

## Biochemistry & Biophysics 10-year SP2017 Strategic Plan

(adopted November 3, 2017)

### Significance of the BB department and programs

*Historical Context:* Since the 1967-68 academic year, the Department of Biochemistry and Biophysics (BB) in the College of Science has been the academic home to an excellent cadre of faculty who have successfully accomplished a dual pronged mission of fundamental, cutting-edge research in molecular life sciences, and teaching upper division and graduate coursework in Biochemistry and Biophysics. This included courses in general biochemistry for non-majors and more in-depth courses for majors. BB has offered bachelors, masters, and doctoral degrees. Prior to 1967, the Department of Chemistry offered degrees with emphases in Biochemistry or Biochemistry and Biophysics. Our roughly 850 alumni include about 480 B.S., 85 Honors B.S., 95 M.S., and 190 Ph.D. degrees.

*Who we are today:* With the successes of genomics, the rise of personalized medicine and the pursuit of molecular explanations for all aspects of biology from evolution through behavior, the disciplines of biochemistry, biophysics, and molecular biology have become increasingly central to biology in general and biomedical sciences in particular. In BB, our faculty and students share excitement about life at the molecular level – understanding both *what* processes take place and *how* they occur. Our department also values community and teamwork, and our faculty and staff cultivate a supportive, family-like atmosphere promoting the well-being and success of all students. Our passion is discovery and new knowledge through the research of our faculty, students and collaborators across campus and around the world. This is only equaled by our passion for providing an excellent education to students at OSU and around the world through on-campus and on-line courses. Our departmental slogan: “Revealing how life works, for the benefit of all” captures this attitude and commitment.

BB is a vibrant, diverse and collaborative community that includes 30 faculty (12 adjunct faculty from seven different departments), about 30 doctoral students, and about 240 undergraduate BB/BMB majors. The departments of BB, Microbiology, and Integrative Biology comprise the School of Life Sciences. Our faculty’s research interests span biochemical, molecular, cellular, synthetic and structural biology, with most advancing OSU’s signature area of “improving human health and wellness,” but also contributing to “the science of sustainable earth ecosystems” and “economic growth and social progress.” Our program successfully competes for ~\$4 million of grants/contracts annually, mostly from the National Institutes of Health (NIH) and the National Science Foundation (NSF), to fund the majority of research. Also, BB faculty led the successful acquisition of a new 800 MHz NMR instrument for a structural biology facility on OSU’s campus, established a one-of-a-kind Unnatural Protein Facility, and an NSF-funded program to increase the success of students from under-represented groups by engaging them in research their freshman year. Four BB faculty are members of the Linus Pauling Institute, which studies micronutrients and antioxidants in human health and aging.

BB faculty have won many research, instructional and advising awards, account for a remarkable 11% of OSU Distinguished Professors. Similarly, our graduate and undergraduates include many top students: for instance, 25% of our BB majors are in the Honors College, nearly 65% of the OSU Goldwater Scholarships awarded since 2004 were BB majors, and BB graduate students regularly win awards at conferences and from the OSU Graduate School. Particular strengths of the undergraduate program are the rigor of the curriculum, the genuine sense of community our students experience and our emphasis that nearly all of our students are involved in life-changing undergraduate research experiences.

*Looking to the future:* The next decade is an important time of growth for the department as the areas of biochemistry, biophysics and molecular biology are of increasing importance in this era of quantitative biology. This growth will build on an already strong foundation of the department’s vibrant undergraduate and graduate programs, as documented by their 2015 decennial reviews. The reviewers noted that the undergraduate program was “excellent and robust” with particular strengths being its “rigorous, well-organized” curriculum, the “high degree of faculty engagement,” “the strong placement of students in post-baccalaureate programs” with alumni feeling that “they had been well-prepared,” “advisory, mentoring, and tutoring programs” and “noteworthy student involvement in laboratory research.” The reviewers noted that the graduate program was “comparable to that of any of the best graduate programs in this field in the country” with particular strengths being the “democratic, supportive,” “outstanding,” and “extraordinarily committed” faculty,” the “positive atmosphere ... as a close-knit community,” and the “excellent, personalized training” of graduate students. It was also noted that the program is well-positioned to participate in

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major College of Science and OSU initiatives such as “big data”, “marine studies”, and “materials sciences”. Furthermore, BB not only provides excellent training to our majors, but also provides key upper-division general biochemistry and molecular and cell biology courses to thousands of OSU life science and pre-professional majors and, through Ecampus courses and free online lectures, to students around the world.

As one major initiative to grow our impact, we have just this year introduced a new “Biochemistry and Molecular Biology” major that is suitable for career options that do not require as much biophysics. It includes a deeper focus in molecular biology in place of physical chemistry and biophysics. We expect this new major to serve a broader range of students and that it will lead to a tripling of our number of graduates over the next decade. We also will seek to grow our doctoral program by 10%, on top of the ~25% growth over the last five years, and we will seek to triple our number of master’s degree students. During this upcoming period, it is of crucial importance that we not only maintain faculty strength through recruiting excellent and diverse new faculty as current faculty move to administrative posts or retire, but that we also grow our faculty by two or more positions to accommodate the increased teaching and advising loads associated with our growing programs. We will also improve student retention and strive for educational equity across diverse student populations by increasing active learning strategies in all of our courses and helping lead the innovative College of Science initiatives that will broadly incorporate a practical personal-development focus across the curriculum to enhance our students’ career readiness. We will face additional challenges keeping our students’ sense of community and providing sufficient authentic research experiences with more undergraduate majors. To address the latter, we have developed innovative course-based undergraduate research experiences that, while fantastic, are also costly and eventually may need more space than we have. To keep these courses at the highest standards and support research activities, we will need funds for maintaining and modernizing equipment, and for supporting additional graduate Teaching Assistants and undergraduate Learning Assistants. This will contribute to both graduate program growth and improved undergraduate success. Furthermore, we will need additional funds to support undergraduate research and other experiential learning opportunities to help equalize outcomes for all students by making such transformative experiences equally accessible to students with financial needs.

To meet these financial challenges, we must not only grow our degree programs, but we must maintain and expand on the highly successful Ecampus versions of our large enrollment courses, develop new Ecampus courses, and grow our philanthropy. Faculty success creates student opportunities and successes; therefore, we must also prioritize faculty support, acquisition and maintenance of research equipment and instrumentation, and recruitment of new faculty. Discussed priority faculty hires are: 1) replacements in pedagogy/Ecampus offerings (related to the impending retirements of Drs. Ahern and Rajagopal), 2) researchers in three areas of structural biology (cryoEM, X-ray crystallography and mass spectrometry), 3) researchers in cell biology and neuroscience (related to the impending retirement of former Chair Dr. Merrill), and 4) excellent biochemists, biophysicists or molecular biologists with research related to the OSU priority areas of biomedical sciences, big data, marine studies, and materials sciences. To lead the department into the next decade, we also argue that the time is ripe for an outside search to hire as Department Head a prominent mid-career scholar with an international reputation in research and teaching. This reflects the current strength of the department and its programs, and the opportunities for hiring new faculty to re-shape programs will likely shift, based on expected faculty retirements within the next decade (Drs. Karplus, Hagen, and Beckman).

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### **Mission:**

*To be a diverse, inclusive community that serves students, our professions and the public through innovative education, individualized advising, holistic mentoring and cutting-edge molecular life science research that creates knowledge and solves real-life problems.*

Accomplishing this mission entails being a diverse and inclusive community that:

- provides excellent, pedagogically effective classroom/laboratory training for students at Oregon State University and around the world
- provides caring, individualized advising for our majors that helps prepare them for success in their chosen careers and in life
- develops innovative educational resources
- performs significant original research into the myriad of molecular mechanisms underlying life and disease, creates marketable technologies that practically benefit society, and provides transformative hands-on training for undergraduate students, graduate students and post-doctoral fellows
- provides service and leadership to our professional communities and through effective outreach helps educate the public about our discipline and the value of science.

### **Vision:**

*Changing the world through scientific discoveries and empowering educational experiences for all students.*

### **Values:**

**Integrity** - We act ethically, with honesty and honor, and without compromising the truth to ensure we do what is right.

**Diversity and Respect** – We recognize that diversity and excellence go hand-in-hand, enhancing our teaching, scholarship, and service. We respect all people, value the perspective and credibility of individuals from different racial, ethnic and socioeconomic backgrounds and treat people in the way we want them to treat us.

**Teamwork and Community** – We care about and help each other. We have fun working together. To maximize our collective impact, we inspire, challenge and support each other to be the best we can.

**Service** – We are public employees and take seriously our calling to serve our community, state, country and the world.

**Excellence** – We commit to constantly improve and provide the highest quality work that exceeds the expectations of our students, colleagues, administrators, collaborators, alumni and supporters/shareholders. We change lives for the better by striving for excellence.

**Knowledge** – Curiosity drives us to create new knowledge through research, discovery and invention. We are experts in our fields and enthusiastically share knowledge and ideas with our constituents through effective communication and teaching.

### **Slogan:**

*Revealing how life works, for the benefit of all*

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## SWOT Analysis

### Strengths

- Capable, engaged and increasingly diverse faculty with reasonable balance of seniority
  - high level of collegiality and community
  - LPI, EHSC affiliations
  - Many federally funded
  - diverse research strengths (structural biology, IDPs, GCE, aging, motor proteins)
  - engagement in undergraduate research
- BB leadership support for faculty
- Excellent undergrad and grad programs and students; ASBMB accreditation
  - undergraduate research support (CURE/SURE)
  - Firm GTA lines including two from IB
- Popular Ecampus versions of all highly enrolled courses; YouTube presence and OER texts
- Central role in STEM leaders program
- Research-based lab courses

### Weaknesses

- number of faculty w/o external research funding
  - Lack of funds for pilot projects for generating preliminary data for grant applications
  - Low proposal preparation support and research office without strong NIH expertise
- traditionally low faculty engagement in department business; weak faculty mentoring
- 6-year graduation rates and achievement gap
- low faculty diversity
- Stability/level office support
- Use of social media for multiple purposes

### Opportunities

- Create strategic plan roadmap we buy into and pursue
- Grow teaching-based income streams
  - grow Ecampus enrollment
  - new Ecampus courses (BB481/581; BaccCore fitness; BB331?, 200-level biophysics; BaccCore neuroscience course?)
  - Accelerated Masters programs
  - PACE courses
- With retirements, there will be new hires
- Build regional/national excellence areas
  - UP facility and GCE technology
  - 800 MHz Biomolecular NMR center
  - LPI micronutrients ; healthy aging
  - Mass Spec innovations involving Joe Beckman
  - attract NIH center grant
  - Build on OER resources
- Building successful BMB major, tripling or more our undergraduate degrees granted; add undergraduate neuroscience option
- COS Chris Larson developing internships/work-readiness trainings
- Increase IP development (SBIR, STTR)
- New RAPs (Cooley, Franco, Estevez)
- Increase research collaborations
  - with School of Life Sciences; Matt Andrews
  - colleagues across campus;
  - Marine Studies initiative; Cascades campus; Knight Cancer center; materials center; Brain Initiative
- Increase ties with alumni for fundraising

### Threats

- Ecampus, Recruitment, Honors college connections largely, advising leadership on shoulders of Kevin and Indira, who plan to retire in Dec 2018
- Recent/upcoming loss of faculty (Frei, Zhang, Merrill, Greenwood, Karplus, Beckman); weakening of LPI connection
- Increased advising and teaching workload with new BMB major; especially related to meeting need for WIC and lab courses; space/time needs for growing offerings needed of lab courses
- Budget shortfalls/funding challenges
  - Federal/University/College/Dept budget cuts
  - Shifting college/university funding models leading to underfunding of department
  - Increasingly competitive funding climate;
  - High tuition cost of graduate students

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### Six Strategic Priorities

**To achieve our vision for 2027, we have defined six key priorities that we will pursue. Here these priorities are listed along with two to four key goals that are associated with the priority. In addition, in an appendix we include for each priority a more extensive set of types of action steps to take related to each priority. The six priorities relate to (1) our People and Culture, (2) our Undergraduate Program, (3) our Graduate Program, (4) our Research and Research-teaching related Infrastructure, (5) our Extended Campus Programs, and (6) our Outreach, Alumni Relations and Fundraising activities.**

**Strategic Priority 1: People and Culture** - *Our faculty and staff are the key to our future successes so we must attract, engage, support, train and retain excellent, diverse, and team-oriented faculty and staff, with faculty growth needed to meet the needs of our growing programs.*

#### Key goals

- (1) By June 2019 hire diversity-minded, visionary mid-career scholar as Department Head – forward looking and synergistic with current faculty bringing a healthy breadth while building on strengths.
- (2) Maintain faculty strength by replacing all FTE with equivalent positions for teaching and research while building on current areas of research strength and accounting for teaching needs, and with a commitment to increase faculty diversity, especially increasing women and URM faculty toward aspirational targets of 50% and 15%, respectively. Furthermore, add faculty FTE as needed to accommodate increased advising and teaching responsibilities associated with the growing undergraduate major population.
- (3) By 2018, improve service from the BB office to faculty and students by adding 0.5 FTE to the BB office, reviewing and revising position descriptions for BB office staff and using professional development opportunities to maximize staff productivity and efficiency.

**Strategic Priority 2 - Undergraduate Program:** *Expand our impact by growing our new BMB major to have the same excellence as our BB major while modernizing our pedagogy across the curriculum and increasing the diversity and success of students in both majors.*

#### Key goals

- (1) By 2022, add needed infrastructure and faculty FTE to grow both the BMB and BB programs so that together they are graduating 60-80 students per year. Further, both programs will achieve rates of >90% first-year retention at OSU for incoming students and >75% OSU graduation within 6-years. Also, >67% of graduating majors will achieve BMB certification, >80% of graduating seniors will have been involved in undergraduate research, and at least 3 students/year will be nominated for a Goldwater award.
- (2) By 2020, with BMB major in place and some new courses available, perform a comprehensive evaluation of the BB major curriculum considering opportunities to engage majors earlier and incorporating options, while also creating a completely online Biochemistry minor.
- (3) In collaboration with the College of Science, incorporate professional development content into the BB and BMB majors to better prepare students for jobs, and erase performance gaps of URM students in both majors.
- (4) By 2022, have the design and delivery of all BB/BMB courses reflect scientific teaching principles.

**Strategic Priority 3 – Graduate Program:** *Enhance the quality of graduate student training and professional preparation for both academic and non-academic careers and attract continued support for all doctoral candidates in good standing.*

#### Key goals

- (1) By 2022, the PhD program will increase its visibility and recruiting and grow by 20% (graduating 4 students per year up from 3.3). BB administered Masters Programs (including Accelerated Masters Programs) will be graduating 3 MS students per year.
- (2) By 2022, improve and expand the graduate program by having all first-year doctoral students supported by

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GRAs during their first year and GTAs during their second year, and 10% of students in the program supported by an extra-departmental graduate fellowship.

- (3) By 2022, develop five modular 1 credit courses focused on specific topics or discipline-related skills that can be offered both on campus and online.

**Strategic Priority 4 – Research and Research-teaching related Infrastructure:** *Increase our research impact and profile by improving success in external funding, encouraging intellectual property development, pursuing synergistic collaborations and hires that enhance our breadth while building on strengths, and by proactive investments in laboratory facilities and instrumentation.*

### Key goals

- (1) By 2022, core BB research active faculty members will all have research funding at the level of one R01 or its equivalent, and as a group have secured at least one large multidisciplinary grant (e.g. program project P01 or training grant). (see also SP1, goals 1 and 2)
- (2) Promote, support, and shape the growth of the **Unnatural Protein (UP) Facility** and **biomolecular NMR facility** to become regionally/nationally recognized centers, and by 2022, win external funding for the **UP Facility** as a national resource.
- (3) Recognize in annual reviews and support with matching funds faculty efforts to develop intellectual property and pursue commercialization, because these have realistic revenue generating potential.

**Strategic Priority 5. – Extended Campus Programs:** *Expand our impact in training students in biochemistry and biophysics and stabilize the department's financial health by growing our extended campus footprint.*

### Key goals

- (1) By 2018 and 2021 respectively, replace Rajagopal and Ahern positions with hires that will continue/establish Ecampus offerings for large enrollment BB courses (314, 350, 450, 451) and advise BB faculty and graduate students in teaching pedagogy and Extended campus course development.
- (2) By 2021 develop fully online biochemistry minor
- (3) By 2022 double total revenues from BB Extended campus courses
- (4) Explore in collaboration with the College of Science the development of a molecular science-based Bacc Core health class primarily delivered through Ecampus that provides OSU students a second option for satisfying this requirement. For many OSU students, it will provide greater value than the existing option and would generate revenue for COS and BB.

**Strategic Priority 6 – Outreach, Alumni Relations and Fundraising:** *Educate and inspire the general public, K-12 schools, and our alumni about science while demonstrating the value, relevance and positive impact of molecular sciences and our research and education activities. Attract and partner with alumni and friends of the department, through personal collaboration and donations, to help us in “revealing how life works for the benefit of all.”*

### Key goals

- (1) By 2019 establish an effective networking platform that connects BB alumni with each other and with current undergraduate and graduate students and faculty
- (2) By 2022, increase annual giving by 3-fold to \$60,000/year to be used to enrich undergraduate and graduate programs and support state-of-the-art teaching and research related infrastructure. Also, add one additional endowed graduate fellowship and at least two fully-funded first year scholarships for high-achieving URM students to enhance recruitment
- (3) Send out a newsletter every spring that invites involvement of alumni and friends and that clearly conveys the importance of supporting undergraduate and graduate student research, and high-achieving URM scholarships through philanthropic donations.

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## Appendix 1: Specific ideas for goals and action steps related to each of the six strategic priorities

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**Strategic Priority 1: People and culture** - Our faculty and staff are the key to our future successes so we must attract, engage, support, train and retain excellent, diverse, and team-oriented faculty and staff.

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### Subaims 1: Office staff-centered

- 1.1. **Positions:** Review and revise office staff position descriptions to improve staff productivity and efficiency. Benchmark: Fully staff office by expanding from current 2.0 FTE to 2.5-3.0 (note: 0.5 FTE committed by Dean as part of BMB major).
- 1.2. **Professional development:** Increase efficiency of office staff for graduate and undergrad program support and website maintenance and development by supporting continuing education.
- 1.3. **Awards:** Nominate qualified staff for College and OSU awards. Recognize special efforts.

### Subaims 2: Faculty-centered

- 2.1. **Faculty size:** Maintain or grow number of active professorial and instructional faculty. Benchmark: In 2022 teaching and research faculty will be at or above December 2016 levels of 16 tenure-tenure-track faculty summing to a total of ~11.5 COS FTE and 2.0 Instructor line faculty. **Transitions:** Survey faculty annually for voluntary updates on anticipated retirements or transitions to administration for 5-10 year windows.
- 2.2. **Planned hires:** Current priority faculty hires include:
  - a) Instructor (Sr. Instructor) and advisor to fill Rajagopal position (BB314, BB317, Ecampus BB314, and advising.
  - b) Diversity-minded, visionary mid-career scholar as Department Head – forward looking and synergistic with current faculty bringing a healthy breadth while building on strengths.
  - c) Pedagogy focused instructor/teaching professor to design and deliver superb online BB350, BB450, BB451 courses each term. This person will also be a resource for anyone wanting to improve pedagogy or develop an Ecampus course.
  - d) Cell biologist with neuroscience focus to strengthen cell biology and neuroscience teaching and research, OR Structural biologist (protein crystallography and/or Cryo-EM) to build strengthen teaching and research, OR Biochemist with strong background in metabolomics/mass spectrometry, OR
- 2.3. **Diversity:** Increase the diversity of our active professorial and instructional faculty. Benchmark: Hires from 2017-2022 will meet aspirational targets of  $\geq 50\%$  of women and  $\geq 20\%$  underrepresented minorities. Use **Search Advocate Training** to promote effective hiring all faculty will take basic search advocate training. Require that applicant pool diversity approximates diversity targets before applicant screening moves forward. Use the **Seminar Program** to improve networking. Seek allies and collaborators to develop diverse search pools. Provide **ADVANCE Equity Grants** for women and URM faculty and trainees to help offset possible hardships hindering meeting attendance and similar professional development opportunities. Benchmark: Carry out diversity and inclusion climate survey every 3 years to discover climate issues in need of addressing
- 2.4. **Pedagogy:** Support opportunities for pedagogical training of faculty.
- 2.5. **Mentoring:** Develop and implement formal mentoring processes, including peer reviews of teaching.
- 2.6. **Awards, Academy Memberships:** Nominate qualified faculty for College, OSU, regional, national and society awards and recognition. Encourage faculty participation at the national level with grant reviews and policy.
- 2.7. **Governance:** Maintain democratic governance structure. Continue to develop and strengthen committee structures that enhance shared governance and faculty participation. Increase involvement of younger faculty in department governance and planning.

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**Strategic Priority 2 - Undergraduate Program:** *Expand our impact by growing our new BMB major to have the same excellence as our BB major while modernizing our pedagogy across the curriculum and increasing the diversity and success of students in both majors.*

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## Subaims 1: Student success-centered

**1.1. Recruiting, advising and support:** Given the expectation of significant growth (doubling the number of majors to ~320 and tripling of B.S. degrees granted to ~60-75), maintain excellence of advising and support structures (e.g. Biochemistry Club) to increase and to enhance retention of all students.

- a) Maintain or decrease current student/faculty ratio for advising.
- b) Use Student Success Collaborative (SSC) tools to improve student retention rates.
- c) Increase peer mentoring activities.
- d) Increase financial support for scholarships for recruiting and retention. Target 3 URM 1-year full tuition recruiting scholarships by Fall 2019
- e) Use advisor guidance and expertise to help students to prepare competitive applications for external scholarships (e.g., ASBMB student member scholarships). Nominate at least three students for Goldwater scholarships every year
- f) maintain recruiting activities in Portland; use summer camps for recruitment

**1.2. Career planning:** Increase student awareness of broader career options related to our majors (including traditional paths, such as research and health professions, as well as non-research careers such as science writing, law, business, and education), and provide additional opportunities for students to interact directly with people in all those careers. Involve alumni and establish formal partnerships with regional bioscience companies, federal/state laboratories, and/or other potential nonacademic employers to increase student awareness of leveraged career paths.

- a) Develop library of short alumni videos (~3 minutes long) relevant to their professions.
- b) Partner with the College and OSU career development personnel to enhance students' practical workforce readiness skills.
- c) Create and fund a panel empowered to increase interactions between BB undergraduates and people in diverse scientific careers, possibly through interactions with BB317.
- d) Offer workshops to prepare NSF graduate research fellowship for BB/BMB students.

**1.3. Experiential learning:** Expand opportunities and funding for students to participate in experiential learning.

- a) Use advisors to guide students to prepare competitive applications for funding of experiential learning opportunities.
- b) Expand departmental financial resources committed to increasing experiential learning.
- c) Devote a section of every newsletter to "Support a Student".
- d). Create ambassador program for the department to increase student interactions with donors.

**1.4. Non-majors students:** Consult with the OSU Academic Success Center and other campus programs to help non-majors to be more successful in the BB 450/451 and BB 350 series.

## Subaims 2: Curriculum-centered

### 2.1. Curriculum development:

- a) Complete curricular proposals associated with BMB major and coursework. Gain ASBMB accreditation. Create options for the BB major (pre-med, neurobiology, computational molecular biology). Develop mechanism for students to waive requirement for certain BB lab courses.
- b) Develop "Molecular Neurobiology" course and "Neurobiology" option for BB and BMB majors.
- c) Develop 200-level course for majors to engage them earlier.
- d) Explore Biomaterials/Chemical Biology option in collaboration with Bioengineering, Chemistry and College of Science/University Materials initiatives. Leverage Unnatural Protein Facility expertise and collaborations. Position BB to compete in future Provost hires in Material Science for joint appointments.

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- e) Develop on-campus 2-credit 200-level molecular science-centered course that satisfies Bacc Core health and fitness requirement (also develop E-campus version).
  - f) implement common departmental learning outcomes for core courses
- 2.2. Pedagogy:** Incorporate active learning pedagogy in *more* courses, with possible use of learning assistants (LAs). Support faculty development for this by:
- a) Annually sending a team to the HHMI-sponsored active learning course until all faculty have attended.
  - b) Identify and prioritize courses that would benefit most from LA-supported active learning.
- 2.3. Experiential learning:** Increase material and financial support for transformative undergraduate research experiences.
- 2.4. Social Justice awareness:** Incorporate into curriculum, intersections of BB/BMB with ethics, social justice, diversity; consider developing a BB/BMB Difference Power and Discrimination (DPD) bacc core course.
- 2.5. Workforce readiness:** Collaborating with Chris Larson's COS team, incorporate personal development and teamwork components across program to enhance students' practical workforce readiness. Develop partnerships with companies and institutions who agree to provide internship opportunities; include options for BB 401 credit.

### Subaims 3: Administration-centered

- 3.1. Course offerings:** Exert care with teaching commitments and course offerings (e.g. some in alternate years) to enable staffing of increased courses offered with existing faculty. With SLS founding principles, if there is a shift in majors, advising and teaching FTE should follow students.
- 3.2. Retention:** Develop automated SSC processes to determine reasons students leave major and/or OSU to determine underlying causes of departure and whether this information can be used to improve retention of students.
- 3.3. Web resources:** Collaborate with SLS to create excellent common web resources for BB and BMB that are coordinated with those provided for BI, ZO, MB and BHS majors.
- 3.4. Student teaching:** Create mechanism to track research/teaching experiences of BB students and research faculty mentors

### Subaims 4: Transition-centered:

- 4.1. Retirements of Ahern and Rajagopal:** To ensure that we can continue and build on all of the extensive program-benefitting activities carried out by Kevin and Indira, have Kevin and Indira make list of their key contributions beyond their core teaching assignments. These will include, for instance, activities associated with recruitment, Biochemistry Club sponsorship, summer START, honors college, etc.
- 4.2. Teaching load and pedagogy:** Hire dynamic faculty with pedagogy expertise to teach BB314, BB450, BB 451 and BB350. Develop position descriptions and timeline for hire.

### Subaims 5: Resource- and infrastructure-centered:

- 5.1. Increase support for lab courses:** Expand support mechanisms to fund materials and equipment in lab courses.
  - a) collaborate with BioE Department faculty, Ryan Mehl, and Michael Freitag to identify equipment needs and apply for equipment through NSF Broader Impacts that will support the lab courses (BB 315, BB493, BB494); have other units commit matching funds.
  - b) Identify industry partners and seek company donations of products appropriately.
- 5.2. Lab space:** Seek new teaching lab space as needs outgrow current single teaching lab, and be sure equipment is maintained/replaced. Also seek development of computer lab for  $\geq 50$  students.
- 5.3. Lab courses:** Identify how we can accommodate growth in BB 494 course

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**Strategic Priority 3 – Graduate Program:** *Enhance the quality of graduate student training and professional preparation for both academic and non-academic careers and attract continued support for all doctoral candidates in good standing.*

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## Subaims 1: Student-centered

- 1.1. **Scope:** In addition to PhD and traditional MS, offer Accelerated Masters programs in BB and BMB (target Fall 2022: 5 total full-tuition MS students).
- 1.2. **Size:** Increase external funding to grow the doctoral program by 10% to a total of 30 doctoral students by Fall 2022. (note: MS students are self-funded).
- 1.3. **Diversity:** Increase the diversity of our doctoral students (Fall 2022 targets of ~50% women, 15% URM, and 15% international). Use our seminar series and recruitment seminars to develop relationships to attract URM students from institutions in the Pacific Northwest.
- 1.4. **Duration:** Lower time-to-degree from 5.7 to 5 years.
- 1.5. **External support:**
  - a) Increase students supported by pre-doctoral fellowships. All qualified first-year doctoral students apply for NSF pre-doctoral fellowships during year 1. All preliminary proposals will be worked into fellowship applications for submission at federal or private agencies. Goal is two external fellowships each year.
  - b) Develop additional fellowships that are externally supported (e.g., Chris and Kate Mathews Fellowship) and dedicated to different years (i.e., years 2-6). (Mechanisms: Alumni, public figures, crowdfunding? \$300,000 or so needed. Foundation-dependent.)
- 1.6. **Internal support:** Increase COS-supported GTA lines in proportion to growth of BB and BMB undergraduate population, including service teaching for other programs, and related to the teaching needs of the department.
- 1.7. **Student self-government:** Support development of BB Grad Student Association as powerful self-governing body that provides professional development and increases beneficial grad student participation in program governance and delivery.
- 1.8. **Professional development:** (i) find opportunities for internships or professional interactions with industry, government and academic labs, (ii) encourage doctoral students to enter professional societies appropriate for their disciplines, (iii) strongly encourage annual attendance at national or international meetings or workshops.

## Subaims 2: Curriculum-centered

- 2.1. **Competencies:** Evaluate and update program outcomes every 3<sup>rd</sup> year.
- 2.2. **Coursework:** Transform advanced topics courses to slash courses to improve teaching efficiency and effectiveness. Every research active core faculty member teach one advanced topics course every two-three years.
- 2.3. **Content:**
  - a) Evaluate and – if appropriate – modernize curriculum at least every five years;
  - b) Incorporate issues relating to ethics, social justice, and diversity into coursework.
- 2.4. **Professional development:** Raise awareness among grad students of non-academic career opportunities. This can be in part done through seminar series speakers and alumni networking. Also, provide professional development opportunities for TAs to improve and document teaching/mentoring skills.

## Subaims 3: Administration-centered

- 3.1. **Online resources:** Develop excellent web resources for prospective and current students. Have every research active lab develop a lab webpage and a brief video introduction on the PI page.
- 3.2. **Program metrics:** Develop checklists and standardize tracking of key metrics for graduate student progress and activities. Also, advocate for Graduate School to track grad student metrics both by program and PI.
- 3.3. **Synergies:** Explore possible synergies with other graduate programs.

# Biochemistry & Biophysics 10-year SP2017 Strategic Plan

(adopted November 3, 2017)

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**Strategic Priority 4 – Research and Research-teaching related Infrastructure:** *Increase our research impact and profile by improving success in external funding, pursuing synergistic collaborations and hires that enhance our breadth while building on strengths, and by proactive investments in laboratory facilities and instrumentation.*

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## Subaims 1: Support-centered

**1.1 Funding levels:** Increase extramural research funding significantly, by traditional federal funding mechanisms (i.e. NIH, NSF, DOD, DOE or USDA), in-kind services (e.g., via DOE or PNNL user themes) or private foundation grants.

Benchmark: All core research active faculty members will be funded by external grants and contracts to support at least one graduate student or postdoc at all times. If funding is adequate or excellent, many other goals are easily achieved.

To increase likelihood of extramural funding:

- a) encourage in-depth reading of proposals by faculty peers (include in “service” component)
- b) bring in seminar speakers that are well-known in areas the Department aspires to win funding
- c) Use new COS proposal support and COS convened proposal-writing workshops
- d) institute mandatory monthly(?) research meetings, where faculty present or develop new proposal ideas
- e) Develop COS/BB-level mechanisms to provide bridging funds/safety nets to support engaged research active faculty in lean times that can support (e.g. provide funds when merited to generate preliminary data, proposal writing help).
- f) Build connections that could improve developing multi-investigator grants; e.g. ties with Knight Cancer Center, increased collaboration with OSU faculty that allow teams to develop conceptually and technically novel approaches that would be more likely to succeed if pursued by a team rather than a single investigator alone. Breaking down silos to push toward more “interdisciplinary approaches and team science” could provide the synergy required to pursue larger program project (P01) grants or multi-investigator R01 applications (note importance for establishing a track record of collaboration through coauthored publications.) Support interdepartmental collaboration-building seminars.

**1.2. Support for GTAs:** Develop new GTA lines and develop additional mechanisms to provide departmental bridge funding support of one grad student for 1-3 years in research active labs. Lobby COS to develop college level bridge funding resources that can be applied for.

**1.3. Faculty performance expectations:** Develop agreed on clear minimum expectations for proposal submissions (e.g. grant proposal submissions) and scholarly products (e.g. publications), that if not met, lead to faculty having PD changes to increase teaching FTE.

**1.4. Faculty hires:** Prioritize faculty hires with ability to engage in potential fundable collaborations with current faculty and build critical mass in existing areas of strength such as genetic code expansion technology, structural biology of protein complexes and intrinsically disordered proteins, aging and age-related disease, fungal genetics, motor proteins.

## Subaims 2: Discovery-centered

**2.1. Research topics:** Maintain a breadth of research topics while seeking out opportunities to improve the depth of specific topics, but prioritize hires with research in areas that connect with current strengths and are perceived to be growing in biomedical importance in the coming decades. These include:

- a) Biophysics and imaging related to neuroscience in mammals or suitable model organisms
- b) X-ray crystallography and/or cryoelectron microscopy of protein complexes
- c) protein/DNA/RNA interactions and thermodynamic modeling
- d) metabolomics/mass spectrometry/big data approaches in human health/marine sciences
- e) natural products biochemistry, especially from marine environments
- f) analytical ultracentrifugation/light scattering/hydrodynamics

**2.2. Hires:** Continue to recruit faculty members with full or partial FTE via University-wide initiatives (e.g., Provost hires, BIG initiative, and marine science initiative);

**2.3. Centers and cores:** Promote, support, and shape the growth of the **Unnatural Protein Facility** (Mehl) to become world leaders, and win funding for this as an NIH Center. Benchmarks: newsletter, website, outreach, national and international workshops and meetings, department supported internships, TAs. The UP facility has already gained traction internationally with support from the department. The first international GCE conference hosted in Corvallis in 2016 was a big success and two conferences are planned for the next four years with the majority of the community agreeing they should be in conjunction with a workshop. Potentially funded from contract work for those inside and outside of OSU to support student internships. Promote, support, and shape the growth of the 800 MHz fee-based **biomolecular NMR facility** (Barbar) to be a regionally and nationally recognized strength. Benchmarks: newsletter,

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website, outreach, regional and national workshops and symposia, internships. Potentially funded from contract work for those inside and outside of OSU to support student internships. Build ties with **innovative Mass Spectrometry** (Beckman).

- 2.4. Applications and intellectual property:** Recognize and promote applied research projects, development of intellectual property and pursuit of commercialization as equally valuable to peer-reviewed publications. Entrepreneurial efforts and commercialization have realistic revenue generating potential.

### Subaims 3: Infrastructure-centered

- 3.1. Available resources:** Develop inventory of select department-designated common resources managed by particular research groups (also in some cases used for teaching) for which the department will provide core support for maintenance and repair and contribute to replacement. (e.g. centrifuges, gel documentation, FPLCs, macromolecular interaction instrumentation, ITC, crystallography, mammalian cell culture facilities...)
- 3.2. RERF:** Submit at least one RERF proposal for common resources every year.
- 3.3. IT:** Ensure internet capabilities of all ALS spaces are up to modern standards
- 3.4. BUC:** Because ALS is aging, check and update/upgrade all cold/freezer rooms and core preparation room (autoclaves dishwasher, water purification systems) using BUCs. Improve technology/furnishings in teaching lab, Cripps room and library; renovate restrooms; improve safety of interior labs by providing two entry/exit paths in case of emergency.
- 3.5. Safety requirements:** Maintain and streamline full compliance with EHS chemical lab safety requirements. Add defibrillators in ALS building and make training available. Increase Lanelle Connolly's FTE as floor safety officer and general equipment manager. Hire of a repair/shop/common area supervisor/ordering.
- 3.6. ROH usage:** When possible return some grant and contract overhead to PI laboratories to cover individual laboratory needs not covered by blanket infrastructure and spending listed above.

### Subaims 4: Administration-centered

- 4.1. Department Head:** Recruit strong leadership in the form of a diversity-minded, visionary mid-career scholar as Department Head. This person should be forward-looking yet synergistic with current faculty and maintain a healthy breadth of research topics.
- 4.2. Proposal support:** Build College, SLS or BB proposal preparation support to facilitate proposal preparation and free up faculty time while increasing number of proposal submissions.
- 4.3. Outreach and advertising of accomplishments:** For every paper published or grant won create a 2-minute video interview synopsis for posting on BB web and facebook pages. Issue press release using OSU Media Services writers.

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**Strategic Priority 5 – Extended Campus Programs:** *Expand our impact in training students in biochemistry and biophysics and stabilize department's financial health by growing our extended campus footprint.*

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**Subaim 1: Convene a departmental summit in January 2018 to chart a plan, including faculty hiring, aimed at expanding BB's Ecampus footprint**

**Subaim 2: Expand E-campus course enrollment in existing BB E-campus courses:**

- a) Continue every term Ecampus offerings of BB350, 450/550, 451/551 and possibly BB100; expand BB314 to every term; maintain and expand offering of 485/585.
- b) Partner with Ecampus, college, and university marketing teams to expand our Ecampus footprint/enrollment
- c) Recruit/identify/train faculty to maintain and expand scope and quality of BB Ecampus courses when Kevin and Indira retire
- d) Consider Ecampus dedicated GTAs that might have training in teaching proficiency and assignments for a year or longer in delivering Ecampus courses as an efficient way to deliver Ecampus and grow the graduate program.

**Subaim 3: Develop and deliver new Ecampus courses**

- a) Develop BB481/581 and select other courses for which potential revenues are expected to exceed costs of development/delivery
- b) Develop Ecampus (and on-campus) 2-credit 200-level molecular science centered course that satisfies Bacc Core health/fitness requirement.
- c) Develop new Ecampus courses with a focus on biochemistry that will appeal to a wide spectrum of students around the world: e.g. "The Biochemistry of Human Health", "Biochemistry of Cancer", "Biotechnology in Forensics", "Biotechnology and Culture", "Biotechnology and Economics", "Technology and Human Health".

**Subaim 4: Design Professional and Continuing Education (PACE) Programs**

- a) Develop set of PACE courses, each focused on a single instrument. Requires budget for instrument usage. Deliver in both on-campus and Ecampus hybrid course with workshop on campus instrument time (NMR, other instruments?)
- b) Develop PACE/Ecampus/hybrid courses focused on professional skills, such as Pymol or other relevant discipline-based software.
- c) Develop PACE courses based on largely existing OER materials that could provide continuing education credits to professionals.
- d) Consider development of a biochemistry certificate/badge

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**Strategic Priority 6 – Outreach, Alumni relations and fundraising:** *Engage with the general public, K-12 schools, and our alumni to educate and inspire them about science while demonstrating the value, relevance and positive impact of molecular sciences and our research and education activities, and make it attractive for alumni and friends of the department, through personal collaboration and donations, to partner with us in “revealing how life works for the benefit of all.”*

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## Subaim 1: Outreach-centered

- 1.1. **Media:** Actively work with communications or media offices on campus to engage BB faculty in public lectures in Portland, Eugene, Bend and Corvallis. Examples include, but are not limited to Science Pub (Corvallis), Academy for Lifelong Learning (Corvallis, <http://www.academyforlifelonglearning.org/>) and their equivalents in other cities.
  - a) Sponsor annual public lecture on Nobel Prize relevant to molecular life sciences
  - b) Have more faculty and graduate students take science communication trainings (OSU's News and Research Communications office, OMSI, etc); consider providing incentives for participation.
  - c) Highlight BB research by press releases. Get BB researchers interviewed by regional (local radio, TV and newspapers) and national news outlets.
- 1.2. **Outreach (van Zee):** Provide tangible support of Kari van Zee's leadership in mentoring of faculty, grad and undergrad students in outreach, as well as volunteer engagement by grad/undergrad students in planning/leading summer camps
- 1.3. **OER textbooks:** Develop and host “Biochemistry Freesource” expert-edited wiki as “go to” site for accurate info on general aspects of biochemistry. Use LPI's MIC as a model. Also consider how to enable appreciative users of OER texts and “Freesource” to support BB these and other programs. Have students publishing papers update Wikipedia pages relevant to the advances
- 1.4. **Create new BB outreach activities:** Including those associated with BioNMR and GCE facilities to improve public biochemistry literacy (part of Discovery Days, Davinci Days, Portland/Salem/Cascades outreaches, etc).
- 1.5. **High school outreach:** Encourage more faculty to participate in the Apprenticeships in Sciences and Engineering (ASE, Saturday Academy) program for high school students – OSU is quite strong in this area. (Find funds for housing out of town students)

## Subaim 2: Alumni-relations and fundraising-centered (highly collaborative with OSU Foundation)

- 2.1. **Communication with OSU Foundation:** Be sure we communicate well so they can work effectively on our behalf. We should assist them in obtaining donations. Define our priorities so that not all donations go into endowments.
- 2.2. **50<sup>th</sup> anniversary celebration:** Planned for October 13-15, 2017.
- 2.3. **Newsletter:** Maintain regular communication with the “BB family” via annual newsletter and regular social media postings (e.g. post one-two minute high quality, polished videos about publications on Facebook or YouTube). Consider Instagram, Twitter or other popular formats? Consider how to keep social media accounts active. Hire someone?
- 2.4. **Mailing lists:** Obtain relevant email lists and invite local donors/alumni to regular activities such as grad rotation talks; undergrad research talks; Third year seminars, Thesis defenses, Honors thesis defenses; P&T talks, picnics, Celebration Undergraduate Excellence, etc.
- 2.5. **Alumni outreach:** Invite graduates in various jobs to become networking resources with undergraduate and graduate students to raise awareness of careers and help with job placement (see also Priority2.1b). An effective mechanism may be to create a LinkedIn “Oregon State BB Alumni” group to facilitate networking of current students and faculty with alumni and alumni with each other. Create an advisory board of alumni and friends to be very engaged advisors
- 2.6. **Encourage donations by graduates:** For alumni engaged in research or industry clearly related to BB training, seek to develop industry-sponsored fellowships and/or internship opportunities. Invite each faculty member to send emails to their own former grad and undergrad mentees inviting them to “pay it forward” through regular, annual giving to BB-unrestricted in support of respective programs. (This could generate substantial ongoing support: e.g. undergrad alum pledges of 100@\$50, 20@\$100, 10@200, 2@500 would generate \$10,000/yr dedicated to UG mission; similar could work for Grad mission). Ensure current faculty/staff are aware they may also donate in

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support of BB and other OSU programs (see <http://campaignforosu.org/fundraisingpriorities/facultystaff/> )

- 2.7 Awards:** Continue offering annual “Outstanding Alumni Award” as part of seminar series and maintain contact with awardees.
- 2.8. Priorities in fundraising:** Define concrete list of fundraising priorities and develop concrete pitches (“Wow” statement, etc.) for each; make UG research support and graduate fellowships top items that are being actively communicated to potential donors. Make sure they are featured in each department newsletter. Additional priorities may be other UG program support (modernizing equipment for teaching, travel, Learning Assistants), other graduate program support (travel, research infrastructure, outreach activities). By 2021, have one additional endowed graduate fellowship and at least two full-funding scholarships for high-achieving URM students in their first year to enhance the recruitment
- 2.9. Stewardship:** Create procedures and checklists for maintaining good stewardship of existing gifts.
- 2.10. Mechanisms for success:** Establish mechanisms to accomplish all of these activities. How do we support all of this? Do we hire a communications director?