Department of Chemistry and Biomolecular Sciences (CBMS)
Macquarie University
21-22 July 2011

External Review Committee

Prof. Robert Lamb (chair) (University of Melbourne)
Prof. Alastair McEwan (University of Queensland)
Prof. Mary Spongberg (Macquarie University)

Background

The review was carried out within the Faculty of Science at Macquarie University. The programme of interviews (see Appendix 1) included additional follow up discussions with staff as noted (22 July afternoon).

Additional written documentation presented as
Appendices

2. Terms of Reference
3. Self-evaluation review 2011 together with attachments
4. Workload Statistics (including workload calculations)
5. 16 confidential submissions (list only attached)

Executive Summary

A total of 18 recommendations have been outlined in the following review paper. The key outcomes of the review are summarised below

1. Retain Majors in Chemistry and in Biomolecular Sciences.
3. Develop Operational and Strategic plans as a matter of priority
4. Review collaborative teaching opportunities and prerequisite requirements with the aim of reducing teaching loads
5. Review technical support capabilities across teaching and research activities with the aim of consolidating Analytical Service centres.
6. Establish Research Themes in place of the existing Research Matrix.
1. Governance, Leadership and Management

The management of the department appears to be functioning reasonably well but there is a general perception that it is not sufficiently inclusive in decision making processes. As a starting point broadening representation through expansion of the HAT group is suggested. A joint sense of ownership in decision making is critical with respect to successful implementation of outcomes.

**Recommendation:** Changes in management structure and action with the aim of broader representation and leading to greater transparency of decision-making process.

More consultation with staff should be seen as a priority. However the approach to tackling this should be examined and a plan developed. The intranet communication alone does not appear to be succeeding. Regular Departmental forums that include all academic and general staff should be instituted.

**Recommendation:** A communications strategy should be developed and distributed for discussion.

There was a clear sense of disconnect between the chemistry and biologically oriented groups in the department. Yet there are significant complementarities that could be explored. In particular the centres and services activities could inform directions for consolidation.

Any discussion might consider the department’s role in unifying similar activities in other parts of the university with the aim of consolidating common goals campus wide. As an example, where else is chemistry featured across the campus and how does the department facilitate a focus for activities in the Chemical Sciences?

**Recommendation:** Schedule of formal planning day(s) to review departmental teaching and research programs with the aim of preparing an annual operational plan and updated strategic plan.

The department has a Teaching and Learning committee but no Research and Research Training Committee. Such specialist groups ought to develop plans for consideration by HAT and also implement appropriate changes across the major activities of the school. This will help define the directions and workload distributions and help integrate the department. The Head of each of these committees would be part of HAT and also represent the department at the appropriate Faculty committees.

**Recommendation:** Creation of a Research and Research training Committee and appointment of Director/Head Research and Director/Head of Teaching positions.
2. Academic Program

The Department has a proud tradition of educating students in Chemistry and Biomolecular Sciences. Chemistry interfaces with Biology and the Physical Sciences and, as a consequence, if a single Major in Chemical Biology were adopted it would significantly diminish Chemistry as a discipline at Macquarie University. However, it does not follow that Chemistry teaching should not be adjusted to reflect the situation of the Department and its strengths.

Recommendation: Majors in Chemistry and in Biomolecular Sciences should be retained

The Chemistry curriculum was seen as a significant encumbrance in the development of common teaching goals that could be embraced by the entire department. At 2nd level the emphasis on ‘Chemical Synthesis’ and ‘Chemical Analysis’ seemed to be out of step with contemporary Chemistry and Biomolecular Sciences. It is suggested the courses at 2nd and 3rd level should be reassessed and structured in a way that builds on the strength of the entire Department. There is a common strength in Analytical Molecular Science and connects Chemistry to the Biosciences and to the Environmental Sciences. Thus, at 2nd level the six courses offered by the Department might be:

- Chemistry: Reactions and Mechanisms (Organic and Inorganic)
- Analytical Molecular Science
- Physical Chemistry
- Microbiology
- Molecular Biology
- Biochemistry

With this arrangement it should be possible to teach Chemistry of relevance to both the Biological and Environmental/Physical Sciences. Adjustment to 3rd level should follow this 2nd level alteration.

The amount and purpose of practicals and tutorials at 1st and 2nd level should be reassessed and a substantial decrease in teaching load should be achieved, particularly in Chemistry (in line with standard practices). Although RACI accreditation is important realistic teaching loads are more fundamental to the success of the Department. The viability of the Advanced Chemistry course at 1st level should be assessed.

Recommendation: Review Chemistry courses with the aim of positioning Chemistry as a central science of importance to a wide variety of disciplines and to improve the pass rate.

Recommendation: The strength of the entire Department in Analytical Molecular Science should be harnessed as a potential unifying focus

Although 1st level Chemistry is a key course that ought to be taken by all Science students it was apparent that enforcing prerequisites for Chemistry in 2nd level courses was affecting enrolments and that there was a case for relaxing this requirement in areas of Biomolecular Sciences that were oriented towards genomics and bioinformatics. Prerequisite requirements for entry into 2nd level Molecular Biology
should be reassessed in order to provide students with a Biology background the
opportunity to enter 3rd level Genomics and Systems Biology courses.

CBMS has a very small role in 1st level teaching of Biology. This low level
involvement was leading to a biological sciences curriculum that overemphasised
ecology/evolutionary biology at the expense of functional biology. This imbalance
cannot be addressed by moving ‘molecular and mechanistic’ aspects of Biology into
Chemistry courses. To address this there should be greater collaborative teaching at 1st
Level between the CBMS and BIOL where courses (BIOL115) have an evolutionary
biology and functional biology dimension. The difficulty that CBMS has had in
appointing a staff member to teach Microbiology was noted and the potential to teach
Microbiology in partnership with BIOL ought to be explored.

Recommendation: Review Biology courses with the aim of establishing synergies
between CBMS and BIOL that produce a balanced curriculum in the Biological
Sciences

The Master of Biotechnology Program appeared to be well managed and there was a
clear student demand. Enrolments in courses associated with the Master of Laboratory
Quality Analysis and Management were lower and concern was expressed about the
quality of international students enrolled in this Program. There was also the view that
it be better geared to meeting industry needs. External groups while being involved in
course development did not appear to employ any of the graduates. Partnering for
impact would be essential for such programmes to survive.

Recommendation: The breadth of PG courses in Chemistry should be examined and
the market for courses in this area should be reassessed with respect to domestic and
international student demand.

3. Research and knowledge leadership

The department has a highly successful program of research associated with the
CORE (BMFRC) and APAF. However there appears to be some disconnect between
those associated with the ‘CORE’ and a number of staff associated with Chemistry.

In addition there appears to be some concern by staff regarding the rationale behind
new CORE appointments at the expense of other areas of activity. While this may
simply be a communication problem it exacerbates the divide between teaching and
research and inhibits research inspired teaching initiatives, particularly in Chemistry.

A more inclusive approach to research needs to be formulated. As noted in section 2,
the example of Analytical Molecular Science should be seen as one possible focus.

Recommendation: Collaboration should be developed around associated themes in
research and teaching. The latter being targeted at perhaps a more integrated
honours year.

The Department currently has 5 research analytical facilities with instrumentation
purchased from NCRIS, RIBG and external LIEF schemes. Routine support for the
maintenance of these instruments is negligible and with no dedicated staff to operate
them. Rather HDR candidates and with some assistance from technical staff are being
utilised to maintain the instruments. The introduction of a mechanism for providing routine maintenance other than through support of HDR students should be a priority. This is discussed further in Section 5. The Department should consider a subsidised “fee for service” operation. This Services base can also act as a catalyst for research.

**Recommendation:** There should be consideration given to consolidation of analytical service type centres and facilities within the department. (esp: MUCAB + NMR +Chemical Analysis) to form a supportable central facility.

4. **HDR Review**

The Department has a large cohort of higher degree research students across both disciplines and they appear to be well managed and the commitment was high. The committee was particularly impressed with the practice of providing students with the opportunity to manage a small research budget.

HDR candidates in the department saw the lack of available, working analytical instrumentation as a real problem. While this point has been addressed earlier in the review (section 3) it is interesting that the HDR group saw this as a major issue that impacted upon completion. There was also a concern that while they were well supported upon entry to the program, during the stressful completion period there were not similar levels of support.

While many of these problems are systemic within similar Departments around the country there is a clear need for improvement in HDR engagement with the affairs of the Department. One suggestion might be to complete the current Departmental seminar series with 2-3 HDR 15 minute student talks.

**Recommendation:** The Departmental HDR student society (SCABS) should be expanded to include undergraduates and broader postgraduate participation. A student representative should be nominated who engages with appropriate Departmental committees.

While HDR candidates indicated that they were involved in some teaching activities, there did not appear to be a strategy for integrating postgraduates and postdoctoral fellows into all teaching activities in the department. This should be taken into account in subsequent teaching reviews and the involvement of HDR and ECR’s in these plans should be considered.

**Recommendation:** Develop clearer pathways for the extracurricular/professional development of postgraduate and Early Career Researchers.
5. **Staff and Student Profile**

The Department has aimed to maintain a relatively broad research profile by projecting a Research Area Matrix. However, the profile does not do justice to the strength of research in CBMS and it works against the concentration of research to build excellence. It is suggested that instead the Department should develop Research Themes that reflect the common research strengths of CBMS and also its interface with the Biosciences and Environmental Sciences/Geosciences. These themes could be:

- Analytical Molecular Sciences
- Environmental Chemistry
- Chemical and Structural Biology
- Systems Molecular Biology

There is potential to build from these themes to develop Materials Chemistry.

**Recommendation:** *The Research Area Matrix should be replaced by a small number of Research Themes.*

A period of post-review reflection would be helpful for the Department and during this period an agreed plan for integrating across Chemistry and Biomolecular Sciences in teaching and research needs to be aligned with agreed strategic directions. Once this is achieved it should be possible to move forward with new appointments.

**Recommendation:** *New Academic staff appointments in CBMS should not be made until clearly defined Research Themes are articulated and approved by the Dean.*

The Department has an impressive suite of instrumentation that underpins both Chemistry and Biomolecular Science research. (see section 3). While some of these facilities are well appointed with technical support, others, particularly in Chemistry (NMR, for example) are not. As mentioned above, this situation is causing frustration for researchers, especially HDR students. It was observed that technical staff are capable and willing to provide research support but their time is taken up by the very high workload supporting practical teaching.

**Recommendation:** *The balance of duties of technical staff within the teaching and research support areas should be reassessed, as part of the review of the amount of practical teaching with the aim of increasing the support for research instrumentation.*

6. **Community Engagement**

The interactions with the community need to be formalised. An external advisory group comprised of stakeholder representatives from teaching, industry, and government organizations should be formed. This group, which should meet once or twice annually, can provide external perspectives on departmental offerings (e.g. new directions for teaching) and suggest potential directions for development.

**Recommendation:** *Establish an external community advisory group to the department.*
The approach to outreach should be recast to incorporate the new consolidated themes in research and teaching of the department. The basic of business development across centres and services needs to be reexamined and incorporated into the plan.

**Recommendation:** An outreach plan should be prepared that covers community engagement across both educational and business areas.

### 7. Future Directions and Overview

The committee was impressed by the commitment and passion displayed by all the groups interviewed and the very helpful written submissions that were received. While the Department has issues (and every similar organisation does) the committee doesn’t see these as intractable.

This review seeks to identify key elements of the overall operations that should be addressed. In particular the imbalance between teaching loads and the clear strengths in research need to be reconciled. One comment that was made during the interviews was the need for “more quality and inspiration less quantity of teaching”. The committee agrees with this but feels that getting the balance right will unlock the inherent potential.

The Department should undertake a strategic planning exercise in order to develop a consensus about the direction its direction in the light of the recommendations arising from the Review. In addition opportunities to deliver short courses linked to Continual Professional Development should be explored as a way of assisting in this transition.
Appendices

1 Interview Schedule (Attached)
2 Terms of Reference (Attached)

3 Self-evaluation review 2011 (54 pages) together with attachments
   1. Specific goals for 2011 document (12 pages)
   2. Major in Chemistry (1 page)
   3. Major in Biomolecular Science (1 page)
   4. Master in Biotechnology (1 page)

4 Workload Statistics, including workload calculations

5 List of confidential submissions
   a. Lesley Hughes, HoD and members of the Dept of Biological Sciences
   b. Deb Kane, Physics & Astronomy
   c. Mark Baker, CBMS
   d. Jenny Donald, Biological Sciences
   e. CBMS Academics (10)
   f. Fei Liu, CBMS
   g. Shoba Ranganathan, CBMS
   h. Robyn Beirman, Chiropractic
   i. Brian Orr, Physics & Astronomy
   j. Orsola de Marco, Physics & Astronomy
   k. Marie Herberstein, Sham Nair and Rekha Joshi, convenors and tech. staff for units BIOL114 and BIOL115
   l. David Coutts, HoD, Physics & Astronomy
   m. Peter Karuso, CBMS
   n. R.J. Smith, MD, Phytex Australia Pty. Ltd.
   o. Rekha Joshi, Faculty of Science
   p. Jason Smith, Student CBMS
## Appendix 1

**SCHEDULE FOR REVIEW OF CBMS - 21-22 July 2011 - E6A room 202**

Panel: Prof Robert Lamb (Chair), University of Melbourne  
Prof Alastair McEwan, University of Queensland  
Prof Mary L Spongberg, Macquarie University

### Day 1 - Thursday 21 July - Building E6A room 202

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:30-10:00</td>
<td>Prof Stephen Thurgate and Prof Helena Nevalainen (Head of Department)</td>
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<tr>
<td>10:00-10:30</td>
<td>Prof Helena Nevalainen, A/Prof Joanne Jamie and Prof Nicki Packer</td>
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<tr>
<td>10:30-11:00</td>
<td>Panel discussion and morning tea</td>
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<tr>
<td>11:00-11:20</td>
<td>Academic Staff: Dr Ian Jamie and A/Prof Andrew Try</td>
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<td>11:20-11:40</td>
<td>Academic Staff: Dr Louise Brown and A/Prof Bridget Mabbutt</td>
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<td>11:40-12:00</td>
<td>Professional staff (general): Maria Hyland and Catherine Wong</td>
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<tr>
<td>12:00-12:20</td>
<td>Professional staff (technical): Mark Tran, Elsa Mardones, Rekha Joshi</td>
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<td>12:20-12:40</td>
<td>Academic Staff: Prof Shoba Ranganathan</td>
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<td>12:50-2:00</td>
<td>Lunch with Stephen Thurgate</td>
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<td>2:15-3:00</td>
<td>CoRE: Prof Nicki Packer, Prof Ian Paulsen, A/Prof Paul Haynes</td>
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<td>3:00-3:40</td>
<td>Tour of CBMS and APAF - led by Nicki Packer and Helena Nevalainen</td>
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<td>3:40-3:55</td>
<td>Afternoon tea</td>
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<td>3:55-4:15</td>
<td>Academic Staff: Prof Mark Baker</td>
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<td>4:15-4:45</td>
<td>Academic Staff (Dept of Biological Sciences): A/Prof Jenny Donald (Director, Medical Sciences), Prof Lesley Hughes (HOD, Biological Sciences)</td>
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### Day 2 - Friday 22 July - Building E6A room 202

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<th>Time</th>
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<tr>
<td>9:00-9:15</td>
<td>Panel discussion</td>
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<td>9:15-9:45</td>
<td>UG students: Matthew Jacobs, Sofia Casbolt and Donald Cameron</td>
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<td>9:45-10:15</td>
<td>PG/HDR Students: Arun Dass, Sophia Goodchild, Jason Smith, Robyn Peterson</td>
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<td>10:15-10:30</td>
<td>Panel discussion and morning tea</td>
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<tr>
<td>10:30-11:30</td>
<td>Industry Contacts: Bill Russell (Faculty Business Development Manager); Marlan Haire* (Manager, Training &amp; Technology Transfer, National Measurement Institute); Dr Simon Apte* (CSIRO);</td>
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<td>11:30-12:00</td>
<td>A/Prof Mark Molloy and Dr Tom Roberts</td>
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<td>12:00-12:05</td>
<td>Karl Lukezic, Faculty Technical Services Manager</td>
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<td>12:05-12:15</td>
<td>Paul Haynes, administratively responsible for Coursework masters program and HDR students</td>
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<td>12:30-1:30</td>
<td>Working lunch with Stephen Thurgate</td>
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<tr>
<td>1:30-3:30</td>
<td>Panel discussion</td>
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<tr>
<td>3:30</td>
<td>Final discussion with Stephen Thurgate and Helena Nevalainen</td>
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* via phone link up
Appendix 2

MACQUARIE UNIVERSITY
Faculty of Science

Chemistry and Biomolecular Sciences Terms of Reference – 2011 External Review

1. Governance, Leadership and Management
   Review the effectiveness of CBMS planning, leadership and management structure, processes and resources in responding to Faculty and University strategic planning directions.

2. Academic Program
   Review the appropriateness of the degrees, programs, and units offered by CBMS relative to Faculty and University priorities, employer and professional community demands. Include (i) a review of retention rates from first year and strategies to improve these, and (ii) a review of postgraduate coursework programs and strategies to increase offerings.

3. Research
   Review current research outputs, activity, and capability relative to Faculty and University objectives including opportunities for developing research and knowledge leadership.

4. Research Training
   Review the HDR program, including admission standards, methodology and skills training, completion times and drop-out rates, supervision and reporting standards.

5. Staff and Student Profile
   Review the alignment of academic, professional, and student profile relative to current and future objectives and plans.

6. Community Engagement
   Review the scale, scope, and quality of community/industry engagement, including external/professional contribution to and referencing of, curriculum and research development.

7. Future Directions
   Recommend future development opportunities for CBMS in terms of its resources, research, teaching and community/industry engagement activity.