

**Findings and Recommendations**  
**Graduate Council**  
**Plant Biology Graduate Program, 2022-2023**

**Graduate Council Review Subcommittee**

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Fiacco's term of service on GC ended on August 31, 2023, so he was not involved in the drafting of the F&R.

**Section One: Introduction**

The Plant Biology Graduate Program (PLBL) offers PhD and MS degrees in Plant Biology. The program is housed in the Department of Botany and Plant Sciences (BPSC) of CNAS. In Fall 2022, there were 36 BPSC faculty and 10 cooperating faculty from other departments. Of the 36 BPSC faculty, 28 were senate faculty and 8 were cooperative extension specialists. (Cooperative extension specialists do not hold teaching appointments and are not expected to train graduate students although some do.) There were 54 PhD students and 6 MS students.

The external reviewers were:

- Dr. David Ackerly (Dean of Rausser College of Natural Resources and Professor of Integrative Biology), University of California, Berkeley;
- Dr. Richard Amasino (Professor of Biochemistry), University of Wisconsin, Madison;
- Dr. Paula McSteen (Professor of Biological Sciences), University of Missouri, Columbia.

The review took place on April 3-7, 2023, remotely via Zoom. The external reviewers conducted a series of interviews with the GC subcommittee members, Graduate Dean, CNAS Dean, Associate Provost, the program Chair and Graduate Advisors, Chairs/Directors of related graduate programs, and PLBL faculty members and students. The external review team's report was emailed to BPSC on September 25, 2023. The program's preliminary response was received on October 9, 2023.

The external reviewers are overall very positive about the PLBL graduate program. They believe that this is a strong program with outstanding faculty, excellent research programs, and an excellent and highly diverse student body, and praise that the program is internationally recognized. They also note the challenges facing the program, including getting new faculty positions, maintenance of research facilities,

support for graduate students, and faculty-student communications.

## **Section Two: Strengths, Achievements, and Challenges**

### *Strengths*

The PLBL program at UCR has a high reputation for its outstanding faculty across plant biology disciplines. The external reviewers note that UCR is internationally recognized for the strength of the PLBL program, including excellence in plant biochemistry and cell and molecular biology. Among the faculty are 6 U.S. National Academy members and 11 AAAS fellows; Six of 15 faculty appointed as Assistant Professors were awarded NSF CAREER Awards. The research programs cover an unusually broad range of topics, and the department is one of the largest and most diverse of its kind. The faculty use both experimental and theoretical tools to address critical basic and applied issues in plant sciences. Importantly, the faculty's work directly helps address needs and challenges of California's agriculture industry, and beyond.

The PLBL program has been successful in recruiting an outstanding and highly diverse student body. On average, each PLBL faculty advised 3.8 graduate students, including those in other programs. Aside from PI's research grant, which remains strong, students also received partial support from training grants: two Department of Education GAANN grants and two NSF IGERT/NRT grants. Many students received prestigious awards from federal funding agencies and private foundations, including NSF GRFP fellowships and Ford Foundation fellowships. The placement of the graduates is impressive. In particular, ten of the PLBL graduate students (13.3%) who graduated between 2013-2020 have been recruited by universities as faculty. As indicated by the placement data, the PLBL program has had a significant national impact.

### *Achievements*

Since the last review, the program has made significant efforts in the following three areas. First, the program has been successful in seeking new extramural funding sources for graduate students, including the training grants mentioned above. In addition, the program has established new endowment funds. Second, the program has explored the possibility of creating a five-year BS/MS program, though it has not been materialized. The department is developing a new undergraduate major in Genetics and Biotechnology, and its undergraduates are likely to be a good candidate for the five-year program. The department has also created a program for recruiting international students. Lastly, the department has held a yearly faculty retreat. The events provided an important opportunity for allowing discussions about all aspects of the department and enhancing faculty cohesiveness.

The program is strong in recruiting students from diverse backgrounds and creating an active learning environment for them. The longstanding NSR REU program provides an important pipeline of undergraduates into graduate programs. The professional development course series BPSC 200A and 200B help the students have a smooth transition to the graduate program and build a community. The students are required to obtain teaching experience through TAs, and they have strong collaborations with other departments on campus, national and international institutions. The program's completion rate and time are comparable to other top UC campuses. The students have strong career success after obtaining their Ph.D. While the department is unusually wide in its research directions, there is a strong sense of community among faculty and among students.

### *Challenges*

While the BLPL program has been tremendously successful in many aspects, it does face challenges, some unique to the program and others shared at UCR. These include:

- 1) **Hiring and retention of faculty.** Since the last review, 17 faculty joined the department and 15 left. The number of faculty in the program grew from 33 in 2010 to 44 in 2017, but it has dropped to 36 as of today. Approximately 50% of the faculty are full professors, and retirements are expected within the next few years. There was no hiring between 2019 and 2023 due to the budget impacts of the COVID pandemic. The external reviewers expressed strong concern that the program is at risk for future losses due to retirement and lack of retention. They also noted different views between the department and the administration regarding the decline of the faculty number.
- 2) **Facilities.** Shortage of high-quality research space limits the opportunity for recruiting excellent faculty. The Batchelor Hall, in which about 50% of the faculty reside, is aged and its research facilities are outdated. Although it is being renovated, the scope is limited and the labs themselves will not be upgraded and refreshed. Genomics and Boyce are shared with other departments and BPSC may lose space when faculty leave. Since the last review, the progress has been made to improve plant growth facilities including the construction of a greenhouse facility. Nevertheless, additional modern growth space will be needed in order to continuously attract high-quality new faculty.
- 3) **Graduate student funding.** Students in their first year used to receive GSR support from CNAS in addition to the Graduate Division fellowship, allowing them to do rotations in different labs. Recent cuts from CNAS had led to reduction in the length of rotation time. More recent cuts from the Graduate Division further reduced the number of fellowships. With increased costs of graduate student

salaries and benefits, the program faces pressure in keeping a desirable cohort size of graduate students for the program to be sustainable.

- 4) **Concerns within the program.** The qualifying exam has become a significant stress source for the students, and there is sometimes a mismatch between expectations of faculty and those of students in the exam. Although the program's completion rate and time appear reasonable, there are concerns about the long tail of students taking 8 years or more. Graduate students, who have difficulties, need a path for seeking help from faculty other than their major professor. Improvement in communications is needed to further improve faculty-student relationships. There are growing mental health concerns among graduate students, specially, those from minority backgrounds.

### **Section Three: Goals and Plans**

The mission of the PLBL program at UCR is to train future scientists in plant biology, and its goal is to prepare students for a wide range of careers. By leveraging diverse research expertise of the PLBL faculty, the program seeks to develop students' abilities to take multi-disciplinary approaches to solving contemporary issues in the plant sciences. The program prepares students with broad interests and long-term career goals. The UCR PLBL program is internationally recognized, and its future success is central to the excellence of UCR.

To maintain the excellence of the PLBL program and further grow it into a world-class program, both the department and the external reviewers agree that hiring and retention of faculty are critical and a significant investment in this area is needed. The external reviewers also note that the college and the department have different views about the causes leading to the decline of faculty numbers in Agricultural and Life Sciences. Thus, it is important to improve the dialogue between the two parties and develop a long-term strategic plan for faculty hiring. The shortage of high-quality research facilities is another limiting factor for the recruitment of new faculty. Though resource constraints are an UC-wide issue, the external reviewers do recognize that the continued excellence of the program will depend on investment in high-quality research facilities and suggest that the administration and the department develop a renewal strategy to provide all faculty with access to high-quality research facilities.

The external reviewers praise the program's efforts in recruiting, supporting, and mentoring students with diverse backgrounds. Nevertheless, there are new challenges that require concrete plans in this area. The program needs to work together with CNAS and the Graduate Division to develop a sustainable plan to deal with the increased costs of student salaries and benefits, while keeping a desired cohort size and a proper rotation system. The recent change in graduate student culture requires better and

more effective faculty-student communications within the program. The external reviewers suggest that the program evaluate the format of qualifying exams and decide if the adjustment is needed to reduce the stress of students.

The external reviewers were asked by the administration to consider the potential value of a professional master's program in Plant Biology to provide an additional revenue stream for the department and the graduate program. The external reviewers do not express strong support for this idea. They are mainly concerned that the PLBL program does not currently have the size and breadth to provide a range of specialization opportunities which some other universities are offering. Nevertheless, they recommend a modest investment in market analysis and a review of other such programs nationwide before taking any further steps.

#### **Section Four: Recommendations**

**Hiring new faculty should remain the top priority for the program.** The PLBL graduate program is highly successful and internationally recognized. Agricultural and Life Sciences are critical to the excellence of UCR and UCR's role in the UC system, and the PLBL graduate program plays an important role in this. There is a strong case for the campus to further invest in the program. The department and the CNAS administration should engage in discussions to reach a common understanding on the faculty size needed to sustain the excellence of the department and the graduate program. The faculty within the program should further discuss and identify research areas of future investment that will keep the program at the cutting edge of research and student training.

**Develop a capital and facilities renewal strategy.** The recruitment and retention of faculty and the training of graduate students require availability of high-quality research space. There should be a strategy to provide updates to research spaces (this issue is, of course, not limited to BPSC). Since the last review, the college and department have invested in renovation of buildings and facilities, as well as construction of a new greenhouse. The department and CNAS should continue the communications and make a long-term plan for facilities renewal. It is also important for both to ensure that the new greenhouse facility is properly managed such that it is fully and effectively utilized.

**Graduate student funding.** The enrollment has been steady over the past decade, 58 students per year on average; the program recruits about 15 new students per year, with some fluctuations. The financial support is from a combination of multiple sources, including the Graduate Division fellowships, PI's research grant, TAships, as well as

training grants the program has successfully obtained in recent years. However, with the evolution of the funding model in CNAS and the Graduate Division, as well as the increase of student salaries, there has been a significant financial burden facing the program and its faculty. The program and CNAS should have further communications on long-term prospects for student support. The program may evaluate and optimize its rotation system and cohort size given the constraints. The external reviewers note that 5- to 6-week rotations become the norm at peer institutions given the funding and time-to-degree arguments. Furthermore, given the past success, the program should continue to pursue training grants from federal agencies.

**Evaluate and improve administration of the written qualifying exam.** There appears to be a lack of clarity on what students are expected to know for the exam. The faculty may consider providing publicly available exam syllabi for different areas of study (independent of which student is taking the exam), which will also help to standardize expectations. A culture in which committee members review and discuss the exam collectively (even if over emails) before giving it to the student may help to clarify each other's expectations and provide an opportunity to revise the exam if needed.

**Improve communications with students.** Overall, the program's completion rate and time to graduation are comparable with peers (UC Berkeley and UC Davis). The external reviewers note that there is a long tail of students spending 8 years or more in the program. It will be useful for the major professor to be clear on what additional work students need to complete for graduation and make a concrete plan with them. To improve faculty-student relations, which may have been damaged by the strike, the program may consider organizing town hall events and social activities. Through the graduate education advisory committee (with two graduate students on the committee) or other channels, the program should provide feedback to the issues raised by the students in a timely manner.