

**Florida Atlantic University
Chemistry and Biochemistry Department
Program Review
March 9 & 10, 2015**

Review Team:

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OVERVIEW

The team of Dr. Mary Barkley, Dr. Robert Potter, and Dr. Patricia Liehr reviewed FAU's Department of Chemistry and Biochemistry on March 9 and 10, 2015. Dr. Gregg Fields, Chair of the Department, provided the team with the self-study that the team had reviewed prior to the visit. The visit also included a facility tour. During the evaluation visit, the team met with:

- Members of the Department faculty in two separate sessions (tenured and tenure track/non-tenure track),
- Ed Pratt, Dean of Undergraduate Studies
- Camille Coley, Assistant VP for Research
- Gregg B. Fields, Professor & Chair of Chemistry and Biochemistry
- Russ Ivy, Interim Dean, College of Science
- Michele Hawkins, Associate Provost
- Susan Fulks, Assistant Dean of the Graduate College
- Debra Szabo, Director, Student Success and Degree Completion
- Graduate and undergraduate students (about 20 of each) in Chemistry and Biochemistry.

There has been significant turnover of upper administrative at FAU in recent years. The current president, President Kelly has been in his leadership position for one year. There is currently a search underway for the Dean of Science as the past dean has now moved on to become Provost. Dr. Fields assumed the lead for the Department of Chemistry and Biochemistry in January 2015, most recently serving as Full Member of Torrey Pines Institute for Molecular Studies in Port St. Lucie, FL. Although much of the energy needed for the department to "move to the next level" will be shaped by new leaders, a direction has been set by President Kelly with the announcement of a STEM campus at the Jupiter campus. Consistent with this direction, the appointment of Dr. Fields as the department chair uniquely prepares the department to assume a prominent role in the integration of the Chemistry and Biochemistry Department across the Boca Raton and Jupiter campuses.

One of the major strengths of the Department of Chemistry and Biochemistry is the generally youthful talent and the positive spirit of the faculty members. Even when concerns about funding and workload are expressed, there is a spirit of appreciation for colleagues and for FAU. This creates a firm foundation for the ongoing development that is essential over the next several

years. Faculty would like assurances that their positions in Boca Raton will not be devalued as the Boca Raton and the Jupiter campuses are integrated. It is essential that faculty be involved in the plans for further program development and the integration process.

The review addresses: A) evaluation team observations with associated action suggestions, B) responses to the questions for reviewers posed at the end of the self-study, and C) summary that prioritizes the most pressing suggested actions.

A. Observations/Action suggestions

Observation #1: Leadership. First and foremost the Department is in need of direction and leadership. Through a series of misfortunes and economic factors outside the control of the faculty they suffered a significant loss of research capacity and senior leadership between 2008 and 2013. Several faculty including then chair Greg Fields left the university taking both research expertise as well as senior leadership and mentoring capacity. These faculty were replaced by enthusiastic but relatively inexperienced faculty. Given the strong sense of community and significant talent that exists in the Department, the remaining faculty carried on the best they could to meet the challenges of supporting an expanding undergraduate population while pursuing a research agenda with a decreasing graduate student population in an increasingly competitive federal funding environment. This situation has led to a significant sense of anxiety among the faculty, which is especially intense among the untenured tenure-track faculty. They are in critical need of mentoring in grantsmanship. Some of the associate professors also need help to continue their progression onto full professor and to generally create a culture that can sustain research and scholarly activity.

Actions:

- More time with the department chair. Dr. Fields should spend an extended period of time (eg., a month) at the Boca Raton campus to help the faculty develop a strategic plan to move forward. He should especially spend time with junior faculty to mentor them in grant writing. He should engage university support for grant editing and budget preparation.
- Because some of the faculty are approaching retirement, one or more hires at the associate professor level in research areas synergistic to current faculty could invigorate the research capacity and add more experience and leadership.

Observation #2: Critical shortage of Department faculty. This threatens both research productivity and teaching outcomes. It is essential that the Department reach a critical mass of faculty to accomplish the research and teaching missions.

Actions:

- Add tenure lines over time at the Boca Raton campus that synergize with focus areas of the integrated department (Boca Raton and Jupiter)
- Eliminate labs for nursing courses and some of the engineering courses to reduce instructional demand
- Hire adjunct or visiting instructors to bridge instructional gap until sufficient critical mass of full-time instructors and tenure line faculty can be hired.

Observation #3: Integrating Chemistry and Biochemistry at the Boca Raton and Jupiter campuses. These campuses are more than 30 miles apart and faculty teaching chemistry and

biochemistry courses are housed on both campuses. The chair of the Department is on the Jupiter campus; he currently comes to the Boca Raton campus monthly.

Actions:

- Begin by shoring up the department structure at the Boca Raton campus with an extended presence on campus (see #1 above). After the initial period, establish regularly scheduled “office hours” for Dr. Fields that are video-conferenced; faculty from both campuses could participate.
- Fully integrate the chemistry and biochemistry initiative across campuses.
- Have Honors College chemistry professors become part of the Department of Chemistry and Biochemistry.
- Provide transportation between campuses (eg. internet shuttle; shuttle to and from Tri-Rail stations in Boca Raton and West Palm).

Observation #4: Limited support for grant submission/development of research programs.

Actions:

- Provide direct grant submission support such as budget preparation and support to meet submission criteria.
- University research office should provide grant editing to improve quality, especially for faculty whose first language is not English.
- Provide seed funding for research after start-up funds are exhausted to those faculty who are continuing to seek collaborations and submitting competitive proposals.

Observation #5: Limited mentoring for new faculty.

Actions:

- Create a mentoring structure with senior faculty whose research programs are successful that specifies lines of communication and facilitates development of junior faculty in both research and graduate education.
- Accelerate new faculty initiating their research program by allowing them to choose the semester in which they will have no teaching responsibilities.

Observation #6: There is interest in creating a unique niche that distinguishes FAU’s Chemistry and Biochemistry Department.

Action:

- Consider green chemical biology as a department focus.

Observation #7: Undergraduate students. About 25 students from primarily one upper level required course participated in the discussion. They were largely complimentary of faculty efforts and felt they were receiving a good education. They were, however, quite vocal on several issues. Frequency of required course offerings seemed to be a major problem for many. In some cases this delayed their graduation. Access to computers with software needed for laboratory data analysis was also a major concern. Apparently, engineering has special facilities that are not available to other students. The systematic development of writing skills was something that several students thought would enhance career opportunities. Some students noted what they perceived to be a random (individual faculty based) laboratory report format. They thought there should be a better progression of report requirements/sophistication as they progress from lower to upper level courses.

Actions:

- Curriculum changes that streamline course offerings and enhance flexibility. Additional faculty to staff courses. Graduation rates are adversely affected by lack of timely offerings of some currently required courses. Visiting faculty could be used in the short run to allow more core courses to be offered, so that tenure line faculty can both provide instruction and increase research productivity.
- Enable OWL card access to the computer lab for selected undergraduates (those taking relevant chemistry courses).
- Thoughtful scaffolding of scientific writing expectations across courses.

Observation #8: Graduate students. About 20 students took part in the discussion. They appreciated their mentors' efforts and felt they were receiving good training. Interestingly they were aware of the stress placed on faculty to deliver the curriculum to an increasing undergraduate population while maintaining research productivity. They had three major concerns. First, and by far foremost, the stipends are too low in comparison to nearby state institutions, made more burdensome by the relatively high cost of living in Boca Raton. The graduate students unanimously opined that they should also receive health insurance. This was vitally important to those with families. Another concern was the overall lack of relevant graduate courses, specifically the infrequency of required course offerings. Many graduate students felt that perhaps too many courses were cross listed with undergraduate courses and were not being taught at a sufficiently advanced level. They did understand that the limited number of faculty made offering more graduate courses a challenge, but thought that their graduate education could be enhanced by greater regularity among course offerings and some new course offerings in emerging technologies. Finally, availability of and access to equipment was a concern that inhibited the progress of research. Some major equipment was not repaired in a timely fashion due apparently to budget limitations (in some cases this was said to be months). In other cases where instruments were available in other departments, chemistry graduate students were only allowed limited access, again inhibiting research progress.

Actions:

- Check with other Florida universities to benchmark the amount of chemistry graduate student stipends. Since FAU directly competes in the large urban market of southeast Florida, stipends must at least be competitive with those at the nearest state university, Florida International University.
- Raise the stipends over time rather than all at one time.
- Provide health insurance for graduate students. This can be added over time.
- Ensure cross-listed course meet graduate student expectations.
- Work with FAU administration to secure timely equipment repair and maintenance.
- Establish cross-departmental procedures for allowing graduate students appropriate training and access to research equipment.

Observation #9 Chemistry education research. The departmental self-study suggested one area of research focus could be chemistry education research. The department has had several successful NSF collaborative grants to design and implement more effective courses and curricula and has published the findings in well-respected journals. While improving the way we teach undergraduates by implementing evidence-based instruction is a national need strongly supported by NSF, creating a graduate program in this area will require serious rethinking of what experiences a chemistry Ph.D. student should have as well as what a dissertation in this area comprises. While they ponder this new initiative, the Department should definitely continue

their highly collaborative efforts to improve the undergraduate curriculum and continue to seek funding for these efforts.

Action:

- Faculty should examine Departments at other Universities, including Purdue University, Northern Colorado University, and the University of South Florida, which have invested in chemical education programs. They must be aware of the new funding opportunities this creates and the curricular and graduate education challenges that will arise.

B. Response to Questions for Internal and External Reviewers

(1) As our main focus is to be Chemical Biology, what courses do you recommend that we add in order to better prepare both our undergraduates but especially our graduate students for success in fields of endeavor which would fall under that heading?

Refocus the undergraduate curriculum to meet the new, more flexible ACS guidelines and emphasize chemical biology. The advanced undergraduate courses should be cross-listed as graduate courses with additional content for graduate students. Hopefully, that will reduce the total number of course offerings. At present, current faculty numbers allow offering very few of the advanced undergraduate and graduate courses. We do not recommend adding any new courses at either the undergraduate or graduate level until new faculty are hired.

(2) For graduate study in either or both the focus area of Chemical Biology or chemistry in the broadest sense, do you recommend adding any graduate level laboratory courses, such as advanced instrumental analysis or the-like?

The current graduate courses are traditional subjects. Graduate committees should recommend course work for graduate students consistent with the student's research interests. Consider replacing the core graduate courses with cross-listed advanced undergraduate courses in chemistry or appropriate courses in other departments.

(3) Having reviewed our departmental instrumentation infrastructure, what are the shortcomings that you can identify?

A mechanism for maintenance and upgrades of instrumentation as technology advances is critically important for both faculty research and student career outcomes.

(4) Do you feel that the support staff presently in our department is adequate? If not, what changes do you recommend?

Excellent staff support for grant submission, such as budget preparation and adherence to grant guidelines, is greatly needed.

(5) Do you feel that the University should provide faculty with a certain level of expense monies for the operation of their laboratories given that undergraduate students enrolled in Directed Independent Study courses utilize these facilities? Please recall that undergraduate research experiences (viz. experiential learning) is a university-wide focus.

Undergraduate research has historically been funded by faculty research funds. Money should be put into the undergraduate research enterprise, such as the Quality Enhancement Plan, for distribution to meritorious laboratories.

(6) Given that Environmental Sciences is already a strong interdisciplinary program at FAU and given that Marine and Coastal Studies is a declared area of emphasis for the University, do you recommend that our department interface with these programs? If so, what would be needed in the way of faculty and support to ensure that those activities do not detract from the main focus of Chemical Biology?

This could be considered in a strategic plan. However, developing a robust Chemical Biology program and integrating the Department across the Boca Raton and Jupiter campuses must be the highest priority.

(7) Can you suggest any grant or contract avenues that we may be overlooking for research and/or teaching support.

The junior faculty should be applying for NSF CAREER Awards. To be successful, they will need help getting grants out the door. A possible mechanism would be to develop an internal review team of junior and experienced senior faculty to critique drafts of the proposals. To improve success rates, proposals would have to be ready for review well in advance of the deadline (eg., 4–6 months).

C. Prioritized Actions

- Ensure that faculty feel supported by departmental leadership and that the leadership receives support from the higher administration to accomplish departmental goals
- Invest faculty in decision making and goal setting for the unit that aligns with FAU strategic initiatives.
- Build a critical mass of faculty with research programs.
- Provide incremental increases in graduate student stipends to become competitive with regional universities. Add health insurance for graduate students incrementally.
- Consider curriculum changes at both the undergraduate and graduate level to streamline offerings and build in more flexibility.
- Make work environment/infrastructure changes that will benefit faculty and students.