

**University of Wisconsin – Madison**  
**Department of Chemical and Biological Engineering**  
**Report of the Visiting Committee**

Meeting: October 1-2, 2008

## **1.0 Introduction**

The Visiting Committee met from 4:00 p.m., October 1<sup>st</sup> to 5:00 p.m., October 2<sup>nd</sup>, 2008. Ten of the 12 members of the committee attended the meeting as shown at the end of this report. The agenda for the meeting is attached as Appendix A. Handouts of most of the presentations and other extensive supporting materials were provided to the committee during the meeting. During the meeting the committee met with the junior faculty as well as representative groups of undergraduate and graduate students. The students represented a good cross-section of those in the department. The Committee divided into three groups to meet simultaneously with these three groups. These meetings were held without the Department leadership present. During the last hour of the meeting a discussion of the department's relationship with the College of Engineering was held with Dean Paul Percy.

## **2.0 Overview**

The Department of Chemical and Biological Engineering is very strong and well-positioned to remain one of the preeminent departments during the twenty-first century. In prominent surveys of chemical engineering departments it is typically ranked among the top few departments. Michael Graham, the Chair, has strong support from the faculty, students, and staff. The department has excelled within the College of Engineering at UW in both research and teaching. It has an outstanding group of young faculty, and the faculty as a whole is distinguished and continues to receive significant external recognition.

Since the last meeting of the Committee in 2006, all of the recommendations from that meeting have been addressed at least in part. We also toured the remodeled laboratories, which were a big improvement over previous spaces.

We heard reports from the Department Chair Mike Graham (State of the Department), Great Lakes Bioenergy Research Center (Jim Dumesic), new faculty research presentations (Jennie Reed, Brian Pflieger), Undergraduate Program (Dan Klingenberg), and the Graduate Program (Nick Abbott). These presentations are available from the Department Chair. We learned that undergraduate enrollment in chemical engineering is growing again.

### **3.0 Review of Recommendations from 2006 Meeting**

The previous Visiting Committee made five recommendations for the Department when they last met in 2006:

- (1) Proceed with the systems in place for ABET program objectives and outcomes evaluation.
- (2) Work to improve faculty advising of undergraduates.
- (3) Set up and communicate to the graduate students a clear path and set of resources for conflict resolution.
- (4) Consider a more structured mentoring process for junior faculty, with specific senior faculty assigned to each junior faculty member upon arrival in the department.
- (5) Benchmark research and Ph.D. production against other top ten departments of chemical engineering in addition to the benchmarking that is done within the College of Engineering at the University of Wisconsin-Madison.

During the past two years, all of these items have been addressed satisfactorily, although item 5 on benchmarking still needs more attention. Items (2), (3), and (4) are discussed in Section 4.0.

### **4.0 Results from Small Group Meetings**

The Visiting Committee broke up into three small groups covering undergraduate students, graduate students, and young faculty.

#### **4.1 Undergraduate Student Meeting (Cameron, Curler, Pruessing, Kelley and Jensen).**

Discussions were held with six undergraduates; William (Jr), Heidi (Sr), Jeremy (Sr), Jessica (Sr), Stephen (Sr) and Tim (Jr). A wide variety of areas were covered, which are grouped into four topics: advising, curriculum, teaching and labs, and other.

##### **4.1.1 Advising**

All students felt advising was very solid to excellent. Several students handled their contacts via email, which is handled promptly and well. Certain professors provide excellent advice concerning curriculum and courses. One senior commented that he had handled his advising using only email all four years. While emails were efficient, several students commented they learned of more possibilities from “face-to-face” discussions, suggesting a richer exchange might be beneficial. Advantages of face to face discussions were knowledge about interdisciplinary research opportunities and certificates from other academic areas. In addition, students rated the engineering career services as excellent, especially for managing co-op and internship possibilities. However, professors seldom recommend these options, instead they tend to recommend the research opportunities within the Department instead.

##### **4.1.2 Curriculum**

Overall course work is seen as challenging (most said this with a sense of pride). Actions by the Department in redesigning Comp Sci 310 and the addition of Introductory Biology before Advanced Biology (570?) have solved key problems. On the other hand, the core CBE course 470 (process control lecture and lab) is broadly felt to be significantly more work than the three credits warrant. Biology courses are viewed bimodally. Some students love learning different mechanisms while others feel the memorization, while necessary, is excessive. The Department should consider doing for Biology what was done for Comp Sci 310; make it more relevant to CBE students. However, the committee recognizes this would require a substantial amount of work.

##### **4.1.3 Teaching and Laboratories**

Overall Teaching Assistants receive high ratings from the undergraduate students. Discussions are well-led and TA's are responsive with emails outside of class. Also CBE labs are well-organized and well-run. The addition of Eric (the Lab Manager) is broadly viewed as a positive step. Computer tools and software work well and are readily accessible. About 50% of students take advantage of laptops made available. Due to scheduling issues, a number of students had the same professor for three or four different classes. While the student felt he did a good job, they feel they missed the opportunity to get a broader perspective from different faculty. It may be desirable to review the course assignments to provide more diversity with professors teaching key courses.

#### **4.1.4 Other**

Several undergraduates enjoyed doing research (independent study), especially research that cuts across several departments. Examples include biological research, teaching fourth grade in the Madison schools and of course research in the CBE department. The AIChE student chapter is in the process of being revitalized by the students. SWE is seen as a strong organization by the students. Communication across disciplines (e.g., between Microbiology and CBE) is an opportunity, where they would like to see more involvement from the faculty.

## **4.2 Graduate Student Meeting (Amiridis, Edgar, Garcia)**

We had a good mix of students at various stages of their Ph.D. program and from different advisors. They were all very impressive and articulate. In general the students were very positive about their experience at UW. We had to work hard to get them to identify areas where improvement is needed. The discussion centered around four main topics:

### **4.2.1 Qualifiers/Prelims**

They thought the new system is a good compromise that keeps in place some positive things about the old system. Uniformity of qualifiers was an issue in the past, now with the new requirements (course grades instead of qualifiers), the department needs to monitor uniformity of required courses as teachers are changed from year to year.

#### **4.2.2 Advisor Selection Process**

Students feel they are not given enough time to make this very important decision that will significantly impact their career. They would like more guidance on what to look for in an advisor as part of this process.

#### **4.2.3 Industrial Internships**

The students perceive that internships are mostly discouraged by their advisors, who feel research work is the most productive activity during the summer. Also, if the internship is too early in the students' career, it interferes with the coursework/prelim process; if an internship is taken too late, completion of the thesis can be slowed. Most students felt internships are very important to help them decide career paths in industry vs. academia, since few professors have industrial experience and can provide coaching.

#### **4.2.4 Advising**

Students would like to see more "open doors" from the faculty. They would like more help with job/career decisions, and would consider using outside industrial contacts for coaching. Also needed are improved communications on the industrial recruiting process, because students discover too late when to start interviewing with no time to prepare. They would like more advance guidance from advisors on when they will be finished with their thesis work (more transparency).

#### **4.3 Junior Faculty Meeting (Leckband and Jensen)**

Jennifer Reed, Brian Pflieger, Christos Maravelias represented the young faculty. There was positive morale, largely based on good departmental support, fair student assignments, and involvement in department decision-making. Junior faculty are involved in new initiatives and leadership opportunities. They commented that renovations are typically needed for new faculty, due to the old building. Lab renovations take a long time (a campus issue). Mentoring by senior faculty (i.e., mentoring committee) needs a bit more transparency but overall is positive. Teaching duties are reasonable (two courses per year, no complaints on assignments, which are

done by Department Chair). There is some tension between research and TA requirements for courses, especially with decreasing student support from the department and minimal staff support. The problem may stem from graduate students spending more time on grading than their appointments call for. The Department supports the TAs for the courses (TA support is 1/2 to 1/3 stipend covered by Department), and two semesters as a TA are required for each graduate student.

The young faculty report a very positive experience; they are very loyal, with good esprit de corps and are involved in department governance. They have good experience with graduate student placement, and were assigned the students they wanted. Young faculty reported receiving lower startup packages (20% less than upper end of offers); and are given access to training grants (but student support is not guaranteed through training grants). There is no secretarial support for grant submissions or other activities, which adds to the young faculty workload. In the area of promotion/tenure, the Department keeps an example of a tenure dossier as an example for junior faculty. The dossier is prepared around the time of the annual performance review. Collaborations with other faculty are encouraged as long as individual contributions can be distinguished (transparent). Apparently fewer NSF fellows are applying to UW (faculty are concerned about how to attract the best students). Mentoring committees (senior member/chair, four other members in related area) operate informally; most young faculty interact with faculty outside of their formal committee, with a good exchange of information. There are teaching evaluations by senior faculty (in class review), and student evaluations at the university level. The research vs. teaching vs. service weighting is not transparent. They like the teaching rotation: two UG core plus one grad core (or special topics). There was a feeling that requirements for graduate students on coursework vs. research are in conflict. The large number of course requirements is a source of conflict with the recent reduction in the first year of student support. The projected large increase in UG student numbers is a concern, but perhaps is an opportunity for the Department. Collaborations with biological sciences is very open; faculty need to take advantage of collaborative activities. A 0% appointment is relatively easy to get in Life Sciences or in COE; senior faculty have these across campus. For doctoral training programs outside of

COE, there are stricter requirements for membership but admission mechanisms for faculty are transparent. Government-sponsored training programs are other vehicles to get access to students support.

### **5.0 Meeting with Dean Peercy**

The meeting between the Visiting Committee and Dean Peercy lasted for approximately one hour and covered several aspects of the operation of the Department and the College. Dean Peercy discussed with the committee his vision regarding undergraduate education (i.e., VISION 2010) and the successes the College has enjoyed in this area. Mostly noted is the increase in the enrollments, attributed both to a larger pool of qualified high school applicants and improved retention between the freshman and sophomore years. Dean Peercy believes that this success is related to the improvements in the freshman year curriculum and the onset of the supplemental instruction initiatives. Dean Peercy pointed out that the Department has played a significant role in these initiatives, and more specifically, he noted its contributions in the energy sustainability and grand challenges in engineering freshman courses.

Dean Peercy further discussed the new differential tuition initiative for the College and pointed out that the different departments will compete for these additional funds by submitting proposals on innovative ways to address the goals associated with the initiative (i.e., shortened time to graduation and improved undergraduate curricula). Prompted by committee members regarding the need of the Department to hire additional faculty members, the Dean pointed out that the College finances are under stress, thus non-tenure track instructional staff members could be hired with funds made available through this initiative because there is no guarantee the funding will continue beyond three years.

The issue of a top-five ranking for the College was also discussed. Dean Peercy confirmed that this is a stated College goal and expressed his satisfaction with the current top-three ranking of the Department. Committee members were concerned about the ability of the Department to maintain such a ranking without substantial investment in

new faculty members. The Dean stated he has been enormously generous with the Department's finances and believes there has been an increase of the chemical engineering faculty size during his Deanship.

In the area of graduate education and research, Dean Percy pointed out that he is a great supporter of the GLBI initiative and new faculty lines could become available for the department through this initiative from the College of Agriculture and Life Sciences. He is satisfied with the Department's success with the two major centers, but also expressed a desire for these centers to become more interdisciplinary and to involve other researchers in the college. He also pointed out that graduate education is mostly directed by the graduate school and the individual departments, and he does not think the COE administration has a strong voice in this process.

### **5.1 The Relationship Between COE and the Department**

The Visiting Committee is concerned with what appears to be a lack of alignment between the goals and aspirations of the College and those of the Department. The discussion with Dean Percy made it clear to the committee that the primary emphasis of the college administration is on the undergraduate program. In contrast, the international reputation and strengths of the Chemical Engineering Department derive from its outstanding graduate education and research programs. We believe this situation has strained the relationship between the department and the college, with the majority of the faculty believing the college is not making the necessary investments to maintain the department's international position despite their contributions to the college's mission. In addition, the Dean indicates that insufficient progress towards Vision 2010 has been made in Chemical Engineering despite what he views as enormous investments in this Department. Comments by the junior faculty members regarding the magnitude of the start-up packages they were offered at other peer-aspirant institutions were troubling, since they suggest that what may be considered as "enormous investments" by the Dean fall below market competition in the field of chemical engineering.



We felt that a holistic view of the department finances to justify the increase in faculty size was missing from our discussion. It appears the Dean only looks at the undergraduate program finances and within that envelope faculty additions cannot be justified. However, each additional faculty member brings significant R&D funding that the university benefits from in the form of overhead and regional/national/international visibility. Although the committee recognizes the importance of undergraduate education and applauds the Dean for his initiatives, it was surprised by the lack of equal emphasis on the research programs, especially for a top research institution such as the University of Wisconsin. The committee believes that the department's international reputation developed over the past 40 years is at risk by the lack of new investments that limits the ability of the Department to grow in the face of very stiff national and international competition in its top areas of expertise (e.g., nanomaterials, alternative energy research, biotechnology applications). A substantial effort needs to be made on both sides to find common ground between the College and the Department. The Department should engage in a systematic planning process that will clearly outline the Department's core values, contributions to the College and University at large, and strategic directions and needs for the future with appropriate benchmarking of other top ten programs. It is our hope that the plan generated by this process will help the College evaluate the current status and needs of the Department and invest in its future.

## **6.0 Summary of Recommendations**

- (1) The Department has done a good job dealing with concerns from the last Visiting Committee in the areas of undergraduate advising, graduate student qualifying system, and young faculty mentoring.
- (2) The Department should engage in a strategic planning effort with the help of a professional facilitator. This process should outline the core values of the Department, its contributions to the College and University, and appropriate benchmarking of other top ten programs. The issues of departmental goals and governance and the continuity of the chair's position should be addressed.

- (3) While the undergraduate enrollment is rising recently, the Department should make an effort to improve the diversity of its student body, which appears to be low in the percentage of female students.
- (4) There needs to be more encouragement for graduate students to pursue industrial internships plus more communication on the industrial recruitment process.
- (5) There is a serious concern about the lack of alignment between the goals of the Department and those of the Dean of the College.
- (6) The Department's international reputation developed over the past 40 years is at risk due to the lack of new investments by the College of Engineering so that the Department can grow in the face of stiff national and international competition from other top-ranked departments.

Respectfully submitted by:

Michael D. Ameridis – Dean of Engineering, University of South Carolina

Douglas C. Cameron – Science Advisor, Piper-Jaffray

Jeffrey Curler – Chairman of the Board, Bemis

Thomas F. Edgar – Abell Chair of Engineering, University of Texas-Austin

Carlos Garcia – Global Technology Manager, Shell Global Solutions

Jay V. Ihlenfend – Senior Vice President, 3M

Michael J. Jensen – Vice President R&D, Procter & Gamble

Klavs F. Jensen – Lewis Professor, MIT

Brian D. Kelley – Senior Director, Genentech, Inc.

Deborah E. Leckband – Milner Professor, Univ. of Illinois, Urbana-Champaign

Gary W. Pruessing – President, ExxonMobil Pipeline Co.

Timothy C. Scott – President/Director, Provectus Pharmaceuticals

## Appendix A

DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING  
UNIVERSITY OF WISCONSIN-MADISON

### 2008 Visiting Committee Meeting Agenda

#### Wednesday, October 1, 2008

- 4:00 P.M. - 5:30 P.M. Poster session and laboratory tours (Engineering Hall lobby)
- 6:00 P.M. - 6:30 P.M. Reception (Hilton Madison Monona Terrace)
- 6:30 P.M. - 7:30 P.M. Dinner (Hilton)
- 7:30 P.M. - 8:00 P.M. State of the department – Mike Graham (Hilton)

#### Thursday, October 2, 2008

- 7:00 A.M. - 8:00 A.M. Visiting Committee executive meeting & breakfast (Hilton)
- 8:00 A.M. - 9:00 A.M. Committee members check out of the hotel, park in Lot 17, and walk to the Mechanical Engineering Building.
- 9:00 A.M. - 9:15 A.M. Meeting overview – Mike Graham (Room 2180 ME)
- 9:15 A.M. - 10:15 A.M. Research presentations and discussions (Room 2180 ME)
- Research activities in catalysis/overview of the Great Lakes Bioenergy Research Center – Jim Dumesic
  - Research in synthetic biology – Jennie Reed
  - Research in systems biology – Brian Pfleger
- 10:15 A.M. - 10:30 A.M. Break
- 10:30 A.M. - 11:30 A.M. Department programs and initiatives (Room 2180 ME)
- Undergraduate program – Dan Klingenberg
  - Graduate program – Nick Abbott
  - Development – Mike Graham
- 11:30 A.M. - 12:30 P.M. Catered lunch (Room 2188 ME)
- 12:30 P.M. Concurrent subcommittee meetings
- Discussions with undergraduate students (Room 2065 ME)
  - Discussions with graduate students (Room 2270 ME)
  - Discussions with junior faculty (Room 2180 ME)

1:30 P.M. - 2:30 P.M.	Visiting Committee executive session (Room 2180 ME)
2:30 P.M. - 2:45 P.M.	Break
2:45 P.M. - 3:30 P.M.	Presentation of draft report and discussion (Room 2180 ME)
3:30 P.M. - 4:00 P.M.	Meet with Dean Paul Percy (Room 2180 ME)
4:00 P.M.	Adjourn

## Appendix B

DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING  
UNIVERSITY OF WISCONSIN-MADISON  
VISITING COMMITTEE – 2008

Amiridis, Michael D.	Univ. of South Carolina	Dean of Engineering
Cameron, Douglas C.	Piper-Jaffray	Science Advisor
Curler, Jeffrey	Bemis	Chairman of the Board
Edgar, Thomas F.	UT-Austin	Abell Chair in Engineering
Garcia, Carlos	Shell Global Solutions	Global Manager PDO/PTT Technology
Ihlenfend, Jay V.	3M	Sr Vice President/Asian Pacific
Jensen, J. Michael	Procter & Gamble	Vice President/Research & Development-Global Snacks & Beverages
Jensen, Klavs F.	MIT	Warren K. Lewis Professor of Chemical Engineering
Kelley, Brian D.	Genentech, Inc.	Sr. Director, Late Stage BioProcess Development
Leckband, Deborah E.	Univ. of Illinois, Urbana- Champaign	Reid T. Milner Professor
Pruessing, Gary W.	ExxonMobil Pipeline Co.	President
Scott, Timothy C.	Provectus Pharmaceuticals	President/Director