

June 4, 2001

REPORT OF THE 2001 VISITING COMMITTEE
DEPARTMENT OF CHEMICAL ENGINEERING
UNIVERSITY OF WISCONSIN

The 2001 Visiting Committee met in Madison on April 30 and May 1, 2001.
Members in attendance were:

Dr. Kathleen Barton, Searle/Pharmacia
Mr. Gordon F. Brunner, retired, Procter and Gamble Company
Mr. Jeffrey H. Curler, Bemis Company, Inc.
Dr. Babatunde Ogunnaike, E.I DuPont De Nemours & Co.
Mr. John J. Schmid, Kimberly-Clark Corporation
Dr. Lanny D. Schmidt, Department of Chemical Engineering and Material
Sciences, University of Minnesota at Minneapolis St. Paul
Dr. Jeffrey J. Siirola, Eastman Chemical Company
Dr. Harry L. Spiegelberg, retired, Kimberly-Clark Corporation
Dr. David Yarusso, 3M Company

On April 30, the committee attended a poster session and social hour with students, faculty and guests. The research described in the posters was covered verbally by graduate students who presented the work with enthusiasm.

The committee then adjourned to the Fluno Center for dinner, after which Professor Rawlings presented the State of the Department report. One of the areas highlighted was the faculty age distribution, and the obvious need to hire several senior faculty. This was corroborated by opinions expressed by junior faculty and graduate students during interviews the following day. A senior faculty hire in biotechnology was particularly emphasized.

Another area highlighted was industry hiring of graduates. The data, corroborated by interview with the students, show the high value industry places on UW-Madison ChE graduates.

On Tuesday, May 1, the committee focused on research programs, then split into subcommittees to interview undergraduate students, graduate students, and junior faculty.

Following is the visiting committee's overall assessment. More details are shown in the attached subcommittee reports.

While the existing faculty is very productive, the size of the undergraduate and graduate student classes mandates hiring at least four additional faculty. Six could be well utilized given the demonstrated needs. Any hires over two additional

faculty will require additional space, but opportunities for same have been identified and discussed with Dean Peercy.

The visiting committee notes that one of the strengths of the department is the interdisciplinary collaboration, within the department, within the Engineering College, and elsewhere in the university. This is not common among universities, and is appreciated by graduate students and junior faculty as well as the committee.

An opportunity was identified to improve interaction between faculty and undergraduate and graduate students by establishing mentoring early in their respective stays at Madison. Students noted that faculty and senior students were very approachable. However, both undergraduates and graduate students many times did not avail themselves of mentoring help early, particularly in course selection and in career determination.

The students interviewed strongly recommended that the faculty promote the seeking of mentoring, not only by the students approaching faculty and senior students, but also by early membership in the AIChE student chapter and Society of Women Engineers (as examples). Unfortunately, new students exhibit apathy toward student organizations, probably because of workload and under-appreciation of the importance of same.

The committee heard summaries of a spectrum of research programs, demonstrating broad and innovative new directions in chemical engineering research. These included topics such as modeling and systems, materials processing, polymers and surface modifications, and biotechnology. These subjects reflect changes in industry, and clearly are on the forefront of future industry needs. Chemical Engineering is a profession in transition, with past emphasis on the chemical and related industries broadening to include the pharmaceutical, consumer products, and computer industries.

This department has a long and distinguished tradition beginning approximately six decades ago with Hougen, Watson, and Ragatz in Unit Operations and continuing approximately four decades ago with Bird, Stewart, and Lightfoot in Transport Phenomena. The department is world-renowned for preparing some of the chemical engineering professions's leading textbooks. Some of their famous educational textbook innovations include:

- Hougen and Watson; early book on industrial stoichiometry
- Hougen, Watson, Ragatz 3 volume set; first combined thermodynamics and kinetics in chemical engineering
- Marshall and Pigford; first advanced mathematics course in chemical engineering
- Bird, Stewart, and Lightfoot; transport phenomena
- Crosby; experiments on transport phenomena
- Rudd; first process synthesis textbook
- Hill; successful kinetics and reaction engineering textbook

Ray; required undergraduate lab for data acquisition and feedback control.
Popular undergraduate control textbook.

Several of these innovations have international educational impact, being copied around the world.

It is clear that the legacy of one of the top Chemical Engineering departments in the world has been maintained as the department has transformed itself to reflect changes in the profession, while maintaining long established excellence. We commend the extent and creativity in these new directions.

As examples, the department faculty currently has more than three major textbook writing projects under way. These include:

Rawlings and Ekerdt; undergraduate textbook emphasizing modern computational approach to reactor analysis and design
Schieber and DePablo; undergraduate thermodynamics textbook supporting the recently introduced two semester sequence in thermodynamics
Murphy and Root; undergraduate textbook supporting the new introductory course in process synthesis

This excellence is understood by both graduate and undergraduate students, the latter commenting that they were prepared very well for industry, and that their BS-ChE degree from UW-Madison was a “ Badge of Honor”.

The committee notes the cohesiveness of the faculty and its openness to suggestions and critique. Certain previous visiting committees had noted divergent views among the faculty about the vision of the future. The current cohesiveness is to be commended, a tribute to the senior leadership.

Uneven distribution of workload on junior faculty was an issue identified at the previous visiting committee review. This obviously has been corrected, with current junior faculty satisfied with their treatment and their roles in the department. The department has established a policy wherein a junior person could have a semester without teaching in order to devote more effort to research that would be needed for tenure.

The committee recommends that the faculty initiate a review on an approximately two-year time frame. If possible, a tour of the department facilities would be desired. It may be necessary to include an extra 1/2-day in the committee visit to make that a possibility.

The facilities at the Fluno Center proved excellent for interviews and discussion, and were very comfortable overall.

2001 Visiting Committee
Undergraduate Subcommittee Report
May 1, 2001

Members: John Schmid, Chair; Gordon Brunner, Tunde Ogunnaike, Harry Spiegelberg

The subcommittee met for about an hour with 12 undergraduates. The students ranged in standing from sophomore to senior within the CHE program. Nearly all of the students had either intern or co-op industrial experience.

Discussions were informal but could be grouped in the three areas of Mentoring/Advising, Co-Op/Intern experience, and Specific course comments

Mentoring/Advising-- The students find the faculty advisors very accessible when the students take the initiative to seek out the advisors. The students recommended that advising be initiated earlier in the program, certainly as they enter the ChE program, and even during their freshman year.

Students would benefit by faculty emphasis on the importance of early advising, and faculty recommendations for joining students groups such as the AICHE student chapter and Society of Women Engineers. The AICHE student group was viewed as especially valuable for networking with upperclass students.

Selection of electives is a choice area for mentoring, by faculty and upperclass students. The discussion group noted that information exists in this subject but it is not generally known and should be publicized and explained.

Co-op/Intern Experience-- This program is felt to be extremely valuable in preparing the students for industry. They felt the program at the UW-Madison is excellent.

However, students experienced perceived shortcomings in three areas when they enter industry in this program. These are inadequate presentation skills, technical writing skills, and understanding of design of experiments. They would welcome any curriculum modification to address these areas. It was suggested that the AICHE student chapter could help outside of the formal curriculum.

Specific course comments-- Students pointed out a lack of synchronization within the Process Dynamics and Control Course (ChE 470). The lab work is ahead of the course lectures and seems to be a source of frustration for the students.

Students pointed out that Computer Science 310 is taught well. However, it seems a bit advanced without having an earlier course. Computer 110, which is no longer offered, seemed to have the right content but the teaching methods were less than acceptable. A replacement for 110 is recommended.

2001 Visiting Committee
Junior Faculty Subcommittee Report
May 1, 2001

Members: Lanny Schmidt, Chair; Jeff Curler

Mentoring--In the previous visiting committee review, there was indication of dissatisfaction among junior faculty in that they were sometimes given high work loads compared to senior faculty. We met with three junior faculty to discuss these issues, and found no evidence of unfair treatment. In fact they seemed quite satisfied with their treatment and their roles in the department. All three were happy with their choice of UW-Madison for their career.

They mentioned a policy in which a junior person could have a semester without teaching in order to devote more effort to research that would be needed for tenure.

Biotechnology--The junior faculty recognizes the importance of biotechnology, as does the rest of the faculty, to the future of chemical engineering. This trend is reflected in most Chemical Engineering departments in the country. At least nine of the faculty have some research related to biotechnology and this permeates much of the research that is not focused specifically on biology issues.

Major issues discussed were:

- (1) future hiring in biotechnology
- (2) relationships of the bio program in the department with research in other departments in the university
- (3) the need for senior leadership in this important area

Since the faculty in this department have strong research programs covering a broad spectrum of topics in biotechnology, it seems natural that Chemical Engineering should play a central role in the future of biotechnology in the College of Engineering and in the broader University. Most research collaborations are now on an informal basis with few faculty having formal relationships or students having joint advisors. The Biomedical Engineering Department in particular seems quite separate from Chemical Engineering. While the thrusts of the research programs are quite different, more interactions with this and other departments and programs seem to be universally welcomed.

Faculty and the committee note that hiring senior faculty in biotechnology is difficult. While suitable senior candidates should be sought, it seems evident that planning for improved coordination should continue irrespective of any new senior additions.

2001 Visiting Committee
Graduate Students Subcommittee Report
May 1, 2001

Members: Kathleen Barton, Chair; Jeff Siirola, David Yarusso

The subcommittee met with eight graduate students, representing a cross-section of faculty advisors. The students ranged in experience from first year through fifth year and included both women and men. Six of the students intend to go into industry after graduation, the other two students desiring academia. The students expressed their likes and concerns on several subjects, summarized as follows:

Advising/mentoring-- Some students felt pressured into choosing a faculty advisor too soon after entering the program (within the first month). Since interaction with their advisor over time is very critical to their success in graduate school, they need sufficient time to get to know the projects and faculty in order to make a good decision. They suggested they be allowed to wait until November or December before deciding on an advisor.

Some of the students felt that the advisor/student ratio was too high in some research groups, although other students did not share this concern. The aforementioned extra time before selecting an advisor would allow those students who are more comfortable in smaller groups to make a better assessment and subsequent selection.

Some students find it difficult to approach other faculty who are not their advisors. While there was some feeling that the faculty and students are silo'ed, i.e., that the faculty and students are expected to interact in separate groups, the students agreed that they need to be more proactive in approaching the faculty. Those students who have done so felt that the faculty are very willing to interact with them. The students felt that the interactions must be voluntary and informal.

The students feel that the transfer of technology from leaving to entering graduate students is critical and should be seamless. Accordingly, they recommended a longer, smoother transition, which will help mentoring.

Most students agreed that they receive the appropriate amount of mentoring and direction from their advisors. That level of direction is higher during their first year, with more autonomy later as they become more experienced.

The flexibility offered to students is highly valued. They appreciate the interdisciplinary collaboration offered at Wisconsin. The students feel that this is better than at other schools that they had visited.

Resources and facilities-- The students like the facilities at UW-Madison, including the amount of equipment and technical support available. However, there is not enough access to the stockroom. The suggestion was made that the stockroom hours be extended or that the graduate students be given keys to the stockroom on an honor system and an e-mail notice of received research materials rather than a post-it note.

Coursework-- There was a strong feeling of insufficient alternative electives within the chemical engineering graduate curriculum. Professor Abbott's colloids course was cited as a positive example. Suggested additional coursework included statistical mechanics, nanostructures, biochemistry/biotechnology (like taught at M.I.T).

Offering the transport course (ChE 620) following the introductory math class (ChE 660) was viewed as a positive.

The students felt the foreign language requirement is outdated. They felt reading foreign journals in the original language was no longer necessary. They liked the idea of taking courses outside chemical engineering, but felt that the requirement should be broadened to include a course option providing a humanities understanding of cultures outside the U.S. This would be of value in the growing global economy.

Workload-- The students perceived an uneven distribution of T.A. workload. They suggested that the department put limits on the frequency as well as the total number of times that a graduate student is expected to T.A. Also the faculty should be more understanding of the time requirements and not expect the student to be as productive in their research output while they are a T.A.