

Universities: Costs and Benefits on the Academic Frontier –

Donald Kennedy

Science: the Endless Frontier as metaphor represents a momentous decision that decanted the mechanism and the resources for supporting science into the institutions responsible for training the next generation of scientists. It was a bold step that no other industrial democracy took, and the others have reason to regret their choice. There is no question that the decision was good for science. The question I want to consider is, was it also good for the universities? That is a harder question.

It may not be the right moment to answer it, because for America's universities it is not unfair to say that it is the best of times, it is the worst of times. Surely it is the best in a number of important respects: scientific vigor, desirability, international respect, and others. But it is also the worst of times, and for a whole array of reasons. This awkward sense of doing better but feeling worse resonates with a historic public ambivalence about higher education. On the one hand, we are the escalator of upward mobility and the agent of personal improvement. On the other, we are seen as elitist and stuck up.

Our public, while clamoring for their sons and daughters to get accepted, resents the fact that in little more than a decade the lifetime earnings gap between high school and college graduates has increased by 50 percent.

Our research accomplishments are recounted breathlessly in the newspapers, but in conversations among parents, the central theme is that Susie's calculus teacher can't speak English as well as Susie. Some of this disaffection is aimed at a utilitarian academic research culture that in some ways is a collateral descendant of *Science: the Endless Frontier*.

That report introduced a new role for America's universities. As keepers of the national scientific flame, they came to be seen also as the driving force for a whole suite of economic and social objectives. At first it was the general argument that basic research would empower a more innovative society. By the late 1970s, international competitiveness was already being invoked as a challenge for university science and as an argument for funding it more

generously. By the 1980s, higher education was being seen as an engine for improving regional economies. And every valley with a university in it seemed to be made of silicon.

Somehow, though, the American public has held on to a more distant version of the university: one that today sounds almost quaint. It is a place where young people get in touch with great ideas through introductions conducted with sympathy and understanding by thoughtful older scholars. It is a place where they learn to analyze and reason, and develop the habits of inquiry. It is a place where intellects can wander freely over ground that may or may not have immediate application, but where the culture is examined and advanced.

At the core of this image is the passage not just of knowledge but of the capacity to gain more knowledge from one generation to the next. When Americans look at their universities, they sense that the new utilitarian obligations have somehow triumphed over this older and deeper vision. That disparity, the gulf between new reality and old expectation, lies at the heart of our present public discontent.

In what follows, I want to try to map that more precisely. But lest the rest of this seem too discouraged or critical, let me begin with a quick accounting of the benefits that *Science: the Endless Frontier* has left with American universities. They are boundless.

First, doctoral training has been made richer and more effective, to the benefit of science and, presumably, to the benefit of the trainees as well. Revenue accruing to the universities from sponsored research has not only made possible a new level of intellectual activity in scientific fields, it has permitted internal reallocations that have helped the non-scientific disciplines as well. Educational programs generally have been enriched by closer contact with active investigation: not only graduate students but undergraduates have been the beneficiaries of new opportunities for well-equipped independent study. There has been a closer coupling between university research and societal need. Support from federal mission agencies and from industry has extended the domain of research application. It has helped to keep faculty closer to the most dynamic locus of research activity, and in that way has enriched teaching at all levels.

But in other respects, the very success of the idea Bush launched has, as so often happens, produced some second order problems. First, the postwar research surge has altered the balance both between undergraduate and graduate education and between research and teaching. Although in some respects there has been expanded opportunity for engaging in supervised research, and undergraduates have benefited from the change in those ways, their greater distance from faculty and the absorption of the latter in their own work has probably weakened the undergraduate experience. Undergraduates spend far more time today with para-faculty and teaching assistants, and less with senior faculty.

Second, the expanded opportunity for graduate students in their own specific research areas has been accompanied by some real restriction of opportunity. The growth of research assistantships and the lengthening of time required to complete the doctorate are side effects of the need for graduate students as labor in the university research enterprise.

Perhaps this need accounts for the unwillingness of our science departments to limit graduate enrollments even in the face of evident oversupply. This is a tragedy of the commons that is producing a morale crisis for some of our best and brightest young people. If you want to glimpse the depth of this discontent, talk to doctoral candidates at west coast universities who refer to the "I-5 route," the series of substitute teaching assignments they may be forced to take at the several dozen institutions spread along the Interstate 5 corridor.

There is a litmus test for detecting when sectoral problems assume enough significance to begin the transition into publicly recognized issues, and it happened to this one: Garry Trudeau made it a long-running theme for *Doonesbury*. The agent of President King is outside the gates of Walden College recruiting gypsy faculty from an eager crowd of candidates assembled there in a mob. He's shouting through a bullhorn. "Intro Bio. I'm looking for an Intro Bio." A well-dressed respondent says, "I'm a Cornell Ph.D. I don't expect tenure, obviously, but I would like a two-year contract with medical benefits." The agent looks around, then asks, "Any other candidates?" From the back, "I'll work for food."

The crisis of confidence is made worse by a disjunction between what the students are trained to expect and what they are likely to get. Little or no effort is made to prepare our doctoral candidates in the sciences for alternative careers, or to be more effective teachers, or even to confront some of the professional and personal challenges – ethical and other – that they may meet in academic careers. We do more for MBA and law students in this regard than we are doing for those whom we are preparing for our own profession. It is extraordinary.

In fact, our graduate students are being prepared to lead lives exactly like those of their research supervisors, and for that only. Naturally, they expect they will find work in elite universities. They are almost invariably disappointed.

The growth of dependence on federal funds among state-supported as well as private research universities has blurred the distinction between public and private. The University of Michigan and Stanford might both be described as quite similar federal universities. This blurring has been accompanied by a subtle but steady increase in government ambitions for control, which are justified under the all-purpose principle of accountability. In the past ten years, government agencies have made determined efforts to regulate access by particular groups to unclassified university research; restrict access of foreign nationals; place restrictions over academic researchers publishing their own data; and pursue newly-claimed regulatory authority over something vaguely defined as academic misconduct. We have also watched the growth of legislative pork-barrel appropriations.

I am not suggesting that universities should do no government work or take no government money, but we need to be realistic. When institutions serve utilitarian purposes, they invite political intervention. Absent the growth in federal control we have seen, I suspect that state university governing boards might not have become as ambitious as they have, and might have stayed in their traditional oversight roles.

Today, three great public university systems – Michigan, California, and Minnesota – are in desperate disarray over efforts by political regents to assert control over traditional academic

functions. It is a very serious situation, so far without significant opposition or public outcry.

The success of the research venture, spectacular though it has been in many respects, has been mixed. Where there are small production units and tightly bounded problems, the returns have been extraordinary. Perhaps the success of biomedicine is the best example.

For the big problems that societies have to solve – violence, poverty, environmental deterioration, the economics of health care – university research has been much less successful. I suspect that two explanations for this may be valid. One is that the funding system has strengthened departments, making interdisciplinary work more difficult. The other is that the very system of making grants defines areas too tightly.

Finally, the legacy of *Science: the Endless Frontier* has been to alter life irreversibly for faculty members, especially in the sciences. The new order has added immeasurably to their productive capacity, but it has also attenuated their institutional loyalty. Faculty are more peripatetic. Their membership in the invisible international academies of their disciplines is far more weighty in their lives than their attachment to their own university and their students. It is this disengagement that caused Henry Rosovsky, concluding his second term as Dean of the Faculty of Arts and Sciences at Harvard, to speak of the secular decline in civic consciousness of his distinguished professorate.

Now I return to the problem of the American public's troublesome disaffection with higher education. First I will summarize it, then suggest some resolutions. The problem is that we are seen as not occupying a central role in solving the big problems, as overbalanced in our emphasis on esoteric research, and worst of all, as failing in our duty to educate our sons and daughters. In short, even considering the benefits we have gained in the past 50 years, we need to worry about the costs.

Can those costs be reduced without giving up the benefits? I think that the resolution depends, in the end, on a pretty simple principle that rests on a notion about

intergenerational equity, a notion very much built into the Bush proposition as it was originally put: we need to return students to the center of our institutional concern.

The argument for this is not a kind of moral abstraction, it is intensely practical. It is very difficult for me to think of an academic scientist, even among the most distinguished colleagues I have had, who has not contributed more through the students he or she has produced than through his or her own work.

That is how we progress: by finding people with capacities greater than our own, filling them partway with what we have to offer, and then watching them go off and go farther than we have been able to do. They, more than the innovations begun in the labs where they were trained, are the mainstream of technology transfer.

It is people, not things. In practical terms, shifting our gaze does not require a disengagement from research. But it does require abandoning the idea that advanced students are there primarily to serve contemporary ongoing research programs. On the contrary, they are there to develop their own capacities, which they will do best if permitted much more choice and control, and given a broader education than is now the case in most university science departments.

William James once referred to the Ph.D. octopus. Times haven't changed much. We are requiring a degree well-designed for one set of things, giving it to people, and watching them go out and do another set of things. It is remarkable to me how we could have gotten into the situation we have with respect to the market crisis our graduates are confronting.

In the 1960s and early 1970s, those of us with active research programs thought we could turn out a Ph.D. every year or two, totaling up to maybe 15 or 20 over a long career. Did we really think that this employment sector was going to increase by 2000 percent in one generation? Had you posed that question then, anybody would have said, "of course not."

We created that excess with the encouragement and enthusiastic support of government policies and funds. Now we have to rethink our rate of production. One of the difficulties

is that replacement is happening too slowly. Universities are in a kind of academic gridlock in which resource constraints and retirement disincentives are combining to block a generational transition. That is unfortunate, because the young people who are surviving this experience and getting the few positions that are available in the research universities are extraordinary. They are the best we have ever seen.

That brings me to a concluding recommendation. The most promising route to constructive institutional change is, in fact, to change the players. We are confronting an alarming problem in an aging science faculty that will not quit. In the past two decades, the average age of faculties of most research universities has increased by somewhere between six and eight years.

I promised you another meaning for the endless frontier metaphor. It is this: my cohort of academic scientists, this group of aging buckaroos, has been riding through the golden age of the frontier. We have passed through the fence that was called mandatory retirement until the Congress busted it, and we're headin' for the sunset, defined contribution retirement plans in hand. There's every incentive to stay in the saddle. So happy trails, partners. The frontier may be endless in more ways than one.

To rescue our successors from discouragement and broaden the influence of science in the larger society, we need to change graduate education for our best students. We need to open up some different opportunities for the very good others. Above all, we need to put the next generation at the center of our concern. And the best thing we may be able to do for 'em, partners, is to get out of the way.