**SPECIFIC AIMS (ADMINISTRATIVE CORE)**

Biomedical research in universities spans multiple academic units and research centers/institutes, sometimes resulting in duplication of administrative resources and/or a failure to take advantage of inter-disciplinary collaborative opportunities. UNH is poised to overcome these traditional obstacles due to increasing recognition by its upper administration of the need to support and promote areas of research excellence, to provide programs for faculty development that cross disciplinary and academic unit boundaries, and a commitment to develop assessment tools to evaluate program effectiveness. What is currently lacking at UNH is a coherent administrative structure to oversee and coordinate biomedical research initiatives, including: (1) strategic recruitment and hiring of biomedical researchers across traditional academic boundaries, (2) professional development and mentoring opportunities for junior investigators, (3) institutional support for core research facilities (*see Research Core*), and (4) an assessment plan to ascertaining the effectiveness of programs once implemented.

The long-range goal is to utilize the GEBRI program to permanently establish an administrative, fiscal, and research infrastructure at UNH to promote increased participation in genome-enabled biomedical research at UNH itself and with its academic partners regionally. The objective of this proposal is to design and implement an administrative core structure at UNH that successfully supports the growth in the number of NIH-funded projects in the area of genome-enabled biomedical science, coordinates sharing of resources, promotes transfer of scientific expertise, and fosters scientific communication. We propose that this investment in an effective administrative infrastructure will greatly facilitate and expand current efforts to enhance the quality and quantity of biomedical research at UNH (and regionally), as well as simultaneously supporting the professional development of outstanding, early-career biomedical researchers.

The specific aims of the Administrative Core are:

**(1) To create a sustainable administrative structure to effectively oversee and coordinate the activities sponsored by the GEBRI program.** To effectively implement the GEBRI program, the project directors will establish a set of advisory and steering committees, provide oversight of the mentoring relationships for the junior investigators, and develop the network of academic partners at other regional institutions.

**(2)** **To implement an intensive, multi-step career development program that prepares early-career researchers to develop independent, externally funded biomedical research programs.** To accelerate the pace of career advancement of the junior investigators, the PIs will actively participate in two ongoing UNH faculty mentoring programs, and integrate these programs with GEBRI-specific mentoring relationships and multidisciplinary training experiences.

**(3) To establish a comprehensive evaluation process for the junior investigators and for the overall effectiveness of the GEBRI program**. To determine the effectiveness in meeting the aims of the program, formative and summative evaluations will be conducted by the Steering Committees for the junior investigators (e.g., achievement of agreed-upon milestones). In addition, evaluations will be conducted by the IAC for the Steering Committee (e.g., implementation and effectiveness of program administration, impact of mentoring on professional development of mentees, effectiveness of communications and development of collaborative relationships with academic partners).

The expected outcome upon completion of these aims will be the establishment of a sustainable administrative structure at UNH that supports the growth of the biomedical research infrastructure within UNH and regionally. The impact of this program, in our opinion, will be to increase the quality and quantity of biomedical research at UNH and in the region, to better engage junior faculty in career-enhancing, mentor-based relationships, and to create a vibrant collaborative biomedical research environment for UNH and for its academic partners in the region.

**SIGNIFICANCE (ADMINISTRATIVE CORE)**

The University of New Hampshire (UNH) has a focus on high-quality undergraduate education while offering a small number of excellent graduate programs. The Carnegie Foundation for the Advancement of Teaching classifies UNH as a “Research University/High Research Activity.” UNH is also distinguished as a land-grant, sea-grant, and space-grant institution. Within the College of Life Sciences and Agriculture (COLSA) and in the College of Engineering and Physical Sciences (CEPS) there are a substantial number of research-active faculty that have historically focused on fundamental biological problems and/or advances in engineering without explicitly linking their research to its potential relevance to human health and disease. In addition, both colleges have recently invested in the hiring of faculty in the areas of genome-enabled biology (COLSA) and bioengineering (CEPS), most of whom are excellent candidates for developing strong biomedical research programs (including the four juniors investigators in this proposal). The Senior Vice Provost for Research, recognizing the need for enhancing the NIH grants portfolio at UNH, has instituted a university-wide “Up-2-NIH” program to specifically target UNH faculty poised to re-direct and enhance their efforts to secure NIH funding for biomedical research programs. This GEBRI proposal will provide the administrative mechanisms needed to greatly intensify these efforts to enhance the number and quality of NIH-funded research programs at UNH.The career-development and assessment programs that are offered to the junior investigators whose multidisciplinary research programs center around the theme of “genome-enabled biology” will be scaled up to include other biomedical research investigators at UNH and in the region.

*Implementation of the GEBRI program at UNH is significant because it is the next important step in enhancing a strong biomedical research climate at UNH and with its academic partners.*

Once the proposed programs/activities are implemented, several benefits will accrue: (1) creation of a community of inter-connected, genomics-enabled biomedical researchers that cross traditional academic boundaries of department, college, and even institution; (2) a greater number of NIH-funded, sustainable biomedical research programs—not only for the junior investigators but for subsequent faculty hires and faculty at other institutions—will result from the administrative structure and rationally designed mentoring programs that are implemented; (3) quantitative measures of the effectiveness of the GEBRI program will be obtained that inform us about what is working and how we can improve the programs/activities over the project period.

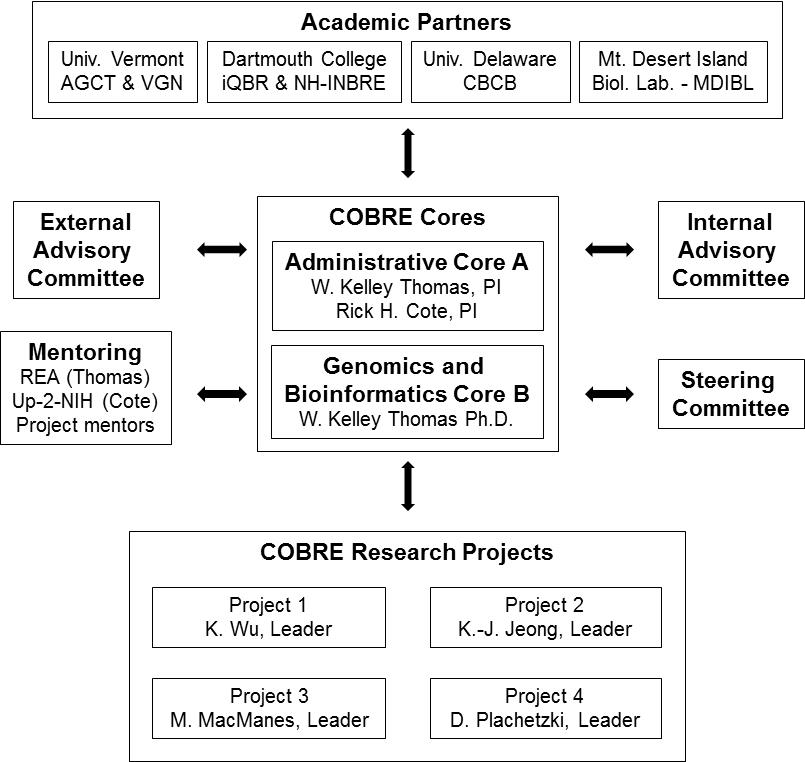
**INNOVATION (ADMINISTRATIVE CORE)**

There are several possible reasons why NIH funding at UNH has not achieved “critical mass” in comparison to external funding awarded from other federal agencies (e.g., NSF, NASA) to UNH. These include: (1) many biomedical researchers are scattered in multiple departments in multiple colleges on the UNH campus; (2) prior to the creation of the Up-2-NIH program, UNH lacked training workshops and mentoring opportunities specifically geared to the needs of biomedical researchers, and; (3) failure by previous upper administrative officials to appreciate that a vibrant biomedical research environment could exist without requiring the presence of an affiliated medical school. We believe that several highly innovative aspects of the GEBRI will overcome these historical obstacles to the growth of biomedical research at UNH.

This proposal is highly innovative in

* **providing a three-tiered professional development sequence that seamlessly and sequentially integrates institutional and GEBRI-specific programs;**
* **creating a genome-enabled biomedical research community at UNH that transcends departmental and college “silos” and is self-sustaining;**
* **establishing new linkages with existing programs [e.g., COBRE-QBRI (Dartmouth), NH-INBRE (Dartmouth and UNH)] and with new academic partners that enable the GEBRI to communicate and engage with these partners and the public more effectively.**

The recent positive changes in the institutional climate at UNH (*see Significance*) provide a very timely opportunity for the GEBRI program to have a profound and lasting impact on increasing the number of NIH-funded programs at UNH, training the next generation of genome-enabled biomedical researchers, and enabling more researchers at UNH and in the region to understand and utilize genomic approaches to address important issues in human health and disease.

**APPROACH (ADMINISTRATIVE CORE)**

**AIM #1 To create a sustainable administrative structure to effectively oversee and coordinate the activities sponsored by the GEBRI program.** To effectively implement the GEBRI program, the project directors will establish a set of advisory and steering committees, provide oversight of the mentoring relationships for the junior investigators, and develop the network of academic partners at other regional institutions.

***Introduction.*** Implementation of the Genome-Enabled Biomedical Research Institute requires a well-designed plan, including an administrative structure that oversees the entire program operations, supports the leadership team, provides quality mentoring for the junior investigators, and facilitates communication and outreach to external stakeholders. The objective of this aim is to create an administrative structure that at its core consists of a Steering Committee, an Internal Advisory Committee, and an External Advisory Committee, but which also integrates and oversees the activities of the Research Core, the individual junior investigators’ research projects, and interactions with Academic Partners and external audiences.

***Justification and Feasibility.*** As shown in the accompanying diagram, we propose an administrative structure that is led by a Steering Committee consisting of the two PIs and an experienced administrator of active COBRE programs at Dartmouth College (Dr. Jason Moore). An Internal Advisory Committee consisting of key academic administrators and research administrators at UNH will provide oversight and periodic formative evaluations of the program and the Steering Committee. An External Advisory Committee will also be assembled prior to the start of the grant to carry out assessment of the scientific progress of the GEBRI and to advise the Steering Committee on scientific matters. Together, these three administrative components will become the foundation for long-term improvements in the biomedical research infrastructure that will become self-sustaining during the five-year project period. The composition and detailed functions and responsibilities of each administrative component are described in the next section.

***Design.*** The administrative core consists of three major components: Steering Committee, Internal Advisory Committee, and External Advisory Committee.

***Steering Committee.*** The responsibilities of the Steering Committee are to provide ongoing leadership of the overall operations of the entire GEBRI for the entire project period. More specifically, the Steering Committee will meet weekly to oversee the administration of the program, be available for consultations with the junior investigators and other biomedical researchers at UNH and at partnering academic institutions, and supervise the administrative and research staff of the GEBRI. The two PIs, Cote and Thomas, are committing 2 and 3 months per year, respectively, of effort exclusively to management of the administrative and scientific aspects of the GEBRI, in recognition of the fact that this type of biomedical infrastructure currently does not exist at UNH and will require sustained effort to create and maintain.

Rick H. Cote, Ph.D. is a highly skilled and effective academic administrator in his role as department chair (for the past six years) of the Molecular, Cellular, and Biomedical Sciences (MCBS) department at UNH, the academic unit with the highest concentration of biomedical researchers at UNH. The department he heads consists of 44 faculty, 4 professional instructional staff, 4 administrative assistants, 4 undergraduate degrees (enrolling >900 students) and several graduate programs (>60 graduate students). His administrative accomplishments include chairing the committee that implemented the reorganization of COLSA in 2008, leading to the formation of the MCBS department as the primary locus for biomedical research. He guided the design of a new undergraduate curriculum in Biomedical Sciences that quickly became the most popular baccalaureate degree program in COLSA. He, PI Thomas, and another MCBS faculty member have recently led the creation of a new multi-disciplinary doctoral program in Molecular and Evolutionary Systems Biology whose thematic focus aligns extremely closely with the GEBRI scientific mission. Cote is also a leading biomedical researcher at UNH, currently in his 25th year of R01 funding from the National Eye Institute. He is a leading expert on cyclic nucleotide phosphodiesterases (PDE) with a focus on the structure, function, regulation, and molecular evolution of this enzyme family. He serves as the Faculty Director of the Up-2-NIH faculty mentoring program, and will continue in this capacity in order to integrate the GEBRI mentoring plan with this university-wide program. Cote will take primary responsibility for oversight of the Administrative Core of GEBRI, in addition to his mentoring duties.

W. Kelley Thomas, Ph.D. is a recipient of the UNH Excellence in Research Award for his contributions to advancing genome biology across diverse disciplines. As the Director of the Hubbard Center for Genome Sciences (HCGS), he has a long history of managing service-based genomics and bioinformatics facilities, as well as providing expertise in consulting, training, and curriculum development related to genome science. Thomas has experience coordinating large-scale multi-investigator projects, including the NSF Tree of Life project. He recently was the PI on a successful NSF-Major Research Instrumentation proposal that led to acquisition of a next-generation sequencing instrument in support of numerous research projects, and also serves as PI of a research coordination project in metagenomics. Thomas serves as a Director of the NH-INBRE Bioinformatics Core (along with Jason Moore, the third member of our Steering Committee; *see below*) which serves numerous investigators from primarily undergraduate institutions in the region. Thomas has extensive mentoring experience from his past and current participation in the UNH Research and Engagement Academy and in the Up-2-NIH program. Thomas has responsibility for the Genomics and Bioinformatics Core and the Administrative Core, along with his mentoring duties.

Jason H. Moore, Ph.D. is the Director of the Institute for Quantitative Biomedical Sciences (iQBS) at Dartmouth College, and a Fellow of the American Association for the Advancement of Science (AAAS). He is a leading expert on translational bioinformatics research with a long history of NIH funding, including as PI for the Dartmouth COBRE on Computational Biology. His extensive administrative experience with COBRE programs at Dartmouth will accelerate the establishment of an effective GEBRI program at UNH. Moore’s expertise in computational biology is critical to successfully establishing effective linkages with the Dartmouth COBRE, and his leadership role in establishing the computational infrastructure in the state of New Hampshire (New Hampshire Net) underlies the ability to engage regional partners through NH-INBRE. The strong working relationship that exists between Moore and Thomas represents an exceptional opportunity to efficiently establish the GEBRI program at UNH and to engage academic partners through the regional network that they both supervise.

***Internal Advisory Committee (IAC).*** The responsibilities of the IAC are to provide institutional oversight of GEBRI program, coordinate with the Steering Committee for providing mentoring opportunities (Research and Engagement Academy, UP-2-HIH, Writing Academy), coordinate future faculty hires in COLSA and CEPS whose research has a biomedical focus, support opportunities to improve the biomedical research infrastructure (e.g., University Instrumentation Center, submission of Major Research Instrumentation grants), meet quarterly to assess program effectiveness and timelines/milestones, and to conduct a formal annual evaluation of the effectiveness of the Steering Committee in meeting the specific aims of the administrative and research cores of GEBRI.

The following members of the IAC represent academic and research administrators at UNH with leadership roles and a shared institutional aspiration to develop and grow a strong biomedical research infrastructure on the UNH campus.

Jan Nisbet, Ph.D., Senior Vice Provost for Research, provides leadership and support in advancing excellence in research at UNH. In the past few years, she has recognized the need and opportunities for creating a stronger biomedical research environment at UNH by providing resources to create the Up-2-NIH program (designed and implemented in collaboration with PI Cote and others). Nisbet oversees the shared instrumentation facilities at UNH, and her institutional investment in the biomedical research infrastructure and support of hiring new faculty in the area of biomedical research helps ensure success of the GEBRI program.

Julie E. Williams, Ph.D., Senior Vice Provost for Engagement and Academic Outreach, is the architect of the Research and Engagement Academy, the foundation of the three-tiered mentoring program (*see Aim 2*). In addition to nurturing a community of engaged and researchers, Williams offers expertise in assessment and tracking faculty development.

Jon M. Wraith, Ph.D., Dean of COLSA, recently approved and provided support for the hiring of four assistant professors in the area of genome-enabled biology (two of whom are junior investigators in the GEBRI program). Wraith and Nisbet have jointly committed to support an additional faculty position in bioinformatics that will join the GEBRI upon arrival at UNH. We anticipate continued support from Wraith in hiring additional faculty in the area of genome-enabled biology to sustain the GEBRI with new junior investigators that will replace the current faculty when they obtain NIH funding.

Samuel B. Mukasa, Ph.D., Dean of CEPS, is committed to growing bioengineering research in the context of the College of Engineering and Physical Sciences, as evidenced by the recent hires of two faculty to the Chemical Engineering Department who are junior investigators on this proposal. This GEBRI is strengthened by the multi-disciplinary approaches that incorporate a genome-enabled biological perspective/approach to biomedical engineering research programs.

Kathryn B. Cataneo, Director of Research Development and Communications, is the Administrative Director of the Up-2-NIH program, the second component of our three-tiered mentoring program. In collaboration with Cote, Cataneo provides leadership for the programming of the Up-2-NIH, as well as developing assessments of the program’s effectiveness. Cataneo is also a member of the leadership team for the Research & Engagement Academy.

Scott Valcourt, Ph.D., Director of UNH Information Technology Project Management, has served as PI on several cyberinfrastructure grants to the region that have greatly improved communications and data transfer for bioinformatics projects. He brings expertise in videoconferencing that will enhance our ability to communicate amongst members of the Steering Committee and advisory committees, as well as with academic partners in the region.

***External Advisory Committee (EAC).***The responsibilities of the EAC are to (1) oversee and guide the Steering Committee in developing and implementing the specific aims of the GEBRI; (2) critique the performance of the administrative and research cores as well as the scientific progress of the junior investigators; (3) share their scientific expertise in genomics and bioinformatics; (4) conduct annual, written formative evaluations and a final summative evaluation of the development of the center and the progress of the junior investigators toward independent status, and; (5) review and recommend candidate investigators for those who “graduate” or who fail to demonstrate satisfactory performance. The EAC will meet semi-annually, and a written summary prepared of the issues discussed, recommendations made, and actions to be taken.

The composition of the external advisory committee (EAC) will be critical to the sustained success of GEBRI. EAC members will be familiar with the mission of the GEBRI, have extensive expertise in genomics and bioinformatics, and have the administrative experience to provide critiques of the scientific progress of the junior investigators and of the Steering Committee’s effectiveness in administering the cores. The GEBRI is firmly committed to enabling partnerships and resource-sharing mechanisms to enhance scientific exchange, as well as providing state-of-the-art infrastructure to the academic partners. For this reason, regional scientific leaders familiar with genomics and bioinformatics infrastructure (as well as with individual junior investigator’s research interests) would be exceptionally well suited to serve as members of the EAC. The high density of regional IDeA states (NH, ME, RI, VT, DE) with which we partner offers a deep pool of scientific experts with knowledge of regional biomedical research infrastructure. Among other COBREs outside the northeast region, the Institute for Bioinformatics and Evolutionary Studies (IBEST; University of Idaho) is similar in scientific theme and administration to our GEBRI and could play an important role in advising us about the entire scope of our program—scientific and administrative. Finally, the scientific backgrounds and expertise of two of our junior investigators in bioengineering bring an exciting multidisciplinary element to our GEBRI, and the effectiveness of the EAC to advise and oversee the program would be greatly enhanced by inclusion of someone highly knowledgeable of the biomedical engineering discipline; we are aware of highly successful such programs at the Massachusetts Institute of Technology and at the University of Delaware.

***Expected Outcomes.*** Upon completion of this specific aim, we will have established a stable, sustainable administrative core that support the career development of the junior investigators participating in the program, and more broadly enhances the biomedical research infrastructure within UNH and with its regional academic partners. We anticipate that the four junior investigators originally participating in GEBRI will have successfully obtained external funding from NIH or other federal agencies, and that a second group of junior investigators will be mid-way through the process of applying for and obtaining research projects grants. Through the participation of the PIs in the two university-sponsored mentoring programs mentioned above, the influence of the GEBRI will extend to additional biomedical researchers at UNH and in the region. Finally, the establishment of the GEBRI administrative core will greatly strengthen communication of scientific knowledge and the sharing genomics and bioinformatics resources to its regional partners and the public.

**Aim #2** **To implement an intensive, multi-step career development program that prepares early-career researchers to develop independent, externally funded biomedical research programs.** To accelerate the pace of career advancement of the junior investigators, the PIs will actively participate in two ongoing UNH faculty mentoring programs, and integrate these programs with GEBRI-specific mentoring relationships and multidisciplinary training experiences.

***Introduction.*** A second major objective of the GEBRI program is to promote the ability of investigators to successfully compete for independent research grants through NIH or other peer-reviewed funding agencies. In this difficult climate for securing adequate funding for health-related research, it is incumbent on academic institutions and those faculty members who have a strong track record of peer-reviewed, external funding to provide structured as well as personalized mentoring opportunities that enhance the ability of junior investigators to be competitive for external grant support.

One significant and highly innovative aspect of the GEBRI is its reliance on already established, effective faculty mentoring programs at UNH (i.e., Research and Engagement Academy and the Up-2-NIH program) to augment specific one-on-one research mentoring relationships focused on the advancement of individual research programs. This three-stage mentoring approach includes broad mentorship (REA), NIH-specific mentorship (Up-2-NIH), and specialized GEBRI-specific mentorship designed to develop each individual’s research program in a multi-disciplinary context.



***Justification and Feasibility.*** The diagram above summarizes the three-phase mentoring plan that we will enact in the GEBRI. Indeed, all four of the junior investigators have completed or are currently (“Year 0”) enrolled in the Research and Engagement Academy (REA), and will enroll in the Up-2-NIH program in the Fall of 2014 (“Year 1”). Both programs include a well-organized set of workshops, writing projects, and mentored experiences in which both PIs will participate as mentors; Cote also serves as the Faculty Director for Up-2-NIH. Thus, two of the three stages of the mentoring experience for the junior investigators are already established, with the GEBRI providing the research mentoring that commences with the beginning of the project and continues until the researchers obtain a research project grant and “graduate” from the program, hopefully in the third year of the program. This then allows the GEBRI to “induct” new junior investigators to initiate the three-stage mentoring process again. [Note that this generic timeline does not explicitly include the proposed new faculty hire in bioinformatics who would start in Year 2 of the project period; since each program operates annually, new faculty can be enrolled in the three-stage mentoring sequence at any time.] This progressive, three-stage mentoring sequence will offer junior investigators (both GEBRI project leaders and other biomedical researchers) a structured, supervised environment in which to develop competitive research project proposals that, when funded, will transition them to “independent investigator” status and allow new faculty to join the GEBRI.

***Preliminary results.*** The four research projects included in this COBRE proposal represent successful completion of the first milestone resulting from participation of the junior investigators in the Research and Engagement Academy.

***Design.*** The design of the three-stage career development program for the junior investigators consists of three components: the UNH Research and Engagement Academy, the Up-2-NIH program, and GEBRI-specific mentoring.

***Research and Engagement Academy (REA).*** The REA has the mission to advance and support the scholarly careers and success of faculty members by strengthening the quality and quantity of grant proposals submitted to federal agencies. REA has been offered by the Office of the Senior Vice Provost for Engagement and Academic Outreach (Dr. Julie Williams; *see letter of support*) to 63 UNH faculty since 2011.

Admittance into the REA is contingent on a commitment by participating faculty to attend six day-long workshops, to work closely with an assigned “scholarly coach,” complete assigned activities (e.g., interaction with grant program officers), and to write and submit a grant to a peer-reviewed agency. The scholarly coaches’ responsibilities include: serving as mentors for two of the REA participants; meet monthly with each mentee; provide assistance in identifying the agency/institute to target with a grant proposal; establish a timeline for complete of the proposal; critique the proposal, and; serve on a discussion panel.

For the GEBRI junior investigators, Cote or Thomas will serve as the scholarly coaches, as part of their comprehensive mentoring responsibilities (*see below*).

***Up-2-NIH.*** In FY10, NIH funding represented only $2M of UNH’s total $120M funding profile that year, yet New Hampshire universities received approximately $90M in NIH funding (primarily to Dartmouth Medical School.)  Other state universities without medical schools were able to obtain significant NIH funding in 2010.  For example, Maine received $65M and Delaware received $31M (NIH Research Reporting Tools, 2010). Although many UNH faculty have research programs in health, biomedical and behavioral sciences, their success in competing for extramural funding from the National Institutes of Health (NIH) has been limited. To address UNH’s relative lack of success in securing NIH awards, the Senior Vice Provost for Research (Dr. Jan Nisbet; *see letter of support*), Cote (Faculty Director of Up-2-NIH), Kathy Cataneo (Director of Research Development and Communications), and UNH faculty with NIH experience  together developed and offered the Up-2-NIH program starting in 2012. In the two years it has operated, xx faculty have participated, xx grants have been submitted by participants, and xx awards have been received, attesting to the effectiveness of this NIH-targeted mentoring program.

[more details on curriculum and structure of the program from Kathy? Or from training manual?] For the four GEBRI faculty participating in Up-2-NIH, Cote and Thomas (both experienced mentors in this program) will serve as their mentors, providing seamless, consistent guidance as supervision from REA through Up-to-NIH, and then to the GEBRI research project mentoring experience (*see below*).

***GEBRI-specific Mentoring***. The third and individually tailored mentoring of junior faculty…

While our experience with the first two layers has been excellent and will play an important role in the development of our faculties programs, the goals of our COBRE program include a purposeful multidisciplinary approach. To accomplish this, we will pair our junior faculty with mentors that represent the breadth of discipline that under pin their programs. The challenges faced by multidisciplinary research can be daunting. These include the need to design and target research proposals to the appropriate institutes while maintaining the intellectual integrity of the science. In this last layer of mentoring, these faculty will interact with their mentors with a focus on opportunities for enriching their knowledge. We specifically expect that the mentors will work with the PIs to hone their research strategies, including frequent review of progress with discipline specific feedback on publication strategies, target institutes and meeting and workshop opportunities.

The expected outcome of this NIH specific mentoring program is the submission of an NIH grant under one of the funding mechanisms. Explicit in the mentorship program are a set of milestones focused on the submission of competitive applications. The development of their individual research projects for this proposal is the first milestone expected from their participation in the Research Engagement Academy. The next milestone will be their submission of an NIH grant one year after the fall. Depending upon the development of preliminary data and specific progress of current aims, the mechanism may vary from RO1 to R15 or R21 mechanisms.

Expectation of mentors: Within each of these programs, mentors are expected to provide written feedback shared with the mentees. Conversely, we will seek evaluations of mentorship progress each month as a standard component of our monthly meetings.

In addition to the comprehensive mentoring relationships each junior investigator develops with Cote and Thomas, we will encourage and guide the junior investigators to take the initiative to establish a new, collaborative relationship with an established investigator (“scientific consultant”) with deep expertise in the same area as the junior investigator’s. This not only provides an additional, expert’s perspective for the research project, it also develops the skill of forging meaningful scientific relationships within one’s discipline (“networking”).

While the overall timeline is presented above, detailed milestones for the GEBRI-specific mentoring and a timeline for their completion are described in the Table in Aim 3A on formative evaluation..

Additional mentoring resources. The Writing Academy is a faculty development program offered by the Office of the Senior Vice Provost for Engagement and Academic Outreach. It is designed to help advance the scholarly careers of faculty at UNH and enhance the intellectual climate at UNH. The Academy supports faculty in developing their writing abilities to enhance the preparation of research manuscripts and grant proposals. More information on this optional resource available to GEBRI faculty can be found at <http://www.unh.edu/engagement/writing/mission.html>.

***Potential pitfalls and alternative strategies.*** While this three-stage mentoring plan provides a rich set of activities and guidance to support each junior investigator to achieve their desired outcomes, it also provides frequent, detailed feedback on areas needing greater attention and opportunities to develop strategies to overcome obstacles.

***Expected Outcomes.*** Having completed the REA by the beginning of the project period (with the research project proposal contained in the COBRE proposal serving as the final outcome from the REA), we expect all four GEBRI junior investigators to have enrolled and begun participating in the year-long Up-2-NIH program starting in Fall 2014. This will culminate with submission of research project grants no later than the middle of 2015. In those instances where the proposal is not funded, the junior investigators will revise their proposal under the individual guidance of the GEBRI mentoring program (*see below*), submit the revised application in early 2016, and hopefully obtain external funding at the conclusion of their third year of the GEBRI mentoring process (*see timeline above*). As faculty “graduate” upon receiving a grant award, new faculty will enter the program (subject to the review and approval process described elsewhere). By the end of the 5-year project period, we expect that four faculty will have obtained NIH R01 awards (or similar peer-reviewed external funding), and their replacements will be midway through the second cycle of the mentoring process.

**Aim #3 To establish a comprehensive evaluation process for the junior investigators and for the overall effectiveness of the GEBRI program**. To determine the effectiveness in meeting the aims of the program, formative and summative evaluations will be conducted by the Steering Committees for the junior investigators (e.g., achievement of agreed-upon milestones). In addition, evaluations will be conducted by the IAC for the Steering Committee (e.g., implementation and effectiveness of program administration, impact of mentoring on professional development of mentees, effectiveness of communications and development of collaborative relationships with academic partners).

***Introduction.*** Essential to the achievement of the two overarching objectives of the GEBRI (to improve the biomedical research infrastructure at UNH and to enhance the competitiveness of investigators for external funding) is a comprehensive plan for assessing the performance and effectiveness of the GEBRI in achieving these goals. In addition to a structured formative assessment protocol for the junior investigators requested in the COBRE program announcement, we also intend to evaluate the effectiveness of the major administrative elements of GEBRI. In so doing, programmatic strengths can be highlighted and deficiencies in the operations and organization of the GEBRI can be remedied early on to optimize the effectiveness of the program.

***Justification and Feasibility.*** Both formative and summative assessments of GEBRI are a critical part of program administration, both in terms of documenting “return on investment” as well as being able to dynamically respond during the project period to identified strengths and weaknesses in program design to maximize desired outcomes. Comprehensive and ongoing assessments are often overlooked by program leaders whose efforts are appropriately directed to administering the day-to-day operation of the program and to providing services to clients/stakeholders. One important responsibility of the Program Manager requested in the budget is to collect data on all of the metrics/milestones described in the following sections, and to design and administer surveys and other evaluation tools on behalf of the Steering Committee and the IAC. The Steering Committee [Cote (as an experienced academic administrator), Thomas (as Director of the HCGS and a Director of NH-INBRE), and Moore (as PI for awarded COBREs)] have extensive experience and appreciate the importance of formative and summative assessments. Furthermore, at the institutional level the UNH Center for Excellence in Teaching and Learning is an excellent resource to assist the Steering Committee in developing assessment tools uniquely designed for evaluating the GEBRI.

At the outset of the GEBRI program, we will conduct a baseline survey to serve as a reference point. This initial survey will assess the current biomedical research infrastructure/climate at UNH and the competencies each junior investigator possess that relate to the objective of achieving the status of independent investigator. For this initial assessment and the final summative assessment, we will identify and enlist the participation of a control group, consisting of faculty in COLSA or CEPS at a similar stage in professional career development who are not participating in GEBRI. This initial evaluation will use the same metrics as described below for the two sub-aims that constitute our comprehensive approach to formative program evaluation.

***Design.*** We will establish two different formative evaluation strategies, one for junior investigators and the other for the Steering Committee. In addition, we will use the assessment information collected during the entire project period to perform a summative evaluation that comprehensively reviews the extent to which the mission of GEBRI in its first five years was accomplished.

Data to be collected and compiled by the Program Manager will include: (1) online surveys that will have both quantitative and subjective questions; (2) institutional data on grant submissions/awards available from UNH Sponsored Programs Administration; (3) bibliographic and citation databases; (4) web analytics (e.g., site visits) of content created for the GEBRI web site, and; (5) other information provided by GEBRI participants typically contained in annual activity reports (conferences attended, presentations, outreach/engagement activities, etc.).

***3A. Formative, annual evaluations of junior investigators.*** Of course, the primary milestone for the junior investigators is the attainment of their individual research project grant and independent investigator status, resulting in “graduation” from the GEBRI mentoring activities. Intermediate milestones and expectations are listed in the accompanying table. These metrics satisfy the criteria of the SMART test: specific, measureable, attainable, realistic, and timely. Note that we expect that “graduates” will remain engaged as active participants in the overall GEBRI program, and take on peer-mentoring of newly enrolled junior investigators who are “inducted” into GEBRI.

***3B. Formative, annual evaluations of Steering Committee.*** Under the direction of the IAC, the Program Manager will be tasked with conducting annual evaluations of the Steering Committee, with the results being conveyed to the IAC for analysis, interpretation, and feedback to the Steering Committee. The annual evaluation summary will also be provided to the EAC annually.

Annual evaluations of the Steering Committee will consist of two components: Part 1, evaluation of overall GEBRI program management; Part 2, evaluation of GEBRI-specific mentoring (Cote and Thomas). The survey recipients will include the junior investigators (Parts 1 & 2), staff responsible for the REA and UP-2-NIH programs (Parts 1 & 2), research staff supporting the GEBRI Research Core (Part 1), academic partners and GEBRI collaborators at UNH and in the region (Part1), and department chairs of junior investigators (Part 2).

While the IAC will have responsibility for the design of the survey and for ensuring the anonymity of the respondents, we propose that the following metrics should be included.

For Part 1 (Steering Committee administration): [insert metrics or references to available evaluation survey for program administrators]

For Part 2 (GEBRI-specific mentoring): frequency and nature of meetings/communication; qualitative assessment of the strengths and weaknesses of the mentoring relationship; extent to which the mentor provided assistance in attaining mentee’s milestones. Published assessment tools [e.g., (Berk *et al.*, 2005)] will be evaluated and modified for the purpose of conducting these formative evaluations

***3C. Summative evaluation of GEBRI.*** In the absence of established standards for performance of a COBRE program, we will rely on the baseline evaluation conducted at the beginning of the project period to assess the *change* in the desired outcomes, namely enhancement of the biomedical research infrastructure and advancement of the careers of junior investigators participating in the GEBRI program. As such, we will aggregate the data collected for all of the annual (formative) evaluations of both the junior investigators and the Steering Committee (Parts 1 and 2). We will also survey the control group (i.e., faculty who had not participated in GEBRI; see above) to help determine whether the changes in outcomes for the GEBRI junior investigators can be attributed to enrollment in GEBRI (as distinct from a non-program influence).

**Alternative strategies.** A plan for remedying deficiencies in program administration will be established at the outset.

***Expected Outcomes.*** Upon implementation of the evaluation process, we will have a detailed set of specific, quantifiable, realistic milestones to provide regular, detailed feedback to the junior investigators on their progress to achieving the goal of obtaining a research project grant. We will also have established a mechanism for periodic evaluation of the effectiveness of the Steering Committee in order to make any necessary mid-course changes to the administration of GEBRI or to the mentoring program for the junior investigators. Finally, we will have established a process for collecting data that will permit a detailed final evaluation of the overall effectives of GEBRI in achieving its stated aims.

**Future directions.** At the conclusion of the five-year program, we will have accomplished the following: (1) established a stable, sustainable administrative structure for promoting biomedical research centered on GEBRI but with established partners within UNH and with our academic partners; (2) successfully mentored the initial four junior investigators as judged by their submission of funded NIH proposals, and recruited a second set of junior investigators who are mid-way through the mentoring process; (3) submitted a summative evaluation of the achievements of the program and its junior investigators, documentation of specific areas where the program succeeded or failed to achieve its stated goals, and a plan of action going forward to further develop the biomedical research infrastructure at UNH and in the region.

REFERENCES

1. Berk RA, Berg J, Mortimer R, Walton-Moss B, and Yeo TP (2005) Measuring the effectiveness of faculty mentoring relationships. *Acad Med,* **80,** 66-71.