University of Colorado **Boulder**

2017 Program Review

Division of Biochemistry

Academic Review and Planning Advisory Committee Report

Approved

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Provost and Executive Vice Chancellor for Academic Affairs: Date

Contents

Process Overview

The review of the Division of Biochemistry within the Department of Chemistry and Biochemistry was conducted in accordance with the 2017 review guidelines. Since the separation of Biochemistry from the larger department is now in process, this review has sought to document and assess its distinctive features and record. The Academic Review and Planning Advisory Committee (ARPAC) completes the final reviews of all Boulder campus academic units. The division prepared a self-study report during 2016, which was checked in early 2017 by a two-person internal review committee staffed by faculty members from outside of the department, who also met with division personnel and surveyed undergraduate and graduate students. An external review committee, consisting of two members from within the discipline outside of CU Boulder, visited the division on April 16-18, 2017. The external reviewers read the relevant documents and met with faculty, students, staff, university administrators, and ARPAC members. Following the visit, in May 2017, ARPAC issued a preliminary statement encouraging continued discussion at all administrative levels of the department's separation. Additionally, on September 1, 2017, the ARPAC chair and the committee's liaisons to the Biochemistry and Chemistry divisions met with the leaders of those divisions to discuss ongoing developments. The internal and external reviewers' comments and recommendations, as well as the preliminary ARPAC statement, are cited at appropriate points throughout this report. This public document reflects the assessment of, and recommendations for, the Division of Biochemistry as approved by ARPAC.

Academic Review and Planning Advisory Committee (ARPAC)

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Bob Boswell, Vice Chancellor for Diversity, Equity, and Community Engagement and Professor of Molecular, Cellular, and Developmental Biology

Katherine Eggert, Quality Initiative Leader and Professor of English

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Mary Kraus, Vice Provost and Associate Vice Chancellor for Undergraduate Education and Professor of Geological Sciences

Ann Schmeising, Interim Vice Provost and Dean of the Graduate School and Professor of Germanic & Slavic Languages & Literatures

Staff

Andre Grothe, Office of Faculty Affairs

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Division Overview

The campus's standardized description of the division may be found on the website of the Office of Data Analytics (ODA) at https://www.colorado.edu/oda/institutional-research/institutional-level-data/information-department/academic-review-and-planning. ODA updates the profile annually in the fall semester. This report cites the ODA data for the Department of Chemistry and Biochemistry posted in October 2016, reflecting the state of the department as of academic year (AY) 2015-16. As detailed below, not all data are available for the division as distinct from the larger department.

The Division of Biochemistry counts as one of the university's most distinguished research groups, with a faculty that includes a Nobel laureate, three members of the National Academy of Science, and other members of distinction. The division conducts a vigorous research program, with specific emphasis on (1) nucleic acid chemistry and biochemistry, including Ribonucleic acid (RNA) structure and the function and mechanisms of genetic transcription and replication; (2) signal transduction; and (3) proteomics, informatics, and structural biology, including using X-ray imaging and Nuclear Magnetic Resonance Spectroscopy. The division offers undergraduate and graduate degrees in biochemistry.

Personnel and Governance

The Office of Data Analytics profile for the Department of Chemistry and Biochemistry lists 46 tenured and tenure-track faculty full-time equivalent positions (FTE). The portion assigned to Biochemistry includes 12.5 full professors (of which one is 0%), three associate professors, three assistant professors, two research professors, and one instructor. As discussed below, the division hopes to add new assistant professors, beyond replacements, over the next five years. Data from ODA indicates that salaries for assistant and associate professors (aggregated at the department level) are close to or above peer-

institutional averages (98% and 107%, respectively), while those for full professors lag (90%).

The division operates with considerable autonomy within the department and is led by a director elected by the division faculty with guidance from the East Campus Oversight Committee (the committee includes three Biochemistry faculty elected to serve three-year terms). After the proposed split, the division plans to create a governance structure like that of the existing department.

Research and Scholarship

Biochemistry faculty members hold numerous distinctions, including a Nobel Prize and three memberships of the National Academy of Science. Two hold the title of distinguished professor. The Office of Data Analytics report does not provide data on division-specific research productivity. However, the self-study, including the response to the internal review report, presents various productivity measures for Biochemistry including external grant support, publications, citations, and awards. These metrics suggest that the division's publications, citations, and funding are broadly competitive with other nationally prominent units selected for comparison. The self-study also describes how research productivity has been affected by recent faculty departures and a recent faculty hire.

Undergraduate Education

The Department of Chemistry and Biochemistry offers two majors and two minors that will require separation prior to the regents' approval of a split. Biochemistry offers the Bachelor of Arts (BA) degree in Biochemistry, as well as a minor. Office of Data Analytics statistics for the fall 2017 census show 437 Biochemistry majors, an increase of about 1% over the last five years. Division-specific ODA data counts of declared minors, the student/ tenured and tenure-track faculty ratio, the total undergraduate credit hour production, and the proportion of

credit hours taught by tenured and tenure-track faculty are not available.

The internal reviewers report generally positive results from their undergraduate Biochemistry student survey, though 7% of respondents were critical about the department climate with respect to diversity. Themes from student comments include frustrations registered about infrequently offered courses (resulting in students struggling to meet graduation requirements or take desired electives), sparse information about undergraduate research opportunities, and poor course scheduling coordination, a matter of consequence to students attempting double majors.

A substantial share of students declaring Biochemistry as their first major are not retained within the major. Office of Data Analytics statistics for the undergraduate cohorts entering CU Boulder between 2007 and 2010 show that, of students declaring Biochemistry as their first major, only 25% graduated with a Biochemistry major within six years. The average among natural sciences units during the same period saw 48% of students graduating within six years in the major that they first declared. Of those declaring Biochemistry as their first major, 65% graduated with a College of Arts and Sciences degree (any major) within six years, and 68% graduated from CU Boulder overall (any college). Campus-wide, the six-year graduation rate for these cohorts was 70%.

Graduate Education

Biochemistry offers the M.S. and Ph.D. in Biochemistry. The Office of Data Analytics count following the fall, 2017 census show 63 doctoral students and two master's students, about the same as five years ago. The division has been successful in securing training grants to support its graduate program. The self-study states that Biochemistry aims to reduce the median

time to degree to 5.5 years for Ph.D. students within the next seven years.

The most recent graduate student surveys supplied by ODA involve the entire department and date to 2009. These 2009 results display unsatisfactory ratings of certain program elements, ranging from a low of 47% for “space and facilities” to a high of 67% for overall quality (mean of 57.17% across six items). The internal review contradicts these results, however, reporting generally positive responses in its survey of Biochemistry doctoral students, with 96% of students “satisfied” or “very satisfied” with the Biochemistry graduate program. As with the undergraduates, some students (11%) were critical about the climate with respect to diversity, and about the same percentage were dissatisfied with financial support and with the clarity of program requirements.

The self-study supplies extensive data on graduate placement in postdoctoral, academic, laboratory, governmental, and industry positions. According to the self-study, fewer than 5% of Ph.D. graduates take academic positions, apart from postdoctoral appointments.

Facilities

The division is housed in the Jennie Smoly Caruthers Biotechnology Building (JSCB), located on the CU Boulder East Campus. The self-study reports that the space is generally adequate, but expresses concern that construction of a new wing, needed for future requirements, might be held up; at this writing, however, construction of the new wing has been approved. The self-study also recommends improvements to refurbish existing space.

Staffing and Budget

The Office of Data Analytics profile reports 17 exempt and classified staff positions for the Department of Chemistry and Biochemistry. The self-study reports about 3.2 FTE of staff solely in Biochemistry, with additional staff shared between the two divisions and with neighboring JSCB tenants. The study cites a need for an additional 1.5 FTE administrative staff, regardless of whether the separation of the division from the department goes forward.

The division projects a healthy budgetary situation but expresses reservations relating to large future startup requirements for new faculty and uncertainty about the national research funding picture.

Inclusive Excellence

Division-specific Office of Data Analytics statistics describing faculty diversity are not available. The self-study reports that while the number of female faculty has increased, the proportion has risen less noticeably, and stands at a little over 25%. The report also notes that the division has never hired a tenured or tenure-track faculty member from an underrepresented group.

The self-study reports that the number of underrepresented minority students in the graduate program has increased substantially and that the ratio of female to male graduate students has remained approximately 50-50 over time. Office of Data Analytics census data confirm the gender balance but show that the number of students from underrepresented groups has not changed much over the last five years. The self-study expresses concern about student success and notes possible climate issues affecting minority graduate students.

The self-study does not discuss inclusiveness in the undergraduate program, but ODA student census data for fall

2017, show that 18% of the undergraduate students are members of underrepresented minorities, a relatively high degree of diversity among the units being reviewed. The number of undergraduates from underrepresented groups has increased steadily over the last five years.

Women comprise 52% of the undergraduate student body. The number of undergraduate women has increased by 35% over the last five years.

Past Reviews

The Division of Biochemistry has not been reviewed as a separate entity in the past. However, some recommendations from previous reviews of the larger department are relevant to the division.

In 2010, at the time of the previous review, the division's move to the East Campus was pending. The department intended then to continue to operate as an integrated unit, and ARPAC recommended various efforts to increase cohesion. These matters are now moot. The department has strengthened new faculty mentorship in accordance with a recommendation in the last review, and a well-organized program is in place in Biochemistry, according to the self-study. Poor completion rates for graduate students were an issue for the department at the last review; this does not seem currently to be a problem for Biochemistry, according to the self-study, though the report expresses a commitment to reducing time to degree. High attrition of female graduate students was a problem for the department at last review, but the Biochemistry self-study does not suggest this as a current concern. Laboratory safety was an issue in the last review of the department before the move of Biochemistry to new facilities; these concerns appear to be moot. Support for shared instrumentation was a concern in 2010, and still is.

Recommendations to levels of administration outside the unit did not pertain to Biochemistry, apart from those dealing with the now-completed move to East Campus and with unit cohesion, now moot.

Campus Context

The most important campus contextual circumstance for Biochemistry is its relationship to the current parent department. Planning for the proposed split appears to be proceeding in a collegial and professional manner with the intent that each division shares the end goal of successful independence. Both the Biochemistry internal and external reviewers express support for the plan.

A key aspect of the transition, not yet fully elaborated but under consideration by a faculty committee, is the plan for how lower-division teaching will be shared between the two departments-to-be. Biochemistry undergraduates take many courses offered by other units, while Biochemistry courses are not taken by many non-majors.

Biochemistry maintains collaborative relationships with many campus entities, as detailed in the self-study's impressive list of faculty research collaborations. The department also formally cooperates with the other units resident in the Jennie Smoly Caruthers Biotechnology Building, the Department of Chemical and Biological Engineering and the BioFrontiers Institute. It shares three faculty members with the latter, as well as one faculty member with the Renewable & Sustainable Energy Institute (RASEI).

Disciplinary Context

The external reviewers project that Biochemistry, once established as an independent unit, will rank as a top ten department nationally. As noted, the self-study presents favorable productivity comparisons supporting this projection.

That a small proportion of Biochemistry Ph.D. graduates take academic positions may negatively impact a future department's rankings, but it may be difficult to increase this proportion, as discussed below.

Analysis

The biochemistry external review committee expresses enthusiasm for the proposed division of the Department of Chemistry and Biochemistry, saying that Biochemistry stands a good chance in succeeding as an independent department. Noting this and similar support for the separation of the two divisions by the chemistry division external reviewers, ARPAC issued a statement on May 10, 2017, endorsing the separation.

The external reviewers identified many strengths in the division of Biochemistry, which include faculty quality, especially in research and leadership endeavors; strong support for junior faculty; graduate program excellence; and its commitment to improving undergraduate education, following the best current practices. The internal reviewers are also positive about the unit. Nonetheless, as summarized below, the self-study and the internal and external reviewers identify some needs for building on these strengths and realizing the potential of the unit after separation. ARPAC in large part concurs with these evaluations.

Governance

As mentioned earlier, the division plans to adopt a governance scheme like that of the current department. However, the external review report for Chemistry suggests some changes to that scheme, including relying more on the executive committee and less on meetings of the full faculty. Biochemistry should consider these suggestions.

Faculty Hiring

The self-study and the internal and external reviewers argue that at least three assistant professor hires of are needed within the next five years, in addition to replacement hires necessitated by faculty retirements or departures. The needs and opportunities identified are (1) to enable new research directions necessary for maintaining competitiveness and reputation; (2) to better support the undergraduate program by enabling new courses and research opportunities; (3) to enable

increased participation in major interdepartmental research initiatives; and (4) to generate increased indirect cost recovery (ICR). Of these, ARPAC finds (1) and (2) persuasive, and (4) less so. ICR does not represent a financial gain for the university, as it only partially recovers the actual costs of the research that generates it.

Regarding goal (3)—hiring to support interdepartmental research initiatives—ARPAC cautions that care must be taken to maintain a proper balance of department and institute hiring. Institute hiring poses a financial challenge for departments because institute faculty contribute relatively little to departmental ICR. A related concern, mentioned in the self-study and elaborated in a meeting between ARPAC and the department leadership, is that when faculty are hired in institutes rather than departments (i.e., using college positions), departments lose the ability to address their education and research priorities. Thus over the long term, institute hiring, if done at the expense of college hiring, exacts an intellectual as well as a financial cost to departments. ARPAC agrees that there are important and complex issues here, involving resource allocation decisions by campus leaders. ARPAC asks for a study of these matters, to determine if the issues seen by Biochemistry also arise for other units, and to investigate what adjustments to policy and practice might be appropriate. Active engagement by affected departments when institute and campus hiring priorities are considered will no doubt be part of a response to these issues.

Undergraduate Program

The Biochemistry internal and external reviewers concur that undergraduate enrollment increases are likely, especially in the wake of curricular and educational improvements now underway, and consequently suggest that the division's request for three new faculty may prove to underestimate future needs.

They also suggest that course fee increases will be needed because Biochemistry laboratory courses are more expensive to teach than general chemistry laboratories, with which they are currently financially lumped. Recently, however, CU Boulder has discontinued the course fee system, substituting it with increased unit operating budgets. While providing greater budget flexibility, this may make it more difficult for Biochemistry as a free-standing department to adequately fund its laboratory courses unless mechanisms are in place for increases in the funding that used to be tied to fees.

ARPAC feels that care will be needed to manage the support of the program so that sufficient resources are available, but without incurring heavy costs before revenue from increased enrollment is available to cover them. Matters that should be considered in this growth planning include the following: First, the unit's East Campus location may affect the growth of the Biochemistry undergraduate program. While comments on the internal review student survey do not mention this as a problem, ARPAC is concerned that scheduling constraints caused by added travel time may act to limit the proportion of undergraduates who choose the biochemistry major. Second, the course fee termination will not have immediate impact because these funds will be replaced, but in the long term the new funding model may complicate management of possible cost increases. Third, Biochemistry's low service teaching contribution will lower the unit's academic prioritization standing. Four, the low Biochemistry tenure and tenure-track faculty teaching load (1 course per year) increases cost per student credit hour and again lowers the unit's standing in academic prioritization relative to the current combined department.

Another concern to address in planning is that Biochemistry loses more of the students who initially choose it as a major

than do its sibling natural science departments (75% vs 52%). If unchecked, these losses may inhibit the major's hoped-for growth and unbalance lower-division vs. upper-division instruction. The division should monitor these indices carefully and be prepared to act if curricular improvements already underway do not work.

The self-study proposes new activities to build undergraduate student engagement and to increase persistence, including the creation of a Biochemistry Club. Properly handled, these activities may mitigate the problem of sparse information about research opportunities for undergraduates, noted in the student survey comments. The external reviewers endorse these ideas, and ARPAC concurs.

The self-study and the internal and external reviewers recommend adding at least one staff support position for the undergraduate program, in addition to a recently hired instructor. ARPAC concurs.

At the time of the self-study, the division was pleased with its undergraduate advising. Unfortunately, in discussion with the division leads, we learned that recent advising organization changes have removed advisors specifically assigned to Biochemistry. The new advisors lack knowledge of the program and its requirements, leading to concerns that students now receive lower quality support.

Graduate Program

The Biochemistry external reviewers find the division's graduate program "truly exemplary." They suggest, however, that the division should do more to support students who intend to seek non-academic research careers, say in industry. The self-study also expresses the wish to shorten the time to degree.

As mentioned earlier, ARPAC is concerned that the small proportion of Biochemistry Ph.D. graduates who take academic positions may limit prospects for the department-to-be to rise in reputational rankings, since a unit's perceived quality often hinges on its placing graduates as faculty in high-profile university programs. However, it is unclear if the proportion can be increased. Unfortunately, discipline-wide comparative data about career paths after postdoctoral placements is not available. In response to an ARPAC query, the division suggested that, except for a handful of the most highly-ranked departments, the academic placement rate for comparable biochemistry departments is like that of CU Boulder's program. Faculty positions in biochemistry have increased at a much lower rate than the number of Ph.D.'s graduating, and some faculty positions go to holders of Ph.D.'s from other countries. Further, many graduating Ph.D.'s find academic positions unattractive, especially given the difficulty in securing research funding. ARPAC encourages the division to gather longer-term placement information to further explore this matter. Alumni who have succeeded in academic positions may be able to provide valuable advice and encouragement to current students.

Postdoctoral Training

The external reviewers praise the division's support of postdoctoral fellows but note that some fellows report a lack of exposure outside their laboratory. This leads to a shortage of references for some fellows when entering their next career stage. ARPAC feels that this problem should be readily solvable by adopting practices common in similar units. The Office of Postdoctoral Affairs can help with this effort.

Financial Issues

The self-study is generally sanguine about Biochemistry's financial situation, but expresses concern about funding startup packages for new and replacement faculty hires. The

Biochemistry external reviewers echo this concern. They also note that institute faculty contribute little in the way of indirect cost recovery to the unit, as mentioned above. So as institute hires increase in proportion to total faculty hires, the financial challenge to departments increases. On the positive side of the financial picture, the self-study and the external reviewers agree that Biochemistry has unrealized fundraising potential.

ARPAC concurs that startup package financing is a serious problem and believes that the college dean and the vice chancellor for research and innovation should assist the unit in coordinating its hiring plans with those of relevant institutes. ARPAC also concurs with the finding that Biochemistry should increase its fundraising efforts.

The self-study notes that the division is concerned about the impact of possible federal research reductions. However, the self-study does not mention diversifying funding by seeking industry support. ARPAC suggests that this may be an oversight, especially in view of the large number of Biochemistry Ph.D. graduates working in industry.

Space

As mentioned earlier, the self-study notes that the division's need for increased space may be accommodated by the completion of a new Biotech building wing, and the external reviewers endorse this claim; happily, the needed construction has been approved. The external reviewers also endorse smaller requests for building renovation. However, ARPAC does not believe that these smaller requests will enjoy high priority among the many pressing campus space needs.

Shared facilities

The self-study and the external reviewers note that funding large instruments and apparatus, and associated staff, is a major cost of research. The external reviewers suggest that this

cost might be more effectively spread across units with a rolling structure for staff positions to decrease staff insecurity. ARPAC notes that support of shared facilities is a recurring concern, and that, in some cases, shared facilities can reduce required startup investments. ARPAC endorses continuing attention to the search for a workable funding model by the campus research community and its leadership.

Staff

The self-study requests two additional staff positions to meet anticipated post-separation needs, and the internal reviewers endorse this request. But the external reviewers argue that four new positions are needed, some of which, they suggest, are needed to meet current requirements, not just to support the separation. ARPAC feels that the staffing needs analysis that was performed as part of the planning for the split, and on which the request in the self-study is based, was thorough. This analysis may, however, reflect the status quo at CU Boulder and not the situation at peer institutions. ARPAC asks that these discrepant appraisals be examined, so that, on the one hand, the needs of the division and its programs are met, and, on the other, costs are carefully considered.

Inclusive Excellence

The self-study indicates that the division will make recruiting faculty from underrepresented groups a priority. It also notes the need to investigate student success among underrepresented groups in the doctoral program. As mentioned earlier, some student survey results suggest that an inquiry into climate issues is in order.

The division should also seek to increase the proportion of female faculty. This proportion stands at a bit over 25%, but national data show that almost 50% of Ph.D. recipients in the field are women. Thus, it should be possible to increase diversity with future hires, especially if the division familiarizes

itself with and responds to research[1] showing the impact of including more than one female/underrepresented minority candidate in each finalist pool. If there's only one woman in a candidate pool, there's statistically no chance she'll be hired.

The division should continue the steady increase in students from underrepresented groups in its undergraduate program, while also expanding graduate program participation from these groups and maintaining the gender balance it has achieved in both programs.

[1] Johnson, S.K., Hekman, D.R., & Chan, E.T. 2016. If There's Only One Woman in Your Candidate Pool, There's Statistically No Chance She'll Be Hired. Harvard Business Review. April 26, 2016.https://hbr.org/2016/04/if-theres-only-one-woman-in-your-candidate-pool-theres-statistically-no-chance-shell-be-hired

Recommendations

The members of the Academic Review and Planning Advisory Committee (ARPAC) address the following recommendations to the Division of Biochemistry, and to the offices of responsible administrators:

To the Division:

1. Proceed with planning and gaining approvals for the separation of the Biochemistry division from the Department of Chemistry and Biochemistry and its establishment as an independent biochemistry department. As part of the planning process:

    a) Consider how the new department will rate in the campus academic prioritization process that weighs the number of degrees per year, cost per student credit hour, faculty scholarly achievement, student satisfaction, and service teaching.

    b) Compare planned staffing levels with those at peer institutions. Be mindful of the internal and external reviewers' caution that the self-study may underestimate staffing requirements. At the same time, take care not to overstate such requirements.

    c) Reconsider plans to duplicate in the department-to-be the legacy department's previous governance structure. Consider recommendations for streamlined governance made by the Chemistry division external reviewers.

    d) Define how Chemistry and Biochemistry will equitably distribute responsibilities for the instruction of shared introductory courses. Explore the possibility of a joint hire in discipline-based education research to support these courses, as well as contributing research-based improvements in pedagogy to both units.

2. Work with the Office of Diversity, Equity, and Community Engagement (ODECE) and the Office of Faculty Affairs (OFA) to develop a concrete faculty recruitment plan for women and members of underrepresented minorities, using tools such as the Strategic, Targeted, and Accelerated Recruitment (STAR) program and the Chancellor's Postdoctoral Fellowship program. In reporting progress on this recommendation, include the makeup of the finalist pools for each period of faculty recruitment. Aim for pools that include multiple diverse candidates.

3. In developing faculty hiring plans, consider specific educational needs and explore the relationship between unit needs and those of related institutes, to help manage the issues discussed above connected with institute hiring.

4. Initiate conversations with the college and campus administration about new faculty start-up costs. Work to identify additional resources for start-up cost funding, including external fundraising and the possibility of banking salary savings.

5. Analyze and monitor climate issues for undergraduate and graduate students and act to address those issues you find.

6. Work with ODECE to develop ways to increase participation in the graduate program by students from underrepresented groups.

7. In planning for undergraduate program growth, anticipate and remedy scheduling problems by increasing course availability, including for double majors with the Department of Molecular, Cellular, and Developmental Biology. Continue efforts to enhance the undergraduate program, increase

engagement and persistence, and better inform students about undergraduate research opportunities.

8. Work with the College of Arts and Sciences Academic Advising Center to address newly emerging advising challenges. Fortify advisors' knowledge of the division's programs.

9. Reduce the proportion of Biochemistry majors who leave the program. Aim to reach the retention and completion levels of other natural sciences majors. Gather and respond to data bearing on this matter.

10. Seek longer-term data on the proportion of Ph.D. graduates who take up faculty positions and explore ways to increase that proportion. Aim for a proportion that meets or exceeds the proportion at aspirational peer institutions.

11. Enhance mentoring to better meet the needs of the large proportion of Ph.D. students who pursue careers outside of academic research.

12. Implement the plan to shorten time to degree for Ph.D. students.

13. Work with the Office of Postdoctoral Affairs to ensure that postdoctoral fellows have adequate engagement with faculty other than their primary advisors.

14. Work with the Office of the Senior Vice Provost for Planning and Budget and the quality initiative leader to develop formal mechanisms for measuring learning outcomes and student success.

15. Work with the Office of Advancement and the Office of the Vice Chancellor for Research and Innovation to diversify division research funding, including seeking opportunities for external fundraising and funding from industry.

To the Dean of the College of Arts and Sciences:

16. Facilitate and support the separation of the biochemistry and chemistry divisions into separate departments. Provide biochemistry faculty and staff with the resources required to establish independence without losing quality in educational and research programs.

17. Ensure that following the separation, the department-to-be receives appropriate credit for its teaching activities in Chemistry courses, including contributions by graduate teaching assistants.

18. Work with Biochemistry to address problems created by recent changes in the organization of undergraduate advising, recognizing that advisors must have full knowledge of the needs of students in the specific programs they support.

19. Assist Biochemistry in understanding the transition away from using course fees as a funding mechanism.

20. Support Biochemistry in developing sustainable plans for funding startup packages for new and replacement faculty hires. Consider how changes in staffing shared facilities might reduce startup requirements.

21. Assist Biochemistry in coordinating its hiring plans with those of relevant institutes. Investigate and address the financial and programmatic problems, alluded to in this

report, associated with the allocation of faculty positions to institutes rather than the college.

22. Ensure that Biochemistry recruitment plans increase faculty diversity, including gender diversity.

23. Provide the staff resources needed to establish Biochemistry as an independent department. Consider information about staffing in departments at peer institutions as well as comparisons with other Boulder units.

24. Assist Biochemistry in planning for and supporting undergraduate program growth so that quality is maintained in a financially sustainable way. Ensure that the division's plans address the availability of courses and the need to avoid scheduling conflicts.

To the Vice Chancellor for Research and Innovation:

25. Investigate the financial and programmatic issues associated with the faculty position allocation to institutes rather than to the college. Assist Biochemistry in working with institutes to minimize problems and maximize benefits.

26. Assist Biochemistry with exploring opportunities to diversify its research funding, including seeking external fundraising and industry funding.

To the Provost:

27. Support efforts to achieve the successful establishment of biochemistry and chemistry departments.

28. Support efforts to develop sustainable funding of Biochemistry faculty startup packages. Consider how changes in staffing shared facilities might reduce startup requirements.

Required Follow-Up

The lead of the Division of Biochemistry, or the chair of its successor department, shall report annually to the provost and the dean of the College of Arts and Sciences on the implementation of these recommendations. Reports should be filed on the first of April for a period of three years following the year of the receipt of this report (i.e., April 1st of 2019, 2020, and 2021). Likewise, the dean and the vice chancellor for research shall report annually on the first of May to the provost on the implementation of recommendations addressed to their units. The provost, as part of the review reforms, has agreed to respond annually to all outstanding matters under their purview arising from this review year. All official responses will be posted online.