering folks via UMO Foster: [http://www.innovationengineering.org/](http://www.innovationengineering.org/)
- Participate in Blackstone Innovate for Maine Fellows: [http://blackstonegrowth.com/innovate-for-maine-fellows/](http://blackstonegrowth.com/innovate-for-maine-fellows/)
- Link up with MCED and determine if some on-line courses can be taken (Top Gun, Top Gun Prep): [http://www.mced.biz/](http://www.mced.biz/)
- Establish partnerships with biotech industry for internships; consider having biotech industry faculty as outside mentors (have a conversation with Mike Wing, Director of External Relations at University of Southern Maine; there is an internship program for college credit with enormous industry participation... and in the absence of the applied medical science degree/program, southern Maine bioscience eco-system is very forward leaning at the current time to getting involved with students). Also see: [https://usm.maine.edu/cesb](https://usm.maine.edu/cesb)
- Create an official linkage with Maine Technology Institute ([http://www.mainetechnology.org/](http://www.mainetechnology.org/))
- Take classes as SMCC Entrepreneur Center: [http://www.smccme.edu/business-a-community/business-resources/entrepreneurial-center.html](http://www.smccme.edu/business-a-community/business-resources/entrepreneurial-center.html)
- See mentors from Maine Angels and investigate these resources: [http://www.maineangels.org/resources-for-entrepreneurs/resources/](http://www.maineangels.org/resources-for-entrepreneurs/resources/)
- There is a program in Machias worth leveraging: [http://machias.edu/online-certificate-programs](http://machias.edu/online-certificate-programs)
- Get involved here: [http://www.up.co/communities/usa/maine/](http://www.up.co/communities/usa/maine/)
- Possible class participation/partnership here: [https://www.thomas.edu/academics/areas-of-study/business-management/entrepreneurshipsmall-business-bs/](https://www.thomas.edu/academics/areas-of-study/business-management/entrepreneurshipsmall-business-bs/)
- See videos on [www.ted.com](http://www.ted.com) (more specifics here may be useful)
- As above in clinical/medical fields
- As above in other professional areas such as facility core directors, etc.