

Subcommittee on the Educational Commons
Committee on the Undergraduate Program

Final Report

November 14, 2008

INTRODUCTION

The following is the final report of the Educational Commons Subcommittee (ECS) of the Committee on the Undergraduate Program (CUP). Its purpose is to summarize our work over the past academic year and to report on a set of proposed changes to the General Institute Requirements (GIRs).

Our work has built on the final report of the Task Force on the Undergraduate Educational Commons, taking into account reactions to that report by the wider MIT community following its presentation to the President in October 2006, and our own consultations with constituents of that community since we were charged by the CUP in October 2007. These deliberations have led us to focus on the following set of recommendations that ECS envisions implementing in two phases. Some of these changes can be developed and implemented fairly soon while others require an experimental period. We will discuss this in more detail later in this report.

- *Science, Mathematics, and Engineering Requirement.* The Science, Mathematics, and Engineering portion of the GIRs should be changed by (1) establishing a new structure to encourage flexibility and innovation in teaching the traditional “core” material in calculus, physics, chemistry, and biology, (2) establishing a new category of required subject, termed Elements of Design and (3) establishing a new type of GIR, termed Science, Mathematics, and Engineering (SME) Foundations. The first change can be implemented soon; however, ECS recommends a period of experimentation for the second and third of these changes, details to be discussed later in this document.

- *Humanities, Arts, and Social Sciences (HASS) Requirement.* The HASS portion of the GIRs should be changed by (1) establishing a new type of class intended for first-year students that will explore questions and problems of perennial human concern, (2) simplifying the distribution requirement to three categories and abolishing the separate category of HASS-D subjects and (3) continuing the development of CI-H subjects, taking into account the findings of the assessment by the CUP's Subcommittee on the Communication Requirement (SOCR). ECS recommends a period of experimentation for the first of these changes, while the other two can be implemented without a period of experimentation, details to be discussed later in this document.
- *Governance.* To govern and encourage continual innovation of GIRs, the Committee on the Undergraduate Program should establish two additional permanent subcommittees on the General Institute Requirements: the Subcommittee on the Science, Mathematics, and Engineering Requirement and the Subcommittee on the HASS Requirement.

All of the proposed changes are seen by ECS as important to the goal of making the Requirements as effective as possible in the general education of our students and in encouraging continuous improvement in the subjects that comprise the GIRs.

SUBCOMMITTEE CHARGE AND ACTIVITIES

The Subcommittee's charge and membership are detailed in Appendix A. We understood our charge to be one essentially of reviewing and refining, with the ultimate goal of proposing to the Faculty a set of concrete changes to MIT's general undergraduate curriculum. Our foundation was the final report of the Task Force on the Undergraduate Educational Commons, including the background deliberations and research that informed that effort. The Task Force engaged in a comprehensive review of the undergraduate educational experience at MIT that extended over two and a half years, and we were not asked to re-do the Task Force's work.

Since the Task Force report was released in Fall 2006, a number of different mechanisms have been used to actively solicit feedback and encourage communication. The release of the

Task Force report engendered a lively reaction from the entire MIT community, expressed in many settings, including Institute Faculty meetings, an edition of *The Faculty Newsletter*, and *ad hoc* meetings with departments, faculty committees, and other interested parties. Discussions were held during a portion of five Faculty meetings between Fall 2006 and Spring 2007. Immediately after the Task Force report was distributed, Faculty Officers and Dean for Undergraduate Education (DUE) representatives met with departments, student groups, and School Councils to receive feedback on the proposals in the report. In February 2007, *The Faculty Newsletter* published a special edition devoted exclusively to discussion of the issues raised by the Task Force report. Supplementary articles have appeared since then. Written comments were collected online via discussion board. Discussions were held with Standing Committees of the Faculty and in a number of academic departments.

This feedback has greatly influenced our work, and we comment explicitly on it below. In addition, we met anew with many of the same groups that gave initial input to the Task Force and that provided feedback after its report was issued. A list of the groups we have met with since we began our work in October 2007 is available in Appendix B. An additional update was provided at the February 2008 meeting. Last May we issued a preliminary report in advance of a presentation made by the Subcommittee co-chairs to the May 2008 Faculty meeting.

Over the past summer, faculty members from a variety of departments and academic sections across the Institute participated in three different working groups: Elements of Design, SME Foundations, and HASS First Year Focus, to refine various aspects of the ECS proposal. A list of participants and their affiliations are detailed in Appendix C. ECS continued this collaboration throughout the early fall of 2008. The Subcommittee co-chairs authored an update about our work that appeared in the September/October issue of *The Faculty Newsletter*. That was followed by a presentation to the October 2008 Faculty meeting, at which time the subcommittee co-chairs summarized many of the points detailed in this report and previewed our recommendations.

OVERVIEW OF TASK FORCE REPORT AND PROGRESS TO DATE

The Task Force report was a comprehensive review of MIT's undergraduate *educational commons*. The term "educational commons" encompasses a broad set of components that

contribute to the success of the undergraduate educational experience at MIT and that are generally not “owned” by the departmental programs (*i.e.*, majors). The most obvious of these components is the General Institute Requirements.

While the charge of this Subcommittee is to recommend changes to MIT’s policies and regulations concerning undergraduate education using the Task Force report as its starting point, we have focused our efforts, and thus the substance of this report, on the Science, Mathematics, and Engineering Requirement; the HASS Requirement; and faculty governance issues related to the GIRs.

The GIRs provide the setting for *general education* at MIT, on which students depend as building blocks for their later lives as citizens, leaders, employees, parents, and other social roles they will embrace. The entire MIT faculty shares the responsibility of ensuring that GIR subjects provide a rich environment that supports a lifetime of learning and responsible citizenship. The GIRs also help to provide a common base of *prerequisite knowledge*, on which virtually all departments depend for the success of their majors. The entire MIT faculty shares the responsibility of ensuring that the pre-conditions are set so that GIR subjects are first-rate and suited for later use in majors. Not every subject contributes equally to general education and to prerequisite knowledge, but it is important to remember that GIR subjects, taken as a whole, address these two needs of the curriculum simultaneously.

The response to the Task Force’s report demonstrated that further work was needed to reconcile the structure of the GIRs with the dynamic challenges facing undergraduate education at MIT. The most important of these outstanding issues may be summarized with the following questions:

1. How can we introduce more opportunities for active learning for all MIT undergraduates?
2. If we are to introduce a new element into the GIRs, which one(s) should it be?
3. How can we create an environment in which attention to issues of culture and society hold their own within the GIRs, while maintaining the cherished flexibility currently structured into the HASS Requirement?
4. How can we create greater flexibility in the Science Core without losing the valuable feature of the current core that, regardless of which specific classes students take to

fulfill a requirement, they are prepared to begin work toward any major at the Institute?

5. How can we manage the GIRs to best balance creativity and innovation with predictability and coherence?

Over the past 13 months, these issues formed a basis for our discussions as we formulated our recommendations.

The final report of the Task Force covered a range of other topics. Some of these are presently being attended to outside of our deliberations. For a summary of activities regarding global education, classrooms and scheduling, diversity, and the change to double majors from double degrees, see Appendix D.

THE SCIENCE, MATHEMATICS, AND ENGINEERING REQUIREMENT

Briefly, the current GIRs in science, mathematics, and engineering include two semesters of physics (8.01, 8.02 and their variations), one semester of chemistry (5.111, 5.112 or 3.091), two semesters of calculus (18.01 and 18.02 and their variations), one semester of biology (7.01n and its variations), one Institute Laboratory, and two Restricted Electives in Science and Technology (REST). The Task Force report proposed an eight-subject Science, Mathematics, and Engineering core: three required subjects (mechanics, single-variable calculus, and multi-variable calculus) and a choice of five additional subjects from six categories that included chemical sciences, computation and engineering, life sciences, mathematics, physical sciences, and project-based experience.

Faculty response to this proposal was mixed. The main message coming from many discussions was that the core content in the current GIRs is an essential foundation for all students wishing to pursue any major at MIT, making the choice of five-out-of-six in the proposed model problematic. Departments would not be able to count on students having adequate prerequisite knowledge to move into any major. In response to this widespread criticism, we considered ways to preserve the common core while providing opportunities for evolution of content, innovative teaching, and appropriate flexibility for students. The resulting proposed Science, Mathematics, and Engineering Requirement would consist of “flavors” of six

required subjects and experiments with two possible new GIRs in Elements of Design and SME Foundations (thus a total of eight 12-unit elements).

Flavors in the Science, Mathematics, and Engineering GIRs

The proposed science, mathematics, and engineering core curriculum, in its first stage, is composed of six “elements,” each of which carries 12 units of credit: calculus of one variable, classical mechanics, calculus of several variables, electricity and magnetism, biology, and chemistry. Each of the Science, Mathematics, and Engineering GIR elements can be offered in a variety of flavors that share core content. The flavors model is best explained by reviewing the current Biology GIR. All 7.01n subjects contain the same core material: the fundamental principles of biochemistry, genetics, molecular biology, and cell biology. Each subject, however, includes material that is distinctive to that subject. For example, 7.012 explores current research in cell biology, immunology, neurobiology, human genetics, developmental biology, and evolution. 7.013 emphasizes human biology, and 7.014 focuses on microorganisms as geochemical agents. We recommend that all six Science, Mathematics, and Engineering Elements be offered in a variety of flavors that provide the opportunity to introduce contemporary material, contrasting pedagogies, or discipline-specific examples while maintaining core knowledge. Students would be free to select any flavor of a required element, and any flavor would serve as a prerequisite or degree requirement. Flavors would be approved and monitored by the CUP Subcommittee on the Science, Mathematics, and Engineering Requirement, whose function is explained in the section on governance. There are specific advantages to the flavor model. It provides more flexibility for students to explore their personal interests and to take a more active role in their education. For faculty, it offers new opportunities for content to evolve and a clearer path by which innovations in teaching methods may be proposed (*e.g.* project-based or other hands-on flavors of the GIRs).

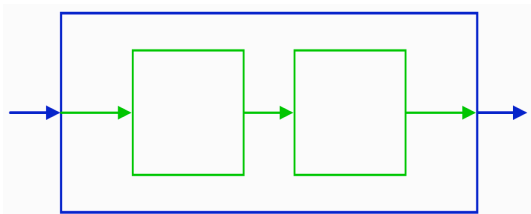
SME Foundations

The SME Foundations category would include subjects from a short list which would be approved and monitored by the Subcommittee on the Science, Mathematics, and Engineering Requirement. SME Foundations provide introductions to fundamental topics and/or modes of analysis that are broadly applicable in science, mathematics, and engineering. Examples of these

subjects might include differential equations, probability, statistics, discrete math, linear algebra, and computation. The Subcommittee hopes that the SME Foundations category will be viewed by departments and faculty as an important opportunity for innovative teaching, including perhaps 6-unit subjects. While only twelve units of SME Foundations are required, taking additional subjects from this list as electives would be appropriate for many MIT undergraduates. Unlike the other 7 elements, particular subjects in the SME Foundations may be specified as required by departmental programs. Because these are new subjects and a new form of GIR, we suggest a pilot period to undertake assessment of the proposed subjects, ascertain student interest and subject viability before asking the faculty to make SME Foundations a part of the GIRs.

Elements of Design

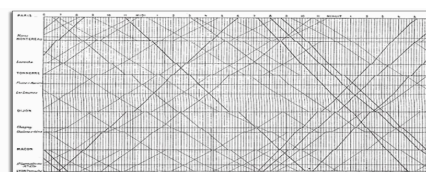
Building on recommendations of the Task Force as well as prior recommendations of the Zacharias Report (1964), we recommend a series of experiments to investigate further the advisability of creating a new category of Science, Mathematics, and Engineering GIR: Elements of Design. The core content of Elements of Design is intended to capture modes of reasoning that facilitate design:



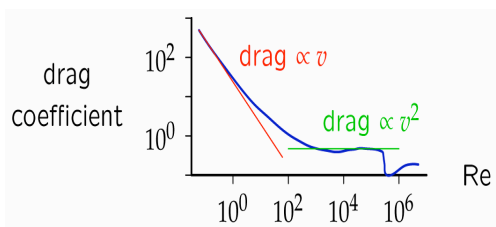
Hierarchical Reasoning. Good abstractions break systems into meaningful and manageable parts. Examples include modular design of systems across the Institute (electrical, mechanical, chemical, and software systems).

Graphical Reasoning. Graphical representations display relations among parts and facilitate thinking about interactions. Examples include graph diagrams, and Venn diagrams.

space



time



Scaling and Approximate Reasoning. By recognizing how phenomena scale, we reduce the dimensionality of the design problem. Examples include the dependence of drag coefficient on Reynolds number and the dependence of speed and power consumption on transistor size.

Reasoning with constraints. Effective designs address multiple constraints including physical constraints, economic constraints, and social constraints.



Reasoning with Uncertainty. Good designs are robust in the face of uncertainty. Examples include redundancy, fault-tolerance, margins of safety; error detection and correction; probabilistic reasoning.

These modes of reasoning facilitate design by increasing intuition and by managing complexity. Both skills are important throughout our students' careers at MIT and beyond, and both are important in technical fields across the Institute. For these reasons, Elements of Design should be a General Institute Requirement.

To introduce our students to the importance and pervasiveness of design at MIT, we encourage the development of flavors of Elements of Design that build the core modes of reasoning in the context of authentic problems from fields across the Institute. By catalyzing a group of interested faculty to work together to develop this new GIR, we believe that MIT will create a new type of undergraduate experience that will be of enormous importance not only for itself, but also as a model for other institutions.

We propose that the design GIR be piloted in several flavors, including at least one computational flavor, and fully assessed before it is made a permanent part of the curriculum.

A component of the original Task Force proposal is missing from the current ECS proposal: project-based subjects. An assessment of the project-based experimental subjects indicates that this type of pedagogy can be highly successful and useful for first-year students. Project-based subjects are important and should be expanded, but it may be impractical to provide this experience to all students. We envision the project-based approach as a viable pedagogical flavor that may be employed in a variety of Science, Mathematics, and Engineering GIRs, and especially in the Elements of Design.

Highlighted Issues

As we discussed our SME proposals with groups of faculty, students, and members of the administration, several issues emerged that we believe should be highlighted. The first issue has to do with the importance of consistent and effective governance by the proposed CUP Subcommittee on the Science, Mathematics, and Engineering Requirement. As many people have pointed out, if we as a faculty are to maintain the current high standards of the science, mathematics, and engineering core, with its critical importance both as preparation for departmental major programs and as a basis for lifelong learning and citizenship, the governance structure must work as we move to the core and flavors model. Also, as we introduce new GIR categories such as Elements of Design and SME Foundations, the SME Requirement subcommittee must have appropriate expertise and resources to help these innovations succeed. We are aware that there are examples in our history where governance of GIR modifications did not work effectively over time. However, we believe that the structure proposed later in this report, with its clear assignments of responsibility and its close connections to key departments, will serve our faculty and students well.

A second issue that has emerged in discussions concerns the goals of the SME Foundations category. In some ways SME Foundations can be viewed as a much shorter list of REST subjects, with the expectation that faculty and departments will view these subjects as an opportunity for especially innovative teaching. We understand that for most students it will not be difficult to satisfy this 12-unit requirement, especially as departments would be allowed to require specific subjects in this category as part of the major. However, the Subcommittee believes that there is real value in highlighting a limited number of subjects in the SME area that, while not required, *per se*, should be considered by all undergraduates at MIT; indeed, we hope and expect that most students will take several subjects in this category.

Several questions emerged related to the proposed introduction of a GIR in Elements of Design. They include the following: Can one define a core of methodology that is sufficiently common in design in different fields and environments such that our students would understand design in general regardless of the flavor of Elements of Design they take? A related question is whether departments should be allowed to require a specific design subject (or restricted list of subjects) as necessary for their major? Also, how much value will an introductory Elements of

Design GIR have for those students who will later have a capstone design experience, which is the case in several departments.

For the last question, the subcommittee believes that the answer is likely to be strongly positive for the Elements of Design subjects we have in mind, but in any event it is clear there needs to be a period of experimentation with Elements of Design subjects before these questions can be answered. This is one reason for the proposed period of experimentation before the Faculty would vote on formally adopting Elements of Design and SME Foundations as GIRs. We should also emphasize that we hope the experimental period will include a broad range of efforts, such as the possibility of including more hands-on and design experience as part of the science, mathematics, and engineering core subjects.

THE HUMANITIES, ARTS, AND SOCIAL SCIENCES REQUIREMENT

The current HASS Requirement consists of three major components:

1. All undergraduates must take a total of eight subjects designated as falling within the rubric of humanities, arts, and social sciences. The remaining components fit within this eight-subject envelope.
2. All undergraduates take three *distribution* subjects, HASS-Ds, and are encouraged to complete them by the end of the sophomore year. HASS-D subjects meet in sections small enough to allow discussions in which every student can participate, and except for some art and music composition subjects, call for a substantial amount of writing. HASS-D subjects are classified into one of five distribution categories; students choose HASS-Ds from three of these five categories. (In addition, a “language option” allows students to substitute one language subject at Level III or IV for one HASS-D subject.) There are currently 90 HASS-D subjects in the *MIT Bulletin*.
3. All undergraduates complete a HASS *Concentration*, which occupies either three or four subjects, depending on the concentration the student chooses. Concentrations provide undergraduates with a deeper and broader encounter with the subject matter and methodologies in a HASS field than is possible in the HASS-Ds. There are nearly 40 concentrations to choose from, ranging from American Studies to Writing.

The Communication Requirement, while formally outside the HASS Requirement, interacts with it in one very important way. First-year and second-year students are required to take two communication intensive subjects by the end of their fourth term. For most students these subjects are HASS subjects, which are designated either CI-H or CI-HW.

The overlap between HASS-D subjects and CI-H subjects is substantial. In the 2007-08 academic year, there were about 100 CI-H subjects and about 90 HASS-D subjects. Approximately 60 of these subjects were both CI-H and HASS-D. Obviously there were CI-H subjects that are not HASS-D and some HASS-D subjects that were not CI-H.

The Task Force identified a number of structural problems with the current HASS Requirement, including its excessive complexity and lack of clarity to first-year students and advisors. To address these structural problems, the Task Force recommended reducing complexity by altering the distribution system, requiring that the distribution requirement (re-designed as the “foundational” phase of the requirement) be completed by the end of the sophomore year, implementing a Freshman Experience program, and encouraging cross-School collaboration.

The Task Force’s recommendations were met with a number of concerns. The one that concerned us most was the observation that the very strict pace requirement for completing the foundational phase could effectively box-out strategically important areas and/or areas of student passion in the first two years, such as foreign languages and music. Therefore, it seemed wise to consider restructuring the requirement to *emphasize* acquiring fundamentals early at MIT while not *requiring* it of all students.

Many faculty also raised questions about the utility of the Freshman Experience subjects. Why not encourage the development of classes such as these, but not require them? The Task Force concluded that individual HASS classes were already very well taught. The issue was not the quality of specific subjects, such as HASS-Ds or CI-Hs, but the overall structure in which the subjects are placed. Many of our peers have requirements that place a special encounter with the humanities at the threshold of the college experience. There is good evidence that this placement raises the impact of the humanities programs measurably at those institutions, not only among students who will later become humanities majors, but also among students who will go on to major in science and engineering. Given the challenge facing the HASS Requirement at MIT

and the experience of our peers, we are convinced that the Institute should develop a set of high-impact HASS classes at the entryway to its undergraduate experience.

Therefore, in an effort to further the goals for the HASS Requirement enunciated by the Task Force, but responding to the feedback received concerning its original proposals, we suggest that the HASS Requirement be changed in the following ways:

1. Develop a set of classes that would be targeted to first-year students, in the spirit of the original Freshman Experience idea, called First Year Focus subjects. We are sensitive to arguments against absolutely *requiring* such subjects in the first year, but, at the very least, we should move toward a norm that expects students to take one of these subjects in the first year absent a compelling educational alternative.
2. Retain the idea of distribution as a central element of a liberal education in the humanities, arts, and social sciences, but add greater flexibility in how students may achieve distribution. Rather than keeping the current distribution categories, we should require instead that students take one class each in the humanities, arts, and social sciences (individual classes, not departments, will be classified as one of these three categories) at some point during the four years at MIT. Such loosening of the distribution requirement would give students the flexibility to better pursue their intellectual interests while still ensuring that they at least encounter heterogeneity of perspectives during their time here. Eliminating the need for a faculty committee to police the tedious details of the HASS-D “mechanical criteria” — and eliminating the need for instructors to worry about wrestling their subjects into the HASS-D straightjacket — would also free the creative energies of the most engaged and creative faculty to innovate in the HASS curriculum.
3. Retain the Communication Requirement in its current form. We agree that communication skills are a universal building block for intellectual exploration in all subjects, and that CI-H subjects are in principle a very good way for building such a foundation. For the early phase of the Communication Requirement to reach its potential, SOCR should review CI-H subjects in the new context of the revised HASS Requirement.

All three of these proposals work together as a package. It would be a mistake to adopt the last two recommendations without the first. A very flexible distribution requirement alone, as suggested by the second point, would give even less coherence to the HASS Requirement than the old, discredited HUM-D system that we abandoned in the late 1980s because it was intellectually incoherent and encouraged a “race toward the bottom” in terms of student expectations about rigor in the humanities, arts, and social sciences.

First Year Focus

The First Year Focus subjects would be an innovative element in MIT’s curriculum, so we should say some words about their goals and structure.

All students should take one subject that is designated as a HASS First Year Focus subject. The name has two meanings, each of which is useful: the focus of these subjects is on first-year students, and they will focus the attention of first-year students. These subjects are designed to offer gateways into the fields and disciplines of the Humanities, Arts, and Social Sciences and explore questions and problems of perennial human concern. Regardless of their exact topic, all aim to accomplish two tasks:

1. Introduce students to key modes of thought and analysis characteristic of scholarship in the arts, humanities, and social sciences. These subjects should teach students to develop a critical orientation towards a topic and a diverse array of textual and other sources, analyze problems from multiple perspectives, frame appropriate questions, formulate arguments, marshal and interpret evidence, and confront ambiguity.¹ Along the way, these subjects will make explicit the methods of inquiry characteristic of the relevant disciplines and the links to other disciplines and classes that can enhance understanding of the substantive topic. These skills provide a foundation for scholarship within SHASS, as well other Schools at MIT.
2. Provide opportunities and materials for a shared conversation among undergraduates, particularly first-year students. A limited number of HASS First Year Focus subjects should be offered each year. By focusing the attention of 60 to 150 students on a common set of topics and questions, these subjects should spur discussions that

¹ This is supposed to be a suggestive list, not a list of requirements.

continue outside of the classroom. No more than 10 FYF subjects should be offered in any semester. The limitation on offerings in any semester should increase the probability of students sharing topics for conversation.

These subjects should be offered in various formats. For instance, some may be large lectures with discussion sections, while others may be multiple small classes offering the same or a coordinated syllabus. Part of the goal of this *experimental* program will be to identify a range of effective pedagogical and topical models and to develop several prototypical classes and offerings.

Highlighted Issues

As we discussed our proposals with groups of faculty, students, and members of the administration, a few issues emerged that we believe should be highlighted. The first pertains to whether the First Year Focus classes should be a graduation requirement or not. We believe that First Year Focus classes should be required. One of the motivations for making this a requirement is creating critical masses of students who are simultaneously focusing on a shared set of intellectual issues. Another is signaling to students the importance of sustained attention to scholarship in the humanities, arts, and social sciences, which forms a critical part of a solid foundation for success in later personal and professional life. However, many voices at the Institute suggest that the goals of the FYF program might be achieved without making these classes required. We believe that many of the uncertainties on both sides of the issue can be resolved empirically. For the next two years, new classes in the FYF mold would be offered to entering students, and existing classes will be adapted to fit the framework. Their value as excellent starting points will be communicated to first-year students before they arrive on campus. Beginning the program as a highly-encouraged elective, with the Class of 2010, will allow the faculty to assess whether the goals of the program can be achieved through advising and persuasion. With an assessment in hand, the faculty can deliberate the question of making the program a requirement in two years.

A second issue is whether the First Year Focus subjects should be required to be structured as CI-H subjects. While it may be a good thing for a few FYF subjects to be piloted with CI-H components, we are reluctant to prescribe the design of these subjects at this level of detail at this time. The final design criteria for First Year Focus subjects — both required and

variable elements — are best specified once the faculty have been able to assess different modes of teaching these classes.

A third issue is whether FYF subjects should be assigned to distribution categories. We do not recommend this option. To assign First Year Focus subjects into categories would defeat our desire to see the design of many interdisciplinary FYF subjects. We believe that deliberating whether such subjects should be assigned to one or several distribution categories would unnecessarily distract attention away from designing and teaching innovative subjects. Whether, or how, FYF subjects should relate to distribution is an issue that can be addressed after two years of experience with the subjects.

A fourth issue is whether upper-class students would be allowed to take FYF subjects. We believe they should be. However, the goal of creating this category of subjects is to allow the development of compelling HASS subjects that are designed specifically around learning objectives that are most relevant to students just beginning college. For that reason, we believe the name *First Year Focus* is appropriate, even though upper-class students would be welcome in the classes.

A fifth issue pertains to whether the classification of subjects into distribution categories (humanities, arts, and social sciences) should be by *subject* or by *department/section*. We recommend the former, although some advocate for the latter. The principal purpose behind the distribution requirement is to ensure that all students are exposed to a variety of approaches to scholarship about culture and society. The primary reason to choose between the two approaches is based on this goal. Some departments fully straddle the humanities, social sciences, and the arts in terms of the style of scholarship they pursue, the methods of evidence they emphasize, etc. Therefore, assigning some academic units to a single category would defeat the main purpose of distribution. It has been pointed out that the assignment of individual subjects to categories would make it possible, in theory, for students to fulfill their distribution requirement in only one department — if that department were to offer classes in each of the humanities, arts, and social sciences. This possibility exists in the current distribution regime, but such occurrences are rare. We agree that, as a practical matter, nearly all HASS subjects offered by particular departments/sections would reside in a single category. And we agree that, as a matter of simplicity, transparency, and good curriculum design, those subjects offered by particular academic units should generally be assigned to a single distribution category, with

exceptions arising only because of the intellectual approach of the subject in question.

These are the five issues that have arisen the most frequently when we have discussed our ideas for curricular reform with others. We believe that each of these issues is serious and warrants further consideration by the faculty. As we have stressed several times, many of these questions are based on assumptions about how the future will unfold, and we need to gather the data in order to make the best final decisions.

GIR GOVERNANCE

Consultations with faculty and the administration made it very clear that matters of governance are critical for the future success of the GIRs, especially in the transition when new subjects will be developed and precedents set. The major tasks of governance are to monitor compliance with expectations of the faculty about the future of the GIRs and to encourage and facilitate the type of innovation necessary in order to keep the GIRs vibrant and relevant.

The Rules of the Faculty give the Committee on the Undergraduate Program (CUP) the responsibility for “overseeing undergraduate education, including the freshman year, undergraduate advising, the General Institute Requirements, and other interdepartmental programs, giving attention to both short-term and long-term trends and directions.” Therefore, the starting place for recommending how the GIRs should be governed is with the CUP.

We recommend that the CUP create two permanent subcommittees: one focused on the Science, Mathematics, and Engineering Requirement and one on the HASS Requirement, much as it has created the Subcommittee on the Communication Requirement. The flexibility and multiple options potentially available in the proposed General Institute Requirements necessitate a discrete and dedicated governance structure that encourages innovation while maintaining the integrity of the GIRs. The subcommittees will be appointed by CUP, in consultation with the Chair of the Faculty and the appropriate academic Deans.

Science, Mathematics and Engineering Requirement Subcommittee

Responsibilities of the subcommittee include:

- Maintaining the official list of the Institute's SME GIR subjects.
- Recommending to the CUP subjects that will allow students to satisfy the six categories that comprise the Science, Mathematics, and Engineering Requirement including any additions to the GIRs such as additional flavors of the Science, Mathematics and Engineering GIRs and, upon their approval as GIRs, any additions to the list of SME Foundations and Elements of Design. This task would involve reviewing and approving proposals and coordinating with the Committee on Curriculum (CoC)
- Supporting, encouraging and monitoring the development of SME core flavors, Elements of Design, and SME Foundations. This function is only possible with adequate curriculum development resources to fund curricular innovation comparable to the funds that have been available through the d'Arbeloff Fund and Alumni Class Funds. ECS assumes that resources raised through the Campaign for Students will be available for this purpose.
- Ensuring regular review and monitoring of new subjects to ascertain that the educational goals of the SME GIRs are met. This activity is more long-term and would require defined educational outcomes and adequate and regularly deployed assessment tools to measure educational outcomes. The subcommittee would sponsor these activities, create an assessment schedule and be apprised of assessment results. These results would be shared with the CUP and Faculty regularly.
- Coordinating with other appropriate educational groups. The interaction with CoC is noted above. The SME GIR Subcommittee would also need to work closely with the departmental Undergraduate Officers, and report on a regular basis to CUP.
- Updating the Deans' Group on the status of the SME GIRs. The SME GIR Subcommittee would meet once or twice a semester with the Deans' Group to report on the SME GIRs, to discuss issues that would benefit from the combined wisdom of the Deans' Group and to secure necessary teaching, space or financial resources for specific SME GIRs that can appropriately be addressed by the Deans' Group.

HASS Requirement Subcommittee

Responsibilities of the subcommittee include:

- Maintaining the official list of the Institute's HASS GIR subjects.
- Recommending to the CUP subjects that will qualify as First Year Focus subjects. This task would involve reviewing and approving proposals and coordinating with the Committee on Curriculum (CoC). The process for approving new CI-Hs remains under the purview of SOCR.
- Leading the process to designate subjects as Arts, Humanities, or Social Science.
- Supporting, encouraging and monitoring the development of First Year Focus subjects. This function is only possible with adequate curriculum development resources to fund curricular innovation comparable to the funds that have been available through the d'Arbeloff Fund and Alumni Class Funds. ECS assumes that resources raised through the Campaign for Students will be available for this purpose.
- Ensuring regular review and monitoring of new subjects to ascertain that the educational goals of the HASS GIRs are met. This activity is more long-term and would require defined educational outcomes and adequate and regularly deployed assessment tools to measure educational outcomes. The subcommittees would sponsor these activities, create an assessment schedule and be appraised of assessment results. These results would be shared with the CUP and Faculty regularly.
- Coordinating with other appropriate educational groups. The interaction with CoC is noted above. The HASS GIR Subcommittees would also need to work closely with SOCR and the departmental Undergraduate Officers, and report on a regular basis to CUP.
- Updating the Deans' Group on the status of the HASS GIRs. The HASS GIR Subcommittee would meet once or twice a semester with the Deans' Group to report on the GIRs, to discuss issues that would benefit from the combined wisdom of the Deans' Group and to secure necessary teaching, space or financial resources for specific HASS GIRs that can appropriately be addressed by the Deans' Group.

CONCLUSION

In summary, ECS proposes the following changes to the GIRs.

1. For the first-year class entering in 2010, students would be required to take one subject from each of the following categories of Science, Mathematics and Engineering: Chemistry, Biology, Classical Mechanics, Electricity and Magnetism, Calculus of one variable, Calculus of several variables, including new flavors of the subjects as they are developed.
2. For the first-year class entering in 2010, the distribution component of the HASS Requirement would be changed to required one subject in each of the following categories: humanities, arts, and social sciences.

The ECS further proposes that no *immediate* changes be made in the following categories of GIRS:

- The two-subject REST Requirement
- The Institute Laboratory Requirement
- The concentration component of the HASS Requirement
- The Communication Requirement

The ECS also proposes that the faculty and administration continue over the next two-to-three years with the efforts currently under way to develop new elements of the GIRs. These subjects will be rigorously assessed; the results of those assessments will be regularly communicated to the Faculty by the Committee on the Undergraduate Program.

By the Fall Semester of AY 2011–12 the CUP will make recommendations to the Faculty about moving ahead with the three new GIR elements — the Elements of Design, SME Foundations, and First Year Focus subjects.

Two permanent standing subcommittees of the CUP will provide regular oversight to any changes in the GIRs. These committees are the Subcommittee on the Science, Mathematics and Engineering Requirement and the Subcommittee on the HASS Requirement.

If all experiments are successful and made permanent by faculty vote, the GIRs in 2012 will include the following:

8-SUBJECT SME REQUIREMENT	8-SUBJECT HASS REQUIREMENT
<ul style="list-style-type: none"> • Chemistry • Biology • Classical mechanics • Electricity and Magnetism • Calculus of one variable • Calculus of multiple variables • Elements of Design • SME Foundations 	<ul style="list-style-type: none"> • Humanities • Arts • Social Science • First Year Focus • Concentration (3-4 subjects) <p>Communication Requirement remains the same</p>
Subcommittee on the SME Requirement	Subcommittee on the HASS Requirement

As we have discussed the ideas in this report with faculty, students, and staff over the past year, we have encountered many people who are excited about exploring the educational opportunities our proposed changes would afford the MIT community. We have also been met with skepticism of people who wonder whether MIT is up to the challenge of providing the resources necessary to undertake these changes. The global financial developments over the past two months have certainly sharpened these concerns.

MIT should not shy away from continual innovation in its undergraduate education, even in uncertain financial times. All along, we have been clear in our discussions that these proposed changes will require resources to support faculty time, money for innovation, and new (or renovated) teaching spaces. Through the generosity of MIT's friends, significant funds have already been made available to faculty to design and pilot new classes in the past few years. Many of these funds will continue to be available in the coming years. In addition, the current Campaign for Students includes a category for curriculum innovation. Once the Faculty votes to endorse a serious and focused program to launch new elements within the GIRs, this category of the campaign will become fleshed out and compelling in new ways. We have been impressed with the willingness of the senior administration of the Institute to wrestle with these issues of curriculum reform along with the faculty, and we are convinced that they will work hard with the faculty as partners to provide the resources to help bring the GIRs to a new level of excellence, should the Faculty vote to go down that path.

We live in a rapidly evolving world. Our students study with peers of different genders, cultures, races and religions in a world that seems much smaller today than it did even twenty years ago. This is the context in which we are thinking about our curriculum. The structure of the new GIRs is designed to allow introduction of contemporary material while maintaining the basic elemental core of knowledge that is the hallmark of an MIT education. The flexibility afforded by the choice of “flavors” in the SME core curriculum will help to better motivate students in learning core material. New interdisciplinary flavors can integrate ideas and encourage creative thinking. Societal contexts can be introduced into science and engineering subjects while First Year Focus subjects in humanities, arts, and social science subjects use technological examples and comparisons to relate to materials students are studying in other subjects.

In addition to the changes in the curriculum, changes in pedagogy can augment basic knowledge with transferable skills and engage student interest in their learning experience. Small-group based, interactive learning experiences are working their way earlier into the curriculum through experimental innovations in first-year subjects. The Faculty should encourage this. Interdisciplinary and cross-disciplinary flavors can expose students to differing disciplinary perspectives on a common core material. Hands-on activities are being introduced earlier in the curriculum and experiential learning opportunities in real situations with real global clients are increasing through the project-based subjects. Our curriculum must be flexible enough to take advantage of the opportunities and challenges that rapid technological change offers while maintaining the intellectual rigor for which MIT is known.

Appendix A

On September 12, 2007, CUP members approved the charge including changes to the language as follows:

Charge to the CUP Subcommittee

It is the responsibility of the CUP subcommittee to guide the next phase of the review and refinement of the recommendations contained in the Task Force report. To that end, the subcommittee is charged with the following responsibilities:

1. **Lead a process to recommend changes to MIT's policies and regulations concerning undergraduate education, including the General Institute Requirements.** This process should use the final report of the Task Force on the Undergraduate Educational Commons as a starting point, and take into account feedback from faculty, students, and alumni about the report, plus insights gathered from experiments conducted in response to the report.

Recommendations on issues that are within the purview of particular Standing Committees of the Faculty should be made in consultation with those Standing Committees. The subcommittee may appoint *ad hoc* committees to facilitate the consideration of issues that cut across the jurisdictions of Standing Committees. In addition, the process should engage academic departments, School deans, and the Dean for Undergraduate Education during these deliberations as appropriate. The process should also engage the Undergraduate Association and its Student Committee on Educational Policy as appropriate.

All recommendations, including recommendations to change the General Institute Requirements should be made to the Committee on the Undergraduate Program no later than Fall 2008.

2. **Actively engage with appropriate senior administrative officers for matters arising from the Task Force report that are the primary responsibility of the administration, including resources.** These matters include (but are not limited to) the coherence and integrity of undergraduate education and advising, the improvement of classroom resources and scheduling, increasing the diversity of our campus, and securing resources for educational innovation, renewal, and assessment.

It is essential to the work and final recommendations of the subcommittee that resources be identified to (1) enable the development of new subjects, (2) enable faculty to teach subjects as pilots as well as in the steady state, and (3) develop classroom and lab space appropriate for the new curriculum.

The subcommittee shall report its activities and recommendations for action periodically to the Committee on the Undergraduate Program and, through it, to meetings of the Institute's Faculty. It may make recommendations to the CUP about limited educational experiments it feels are appropriate for assessing proposed changes to the curriculum and educational practices.

ECS membership:

Professor Robert Redwine (Physics), *co-chair*

Professor Charles Stewart (Political Science), *co-chair*

Mr. Paul Baranay (Biological Engineering), *student representative, fall 2008*

Professor John Fernandez (Architecture)

Professor Tomas Lozano-Perez (Electrical Eng. & Computer Science)

Professor Dava Newman (Aero/Astro, Engineering Systems Division)

Mr. Shreyes Seshasai ('08, Electrical Eng. & Computer Sc.), *student representative, AY2007-08*

Professor JoAnne Yates (Management)

Professor Dennis Freeman (Electrical Eng. & Computer Sc.), *ex-officio (CUP)*

Professor Steven Hall (Aero/Astro), *ex-officio (CUP), fall 2008*

Professor Diana Henderson (Literature), *ex-officio (DUE)*

Staff to the Subcommittee:

Elizabeth Cooper, DUE

Genevre Filiault, DUE

Peggy Udden, DUE

Appendix B

Educational Commons Subcommittee Meetings and Discussions, AY 2007–08

September 2007

Dean Daniel Hastings to Academic Council

October 2007

Faculty meeting (Dean Hastings and

Professor Dennis Freeman)

Dean Hastings update to ECS

November 2007

School of Engineering Council

December 2007

Dean Hazel Sive

**Bi-weekly meetings with Faculty Officers
in the Spring term**

January 2008

Humanities, Arts, and Social Sciences
(HASS) Requirement working group and

Dean Deborah Fitzgerald to ECS

Dean Steven Lerman to ECS

Dean Subra Suresh

Professor Linda Griffith

February 2008

Committee on the Undergraduate Program
(CUP)

School of Science Council

Undergraduate Officers

Academic Council

School of Engineering Council

Faculty meeting

Dean for Undergraduate Education (DUE)
Advisory Committee

Teaching for Learning Network

Professor Edward Crawley

Professor John Guttag

Professor Rohan Abeyaratne

Professor Meg Jacobs

Professors Jing Wang and Margery Resnick

Undergraduate Association Senate meeting

Mathematics Department faculty

March 2008

Aeronautics and Astronautics faculty

Sloan School of Management Policy

Committee

Student Committee on Educational Policy
and additional students

School of Humanities, Arts, and Social
Sciences Council

School of Architecture and Planning
Council

Physics Education Committee

April 2008

Electrical Engineering and Computer

Science (EECS) education committees

DUE Visiting Committee

EECS Department Lunch

Mechanical Engineering faculty

Faculty meeting

Foreign Languages and Literature faculty

Academic Council

Committee on Curricula (CoC)

Professor Steven Leeb

CUP

May 2008

Deans of the School of Humanities, Arts,
and Social Sciences

Student meeting in East Campus

Undergraduate Officers

Deans of the School of Science

Deans of the School of Engineering

Faculty meeting

Educational Commons Subcommittee Meetings and Discussions, Fall 2008

September 2008

Deans Group

School of Engineering Council

Sloan School of Management Policy Committee

Humanities, Arts, and Social Sciences (HASS) School Council

Committee on the Undergraduate Program

School of Science Council

October 2008

President Susan Hockfield, Provost Rafael Reif, Chancellor Phillip Clay, and Dean for Undergraduate Education Daniel Hastings

Undergraduate Officers

Dean Subra Suresh and Professor Mary Boyce

School of Architecture and Planning Council

Committee on the Undergraduate Program

School of Science Undergraduate Officers

HASS School Council

Faculty meeting

Committee on Curricula

Professor Steven Leeb

November 2008

Faculty Policy Committee

Town Hall Meeting sponsored by the Undergraduate Association

Faculty meeting

Appendix C

ECS Working Groups, Summer 2008:

Elements of Design

Participants:

Professor Dennis Freeman, chair	Electrical Engineering & Computer Science
Dean Cynthia Barnhart	School of Engineering
Professor John Belcher	Physics
Professor Steve Eppinger	Management
Professor Daniel Frey	Mechanical Engineering
Professor Tomas Lozano-Perez	Electrical Engineering & Computer Science
Professor David Mindell	Science, Technology & Society
Professor Dava Newman	Aeronautics & Astronautics
Professor Leslie Norford	Architecture

SME Essentials (Foundations)

Participants:

Professor Robert Redwine, chair	Physics
Professor Dennis Freeman	Electrical Engineering & Computer Science
Professor Linda Griffith	Biological Engineering
Professor David S. Jerison	Mathematics
Professor Haynes, Miller	Mathematics
Professor Robert Silbey	Chemistry
Professor Roy E. Welsh	Management

HASS

Participants:

Dean Kai von Fintel, chair	School of Humanities, Arts & Social Sciences
Professor James Buzard	Literature
Professor Ian Condry	Foreign Languages & Literatures
Professor Ellen Harris	Music and Theatre Arts
Professor Noel B. Jackson	Literature
Professor David Jones	Science, Technology & Society
Professor Rae Langton	Linguistics & Philosophy
Professor Norvin Richards	Linguistics & Philosophy
Professor Susan Silbey	Anthropology
Professor Charles Stewart	Political Science

Appendix D

Summary of Other Efforts regarding the Educational Commons

- Global education. As a result of the Task Force report, the Global Educational Opportunities for MIT Undergraduate Education (GEOMIT) committee was formed to study global education at MIT in greater depth. Its report, which was presented in September 2007, makes a number of recommendations for expanding global education at MIT.
- Classrooms and scheduling. A classroom and scheduling committee was commissioned by the Dean for Undergraduate Education in Fall 2006. It presented an interim report on scheduling to the DUE and is completing its work on the classroom segment.
- Diversity: Associate Provosts for Faculty Equity have been appointed, the Office of Minority Education continues with program development for students, and a “Diversity Matters” campaign is underway.
- Change to double majors from double degrees. The proposal to move from double degrees to double majors was passed unanimously by the Faculty at its meeting in April 2008. The Office of the Dean for Undergraduate Education is working to implement and communicate details of the change to the MIT community through a working group consisting of representatives from Information Systems & Technology and key offices within DUE and lead by the Registrar’s Office. The working group has met with and emailed interested parties, updated websites, and created fliers with information in an effort to An e-mail message has already gone out from the Dean for Undergraduate Education informing students, and faculty members, administrators, alumni, and parents of the change, the guidelines, and the schedule for its implementation.

Appendix E1

Proposed Motion to the Faculty

November 19, 2008

MOVED:

It is the sense of the Faculty that the structure of the General Institute Requirements should be changed to make the Requirements as effective as possible in the general education of our students and in their preparation for concentration in a major discipline, and also to encourage continuous improvement in the subjects that comprise the GIRs. These structural changes should provide a clear avenue that allows faculty members to propose new subjects for inclusion among the GIRs, support departments and individual faculty members who wish to experiment with new modes of teaching established content, and facilitate the oversight of the effectiveness of the GIRs by the Faculty. In particular:

- I. Effective with the first-year class entering in the Fall of 2010, Section 2.84.a.1 of the Regulations of the Faculty, which specifies the six core subjects that comprise the current Science Requirement, shall be changed to read as follows:

2.84.a.1. One subject from each of the following categories of the Science, Mathematics, and Engineering core:

- a. Chemistry
- b. Biology
- c. Classical Mechanics
- d. Electricity and Magnetism
- e. Calculus of one variable
- f. Calculus of several variables

The available, approved choices in each of these categories shall be equivalent as prerequisites for Departmental programs.

The current Institute Laboratory Requirement and the Requirement for two subjects from the Restricted Electives in Science and Technology (REST) list shall remain in place for the class entering in the Fall of 2010.

- II. Effective with the first-year class entering in the Fall of 2010, Section 2.84.a.4 of the Regulations of the Faculty, which specifies the Humanities, Arts, and Social Sciences (HASS) Requirement, shall be changed to read as follows:

2.84.a.4. The Humanities, Arts, and Social Sciences Requirement, consisting of eight subjects, including the following:

- a. A Distribution Component, consisting of one subject each in the following three categories: the Humanities, the Arts, and the Social Sciences.
- b. A Concentration Component, consisting of three or four subjects, as approved by the Subcommittee on the HASS Requirement.

The remaining subjects in fulfillment of the eight-subject HASS Requirement, beyond the Distribution Component and the Concentration Component, shall be chosen by the student.

Furthermore, it is the sense of the Faculty that encouraging and assessing innovation in the GIRs should be given high priority by the faculty governance system over the next several years. Once the reforms proposed by this resolution are permanently in place, a standing committee of the faculty shall provide regular governance and oversight of the GIRs. In particular:

- III. The chair of the Committee on the Undergraduate Program (CUP), in consultation with the Chair of the Faculty and the appropriate academic deans, shall appoint a Subcommittee on the Science, Mathematics, and Engineering (SME) Requirement that will recommend to the CUP subjects included in the categories that comprise the SME Requirement. The CUP shall report to the Faculty annually subjects that have been added to or removed from the requirement. This Subcommittee shall also be responsible for leading the efforts to stimulate further innovation in teaching the SME Requirement, as specified below.
- IV. The chair of the Committee on the Undergraduate Program (CUP), in consultation with the Chair of the Faculty and the appropriate academic deans, shall appoint a Subcommittee on the HASS Requirement that will recommend to the CUP subjects included in the three categories that comprise the Distribution Component of the HASS Requirement. The Subcommittee will also review proposed changes to Concentrations and recommend their approval to the CUP. The CUP shall report to the Faculty annually subjects that have been added to or removed from the requirement, in addition to changes in Concentrations. This Subcommittee shall also be responsible for leading the efforts to stimulate further innovation in teaching the HASS Requirement, as specified below.

Finally, it is the sense of the Faculty that significant effort should be devoted by members of the Faculty, working closely with members of the administration, to develop new elements of the GIRs, in both the SME and the HASS Requirement. In particular:

- V. The CUP shall investigate further the advisability of creating a seventh category within the Science, Mathematics, and Engineering Core, the Elements of Design. The goal of this category will be to expose our students early in their experience at MIT to the methodology of modern design in a variety of settings. The CUP shall investigate further the advisability of creating an eighth category within the SME Core, *i.e.* Science, Mathematics and Engineering Foundations. The goal of the SME Foundations category will be to highlight a

limited number of subjects in science, mathematics and engineering that all MIT students should consider taking.

The CUP shall make a recommendation to the Faculty, no later than the Fall Semester of the Academic Year 2011–2012, about whether the Elements of Design and the SME Foundations categories should be added as new features of the Science, Mathematics, and Engineering Core. As the new features of the SME core are developed, the CUP shall also make recommendations to the Faculty about (1) the status of the Laboratory Requirement, (2) the status of the REST Requirement, (3) the requirement that all undergraduate majors be confined to no more than 198 units, and (4) the expectation that all majors be designed so that students may declare a major in the first semester of the junior year and complete the degree in the normal four-year period.

- VI. The Institute Faculty endorse efforts—led by the academic deans and faculty in the humanities, arts, and social sciences, and in coordination with the Subcommittee on the HASS Requirement—aimed at creating a special program within the HASS Requirement, addressed particularly to first-year undergraduates, termed the "First Year Focus Program." The purpose of HASS First Year Focus subjects would be (1) to introduce students to key modes of thought and analysis characteristic of scholarship in the humanities, arts, and social sciences and (2) to provide opportunities and materials for a shared conversation among undergraduates, particularly first-year students.

The CUP shall report to the faculty, no later than the Fall Semester of the Academic Year 2011-2012, about progress toward establishing such a program, including a recommendation about whether all students should be required to take one First Year Focus subject in partial fulfillment of the HASS Requirement.

Appendix E2

Notes to Accompany Faculty Motion

November 19, 2008

I. Revised description of the Science, Mathematics, and Engineering Core

The rationale for this change is to describe the Science, Mathematics and Engineering (SME) Core in a way that highlights the categories of technical knowledge that all MIT undergraduates are expected to master. The new practice of describing the SME Core has been termed a “core and flavors” model. For each category of knowledge, there is a common “core” of material, so that classes within a category would be interchangeable, as far as providing pre-requisite knowledge for later study. However, subjects within categories could be taught within a particular context, or “flavor.” This would generalize, for instance, the current practice within the Biology Requirement, in which the “core” consists of fundamental principles of biochemistry, genetics, molecular biology, and cell biology, but “flavors” focus on applications in cell biology (7.012), human biology (7.013), and the biosphere (7.014).

This proposal would provide greater flexibility for students and instructors. Students would have more freedom to explore personal interests and be given the opportunity to play a more active (and engaged) role in their education. Faculty members would be given new opportunities to evolve content of existing subjects and to experiment with new ways of teaching. The proposal would also provide a clearer path for faculty members who wish to innovate in the teaching of the Science, Mathematics, and Engineering Core. The current practice of listing all subjects that satisfy the Science Core requirement in the Regulations is cumbersome. Moreover, there is currently no clear path by which faculty members may offer new subjects to meet the requirement, nor is there a clear forum for addressing disputes about the content that should be addressed in Core subjects, aside from the floor of the Institute faculty meeting itself.

Particular points:

1. 2.84.a.1 changes the listing of the six subjects in the core from *named subjects* to *categories of subjects*. Below, the structure for populating each of these categories is delineated. We intend for the current science core GIRs to populate the relevant categories. For instance, the Chemistry category would start with 5.111, 5.112, and 3.091 as subjects designated to fulfill the Chemistry Requirement. We anticipate that the number of subjects allowed within each category will always be limited to a very small number.
2. The final sentence in this section (“The available, approved choices. . . .”) is adapted from the current Regulations. Among other things, the intention of this sentence is to serve as a constraint on the subjects allowed to meet the particular requirements. Classes that rely on Core subjects as prerequisites must be able to count on students encountering the same core material, regardless of the “flavor” of Core subjects they take.

II. Revised description of the Humanities, Arts, and Social Sciences Requirement

The rationale for this change is to streamline the HASS Requirement, allowing it to be described more clearly to students and their advisors. The reduction and simplification of distribution categories would provide greater flexibility to students seeking to fulfill the requirement. This change would also allow teachers of HASS subjects to design their classes with fewer, less conflicting constraints. By separating out the idea of *distribution* from the need to focus on foundational materials in the early years at MIT, faculty members would be able to design HASS subjects with clearer learning objectives. Finally, by reducing the constraints associated with meeting the distribution requirement, faculty would be able to focus their attention on developing new subjects intended to engage first-year students particularly, implement changes within the Communication Requirement to make CI-H subjects more effective, and develop new interdisciplinary HASS subjects.

Particular points:

1. This section captures the basic structure of the HASS Requirement more completely than the current provisions in the Regulations of the Faculty. It also makes the description of the HASS Requirement more similar to that of the Science, Mathematics, and Engineering Requirement.
2. The description of the Distribution Component implies the elimination of HASS-D subjects as a special category of subjects. HASS subjects will need to be identified as belonging to each of these categories (humanities, arts, and social sciences) by the Subcommittee on the HASS Requirement. We assume that departments will take the initiative in specifying which of their subjects belong in each category, and that the Subcommittee will generally follow the lead of departments. As a guide to students wishing to begin study in a HASS field, departments will need to revisit the description of their subjects, to make it clear which may be taken without any prerequisites.
3. An issue that many have grappled with is whether individual subjects should be assigned to the three categories (humanities, arts, and social sciences), or whether all subjects from any given department or section should be assigned to the same category. While there are good arguments on both sides of the issue, we believe that assigning individual subjects to categories rather than whole departments to categories is preferable. In the great majority of cases, subjects from particular departments/sections will tend to cluster in the same category. However, some departments inherently straddle the boundaries between categories, and little would be gained educationally by forcing subjects into incongruous categories. Some worry that departments/sections will be encouraged to spread their subjects across all three categories, regardless of how the subjects approach the class material, in order to attract enrollments. This is a temptation that needs to be monitored. However, our experience with faculty committees leads us to believe that if this behavior were to emerge, it would draw the full attention of the Subcommittee on the HASS Requirement.
4. The Concentration Requirement, which encourages students to gain greater sophistication in understanding the intellectual challenges and analytical tools used by the disciplines of the humanities, arts, and social sciences, would remain unchanged from the present.

5. While it is not mentioned in this part of the motion, the Communication Requirement would remain as currently configured. However, by eliminating the separate category of HASS-D subjects, we would be disentangling the distribution and communication requirements, which sometimes have worked at cross-purposes in particular subjects. A major assessment of the Communication Requirement was completed in the 2007–08 Academic Year. An important activity over the next two years will be addressing the issues raised in that assessment that pertain to CI-H and CI-HW classes. We assume that the Subcommittee on the Communication Requirement will take the lead in ensuring that these issues are addressed, working with the academic deans.

III. Creation and composition of the Subcommittee on the Science, Mathematics, and Engineering Requirement

The purpose of this provision is to establish a committee of the faculty to be responsible for the maintenance of high standards within the Science, Mathematics, and Engineering Core, including the approval of new subjects to meet the detailed aspects of the requirement, the continuing assessment of the effectiveness of the Core. This provision also makes it clear that the CUP is responsible for regularly reporting to the full faculty on the effectiveness of the SME Requirement. We recognize that with the establishment of this and the HASS Requirement subcommittee, a larger number of faculty members will need to be recruited to participate directly in the oversight of the GIRs. As the requirement reaches equilibrium in a few years, the Faculty may wish to revisit the maintenance of separate subcommittees on different aspects of the GIRs, favoring a single subcommittee. For the next several years, however, we believe that it would be wise to involve more faculty members in the important task of refreshing the curriculum.

Particular points:

1. We assume that the current set of subjects that correspond to the six Science, Mathematics, and Engineering Core categories will be automatically included among the categories when the changes first go into effect.
2. The membership of this subcommittee should have specific representation from those departments (Biology, Chemistry, Materials Science and Engineering, Mathematics, and Physics) that currently teach subjects in the Science, Mathematics, and Engineering Core, but it is also important that representation come from all Schools. Clearly, there will need to be expertise in Design on this subcommittee.
3. While the Subcommittee will recommend subjects to be added to or subtracted from each category, final action would be taken by the CUP, which is broadly representative of the faculty, the student body, and the offices involved in academic administration.
4. We believe the annual reporting of subjects added to and deleted from the categories to the full Faculty is an important part of the process for highlighting the critical role of Core subjects in the overall educational system at MIT. It should also provide the chair of the CUP the opportunity to highlight annually innovations within the Core and the challenges that the committee faces.

5. The Subcommittee will be responsible for maintaining MIT's high educational standards in the GIRs, while also encouraging innovation in teaching and pedagogy.

IV. Creation and composition of the Subcommittee on the HASS Requirement

The purpose of this provision is to establish a committee of the faculty that would be responsible for the maintenance of high standards within the HASS Requirement. Many of the general comments made in reference to provision III apply here. In addition, the creation of a Subcommittee on the HASS Requirement establishes the oversight of the requirement firmly within the regular faculty governance system of the Institute. (Oversight of the HASS Requirement is currently lodged with the Dean of the School of Humanities, Arts, and Social Sciences, but implemented on an ongoing basis by the HASS Overview Committee [HOC].)

Particular points:

1. We assume that departments will be given deference in specifying which of their subjects correspond to the humanities, arts, and social sciences categories. One of the first orders of business for the new subcommittee will be the development of criteria governing the designation of subjects into categories. We understand there are "boundary" issues between the categories, but these issues should not impede the assignment of current HASS subjects into one of the categories. We also understand that a small number of HASS subjects are inherently interdisciplinary; the subcommittee should be given latitude to make sure that the failure of these subjects to fit neatly into a single category does not discourage students from taking them.
2. The membership of this subcommittee should have specific representation from departments that currently teach subjects that are part of the HASS Requirement, particularly the School of Humanities, Arts, and Social Sciences, the School of Architecture and Planning, and the Sloan School of Management, but it is also important that representation come from all Schools.
3. The final three points above pertaining to the Subcommittee on the Science, Mathematics, and Engineering Requirement, also apply here.

V. Creation of two new categories within the Science, Mathematics, and Engineering Requirement.

The rationale behind this point is three-pronged, corresponding to the three substantive elements covered here. First, the rationale behind the Elements of Design requirement is to expose students, early on, to the process by which technology is applied to human needs. While this general topic is explicitly addressed in the requirements of many departments, especially in the School of Engineering, it is not a subject universally required of all students. Such a topic cannot be taught in the abstract, and thus must be focused around design in particular contexts. A subject in the Elements of Design would be a powerful complement to the existing subjects in the Science, Mathematics, and Engineering Core. The Task Force on the Undergraduate Educational Commons and the Subcommittee on the Educational Commons both heard many

impassioned arguments in favor of adding a variety of topics to the GIRs – in engineering, computation, and hands-on learning, to name a few. We believe that the Elements of Design framework offers the opportunity to address the underlying issues that gave rise to these proposals.

Particular points:

1. The ECS sponsored a series of meetings this past summer in which the core set of ideas to be included in an Elements of Design subject were proposed and refined. An important part of the experimental period will be assessing whether there *is* a core of material that could be common across a wide variety of design subjects.
2. We are confident that some Elements of Design subjects could be successfully taught within a context that focuses on computation.
3. An open question is whether departments should be allowed to designate particular subjects within the Elements of Design as a part of their majors. This issue should be brought to the faculty for consideration when the CUP reports back to the Faculty in Academic Year 2011–2012.

Second, the rationale behind the SME Foundations requirement is to provide a flexible component of the technical requirements that channels all students into a limited set of subjects that form the fundamental building blocks of further technical work, but which cannot be required of all students because of other constraints – in general education and in departmental programs. The SME Foundations requirement differs from the current REST requirement by focusing more on the general education of students, and thereby envisioning a shorter list of subjects than the REST requirement.

Particular points:

1. As a practical matter, departments shall be allowed to specify named subjects within the SME Foundations.
2. While we suspect that several currently-taught subjects will be a part of the SME Foundation subjects, we also hope that faculty members will take this opportunity to innovate through experiments that develop existing subjects and create new subjects, including some that may be taken in six-unit modules.

Third, the entirety of the changes we are proposing would cause obvious conflicts and tensions with current graduation requirements, particularly the Laboratory Requirement and the REST Requirement. And, the required changes would obviously interact with departmental programs in obvious and not-so-obvious ways. It is premature to propose changes to these current graduation requirements without the evidence that will be provided by the experimental period, when ideas in support of the new requirements will be implemented. It is also premature to predict with great precision how the proposed changes will interact with existing departmental programs before we have been able to pilot the new subjects.

VI. Creating First Year Focus subjects and re-examining CI-H subjects

The purpose of this provision is to endorse the efforts currently under way to establish a First Year Focus (FYF) Program within the HASS Requirement. In order to inform the final decisions about whether to make such a program permanent and whether to require that all students take a subject within the program, it is necessary to experiment with the design of subjects that might fit within this program. This provision of the motion, therefore, particularly endorses efforts to clarify how First Year Focus subjects might best be taught in the MIT environment.

The idea behind designing HASS subjects that might be targeted to first-year students has been a topic of regular discussion among MIT faculty, students, administration, and alumni for many decades. The aspiration behind these subjects has been to expose students in their earliest undergraduate days to perennial questions of human concern, while at the same giving explicit attention to different modes of inquiry and knowledge-making, making explicit links to other classes and disciplinary approaches to the same topic, and emphasizing a set of transferrable skills (*e.g.*, working with a variety of original sources, marshalling and interpreting evidence, etc.) that will serve first-year students well in later scholarship.

Supported by d'Arbeloff funds, funds from the Dean of Humanities, Arts, and Social Sciences, and departmental resources, faculty members have developed new subjects that might be appropriate for inclusion in a First Year Focus Program, and other new subjects are currently in the pipeline. While the First Year Focus Program will undoubtedly also include some subjects that are currently being offered (perhaps in slightly modified form), we anticipate that this new program will be the focal point for faculty to explore fresh ideas about teaching in the humanities, arts, and social sciences.

Particular points:

1. An important goal of the proposed First Year Focus Program is to create large enough communities of shared intellectual interest that the impact of these subjects will be felt well beyond the classroom. Therefore, it is important that the number of FYF subjects be relatively small (in the range of 10-to-15), so that a critical mass can be reached in each area.
2. Important questions remain about the “template” that should be associated with the typical FYF subject. For instance, should they require a certain amount of writing? Can large numbers of students be reached in each subject without losing the feel of the small-scale teaching setting that is now common among many HASS subjects? Should the standard model involve lecture-and-sections or several parallel, self-contained sections? These questions, and others, can best be answered empirically. Therefore, a systematic program of assessment of piloted FYF subjects should be developed, to help inform final decisions about how best to organize the program.
3. In the spirit of the previous point, for the next two years, the FYF Program should not be overly prescriptive about issues of subject design, so long as each subject is designed to engage the imagination of students in a creative way.
4. One goal behind developing First Year Focus classes is to encourage the development of more *interdisciplinary* subjects. We believe that the final portfolio of First Year Focus subjects will contain classes that vary in terms of how focused they are on a single

discipline. Given the hurdles that accompany the design of interdisciplinary subjects, we encourage those who will be leading the efforts to establish new FYF subjects to make special efforts to see that these hurdles are overcome.

5. A major question that has arisen is whether the FYF Program should be a graduation requirement. On the one hand, some believe that making the FYF Program a requirement would be a strong signal to undergraduates that such an experience was highly valued by the faculty, and a strong signal to the faculty that their efforts to develop new, innovative subjects would be rewarded. On the other hand, others maintain that making such a subject a graduation requirement would kill the enthusiasm of students for these classes, and undermine the flexibility in subject choice that students value. However, a decision on this point does not need to be made immediately. Therefore, we recommend that a decision about requiring FYF subjects be made after students and faculty have experience with the program in its non-required form.