REPORT OF THE COMMITTEE TO EVALUATE THE ME-OE MERGER
27 May 2010

1. Background

In December 2009, Provost Rafael Reif constituted an Ad Hoc Committee to review the merger of the Ocean Engineering (OE) and Mechanical Engineering (ME) Departments. This evaluation, five years after the merger date of January 1, 2005, was called for by the initial terms of the merger.

Provost Reif's charge to the committee (members listed below[1]) was to review the merged Department with a focus on "the level of unification and integration of the Department." More specifically, the charge directed the committee to assess the merged Department in terms of:

- The visibility of Ocean Engineering;
- Faculty hiring, retention, and diversity;
- Role and effectiveness of the Center for Ocean Engineering, and its long-term function;
- Undergraduate and graduate student enrollment, and graduate student support;
- Teaching loads, research activities;
- Administrative and support structure and staffing;
- Ocean Engineering representation in the leadership, ME Council, and standing committees of the Department;
- Use of space;
- Composition of the Visiting Committee; and
- Acceptance of the merger by faculty and students.

The committee was also directed to "include, if necessary, recommendations on how any weaknesses may be improved."

Between February and May of 2010, the committee met several times as a whole. One or more committee members also arranged to meet with each of the following groups in March and April: former senior OE faculty; former junior OE faculty; Professors of the Practice; ME research staff; the two ME Associate Heads; non-OE ME faculty; the director of the Center for Ocean Engineering (COE); the ME Department Head; graduate students; and undergraduate students. The meeting advertised for ME research staff, and one of the two meetings advertised for non-OE ME faculty, drew no attendees other than the committee members.

2. Summary of Findings

[1] Committee Members:
Edward Boyle, Professor of Ocean Geochemistry, Department of Earth, Atmospheric, and Planetary Sciences
Sallie Chisholm, Lee and Geraldine Martin Professor of Environmental Studies, Department of Civil and Environmental Engineering
Ahmed Ghoniem, Ronald C. Crane Professor of Mechanical Engineering, Department of Mechanical Engineering
Edward Greitzer, H. N. Slater Professor of Aeronautics and Astronautics, Department of Aeronautics and Astronautics
John Leonard, Professor of Mechanical and Ocean Engineering, Department of Mechanical Engineering
Caroline Ross, Toyota Professor of Materials Science, Department of Materials Science and Engineering
Seth Teller (chair), Professor of Computer Science and Engineering, Department of Electrical Engineering and Computer Science

While the interviews conducted by the committee have identified areas of concern, our overall conclusion is that the consequences of the merger have been positive. The findings that underpin this view are listed below in two groups: *Positive Aspects of the Merger* followed by *Areas of Concern*. The findings are listed in what the committee feels, based on the interviews, is a rough order of importance. A short list of Recommendations is then given in Section 3.

The remainder of the report (Sections 4, 5, and 6) amplifies the summary findings and recommendations and provides supporting observations gleaned from the one-on-one and group interviews and discussions conducted by the committee.

Positive Aspects of the Merger

- The merged Department is functioning effectively.
- The ME leadership is making good-faith efforts to accommodate the needs of OE colleagues.
- Former OE junior faculty are well-supported, thriving, and pleased with the merger.
- OE research volume continues to be substantial (higher, per faculty, than the average within ME).
- The Department enjoys an additional seat on Engineering Council.
- The head count guarantee has ensured OE junior faculty hires in a time of tight budgets.
- Several former OE faculty have participated in ME core teaching.
- OE graduate students make up a significant fraction of the merged Department.
- OE space and facilities have not been reduced (as some had feared).

Areas of Concern

- There is insufficient in-depth communication between ME leadership and senior OE faculty.
- The School's strong connection to WHOI, once primarily through Courses 13 and 12, is at risk.
- Junior and senior OE faculty are concerned about the long-term viability of OE at MIT.
- Faculty involved in the Naval Construction and Engineering Program (Course 2N) express concern about its viability.
- Former OE faculty and the ME Head desire greater OE representation on the Visiting Committee.
- Undergraduate enrollment in Course 2-OE has returned to, but not exceeded, pre-merger levels; its current low level (15 of 446) brings into doubt for some the viability of the 2-OE degree program.
- A large department vs. small department "culture shock" persists for some OE Faculty.
- Some senior OE faculty feel lingering resentment about the merger.
- Students felt that there were no faculty identifiably responsible for the OE curriculum.
- Students felt that the visibility of OE both within and outside MIT has diminished.
- Some OE students feel they have unequal access to departmental facilities.

3. Summary of Recommendations

- The Department should improve its internal communication about: its commitment to the field of ocean engineering; its hiring and faculty renewal in OE; and its resource usage and process.
- The Department should actively nurture and strengthen its (now at-risk) connection to WHOI.
- The Institute should work with the ME Department to increase OE representation on the Visiting Committee.
- MIT should revisit the idea of an Institute-wide MIT Initiative for the Oceans to address visibility issues for OE, to revitalize the MIT/WHOI Joint Program, and to provide a focal point for all ocean research at MIT under the broad umbrellas of the MIT Energy Initiative and the MIT Environmental Initiative.

.**4. Positive Aspects of the Merger**

The merged Department is functioning effectively. Most former OE faculty have been successfully "integrated" into the merged Department, including its leadership, committee structure and teaching efforts. Former OE faculty have established themselves as Ocean Science and Engineering (Area 5), one of the seven research Areas within the Department. A substantial number of Area 5 faculty have participated in the teaching of core ME subjects, and many Area 5 faculty actively participate in Department governance.

The ME leadership is making good-faith efforts to accommodate the needs of OE colleagues. The Department is renovating a number of spaces used primarily by OE faculty and students, such as the OE teaching laboratory and the offices on the fourth floor of Building 5. The Department is supportive of junior OE faculty (see just below). The merged Department has also undertaken fund-raising efforts targeting OE alumni, recently securing funding for a number of graduate fellowships and a junior faculty chair. The Department head is attempting to have additional OE-related members join the Visiting Committee.

OE junior faculty are well-supported, thriving, and pleased with the merger. All three junior faculty reported that they are receiving sufficient support from the Department, are developing new subjects, and are enthusiastic about the merger. They like being part of a bigger Department, and the interactions this brings – for example with colleagues in fluid mechanics. They also see colleagues from ME being drawn into ocean research. They like teaching larger classes and feel they can attract graduate students who would not have applied to OE. They do have concerns about the visibility of ocean research at MIT; they feel an Institute-wide initiative focused on the oceans would be advantageous in this regard.

OE research volume continues to be substantial (higher, per faculty, than the average within ME). Nearly all OE faculty maintain vibrant research programs.

The Department enjoys an additional seat on Engineering Council. This second seat, formerly that of the Course 13 head, was effectively "inherited" by ME as part of the merger.

The head count guarantee has ensured OE junior faculty hires in a time of tight budgets. Since January 2005, the Department has added two junior faculty in Ocean Science and Engineering, Pierre Lermusiaux and Franz Hover. For comparison, during this period the Department hired 8.5 junior faculty in non-OE disciplines.

Several former OE faculty have participated in ME core teaching. Former OE faculty have contributed to many ME subjects, which are also used to satisfy the requirements of the 2-OE degree (the Bachelor of Science in Mechanical and Ocean Engineering). Several former OE faculty members have contributed to teaching (non-OE) ME subjects.

OE graduate students make up a significant fraction of the merged Department. As of October 2009, there were roughly one hundred SM and PhD students advised primarily by OE faculty, out of the total population of 448 ME graduate students. For comparison, the 14 OE faculty make up about a fifth of the total population of about 75 ME faculty. Some ME faculty members supervise theses in the OE area.

OE space and facilities were not reduced (as some had feared). The COE Director has taken over the office formerly used by the Course 13 head. Space for OE graduate students on the third and fourth floor of Building 5 has been preserved, and is slated for renovation within the coming year. Major OE facilities such as the tow tank and the propeller tunnel remain available for use.

5. Areas of Concern

There is insufficient in-depth communication between ME leadership and senior OE faculty. One aspect of this lack of communication is that several potential concerns raised by OE faculty are in fact shared by the Department leadership and are the subject of leadership efforts to resolve. An example is increasing the OE representation on the VC. Beyond this, however, there are aspects, such as the use of resources that were specifically earmarked for OE, where there appears to be a gap in understanding of the actual situation by the OE faculty. In addition some OE faculty feel that the commitment of the Department to ocean engineering as a field has not been made explicit (at least we did not hear about such an explicit commitment). This includes the issue of the selection of areas for hire and the execution of the hiring process. There does not seem be a shared understanding of these issues between the Department leadership and the OE faculty.

OE's historically strong connection to WHOI is at risk. The OE/ME merger has played some role in this, but it is part of a larger, Institute-wide weakening of the MIT/WHOI connection through the Joint Program. All five branches of the Joint Program – Chemistry, Biology, Physics, Geology, and Engineering – have lost some vitality in the past decade or so. This was recognized in the recent Joint Program Visiting Committee Report, and a Committee has been established to look into it and find solutions.

Junior and senior OE faculty are concerned about the long-term viability of OE at MIT. One issue raised was a concern about whether hiring of faculty in OE-related areas would continue beyond the period prescribed by the terms of the merger. The Department leadership did not rule out OE-related hires, but in keeping with the Department policy of not making guarantees to specific areas would not commit to a guarantee of future hiring in OE. This lack of an explicit commitment is a cause for concern among the former OE faculty. The concern stems not simply from the normal tendency of faculty groups for self-preservation, but more importantly from their conviction that advances in Ocean Engineering are central to solving some of the major energy and environmental challenges in the coming decades.

Faculty involved in the Naval Construction and Engineering program (Course 2N) express concern about its viability. It was observed that several critical Course 2N subjects are taught by lecturers, and that the Department has not made any recent hires in power and propulsion, materials and fabrication, or structural mechanics who could teach 2N subjects in those areas. (There is an ongoing search in power and propulsion, with representation from OE faculty, that if successful should fulfill the needs of both ME and OE.)

Former OE faculty, and the ME Head, desire greater OE representation on the Visiting Committee. There was general agreement that greater OE representation would be desirable. Former OE faculty felt that their desire for representation was being stymied. The ME head reported that she had tried to add an OE-related member to the VC but had not been successful.

Undergraduate enrollment in 2-OE has returned to, but not exceeded, pre-merger levels; its current low level (15 out of a total of 446 ME undergraduates) brings into doubt for some the viability of the 2-OE degree program. The ME head observed that, given the administrative burden of maintaining the 2-OE degree for so few students, perhaps 2-OE should be converted into another 2-A (flexible) degree track. OE faculty and students feel strongly that some sort of named Ocean Engineering degree should persist. (The committee sympathizes with this view.)

A large vs. small department "culture shock" persists for some OE Faculty. Some senior OE faculty characterize the ME Department as "fragmented." Unlike the former OE Department, ME does not have a culture of regular all-faculty lunches. Several OE faculty are dissatisfied with the ME qualifying exam process (we note that the Department is reviewing its graduate program and exploring other qualifying exam models). Some OE faculty report that they are unhappy with the graduate admissions process and funding practices for newly-admitted students. Students are admitted without funding and have to "shop around" for RAs; it is felt that some of these students choose projects in OE just so they can get funding, are not really interested in ocean research and eventually move on.

Some senior OE faculty feel lingering resentment about the merger. Three or four former senior OE faculty can be characterized as continuing to desire a return to pre-merger status.

Students felt that there were no faculty identifiably responsible for the OE curriculum. There was a consensus view among the students we interviewed that, when they had a question about the OE curriculum or a suggestion about how to revise it, they did not know to whom within the ME Department they should turn. (The students emphasized that they found the support provided by the administrative staff of the COE to be superb.) Perhaps related to this point, some OE faculty felt that there was not a knowledgeable staff member in ME headquarters to whom prospective OE graduate students could turn for information.

Students felt that the visibility of OE both within and outside MIT has diminished. There was a strong consensus among the students with whom we spoke that the OE program is not as visible as before the merger. Regarding visibility outside MIT, students felt that this had hurt MIT's ability to draw the best graduate applicants. The ME faculty with whom we spoke, whether or not former OE members, did not share this view.

Some OE students feel they have unequal access to departmental facilities. Students reported they did not feel welcome to use "ME facilities," but rather that they "needed to know someone" to gain access. This seems to be another area that could be improved by increased communication.

6. Recommendations

The Department should improve its internal communication about: its commitment to the field of ocean engineering; its hiring and faculty renewal in ocean engineering; and its resource usage and process. As mentioned, the committee found that there was not a shared view of the Department's commitment to ocean engineering, including hiring. In addition, a number of specific aspects (for example the COE head and Area 5 head) were not well-defined in terms of roles and missions. Further, there are lingering items that former OE faculty are concerned with, for example representation on the Visiting Committee, control over COE-related funds, student access to facilities, the process by which new faculty positions are allocated, and administrative support for the COE. From our discussions with ME leadership and with former OE faculty, it seems as if some of the difficulties can be resolved through better communication and definition of roles. This is something that all involved need to work at.

The Department should actively nurture and strengthen its (now at-risk) connection to WHOI. The ME Department should participate fully in the Joint Program Strategic Planning Committee (now being formed). The Department should coordinate with WHOI to improve its national and international visibility, and should encourage the active involvement of more ME faculty in the Joint Program.

The Institute should work with the ME Department to increase OE representation on the Visiting Committee. Despite a desire, shared by former OE faculty and the Department leadership, for more OE-related members, the VC's OE-related membership (two people out of roughly 20 members total) does not match the proportion of OE faculty in the Department (fourteen out of roughly 75 faculty total).

MIT should revisit the idea of an Institute-wide MIT Initiative for the Oceans, *with the MIT/WHOI Joint PhD Program as the educational core of the Center*. This idea was discussed and rejected at the time of the merger for a variety of reasons, most of which are no longer relevant. First, the merger is complete. Second, the Institute is about to launch an Institute-wide Environmental Initiative, with "Oceans" as one of its six research themes. Third, oceans are relevant to MITEI. Fourth, the Joint Program needs revitalization, and an Institute-wide Oceans Initiative could facilitate this. Finally, there are many Foundations (e.g., Moore and Google) with interests in funding Ocean-related research and MIT's enormous strengths in EAPS, CEE, BE, and OE/ME are simply not sufficiently visible to them. A well-maintained "Ocean Research and Education@MIT" web site could be a help in solving this problem.

Respectfully submitted,

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