DEPARTMENT OF BIOLOGICAL SCIENCES

STRATEGIC PLAN 2010-2014
INTRODUCTION
The Department of Biological Sciences aims to become a destination for world-class scholars and a flagship for the life sciences on this campus and across our state. We envision increasing opportunities for our departmental mission to impact society: the grand challenges of human health, energy supply and conservation of our environment can be tackled with solutions rooted in biological research.

Our previous strategic plan focused on hiring priorities to position the Department for outstanding research. This hiring plan has been successful, changing the demographics of Biological Sciences with an infusion of young and energetic talent. We aim to capitalize on this success with a new strategic plan that is congruous with the goals of the University’s New Synergies plan, and the College’s Insight, Innovation, Impact plan. It is at the Department level that “the rubber hits the road” in creating synergistic research teams, superb learning environments, and successful engagement initiatives on campus. To this end, our strategic plan is constructed as a roadmap – we describe our goals, strategies and metrics, with suggested routes and the first steps that we have taken or will take to advance toward our goals.

All departmental constituencies – faculty, staff, undergraduate, graduate and post-docs – contributed to defining our goals and strategies. An analysis of metrics will be shared annually with our Alumni Advisory Committee, the College of Science and with the faculty. A newly constituted executive team will determine mid-course corrections as needed.

VISION
A key strength of the Department lies in its broad scope of fundamental research in the life sciences across scales from the atomic, molecular and cellular, to organismal development, and to the ecological behaviors of populations. Our research is both interdisciplinary and integrative. We believe that this strength gives us enormous leverage to produce excellent educational opportunities, carry out grand challenge science, and stimulate research-based economic development. The Department will provide leadership in the life sciences within Purdue and across Indiana, and drive research thrusts with national and global impact. We will be proactive in building strategic partnerships with academic, corporate and government partners to maximize the societal impacts of our mission.

MISSION
Our core mission is to achieve excellence in basic research and strategic research with significant societal impacts. We train our students to be technically expert, scientifically literate and intellectually engaged, and we equip students from other disciplines with a fundamental knowledge in the life sciences. Both the University and College strategic plans articulate our values, culture, and commitment to people; everything that we do as a Department is enhanced by diversity, inclusivity, collegiality and respect. In the next five years, our specific aims are:
I. **Building a diverse community of excellence and impact:** We will lead by example, beginning with faculty recruitment, to provide the necessary role models for our students and our colleagues.

II. **Discovery with delivery:** We will provide leadership in the Life Sciences at Purdue and in Indiana for both basic research and strategic research aimed at solving grand challenge problems for society.

III. **Launching tomorrow’s leaders:** We will promote experiential learning for our undergraduates and boost the engagement of under-represented students.

IV. **Strategic partnerships to meet global challenges:** We will build the academic, corporate and government partnerships needed for our research and education missions.

**Benchmark institutions:** Our progress in these four areas will be through the analysis of key metrics of achievement, often in the context of comparison with our current peer institutions: Georgia Institute of Technology, Pennsylvania State University, Michigan State University, University of Florida, Texas A&M University, University of Arizona, University of California at Davis, University of Illinois, and University of Minnesota. We will also benchmark with institutions that are our aspirational peers: University of Michigan, University of California at Berkeley, Cornell University, and the University of Wisconsin. Of these institutions, only Texas A&M, Pennsylvania State and Georgia Institute of Technology have Biology departments, but all have programs with which we can compare strength in specific research focus areas.

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**I. BUILDING A DIVERSE COMMUNITY OF EXCELLENCE AND IMPACT:**

Foster a vibrant culture of creativity within the Department.

**I.1 Goal: Establish a climate of mutual respect**

This goal is focused on making the day-to-day Departmental climate more supportive and friendly for all members. By establishing a climate of mutual respect and team spirit, we will create the conditions for our faculty, staff and students to flourish.

**Strategies**

**I.1.1 Create and enact a mutual respect policy based on the statement of values within the University strategic plan.** A policy statement will be included in the information given to new members of the Department and the Head shall take several opportunities a year to stress the importance of mutual respect, for example, when welcoming incoming graduate students at the start of the academic year or at the Departmental retreat. All members of the Department will be accountable for their actions. While faculty, graduate students, postdoctoral scientists, and staff participate in diversity and gender workshops, it is important that the principles espoused in these workshops are translated into effective actions.

**I.1.2 Establish two new committees, one representing staff (SAC) and the other representing postdoctoral and research scientists (PRSAC).** We are launching two new
committees, similar to the existing undergraduate (UGAG) and graduate (BGSC) student committees, to provide constituencies within the Department the opportunity to voice their opinions. They will meet regularly with the Department Head and other executive team members. SAC will actively provide input to improve the department environment and pursue awards for staff members and training opportunities. Strategies to reward and retain excellent support staff will be developed by the Executive team working together with SAC. PRSAC will constitute a group that will work with the College to create a broader postdoctoral support community on campus, and become integrated with similar efforts in other departments. For example, PRSAC may promote research-specific brown bag lunches as a means to encourage interaction within the Department and across campus.

I.1.3 *Appoint an Ombudsman as a point of contact for graduate students, staff and research scientists to mediate interactions/difficulties with their supervisors.* We will designate a faculty member who can act to negotiate between parties and resolve issues quickly, before an issue has become significant enough to trigger formal Departmental mechanisms. This individual should have the confidence and respect of all constituencies in the Department.

**Metric**

1. Annual, anonymous-response, web-based surveys developed by the College will be used to track impact on Departmental climate of the mutual respect policy, the new committees, and the Ombudsman.

I.2 Goal: *Increase the representation of women and individuals belonging to under-represented groups in our Department.*

There are explicit diversity goals in the University Strategic Plan with which the Department is fully engaged. In this second goal, we address specific strategies for both recruitment and retention of under-represented faculty and staff. As strategies and tools are also developed at the College and University level, we need to maximize Departmental use of these resources. This information may be best conveyed to the Department through the designation of a Diversity Ombudsman who is dedicated specifically to diversity issues.

**Strategies:**

I.2.1 *Increase the retention of faculty from under-represented groups.* We will promote leadership development for women and under-represented faculty, ensure their representation on important Departmental committees while protecting their time from ‘overuse’, and be proactive in nominating them for research, teaching, and leadership awards on campus and nationally.

I.2.2 *Implement marketing techniques to target institutions serving under-represented groups and organizations such as SACNAS and MAC (Minority Affairs Committee-Am. Soc. Cell Biology).* We will maximize the use of our alumni and professional societies to provide the initial contacts with institutions that can help identify future faculty from under-represented groups. The recognition of Purdue as an NSF-funded ADVANCE institution can be used as a marketing tool in recruitment at the faculty level.
I.2.3 Invite outstanding individuals (at the postdoctoral level) to give research seminars or to participate in a funded visiting fellowship program. If outstanding post-doctoral scientists enjoy a stimulating and supportive visit to Purdue during the year or so before they enter the job market, they may be more inclined to apply for a faculty job. We could bring in “new blood” by establishing a funded visiting fellowship program. Desired outcomes are: to promote diversity; identify new talent early; and establish links to other institutions.

I.2.4 Create a Diversity Ombudsman position. A Diversity Ombudsman will be responsible for making cross-campus connections, helping individuals become connected to existing support groups, and informing the Department about University-wide strategies and programs. This person, a faculty member, will also work closely with the Affirmative Action Office to assist in addressing complaints reported by individuals belonging to under-represented groups.

Metrics
1. Track the number of individuals from under-represented groups at all levels in the department.
2. Track responses in exit interviews of individuals conducted by the Diversity Ombudsman.

I.3 Goal: Improve the quality of mentoring
Thoughtful and insightful mentoring is an important aspect of training at all career stages. By effective mentoring of junior faculty, we improve the chances of a successful return for the Department on a considerable investment of resources and we also train future mentors in good practices. For post-doctoral scientists, research scientists and continuing lecturers, mentoring provides a route for their future success and will encourage these future faculty members to be advocates for the Department because of their positive experiences.

Strategies
I.3.1 Provide better mentoring for post-doctoral scientists, research scientists and continuing lecturers. These groups contribute greatly to the research and teaching missions of the Department, but they lack opportunities for advancement, awards, and formal mentoring. NSF grants must now include a mentoring plan for postdoctoral scientists, in recognition of the fact that many post-doctoral scientists receive technical training but are not equipped with the tools for career development – writing of grants and papers, management skills, making presentations, networking and teaching. Outstanding achievement and talent in this group needs to be recognized and nurtured. A web site for the National Postdoctoral Association has a number of good ideas that can be assessed by the Executive Team, together with provisions for postdoctoral mentoring practices and communities within other CoS departments and within our peer institutions. Policies and programs to address mentoring and oversight will be overseen by an Associate Head for Research. The Associate Head for Undergraduate Studies will lead a mentoring effort for the continuing lecturers, including improved orientation of new continuing lecturers and training for developing education-oriented grants for resources.
The continuing lecturers will meet as a group with a designated mentor to discuss professional development issues and to transmit best practices.

I.3.2 Improve the effectiveness of mentoring for junior faculty by providing training/orientation for mentors. The External Review Committee recommended that the Department provide training or orientation to senior faculty mentors to improve their mentoring of junior faculty and reduce its perceived uneven quality. Another approach to improve mentoring is to have a joint meeting between senior and junior faculty in each of the research focus areas so that issues common to junior faculty can be addressed. Research focus areas may share the assessment of the quality of teaching activities in addition to classroom visits made by the teaching mentor. Mentoring activities will be reported in annual activity reports and recognized in evaluations of faculty. A training or discussion session will be instituted for junior faculty and all interested faculty to showcase good mentoring practices with regard to graduate students; skills and attributes to be developed include collegiality, respect, time management, responsible conduct of research, and professional development planning.

Metrics
1. Track development and implementation of mentoring practices for postdoctoral scientists and continuing lecturers.
2. Track development of training for senior faculty to become better mentors.
3. Track satisfaction of junior faculty, postdoctoral scientists, continuing lecturers and graduate students with mentoring practices as part of the metric in Goal 1.1.
4. Track destinations of postdoctoral scientists upon leaving the Department.

I.4 Goal: Improve lines of communication
Department members are often unaware of resources, initiatives or infrastructure that exist at the Department, College or University levels. Examples of such range from outreach activities already ongoing within the Department to grant-writer services provided by the VPR’s Office. Departmental policies with regard to salary compensation and teaching assignments represent two of the most contentious issues for faculty; these will be addressed by more transparent decision-making processes. The Head has instituted regular meetings with junior faculty to provide an avenue of direct communication for their concerns. Improving the lines of communication will also contribute to the goal of creating a climate of mutual respect if everyone understands the criteria by which decisions are made.

Strategies
I.4.1 Keep faculty and staff better informed of the resources and activities within the Department and at higher levels. Monthly faculty meetings provide an excellent opportunity for managers of resources to be invited to give short presentations. Sharing information through the web site and copying emails to staff when it affects them are important for the smooth operation of the Department. The Executive team will meet with staff each semester for an open forum event in which staff issues and concerns can be addressed.
I.4.2 Make explicit the criteria for faculty compensation each year. As compensation is determined largely from evaluation of faculty annual reports, the Head will iterate the importance of timely and inclusive submission.

I.4.3 Utilize wider faculty input to determine teaching efforts and course assignments. Faculty understand that they must fulfill the teaching requirements of the Department, an average of 1.5 courses per year for research active faculty. We will empower the Graduate Studies Committee and Undergraduate Studies Committee, convened with members of the newly constituted clusters and working with the Associate Head for Undergraduate Studies, to review the curricular needs of students, how well our courses meet student needs, what is already available on campus, and our collective teaching expertise. Suggestions include: use research focus areas to provide input to the curricular oversight committees on a yearly basis regarding course needs and teaching assignments; decrease the number of 500-level courses offered by our Department, taking into account their enrollment, and required vs. elective courses for various Biology majors; teach low-enrollment upper-level courses in alternate years; team faculty in junior/senior pairs according to shared expertise; use course evaluations to identify courses that need innovation and rejuvenation of the curriculum.

Metrics
1. Track satisfaction of faculty and staff with communication mechanisms as part of the metric in Goal 1.1.

II. DISCOVERY WITH DELIVERY: Achieve excellence in areas of fundamental biological research and in strategic and interdisciplinary research with broad societal impacts.

II.1 Goal: Enhance the research enterprise
Our success in the research enterprise is the impact that we have in contributing new and significant knowledge and technologies. Near- and long-term federal investments in instrumentation and infrastructure, energy sciences, health sciences, and education are likely, and we should be well-positioned to capitalize on opportunities. However, research dollars are not the only factor in creating an environment of research excellence, and we are building a culture of collaborative interaction. One step that we have taken is to re-organize the Department to reflect our current research strengths; synergies developed within and between research focus areas can enhance productivity and prominence. The current organizational structure has not been modified for many years and a new cadre of scientists has brought fresh opportunities for productive interactions. As the research focus areas coalesce, faculty members can define both individual and multi-investigator funding opportunities and future hiring priorities.

While we will draw more effectively on the experiences of faculty that have been involved in grant review panels, we also need to work with the College and the University to improve our connections with program managers and the funding agencies. Understanding what is truly meant in the description of a funding announcement
improves the chances of success by allowing us to write grants that are maximally responsive.

One of our most precious resources is time – if we are to drive forward an effort to increase research dollars then we need to facilitate other activities that faculty engage in and respect the time commitment that these activities represent. All faculty members are expected to contribute to the efficient functioning of the Department, beyond their commitments to teaching and research. However, we must protect faculty from having their energies dissipated, and better utilize administrative support, in order to facilitate the production of high-quality research and training grants.

Strategies

II.1.1 Re-define research focus areas to optimize interactions. We have aligned faculty in groupings that reflect both the current research portfolio of the Department and the major thrusts of modern biology. The desired outcomes are: to write more collaborative research and training grants; to improve interactions by area-specific seminars and research presentations; to market our strengths for student and faculty recruitment and to strategic partners; and to maximize the availability of shared equipment. As a first step, we have grouped our faculty into three major clusters, for administrative and teaching purposes, comprising Molecular Biosciences, Development and Disease, and Evolutionary Biology. Smaller units within each cluster represent research focus areas, comprising a minimum of three researchers. The concept is that each focus area is a group that would fit around a dinner table to have a conversation. Faculty members, and also faculty outside the Department, can join as many “dinner party” conversations as they wish, according to their research interests. The role of defining student curricula will be mediated by the Undergraduate and Graduate Studies Committees, which will be reconstituted with representation from the new research focus areas.

II.1.2 Promote research networking. Effective research networking among faculty requires clear routes of communication for funding opportunities both on and off campus, and the provision of supporting services that facilitate writing of multi-investigator grants. Creating opportunities for various research communities to brainstorm together may improve both the quantity and quality of applications. Brown bag lunches for faculty across campus have proven an effective mechanism in speeding response to funding opportunity announcements – faculty are already aware of each other’s research allowing interdisciplinary teams to form rapidly. Encouraging brainstorming on specific topics within the graduate student and post-doctoral communities could be a component of their training and a source of innovative ideas.

II.1.3 Build connections to the funding agencies. We will work with the College and University to provide routes for building better connections with program managers of the funding agencies. We also will seek resources for individual faculty to attend workshops that result in funding opportunity announcements and establish routes of communication for those individuals to provide information back to the campus research community.
II.1.4 **Cap and monitor time spent on administrative tasks for faculty.** Administrative tasks require a significant commitment of faculty time. Tasks need to be fairly apportioned so that faculty are not overburdened, adversely impacting the quality of both committee function and faculty research and teaching. We have reduced the total number of committees in the Department. Faculty and the Executive team will use the annual activity report to track the time commitment for administrative tasks including departmental-, college-, and university-assigned tasks, from which a spreadsheet of faculty and committee assignments can be compiled. Tasks done in excess of the cap could be rewarded by reducing time commitments to administrative tasks in the following year, or, for a very high quality contribution, recognized by an award.

II.1.5 **Work at the College and University level to enhance financial support for pilot projects.** The External Review Committee observed that the University and College provide little institutional funding for ‘seed money’ and investigator-level support, when compared with peer institutions. Small research investments to obtain preliminary data for a grant application can frequently be leveraged into larger-scale funding. We will maximize the use of existing seed-grant opportunities as available, but the Executive team will work with the College and University to improve this resource.

**Metrics**
1. Track number and amounts of awards.
2. Track numbers of single-investigator versus collaborative submissions.
3. Track success rate of Biological Sciences PIs receiving seed grants available from the University, Discovery Park, and College.
4. Track time spent on administrative tasks by faculty.

II.2 **Goal: Improve the research infrastructure**

The Department has little latitude for resource allocation to seed grants or to shared equipment. A plan to grow the research enterprise must provide for facilities and instrumentation that allow researchers to collect their data and with rates competitive with those of peer institutions. The External Review Committee was very critical of the lack of sufficient support for Campus-wide core infrastructure including: 1) the sequencing facility; 2) the metabolomics facility; 3) the cell sorting facility; and 4) the animal facility, all of which impact our research. The Department will work with the College and University to leverage resources where possible for these facilities, such that their costs for researchers are kept to a minimum.

The External Review Committee was also very critical of the lack of physical facilities for the Department despite the construction of the Hockmeyer Hall of Structural Biology. It is not a sustainable option to continue depending on renovations of Lilly Hall.

**Strategies**

II.2.1 **Establish the clear near- and long-term physical needs and plans for the Department.** The Executive team will work closely with the College and University toward the goal of a new Life Sciences building that is a flagship building for the College of Science and the University in sustainable and innovative design. Both faculty from
Biological Sciences and faculty from other units on campus could benefit from the possibility of new research interactions in such a building.

II.2.2 Make a financial plan that allows allocation of Departmental resources, leveraging of College and University resources, and opportunities through funding agencies and business partners for infrastructure needs. We will identify and make plans for equipment and infrastructure needs through annual evaluations involving each of the new research areas. Part of a longer-term financial plan will leverage relationships with existing Purdue Centers and units, especially the Bindley Biosciences Center, and obtain cross-campus support for equipment and adequate technical support. Involving the Development Office in implementation of the financial plan may provide some additional external resources. For example, a partnership providing access to expertise and use of a high-end instrument may make it attractive to a company to invest in a portion of the instrument cost.

Metrics
1. Track progress made toward a new Life Sciences building on campus.
2. Track source, number and amounts of awards made for instrumentation.
3. Track usage of departmentally-owned equipment and instrumentation.

II.3 Goal: Promote the national and international reputation of the department
Our web site has developed on an ad hoc basis over a number of years. It is informative but not distinctive or differentiated. This is our face to the world, and as such, we need a web site that is engaging and intuitive with strong visual impact. For many potential undergraduate or graduate students, the web site is their first contact with the department and plays a significant role in their decision to apply or not. Similarly, we can create a strong first impression for prospective strategic partners.

National academy membership, prestigious fellowships, distinguished professorships and national and international prizes are metrics by which research strength can be highlighted. Identifying and supporting individuals also involves facilitating some of the interactions that may result in names being put forward for these awards.

The criteria used by various publications to rank universities have been collated by the VPR’s office. While we cannot overcome the negative impacts of both the absence of an associated medical school and the state of Lilly Hall, there are some criteria that are within our ability to change.

Strategies:
II.3.1 Revitalize the Department website. We will charge the BIO-IT committee with strong faculty representation to revise and oversee our web content. A first step is for the committee to evaluate and recommend more effective lines of communication between faculty, staff and graduate students and the web site manager, such that information on the web site is up-dated on a regular basis, and that our web site reflects our increasing diversity. In-house expertise in web design will be used to create a more distinctive “brand” for the Department.
II.3.2 Identify potential future NAS members and provide resources to promote their development or to make them candidates for key prizes and awards. A first step is for faculty to identify NAS members and invite them to visit the Department and to showcase our achievements. A Department of our size should have more distinguished professorships and two or three endowed Chairs and the Executive team will work with the Development Offices of the College and University to enable this.

II.3.3 Ensure that faculty who are eligible for awards in their national research organizations are nominated. A first step is to gather information about which faculty belong to the major organizations (e.g., ASM, ASCB) and which awards and recognitions are granted by those organizations. The External Recognition of Faculty Committee will target our most accomplished faculty for nomination and coordinate letters of recommendation.

II.3.4 Examine the criteria used in national rankings and evaluate how we could optimize our performance on these criteria. The Executive team will obtain the relevant information from the VPR’s office and provide an analysis to the faculty for discussion.

Metrics
1. Include a survey for web site visitors and make modifications based on this feedback.
2. Monitor frequency of web site updates by faculty.
3. Track how many NAS members visit the Department each year.
4. Track awards received by faculty.
5. Track Departmental national rankings.

II.4 Goal: Build a strong and diverse community of graduate students
A key to achieving excellence is to recruit from the broadest possible pool of talent. The recruitment of applicants from under-represented groups is a priority but faculty participation in this effort needs to be broadened. In part, this could be incentivized by recognition of this contribution in making faculty merit awards, and also by providing faculty with material for the “broader impacts” section of their NSF proposals.

Our students are balkanized in our laboratories, and this situation is compounded by the geography of a Department split between multiple floors of three buildings. Although there are existing opportunities for the graduate students to meet as a group, few of our foreign students in particular are active participants in events. We will address this in part by building a graduate core curriculum that each new cohort of students will progress through together. At present, each focus area defines separate aspects of the curriculum without integration into an overall training structure.

Strategies
II.4.1 Increase the numbers of students from under-represented groups through aggressive recruiting. We can work with our alumni and professional societies to leverage their interactions with key institutions, and especially via initiatives through SACNAS, Tecumseh and ABRCMS. Identifying talented undergraduates and
II.4.2  **Graduate Fellowships: Revamp and use existing programs, and seek funding for the creation of new fellowships.**  We will work with the College and the University to promote a University-wide fellowship program as part of implementing the diversity goals of both Strategic Plans. The PT Gilham fund represents a funding source within the Department for the promotion of a diverse intellectual environment.

II.4.3  **Develop a curriculum addressing key competencies for our graduate students to be taken during the first year.**  PULSe has developed a series of courses on ethics, presentation skills, writing skills and statistics that we may take advantage of, or use as a base for developing a biology-specific curriculum addressing key competencies for our students. A first step is for the Graduate and Advanced Studies Committee to evaluate the range of courses already available and develop a timetable that our students can traverse as a cohort in the first year. The committee should solicit input on a regular basis from the Biology Graduate Student Council. As part of this curriculum, we should develop a graduate student research-in-progress seminar series. Providing the opportunity for students to present their research to each other, or to brainstorm around a particular research topic, allows them to build a community of shared intellectual life.

II.4.4  **Promote broader participation of graduate students in department-wide activities.**  Attendance at departmental seminars and for social events is patchy – faculty will actively encourage their students to participate. Encourage and promote the activities of the Biology Graduate Student Council, and provide them with appropriate resources.

**Metrics**

1. Track the number of graduate students from under-represented groups.
2. Track the number of recruiting visits.
3. Track numbers of fellowships obtained by individuals in under-represented groups.
4. Track development of a core curriculum for graduate students.
5. Track graduate student participation, especially in activities organized by the Biology Graduate Students Committee.

**II.5 Goal: Increase Graduate Student Support.**

Successful recruitment of excellent graduate students depends upon provision of competitive compensation packages, at least relative to those of our peer institutions. We also advocate that the graduate school application fee be reduced or waived, as this represents a very substantial cost to graduate students.

*Strategies*
II.5.1 *Promote development of training grants and fellowship support.* We would like to have the resources both to support fully our first year graduate students (and thus address an inequality between students enrolled through PULSe and through Biological Sciences), and to provide support for graduate students who are near the end of their Ph.D. to improve the quality of their publications. This can only be effected by increasing overall resources in the Department that can be used for graduate stipends. We will provide incentives to faculty who are leaders in the development of training grants (for example, by removing other administrative tasks, providing teaching assistantships to a course taught by the PI, or by providing partial support for a graduate student in the PI’s lab). We will also develop a database of information useful to those preparing training grants. It is also important that the College and the University are willing to contribute adequate cost-share to training grant applications, where appropriate, to increase their chances of success. We will maximize the number of 1st- and 2nd-year graduate student-initiated fellowship grants, and ensure that incentive grants are retained. In parallel, we will reduce the number of first-year graduate students involved in training assistantships. A first step will be to incorporate grant-writing skills early in the graduate core curriculum and to encourage all of our graduate students to prepare fellowship applications.

II.5.2 *Ensure that every graduate student has presented in at least one national/international meeting by the 5th year.* To this end, we will continue to build our current Achieve Excellence endowment that supports graduate student travel to meetings as well as actively encouraging graduate students to apply for College of Science, University, and extramural funding to attend meetings.

II.5.3 *Ensure competitive compensation for graduate students relative to peer universities.* The Business Office and Executive team continue to stress to faculty that stipends should be equal to those of the PULSe program unless there is a critical financial issue. However, even the PULSe stipend is not competitive within Big 10 schools. We will work with PULSe and within the Department to gain resources that allow stipends supported by a research assistantship or a teaching assistantship to be at least at the median levels of the Big 10 schools, and to submit grant applications with increased costs for graduate student stipends. The Development Office will work to build the PT Gilham Fellowship fund, now a signature fund in the Department for augmenting graduate student support.

**Metrics**
1. Numbers of submitted and successful training grants
2. Number of meetings attended by graduate students
3. Track amount of stipend relative to comparable programs in Big 10 schools.

III. **LAUNCHING TOMORROW’S LEADERS: Provide our undergraduate students with a fully-rounded and high-quality education to achieve their potential.**

III.1 **Goal: Facilitate early student success**
We aim to improve the retention of our undergraduate majors into the second year, particularly for students from underrepresented groups. We will provide more course opportunities supporting the transition to University life. Our Undergraduate Advising Office will work closely with the College Advising Office to coordinate efforts to provide students with information and support, both financial resources and campus organizations supporting underrepresented groups. Informing students of available financial resources and helping them to apply could have a significant impact on retention.

Strategies

III.1.1 *Create a self-funding BRIDGE program for incoming freshmen.* We will apply for large-scale grant opportunities to expand resources, especially for under-represented groups. Existing relationships with teachers will be used to build a pilot program. A strong component of the program will be to create incubator labs to expose students early to a summer research experience. We will develop a rigorous academic orientation to help students transition to college life, including study skills, note-taking techniques, meta-cognition, and individual learning styles.

III.1.2 *Target students early who may struggle in the introductory courses of the Biology sequence.* The College academic advisors may be able to identify such students from their academic records. College and Departmental academic advisors should coordinate efforts to encourage students to acquire the quantitative, writing and study skills in their first year that are necessary for success before entering the Biology core courses. We will develop “enhanced sections” of our introductory courses, to be taken for extra credit, that may proceed at the students’ pace of learning and promote formation of learning communities.

III.1.3 *Make the gateway lecture and laboratory courses vibrant learning experiences.* We will continue to put our best faculty into the Biology introductory courses. We will introduce more research or project-based laboratories so that the lab courses are a more significant learning experience for students.

Metrics

1. Track responses in a web-based survey for students that leave Biology.
2. Track student success in the Freshman year after participation in the BRIDGE program.
3. Track student success from participation in enhanced sections.
4. Continue to track gateway course evaluations.

III.2 *Goal: Improve the undergraduate educational experience*

The life science students who will be responsible for solving the global challenges of tomorrow need a different type of education today. At Purdue we have world-class science and engineering faculty taking on these challenges through research and design. Many of our undergraduate students participate in research experiences that engender a ‘culture of discovery’ among them, driving their thirst for knowledge and their confidence that they too can make a difference in the world. The life science education model that would support this ‘culture of discovery’ will require more training in
interdisciplinary collaborations, early opportunities for research experience, and increased focus on quantitative and computer-based tools.

**Strategies**

**III.2.1 Expand the honors curriculum, so that selected students can traverse the introductory curriculum more rapidly with more intensive classes.** The CASPiE model employed by chemistry (http://www.purdue.edu/dp/caspie/index.html) utilizes authentic research to teach students fundamental skills as well as the process of discovery (provides a research experience for first-year students). We plan to adapt this approach to the life sciences and will pilot this laboratory with our honor’s students next year.

**III.2.2 Continue efforts to provide funded summer research opportunities for students.** We will, for example, resubmit our application for support to the Howard Hughes Medical Institute and continue to develop industrial internships.

**III.2.3 Engage students more effectively by developing their technical presentation and writing skills.** More opportunities for encountering the primary scientific literature and quantitative and computer-based tools will be provided from first-year courses onward. Students will be guided to take advantage of the opportunities for writing instruction provided by the University.

**III.2.4 Advocate continued development of courses in physics and organic chemistry that are specialized for Biology majors, in consultation with those departments.** The Undergraduate Studies Committee will work to ensure that the curriculum in courses taught in other departments fulfills the needs of our students. We suggest reducing the combination of general and organic chemistry to three semesters and requiring biochemistry early; integrating physics earlier and more effectively into the curriculum; and focusing on the utilization of skills in quantitative analysis in courses.

**III.2.5 Institute a periodic curriculum review and assessment procedure.** The Undergraduate Studies Committee will take responsibility for balancing the portfolio of courses and the course contents, and work with the research focus areas to implement changes. Desired outcomes are: to facilitate the provision of Undergraduate Student Learning Outcomes; to evaluate both the core and advanced curriculum and determine whether or not the courses are adequately covering a set of key biological concepts and experiential learning activities; to coordinate input from the research focus areas for the advanced undergraduate curriculum; to minimize redundancy in the curriculum; to assist in determining the frequency with which courses should be offered.

**III.2.6 Expand experiential learning opportunities.** Our best teaching is done in our research laboratories; this experiential learning provides students with real insight and participation in the process of discovery. The Department will work with the College and University to provide additional resources to incentivize this training, perhaps by providing some supply money directly to the research laboratory in which the undergraduate is engaged in research for course credit. Many students will continue to be served by our Capstone Laboratory courses as their principle experience with advanced
biological techniques. These courses need to be refreshed with equipment upgrades on an ongoing basis. It will be helpful for every lab to provide a general laboratory-specific report of course requirements such as written lab reports, lab meeting presentations, lab meeting attendance, reading of the primary literature and/or general wet lab benchwork. Desired outcomes are: to encourage additional faculty participation perhaps by covering the student (through fellowships) or the laboratory expenses (through supply monies); experiential learning opportunities that improve the relevance of information being presented in lecture courses; provision of a de facto faculty mentor early in their curriculum; to provide a better match between faculty and student expectations for the undergraduate research experience and to provide explicit criteria to distinguish between Honors Research credit vs. regular Undergraduate Research credit; to assist with the University accreditation process. In addition, we will seek more participation in service learning courses similar to EPICS in the College of Engineering, to equip our students with a broad set of practical skills.

**Metrics**
1. Track enrollment in upper division courses.
2. Continue to track course evaluations.
3. Track University/College metrics for student learning outcomes.
4. Continue to track destinations for graduates.

**IV. STRATEGIC PARTNERSHIPS TO MEET GLOBAL CHALLENGES:**

**Develop deeper connections with other units on the Purdue campus, in Indiana, and with national and international academic, education and corporate partners.**

**IV.1 Goal: Maximize interactions with Discovery Park Centers.**
If the Department is to provide leadership in the life sciences on campus, we must be fully engaged with Discovery Park. As a first step, the Directors of DP Centers will be invited to make a presentation for the faculty describing resources, access, and how to promote interactions.

**Strategies**

**IV.1.1 Develop a vision for closer integration with Bindley Biosciences Center.**
Building relationships with Bindley, through joint projects and interactions between Biology PIs and Bindley personnel, will be used as a model for connecting to other Discovery Park resources, for example, the Center for Entrepreneurship and the Discovery Learning Center.

**Metrics**
1. Track joint grant submissions and awards with individuals in the Bindley and other Discovery Park entities.

**IV.2 Goal: Work with Indiana business, education and government partners to promote research-based economic development and educational opportunity and build relationships with world-leading national and international academic partners.**
Integral to our ability to grow the research and education enterprise of the Department is a plan involving new academic, corporate and government partners. Building these partnerships will require a significant commitment by faculty. One possibility is to identify individuals who are either in late-stage career but with the requisite knowledge and experience, or who desire to enter an alternative track of career development. It will be important to recognize the contributions that are made in these signature areas in pay awards and promotion/tenure decisions.

**Strategies**

**IV.2.1 Partner with regional campuses, Indiana liberal arts colleges and historically black institutions to increase educational opportunity for undergraduates.** Linking with other educational institutions in Indiana can provide opportunity to draw students from varied academic and socioeconomic backgrounds, and for collaborative grant applications such as the Howard Hughes Medical Institute science education program.

**IV.2.2 Promote economic development in the life sciences in Indiana.** Within the Department, we will raise awareness of steps involved in managing intellectual property and launching start-up companies. We will build on the Innovation Alliance with IU and existing relationships with Biocrossroads. We will work to develop Professional Masters Programs and work with Biocrossroads to establish short technical courses to update those individuals in life science positions in industry.

**IV.2.3 Develop relationships with corporate partners.** Our Alumni Advisory Committee will work with us on a corporate liaison committee, that may for example, identify mentors with industry connections to build corporate engagement. We will use corporate engagement to establish more internship opportunities for our undergraduates. We will work to build track records of accomplishment with key partners.

**IV.2.4 Develop relationships with centers of academic excellence.** We will build on existing DOE national lab partnerships with Argonne and the National Renewable Energy Laboratory, and partnerships with Indiana University and Northwestern University in the Clinical Translational Sciences Institute (CTSI). We will build on existing DOE national lab partnerships with Argonne and the National Renewable Energy Laboratory, and partnerships with Indiana University and Notre Dame University in the Clinical Translational Sciences Institute (CTSI) and the Korea Institute of Science and Technology (KIST). We will develop relationships with targeted universities to serve graduate student recruitment and with centers of academic excellence for major funding opportunities.

**Metrics**

1. Track numbers of academic, corporate, and government partners.
2. Track the value of the relationship to the Department, for example, financial gifts, cost-share in grant applications, provision of undergraduate internships.
3. Track numbers of grants submitted and awarded jointly with other institutions.

**IV.3 Goal: Increase faculty engagement in outreach activities.**
We need to engage the support of our local community and beyond for our academic mission.

**Strategies**

**IV.3.1 Make faculty aware of the range of programs and the benefits of outreach activities for “broader impacts” in grant applications.** We need to develop an “idea farm” for broader impacts. More resources from retiring and late-career faculty could be used for outreach activities.

**IV.3.2 Include selected faculty as ambassadors in focus visits to schools (faculty-in-the-classroom program) and meetings of the Hoosier Association of Science Teachers.**

**IV.3.3 Engage with the community.** Another aspect of experiential learning for our students could be to promote their interactions with the community. As a first step we have created the community lab in Lilly Hall as a resource for faculty-school interactions, beginning in the 9th grade.

**Metrics**

1. Track faculty involvement in outreach activities.
2. Track faculty involvement with local organizations.