

May 26, 2011

Report of the Committee on the Structure of the Harvard-MIT Health Sciences & Technology (HST) Effort at MIT

Background and Charge to the Committee

HST is a highly regarded educational program, and is extremely valued by both Harvard and MIT. However, HST has also faced a number of major organizational and financial challenges over recent years, which have been the subject of many discussions within HST and between MIT and HMS. Following a careful evaluation, both institutions have agreed to focus HST on the flagship MD (at HMS) and PhD (Medical Engineering Medical Physics or MEMP at MIT), as summarized in the “HST Consensus Document.” This will allow the world-class HST academic program to continue in the illustrious tradition established over the past four decades. Appropriate transitions have been completed or are underway for other highly valued HST related programs.

MIT’s Corporation Visiting Committee for HST recommended that we consider strategic changes to how HST is structured within MIT. The goal is to bring the HST effort at MIT more into the mainstream of MIT’s academic community while preserving its many existing strengths—including its interdisciplinary faculty, quality educational experience and exceptional student body. This would strengthen the HST program and provide a more robust structure for other MIT activities in biomedical sciences and engineering. To this end, the Provost and Vice-President for Research are convening a committee of distinguished faculty from across the Institute to explore options for the structure of the HST effort at MIT. The committee will engage with the HST faculty, the broader HST community and all other interested parties.

Charge

The Committee is charged with examining various structural options to insure that the HST effort at MIT is better aligned and organizationally more congruent with the other academic units at MIT. The committee is asked to examine several options, considering the strengths, weaknesses, challenges and opportunities presented by each possibility. The options could range from leaving the structure relatively unchanged, merging in some fashion with an existing department, or creating a new unit in the School of Engineering. The Committee is free to suggest other alternatives. It is essential that the committee engage with the HST faculty, the broader HST community and other interested parties.

If at all possible, the assessment of the options explored, in particular the pros and cons associated with each reasonable option, should be received by April 15, 2011.

Membership

Professor Duane Boning
Professor Arup Chakraborty
Professor Robert Langer
Professor Richard Lester
Professor Gareth McKinley
Professor Phillip Sharp
Professor Sheila Widnall (chair)

Staff to the Committee

Douglas Pfeiffer

Process Followed by the Committee

The Committee conducted an extensive set of meetings and interviews with the faculty, students, staff and alumni of HST as well as meetings with the senior administration of MIT, other MIT faculty and department heads within the Schools of Engineering and Science. We also met with members of the academic administration of Harvard Medical School, which shares with MIT the responsibility for the joint HST Program. A complete listing of these meetings appears in the Appendix.

In addition, the Committee solicited written feedback from all members of the HST and wider MIT communities, and approximately 50 individuals responded with emailed comments, including group statements from HST faculty, students and alumni. Copies of the letters calling for this input are included in the Appendix.

The range and depth of information gained through these meetings and communications was extraordinary and invaluable to the Committee in its assessment of HST's role at MIT and its consideration of possible structures for the program going forward. The Committee is extremely grateful to all who took the time to participate in these discussions and support us in our task.

Context

We conducted our examination conscious of the extraordinary growth in the involvement of MIT faculty in research at the boundary between medicine, engineering and the physical and life sciences, and of the unique contributions of Harvard and MIT to the strength of the HST program since its founding. We see enormous opportunities for MIT to contribute to solving major global health problems through research and education in this arena. We believe that research in medical science and engineering—turning scientific advances into applications and translational research-- is very much in the spirit of the contributions that MIT faculty have made since the founding of MIT and will continue to make going forward. Our location in the Greater Boston area provides unique and unusually widespread opportunities across many MIT departments for joint research with the surrounding medical community,

including Boston/Cambridge area hospitals and medical schools. In the spirit of MIT and the unique contributions it makes to education and research, our committee was focused on producing recommendations to improve the visibility and effectiveness of outstanding medical engineering based upon superb science.

History and Organization of the HST Program at MIT

HST formally began as a joint educational program between Harvard and MIT in 1971, when 25 Harvard Medical School students were selected to pursue a newly designed biomedical sciences curriculum leading to an MD degree. In 1977, the program was institutionalized as the Harvard-MIT Division of Health Sciences and Technology, and the PhD Program in Medical Engineering and Medical Physics (MEMP) was added. The following year, HST became a part of the newly established Whitaker College of Health Sciences and Technology at MIT. The joint HST educational program has two co-directors, one from Harvard Medical School and one from MIT. Since 1985 the MIT portion of the joint HST Program has reported to the Vice President for Research and Associate Provost, whose office therefore has oversight of HST-MIT's budget, space and personnel.

Roughly two-thirds of HST's MIT faculty have dual appointments with another department in either the School of Engineering or the School of Science, with the remainder holding primary appointments in HST. HST faculty promotion and tenure cases are normally reviewed by Engineering Council, of which the HST-MIT Co-Director is a member.

Today there are more than 400 graduate students in medicine, engineering and science who study in HST under a variety of degree options and training programs, leading to MD, PhD, combined MD/PhD, and Masters degrees. These students also pursue a wide range of research activities with faculty from MIT, Harvard, and affiliated teaching hospitals.

MIT Programs and Resources in Life Science and Medical Research and Education

Over the years, MIT has developed and partnered with several research institutions of various forms dedicated to the advancement of research in life sciences and its application to medicine. Among these organizations are: the David H. Koch Institute for Integrative Cancer Research, the McGovern Institute for Brain Research, the Picower Institute for Learning and Memory, the Whitehead Institute for Biomedical Research, the Ragon Institute of MGH, MIT and Harvard, and the Broad Institute. Many MIT faculty have affiliate appointments with these institutes. These unique research institutions thus provide MIT faculty with links to substantial research facilities and programs while these faculty retain their academic departmental appointments. However, in many cases MIT academic departments conduct joint faculty searches with these institutes, with support and research space provided by the institute to the incoming faculty, whose primary appointments are in the academic departments.

The HST program differs from these types of organizational forms in important ways. First, as noted above, most faculty within HST at MIT have dual appointments in HST and another department, although some have been appointed entirely within HST. Second, HST has

responsibility for its educational, degree-granting programs, some of which are joint with HMS.

Today, nearly every department within the School of Engineering has an active program of research and education relating to the application of engineering to the life sciences and human health. This is reflected in the research done by the faculty, often in partnership with researchers from Boston area hospitals. The current HST faculty have an important but not unique role in these activities. We believe that there are significant opportunities to enhance such interactions between MIT faculty across MIT schools and the Boston area hospitals, and we have crafted our recommendations to accomplish this. Our recommendations should also positively impact education at the interface of medicine, science, and engineering at MIT.

We believe that senior leadership commitment is required if MIT is to effectively seize the opportunity presented by the increasing application of engineering and science to medicine and to leverage this region's assets for collaborative research. This will enable MIT to make important contributions to the solution of major global health problems.

Conclusions

We here summarize some of the conclusions we reached as a result of our extensive interviews. These form the basis upon which we make our recommendations.

- The joint HMS-MIT Program within HST is a unique program of exceptional quality. Students of exceptional quality are attracted to this program by the unique opportunities to simultaneously join the MIT and HMS communities.
- Many HST faculty report that they would not have come to MIT without the opportunities presented by HST.
- HST alumni play an important role in the joint program, acting as advisors, engaging in collaborative research with MIT faculty and participating in the teaching program.
- HST is not the only platform or portal for research and education in medical engineering and science at MIT.
- There is a need to increase the visibility and effectiveness of research and education in medical engineering and science at MIT.
- With dual faculty appointments, a unit that includes the HST Program could be an enabler for increasing the visibility and effectiveness of research and education in medical engineering and science at MIT.

Recommendations

We make our recommendations both in the context of the *long-term* challenges and opportunities and mindful of the *short-term* imperatives.

MIT is unique in the quality and effectiveness of its cross-school activities in education and research. And these interactions are particularly strong in the application of engineering and science to medicine. Nonetheless, in order to develop a strong academic unit to focus on these opportunities, we believe such a unit should be housed within a school. Given the current academic and administrative structure, and the interests and activities of our faculty, we believe that the School of Engineering is the most appropriate home for a unit with a focus on medical engineering. Dual faculty appointments that cross school boundaries, as well as cross-school education and research, can be well handled with our current framework. We therefore focus on the School of Engineering as a platform for medical engineering based on strong scientific foundations.

Recommendation: The Dean of Engineering, in concert with other senior academic administrators, should become an advocate for medical engineering at MIT: to articulate the opportunities and challenges; to support collaborative research; to support faculty searches at the interface between engineering and medicine and the related sciences; and to enhance our ability to attract outstanding faculty in this area of “convergence”.

The *long-range* goal of this recommendation is to improve the effectiveness and visibility of medical engineering and science at MIT.

Possible outcomes of such a recommendation could be:

- Increased access to the Boston medical community, including area hospitals, to expand research opportunities across MIT departments.
- Increased opportunities for faculty research and contributions to education in medical engineering and related areas and applications across several departments.
- Joint graduate programs in medical engineering and science and other related interdisciplinary areas across several departments.

Options considered:

Within this *long-range* context, considering our charge and our findings regarding the growth opportunities in the application of engineering and science to medicine, we focused upon the placement of the HST Program within the School of Engineering. Several options present themselves for placing the HST Program within the School of Engineering: establish HST as a department; merge HST with an existing engineering department and place the responsibility for the joint MIT-HMS program in that department; as a division with all

future faculty appointments dual; as a program with current HST faculty placed in various existing departments but having responsibility to carry out the joint MIT-HMS program; as an institute with joint faculty searches but all faculty appointments based in an academic department (similar to the structure of the McGovern Institute, the Picower Institute, and the Koch Institute) or some combination of these options. In considering these options, our principal goals were: 1.) to strengthen the unique joint educational program between MIT and HMS; 2.) to provide a stronger platform for collaborative research in medical engineering and science across MIT departments and schools; and 3.) to improve the visibility of MIT activities in medical engineering and sciences both within and outside MIT.

As mentioned earlier, most of the current faculty in the HST Program hold dual appointments with MIT departments, principally in the School of Engineering, but also in the School of Science. We have found these dual appointments to be extremely fruitful in achieving the goals of encouraging collaborative research and strengthening the joint program, and serving to attract unique faculty to MIT in this area of education and research. Therefore we rejected the options that would concentrate HST faculty within a single department or merge HST with an existing department. Establishing HST as a regular academic department might suggest a circumscription of the activities in medical engineering and science that already are widely dispersed across departmental boundaries at MIT, and this result would be contrary to the core interdisciplinary nature of HST. Moreover, formal academic departments at MIT normally have undergraduate degree programs, which HST lacks. Merging HST within an existing department would tend to decrease both the visibility and the collaborative nature of HST to an even greater extent.

We also believe that returning all faculty to their existing primary departments, dissolving HST faculty appointments and running the joint MIT-HMS program as an Interdepartmental Program within School of Engineering would significantly weaken the joint MIT-HMS program and would not achieve the goal of promoting research at the interface of medicine, engineering and science at MIT. We therefore rejected those options that, in our opinion, do not provide the greatest opportunity to enhance the visibility of medical engineering and sciences at MIT, undermine the essential interdisciplinary nature of the HST program, and do not provide the best structure to encourage dual faculty appointments between departments and the unit responsible for the joint program.

Finally, although our ultimate recommendation is perhaps closest in form to a division, with most faculty appointments dual with a department, we are recommending a different structure for the following reason: given the importance of and the opportunity for collaborative research as laid out in our report, we believe that the visibility provided by a division is not sufficient. MIT has used the organizational form “division” for various purposes and its character is somewhat uncertain. We feel strongly that MIT must move beyond this organizational form to take advantage of the opportunities presented in this case.

Preferred Option

We believe that the following organizational structure best meets the current needs of the HST Program, the School of Engineering and MIT. We believe this structure will strengthen

MIT's role as a world leader in education and research in the application of engineering and science to human health.

- Establish the “**Institute of Medical Engineering and Science**” within the School of Engineering as a platform for research and education in medical engineering and science at MIT.
- House the joint HST MIT-HMS Program within this Institute.
- The HST Program faculty would become faculty within the Institute.

Further recommendations that we believe will contribute to the success of this new structure:

- Future faculty appointments in this Institute should be dual with academic departments, with all searches for dual faculty to be conducted jointly between the Institute and the relevant science or engineering department.
- Immediately initiate joint searches for dual senior or mid-career faculty for the Institute of Medical Engineering and Science, bringing to MIT individuals with outstanding credentials, bridging engineering, medicine, and science with the goal of providing leadership, credibility and a clear vision for this area of emphasis at MIT and within the School of Engineering
- Strengthen the joint HMS-MIT educational program by providing it with sufficient ongoing resources, including adequate, functional space to accommodate its core activities, to enable it to maintain the highest academic standards and to continue to attract the most highly talented students and faculty.
- Provide substantial resources, including seed funds, in order to promote collaborative research between faculty in the Institute for Medical Engineering and Science and faculty from departments in the Schools of Engineering and Science and with researchers in the surrounding Boston/Cambridge medical community.
- We envision that, in the future, other interdisciplinary programs of education and research at the “convergence” of global health problems with the historical disciplinary strengths of MIT will join the joint MIT-HMS program as additional units within the Institute of Medical Engineering and Science. We also urge that this new unit be seen as a potential location for the development of unique facilities or experimental capabilities that could become a resource for faculty and other researchers throughout MIT.

In the short term, the use of dual faculty appointments will serve to integrate both research and education in the application of engineering and science to medicine across the School of Engineering and across MIT more broadly. The use of dual appointments should also act as a significant additional enabler for the collaborative activities of MIT departments with the Boston medical community. It will create occasions for departments and the new Institute to focus on the individual needs and opportunities presented by potential dual faculty

appointments and to come to agreement about the quality and fit with the research and educational programs of each unit. We anticipate that, in the short term, most of these dual appointments would be within the School of Engineering, although dual appointments with the School of Science and other schools are clearly anticipated and could be handled by existing processes involving the relevant Deans.

In the longer term, as dedicated HST faculty chairs turn over or otherwise become available, a limited number of searches for faculty appointments directly into the Institute for Medical Engineering and Science could take place within the School of Engineering under the authorization of the Dean of Engineering (or in some cases, with the agreement of the Dean of Science).

We realize that our preferred option does not fit any of the current organizational frameworks at MIT. It does have some similarities to other Institutes at MIT but in this case would have responsibility for education -- the joint program between Harvard and MIT-- in addition to research. It is our expectation that this organization will encourage interdepartmental education and research in the application of engineering and science to medicine to flourish at MIT.

Given the importance of this area of research and education to the future of MIT, we believe that this structural form is the most appropriate, combining as it does the commitment to interdepartmental research and education with the enhanced visibility afforded an Institute. It also demonstrates MIT's commitment to this area of scholarship. We also see the proposed Institute as an important enabler for collaborative research across departmental, school and organizational boundaries, such as those with HMS and the local teaching hospitals.

We believe that the joint HMS-MIT Program will flourish in this new Institute. The creation of this unit also should strengthen the links with departments in engineering and science and should provide a healthy environment for graduate student research and teaching in the joint program.

We urge MIT to take advantage of the inherent flexibility of this kind of unit relative to a department or a division and allow for more flexible "membership" in the unit. In addition to dual or joint faculty appointments, the new Institute for Medical Engineering and Science could craft an affiliate membership (as other MIT Institutes have done), based on research and/or teaching participation, as a way to lower the barriers to wider participation of faculty from existing departments. We anticipate that the Institute for Medical Engineering and Science, like most academic units, will evolve over time, moving in different directions to reflect changing priorities in its areas of education and research.

Appendix 1

Meetings

The Committee (or in some cases individual members or sub-sets of the Committee) met with the following people, either individually or in small groups:

MIT Administration:

Rafael Reif, Provost
Claude Canizares, Vice President for Research and Associate Provost
Eric Grimson, Chancellor
Marc Kastner, Dean of Science
Ian Waitz, Dean of Engineering

MIT Department Heads:

Edmund Bertschinger, Physics
Mary Boyce, Mechanical Engineering
Klavs Jensen, Chemical Engineering
Chris Kaiser, Biology
Douglas Lauffenburger, Biological Engineering
Mriganka Sur, Brain and Cognitive Sciences
Ned Thomas, Materials Science and Engineering

MIT HST Faculty:

Elfar Adalsteinsson
Daniel Anderson
Sangeeta Bhatia
Emery Brown
Richard Cohen
Elazar Edelman
John Gabrieli
Lee Gehrke
Martha Gray
Irving London
Roger Mark

Leonid Mirny
Ram Sasisekharan, Co-Director of HST
Collin Stultz

HST Administration:

Sherene Aram, Administrative Officer

HST Students:

Pam Basto
Rachel Ellman
Ben Larman
Taylor Lloyd
Daniel Macaya
Annalisa Pawlosky
Ashley Wessendorf

HST Alumni Association:

Ed Cheal
Domenica Karavitaki
Joseph Madsen
Steven Stufflebeam

Harvard Medical School:

Jeffrey Flier, Dean of the Faculty of Medicine
David Golan, Dean for Graduate Education
David Cohen, Co-Director of HST

Others:

Richard Hynes, MIT Professor of Biology
Henri Termeer, MIT Corporation Member;
Chair of 2010 HST Visiting Committee

Communications

The Committee contacted members of the HST community and members of the MIT faculty to solicit their inputs. These letters appear below.

To members of the HST Community,

As has been announced, Provost Reif and Vice President for Research and Associate Provost Canizares have jointly appointed an **Ad-Hoc Committee to Explore Options for the Structure of the Harvard-MIT Health Sciences & Technology (HST) Effort at MIT**. The Committee is charged with examining various structural options to insure that the HST effort at MIT is better aligned and organizationally more congruent with the other academic units at MIT. The full charge can be seen at: <<http://web.mit.edu/provost/hst/>>. Members of the Committee are: Professors Duane Boning, Arup Chakraborty, Robert Langer, Richard Lester, Gareth McKinley, Phillip Sharp, and Sheila Widnall (chair); Doug Pfeiffer (dwp@mit.edu) is staff to the Committee. As we move forward we anticipate many opportunities for communications with the community. In particular, we wish to hear from HST students, faculty and staff as well as other MIT faculty in related disciplines.

There is no question about the value of, and the commitment of MIT to, the joint Harvard Medical School - MIT program that resides in HST. It is important that any recommendations that emerge from our Committee's deliberations only strengthen the quality and effectiveness of this joint program and its integrations with MIT.

To this end we would like to hear from the HST community and other interested parties regarding the core strengths of the HST effort. In particular: What is best about HST that needs to be preserved? What is HST's most valuable aspect? How will it thrive in the future?

We invite you to communicate by email with any member of the committee, or with the committee as a whole (hst-committee@mit.edu). As part of our ongoing process we will organize joint meetings of the Committee with as many HST students, faculty, staff, and other community leaders as practical. Although we will not be able to meet with all members of the HST community and other interested parties, your input is very important to us, and we encourage you to send your comments by email. We would appreciate receiving any comments no later than March 7, 2011.

Thank you for your interest in this important effort.

Sincerely,

Members of the Ad Hoc Committee on HST

To members of the MIT Faculty,

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