



**TO:** Mike Mahon  
President and Vice Chancellor

**DATE:** October 31, 2016

**FROM:** Alan Siaroff  
Chair, Academic Quality Assurance Committee

**RE:** Department of Chemistry and Biochemistry Academic Quality Assurance  
Review

In accordance with the U of L *Academic Quality Assurance Policy and Process*, the Academic Quality Assurance Committee approved the review of the Department of Chemistry and Biochemistry at its October 25, 2016 meeting.

The Self Study Committee for this review comprised Marc Roussel (Program Review Coordinator), Michael Gerken, Ute Kothe, and Peter Dibble. The review produced four documents:<sup>1</sup>

1. *Department of Chemistry & Biochemistry - Self Study Report* (received February 11, 2016) – Self Study Report, developed by the Chemistry and Biochemistry Self Study Committee.
2. *External Review Report* (received April 29, 2016) – by Neil Burford (University of Victoria) and Martin Bisailon (Université de Sherbrooke) based on their site visit of March 21-22, 2016.
3. *Program Response* (received July 11, 2016) – response of the Self Study Committee to the external review.
4. *Dean's Response to Quality Assurance Review: Chemistry and Biochemistry* (received October 11, 2016) – response to the review, written by Craig Cooper, Dean of the Faculty of Arts and Science.

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<sup>1</sup> All documents are available upon request.

## ***Self Study***

The body of the Self Study Report detailed the following strengths and opportunities:

- Department faculty have developed a level of maturity as scholars.
- The department will be part of the Destination Project's forthcoming integrated science building.
- The department has developed two research institutes: the Canadian Centre for Research in Advanced Fluorine Technologies and the Alberta RNA Research and Training Institute.
- Undergraduate class sizes are kept as small as possible.
- The department promotes a culture of excellence in teaching.
- The department strives to involve undergraduate students in research programs.
- Community outreach programs include iGEM, Let's Talk Science, and the Chem Guys.
- Faculty have a strong research funding track record.
- The department wants to grow the number of chemistry and biochemistry students in the M.Sc. and Ph.D. programs.
- Excellent equipment, such as the Magnetic Resonance Centre, supports departmental research.
- There is the possibility to create new chemistry and biochemistry majors that have a medical focus.
- The Chemistry major is accredited by the Canadian Society for Chemistry.
- Graduates have gone on to post-graduate programs across Canada and around the world.
- Chemistry majors qualify for membership in the Association of the Chemical Profession of Alberta.
- Graduates have found employment in a diversity of work settings.
- There are co-op opportunities for Chemistry and Biochemistry students.
- There are professional development opportunities for students and faculty, including seminars, the School of Graduate Studies THRIVE program, and the Teaching Centre's professional development programs.
- Student satisfaction with the department programs is high, with only 10% of respondents reporting dissatisfaction.
- Undergraduate enrolment has recovered after a decline from 2005 to 2011.
- Graduate enrolment rose steadily until 2010 and has now plateaued.
- Graduate students do very well in internal, provincial, and national competitions.
- Online access to relevant journals has been excellent.

Several challenges were discussed in the body of the report:

- The department has outgrown the current location in University Hall.
- Maintaining the balance between teaching and research duties is difficult.
- There is a lack of departmental control of resources, especially graduate student funding.
- The repair and maintenance of increasingly complex equipment is challenging.
- The structure and decision-making mechanisms of the Biochemistry major reflect the modest origins of this program.
- Moving to the new science building will require changes to how the department operates research and teaching laboratories and will likely lead to significant cultural changes.
- New faculty positions will likely have to be externally funded.
- In the next few years the department will be involved in more entrepreneurship and corporate partnerships, which is a major cultural shift.
- There is currently no way to stream weaker incoming students into the preparatory course CHEM 0500.
- The non-traditional titling of the science Ph.D. programs offers challenges when communicating the content of these programs externally.
- Resource constraints mean that required 3000-level courses are offered every second year.
- The number of hours of laboratory instruction for biochemistry are lower than other programs in Canada, due to limited resources.
- There are no third-year elective courses in Biochemistry.
- There is a lack of variety in the 4000-level Biochemistry courses.
- In student advising, there is no mechanism to ensure students who need program advice consult the department.
- Teaching loads for department faculty are not competitive with other chemistry departments across Canada.
- The department needs to add an analytical chemist to the faculty complement, plus add an organofluorine chemist to the Canadian Centre for Research in Advanced Fluorine Technologies. One source of funding for the latter is an NSERC Industrial Research Chair.
- The U of L does not have a standard graduate student support package that offers each student a minimum level of support. This makes recruiting graduate students more difficult.
- Student retention is a challenge for Chemistry and Biochemistry undergraduate programs.
- The department lacks equipment for mass spectrometry.
- There are not enough fume hoods.
- There are no dedicated support staff for the Biochemistry equipment.
- There is no Biochemistry teaching laboratory.
- Budget constraints may affect the department's ability to maintain subscriptions to academic journals.
- Finding funding for medium-priced equipment is a challenge.

The report contained the following issues on which the Self Study Committee solicited the advice of the External Reviewers:

- Is the department allocating its human resources effectively?
- How is the department performing in research?
- Related to undergraduate programs:
  - Are there areas in which we should be offering courses?
  - How can the department expand the hours of instruction in the Biochemistry laboratory?
  - Are there areas of the curriculum that need to be rethought?
  - How do the labs computer to those at other institutions?
  - Are there areas of the lab curriculum that should be revised?
- Related to graduate programs:
  - Is the graduate student funding model competitive?
  - Are there changes to graduate curriculum or practices that would increase the retention of graduate students who want to take a Ph.D. program?
  - How can the department identify foreign graduate students that are likely to be successful?
  - How can the department maximize the chances of success of foreign graduate students?
  - Is it an issue that the department has no control over graduate student funding?
  - What is a typical distribution of responsibility for graduate student funding between the department, the faculty, and the graduate studies unit?
  - Is it typical that the cost of Independent Study and Honours Thesis courses are borne by researchers?
  - What are typical mechanisms for funding routine maintenance of research equipment?
  - Is there adequate technical support for the equipment?
  - Should the department consider other models for maintaining and repairing equipment?
- How can the department give biochemists more autonomy in administering the Biochemistry major?
- Is the department providing the appropriate recognition and resourcing to both the chemistry and biochemistry communities within the unit?

The Self Study Report concluded with some reflections:

- The department needs greater control over the resources necessary to run its programs and research.
- The department should consider giving the biochemists a more direct voice in decisions affecting the Biochemistry program.
- The move to the new science building will provide many opportunities to innovate in teaching and research.
- The QA review of the department will be a basis for long-term planning and renewal.

### **External Review**

In summary, the External Review Report stated that the Department of Chemistry and Biochemistry "is an effective unit of undergraduate education, has a good and growing reputation in research and is a pillar of the Faculty of Arts and Science." The report summarized the strengths, weaknesses, and recommendations for the Department.

#### **Strengths:**

- Faculty research significantly impacts three of the five research themes in the U of L Strategic Research Plan.
- Faculty are dedicated to students and the student experience.
- The Department addresses the three academic directions in the U of L Academic Plan.
- Learning opportunities are on the level of comparable universities across Canada. Highlights include access to first-class instrumentation and opportunities for independent studies.
- There are many research opportunities for undergraduate students.
- There is a strong spirit of collegiality among the professors, instructors, and staff.
- The instrumentation and equipment is of a high standard.
- B.Sc. Chemistry and Biochemistry graduates are frequently successful in being admitted into graduate studies.
- Alumni have found employment in a wide variety of related fields.

#### **Weaknesses:**

- Many students and faculty feel that 3000 and 4000 level course offerings are limited.
- Some faculty members feel that some faculty from the Department of Biology try to take control and ownership of the B.Sc. Biochemistry program.
- Some students and faculty feel that the B.Sc. Biochemistry program is weak, due to the low number of Biochemistry courses in the program.
- The teaching load for a professor is double the teaching load of professors of chemistry in research-intensive universities in Canada, and four times the teaching load of professors of biochemistry.

- Growth of the graduate programs will require additional resources from the University or more external research funding by faculty members.
- The graduate student stipend can vary significantly, depending on the availability of Teaching Assistantship funding.
- The procedure for distributing Teaching Assistantships is inefficient.
- Financial management procedures between the Faculty and the Department are inefficient.
- Academic advising is ineffective.

**Recommendations:**

- Develop a strategic plan for the Department.
- Establish an identity specifically for Chemistry and Biochemistry.
- Review the administrative structure of the Biochemistry program. Disband the Biochemistry Program Committee and assign management of the Biochemistry program to the Department of Chemistry and Biochemistry.
- Implement changes needed to align the Biochemistry program with similar programs across Canada. E.g., develop more Biochemistry courses, and introduce a lab component into Biochemistry 2000.
- Develop a more effective working relationship with the Department of Biological Sciences.
- Facilitate more efficient administration for the Department, especially related to financial management.
- Develop mechanisms for revenue generation and financial management that allow for the creation of contingency funds.
- Regulate graduate student stipends so they are consistent with those for chemistry and biochemistry students across the country.
- Develop a formal seminar program for graduate students to present their research.
- The Faculty of Arts and Science should provide the Department with an unrestricted Teaching Assistant budget that the Department Chair has the flexibility to distribute.
- Review the effectiveness of academic advising.
- Review the annual course offering to optimize the allocation of teaching personnel. Consider offering courses that include chemistry and biochemistry components.

The following additional recommendations were contained in the body of the report:

- Review the teaching load of faculty who are active researchers to ensure teaching loads are comparable with other universities in Canada. Use a fair and transparent model to assign teaching loads.
- Assign the position of Associate Chair of the department to a faculty member, as a training opportunity for the Chair.
- When making future faculty and staff appointments, consider student distribution across Chemistry and Biochemistry.

- Plan how the undergraduate student distribution should evolve across the Biochemistry, Chemistry, combined degree, and pre-Education programs.
- Review the workload and expectations for Teaching Assistants to ensure these are reasonable.
- At the Faculty level, review how funds are distributed to the departments to enhance efficiency and effectiveness of resources.
- Consider reinvesting Canada Research Chair positions in the Department.
- In promotional activities, emphasize the close relationship between teaching and research.

### ***Program Response***

In their Program Response, the Self Study Committee addressed several of the recommendations from the External Review Report:

<b>Recommendations:</b>	<b>Program Response:</b>
Develop a strategic plan for the Department.	<p>The Department will hold a retreat, which will lead to a working group that will develop a departmental strategic plan.</p> <p>Issues this plan will address include:</p> <ul style="list-style-type: none"> <li>• Clear departmental priorities.</li> <li>• A review of the department leadership, including decision-making processes and the Associate Chair role.</li> <li>• Optimizing teaching resources in alignment with department priorities.</li> <li>• Developing a departmental identity.</li> </ul>
Review the administrative structure of the Biochemistry program. Disband the Biochemistry Program Committee and assign management of the Biochemistry program to the Department of Chemistry and Biochemistry.	The Biochemistry program advisory committee should be reconstituted to give biochemists control over the program.
Implement changes needed to align the Biochemistry program with similar programs across Canada.	The Biochemistry program advisory committee will work on curriculum renewal of the program to align it with Biochemistry programs at similarly-sized institutions across Canada.
Develop a more effective working relationship with the Department of Biological Sciences.	Agreed. The Department will establish better communication channels with Biological Sciences. The Dean's office can play a role by ensuring all departments affected by decision on space are kept informed and by organizing regular meetings of the Chairs of science departments.

Recommendations:	Program Response:
Facilitate more efficient administration for the Department, especially related to financial management. Review the teaching load of faculty who are active researchers to ensure teaching loads are comparable with other universities in Canada. Use a fair and transparent model to assign teaching loads.	For the department to have competitive research programs, teaching loads should be reduced for research-active faculty members. The Chair of the Department should be allowed to assign teaching without the involvement of the Dean's office and without the requirement to follow an Arts and Science teaching load model. The Department should be able to charge for the use of equipment and use these funds for supplies, maintenance, and renewal.
Regulate graduate student stipends so they are consistent with those for chemistry and biochemistry students across the country.	A joint working group of the School of Graduate Studies and the Department has been established to transfer responsibility for graduate student funding to the Department.
Develop a formal seminar program for graduate students to present their research.	Agreed. The Department will establish a working group to implement this recommendation.
The Faculty of Arts and Science should provide the Department with an unrestricted Teaching Assistant budget that the Department Chair has the flexibility to distribute.	The Faculty of Arts and Science, in collaboration with the School of Graduate Studies, should establish a Teaching Assistant budget. The Department should be allowed to make Teaching Assistant assignments within the parameters of the GSA Collective Agreement.
Review the effectiveness of academic advising.	Agreed. Centralized advising is not a good fit for complex programs like Chemistry and Biochemistry.

The Program Response also addressed increasing workloads on administrative support. It noted that if more administrative work is downloaded to the departments then more administrative support will be required in the Department.



## **Dean's Response**

Craig Cooper, Dean of Arts and Science, responded to the recommendations as addressed in the Program Response:

Develop a strategic plan for the Department.	<p>Agreed. The Department will hold a retreat, from which they will create a working group to develop the strategic plan. This plan will address:</p> <ul style="list-style-type: none"><li>• Clear departmental priorities - This will help the Department identify where to invest their resources.</li><li>• A review of the department leadership, including decision-making processes and the Associate Chair role - The Department will have to decide if to assign the position of Associate Chair to a faculty member, as opposed to assigning it to an instructor, which is the current practice.</li><li>• Optimizing teaching resources in alignment with department priorities - Several areas need consideration, including: a lab component for Biochemistry 2000; more Biochemistry courses; limiting the number of 3000 and 4000 level courses; and offering courses with both chemistry and biochemistry components.</li><li>• Developing a departmental identity - This identity should make the Department distinct and useable for recruiting.</li></ul>
Review the administrative structure of the Biochemistry program. Disband the Biochemistry Program Committee and assign management of the Biochemistry program to the Department of Chemistry and Biochemistry.	<p>The Biochemistry program advisory committee should be restructured so that Biochemists form the core of this committee. There should be one representative from Chemistry and one representative from Biological Sciences.</p>
Implement changes needed to align the Biochemistry program with similar programs across Canada.	<p>Additional courses have to be added at the third and fourth year levels, and a lab component should be added to Biochemistry 2000. These changes will have to be made incrementally due to scarce resources. The Biochemistry program advisory committee can start work on this.</p>
Review the teaching load of faculty who are active researchers to ensure teaching loads are comparable with other universities in Canada. Use a fair and transparent model to assign teaching loads.	<p>According to the Faculty Handbook the Dean is responsible for assigning teaching loads. In practice the departments work out course offerings and teaching assignments, but the Dean must ensure equity and fairness across the Faculty of Arts and Science.</p>
Facilitate more efficient administration for the Department, especially related to financial management.	<p>Related to mechanisms to maintain and renew equipment, the Dean's office has helped the Department with larger purchases and will continue to work with the Department to ensure state-of-the-art equipment. The model for equipment maintenance and renewal used for the NMR facility is effective and should be adopted for other equipment and instrumentation clusters. The Dean's office will continue to work on this with Finance.</p>

The Faculty of Arts and Science should provide the Department with an unrestricted Teaching Assistant budget that the Department Chair has the flexibility to distribute.	This recommendation considers only Graduate Assistantships and the Faculty of Arts and Science does not supply the funding for these. The School of Graduate Studies will be running a pilot where the oversight of graduate funding rests with a department. However, if the Graduate Assistantship budgets devolve from the School of Graduate Studies to the departments, the budget might be less than under the current process.
Develop a more effective working relationship with the Department of Biological Sciences.	The Department is already developing better lines of communication with Biological Sciences, and the Dean's office can play a role by meeting with the Chairs of the science departments.
Develop a formal seminar program for graduate students to present their research.	The Department will establish a working group to implement this recommendation.
Review the effectiveness of academic advising.	Resources are not available to establish advisors within departments. One option is for a faculty member to undertake advising for the Department as part of their service. If this is not possible, key members of the Department should meet with the Associate Dean to discuss issues related to advising.

Though it was not explicitly recommended in the External Review Report or Program Response, the implied growth in the number of Biochemistry instructors will be challenging due to a lack of resources.

The Academic Quality Assurance Committee is satisfied that the Department of Chemistry and Biochemistry academic quality assurance review has followed the U of L's academic quality assurance process appropriately, and acknowledges the successful completion of the review.

Sincerely,



Alan Siaroff

Chair, Academic Quality Assurance Committee

Cc: Andrew Hakin, Provost and Vice President (Academic)