



HARVARD UNDER REVIEW

Harvard is embarking on an experiment to foster collaboration and interdisciplinary research. **Corie Lok** looks at whether it can change its culture and reinvent communities along the way.

Harvard University is the oldest, richest, most prestigious institution of higher learning in the United States. In many fields it is also the best. But its efforts to move into new areas of interdisciplinary science are often slow or fragmented compared with more nimble powerhouses such as Stanford University or the University of California, Berkeley.

A typical example is chemical biology, in which researchers use small molecules to probe and learn about biological systems. Harvard has one chemical-biology group on its main campus in Cambridge, Massachusetts; another at the Harvard Medical School, six kilometres away across the Charles River in Boston; yet another at the Broad Institute, jointly run by the Massachusetts Institute of Technology and Harvard; and still other, smaller efforts within some of Harvard's many affiliated research hospitals and institutions.

Such a proliferation of similar efforts troubles

Tim Mitchison, co-founder of Harvard Medical School's Institute of Chemistry and Cell Biology. "It leads to inefficient use of resources and expertise," he says.

It troubles Harvard's leadership, too — which is why the university is now engaged in a controversial effort to reinvent the way that research gets done and managed there.

A major part of this effort is to expand the campus in Allston, a neighbourhood of Boston just across the river from Cambridge. Construction began there earlier this year on a 46,500-square-metre, US\$1-billion facility that will house the new Department of Stem Cell and Regenerative Biology. The department was formed last year as a new academic home for Harvard's stem-cell community, which, like the chemical-biology groups, is currently scattered across various schools, research hospitals and centres. Bioengineering and systems-biology researchers will also be moving to the new complex.

Another key part of the effort is the Harvard University Science and Engineering Committee (HUSEC), which encompasses Harvard's provost and other top leaders of science and aims to improve the coordination of science planning across the university and to provide funding to start up new initiatives.

Yet another important piece is a strategic review now under way at the medical school — the first in recent memory. Instigated by the school's new dean, Jeffrey Flier, the review is asking for recommendations on how to strengthen ties across the medical school and research hospitals in areas such as human genetics, neuroscience, technology development and therapeutics and chemical biology. A similar review is under way at the Faculty of Arts and Sciences, led by its new dean, Michael Smith.

In effect, Harvard has launched a radical, university-wide experiment to create a more open, agile and collaborative research culture — as well as research communities that go

Harvard is building a new science complex at its Allston campus to boost interdisciplinary science.

beyond traditional departments and schools. "Science is changing in dramatic ways," says Harvard's president Drew Faust. "The implications of this for the way we organize our scientific enterprise are very significant. It challenges us to break down barriers." Like the president, the provost and deans at Harvard have also bought into this vision. "We're realizing that we can be more than the sum of our parts," says Jeremy Bloxham, dean of science in the Faculty of Arts and Sciences. But what remains to be seen is whether enough faculty members and departments at a grassroots level will join them for the changes to take hold.

Grand designs

Harvard has the resources to show on a grand scale how to foster new ways of doing science. It has a large and growing science and engineering component — 1,750 investigators, including those from Harvard's 20 affiliated hospitals and research institutes — which pulls in around \$2 billion a year in external funding. At \$35 billion, it has the biggest endowment of any university, and it has more than 80 hectares of land on which to expand its Allston campus.

But Harvard is used to being a leader and isn't in the habit of self-reflection or admitting to its weaknesses. It has a long tradition of fierce independence — every school and hospital has its own powerful leaders, administrative structures, fundraising efforts and cultures. At times, hiring committees from different parts of Harvard even compete with each other for the same candidate. And researchers doing similar work may be more likely to come across each other at international meetings than at home. Until recently, says Venkatesh Narayanamurti, dean of Harvard's School of Engineering and Applied Sciences, "our organizational structure was always very decentralized. The president had very little authority, and the money was with the deans. That's not all bad, because you want decisions being made close to where the work is being done. But one has to balance the role of local autonomy with central direction."

Bringing more centralized direction to Harvard was a key goal of Larry Summers, the university's president from 2001 to 2006. To help him implement that strategy, he brought in Steve Hyman, a psychiatrist at Harvard Medical School from 1992 until 1996 and then director of the National Institute of Mental Health. Summers installed Hyman as provost

in 2001 and together the pair moved aggressively to change the status quo. By the end of 2003, Harvard Medical School had established a new systems-biology department; the university had announced it would collaborate with the Massachusetts Institute of Technology to launch the Broad Institute; and Summers had convened four task forces to jump-start planning of the Allston campus.

One of those task forces, chaired by Hyman and focused on science and technology, envisaged that Allston would become a hub for interdisciplinary science. Accordingly, it put out a call for ideas for science projects that needed space and investment. From the 70 proposals it received, several interdisciplinary, cross-school initiatives were selected to receive start-up funding from the provost's office, including the Initiative in Innovative Computing, the Microbial Sciences Initiative and the Origins of Life Initiative.

Meanwhile, the university was drawing up ambitious plans for a large fundraising campaign, with substantial sums devoted to science. University spokesman John Longbrake explains that Harvard generally needs to raise funds to support new initiatives, as 83% of the endowment is restricted by donors for specific uses, such as undergraduate financial aid or library collections, and it spends only about 5% of its entire endowment every year.

Then trouble hit: in early 2005, Summers

made his infamous remarks about how innate differences between men and women affect their success in science. The resulting headlines galvanized long-simmering discontent with Summers, whose aggressive, top-down leadership style had proved highly polarizing. Although some faculty members found his vision and decisiveness refreshing and exciting, others felt disenfranchised and offended.

Fast and furious

Many critics also thought that the Allston task-force planning process was moving too quickly, and wasn't inclusive enough; and some even questioned the need to expand so aggressively into Allston at all. Others considered the creation and funding of the new interdisciplinary initiatives to be too ad hoc, and that more transparent governance structures and consultation were needed. "There was a bit of a free-for-all period," says James McCarthy, a biological oceanographer at Harvard. "There needed to be some order."

In 2006, with so much unrest on campus, Summers was forced to resign after just five years in the job (see *Nature* 10.1038/news060220-13; 2006). As one of his last acts as president, he convened a university-wide faculty committee to address concerns about how initiatives that involve researchers from different departments and schools should be organized and managed. In its final report at the end of 2006, the committee recommended the formation of the HUSEC and other organizational structures for science, such as cross-school departments and

"We're realizing that we can be more than the sum of our parts."

— Jeremy Bloxham



Harvard's president, Drew Faust, has to win over students and staff alike.

J. IDE/HARVARD UNIV. NEWS OFFICE

interdepartmental committees. The 17-member HUSEC, chaired by Hyman, began meeting in April 2007. Among other things, its \$50-million annual budget now funds the initiatives launched as a result of the Allston task forces.

The scientists involved with those initiatives are perhaps the ones who have been the most affected by Harvard's bumpy foray into interdisciplinary science. They began with much enthusiasm during Summers's reign, launching new research projects, holding symposia and seminars, recruiting graduate students, postdocs and other staff, and churning out papers. But with Summers's departure, a stalled fundraising campaign and shifts in their governance structure, the initiatives have lost momentum. Some have not received the funding they had initially planned for, and they have not been able to take on new research projects.

Fighting the system

Harvard's experiment is as much about leadership as it is about science. Summers got the process moving, but in a way that also generated much opposition. Now the job falls to his successor, Faust.

Faust is not a newcomer to leading institutional change. As the first dean of Harvard's Radcliffe Institute for Advanced Study, where she served for six years, Faust oversaw the transformation of the former independent women's college into a Harvard-affiliated scholarly institute. Initially, sceptics questioned whether this was the right type of experience for the Harvard presidency; the Radcliffe Institute is small and doesn't have a faculty or students, just fellows.

But so far, Harvard scientists have generally been pleased with Faust, saying that she's insightful, respectful, supportive of faculty and a good listener. Although a historian, Faust has been supportive of science, testifying before the US Senate in March calling for greater funding from the National Institutes of Health. She has kept Hyman on as provost, effectively allowing science planning to continue without major changes in direction.

Faust has put unity high on her agenda, speaking of Harvard as "one university" at which collaborative research can flourish, rather than just a loose collection of independent schools. And she has hired new deans who share that vision. Smith, for instance,

says that "one of the things we want to do here is not just push forward with individual basic research in the sciences and engineering, but also have connections made with the professional schools."

The next test of Faust's leadership will come with the revival of the fundraising campaign. As fundraising is so crucial to Harvard's ability to launch new projects, Faust's challenge will be to win over potential donors.

Over the next several years, Harvard will face

In fact, the departments within Harvard's Faculty of Arts and Sciences are beginning to loosen up. They are doing more joint appointments. In some tenure cases, letters of recommendation from people outside of the candidate's home department are given equal consideration. And the medical school has revised its promotion criteria for its faculty to explicitly include collaboration with groups of investigators.

Another major issue is how to fund interdisciplinary projects. Alyssa Goodman, founding director of the Initiative in Innovative Computing says, "I would say that half of the mission of our initiative is to do interdisciplinary science and the other half is to come up with a rational funding model for how you should do that."

Dimitar Sasselov, director of the Origins of Life Initiative also thinks a lot about funding. Because his initiative doesn't fit neatly into the traditional categories of research funded by government agencies, it is especially dependent on seed money from the university and on private sources during the first few years. And that money needs to come quickly, says Sasselov, while the inspiration is still fresh. Otherwise, busy collaborators are likely to simply drift apart. What is required, he says, is a mechanism that would support interdisciplinary projects in the way that a venture-capital firm invests in a start-up company: quick but limited funding, with clear timelines and milestones.

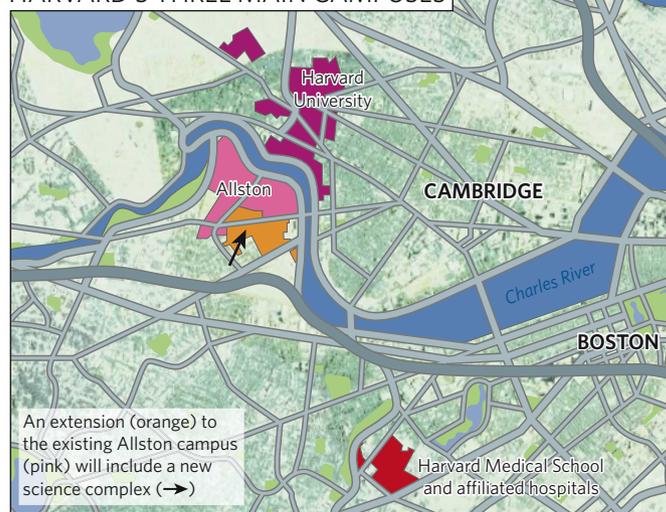
Business approach

Business approach

That 'venture-capitalist' function is one of the multiple roles that Hyman sees for the HUSEC. So far, the committee has put out a call for proposals for seed grants of up to \$75,000 per year for interdisciplinary research. It has also designated \$7 million of its annual budget for the funding of first-year science graduate students. In addition, it has commissioned a review of how Harvard can beef up its bioengineering endeavours. And it has come up with a plan for what will go into the first science building on the Allston campus.

Despite those steps forward, the HUSEC remains a work in progress. The committee has yet to develop a clear mission and to decide how it will prioritize its projects — not to mention put in place a system for allocating its funds. A particular challenge, many say, is to strike the right balance between support for the existing, core disciplines, and investments in the new ones.

HARVARD'S THREE MAIN CAMPUSES



many questions as it expands and reconfigures science. "There's a bit of naivety in terms of how difficult it is to get these things to work, taking it beyond just talk," says Geoffrey West, president of the Santa Fe Institute in New Mexico, which specializes in interdisciplinary research. "It takes much more than just setting up [a new centre or building]. Universities need to provide mechanisms for this kind of research to be rewarded in the right ways and for people

to interact both informally and formally." In particular, he says, they have to adapt their hiring, tenure and promotion criteria to make them more suitable for young interdisciplinary researchers who work with people from fields outside their own department.

This will be a major challenge, given how deeply entrenched department-based structures and cultures are at many universities, says West. "You've got to get people [from different departments and fields] to break away from their departments and spend serious time together," says West. "I'm not an anti-department guy. I like departments. They just have to loosen up."

"Harvard has an opportunity to play a leadership role in the world in solving some of the great challenges like climate change."

— Dan Schrag



Harvard's main campus is the historic centre of the university.

Perhaps the most prominent test case is the Department of Stem Cell and Regenerative Biology. Chaired by stem-cell researchers Doug Melton and David Scadden, it will be the first tenant in the Allston science building. It developed out of the Harvard Stem Cell Institute, also co-directed by Melton and Scadden, as a way to enhance undergraduate teaching and to hire and promote new faculty members, as institutes do not have the authority to make these decisions.

Although its new building won't open until 2011, the department is already active. Several existing faculty members have moved to the new department and some will begin teaching undergraduates this year.

Moving plans

However, says Scadden, creating the department is one thing. It will be much more complicated to figure out which members of the department will move their labs to the Allston campus, and whether they'll move over completely or maintain labs in two locations. Many stem-cell researchers who are scattered across different campuses and hospitals are excited about the prospect of being next-door neighbours in Allston. But some are concerned about losing connection with their existing communities. For instance, Gary Gilliland, head of the

Cancer Stem Cell Program at the Harvard Stem Cell Institute and based in the medical campus says he is interested in Allston, but that "it's possible I would have a harder time recruiting clinical fellows" there.

Home institutions and departments are also concerned about losing key faculty members to the Allston campus and having their communities disrupted. "It's good for them and it's maybe not good for us," says neuroscientist Jeff Lichtman, referring to the three people from the molecular and cellular biology department in which he works, including Melton, who will be moving to the new stem-cell department. "We're not losing them as colleagues; some will have joint appointments. But the truth is distance is a big problem for scientists."

"We want to make sure that we do everything we can to not gut those communities," says Scadden. "We want them to be vibrant. It's essential to the success of this department and for the Stem Cell Institute that we continue to have close relationships with the hospitals and the medical school."

Some of the junior faculty members are deferring their decision until they see which

of the senior researchers move to Allston. "It's important for us to know who will be going there, who our neighbours would be," says Konrad Hochedlinger, a stem-cell biologist at the Harvard Stem Cell Institute, who will be part of the new department.

As the university builds Allston and plans for the next science buildings there, discussions will continue about which other scientific communities will be the most appropriate ones to move there. For some emerging fields such as systems biology or regenerative biology, creating a critical mass in one location may be the key but for other, more mature fields, it may be more important to have individuals scattered throughout an established campus where they can easily interact with people from other departments and disciplines.

"I like the model of distributed expertise as opposed to critical masses," says Lichtman, who takes advantage of his close proximity to the physical-sciences departments to attend seminars and meet colleagues there. "It's not that I know everything a neuroscientist might say to me, but I would know a lot of what a neuroscientist might say to me because I've been talking to neuroscientists most of my career. But every time I talk to a chemist or a physicist, I learn something new."

Testing times

In the end, perhaps the most important challenge facing Faust during this era of change is to find the right combination of top-down decision-making and bottom-up consensus-building — especially given how much her predecessor failed at this.

Some faculty members who liked Summers's approach hope that Faust, who is seen as being more considered in her leadership style, won't be so cautious that Harvard settles back into its old, slow ways. "Harvard has an opportunity to play a leadership

role in the world in solving some of the great challenges such as climate change and I really hope that, over the coming year or two, Faust does stand up and really lead on these issues," says Dan Schrag, director of the Harvard University Center for the Environment.

Faust is taking her own approach to leadership. "We need to be careful about what we do but we also need to figure out what the important initiatives are and then do them," says Faust. "I don't decide to do things because they're bold. I decide to do things because they're right."

Corie Lok is senior editor of Nature Network, based in Boston.

"Universities need to provide mechanisms for people to interact both informally and formally."

— Geoffrey West