Attributes of MIT’s Unique Culture

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“Many countries and many institutions have tried to replicate the success of the world’s foremost institution for science and technology. However, MIT is more than just a collection of buildings on the Charles River populated by brilliant students, faculty and staff. MIT represents a particularly unique and often poorly understood culture. Anyone who seeks to replicate or simply understand MIT must first try to understand and appreciate a culture that celebrates quirkiness, choice, independence, entrepreneurship, focus, creativity, and intensity.”

- Larry Bacow, introduction to Mens et Mania
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Introduction

Despite its relatively compact size and short history, MIT has achieved a global reputation for leadership, impact, and excellence in science, engineering, management, and innovation. Universities from around the world turn to MIT for support with building and sustaining institutional excellence. Some have argued that much of this success can be derived from the culture of MIT, which is unique from other universities.

MIT has been described as unconventional, unique, and an outlier. Those who thrive in this environment feel a strong sense of pride, passion, community, and family. Those who know MIT understand that its uniqueness is a combination of strengths and values shaped by its evolution and its people. MIT is a community, a culture, and an ecosystem.

Nevertheless, to the best of our knowledge, MIT's unique culture has not yet been studied systematically. This report seeks to remedy this by identifying key attributes of MIT's culture in such a way that the culture might more easily be modeled, communicated, and potentially replicated. In this way, this study provides a foundation for further study of transferability.

For this study, we completed a comprehensive literature review of published and unpublished articles, books, and reports on the culture of MIT and of other universities, and studies linking culture and excellence. We also reviewed and analyzed over 1,000 pages of oral history transcript analysis using both manual and automated review, and identified key themes, words, and examples. Word frequency and word proximity were also studied. We conducted 22 in-depth interviews of faculty, administrative leaders, and MIT alumni, including university presidents, deans, faculty noted for their innovative activities, and current and former MIT staff.

Based on this work, some of our conclusions include:

- MIT has a strong culture that is considered critical to its success and excellence
- MIT's culture is recognized both within MIT and beyond the Institute’s borders
- MIT's culture is made up of attributes that interrelate, support, and balance each other
- Although different words and phrases are used to describe culture, and the emphasis placed on them may vary, the attributes themselves are relatively consistent
- MIT's culture is influenced by, but is still distinct from, broader U.S. university culture
- Many sub-cultures also exist at MIT

As an organizing principle, we have identified seven key attributes of MIT culture. These are:

- **Openness**
- **Excellence**
- **Innovation**

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2 See Appendix IV for these and other terms.
Usefulness
Freedom
Focus
Principled

While comprehensive, this list is not definitive. Those who know MIT well might reasonably come up with different words or a different list altogether, perhaps one that is longer or shorter. These terms are not exclusive to MIT – many universities value openness and freedom, for example, and also share some of the policies and values described in this report. However, these attributes have particular strength and meaning within the MIT context, and in aggregate, they help to comprise a culture that is unique.

For this study, our goal was to come up with a concise, yet thorough, list of attributes. The selection of the attributes was completed carefully and in several iterations. As part of developing the list, interviewees were asked for their ideas, documents were searched, and automated text analysis was used (see Appendix III). To the extent possible, the words selected are non-specialized.

In finalizing the list, the meanings of the words selected are mostly general in nature, and are not too specific to the MIT context. For example, the phrase “mind and hand” is widely used at MIT and has deep meaning inside the MIT community, but would likely require further explanation outside of it. Those outside MIT should have little trouble understanding ‘usefulness’, on the other hand.

To be as inclusive as possible, and to cross-check the completeness of the list, these seven attributes were mapped against all of the 100+ words and phrases used to describe MIT’s culture during the course of the study (Appendix IV). This matrix also illustrates overlaps and connections between the attributes.

The attributes support and counter-balance each other. Some, like openness and freedom, are closely related and complement one another, while others illustrate dependencies – for example, it is possible to have openness or freedom without excellence or being principled, but not at MIT. Because of the way the attributes interrelate and interact, understanding only a subset of them would provide an incomplete picture. A preliminary discussion of intersections and synergies is included in this report.

The attributes are not presented in any particular order. They are also not necessarily equal in terms of how they are institutionalized or experienced at MIT, either by individuals or the community. Freedom, for example, relates to common practices and an approach to policy and work that assumes a great deal of trust, whereas focus has been institutionalized in the structure of MIT’s administration. Put another way, these seven attributes fill a sphere, but they are not necessarily of the same weight, color, or dimension. The goal in this report is to describe all seven attributes without bias or emphasis. From an experiential perspective at MIT, their relative importance depends on the context, the individual, and the work.

In addition to identifying and describing seven key attributes, this report describes some initial findings on subcultures at MIT. Included are some preliminary suggestions of opportunities for transferability.

Lastly, MIT is not perfect. To the extent that strengths and values are described in this report, there are also shortcomings and challenges that are part of the culture. A few of these are described as well.
MIT’s culture is complex and evolving. In this report we have chosen to quote extensively from oral histories, interviews, and other sources to define and illustrate the attributes. As much as possible, this report attempts to allow MIT’s words and voices to provide the descriptions and explanations.  

A complete list of individuals is included in Appendix 1.
I. Openness (To Criticism, To Change, To New Ideas)

At MIT, we believe in openness, and we are not afraid to reexamine our own actions.4
- MIT President L. Rafael Reif

The first attribute is openness. “At MIT, good ideas come from anywhere,” noted an interviewee.5 Openness relates to people, to ideas, to change, and to criticism. Openness is practiced through transparency, accessibility, and free speech.

MIT celebrates many differences and is nonjudgmental in both word and deed. It prepares people to work collaboratively and expects them to bring many different talents to the table. MIT has students who are quirky, who question authority, who are in fraternities and sororities, and who play sports. There are incredibly smart math students, different religious and cultural groups, and so on – all provide cross-pollination.6 Campus laboratories include people from every age group. Anyone with a good idea can participate in the MIT culture. MIT is diverse in people, technologies, initiatives, expertise, and resources.7 MIT has open doors, open halls, and OpenCourseWare.

At the individual level, openness is a willingness to consider things that are new, different or haven’t been done before, and then try them. Additionally, from the perspective of the institution, openness is a willingness to let people try things. MIT Vice President Claude Canizares8, in his oral history, describes the openness to new ideas at MIT, contrasting this with his experience as a student at Harvard:

…In terms of institutions, Harvard is a very tradition-bound institution for good reason. It has a long and distinguished tradition. But I used to characterize the difference between us is that when you're at Harvard and you say, I'd like to do something new, there would be more of a tendency for people to say, well, we've done it this way for 336 years, at least when I was an undergraduate, now it’s been more years. Why? Let’s examine that one; I’m not sure we should do something new. At MIT you say let’s do something new, they say, oh that’s great, what is it, let’s try it. That means that we're always very willing to renew ourselves and to optimize -- maybe too willing sometimes. But we run experiments. We are experimenters. So running an experiment is absolutely in our blood, and that's a great thing about this institution.

Professor Martha Gray also identifies openness to ideas and trying things as an important aspect of MIT:

…This is a place where… if you want to get something done and you're passionate about it, you can get it done. That's not universally true, and of course different personality differences can make that easier or harder. But I would say that even from my days as a student… there is a real openness that I think does not happen in lots of institutions that says, if you want to drive it, and you want to make it happen, whether you're a student or faculty or a staff person, you can

This and all subsequent links as accessed in July, 2013.
5 Schindall interview. See Appendix I for a list of individuals interviewed, including their affiliations with MIT.
6 Schmill interview
7 Harris interview
8 Information on individuals cited in this report, including their affiliations to MIT, is contained in Appendix I. Oral history videos and transcripts are available online, http://mit150.mit.edu/infinite-history. In this report we have made a few minor grammatical edits to the transcripts, but generally they are quoted exactly as provided.
do that. And there are people at every level in general that are highly valued. It's not so much of a class system. And again, none of this is universal, and it's highly personal. But I think those things tend to be huge enablers.

Open Education

A widely cited example of openness at MIT is the Undergraduate Research Opportunities Program, or UROP. Started in 1969 and based on a belief in the power of learning by doing, the UROP program enables students to work on research projects. Through this program, students explore research in any academic department, interdisciplinary lab, or center at MIT.9 One remarkable aspect of this program is that the students are fully integrated into the research projects in which they participate. Additionally, emblematic of MIT’s openness, they are listened to and their good ideas are taken seriously.10

Another widely cited, and more publically known, example of openness is OpenCourseWare (OCW). Now in its eleventh year, MIT OCW receives more than 2 million visitors a month, and has received more than 174 million visitors, more than 80 million of them unique, since its inception. Included within OpenCourseWare are over 2,000 courses taught by more than 600 tenure-track faculty.11 Educational uses include enhancing personal knowledge, finding reference materials for students, learning new teaching methods, and incorporating OCW materials into courses and curricula at other institutions.12 A recent visitor from India described his experience with OpenCourseWare as follows:

As a Professor Mathematics, I am very much fascinated by OCW courses. I am regular visitor to the web site. I advocate about this site to students from Universities to the school level in remote villages. As you have mentioned, this initiative is big boost to get high quality of education from lion's mouth. Which otherwise we cannot even think of listening to such a great stalwarts. Even Professors like me these courses inspire me very much and changes my method of teaching. For example I get up at 4 AM and listen to the Course of Walter Lewin on Classical Mechanics on YouTube. I greatly appreciate the wonderful service rendering by MIT through borderless education to the rich and poor in equal footing. Many Governments are trying to give best education to their children but with struggle. However, OCW is giving world class education for free. Please convey my best wishes for further success of this venture. 13

Eighty-nine percent of educators who use the site to improve their personal knowledge say OCW has improved their motivation to teach, 96% of students complementing their course materials say OCW improved their understanding of concepts covered, and 92% of self-learners using the site to plan a return to school say the site has increased their confidence of success.14

Electrical Engineering and Computer Science (EECS) faculty member Charles Leiserson frequently speaks of OpenCourseWare when recruiting graduate students. “You want to know about MIT? Think of OCW. This is the place that did that. We have our priorities right.”15

9 http://web.mit.edu/urop/basicinfo/index.html
10 Rowe, Schmill interviews
15 Leiserson interview
Other examples of major MIT initiatives that exemplify openness in education include edX, an online platform offering MOOCs from MIT, Harvard, Berkeley, and other universities; MITx, an interactive extension of MIT OCW; and iLabs, a project that allows thousands of students to access real lab facilities and conduct experiments remotely through the use of a web browser.16

**Open Research**

Openness in education and research is so central to MIT that a section is devoted to it in MIT’s official *Policies and Procedures*:

*The encouragement of research and inquiry into intellectual areas of great promise is one of the most basic obligations MIT has to its faculty, to its students, and to society at large. The profound merits of a policy of open research and free interchange of information among scholars is essential to MIT’s institutional responsibility and to the interests of the nation as a whole. Openness requires that as a general policy MIT not undertake, on the campus, classified research or research whose results may not be published without prior permission — for example, without permission of governmental or industrial research sponsors. Openness also requires that, once they are at MIT, foreign faculty, students, and scholars not be singled out for restriction in their access to MIT’s educational and research activities.*17

The divestment in 1973 of Draper Laboratory, which engages in classified research, is an example of a decision that was undertaken to support openness in research and education on campus. Another example is the Open Articles Collection in DSpace@MIT, which provides global access to MIT faculty scholarly research articles.18

**Open Communication**

Openness in communication is very important at MIT. As a student blogged on the MIT Admissions website: “What tipped the balance towards MIT for me was the culture. I didn’t realize this until I started visiting colleges, but culture is really a tangible thing that you can compare. So much of MIT is about openness, whether it’s the open source movement or OCW or edX or hacking…”19

MIT Admissions maintains a blog where students can write openly about their MIT experiences:

*Why should your knowledge of the school be limited to what admissions wanted to tell you? Why should you only know a little? The solution was a series of blogs. Blogs written by students. Blogs written by students who actually attend the school. Blogs that let students that attend the school write about whatever they want, whatever they think helps potential applicants learn a little bit more about life at MIT…. I’m free to post whatever I want. When I push "Publish" it goes onto the Internet.*20

Openness is not chaos; rather, it is subject to guidelines, and these are carefully constructed at MIT. In the same post, the student describes the guidelines that were developed and implemented for blogs on the admissions site:

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16 See, for example, [http://oeit.mit.edu/gallery/themes/open-education](http://oeit.mit.edu/gallery/themes/open-education). One aspect of MIT’s education is a belief that individuals learn in different ways – this is implicit in MIT’s curricular views – Rowe interview.
17 [http://web.mit.edu/policies/14/14.2.html](http://web.mit.edu/policies/14/14.2.html)
There's a lot of trust between admissions and the bloggers, but it's for the better. It makes things honest. It makes things real. What I say is what I think, not what admissions necessarily thinks. This doesn't give me permission to post about ANYTHING, however, there are some guidelines.

1) Make sure it's relevant to applicants

2) Make sure it's not out of context and that prefrosh [that is, candidates for admission] understand the background

In the past I've posted some entries that didn't follow those two guidelines. That was my mistake and those entries were removed. Apart from those 2 entries, every entry I've written has been real.

Now, since I'm allowed to write whatever I want, there's no reason that blog readers shouldn't be able to write whatever they want. It's an open forum, a place for prefrosh to ask questions, chat with bloggers, chat with each other, and learn more about MIT. They are not designed to personally attack bloggers, prefrosh, or other readers. While not designed for it, those things happen.

People will have opinions, people will express them, and because of MIT's openness these comments will be published.21

Another example of open communication is MIT faculty meetings, which are, for the most part, open for anyone to attend. They are covered by The Tech, MIT's student newspaper, and the Faculty Newsletter, both published online. The Tech and the Faculty Newsletter both cover a range of important Institute topics, and feature free and collective voices that may or may not come from senior figures at MIT. These publications are able to state a range of viewpoints without fear of retribution.22

These themes are present in a 2007 article in the Faculty Newsletter:

Since its inception nearly 20 years ago, the Faculty Newsletter has attempted to bridge the communication gap at the Institute by providing a channel of communication for the faculty (and others) on issues of importance. The interest and enthusiasm in major issues that faculty members have exhibited by their participation in the Newsletter (writing articles, sending letters, etc.) again is evidence of the value of a truly open channel of communication amongst peers and the entire MIT community. The importance of this open channel is perhaps most significant when a consensus cannot be reached on matters of concern, or a minority of faculty do not accept or go along with the consensus of the majority. It is at these times that the Newsletter serves as a forum for diverging views. Over the years it has provided an avenue for the faculty (sometimes disgruntled ones) to challenge the administration on a variety of issues. The MIT administration, unlike corporate administration, recognizes these privileges of MIT faculty (emphasis added). It distinguishes between faculty of a university and an employee of a corporation. This has so far allowed for a healthy, vibrant, and productive give and take, which should and will continue. Although some segments of MIT have, on occasion, been dismayed or angered by what has appeared in the pages of the FNL, most have eventually come to recognize and respect its independence.

The results of the opening of the Newsletter Website to the entire world community nearly two years ago are again evidence of the importance of clear channels of communication. Significant additional interest in MIT has been generated, and colleagues at other institutes throughout the world have taken notice.23

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21 Ibid.
22 Allen interview
23 Fred Moavenzadeh, John Belcher, Jonathan King, Stephen Lippard, “MIT Communications:
A third example came along with the early Internet. In the 1980s and 1990s, MIT was not immune from harassment on the nascent Internet. The Institute had to straddle the balance between freedom of speech and protecting members of the community from abuse. To deal with this problem, MIT started a program called Stop It. If a person receives an electronic communication and takes offense at its contents, the message can be forwarded to Stop It, and the message’s sender is politely informed in a non-accusatory manner that they have written an email that has been considered to be offensive. The approach is not litigious, nor confrontational, but rather a civil, organized discussion. As long as one does so in a professional manner, it is possible to speak up.

Open Community
In September 2012, a graduate student from Harvard wrote an open letter to the MIT community in The Tech, in which she mentioned how important MIT’s openness is to her:

You made yourself an open playground. Literally, your buildings are always open. You can easily find an open classroom for students and friends to gather to brainstorm startup ideas. This is quite different from Harvard where even if you are a student, you are often met with locked doors. You allowed me to conduct my senior thesis research through UROPs (the Undergraduate Research Opportunities Program) at what is now the Koch Institute for Integrative Cancer Research, and take courses at MIT without any hassle. By being a cross-registered student of even just one course, you gave me access to everything at MIT. I could ride on the SafeRide, print for free, and access all your buildings and libraries.

Civil and Environmental Engineering faculty member and Associate Dean of Engineering Cynthia Barnhart described her experience as a student and the impressions that MIT’s open community and open halls made on her:

I was amazed in meeting the students who were from all around the world, how interesting they were and how smart they were. At times I thought oh, this is kind of a weird place. When you walk through the basement halls -- of course, that's where my office was -- at all hours of the day and night there are people walking around. So sometimes it does feel a little like you've entered a different world. That was one of my first observations that sometimes it could be a bit strange around here.

Openness has contributed to an ongoing dialog on gender, race and diversity. MIT President Emeritus Susan Hockfield wrote about this in a preface to a major report during her tenure:

The history of the Institute and of the United States show that brilliant minds can emerge from anywhere; we must ensure that for those women and men who have the ability and ambition to succeed at MIT, MIT is a place where they can thrive… Creating a culture of inclusion is not an optional exercise; it is the indispensable precondition that enables us to capitalize on our diverse skills, perspectives and experiences, so that we can better advance the fundamental research and education mission of MIT. To maintain the Institute’s unrelenting standards of excellence, all members of our community must contribute at the apex of their abilities. A productively diverse community at MIT will make us

24 http://ist.mit.edu/stopit
25 Rowe interview
better at what we do: broader and deeper as thinkers; more effective as collaborators; more creative as teachers; and more understanding as colleagues and friends.  

At MIT, who you are or where you come from is far less important than what you can do and how motivated you are to do it. Words and phrases used in interviews to describe this phenomenon include “no snob factor”, “unpretentious”, “an absence of class interest”, and “meritocracy.” MIT is “a culture where we celebrate people who pull themselves up by their bootstraps.”  

There is a need-blind admissions process where legacy is not considered – no one gets a better grade in a class because their parent is a donor. 40% of the faculty is foreign-born, as are 40% of graduate students.

Cynthia Barnhart speaks on openness as part of the student learning experience:

I found that the students here provided me this really incredible community. So we would every day sit and work together on problem sets, something that the faculty encouraged because they know that learning comes by interacting with each other. I can remember sitting and arguing about how to prove something, stealing the chalk out of my friend’s hand and saying no, no, no, this is how you do it. And they would come right back and we’d have these really exhilarating debates.

It was really fun and I just learned so much -- because what you learned usually was we often were both right. That you could prove what we were trying to do either way, but we were both doing it in different ways. And so you learned how to think a little bit differently. Then sometimes you just learned that you were just wrong and your fellow students had something to teach.

One theme in stories of openness relates to how people dress at MIT. Deborah Ancona tells a compelling anecdote about links between dress and tenure, contrasting MIT to another U.S. institution.

So when I was at this other institution, it's a young junior faculty-- in the book it said that, in order to succeed, you had to do great research, teach well and do service. Those are the three major things.

And so I was moving along in those three domains and thought, oh, things are going really well. And then, one day, the head of my department came in to chat. Always a bad sign when they come to chat.

And so there we were chatting. And I'm trying to figure out what's the messaging here because I knew there was a message. And finally, it came out that I was wearing non-tenure track shoes. And it actually took me some-- like, shoes? What does shoes have to do with anything?

They were purple. They weren't high heels. They weren’t open-toe. They weren’t open-heel-- I’m pretty conservative-- but they were purple. And in that institution, purple shoes were non-tenure track shoes.

And so coming to MIT was great because no one cares what you wear.

Lotte Bailyn, also a Professor of Management, tells a similar story:

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27 Susan Hockfield, preface to the 2012 “Report on the Initiative for Faculty Race and Diversity”

28 Bacow interview

29 Keyser, Rowe interviews

30 Barnhart oral history

31 Ancona oral history
So, MIT was much more informal, much more scruffy. It just looked different. People dressed different. I mean I was surprised. Here I was 13 years after my PhD, and even though it was a sort of spotty job experience, I still considered myself a professional and all the graduate students started calling me by my first name. I was shocked. It took me awhile to realize that’s what people do -- it would never have happened at Harvard. The way people dressed. I mean Harvard was coats and ties. There weren’t necessarily coats and ties in the way the place looked. So it’s completely different. But it had a sense of more openness and more freedom. We’ve had this Harvard-MIT going on forever, because my husband was at Harvard, and there’s something open, I liked it. But it took me awhile to get used to the informality and to this more openness.32

Professor Tim Berners-Lee describes what kind of person fits in at MIT:

Well, the person probably doesn’t expect to be judged by their clothes. So certainly the people I work with they wear all kinds of things. There’s no typical. Some of them wear shoes, some of them don’t. Some of them wear lots of clothes. Some of them dress rather carefully and some of them have no idea what they put on in the morning. And they have to look down to see if you ask them. What sort of person? The sort of person who there’s an intellectual space. A person who’s curious I suppose and people who are creative.33

Caltech President David Baltimore, reflecting on his time at MIT, describes it as a leveling atmosphere:

I think the real contribution of MIT is that it doesn’t take itself too seriously. It takes ideas seriously, but as people, the people are relatively informal. They are not self-aggrandizing the way academics can be and often are in the humanities, I might say. The combination of its style, of its sort of rugged nature -- the buildings are -- some of them are impossible. Until the Gehry Building [the Ray and Maria Stata Center] was built, it looked like a corporate factory.

It is a leveling atmosphere, which is really very good. You have to prove yourself, and you have to prove yourself every day, and that’s how it should be.34

32 Bailyn oral history
33 Berners-Lee oral history
34 Baltimore oral history
II. Excellence (Demanding, Intense, Community)

“I love the culture here. This notion of a whole community of very smart people. Highly motivated, intense in their passion for discovery and learning.”

Steve Lerman, former MIT Vice Chancellor and Dean for Graduate Education

The second attribute of MIT culture is excellence. MIT is an exceedingly hardworking place. A commitment to excellence in the execution of all duties and responsibilities is expected from everyone in the community and is measured based on what a person does. As one interviewee commented about MIT, “You could be green and two feet tall, but if you could get up the river faster, you had a place in the culture.” MIT is rigorous and demanding. “Striving for excellence is built into the brick and mortar of the place…doing things the best possible way,” said another interviewee. Excellence and intensity are present in all activities and disciplines: “Academic work is extremely rigorous; there are no easy paths.”

Excellence at MIT is not an end state, but an ongoing and active pursuit that strives for continual improvement. Many top universities have great faculty; MIT has great faculty who continue to work extremely hard throughout their careers, never resting. The demand for excellence in all things and at all stages of a career creates an intense atmosphere, as well as a strong sense of community for those who are able to succeed in this environment.

President Emeritus of Tufts University and former MIT Chancellor, Larry Bacow, describes this atmosphere:

MIT is a place that does just about everything very, very well. I mean, incredibly high standards at the Institute, not just for the students and faculty -- the staff at MIT are first rate, in every place that you look. And so you get used to working with first rate people. And the Institute tends to be very advanced in its thinking about a whole host of issues.

Excellence and Accomplishments

MIT is proud of its accomplishments, and it never rests on its laurels. Seventy-eight present and former members of the MIT community have won the Nobel Prize, including nine members of the current faculty. Thirty-nine current and former members of the MIT faculty have received the National Medal of Science. There are 77 members of the National Academy of Sciences, 65 members of the National Academy of Engineering, 70 Guggenheim Fellows, six Fulbright Scholars, and 20 MacArthur Fellows among current MIT faculty and staff. In view of its extraordinary accomplishments, US News and World Report ranked MIT the number one university in the world in 2012.

35 Lerman oral history
36 Rowe interview
37 Wilson interview
38 Schmill interview
39 Bacow oral history
40 http://web.mit.edu/facts/faculty.html
Excellence at MIT is about doing: it is about working very hard and solving problems. Dean of Undergraduate Research, Kim Vandiver, in his oral history, describes how this factors into the undergraduate experience:

“Our alums tell us when they come back [that at MIT] they learn how to work really hard, they learn how to solve hard problems. They’re not coming back telling you that it was great learning how to do all those differential equations. So it’s more of the work ethic and taking on problems that are really difficult and finding out that you actually can do them that I think is the more important essence of the MIT education.

So it is a hard place, but what I tell my advisees and have for a lot of years is, it’s not so important that you get A’s in every subject you’re taking because not everybody can get A’s. Half of you have got to be in the bottom half of the class. How can you graduate from MIT and maintain your self-esteem if the way you measure yourself is by grades? It’s not going to happen.

And so what’s important is to find something you’re good at and focus on that and become really good at that. You have to pass your other subjects, but become and do something that you feel really good about. That’s what, I, as an adviser really try to help my students do, is find something that they’re really good at and then go for it.

MIT students like to say: “Sleep, friends, p-sets – choose two.” The understanding is either sleep or friends will be compromised, because if a person doesn’t do the work, he won’t stay at MIT. Candace Royer tells a story from her first year at MIT as tennis coach about the choices students made, and how this differed from her experience at other universities:

The funny story is my first trip across the river to play Simmons College. I remember getting into the van, closing the doors, having everybody be absolutely silent. Now I can tell you, at Penn State University that wasn’t typical. I’d get into the van and the first thing someone would say to me is, Coach, tunes. Which meant I should turn on the radio. So that was the first difference that I noted.

The second was I was driving across to the FENS and I was hearing this sound. Zip, zip, zip. And I heard it repeatedly. Finally, I pulled the van aside off the road and I turned back only to see three or four of the students unzipping their little calculator cases so that they could do a problem set on the way between here and the Fens. I was stunned. But I realized that this is MIT. And that particular quality, I think, pervaded all of our trips. Every time we were in the van going somewhere, the MIT student was busy trying to get something done. It was great.

Arthur C. Smith, Dean for Undergraduate Education and Student Affairs in the 1990s, gave an address to freshmen that captured how being a part of MIT’s elite community can be a challenging and intense experience for students:

The students who are sitting around you right now, and the upperclassmen who you will meet later are a very select group. Most of you were somewhere, academically, at the top of your high school class. It is pretty clear that to live and work in an environment in which it is very likely that the person next to you is at least as smart as you and maybe smarter is a challenge, an exhilarating experience, and somewhat different. You need to adjust to that, you need to learn how to make use of that strength without being depressed. If you have established your value system based on being

42 P-set is a problem set, or homework assignment for a course.
43 Fenway: an area not very far from MIT
44 Royer oral history
better than other people, it is sometimes a little disturbing to find in fact, everybody around is at least as good as you are, and maybe better.

On the other hand, to be able to talk to people who can understand you, whose minds can move as fast as yours, and to live in that kind of environment, can be immensely rewarding. So look for the good parts of that, and make use of them.\(^\text{45}\)

The commitment to excellence at MIT extends to all duties and responsibilities including research, teaching, entrepreneurship, and innovation. In other words, excellence means “nothing is ready until it has been scrubbed cleanly, passed all tests, [and] is impeccable.”\(^\text{46}\)

One contributing factor to MIT’s excellence is its location. It is two miles from Harvard, and located in one of the densest concentrations of academic talent in the world. “If you are going to have competition, you want it next door.”\(^\text{47}\)

**Excellence and Community**

Although MIT is difficult and competitive, it has an incredibly strong sense of community. People – the many individuals who make up the MIT community – are very important at MIT. Graduates describe their experience there as “being surrounded by a kinship” and “part of a tribe.”\(^\text{48}\) Karen Arenson, in her oral history, describes how important the community was to her experience as a student:

> I came to campus and suddenly found myself in a community, not only of very smart people, but people who talked my language, who thought analytically and quantitatively. I just felt like I could communicate, like I was a piece of them, even if a lot of them were going into science and engineering and I was going into economics, I never felt like I was outside the mainstream. This was my community. It was also a place-- some of my best friends, many of my best friends are still classmates from MIT.

Issac Colbert, when asked of his impressions of MIT before coming in 1977, contrasts his preconception of the MIT community as ‘nerds and geeks’ to his actual experience:

> Nerds and geeks. Those were the first two things, nerds and geeks. Intense. Absolutely intense, and all focused around engineering. Those were the things that I had heard. Poorly socialized individuals. I heard all those things about MIT. And brilliant, brilliant misfits all over the place. Of course, when I came here I didn't find much of the sort. Of course, there was some. The place was so poorly understood from outside. What I found was that I had fallen into, stumbled into a place that was just right for me. It was just very clear that if you have ideas, energy, willing to work hard, willing to engage other people, try to build bridges, it's a wonderful place. Very affirming. Very entrepreneurial. Celebrating ideas. I just found wow, this is great.\(^\text{49}\)

The community supports and enables excellence, as highlighted by Associate Provost Philip Khoury:

> You know, my colleagues here are fabulous. A number of them are still here, who helped me get tenure. Because you don’t get tenure on your own at an institution this tough and this great. People are there, finding you support, getting

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\(^\text{46}\) Harris interview

\(^\text{47}\) Bacow interview

\(^\text{48}\) Holly interview

\(^\text{49}\) Colbert oral history
you research grants, helping you, teaching you how to do it. So I owed them a tremendous amount. They gave me the latitude.\textsuperscript{50}

Former Dean of Science Robert Silbey also describes the community as a distinctive aspect of MIT culture:

\begin{quote}
I would point to my colleagues. I came in July, '66. I had to start teaching almost immediately. I know this was all organized. My colleagues immediately came to me and said if you're going to teach this subject, I have lecture notes. I've taught it a couple of times. Let me bring down my lecture notes. You can look at what I've done. They were so supportive of everything that I wanted to do.\textsuperscript{51}
\end{quote}

Consistent with its demand for excellence, MIT faculty are deliberate and thoughtful about the education their students receive. While there has been some change and development over the years, all MIT students, regardless of their major, take a set of challenging freshman core courses. Larry Bacow describes this experience as follows:

\begin{quote}
...it's a relatively homogeneous experience for undergraduates. I think that's its strength. When I say that, I don't mean to say that there's a lack of diversity in the curriculum, or there's a lack of diversity in the student body. But everybody at MIT has to pass through the same needle. The core curriculum. It is a way in which, for better or for worse, everybody gets measured. And that can be a humbling experience. I've often said that you hang around MIT long enough and eventually everybody feels stupid.

But it also is an experience that forces people to grow, and to understand that they're capable of doing more than they ever thought that they were capable of doing. I think the most valuable thing I got out of MIT as a student was the realization that there was no problem that was so difficult that if I didn't plug away at it long enough, eventually I'd make some progress.\textsuperscript{52}
\end{quote}

MIT faculty also experience a strong sense of community built on excellence. Faculty member Sangeeta Bhatia, in her oral history, describes it as follows:

\begin{quote}
I think that we all have perceptions of what it's like to be in a place of such excellence. But the magnitude of the energy and the passion and the round the clock work culture, you can't-- there's just no way to perceive that from the outside. You really have to live with this sort of density of great ideas and great minds.
\end{quote}

The MIT community also places a high value on mentoring. For example, David Pritchard, Professor of Physics at MIT, mentored five people who went on to be Nobel Laureates as grad students or associates.\textsuperscript{53}

While not everyone fits in this community, those who do lose interest in being at any other institution. Bhatia speaks of how MIT drew her back as a young faculty member:

\begin{quote}
I would say now, as a faculty member, I'm addicted to the fire hose. So you skipped this part of my bio that I went out to California to be a junior faculty member and then came back. And I think it's because there's really no other place like it. You just can't step away from the kinds of ideas, and excellence, and energy, and passion that exist here.\textsuperscript{54}
\end{quote}

\textsuperscript{50} Khoury oral history
\textsuperscript{51} Sibley oral history
\textsuperscript{52} Bacow oral history
\textsuperscript{53} Bill Phillips, Steve Chu, Wolfgang Ketterle, Eric Cornell, and Carl Wieman
\textsuperscript{54} Bhatia oral history
Faculty excellence is a source of motivation for students, as well as between one another. For example Hal Abelson describes how he was inspired by those around him:

My research was actually in mathematics under Dennis Sullivan, who is a very, very famous topologist, who was in the math department at MIT in those days. And again, he was a little bit different. Dennis was one of these mathematicians who's just magic. You look at this thing and you say how could this guy possibly have ever thought about this stuff? And he was just an enormous influence about just sort of this intellectual excellence where the stuff springs from nowhere. And you're just inspired that way.  

For Tim Berners-Lee, the people at MIT have kept him at the Institute for so long:

Well, the people. The attitude to a certain extent. The general geeky excitement. The place where people understand that geek actually is a term of high praise, not a derogatory term to start with. There's a certain type of person who feels, sort of walks in and feels very at home when they arrive at MIT. They understand discussions. Anything which can you know, wander off into something philosophical or something technical or something mathematical or something curious or generally intellectual I think makes, you know, that whole spirit makes it a great place to hang around. It also indirectly makes it a good place to be because people appreciate coming here. I suppose self-fulfilling thing that once it has a reputation of being a good place to come to speak than you get good people to come and speak and then you can invite people to come and present their work and they'll be proud to do it.  

Isaac Colbert also emphasizes “people” when asked what makes MIT unique:

I think it has much to do with the people who have been through, remarkable people who have been through and who have given real substance to this place, has much to do with the style of MIT which has encouraged innovation -- a level of entrepreneurship that’s unlike any other place I’ve ever seen. A celebration and recognition of effectiveness and competence that’s not matched many places, in many other places. And a spirit of collaboration that just makes this place kind of unique. Of course, there's some sheer genius here too.

Me, I'm not in that camp, but I met some of the most incredibly brilliant people I've ever met in my life here….And some of our Nobel laureates [are] just brilliant people who managed to draw others around them and into enterprises that build upon their collective strengths.

Yeah, it's hard to say what makes MIT “MIT”, but it fundamentally has to be the people, not the buildings, it's not the research infrastructure, it's who's here.  

It is who is at MIT as well as what they do. Excellence can be understood as something that has been achieved and a continuous pursuit. Faculty member Suzanne Berger, in her oral history, likens this to riding a bicycle:

When you're riding a bicycle, you're either going forward and advancing, or else you fall over. And you've got to get everything -- You have to be either forward moving or collapsing.

And I think that MIT basically operates on this principle. And the best leaders of MIT are those who have understood this. That you're either in forward motion or else you're collapsing. There is no standing still here.

55 Abelson oral history  
56 Berners-Lee oral history.  
57 Colbert oral history
And I've often felt that there's a certain element of injustice here. Because MIT is always willing to invest even in hard times. Even now with the financial crisis. Even in the budget crunch. MIT is willing to put resources into something that looks like moving forward, and like it can advance activities, innovation, research. It's willing to invest in things that are moving forward. It's not willing to extend the helping hand to those activities that seem to be falling apart. So depending on whether you're the bicycle rider and moving forward, or whether you're some activity that at the moment has collapsed [or is] not working…your claim on resources here is very low. If you're moving ahead, your claim is very, very good.

If a person thrives in this culture of excellence, if it motivates her to succeed, she becomes a part of the community. President of MIT, L. Rafael Reif, in his 2013 charge to MIT graduates, called it a family:

Let me start by welcoming you, again, to the MIT family — even though you joined our family the moment you registered as an MIT student for the very first time.

And this is no ordinary family. First of all, the MIT family is BIG. Its core members include MIT’s 127,000 alumni, worldwide (...including the ones over there in their colorful red jackets.) Our MIT family also includes the remarkable members, past and present, of the MIT faculty; and our students, postdocs and staff.

Now, as you all know, this is not a family that you are born into – you have to earn being a member of our family. And our big family opens its arms to all those who are committed and dedicated to MIT’s mission, principles and values.

This family you chose to join years ago has been BUSY: Over the years, members of the MIT family have been awarded the Nobel prize... 78 times. That is over 9% of all Nobel prizes ever awarded. There are only three countries with more Nobel prizes than the MIT family: the US, the UK and Germany.

Also, at last count, living MIT alumni have founded about 26,000 active companies. (That's one company for every 5 living graduates!) Those companies provide jobs for 3.3 million people. And they produce 2 trillion dollars in global revenues. (And that was before Dropbox.)

I don't have to tell you that our big MIT family likes to do big things. This family is ambitious. Incredibly, beautifully, disruptively, ambitious. There is simply no place like MIT.”

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III. Innovation (Playful, Creative, Entrepreneurial, Irreverent)

“I really value this entrepreneurial spirit of MIT that allows you to follow a good idea and encourages faculty and students to be able to follow their passions and see how far they can run with it.”

– Kim Vandiver, Dean for Undergraduate Research

The third attribute is innovation. MIT’s innovation spirit is pervasive and complex. Some of its strengths include a belief in a range of solutions as opposed to simply looking for an optimum point, finding one’s own path in an interesting and elegant way, and build-your-own/tinkerers/makers. It is very much a part of the hacking culture in which people can do things that are simultaneously crazy and smart. Innovation is expressed through student culture – steer roasts at Senior House, for example – as well as through faculty inventions in nanotechnology. Stories are told and retold. It is better to do something crazy than nothing at all – to work hard and play hard.

MIT values curiosity – it takes a broad view and encourages new perspectives. MIT is a place that values coming up with solutions and finding ways to do things that have not been done before. Curiosity crosses traditional academic boundaries and interdisciplinary work is encouraged. It pushes a person to try something that has not been tried. Curiosity is reinforced by the excitement one feels walking through the halls where people could be miming, break dancing, juggling. At MIT people design for the future. A systems approach with an emphasis on continuous improvement is valued.

Martha Gray maps a complex landscape when asked what makes MIT so innovative:

When I’m in India, for example, I hear many comments about people’s perception of MIT, as well as other places in the nation. If I try to synthesize what it is I think people say, it’s recognized clearly as being a place of innovation. They look at this as the pinnacle of where people who are innovative come. And they’ll ask, what is it that you do? What’s in the sauce at MIT that makes it happen? I don’t think it’s only MIT. I think it’s the ecosystem, but certainly this is a very creative place and it’s perceived that way. And it’s also perceived for its strength technically. That this is where radar was invented. And those things remains the kinds of things that you hear people talk a lot about. It is very highly valued outside. It’s always nice to hear that of course being part of MIT….

So trying to think about what it is here at MIT that makes it such an amazing innovative cauldron. I don’t think it’s the only place in the country or the world that has an awful lot of innovation happening. And I think it would be at MIT’s peril to think we’re on top and we’ll stay there. But this is a place where, pretty much if you want to get something done and you’re passionate about it, you can get it done. That’s not universally true, and of course…personality differences can make that easier or harder. But I would say that even from my days as a students, you can do what somebody tells you to do here, but there is a real openness that I think does not happen in lots of institutions that says, if you want to drive it, and you want to make it happen, whether you’re a student or faculty or a staff person, you can do that. And there’s people at every level in general that are highly valued. It’s not so much of a

59 Vandiver, oral history
60 Rowe interview
61 See the “MIT Gallery of Hacks”, http://hacks.mit.edu/
62 Jones interview
class system. And again, none of this is universal, and it's highly personal. But I think those things tend to be huge enablers.

And if you do something, you'll be recognized for it. Again, doesn't always happen, but I think it's important for MIT to actually do that. Because that generates people who really try to make things happen. And it's ensconced in an incredible ecosystem in Boston. And if you picked up the entire Institution and moved it into the middle of the desert, even with air conditioning, without any of that I think it would dissipate. Because that adds enormously to the vibrancy of the place. But this is a question so many people want an answer for, of what is it that you do institutionally that makes it the way it is? And partly it's the people and the people who generate that culture. But it's the leadership that has to continue to make sure that they pay attention to that culture and that they attract those kinds of people. Which I think all department heads try to do.\footnote{Gray, oral history}

\section*{Campus and Community}

The physical campus is frequently described as representing and supporting innovation. There is “excitement in the halls.”\footnote{Jones interview} The infinite corridor at MIT is an iconic place that is seen as representing the unique and innovative character at MIT. Hal Abelson describes his experience:

\begin{quote}
And what do I remember of MIT? I remember going up to the door on 77 Mass Ave. And gosh, they were automatic doors. And coming from Princeton, which is an ivy covered-- it's the last thing in the world you would ever imagine like that. And then there were these long, long halls. And I always had these visions of getting on roller skates and going down the halls these automatic doors. It was just a wild place. It was all one building. I didn't know quite what to make of it.\footnote{Abelson, oral history}
\end{quote}

Another iconic example of innovation is Building 20. Originally built in 1943 as a temporary building and torn down in 1998, it was nicknamed “the magical incubator.”\footnote{http://libraries.mit.edu/archives/mithistory/building20/index.html} It is where radar was invented, among many other innovations, and the ethos of the place was “hey, let's knock down a wall and do something.”\footnote{Edelman interview}

When asked to describe his first impressions of MIT, Robert Sibley leads off with his memories of the physical campus:

\begin{quote}
Well, I think my first impressions of MIT were everybody's first impressions of MIT at that time. The buildings are old. The paint in the corridors is something they must have gotten from the Navy. Why aren't they making this a nicer place to be? The physical plant was deteriorating. It was already old, even 40 years ago and then the buildings all had numbers. They didn't have names. Well they did have names, but nobody used those names. And the department had numbers. Everything had numbers. It just seemed a little odd to me when I arrived. Maybe a lot odd. That this is the way it was. It just seemed different. Obviously after 44 years, I've figured it all out, but at the time, I thought this is kind of strange. Different.\footnote{Sibley oral history}
\end{quote}

David Baltimore, talking about his first year as a Biology graduate student, describes how walking in the halls gave him new experiences:
Well, you know, as a first year graduate student, you don't really know a whole lot about the institution… sometimes I would wander the halls and find people playing computer games. That was amazing to me, because I didn't know anything about either computers or games, or that kind of game. At two in the morning, they'd be playing these games in the halls of the physics department.

Creativity and Passion

Gerry Wilson observes, “If you get an idea the community gets behind, you just have to get out of their way. Incredible creativity.”\(^6^9\) MIT students are everything: “young, adolescent, Goth, weird, musical, rebelling against parents” but also respectful and intellectually curious.\(^7^0\) At MIT, a person is free to find her own path as long as she does it in an interesting and elegant manner. MIT values the power of play – not just getting your work done, but physical and mental tinkering.\(^7^1\) Curiosity is valued and reinforced: “Get intellectually curious about what others are doing and try something that hasn't been tried.”\(^7^2\) There is a broad focus and (or on?) new perspectives. Stories of hacks are told and retold.

Coupled with this creativity is a competitive spirit: “Make it better…do better, be more creative.”\(^7^4\) There is something of a compulsion to being out in front, a one-upmanship, always being on the cutting edge, but in a creative manner.\(^7^5\) “You can appreciate a good hack and laugh at a joke involving integrals, even if you happen to study planning or poetry. That’s the sort of geek culture MIT creates. Get used to it. It’s a lot of fun.”\(^7^6\)

Another aspect is a focus on designing the future. While many universities are founded on tradition and embody understanding and preserving the past, MIT spends very little time on this, and more on the future.\(^7^7\) Put another way, “MIT is un-awed by structure and wary about tradition.”\(^7^8\)

Entrepreneurial Ecosystem

In the 2011–2012 academic year, 42 entrepreneurship classes saw 2,753 course enrollments, including six Independent Activities Period short courses. A new summer program, the MIT Founders’ Skills Accelerator, received 129 applications for 10 student-team slots in summer 2012, showing that entrepreneurship is a year-round endeavor at MIT.\(^7^9\) A 2006 report issued by the Office of the Dean of Engineering detailed 34 different programs promoting entrepreneurship on campus, spanning secondary school children, undergraduate, professional/masters level, PhD, faculty, and entrepreneurs.\(^8^0\)

MIT is known for educational innovation. Innovations in the educational space include MIT OpenCourseWare, DSpace (durable digital archives), iLabs, the iCampus/MIT Online Assessment Tool

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\(^6^9\) Wilson interview  
\(^7^0\) Zolot interview  
\(^7^1\) Holly interview  
\(^7^2\) Leiserson interview  
\(^7^4\) Wilson interview  
\(^7^5\) Zolot interview  
\(^7^7\) Rowe interview  
\(^7^8\) Schindall interview  
\(^7^9\) http://web.mit.edu/facts/entrepreneurship.html  
(iMOAT), Conceive-Design-Implement-Operate (CDIO), Technology-Enhanced Active Learning (TEAL), the Singapore-MIT Alliance (SMA), and .LRN (“dot learn”), MIT’s Learning Management System.\textsuperscript{81} The White House recently cited a new MITx course 3.086x, “Innovation and Commercialization,” as a key resource for U.S. innovation.\textsuperscript{82}

Tom Magnanti, President of the Singapore Institute of Design and Technology and former MIT Dean of Engineering, describes his enthusiasm for educational innovation, as well as the support he received at MIT:

\begin{quote}
Well, I think one of the nice things about MIT is MIT in general is entrepreneurial. If I think of myself, I think the last thing anybody would want would be for me to start a company. Because I have no facilities and no talent for managing a business, managing finances for a company, meeting payroll and all this kind of stuff. On the other hand, MIT provides a great opportunity for what you might think of as academic entrepreneurs.
\end{quote}

If in some ways if I were to characterize myself, other than my educational or research contributions, it would be as an academic entrepreneur. I get the biggest charge out of starting new programs. One of the downsides for me for being dean, we were able to start UPOP and a few other things, but you're somewhat removed from that as being the dean. You sort of handed it off to someone else to go off and do it. One of the nice things about stepping down is I could again become an academic entrepreneur, and whether it was LFM or SDM\textsuperscript{83}, these other programs. SMART was one version of that and that notion of getting SMART up and working and try to make it successful was a challenge. I also had the opportunity of working with lots of faculty at MIT and the administration to make it work and putting the puzzle together like starting up a new company, new ventures.\textsuperscript{84}

George Washington University Provost and former MIT Dean of Undergraduate Education, Steve Lerman, talks about Project Athena, which provided computer access to the entire MIT community in the 1980s. This is an example of how one innovation can spawn many at MIT:

\begin{quote}
None of that software still exists in its original form. It's been 30 years almost. But some of the conceptual ideas about educational software really arose from the faculty's experimentation. At one point we had funded, I think my count was over 100, projects ranging from really little ones to very big ones. Where the faculty would experiment and we would provide the hardware, technology support, and advice to the faculty projects to innovate educationally.\textsuperscript{85}
\end{quote}

Some ground-breaking inventions from MIT in the past century include:

\begin{itemize}
  \item Creation of modern food preservation process
  \item First chemical synthesis of penicillin and Vitamin A
  \item Invention of magnetic core memory which made possible the development of the Digital computer
  \item High-speed photography
  \item Development of the inertial guidance systems for the Apollo space program
  \item Development of modern technologies for artificial limbs
  \item Development of steel-making
\end{itemize}


\textsuperscript{82} [http://web.mit.edu/newsoffice/2013/white-house-cites-new-mitx-course-as-key-to-improving-us-innovation.html](http://web.mit.edu/newsoffice/2013/white-house-cites-new-mitx-course-as-key-to-improving-us-innovation.html)

\textsuperscript{83} Leaders for Manufacturing and Systems Design and Management, two professional masters level programs at MIT that engage faculty across engineering and management.

\textsuperscript{84} Magnanti oral history

\textsuperscript{85} Lerman oral history
The space program, including the landing of humans on the moon.

The list of MIT innovations goes on and on.

The entrepreneurial ecosystem extends beyond campus and serves to both initiate and support innovation. Bhatia describes this ecosystem in her oral history:

And the ecosystem that we have here… is really unique, because it's not just the innovators, but it's also the investors, and the entrepreneurs, and the industrial base that we have all around us. Just looking at Cambridge since I was a graduate student, it's changed completely. And that kind of ecosystem really helps to take an idea, a publication, a patent, and push it out into the world and into a product, or a startup, or a license.

At the same time that it supports passion, creativity, and entrepreneurship, the ecosystem is also respectful of rules and processes. Responsible research practices are followed, as are copyright and technology licensing laws.

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IV. Usefulness (Pragmatic, Mind & Hand, Impact)

Mens et manus: with mind and hand we set forth. Our promise will be secured by the collective energies and wisdom of those who are drawn to this great magnet for intellect and creativity. Together, we will give shape to the future – the future of MIT, our nation, and our world.\footnote{Charles M. Vest inaugural presidential address, 1991, \url{http://web.mit.edu/president/communications/inaug-6-91.html}}

\begin{quotation}
– Charles Vest, former MIT President
\end{quotation}

The fourth attribute of MIT culture is usefulness. William Barton Rogers, the founder of MIT, is credited with orienting the institute to “respect the dignity of useful work,” a sentiment embodied in the MIT seal which reads “mens et manus”, or “mind and hand.”\footnote{Edward B. Roberts and Charles E. Eesley, “Entrepreneurial Impact: the Role of MIT – An Updated Report,” \textit{Foundations and Trends in Entrepreneurship}, vol. 7, no. 1-2, 2011, p 54.} The idea of mind and hand is still considered to be at the very heart of MIT, and faculty work hard to make this happen.\footnote{Jones interview} MIT is described as a place organized around practical solutions. The idea of usefulness of work provides a foundation for interdisciplinary collaboration, partnerships with industry, and experiential learning. Unlike faculty at some academic institutions, MIT faculty members do not have to defend themselves if they start a company or work with industry. MIT is very interested in technology transfer, and impact beyond academic papers is considered in tenure cases. There is an expectation that faculty stay in touch with the world and “of course you learn a lot that way,” including things that lead to new research or enhance teaching.\footnote{Interview on 3/21/13; TEAL: Technology Enabled Active Learning lab.}

Problem-Solving and Data-Driven

Wes Harris described the way mind and hand is embedded at MIT as follows:

\begin{quote}
We can do it and we will do it…We like to do things here. We are very impatient. We don’t like to sit around. We are doers. If we want to write a book, we do it. If we want a new model like TEAL, we do some research and do it.\footnote{Berger oral history}
\end{quote}

Some see the focus on usefulness as tied to engineering, but most agree that while MIT culture is strongly influenced by engineering, it is not just an engineering culture. Rather, it is an approach that has been linked to other fields with questions asked across the disciplines. Suzanne Berger describes how this influenced her work in political science:

\begin{quote}
There really is an old and deep engineering tradition at MIT … that’s always asking the question, why does this matter? What’s it good for? Why does it matter? And so at MIT… I would explain what I was doing on French peasants. And someone would say, well why does it matter? Or, what’s it good for? Or, you know, why should I care?\footnote{Larry Bacow also points to the influence of engineering on the way people at MIT think, and the importance of data in making decisions:}
\end{quote}

Larry Bacow also points to the influence of engineering on the way people at MIT think, and the importance of data in making decisions:

\begin{quote}
The culture of MIT is unique, in part, because it is so heavily dominated by engineering…. Engineers see problems and they say, "Great, there's a problem, let's go solve it." There is a premium placed on elegant solutions, ones that are
different from the way in which people have done things in the past. Engineers are not ideological; they are data-driven. And I think that speaks to the strengths of MIT. Other places are very, very different, and they have very different cultures. Tufts is more like the rest of the world than it is MIT.93

Jay Keyser commented, “One thing a graduate will say: there is no problem that I can’t solve, that I can’t begin to work through it. They don’t often realize it when they are here because their egos take such a pounding, but once they are out they realize it.”94

When asked directly whether MIT had an “engineering culture,” however, most people disagreed. MIT’s culture is seen as “problem-solving”, “applied” and “can-do”, ideas that may have originated from engineering at some point, but are now thought of more broadly. Engineering is one school, but problem-solving crosses schools and disciplines.

Interdisciplinary

In fact, the focus on problem solving has strengthened all of MIT’s schools and encouraged interdisciplinary work. MIT is not just engineering and science; all of its five schools have great strengths. Frequently the focus on solving complex problems results in collaboration between departments and across schools.95

There are only five MIT schools and 30 departments and programs, but there are 58 interdisciplinary centers, labs and programs, including the Research laboratory of Electronics, Plasma Science & Fusion Center, MIT Computer Science and Artificial Intelligence laboratory, Institute for Soldier Nanotechnologies, MIT Media Lab, The David H. Koch Institute for Integrative Cancer Research, and the MIT Energy Initiative.96

Dava Newman describes the value of research collaboration:

One of the best things about MIT is the research collaboration. Of course, we have our specific department, but you can do research projects -- research projects, really there's really no walls. You knock on someone's door from whatever department. I found that to be really special. That's really kind of magical at MIT in terms of really being able to do the multidisciplinary work…. And that extends all the way to architecture and design, as well as humanities, arts. ….And so we can really put together… fantastic multidisciplinary teams of researchers just with pretty much asking and getting people to join up to a team. I think we can really produce very different results with multidisciplinary collaboration.97

Claude Canizares comments on the relationship between basic research and interdisciplinary work, and how this is supported and practiced at MIT:

….We’re very firmly in the basic research area. While we talk a lot about the excitement that happens at the interdisciplinary boundaries, I don’t think you can have an interdisciplinary boundary if you don’t have a discipline to start with. So, in fact, that discipline has to be very firmly grounded… I think that one of the challenges for us is to make sure that we maintain the balance effectively.

….If you look at the energy initiative as an example, there are now some 250 faculty, a quarter of our faculty, who are in some ways engaged in the energy initiative. People who 15 years ago if you ask them do you work on energy, they'd

93 Bacow oral history
94 Keyser interview
95 Jacoby interview
96 http://web.mit.edu/facts/research-centers.html; http://web.mit.edu/education/
97 Newman oral history
say no. And now they’re recognizing that some of their skills and their abilities and their interest can be focused on this activity. So it is a bit more of a shift. That’s happening in the School of Science, and in the School of Humanities, Arts and Social Sciences, not just in the School of Engineering. But as I say, at the same time we’ve got to make sure that the basic research and the foundations of the disciplines remain strong as well.  

Phil Clay describes how the interdisciplinary work has become more formalized at MIT in recent years:

Well, I think the basic shift has been to move into the way MIT operates generally, which is you define a problem, you sharpen the questions, and then you bring to bear all of the disciplines and departments and people who can make a contribution to that. Again, environmental is the easiest to illustrate, but if we get into areas of economic development, then the obvious likely people to collaborate on such projects would be [from] urban studies, economics, and Sloan [School of Management]. There have always been small personal connections at that level, but to organize courses and other kinds of initiative is of more recent tenure.  

Martha Gray describes how focus on the world’s big problems, as opposed to advancing disciplines, encourages collaboration and different ways of thinking:

…It’s a very different paradigm when you think about where do you go with what you know? And how do you do the next step? Then saying we’re going to think about major problems. None of which are solved by single disciplines or professions or institutions or individuals for that matter. And it doesn’t happen by accident. When people are able to connect with other disciplines and professions and people. It’s partly a phenotype, it’s probably how people tick. But also I think, just as you can educate people in a disciplinary way of thinking, you can educate people to operate in a multidisciplinary world. So the magic of HST fundamentally is that you have to become comfortable with multiple disciplines and professions.

The people that are attracted to it-- like me --I think are instinctively drawn to those kinds of opportunities. And less drawn to disciplinary opportunities. But I think, the experience of having to work side by side, teach classes with a range of disciplines, helps you build the experience base that enables you to trust and value other disciplines. To have an expertise yourself and understand how to reach out. It becomes hard to articulate in any sensible detail in general terms what happens. But there is a certain magic that is not replaced by content in a classroom, or by a single professor. It’s a community thing. It’s a value system thing.

Work with Industry

From its early years, MIT has had strong connections to industrialists such as Thomas Edison and Alexander Graham Bell. The commitment to useful work, including these and many other connections, has been reaffirmed many times in MIT’s history. Examples include the founding of the Industrial Liaison Program in 1948; Summer Session for professionals working in industries such as textiles, spectroscopy, and petroleum engineering in 1949; and the Institute of Advanced Study, of which Edward H. Land of Polaroid was the first fellow, in 1956.

Currently over 700 companies are working with MIT faculty and students. MIT issues about 150 new patents/year and 100 new technology licenses/year. In total, it is responsible for starting 20-25 new companies/year, and is responsible for more than 350 spinout companies. MIT receives $1.5B per year in

98 Canizares oral history  
99 Clay oral history  
100 Gray oral history  
sponsored research (50% of MIT’s overall budget), representing nearly $1M per year in research funding for each science and engineering faculty. 102

A recent study on the entrepreneurial impact of MIT found:

If the active companies founded by living MIT alumni formed an independent nation, conservative estimates indicate that their revenues would make that nation at least the 17th largest economy in the world. Indeed, a less-conservative direct extrapolation of the underlying survey data boosts the numbers to 25,800 active companies (as of the end of 2006) founded by living MIT alumni that employ 3.3 million people and generate annual world revenues of nearly $2 trillion, producing the equivalent of the 11th-largest economy in the world. 103

Hundreds of new companies are started each year by MIT alumni, and 41 percent of MIT founders are serial entrepreneurs, having started multiple companies. 104

Angie Belcher describes how she straddles academia and industry, and the differences between the two:

…the difference is in—well, I wouldn’t say it’s the speed, it’s just the approach to things…that we’re trying to solve problems. We’re thinking about interesting ideas, but we’re not trying to make products in the lab. We’re trying to develop interesting materials for interesting processes. But we’re not under the kinds of deadlines and performance specs that you are in a small company trying to make it in today’s economic climate.

It’s just different. It’s very different approaches. And the thing that I love about my job is I get to do both at the same time. And my feet are more firmly planted in the academic because that’s my full time job. And I really enjoy the learning process, the process of training students, the process of having the freedom to really try to pull together very different ideas and to build something new. 105

Sangeeta Bhatia describes the openness that comes with working with industry:

Well, I think MIT actually is a really broad minded in what it values. We have all kinds of impact here. If you look across the campus, there’s basic science impact. There’s [the] media labs. There’s software engineering. There’s global health. So I think that it really is pretty resonant with the value system of the campus, not necessarily the academic community internationally. But I think that the MIT ecosystem really does value impact. And if you think about what makes us respect another colleague or student, it may well be, oh, he or she started this company, which has now touched 20 million lives, even if it was never a publication. 106

The ongoing development of Kendall Square, an area of Cambridge that is adjacent to MIT’s campus, is an example of how MIT “gets things done.” 107 Originally home to factories and later engineering consulting firms, this area has gone through significant changes in the last 15 years alone. By 2005, there were 90 biotech

102 http://web.mit.edu/facts/industry.html
104 http://web.mit.edu/facts/entrepreneurship.html
105 Belcher oral history
106 Bhatia oral history
107 Harris interview
companies in the immediate proximity of MIT.\textsuperscript{108} It is now also home to top technology firms including Google, Akamai, VMware, Microsoft, Amazon, Facebook, Apple, and Yahoo.\textsuperscript{109}

**Inventions**

MIT has been extraordinarily successful in “making things.” As Charles Leiserson described it: “You don’t just make stuff, you want to make stuff that people think is cool. Our sweet spot for research is five to fifteen years out. Things that could really happen soon.”\textsuperscript{110}

The Boston Globe’s top 50 things MIT made – the ideas, inventions and innovators that helped shape our world and are associated with MIT – include:

- The World Wide Web, invented by MIT Professor Tim Berners-Lee
- The Human Genome Project, for which MIT's Whitehead Institute, led by Professor Eric Lander, sequenced the most genes
- Transistor radio, co-invented by William Shockley ’36
- Email, invented by Ray Tomlinson ’65
- Biogen, founded by Philip Sharp, MIT Professor (and a lot more!) since 1974
- The first interactive minicomputer
- iRobot, founded by MIT alumni Helen Greneir and Colin Angle
- Ellen Swallow Richards, a public-sanitation and environmental chemistry expert and the first woman to graduate from MIT
- Bose Corporation, founded by MIT Professor Amar Bose
- Ivan Getting ’33 was a primary developer of GPS
- Former MIT Professor and Nobel Laureate Salvador Luria
- E-ink, invented at the MIT Media Lab
- The spreadsheet, designed by Dan Bricklin ’73
- The Internet Archive, maintained by Brewster Kahle ’82
- Akamai, the content delivery network that handles 30% of the world’s Internet traffic
- The "memex" - which helped inspire the Internet - conceived of by former MIT President Vannevar Bush ’16
- The first air-conditioned building
- RSA encryption
- Inertial guidance systems for aircraft
- Technicolor (itself named after MIT)
- Condensed soup
- Reverse transcription, discovered by David Baltimore, founder of the MIT Whitehead Institute
- The link between cancer and genetics
- The first public health school in the nation
- The Executive MBA program at Sloan
- HP, cofounded by William Hewlett ’36\textsuperscript{111}

\textsuperscript{108} A map showing more than 90 biotech companies was done in 2004 and revised in 2005, http://www.hedbergmaps.com/store/catalog/5073;

\textsuperscript{109} Related to recent growth, the city and MIT are currently engaged in discussions of a plan for 2030, http://web.mit.edu/newsoffice/2012/faculty-task-force-report-kendall-square-1017.html

\textsuperscript{110} Leiserson interview

\textsuperscript{111} http://mitadmissions.org/blogs/entry/50_things_that_mit_made and http://www.boston.com/news/education/higher/specials/mit150/galleries/top_50/
Experiential Learning

The idea of usefulness, is also embedded in MIT’s approach to education. Kim Vandiver provides a few examples:

Well, that's why I really believe in experiential learning. You actually cannot tell from solving textbook problems in a class whether or not that subject area is really an area that you ought to be staking your career on. You need to actually try it, and it's one of the great values of the UROP program, which is 42 years along now, is it gives students a chance to try things and they might discover that they think they want to be a biologist and then they work in a lab for a few months and say... I don't really enjoy that. I better try something else.

I think experiential learning is a really important component of what MIT offers. And that students need to really go try things. So some of the most heartwarming stories that I know of are students who have taken the D Lab course and then gone off to Zambia in Southern Africa-- and I'm thinking of a particular young woman who I think as a sophomore-- her name is Jessica-- went to Zambia and worked the first time in an operation where they make wheelchairs. And she observed while she was there that there were no ambulances. There was no way of getting a person from the field to a hospital, so she came back after her month-long experience saying, I've got an idea. I think I can figure out a bicycle drawn ambulance. I'll design one. She did it, she went back that summer, they built the first prototype in that wheelchair shop. The people at the shop liked it. She came back to school. She went back in the next January and by then they had built six more and they were in service. And then a year later, more things developed and she went back again to help them design the tooling for an order for 50 or 100 of them that the World Health Organization had put in.

Well, you could see this young lady just blossoming in the course of that experience. When students have experiences like that I call them life-changing. It's not that she will become an international development professional. That actually isn't the point. It's that she gained great self-confidence. She found out that by her own singular efforts she could do something that would make a difference. That's the MIT education when it's really great.112

The D-Lab, the Undergraduate Practice Opportunities Program (UPOP), the Edgerton Center, the Public Service Center, and the Gordon Engineering Leadership program are all examples of entities at MIT that support experiential learning and problem solving.

112 Vandiver oral history
V. Freedom (Trusting)

“There is a lot of trust at MIT — no one tries to scam the system — you only propose things that make more work for yourself.”

— Charles Leiserson, MIT Professor

The fifth attribute of MIT’s culture is freedom. Freedom at MIT is experienced in different ways, but it is a critical attribute of the culture. Freedom is the ability to choose what one works on, or who to work with. It is the ability to pursue passions and ideas. It also means you can make mistakes, and be better for it. It is, as Institute Professor Ann Graybiel describes, “freedom to fiddle around. And freedom to think that maybe you could solve anything.”

Freedom to Pursue Ideas and Interests

One important aspect of freedom – and this applies to faculty, students and staff – is the ability to pursue ideas and interests. If a person has an idea for a program, an activity, a research project, or a club and can locate the resources needed, he can generally do it.

In his oral history, Hal Abelson describes his experience in the Artificial Intelligence lab:

So it was run by Seymour Papert and of course Marvin Minsky, who are just two completely brilliant people with I think a real sense of faith, in that if you’re surrounded by a lot of smart people and you give them a lot of freedom and your job is really to inspire people, it will do great things. And the AI Lab was just infused with that. There was just a tremendous sense of community among the AI researchers.

This freedom is perhaps greatest for faculty, although students and staff have a significant amount of freedom as well. There is a sentiment that as long as something is not dangerous or illegal, it is permissible. A person has license to follow their intuition and go for it, or in the words of Doc Edgerton, “seal a deal with a handshake, work like hell, and have fun.” At the same time, trust and integrity are crucial to making this work: accepting freedom also means accepting responsibility that this freedom entails. The idea is to be safe, be honest, and play by the rules. Faculty members not only follow these practices, but also work to pass them on to students.

Freedom is a key enabler of interdisciplinary research. Cynthia Barnhart describes this connection:

So that, I think, is one of the things that is really exciting about MIT. Once you’re here, you are given the freedom to do whatever is of interest and exciting to you. As a result, faculty are doing really cutting edge work, but it doesn’t necessarily fall within the boundaries of what you would think computer science or mechanical engineering or electrical engineering, or civil engineering, how we maybe have traditionally defined it. So I think this interdisciplinarity and this dynamic adapting of what we are, is what has kept us where we are.

113 Leiserson, interview
114 Graybiel oral history
115 Vandiver interview
116 Ibid.
117 Barnhart oral history
MIT students are given a great deal of freedom and choice. “Students choose a lot… they choose a
dormitory, can design their own major, and can take pretty much any class they want to. A lot of freedom:
this is a deeply held ethic.”118

Hal Abelson describes how he became involved in computer science, a story that exemplifies the type of
freedom students experience:

I see a guy that I’d been to high school with, who I knew had gone to MIT, but we’d had no contact since then. And I
went up to him and said hi. Gee, hi, Ronnie. This is sort of really nice. And he says, what are you doing? And I said,
I’m a new graduate student. I’m looking for what to do. What’s interesting to do around here? And he said, oh, why
don’t you go over to the Artificial Intelligence Lab. I hear they’re doing interesting stuff. So I wandered over there and
talked to some people. And that’s essentially how I got into computer science and AI and all the stuff I’m doing
now.”119

Krisztina Holly described how she was able, as a student, to propose a class in industrial design. She took her
idea to a faculty member who thought it was a great idea, got it approved by the curriculum committee, and
helped find two firms and a little money to support it. From Krisztina’s perspective, “I was given trust and
latitude to do what I thought was right – to take the baton and run with it.”120

Kim Vandiver shared a story about how he was approached by two students in 2006 about creating a vehicle
design summit. The students had already invited 90 students who would be arriving in six weeks. Vandiver
and his staff helped the students find space for the summit, housing for the students, money to fund the
event and develop the workshops. Forty-six students ended up staying eight weeks and they built four energy
efficient vehicles. This activity continued each summer for a number of years.121

Another example of how freedom is exercised at MIT is through student clubs. Any student can propose a
new club or group, and provided the proposal includes at least five students, is non-discriminatory, legal, and
the idea seems sustainable and unique from existing groups it has a good chance of approval.122 There are
currently 451 student-run clubs at MIT, or approximately one club for every 10 undergraduate students, and
one for every 15 graduate students.123 Student run clubs include the 100K Competition, the 6.270
Autonomous Robot Design Competition, the Clean Energy Prize, Electric Vehicle Club, Energy Club,
Entrepreneurs Club, Future Society, Global Startup Workshop, India Mobile Initiative, Leadership Training
Institute, Mobile Development Competition, Rocket Group, Social Media Club, Solar Car Club, and a
Ventureships Club. There is also an Archery Club, an Art Club, an Asian Dance Team, a Ballroom Dance
Team, a Pagan Students Group, a Poker Club, and a Quidditch Team.

Deborah Ancona also focuses on freedom as being important at MIT. Her interviewer asked her, “What is it
about MIT, do you think, that leads experts like yourself to choose it over many other institutions that do
great work in all kinds of different fields? What is so special about this place?” She answered:

118 Schmill interview
119 Abelson oral history
120 Holly interview
121 Vandiver interview
123 Association of Student Activities, Group Resources list, http://web.mit.edu/asa/resources/group-list.html.
I think part of it is freedom, freedom to search out the problems that you’re interested in and go and pursue them in any way that you want. So no one says you have to study in this way or you have to study this topic. Not that a lot of other schools do that, but I think there's even more freedom here.

I think that there's a spirit of innovation. Go and do it some other way. And pick up different lenses. And study whatever the phenomena is. So I think there is a real spirit of innovation here.

Very smart people, they’re really smart people here. We are very lucky to be in a place where people pull you in all kinds of new and different directions. No one’s shy, right? So if you’re thinking about going in direction A, then someone will say, well, have you thought about [this]? And have you thought about that?

So it’s a culture where people bring in other perspectives and ideas. And it pushes your thinking. And so I think that's unusual.

And add to that this real interaction with the real world. MIT is engineering at heart. I mean, the beginnings are an engineering school. And so being able to show not that something is solely theoretically important, but that it does really work, for me anyway, is a very refreshing way of looking at the world. And I think it pushes both theory and practice in better ways.124

Ancona is clear that freedom does not mean chaos:

So freedom doesn't mean freedom to have chaos or freedom to do whatever you want. It's freedom to take some of goals of an organization, which you help develop in a distributed leadership organization, but to move forward within certain guidelines and guard rails.125

Rules are important at MIT, although depending on the circumstances, opportunities to adapt them do exist. Rules are also understood as “under ordinary circumstances this should happen, taking into account there might be discussion about circumstances.” In other words, “You follow the rules, but if you have a really good reason, people are willing to listen. Rules can be bent – they don’t necessarily apply in that situation.”126 However, this does not mean rules are disregarded. It means that if there is a good reason, they can be discussed, and that MIT has structured ways to have these conversations.

Freedom to Make Mistakes

One of the important aspects of freedom is MIT's approach to mistakes. Hal Abelson talks about how mistakes are opportunities to learn:

Another critical part of that is the notion of debugging. So there’s this idea that you do something, and you make a mistake. And he would always totally emphasize that mistakes are wonderful. Bugs are just great because [once you find them,] that allows you to go back and analyze and think about stuff.127

Failure is part of the process. It is not a terminal event, or necessarily a thing to be ashamed of, but rather an opportunity for learning.128 In support of this principle, the MIT community makes an effort to help its members be successful.129

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124 Ancona oral history
125 Ibid.
126 Leiserson interview
127 Abelson oral history
Angie Belcher, in her oral history, describes how she hasn’t really experienced failure, even when things did not work. Rather, her experience was that she had overreached:

Well, it's the work that you think really is good that gets rejected from papers, gets rejected from a journal. That's a learning process. I remember the first couple of rejections, including the person calling me and saying, you have to recalibrate. And the best kind of recalibration is when you take what the reviewers said and you say, yeah, there's some valid points in this. I understand where they're coming from. And you take these valuable points and you— especially when you're young and you're starting out when you really-- in my case, I really didn't know what I was doing. Restructuring things to make it better. I wouldn't consider those failures, necessarily. I don't ever feel like I've really failed at something. But I've realized I've overreached, and I've learned from when I overreach. Okay, I shouldn't do that. I should make these steps first. I think those are important.

A tolerance for failure does not mean a tolerance for recklessness. Freedom at MIT comes with responsibilities: to achieve excellence, to be safe, and not to break laws. Kim Vandiver makes an important distinction around freedom, specifically that part of MIT’s ability to do this comes from its excellence in the sense that knowledge can help manage risks:

There's a subtlety here that's important about this permissiveness in helping people do things, and it's a balancing act. MIT allows us to do these things, but the world is not risk free. So if you're driving a solar car, a bunch of students that are driving a solar car 3,000 kilometers across Australia, it's not without inherent risks. And so we at MIT have allowed our students to -- we think about risk management. We don't think about no, you can't do it because there are hazards. Everything has its risks. So we work with the students to minimize risks, but still be able to go out there and try things.

...[For example at the] World Solar Challenge... our students were there with our solar car in time trials before the race started. It's mostly just to make sure that it's a shake down for the cars and the crews. And our team rolled the car at 50 miles an hour and it was really bad. They destroyed 40 percent of the cells, [a] student had a banged up arm, but that was it. We could have had a fatality. Ours was the only car out of 28 cars in the World Solar Challenge that had a roll bar. We allow our students to take risks, but we make them think about what you can do to minimize risk.

Freedom also is a source of accountability. It means that when a person takes action, he has made a choice and is responsible for the outcome. As Lotte Bailyn commented: “I like the freedom, but it puts a lot of pressure on people.”

128 Andrews interview  
129 Levenson interview  
130 Vandiver oral history  
131 Bailyn oral history
VI. Focus (Compact, Collaborative, Unity)

“MIT is a place of free energy, as in thermodynamics. It has the capability to move in areas of opportunity quickly – as swiftly as any institution – without losing abilities in areas where we are committed.”

- Wesley Harris, MIT Professor

The sixth attribute is focus. It is important to distinguish focus from narrowness: MIT has great breadth and strength, yet is still compact and does not try to do everything. Due to this focused nature, MIT can change course and at the same time preserve its character and mission.

Compared with other universities, MIT is not large, particularly when viewed in relation to the impact it has in the nation and the world. There are about 1,000 faculty members of all ranks, and this number has remained stable since the 1970s. MIT’s compact size and focus supports collaboration and creates cohesion.

As an organization, MIT is simultaneously centralized and decentralized. Key administrative decisions such as faculty promotion, tenure, salary and allocation of space are reviewed centrally up to the highest levels, with serious and candid input being offered at every step of the process. At the same time, departments are very strong, and faculty members have tremendous latitude to pursue different activities. MIT is able to act as “one” – one faculty, one campus, one community, and at the same time support a great diversity of interests and activities.

One Faculty

Larry Bacow, in his oral history, discusses the importance of centralization and unity:

Of course one of the things that’s unusual about MIT, and I didn’t appreciate it until I came to Tufts, was the degree to which everything is centralized. And as a result of that, we take certain things for granted. We take for granted that there’s one academic calendar. That there’s one unitary faculty at MIT. That to a first approximation, at least when I left it was only with the exception of the Sloan School, there was one tuition at MIT. We took for granted that the educational opportunity was equally open to undergraduate and graduate students…regardless of department. If you met the prerequisites, you could take a course. You were an MIT student, as opposed to exclusively being a student in one school or one department. And as a result of that, if you sit on Academic Council, you get a window literally on every issue that comes before MIT.

MIT maintains a uniform standard for faculty evaluation and promotion. A promotion to tenure, for example, typically goes through rigorous evaluations in the Department Council (consisting of senior faculty chaired by the department head), the School Council (consisting of all department heads chaired by the school Dean), the Academic Council (consisting of all the school deans chaired by the Provost and President), and finally the Executive Committee of the MIT Corporation (MIT’s ultimate governing body). At each level, all the cases at that level are reviewed together with input sought from all participants in the review process, and the chair makes the final decision at that level. To give a sense of the time involved, these councils typically convene for weekly two-hour meetings year round.

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132 Harris interview
The uniform standards of faculty promotion and tenure impact all of the schools at MIT, including MIT Sloan, which is in many ways the most administratively independent school at MIT. Lotte Bailyn describes this:

MIT’s a very centralized institution. Every appointment goes through the Academic Council. So every Sloan appointment has to meet the criteria of the Academic Council, which is more set by the image of science and engineering … [This is different than] Harvard, which would be at the complete other extreme…[where] the business school has hardly any relationship with the rest of the university. So the fact that MIT is centralized has certainly affected probably in both directions, though I don’t know, but has certainly affected Sloan and the way things about appointments and evaluation. So I think the fact that it’s such a centralized place certainly made it very appealing to me. But there is a part of the faculty that still is very much just Sloan oriented.\textsuperscript{133}

Across the five schools at MIT, there is a single class of faculty: every MIT faculty member, from a Nobel Prize Laureate to an expert instructor, is expected to participate fully in research, teaching, and service to the Institute in his or her discipline.

\textbf{Faculty and Administration}

The sense of unity and “one place” extends beyond faculty to the entire MIT community. In addition to “one faculty”, faculty and administration are a continuum at MIT. Interestingly, it is achieved more through culture than through process. The faculty allows the administration to manage certain decisions, such as lab and office space. The administration understands that it is acting on behalf of the faculty, and therefore needs to ensure its decisions are aligned with agreed upon principles and values.

Larry Bacow describes this two-way interaction between faculty and administration as an impedance match:

\begin{quote}
Well, I think one of the unique aspects of MIT that separates it from much of the rest of American higher education, is that traditionally we've not drawn sharp distinctions between faculty and administration. Here I am, I've been gone for over seven years and I'm still saying "we." Old habits die hard. And so the people who've served in the position of Faculty chair have been honest brokers on behalf of the faculty. And to be a broker, you have to be willing to work in both directions. The way I use a particular metaphor which I think is good in describing it, part of one's job as Faculty chair is to ensure that there's a good impedance match between the faculty and the administration. And so, I worked hard at that; Chuck worked hard at that. It was both of our jobs. It was \textit{[neither]} in the faculty's interest, nor … the administration's interest, to see that we were not in resonance.\textsuperscript{134}
\end{quote}

One of the reasons MIT is focused is because it manages distributed conversations so well. Faculty meetings, frequently open to everyone, are rarely well attended. When they are well attended, this means that something has gone wrong. When difficult issues arrive, these are addressed by committees.\textsuperscript{135}

An example of this structure and process at work was in 1986, when a dean decided to close the Department of Applied Biological Sciences in what was widely viewed by the faculty as a unilateral decision made without sufficient support. Then-President Paul Grey, responding to upset faculty, convened a task force on the reorganization and closing of academic units. The task force report was presented in the faculty meeting and led to changes in MIT’s Policies and Procedures. The report described the system of shared governance, as follows:

\textsuperscript{133} Bailyn oral history
\textsuperscript{134} Bacow oral history
\textsuperscript{135} http://committees.mit.edu/
It is the view of this committee, and we believe of the faculty at large, that a key to the success of the Institute has been the maintenance of a system of shared governance. Few of the MIT faculty see themselves in an employee-employer relationship to the Administration. Rather, most feel that the Administration and the faculty share a joint responsibility for sustaining the excellence of the Institute. They expect that, when important choices arise about the mission or internal organization, they will naturally be involved in the process leading up to decisions and in the planning of implementation….As a result of the consultation, administrative officers are better informed about the substance of key choices. With the involvement of people in the affected units, details of implementation are better planned. Because their representatives are involved in the process, faculty are likely to accept the changes as legitimate, even when they disagree on the substance.\textsuperscript{136}

**Breadth and Depth**

MIT’s focus allows it to maintain both breadth and depth with a relatively small faculty. It has a culture centered on science and technology: 85% of students major in these areas, and most on campus share a deep appreciation for them. At the same time, MIT supports three other major schools. MIT is science and engineering, research and education, technology and business, humanities and social sciences.

As Larry Bacow describes,

MIT is fortunate that it doesn’t do everything, but everything that it does, it does exceptionally well. Joel Moses was fond of saying that one of the reasons why academic departments are as strong as they are at MIT is that MIT has no small departments. It’s difficult to sustain excellence without scale. At Tufts, we have a lot of small departments. We have scale, in many cases, but it’s distributed across seven schools and three campuses. That required me to think hard about, how do you knit the schools together? Not a problem at MIT. How do you get the institution to act as one, as opposed to seven small fiefdoms, each going off in separate directions? How do you get it to speak more with one voice, while at the same time preserving the kind of creativity that comes with different academic units still being relatively independent?\textsuperscript{137}

Dava Newman also describes MIT’s breadth:

I think MIT is unique in a lot of different facets. But we’re a research institute. We are very dedicated to undergraduate education. People have to know that first and foremost, and now since we’re ranked so highly in undergraduate education, I think the world knows that. But it hasn’t always been the case, how dedicated that we are. MIT is a world-class research institute, but so focused on education at all levels. It’s a very unique environment.

Our mission, we’re focused on science and engineering, as well as in the breadth of the humanities, our social science management. But that’s actually really very special because we’ve always had the mission to kind of be at the forefront of science and engineering, but within this greater context of the liberal arts and touching to the management and architecture and design. Now some universities are moving more toward that. Before the technical schools or the v-technical, but to be based, to be rooted and based in science and engineering, again, just to approach -- we also have a very applied approach.\textsuperscript{138}

Depth and breadth are institute-wide and demonstrated in each school. Tom Magnanti describes this within the School of Engineering:


\textsuperscript{137} Bacow oral history

\textsuperscript{138} Newman oral history
The School of Engineering’s strengths, I think, are breadth and excellence… It covers the watershed of engineering broadly. There’s hardly anything -- other than some traditional areas of engineering such as bridge building and sort of traditional things which it doesn’t do much of any more. It covers the full landscape of engineering. It’s excellent across the board. I mean it just does it all well.139

Teaching and Research
While many peer schools have “research professors” or “teaching professors”, MIT does not. It sets a single standard and expectation for professors at MIT. Faculty members, even at the most senior levels, teach throughout their careers.

Hal Abelson describes this as follows:

MIT, unlike lots of other places, has this notion of one faculty. We don’t have graduate faculty or we don’t have teaching faculty and research faculty. We have faculty. And there’s the sense if you’re on the faculty, you’re supposed to do all of these things.140

When junior faculty members arrive at MIT, they start by teaching sections of large courses that are taught by senior faculty. Part of this experience is to see how committed the senior faculty are to teaching.

Hal Abelson, in his oral history, points out how important integration of teaching and research is to MIT:

And we did a survey of the MIT community about what's important. And what was interesting is not coming from us on this ed tech council, but as said back to us by the consultants, it said, gee, what’s really important at MIT is the integration of research and education. And now what’s that say? That says if you’re thinking about distance learning in this sense, if somehow that is just curriculum material and it’s not infused with the notion of research, that’s kind of not an MIT education. So that one kind of fundamental they held.

At MIT, faculty view research and teaching as complementary. Suzanne Berger touches on this:

I would say, first of all, that I think that there is absolutely no conflict between teaching and being an excellent teacher, and research and being an excellent researcher. It’s true that there are only 24 hours in the day. And that’s the ultimate constraint. And hopefully you get some sleep along the way.141

She also gives a specific example of the ways in which teaching and research are integrated:

I think about the globalization project. When together with another faculty member, often an engineer, and one or two graduate students, we’d be riding in a minivan, going out to these industrial parks in the middle of China. And we’d argue all the way to the factory about what it was that we’d want to be asking about. And then for the next two hours of the ride, what did we see? What did it mean? What did the man really say? What did it mean that they were -- that the machines were set up as -- so I was learning both from the engineer who saw entirely different things in that factory than I saw. And from the graduate student, who had different questions. And I think also for the graduate students it was a fantastic opportunity…

And what I feel proud of there, too, is that the students didn’t just work on the common project. Each of them developed wholly autonomous projects and books out of this that are very very, different. And projects that have gone on

139 Magnanti oral history
140 Abelson oral history
141 Berger oral history
to win them terrific jobs and honors for their books and dissertations, et cetera. And so this possibility for having both an individual project and a group project. For being a teacher and a researcher. This is, I think, the height of pleasure that’s available. And it’s a deep feeling of satisfaction on all fronts here at MIT. So teaching, research.142

MIT’s goals in the areas of administration, faculty, breadth, depth, education and research are not dissimilar to those you would find in any major research university. However, its ability to focus its efforts allows it to realize these aims at a level of excellence and compactness that is unique.

142 Ibid
VII. Principled (Takes a Stand, Passion, Leadership)

“I am deeply moved by the trust you all are placing in me. MIT is a great human treasure, and serving as its leader is a profound responsibility.”

– MIT President L. Rafael Reif

The seventh attribute is “principled.” MIT is described as “a place that prides itself on integrity.” It is clear about its principles and it acts according to them, even when doing so might be much more difficult than compromising. This is closely connected with the way leadership is understood and practiced at MIT. As Charles Vest said, “Colleges and universities teach by their actions as well as their curricula.”

A faculty member describes MIT Sloan in this way, and her words also apply to the Institute: “this is a place that does what it says. It says that that's what it's going to do. And it goes ahead and does it.”

MIT is known for standing up for its values and following its principles. In 2003, MIT rejected National Security Agency funding because it sought to have control over which students would participate in a funded project:

MIT refused $404,000 in government funding from the National Security Agency last fall when the agency, in return for the money, sought to control which foreign students participated in the funded project.

The NSA had offered to fund further research into advanced computer architecture led by Thomas F. Knight Jr., a senior research scientist in the Artificial Intelligence Laboratory.

However, negotiations over the contract between NSA and the AI Lab were cut short when the agency insisted on including a clause giving the NSA the right to approve which international students worked on the project. Both sides were adamant, as MIT refused to go against their long-standing policy of “open” research, and as a result, the funding was dropped by MIT.

A second example is the “Overlap Group” antitrust case, where the US Department of Justice brought charges against MIT and eight Ivy League schools, stating that their process for collaborating on student aid packages violated antitrust practices. These processes had been put in place because the group believed the overlap meetings served a public purpose by assuring students were admitted on merit and that available financial funds were awarded on the basis of need only. The meetings enabled the participating colleges to preserve a need-blind admissions system and avoid bidding wars. In spite of the benefits of this process, and a belief the overlap meetings were lawful, the eight other schools all signed a consent decree to stop the practices because they wanted to avoid a costly legal battle. Only MIT insisted its actions were legal and

144 Rowe interview
145 Vest, Endless Frontier, p. xiii.
146 Ancona oral history
necessary, and went to trial. MIT prevailed in the lawsuit and all of the claims made by the government were eventually dismissed.\textsuperscript{148}

MIT is willing to take a stand, even when its peers make different choices. As one interviewee said, “you can typically count on MIT to do the right thing… it has tremendous institutional integrity.”\textsuperscript{149}

In another instance, a respected and long-term dean of admissions had falsified statements on her resume, leading to her dismissal. Steve Lerman, who was faculty chair at that time, responded by reinforcing the importance of ethics to the MIT community:

\begin{quote}
The vast majority of our community strives to be ethical in their research, teaching and interactions with others who work here. We as faculty overwhelmingly strive to communicate these values to our students, and we take our ethical responsibilities seriously. In our role as supervisors, we try to treat everyone who works for us fairly and with respect.\textsuperscript{150}
\end{quote}

**Mission and Values**

MIT is a place that does not just have a mission statement, but it embodies it. The mission statement describes both what the Institute does and doesn’t do, and this is realized in the daily actions of the MIT community. As described in the MIT mission statement:

\begin{quote}
The mission of MIT is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century.

The Institute is committed to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world's great challenges. MIT is dedicated to providing its students with an education that combines rigorous academic study and the excitement of discovery with the support and intellectual stimulation of a diverse campus community. We seek to develop in each member of the MIT community the ability and passion to work wisely, creatively, and effectively for the betterment of humankind.\textsuperscript{151}
\end{quote}

An example of how motivating this mission is to the community is embedded in Phil Clay’s story on why he came to MIT:

\begin{quote}
Certainly there were no glossy brochures, there was no recruiter, there was no one dangling a fellowship in my face, none of those things were true. But what was true was a sense of simplicity in relationships. People worked together because they shared a passion. The department was self-conscious about how it prepared its students and was willing and able to articulate that. It made sense to me. People were inviting others -- inviting, in the sense of wanting students to be a part of the activities. There was a sense that we were to make a difference in the world, and that we should prepare students professionally and in academic terms, to take leadership roles. This is all done without pretension, without a sense that we were entitled to this leadership role, but that we earn it, and in the phrase of an old ad, we have to earn it every day. It wasn’t about who you are, but what you’re doing, what you are working on, what you were trying to achieve, what
\end{quote}


\textsuperscript{149} Bacow interview

\textsuperscript{150} Steve Lerman, “Stating Our Core Values: Does MIT Need a Statement of Ethical Principles?” MIT Faculty Newsletter, xix, 6, May/June 2007, \url{http://web.mit.edu/fnl/volume/196/lerman.html}

\textsuperscript{151} \url{http://web.mit.edu/facts/mission.html}
The words and sentiments in the mission statement are repeated again and again in accounts of MIT. They define strategy and engender passion:

We absolutely think it’s our mission in terms of teaching and research to solve some of the world’s most challenging problems. So I think the students here feel that -- they’re passionate, they want to change the world. Even by a little bit, how much can we improve or change the world? So it goes right from our students all the way up through our faculty. That’s a pretty pervasive feeling around this place.

So if you come in with that kind of passion to do better in a sense, to make the condition for another human, another design, to really improve a society -- it could be local, it can be regional, or it can be a very large scale level. But if you’re going to focus on the science and the engineering, but again, it’s application to really make an improvement somewhere in the world. It could be Africa, it could be right here in Boston and Cambridge.

MIT’s mission also leads MIT faculty to spend time on policy and national issues:

I think MIT in the fabric has a strong sense of a duty and an obligation and a responsibility for really making an impact on the Nation and the world. We talk about the sort of three pillars of creating new knowledge, transmitting knowledge, namely education, and service. And the service is service to the nation and to the world. We do that in a number of different ways. You’ve mentioned Lincoln Laboratory, which is really an entity designed to provide service by providing the most advanced technology for National security.

So I think this is very much on people’s minds. I spend a lot of time… on national committees doing studies … or going to meetings and addressing policy issues, which may be of general interest to MIT or might be a general benefit to MIT or maybe not. But would be important for the country and for the world. I think many of our faculty feel that it’s sort of ingrained in the DNA of this place.

MIT is extremely thoughtful about whether or not its initiatives and activities are aligned with its principles and values. As one interviewee commented, when MIT gets involved with a new initiative or institute – examples include the David H. Koch Institute for Integrative Cancer Research, the Whitehead Institute for Biomedical Research, and the Institute for Soldier Nanotechnologies at MIT – it does so because the problems addressed are fundamental and cross-disciplinary, and their solutions will impact humankind.

MIT’s faculty and members of the community both articulate the mission and act on it. This example focuses on Sloan, but is applicable across MIT:

At MIT Sloan, the mission is to develop principled innovative leaders… to change the world. I mean, we say that. But then there are all these huge projects, right?

So we have these cross-MIT projects in energy and sustainability that are really not only telling people, students, faculty, but doing it. So there are role models around. There are people who are saying, hey, we can make a difference. And here’s how.
And so there are many, many initiatives like that. MIT supports initiatives like that. And so I think, for all the idiosyncrasies that make us who we are and some of the odd characters that are around, at the end of the day, that’s what we publicize.

That’s what we do. That’s where resources go. That’s what people are putting their heads together around.\textsuperscript{156}

MIT’s major initiatives in education and educational technology have also been carefully designed to align with MIT’s mission and values. For example, OpenCourseWare is designed as a model for the world:

But to get back to the original ethos of [OpenCourseWare], is you’re setting yourself up as a model and you’re trying to influence the influencers. And what you do matters. And that’s not only a technical obligation, it’s an ethical obligation for how you behave and how you think about it. And that’s kind of how I think about educational technologies. It’s with that sense of you’re creating a model. You have an obligation to sort of see that it works out right with respect to how you think the world is evolving and how you think the internet is evolving. But much, much of MIT is like that. It’s a whole ethos of service that’s really integral to how much of this community works.\textsuperscript{157}

Phil Clay similarly describes MIT’s global obligations:

Well, I think we are the leading science and technology focused institution in the world. I don’t say that in any bragging kind of way, but I think that is our brand; and I think when you’re the leader, then you do have some responsibilities. You have a responsibility to protect that reputation; you have a responsibility to give back—that is, to reach out to students who might not think they can come here and tell them that, yes you can, if this is the right place in terms of your abilities and interest. We have an obligation to reach out for the talent that would honor the contributions that those students bring. We have an obligation to make sure we have an environment that supports the best people wanting to be here; and I think we have an opportunity to communicate to the public that has been so generous in our reaching this status and that we will count on to maintain the status. I think we have an obligation to carry that leadership around the world, sometimes doing things which might not in the first instance appear to be selfishly beneficial to us, but would be beneficial for the large interest of science and technology and education.\textsuperscript{158}

**Leadership**

Through the use of committees and councils, participating faculty receive significant experience with university matters, and are also able to provide direct input into the Institute’s proceedings. Larry Bacow describes his own experience on Academic Council:

*The other treat was being a member of the tenure and promotion subcommittee of Academic Council. If you’re an Academic Council member with professor in your title, you read literally every tenure and promotion case that comes before the Institute. And I found that to be an intellectual feast. You get a window on the most interesting cutting-edge research in literally every discipline that’s represented at MIT. I loved that.*\textsuperscript{159}

Tom Magnanti describes the overall importance of leadership at MIT:

*The other thing that it does very well, as we discussed before, is it takes leadership very seriously. It wants to lead the world of engineering. It is continuing to challenge itself, and I think the faculty continue to challenge themselves about*
how they can lead. One of the impressive things about MIT and its faculty is it can change directions pretty quickly and move into new areas. I would take as an example what we're doing in the energy field right now, or what we're doing in the bioengineering related fields right now.\textsuperscript{160}

The importance of leadership is echoed by Larry Bacow:

MIT does a terrific job of preparing people to be leaders in higher education, in part because it's so centralized. Because of the structure of MIT, if you're in a position like the provost or the chancellor-- I mean, Alice Gast was the vice president for research, Bob Birgeneau was the dean of science-- you get to see virtually every major issue that comes before a university. And so it's outstanding preparation.\textsuperscript{161}

MIT’s integrity and position in the world is a source of deep respect and pride for those who are part of the MIT community. Larry Bacow, reflecting on MIT after leaving to become President of Tufts University, described his experience this way:

I think, a fish doesn't know that it's in water until you take it out. And I think, to some extent, that was true of me at MIT. I knew that MIT was an extraordinary institution when I was there. I think I've come to appreciate it even more now that I'm not.

This is not a statement about Tufts. This is a great place and I love it. I'm very proud of what we're doing here. But MIT is, I think, unique among American higher education institutions because of its focus on science and technology, because of its intensity, because the rest of the world looks to MIT to solve certain problems. It truly is a national treasure. There are many great universities in the country, but there really is only one MIT, and I don't think I quite appreciated that when I was there in the way that I do now that I'm a bit distant from it.

MIT President L. Rafael Reif, in his 2013 commencement address, urged students as follows: “So now go out there. Join the world. Find your calling! Solve the unsolvable! Shape the future! Take the high road! And you will continue to make your family, including your MIT family, proud.”\textsuperscript{162}

\textsuperscript{160} Magnanti oral history
\textsuperscript{161} Bacow oral history
Subcultures

MIT’s culture is not homogeneous. While MIT has a “huge gyroscope called engineering”, it also has “at least a thousand” subcultures.\(^1\)\(^6\)\(^3\)

Some of the subcultures are related to academic fields. There are subcultures in the schools, in the departments, and in academic disciplines. Some disciplinary subcultures extend beyond MIT to the US academic context generally.

Students are part of disciplinary subcultures. Additionally, many of the dorms and other houses are subcultures. Athletics is a subculture, as is hacking. There are subcultures within the 600 clubs. There is a strong Greek culture at MIT. Different nationalities and ethnic backgrounds also create subcultures.

Subcultures at MIT reflect the university’s openness and freedom. The strength of the subcultures is also related to MIT’s excellence, innovation, and principled approach. One of the unique aspects of MIT’s culture is that it can be so strong, and at the same time it supports great diversity. The many and vibrant subcultures at MIT are an example of this.

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\(^{163}\) Rowe interview
Intersections and Synergies

While the report to this point has focused on delineating individual attributes, these attributes exist in a holistic manner, supporting, reinforcing and balancing one another. Some have stronger linkages than others. Openness and freedom, for example, are very closely linked, as are usefulness and innovation. Principled is a balancing attribute, as is excellence. It is possible to be innovative or open without being principled or pursuing excellence, but not in the MIT context.

For example, MIT’s strength in the area of collaboration is an outcome of its focus and unity as well as the strength and excellence of its different parts and its principled approach to work.

Angie Belcher, in talking about her career and work at MIT, shows how a focus on usefulness, mission, freedom, and passion all interconnect:

> And I’m a practical person, I’m an engineer. I want to make things, I want to make things that work. I want to make things that are useful. And so, how do I do it in a sustainable way? It’s not this idea that I have to make the world a better place-- which I do-- but it’s just, why would you not?.... I didn’t plan it. I’ve always followed my passion, and I think that’s the key. And that’s one of the things that I think about with helping students or helping my own kids. How do you help people just facilitate them following their passions, what they’re interested in? Because if you do, then I think the road opens up. And I feel like that’s the way it’s been to me. In terms of what you said, going back to wanting to be an inventor in my garage as a child, to medicine, and following, biology, it all came true. I feel like that’s my life. What would happen if everything you ever wanted would come true? And that’s my life.

Vladimir Bulovic describes the connection between teaching, educating, and changing the world. Embedded in this account is the idea of “in loco parentis” (“in place of a parent”) developed and explored by Jay Keyser in his book on MIT

> So my joy is when I see an ‘aha’ moment, when I say something in a classroom and a student then back says, oh, that’s what you meant. Yeah, that’s what I meant.

> It’s a small thing, and it’s not like it’s going to change your life tomorrow. But at that moment, your life just got a little broader, and you got kind of a picture of where I was heading. And a few times, you get questions from the students. They also say, I can’t answer that because I never thought of it that way, but you know what, I’ll come back tomorrow because that’s a really good thing to ponder. And you come back tomorrow…. and say, well, I thought of it and it’s just this, or maybe I thought of it and that’s a really good line of research to pursue. Sure, let’s think about it more.

> So my joy is in recognizing, for undergraduates, it’s recognizing those aba moments. With graduate students, typical graduate student in my group stays for about five years, and I like to emphasize that…[for the] first two years, more likely or not, I’ll be saying a lot of stuff, and I’ll be telling them a whole bunch of things, and the latter three years, two and a half, it’s their job to teach me, because at that point, they are nearing being the world experts in what they’re doing. By the five years’ mark, they are the world experts. I mean, that’s their goal. They should be. In that little discipline, little subfield of a little subfield, they should be the best in the world doing that.

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And hence, I cannot match their understanding of what it truly is, but I'll revel in being able to talk to them about it, because, I mean, how often do you get the chance to be next to world experts in things that I care about? Because, indeed, we grew together. So my joy is in seeing that.

Now, the next step beyond that, if my students are able to get jobs and actually make a difference in the world, I revel in that as well. I mean, in many ways, what I value, again, is that exportation of knowledge, and people who are capable to take that knowledge to fruition of some sorts. And it can mean either generating that little idea we had, or generating jobs that are carrying out the little idea, starting little companies that can actually make a difference to someone, or if we have a big idea, saving the energy footprints of this or that village by introduction of this or that technology. There are many ways to take joy out of it, but it's all about advancement. It's all about advancement of people and knowledge.\(^\text{165}\)

In this quote we see excellence, openness, innovation, principles, and focus all at work in shaping and supporting Bulovic’s relationship to his students. In other words, it is not just one or two attribute, but many working in both complementary and balancing manners that shape MIT’s unique culture.

\(^{165}\) Bulović oral history
Challenges

As with any organization, MIT is not without its challenges, some of which are related to MIT’s culture. While there are different examples that could be identified, the one that will be described here is the impact the intensity and drive for excellence can have on student life.

As Larry Bacow has described, an institution’s strengths may also be weaknesses, and this applies to MIT:

MIT is a really hard place. There’s no easy or soft path through MIT. There’s no place for anybody to hide. And in fact, that’s one of its strengths. I think institutions are like people. For most of us, our strengths are also mirror images of our weaknesses. This person is great because they’re so focused; well, their limitation is that they’re so focused. One of the things that makes MIT as unique and special as it is, is its intensity.166

Vladimir Bulović suggests that if there was one thing he might change about MIT it would be related to the stress felt by students:

We are surrounded by brilliance in so many ways, understated brilliance, which makes it that much more comfortable to be around. Yeah, I guess the one thing I would change is, if I could avoid stress on students, I would do it if I knew how to. And maybe all we need to do as faculty is to keep repeating it, telling them that it’s good enough that you’re here. Don’t be lazy. Don’t be a slacker. Have a good time. But at the same time, don’t be stressed about it167.

The chief of MIT Medical Health Service, Alan Siegel, discussed this from the student perspective:

Stress at MIT, said Siegel, often takes the form of “discomfort, pain, confusion, or anxiety about failing, or not doing all you’re supposed to, or not knowing how to do what you’re supposed to, and feeling helpless in those situations.”

He attributes much of this stress to the difficulty and complexity of the work done at MIT. In discussions with people in similar positions to his at other schools, he finds that work elsewhere seems to be not as relentless or continuous as it is at MIT, nor the pressure as high.168

Other examples of challenges include challenges related to the idea of meritocracy, which some see as not aligned with diversity; challenges related to openness and how this creates possible risks; challenges related to the entrepreneurial spirit and can-do attitude which can lead to duplication of effort; and challenges that stem from focus, which can mean that some perspectives and voices are not present on campus.

It is important to note – and this relates to both openness and excellence – that while challenges are embedded in any culture, MIT stands out as an organization and a community that has often taken a difficult and public path of discussing its challenges and reviewing its decisions. One example is the Scott Krueger case, where President Charles Vest offered a public apology for a student suicide.169 Another, current example

166 Bacow oral history
167 Bulović oral history
169 http://tech.mit.edu/V120/N42/42krueger.42n.html
is the willingness to take a deep look into MIT’s actions related to the Aaron Swartz case, which is ongoing and receiving worldwide attention.\textsuperscript{170}

\textsuperscript{170} http://swartz-report.mit.edu/docs/letter-from-president-reif.pdf
Transferability

This study focuses on identifying MIT’s cultural attributes, since possessing an understanding of what is to be transferred is a necessary precursor to understanding how to transfer it. Nevertheless, there were some specific suggestions from interviewees on possible opportunities to support culture transfer in a faculty development program for the MIT Skoltech Initiative.

One recommendation was to involve visiting faculty with the MIT Public Service Center, for example as judges in the IDEAS competition. This would allow visiting faculty to see the students, their creativity, the nature of their projects and how they are able to tap into the rich resources of MIT. In other words, seeing student actions would allow them to experience practices of openness, freedom, innovation and excellence at MIT. Another opportunity would be to become a mentor in UPOP (the Undergraduate Practice Opportunities Program), or to be a judge in the 100K Competition, with similar outcomes. Experiencing the TEAL (Technology Enabled Active Learning) classroom was suggested, as an example of innovation and excellence. It was recommended that there be training in the responsible conduct of research, consistent with MIT’s principled approach and management of risk.

Providing visiting faculty with experiences of MIT’s diversity and MIT’s approach to interdisciplinary work came up in the interviews. MIT is a diverse campus and continues to become more diverse without diluting its culture. This is seen as a significant strength. Additionally, MIT’s approach to disciplinary work relies on a focus on problem solving and principles, but also relies on great strength in individual departments and schools – this is related to both focus and excellence.

It was mentioned that any institution desiring to learn from MIT’s culture should develop policies and practices that create a strong sense of research, scientific and engineering ethics. Trust and openness are fundamental to the MIT culture, and they are grounded in a belief in lawful behavior around issues such as copyright and intellectual property.

It was recommended to create an environment that supports acceptance, including ensuring that people feel safe in expressing their personal views.

Almost everyone interviewed for this study felt that understanding how to support the transfer of the positive aspects of MIT’s culture is a worthwhile pursuit, although not a simple one. As one interviewee said, “I have been fortunate to have the MIT experience – it has brought out the best in me. Hopefully I’ve been able to contribute. I’ve met some great people. If Skoltech can reproduce that, it will be successful.”

171 Harris interview
Concluding Remarks

In this study, more than fifty individuals, including senior leaders, faculty, staff and alumni representing all of the schools at MIT shared their perspectives and stories, and these have been reviewed and synthesized. Without exception, those who gave oral histories or were interviewed – even those who had some concerns – shared a deep respect for MIT’s culture as well as a sincere gratitude for the way MIT has enriched their lives and work. Across the interviews and other materials, while specific words varied, there was amazing consistency in the ideas and values people spoke of when asked to describe MIT’s culture. People are attracted to MIT because of its significant accomplishments, but they stay at MIT because of the people and the unique culture, a culture that demands and supports them in doing great work in service of the world and humankind.

Seven attributes have been identified from this study: openness, freedom, excellence, usefulness, innovation, focus and principled. These attributes are both unique and interconnected: “Remove one little piece and it is a different place.” MIT’s culture traces its roots back to the principles and values articulated by William Barton Rogers and others at its founding, and it has developed and evolved over MIT’s 151 years of remarkable experiences and accomplishments.

The general conclusions from this initial study are as follows:

– MIT’s culture is accessible and tangible enough to be described in this way. In spite of the fact that MIT is a complex organization and its culture manifests itself in different ways, it is not magic or nebulous and can be described.

While each attribute viewed individually seems relatively easy to accomplish, to do them all well is both difficult and one of MIT’s strengths. At MIT, these attributes are upheld equally, taken seriously and pursued consistently over time and across the organization. MIT brings a high level of focus, intensity, and energy to its culture. There is an intense dedication and zeal – MIT really believes in what it stands for, and it will follow its principles even when to do so is inconvenient or difficult. MIT’s cultural attributes as they exist today are largely independent of MIT’s location, resources, and history, and therefore, at least in principle, partially transferable.

MIT strives for impact and excellence. Understanding MIT’s unique culture and its transferability will support this in institutional relationships and beyond.

172 Bacow, interview
Appendix I: Brief Bios – Interviews and Oral Histories

In this report there has been extensive use of oral histories\textsuperscript{173}, as well as interviews, to understand MIT culture through the words and perspectives of those who have experienced and shaped it. The voices quoted or paraphrased in this report include the following individuals. Any inaccuracies or misrepresentations are the responsibility of the author.\textsuperscript{174}

**Abelson, Hal** (oral history) PhD ’73; Class of 1922 Professor of Electrical Engineering and Computer Science; Co-founder of OpenCourseWare

**Allen, Samuel** (interview on 3/7/13) ’71 SM, ’75 PhD; Faculty, Materials Science; Faculty Chair, 2011 – present

**Ancona, Deborah** (oral history) Seley Distinguished Professor of Management; Faculty Director, MIT Leadership Center

**Andrews, Margaret** (interview on 1/14/13) ’92, MBA; Staff, 1999-2006


**Bacow, Lawrence** (interview on 2/18/13, unpublished paper, oral history) ’72; Chancellor 1998–2001; President, Tufts University, 2001-2011

**Bailyn, Lotte** (oral history) T. Wilson (1953) Professor of Management, emerita

**Baltimore, David** (oral history) Nobel laureate in Physiology or Medicine, 1975; President, Rockefeller University 1990–1991; MIT Institute Professor 1994–1997; Robert A. Millikan Professor of Biology, California Institute of Technology 2006–present; President, California Institute of Technology 1997–2006

**Barnhart, Cynthia** (oral history) Associate Dean of Engineering for Academic Affairs 2007–present; Professor of Civil and Environmental Engineering and Engineering Systems

**Belcher, Angela M.** (oral history) W.M. Keck Professor of Energy; Department of Materials Science and Engineering; MacArthur Fellow

**Berger, Suzanne** (oral history) Raphael Dorman and Helen Starbuck Professor of Political Science; Director, MIT International Science and Technology Initiative; Class of 1960 Innovation in Education Fellow

**Berners-Lee, Tim** (oral history) 3Com Founders Professor of Engineering; Director, World Wide Web Consortium (W3C); 3 Com Founders Researcher; MacArthur Fellow

**Bhatia, Sangeeta N.** (oral history) SM ’93, PhD ’97; John J. and Dorothy Wilson Professor of Health Sciences and Technology and Electrical Engineering and Computer Science; Director, Laboratory for

\footnotesize{\textsuperscript{173} The oral histories used in this report were produced by, and videos and transcripts published by, the MIT Infinite History project, \url{http://mit150.mit.edu/infinite-history}, as accessed in November 2012.}

\footnotesize{\textsuperscript{174} Please email any corrections or other comments to: jkstine@yahoo.com and they will be addressed in future revisions to this report.}
Multiscale Regenerative Technologies; Associate Member, Broad Institute; Howard Hughes Medical Institute Investigator

Bulović, Vladimir (oral history) Professor of Electrical Engineering; Co-Director, Solar Frontiers Center and the Solar Revolutions Project; Co-Director, MIT Energy Education Taskforce; Van Buren Hansford (1937) – Margaret MacVicar Faculty Fellow

Canizares Claude R. (oral history) Vice President for Research and Associate Provost 2006–2012; Associate Provost 2001–2006; Bruno B. Rossi Distinguished Professor in Experimental Physics; Associate Director for MIT of the Chandra X-Ray Observatory Center

Chomsky, Noam (oral history) Institute Professor, emeritus; Professor of Linguistics, emeritus

Clay, Phillip L. (oral history) PhD ’75; Professor of Urban Studies and Planning; Chancellor 2001–2011; Associate Provost 1994–2001; Department Head of Urban Studies and Planning 1992–1994

Colbert, Isaac (oral history) Dean for Graduate Students 1999-2007

Edelman, Paul (interview on 3/19/13) ’78; Class President; Entrepreneur

Gray, Martha L. (oral history) SM ’81, PhD ’86, J.W. Kieckhefer Professor of Medical and Electrical Engineering

Graybiel, Ann M. (oral history) PhD ’71, Institute Professor; Walter A. Rosenblith Professor of Neuroscience, emerita; Investigator, McGovern Institute for Brain Research

Harris, Wes (interview on 3/21/13, oral history) Associate Provost for Faculty Equity 2008–present; Charles Stark Draper Professor of Aeronautics and Astronautics; Director, Lean Sustainment Initiative; Housemaster, New House 2002–present

Hockfield, Susan (oral history, publications) MIT President 2004–2012, Professor of Neuroscience

Holly, Krisztina (interview on 1/2/13) ’82 Mechanical Engineering and SM ’92 Mechanical Engineering; Staff, 2002-2006; Entrepreneur

Jacoby, Henry (interview on 3/27/13) William F. Pounds Professor of Management, Emeritus; Co-Director of MIT Joint Program on Science and Policy of Global Change

Jones, DiOnetta (interview on 4/4/13) Associate Dean for Undergraduate Education and Director of the Office of Minority Education, 2009-present

Keyser, Jay (interview on 3/5/13, book) Faculty, Linguistics; Associate Provost, 1985-1994

Khoury, Philip S. (oral history) Associate Provost 2006–present; Dean of the School of Humanities, Arts, and Social Sciences 1991–2006; Kenan Sahin Dean 2002–2006; Ford International Professor of History

Leiserson, Charles (interview on 2/27/13) Faculty, Electrical Engineering and Computer Science

Lerman, Steve (oral history, publications) Vice Chancellor and Dean for Graduate Education 2008–2010; Class of 1922 Distinguished Professor of Civil and Environmental Engineering 1991–2010; Housemaster,
Warehouse 2001–2010; Provost and Executive Vice President for Academic Affairs, George Washington University 2010–present

**Lessard, Don** (interview on 2/25/13) Faculty, MIT Sloan School of Management

**Levenson, Dawna** (interview on 3/20/13) ’83, ’84 SM; Partner, Accenture and Anderson Consulting; Staff, 2007 - present

**Luperfoy, Susann** (interview on 2/25/13) Undergraduate Practices Opportunity Program (UPOP) Executive Director, 2007 – 2013

**Magnanti, Tomas L.** (oral history) Institute Professor; Dean of the School of Engineering 1999–2006; Professor of Management Science and Electrical Engineering; President, Singapore University of Technology and Design

**Moses, Joel** (oral history) PhD ’67; Institute Professor; Provost 1995–1998; Dean of the School of Engineering 1991–1995; Professor of Computer Science and Engineering Systems; Acting Director, Center for Technology, Policy, and Industrial Development

**Newman, Dava J.** (oral history) Professor of Aeronautics and Astronautics and of Engineering Systems; Director, Technology and Policy Program; Margaret MacVicar Faculty Fellow; Heath Sciences and Technology affiliated faculty; Housemaster, Baker House 2005–present


**Resto, Chris** (interview on 1/7/13) ’99, Civil Engineering; Staff, 2001-2008; Entrepreneur

**Rowe, Mary** (interview on 3/19/13) Ombudsperson, 1973 – present; Faculty, MIT Sloan School of Management

**Royer, Candace** (interview on 4/4/13, oral history) Associate Professor of Physical Education; Associate Director of Development/Athletics

**Schindall, Joel** (interview on 3/17/13) ’63, ’64 MS, ’67 PhD, Electrical Engineering; Professor of the Practice, Electrical Engineering and Computer Science; 35 years in industry

**Schmill, Stu** (interview on 3/21/13) ’86; Dean of Admissions, 2008 – present

**Silbey, Robert J.** (oral history) Class of 1942 Professor of Chemistry; Dean, School of Science 2000–2006

**Silbey, Susan** (interview on 4/1/13) Leon and Anne Goldberg Professor of Humanities; Professor of Sociology and Anthropology; Professor of Behavioral and Policy Sciences, Sloan School of Management; Head of Anthropology

**Smith, Arthur C.** (published sources) Professor of Electrical Engineering, Chair of the Faculty, 1983-1985; Dean for Undergraduate Education, 1990-1995
Vandiver, Kim (interview on 3/18/13, oral history) ’69 SM, ’75 PhD, Ocean Engineering; Faculty, Ocean Engineering, Dean of Undergraduate Research, 1999-present

Vest, Charles M. (oral history) MIT President 1990–2004; MIT Corporation life member; Professor of Mechanical Engineering; President, National Academy of Engineering 2007–present

Wilson, Gerry (interview on 5/9/13) ’61, ’63 MS, ’65 ScD; Professor of Electrical Engineering; Electrical Engineering and Computer Science Department Head, 1978-1981; Dean of the School of Engineering, 1982-1992

Zolot, Ken (interview on 3/17/13) ’95 SM, Management of Technology; Senior Lecturer, Engineering; Founder Innovation Teams Initiative, Entrepreneur
Appendix II: Interview Questions

(1) When you think of "MIT Culture", what comes to mind for you?

(2) Do you have a story or example that you feel illustrates MIT culture? (or several?)

(3) Can you describe an experience you had when you learned something important about MIT culture?

(4) People have described MIT as an "engineering culture": Does this ring true to you? What do you think it means?

(5) What do you think some of the sub-cultures are at MIT?

(6) How would you contrast MIT's culture with that of other universities with which you are familiar?

(7) Who else do you think I should be speaking with?
Appendix III: Automated Text Analysis

Approach Example: Word cloud. This word cloud was generated automatically based on word frequency in oral histories and interviews.
Approach example: 2-D Dendrogram Map: Also automated, dendrogram maps show both word frequency and proximity (within the same sentence), illustrating key words and their relationships to one another.
Appendix IV: Cross Reference Diagram – Words and Phrases to Attributes

Keywords and phrases from interviews and oral histories used to describe MIT and its culture were collected and then mapped against the seven attributes we identified. This mapping is subjective, but it allowed for cross-checking our final seven attributes for completeness, and it also illustrates some of the overlap between the attributes.

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Appendix V: Bibliography

MIT Publications

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**Culture and Excellence**


About the Author

This report was prepared by Jennifer K. Stine under the direction of Dick K. P. Yue and with the support of Thomas Luly for use by the MIT Skoltech Initiative’s Faculty Development Program.

Stine is an independent consultant. Her background includes six years as an administrator in the School of Engineering at MIT where she established and then led the Professional Education office. Additionally, Stine has served in administrative leadership roles at Harvard and Caltech. She three degrees from Stanford, including a PhD in History with a focus on social and cultural history and the history of science in seventeenth-century England and has also taught Organizational Behavior.