Vision Statement for the Position of
Head of the Department of Chemical and Materials Engineering

Dr. Gregory Beaucage
Professor of Materials Engineering

Summary

The next Head of the Chemical and Materials Engineering Department will be in a position to take advantage of significant opportunities as well as face significant challenges. The conversion to semesters can be used to revitalize the undergraduate and graduate curricula but this will require a coordinated effort on the part of the faculty, students, alumni and the Departmental Industrial Advisory Board as well as others with vested interests in engineering education. Interaction with the College of Applied Science similarly offers the potential for broadening course offerings while potentially challenging the standard of education in the Department. The Department faces an ABET review of the undergraduate programs which allows a reassessment of these programs, but this has already required a concerted effort on the part of the faculty and significant student participation.

The major issue facing the Department lies in the need to unite the two programs as well as develop a sense of community within the Department. The success or failure of the next head will likely be determined by his or her success at developing a sense of ownership among those with a vested interest in the Department: faculty, students, staff, and alumni. A sense of ownership is the direct product of shared governance that has remained an elusive goal of the CME Department. Shared governance must involve participation of all faculty, students and other interested parties with delegation of authority to committees and respect and support of different ideas.

Delegation and Organization

A plan for shared governance was developed by an elected CME faculty committee in 2007 that details the mechanism for delegation of responsibilities in the Department. The Department, College, and University approved a set of bylaws associated with the plan that were

enacted in July, 2007 but never implemented. The bylaws describe the organization and operation of the Department including annual elections of eight Departmental officers each spring quarter. One purpose of the bylaws was to ensure shared governance and to encourage a sense of ownership in the CME Department. The bylaws were also intended to provide internal mechanisms for conflict resolution through an Ombudsman as well as an active Advisory Committee comprised of these eight elected officers and chaired by a Departmental Moderator. Monthly meetings of the Advisory Committee are specified in the bylaws. Delegation of Departmental functions to standing committees and ad hoc committees is also clearly delineated in the Departmental bylaws which have yet to be implemented. The bylaws specify that the head will have final judgment on many crucial issues facing the Department within the context of shared governance.

Academics

Undergraduate programs: The CME undergraduate student population has dramatically improved in recent years including both the number of students enrolled and retained through the sophomore year as well as the academic strength of students. A major problem has been the small number of students who have chosen to major in Materials Engineering from this growing pool within the Department. There have been positive efforts by the faculty such as development of a Materials Minor and a common first two years of study for Chemical and Materials Engineers. There are some signs that interest in Materials Engineering is on the upswing, including an active effort by the Materials undergraduates themselves to enhance the program. A realistic assessment of the situation is needed. Issues concerning the undergraduate programs need to be addressed by the Department through the Advisory Committee.

A major problem with both undergraduate programs is the lack of funded teaching assistant support especially for lab courses and the state of many of the undergraduate laboratory facilities. These issues have led to a decay in morale of some of the best professors in the Department and is a source of frustration for students. Innovative solutions to the lack of teaching assistantships might involve the provision of partial support rather than full support for TA's to expand the number of available assistants. It is the responsibility of the head to support

faculty in their efforts to educate the students. It is equally the responsibility of the head to support undergraduate and graduate students in voicing their feelings about the curriculum and specific courses. Overall, the individual programs are responsible for development of programmatic curriculum and can only be addressed within the context of the standing committees described in the CME bylaws.

The Materials Program undergraduates have expressed interest in developing educational thrusts in Energy Engineering, Biomaterials, and Polymer Engineering. Such educational thrusts already exist in the Chemical Engineering program. In order to fully implement these thrusts the course offerings must be adjusted in sequence to allow students the opportunity to take the required courses. The educational thrusts serve both to recruit new students and bridge the two programs since some of the thrust areas significantly overlap.

Maintenance and expansion of the undergraduate facilities including the lounges needs to be a priority. The programs and department need to have an annual effort to obtain outside funding in support of the undergraduate programs from NSF and from industrial sponsors. This needs to be organized by the Program Chairs. These equipment and support proposals should have the new faculty as PI since these are relatively well funded programs and the grants are useful for their RPT portfolio. The Head and Program Chairs need to also have an ongoing effort to seek funding for equipment and scholarships from industrial associates especially those involved in the COOP program and organizations such as ASM and SPE that provide equipment grants.

In addition to equipment grants, the faculty should have at least one annual submission for an REU site coordinated through the programs. Faculty need to be encouraged to file REU and RET supplements for their NSF grants. This is especially important during the down turn in the economy that has adversely affected coop opportunities. The department can assist in this process by pooling REU and RET applications so that some of the basic programmatic ideas can be shared within the Department.

The first year introductory courses for CME need to be reformulated to include design and team building. The current arrangement that involves a demonstration laboratory course and a lecture series introducing students to the Chemical and Materials Engineering fields could partially be run through the undergraduate organizations as a lecture series independent of course

work sponsored jointly by AIChE, ASM, SPE and other organizations. Some universities have developed a freshmen year design project that involves interaction with clients such as hospital rehabilitation units to develop new devices and processes to aide patients. Such a design project would require the participation of many faculty from the two programs in formulating an appropriate project and could also involve the many hospitals within walking distance of UC for example. Hands-on design would require the use of the machine shop and other facilities accessible to the Department. Such a redesigned freshmen class could serve as a strong recruitment tool.

Graduate programs: The graduate programs face a number of challenges including uncertainty in Departmental support for incoming students that has complicated recruitment. Many graduate students have found that there are limited course offerings to meet the required credits for graduation. Improving the graduate course offerings and enhancing the graduate curriculum to include new thrust areas such as in energy and biomaterials is needed through the program committees.

Job placement for both undergraduates and graduates has been generally good with the exception of the past six months. A CME open house directed at the local Cincinnati industrial and research community could help in student placement. The open house could include poster presentations of senior projects and undergraduate research as well as graduate work in a Department. The departmental web page can also serve as a vehicle to advertise those close to graduation as has been done at several other universities such as Drexel and Cornell, particularly highlighting the productivity of the students in the department such as publications, presentations at national meetings and awards as well as describing research contributions. There are a variety of mechanisms used such as profiles of some students near graduation or, in some cases, a listing of students seeking positions. The CME Department should serve as a primary tool in helping students near graduation find positions.

Program rankings

A major issue affecting both the undergraduate and graduate programs has been the lack of a coherent effort to improve the two programs national ranking. Ranking for both the ChE and MatE programs is far below the quality of the faculty and productivity of the Department. With

a faculty to student ratio near 10 and an extremely active group of faculty, the national rankings are not consistent with the performance. It is partly the Department Head's responsibility to enhance the Program rankings. There are a number of tasks that are required to improve rankings. The following list could serve as a starting point for a discussion of a pathway to improve the two program rankings.

1) Enhancement of 5-year graduation rates for undergraduates. Improvements have been made in sophomore retention that will bear fruit in the coming years. It is expected that the 5 year graduation rate will be nearly 60% in the 2011 and 2012 classes. The national average for engineering is approximately 65% and for the top 25 programs it is typically well above 70%. For example ChE at Northwestern has a 95% 5-year graduation rate in a program that has 40% of the students in coop on the quarter system. Enhancement of graduation rates can be achieved by improved recruitment, tutoring of freshmen and sophomores and active involvement of CME faculty with undergraduates in the first two years of study such as through REU and other early research opportunities and through the proposed design course for freshmen.

2) The Head needs to support faculty, graduate students, and undergraduate students to participate in targeted national meetings which can enhance the national profile of the programs. Particularly, the AIChE, ACS, APS, and MRS meetings are of great importance to academic standing. Many of the rankings are based on comments from faculty in highly ranked programs who attend these meetings. Some Departmental funds should be used to support a UC presence at these national meetings. Further, the Department needs to make a concerted effort to nominate students and faculty for recognition and awards at these meetings such as best dissertation prizes.

3) The Department should encourage or consider requiring graduate student talks at a national meeting during their stay at UC.

4) The Department needs a coordinated process for nominating faculty for awards at the AIChE, ACS, MRS, SPE, TMS, ASM and the like.

5) The Department should encourage faculty to organize sessions and to participate in the organizational structure of AIChE, APS, ACS and MRS through teaching accommodations and other means. The Department needs to keep track of these activities on the web page.

6) The Department should consider funding a social event at the AIChE annual meeting. Most highly ranked programs in Chemical Engineering have such a social event. This event could be funded by industrial contributions solicited by the head.

7) Faculty need to be encouraged to present invited lectures at other universities through teaching accommodations and other support. The Department should keep track of these invited lectures and have a running post of these on the Departmental web page.

8) The Department needs a goal of nominating one faculty member to the National Academy of Engineers. This needs to be an ongoing process, the purpose of which is to place UC CME on the radar screen. We have faculty who should be considered for the National Academy.

9) The head should push for new criteria for MS and PhD degrees that require one peer reviewed publication for the MS degree and 3 peer reviewed publications for the PhD degree prior to graduation in both programs. These issues are the responsibility of the programs through standing committees but an effort in the direction of requiring peer reviewed publications as the main goal of higher degrees needs to be conveyed to the graduate student population. The Department has graduated too many MS and even PhD students with no publications. Undergraduate publication should also be encouraged through a cash award.

10) The Department should give a cash award and recognition such as a reception for publication in journals of high citation index such as Nature and Science. These accomplishments should be highlighted in the CME web page.

11) The Department needs at least one externally funded lecture series for each of the programs similar to the P&G Polymer Community of Practice Lecture that currently exists in CME.

12) The Department should routinely invite program managers from NSF, DOE, DOD and NIH to tour the CME Department and to highlight younger faculty and areas of focus for research such as energy, catalysis, polymers and the like.

The two programs should develop plans along these lines to enhance their national rankings that should be fully supported and encouraged by the Department.

Enhancement of Faculty Performance

Enhancement of faculty performance must begin with an understanding of the goals and desires of each faculty member. The Department must strongly support faculty in their goals especially involving research and teaching but also in terms of nomination for fellowships and professional prizes both within UC and nationally. The Department head must understand these goals by seeking out faculty members and developing a supportive relationship. For untenured faculty, a mentor relationship needs to be developed with at least one tenured faculty member and this mentoring relationship needs to be frequently assessed by the head. Untenured faculty must be frequently informed of their progress towards expectations by the head. The development of an RPT dossier should be frequently reviewed as the untenured faculty member progresses towards the RPT process.

The Head needs to have a clear understanding of tenured faculty goals in terms of research, teaching and progress towards professional goals. The Head needs to provide support for these goals through whatever means are possible such as funding faculty to visit program managers, appealing to funding agencies and encouraging faculty in their funding applications. The Head should facilitate development of synergistic relationships between faculty members, especially between the two programs. Developing a sense of community within the Department is imperative to success and growth. The CME Department should hold social occasions to celebrate granting of awards and other significant accomplishments of the faculty. The web page should keep a running account of publications by faculty and students in the department. The publication record of the CME Department is extremely strong and we should advertise this strength.

Maintenance of Departmental space is a chief concern of the head. The CME Department needs to have a reasonable plan for effective utilization of current space as well as a coordinated effort towards expansion into available space in the College. Many of the faculty require more space for their funded research projects and this needs to be a priority of the Department in negotiations with the College. Teaching lab space and student lounge space need to also be maintained, updated, and enhanced.

Faculty performance can be enhanced by organization of coordinated research efforts across the CME programs such as efforts in photovoltaics, catalysis, polymers and biomaterials. The CME faculty need to be organized into natural research thrusts that can be worked into proposals for NSF and other funding agencies. Similarly, a cross-program IGERT needs to be developed in the CME Department to enhance faculty performance and student recruitment.

Management of the Budget

The Department budget will be reviewed biannually in the fall and spring quarters. Electronic copies of the budget numbers that will be presented will be given to the faculty prior to the budget review. Questions concerning the Department budget will be addressed by the Head and the Advisory Committee.

An attempt will be made to support Department and business functions of the faculty such as supplying paper and other office supplies as well as some budget for purchase of computers and other equipment used in classes. Professors teaching laboratory courses or courses that require materials will be provided with a budget to cover necessary expenses.

Appeal of unsatisfactory budget decisions to the CME Ombudsman, as described in the bylaws, and to the Advisory Committee will be encouraged so that a reasonable consensus can be reached within the Department. The budget will be managed treating the faculty as shareholders in the Department. Some budget issues such as spending on personal grants to support membership in organizations should be left to the discretion of the PI.

Interaction and Support of College Goals

The main College goals include preparation for ABET reviews of the two Departmental programs, conversion to a semester-based curriculum which includes revitalizing the curriculum, and coordination of efforts with the College of Applied Science. Significant progress has been made. Efforts should proceed through delegated responsibilities under the Departmental bylaws to optimize opportunities for growth and success.

The conversion to semesters can be used to revitalize the undergraduate and graduate curricula but this will require a coordinated effort on the part of the faculty, students, alumni and the Departmental Advisory Board as well as others with vested interests in engineering education. Interaction with the College of Applied Science similarly offers the potential for broadening course offerings; albeit while potentially compromising the quality of education. The Department must exercise caution when merging courses to maintain the Department's strength given the pending ABET review and goals for growth in enrollment and ranking. The ABET review allows a reassessment of the undergraduate degree programs. The concerted effort on the part of the faculty and the participation of the students to date shows promise. With strong leadership the Department can continue to develop. It is imperative that faculty are confident of Department support in their teaching, research, and professional development. Shared governance provides the structure to facilitate cooperation among faculty. With a united faculty, a reenergized curriculum and a vibrant student body the Department can achieve the goal of improved national ranking, student satisfaction and development of new research centers that will serve as an example for the College of Engineering.

Assessment of Progress

Deliverables after 3 years:

-Improvement in national program rankings

-Improvement in undergraduate matriculation particularly in Materials Engineering as well as student quality for both programs.

-Improvement in exiting senior assessment of the two programs.

-Enhancement of the graduate programs in terms of number of publications per graduate student, quality of publications, presence at national meetings.

-Placement of graduates in academic positions.

-Improvement in job placement satisfaction of undergraduate and graduate students.

-Improvement in average funding of faculty research as well as in the number of faculty with active research grants.

-Improvement in student evaluation of courses especially for faculty who have not been sufficiently supported in their teaching efforts through TA's and lab facilities.

-Development of a cross program center proposal dealing with Photovoltaics or other research topics.

-Development of a cross program IGERT proposal.

-Development of a cross program REU program.

-Overall improvement in faculty, student and staff morale.