

INTERDEPARTMENTAL

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MEMORANDUM

DATE: 5/26/99

TO: Marsha L. Landolt
Dean and Vice Provost
of the Graduate School

FROM: J. W. Rogers, Jr.
Chairman, Chemical Engineering

SUBJECT: Response to 10-Year Review of Chemical Engineering

This document contains our response as a Department to the Committee Report of May 4, 1999, on the 10-Year Review of Chemical Engineering. I solicited and incorporated comments from all faculty in the Department. First, we wish to thank the Committee for their thorough and thoughtful review of the Department. Their report focused on topics, both strengths and weakness, most of which we share and the overall report can be used as a baseline for us to move to the next plane of excellence.

For the most part, we agree with the Committee's findings of our strengths and we will focus on the weaknesses and threats which were identified by the Committee and on our plans and efforts to remedy them. Some of the responses may seem uncoordinated since they follow the order of the major points detailed in the Committee Report.

Undergraduate Degree Program: We are very proud of our undergraduate program and we continually strive to improve it. We continue to incorporate design and computer based skills throughout the curriculum, from our first course, Mass and Energy Balances (CHEM E 310), to our final Capstone Design (CHEM E 486) options. We continue to offer experiential opportunities to our students in the form of undergraduate laboratory experience, undergraduate research opportunities (ChE 499 projects), and co-op and internships with our industrial partners. Currently 55% of our seniors have done undergraduate research and 29% were involved in co-op or internship programs. The report also singled out our staff who are dedicated and highly talented. Devota Madrano, our

academic advisor, was recently promoted in recognition of her long-time outstanding performance in her position.

Access to our computer laboratory has been problematic and this situation is being rectified. We wrote proposals to Intel, the Undergraduate Tech Fee Program, and the COE CRISP program to replace all Macintosh machines in the Undergraduate Computer Laboratory (Benson 125) with PCs. All three proposals were funded and 25 new Pentium IIIs and a new server have arrived in the Department and will be installed beginning June 14th. Nine of these computers contain instrument cards for interfacing to the Control Laboratory Instruments. We have also just completed rewiring the Undergraduate Computing Laboratory with 100Mbyte Ethernet lines. These computers will utilize software which is no longer supported on the Macintosh. In addition, Paul Ramsay, our full-time computer support technician, will relocate his office to the Undergraduate Computing Laboratory for closer contact with the students. We will hire a temporary person to assist Paul with the conversion this summer.

Our Unit Operations Laboratories (UOPS) have suffered from a lack of continuity in the faculty who teach them and desperately need to be upgraded. We have taken steps to improve the laboratory. Professor Larry Ricker has been given responsibility for UOPS for a period of two years beginning Autumn 1999. He has been relieved of other teaching duties in order to concentrate only on UOPS. He recently submitted a proposal to the NSF Combined Research and Curriculum Development (CRCDD) program, part of which will fund improvements in UOPS. He is also working with CELT on submission of a proposal to the Dreyfus Foundation in June 1999, concerning (in part) the UOPS Laboratory. Finally, Bill Baratuci, a Senior Lecturer, and Professor Ricker intend to submit a proposal to NSF for a major laboratory equipment grant for UOPS next year.

In general, we take exception to the point that our TA training is inadequate. Since 1993, we have provided an annual TA training workshop designed specifically for Chemical Engineering and taught by CIDR. It is a two hour workshop and former outstanding Chemical Engineering TAs are present to offer their perspective and help answer questions. Unfortunately, we did not offer the workshop this year, but prospective TAs did attend the UW training workshop. Responsibility for TA training has been assigned to Professor Krieger-Brockett, who will offer the program in Autumn 1999 and put a TA manual on the departmental website.

The newly constituted Undergraduate Curriculum Committee's first item of business was to tackle the problem of inconsistent advising in the Department. They proposed a complete restructure of the advising system in the Department that was unanimously approved by the faculty on May 3rd, 1999.

The desire of our students to learn more computer programming was news to us. We will look into this specific issue in the near future. However, to prevent surprises like this in the future, I have constituted a Student Advisory Committee to the Chair to foster communications among the undergraduate and graduate students.

As a Department, we are actively committed to increasing the number of faculty and the size of the undergraduate and graduate programs. There are many good reasons for doing this, not the least of which is to provide access to a larger number of undergraduates who are expected to seek admission to the Department between now and 2010. Dean Denton is committed to helping us increase the faculty from 14 to 17, and I recently wrote a small proposal to the graduate school for a modest expansion of the graduate program. There I requested 4 new TA lines per academic year. Growth in the Department will be discussed further below.

The Committee perceived as a threat, the abandonment of the two track course offering. After a careful review of the program, we found that the two track system was not fulfilling its intended purpose. The faculty voted unanimously to return to the one track system but to provide flexibility for students who wish to pursue co-ops and internships, and still graduate with their class without any delay in their time to graduation. In part, this flexibility will come from an option to take required chemical engineering courses by distance learning while away from campus on a co-op. We wrote a Tools-For-Transformation proposal to obtain resources to develop these courses; this proposal has been approved.

Finally, we consider the diversity of scientific background among the faculty a strength, rather than a weakness. The top rated Chemical Engineering department in the U.S. is at the University of Minnesota. It was built by hiring non-traditional scientists who were poised to contribute in areas of this ever-changing discipline. We are trying to do the same thing here at the UW. There is no question that our faculty are highly qualified to teach the fundamentals of chemical engineering to our undergraduates as well as emerging technologies such as nanoscale fluid mechanics and biochemical engineering.

Graduate Degree Program: We concur with the Committee that Professor Stuve does a marvelous job in his role as graduate advisor and recruiter. We do not agree that most outstanding students opt for the biospecialty; it is in vogue currently and a large fraction of our research program (Baneyx, Lidstrom, Horbett, Castner, and part of Rogers' research) is dedicated to biochemical engineering and our faculty are doing a fine job.

We recognize a communications problem between our graduate students and faculty and we are working diligently to solve it. After several years of experimentation, we have finally settled on a schedule and

procedure for choosing advisors and administering the preliminary exam, which all the faculty support. We are preparing a "Policy and Procedures Manual" for the graduate students which will reside on the departmental website for use by incoming and current graduate students.

We are working on our core graduate curriculum. The two transport courses were revamped this year and we will work on reaction engineering next year. We do not agree that our graduate specialty courses are too specialized for anyone but the advisor's own students. I have an average enrollment of 22 in my CHEM E/MSE 559 Thin Films class and Professor Overney had 20 students enrolled in his CHEM E 554 Nanotechnology course the first time it was offered last year. Most graduate specialty courses average between 10 and 15 students.

Improved TA training was discussed earlier in this response. We also disagree that students do not have access to interdisciplinary projects. The NESAC/Bio, UWEB, CPAC, and Nanotechnology programs are interdisciplinary by design, both for graduate students and undergraduates. These programs involve 5/17 research active faculty (some are joint with other departments). Professors Seferis, Finlayson, Lidstrom, Krieger-Brockett, Stuve, and Allan all have joint appointments with other departments or collaborate with faculty and students in other departments. This represents interdisciplinary activities by over 65% of the faculty and we feel it is incorrect to surmise that "few of the faculty are willing to co-advise on joint projects."

Access to computer facilities was a problem last year because 28 students accepted our offer of admission to our graduate program which was twice the number we expected. This year we will have 13-14 new students and computer access should not be a problem. In addition, many of the computers that we are retiring from the undergraduate computer laboratory will be relocated to the graduate computer lab.

We feel strongly that our graduate students must remain highly motivated in order to maintain the *esprit de corps* that we seek among our students. Once accepted into the graduate program, we mentor our students and encourage them to stay focused and on track (usually with financial incentives) and occasionally we must weed out the "bad apples"; we are committed to do both.

Faculty Research Program: While identifying several strong research programs in the department, the committee failed to acknowledge several others. However, their finding that we have a clear deficiency in the number of faculty is right on track. By any metric, it is clear that the number of full time faculty needs to increase from 14 to 17. This can be justified by (1) anticipated increased enrollment pressure for access to the undergraduate program, (2) the fact that 44% of our entering junior class

had a GPA above 3.7 and 65% above 3.5 (i.e., we turn away a lot of good students), (3) most of our students who look receive well paying jobs in their field, (4) the size to rank correlation for graduate programs, (5) our faculty to student ratio is well below our peer institutions, and (6) we have a strong (but cyclic) demand for entrance into our graduate program from highly qualified applicants (U.S. citizens). We will comment further on our efforts to increase the number of faculty in the next section on *Infrastructure*.

We commented earlier on interdisciplinary efforts within the Department and that trend is being encouraged by the Chairman and will continue. We are currently in the midst of a strategic planning initiative, and expansion in the area of biochemical engineering, biosensors, and materials are at the top of the list as potential areas for growth. We recognize that the retirement of key faculty will leave a big hole in our research program. This is yet another problem of having too small a faculty and trying to remain research active in all major areas of chemical engineering. We successfully recruited a new junior faculty member in the area of computational chemical engineering; Dr. Shaoyi Jiang will join the faculty in Winter 2000.

We intend to exploit Professor Finlayson's election as President of AIChE to the fullest extent possible along with other efforts to raise national awareness of our program. These include strategic use of our seminar program, encouragement of increased faculty participation at ACS and AIChE meetings, and a complete revamping of the department's website. We have revitalized our Awards Committee and are aggressively nominating faculty at all levels for awards for which they are eligible.

We are trying to increase our endowment by aggressive solicitation of large chemical companies for major gifts such as Dow, Procter & Gamble, and Intel. However, our efforts directed toward increasing the level of giving by our alumni, from which the majority of our gifts come, are being thwarted by the new centralized annual gift campaign of the UW. The Chairman is cooperating with Nina Tilander to find a way to increase the level of gifts to the department in the context of the new centralized plan. Finally, as part of our strategic planning, each faculty member prepared a mission statement. These statements will be used to set benchmarks for performance by which the faculty will be judged for merit review. Among the benchmarks for all faculty will be enhanced research activity.

Infrastructure: Our office staff is outstanding and we are making every effort to keep them happy by providing recognition for all staff and career paths within the Department for key personnel. Our physical plant is old but functional. Benson Hall was painted last year (for the first time since 1965), the Department bought new furniture for common areas this year, and fire protection is being upgraded and sprinklers added in Spring/Summer 1999. As correctly pointed out by the Review Committee,

our main problem is lack of adequate space. If our program is to grow, we desperately need a fourth floor added to Benson Hall, we must reclaim some space within Benson that is currently owned by other departments, and we must have some temporary laboratory space elsewhere until construction is complete. Addition of a fourth floor to Benson Hall would add an additional 10,000 ft² of space that would be used for undergraduate teaching laboratories and one additional classroom, 2-3 faculty offices, and several customized research laboratories. This would allow enough space for another large multidisciplinary program in the Department as well as space for 2 or 3 new faculty members.

Space is just part of our infrastructure problem, however. If the faculty is to grow, we will need other resources in addition to space. In particular, we need adequate startup packages for faculty, new TA lines within the Department (already discussed), and no further erosion of our already inadequate operating budget. Since 1992 our Department has suffered a 13% cut in our operating budget which has never been restored. The most recent cuts have been to fund the UIF program. This program, although well intentioned, has cut deeply into our infrastructure. If it is to be expanded it should be funded from other sources, not from the already meager operating budgets of the departments or from tuition funds earmarked for faculty salaries. Duke University currently has a fund raising campaign to raise \$1.2 billion dollars and they claim they have already raised three-quarters of this amount to date. If a small private university can do that, why can't a major state university raise enough money to fund the UIF program?

As a result of these budget reductions, we have cut faculty positions and staff positions but we have preserved our TA lines. The staff cuts included part of the salary for our computer support position which the Committee pointed out as a weakness in our infrastructure. We now have inadequate faculty and staff to respond to enrollment pressure and increase the size of our undergraduate and graduate programs. To add insult to injury, we have experienced difficulty in filling a vacant faculty position, not to mention obtaining new faculty lines. In our recent effort to hire a junior level faculty member, we lost an outstanding experimentalist to Georgia Tech whose start-up offer for equipment was a factor of 3 higher than ours. The Provost's office needs to realize that recruitment of top tier junior faculty in chemical engineering requires a minimum of \$300,000 in equipment. We were only successful with our second offer because the candidate was a theorist with modest equipment needs. We have several other candidates that we are trying to attract to the UW, possibly through joint appointments with other departments. However, if we are to grow even modestly, adequate support will have to come from the Provost's Office because we already have inadequate operating budget and inadequate space for our current program.