KEYNOTE ADDRESS

by

Suzanne Walker
Dept. of Microbiology and Molecular Genetics, Harvard Medical School

[Note: Some of the information below was obtained from documents posted by the Association of American Universities.]

When I was asked to speak about why research matters, the first thoughts that came to mind related to the benefits of research for students, which I think are considerable. Research is a fundamentally different intellectual activity from what I am going to call "book-learning" for lack of a better word. Book-learning is what students spend most of their early formal education doing. Book-learning is about the preservation and propagation of knowledge and systems of thought. It provides the intellectual foundation for doing research, but it is not research. Research is the discovery of new knowledge; of new ways of understanding ourselves and the world around us; it provides new frameworks for interpreting observations and events. Research is creative, not conservative. It forces students to go beyond what they or anyone else already knows to accomplish something new. In order to succeed, students must learn to grapple with uncertainty. Research encourages creativity in a way that book-learning alone simply cannot do, and there is no substitute for it.

There is another important way that research benefits students. Research involves the expectation – the necessity – that students do something new and original. Although faculty advisers play a key role in most research projects, no research project involving a student can succeed unless that student takes charge and drives it forward. What that means is that the research process forces a change in the teacher-student relationship; it puts the two parties on a more equal footing. The "book-learning" relationship, as practiced at most levels and in most places, is strictly hierarchical. The research relationship is not, at least not ultimately, and it should not be. The faculty adviser may know more than the student, and certainly does initially, but the student who is doing the research is on the front line in the search for truth. The adviser looks at data and provides guidance, but is dependent on the student's experiments, observations, and decisions. Furthermore, what faculty advisors hope for, and what students should strive for, is that through the process of doing research, students will arrive at the point where they know better – or at least faster - than their advisors what to do next and are able to explain why.

Obviously, getting to that point requires considerable initial attention on the part of faculty advisors. That means the students benefit doubly in the research relationship. First, they benefit from the individual attention that is necessary to launch them, as it were, and second, they benefit through experiencing a more equal intellectual relationship with their mentor.

I believe the creativity and ability to deal with uncertainty that research fosters, combined with the double benefits of a successful relationship with their advisor, prepares those students who participate in research to be leaders – in academia, in high-technology industries, in government, and in their communities.

In thinking more about what I could say that would be interesting on the subject of research, I began to do what I imagine any Professor would do in my shoes. I began to research the subject of research in universities. (Here by research I simply mean to examine the subject more deeply – by reading). One of the things I learned is that the ideal of the research university was first articulated in Germany by a man named Wilhelm von Humboldt in the early 19th century. Von Humboldt was a German nobleman and he became the Prussian equivalent of the minister of education in 1809. He was responsible for establishing a university, and it was then that he articulated the idea that the duty of a university is *not* to train students for specialized jobs – not to provide what one might call "vocational training" -- but to search for "the truth" in both science and the humanities. He believed that there should be a union of research and teaching; that professors who teach should themselves be researchers, and that they should pursue their research interests free of Government interference. He believed that students should have both the freedom and the opportunity to choose their course of study. In von Humboldt's university, teacher-scholars would engage in research and teach the results of that research to students who were independently trying to develop an understanding of the world around them. In other words, von Humboldt recognized and supported the participation of students in the research university.

Oddly enough, although these ideals were articulated in Europe, they have reached their fullest expression in the research universities of America. Von Humboldt's ideas directly influenced how research universities in America were built, and students from all over the world now come to America to study because there are not many places that have been able to fuse cutting edge research with education so successfully. There are not many places that offer students the freedom to do original research, to ask new questions and take new risks in an intellectual journey that will lead, to quote *Star Trek*, "where no man has gone before". Everyone at this symposium is participating in a process that is both relatively rare in the world and extremely valuable in an educational sense.

Okay, you may be saying to yourselves, "I can see that there are long-term benefits for a society to have students who are creative and who have learned through the research process to think independently. That may in itself justify research in a university setting. But America is also a practical country, and so one must ask whether research contributes in a more direct way to society."

Well, I have some interesting facts for you.

First, 54% of the basic research done in America is done in universities. That, to me, is an astonishing number. Industry obviously spends more on research and development than universities do, but the emphasis in industry is on development, not on basic research. There are a number of reasons for that – the most straightforward being that companies need to balance the risks they take in research with the short-term gains they are likely to receive. The need to do that forces companies into a more conservative position than is optimal for making radical innovations. But without research that leads to radical innovations, we cannot continue to lead the world in science and technology, and we cannot make progress as a society. In America, research universities play a major role in filling the gap left by industry. Research universities are the leaders in innovative research.

To give you a sense of the things that has come from America's research universities in the past century:

- The first recombinant DNA technology. Recombinant DNA underlies the genomics revolution that is changing the scientific and medical landscape. It has also opened the door for the biotechnology industry and has led to all kinds of useful new drugs and therapies that are based on polypeptides.
- Satellite camera technology – useful for space exploration, weather forecasting, and, of course, spying on our enemies, which is, in fact, an important thing to be able to do. (Unfortunately, as we learned with Iraq, the images we collect of enemy activity do require appropriate interpretation. Perhaps if more of the parties involved had had more or better training in research – in the rigorous and precise analysis of data – the outcome would have been different.)
- University research also led to the development of global positioning systems, which are important militarily (and which also, if you are directionally challenged and have a fancy enough car, can keep you from getting lost as often).
- The first digital computer was developed in a university, and advances in computer technology continue to be made in universities.
- The Salk vaccine that led to the eradication of polio was invented in a university.
- Other vaccines – one for meningitis, for example – were also developed in universities, and universities continue to play roles in the area of vaccine development.
- Universities developed the first long-term dialysis technology to treat chronic kidney failure.
- The antibiotics bacitracin and streptomycin were discovered at universities and they are still in use today. The first synthetic insulin was made in a university.
- Pap tests and prostate specific antigen tests were developed at universities. I noticed that one of the posters today continues that tradition – it deals with a model for prostate cryoablation.
- Alimta – a drug to treat a form of cancer (malignant mesothelioma) caused by exposure to asbestos was discovered at a research university. That drug, which was developed by Eli Lilly and was launched just a couple years ago, came out of the laboratories of a colleague of mine named E. C. Taylor at Princeton University.

These contributions only represent a partial list of discoveries that have originated in universities!

Many of you may find it easy to see how scientific research in universities can lead to medical and technological innovations, but what you may not appreciate is that universities play important roles in other ways. For example, university-led research showed that Freon in aerosol cans damages the ozone layer – and the United States banned fluorocarbons in aerosol cans as a result. University research showed that lead-based gasoline causes pollution that is harmful to health, and that research that led to changes in policy regarding gasoline use. I contend that this kind of research would not be done in a company because it is not directed towards a product that makes a profit—in fact, the regulations that emerged from the studies on Freon and lead-based gasoline cut into short-term profits. But the rigorous evidence provided by universities about the effects of these pollutants was simply too compelling to ignore. These examples show that research universities play a leading role in society not just because they educate students to be future leaders, not just because they carry out innovative research that leads to technological innovations and medical advances, but because they carry out research that is fundamentally important to our survival on this planet.

University research also led to the development of a computer system allowing quadriplegics to operate basic devices, read books, and manipulate their environment in various ways. Without university research, would this have been done?

Universities also did the first research into educational inequality and provided studies that formed the basis for the Head Start program. I noticed that WSU is continuing in this tradition: the first talk that will be given today deals with the impact of socioeconomic status on academic achievement. One of the major challenges that universities everywhere have a responsibility to think about is how to make education accessible to everyone. There are an enormous number of children in this country who live in poverty, and we cannot call ourselves the land of opportunity unless we provide opportunities – and the means to succeed -- to children of all economic backgrounds.

I noticed there are also some posters related to gender issues, including one from the department of sociology on the persistent gender-pay gap. Gender has been much on my mind lately as a result of comments made by the President of my university about why there are so few women in science. His comments suggested a need for more research in this area. I want to point out, however, that universities have historically played a major role in research that has led to new interpretations of gender roles, which have in turn led to changes in policy that have equalized opportunity for men and women. I was born before the passage of Title IX in the early 1970s, and although many people think that Title IX is about equal opportunity for boys and girls in sports, it actually makes no specific mention of athletics. It is about equal access to all kinds of educational opportunities. When I was growing up, there were enormous barriers to women in education. Women could not apply for Rhodes Scholarships and other prestigious fellowships. There were unofficial quotas in medical school admissions nationwide that limited the numbers of women to about 15% or less. Women teachers had to stop teaching when they got pregnant. Married women were not accepted to some professional schools, including many nursing schools. Partly as a result of university research and university action, things changed. Some universities, including Princeton and the University of Virginia, (which believe it or not excluded women until the 1969 even though it is the major state university) opened their doors to women. The subsequent passage of Title IX opened more doors in all kinds of areas nationwide, but without universities providing the scholarship that led to new frameworks for thinking about gender roles, and without some universities explicitly recognizing their ethical (and practical) responsibilities to ensure equal access to education, a nationwide policy might not have been implemented so quickly. This is another example of how university research and behavior helped to influence government policy to promote changes that I believe have been beneficial for society.

So I would say, yes, that after looking into what has emerged from University Research, I am more convinced than ever that America would not be where it is without the Research University. Furthermore, the complexity of the world is such that we need to preserve and if possible expand the role of the university because we face enormous challenges in the coming century, and I don't think we want to leave the solutions up to business and the government alone. I believe that universities play a key role in the system of checks and balances that keeps our country humane.

Okay—
I'm going to read a quote: this is by Stanley Fish, the former Dean of the University of Illinois at Chicago and an eminent scholar in his own right. These words come from an editorial published in the New York Times on May 21 of last year.
"Marx famously said that our job is not to interpret the world, but to change it. In the academy, however, it is exactly the reverse: our job is not to change the world, but to interpret it.

Don't confuse your academic obligations with the obligation to save the world."

Dr. Fish also advised: *"[A]im low and stick to the tasks we are paid to perform."*

I think the editorial was partly inspired by the last presidential election, which got pretty heated. I know there were lots of discussions in classrooms around the country about the political situation and there were lots of discussions outside the classroom about whether the discussions going on inside the classroom were appropriate. I don't want to comment on that because it is behind us now, but I do want to comment on Stanley Fish's statement: *it is not our job to save the world*. I think you can pretty much guess by now that I disagree with that statement. I think that whatever endeavor in which you are engaged in life, it is a part of your job as a human being to contribute in whatever way you can to the betterment of society and the world. The research university provides a forum for trying to do that in all kinds of ways, large and small. And academic freedom – the freedom to choose research ideas and areas -- must be preserved because, to be frank, we don't always agree on what it means to make the world a better place.

I will also add that Stanley Fish's comment: "It is not our job to save the world," suggests that Dr. Fish does not understand either the role of research in the American university or the fact that students are a fundamental part of the research university. When he said, "It is not our job to save the world," he was talking about "We the professors". He was not talking about the collective "We" of the university. In the research university, that collective "We" includes the students who are doing research. They are an absolutely essential part of the effort to discover the new truths, the new interpretations, the new inventions, and the new worlds.

So, I would say to you that our job in research *is* to try to help save the world by doing something new that leads to betterment, progress (whether medical, social, psychological, ethical), a better understanding of ourselves, a better computer, a better understanding of the past, or a better drug. Research moves slowly and so most of us have a hard time connecting what we do to save the world, but I believe that every new discovery counts. And the only way to make new discoveries in the context of a university is to participate in research.

I want to end by mentioning a couple of the challenges for research in the 21st century. I would put computer technologies and the ramifications of living in a computerized world near the top of the list. Computers literally affect every aspect of how we live and learn, and in many respects they have changed the world for the better. Anyone with access to the Internet can find information rapidly on virtually any subject. This is a tremendous boon to learning, but it also comes with it some responsibility for figuring out how to use the technology and how to expand access to everyone. I noticed that one of the talks to be given to today take on this challenge, the subject is how to transition virtual training into the real world.

A downside of living in a computerized world, of course, is that all our personal information is computerized, and there are issues related to how to keep some of that information private. Another downside is that the dependence on computerized networks creates infrastructure weaknesses. In a world where the possibility of cyber crime exists, we need to figure out how to keep certain types of data networks completely secure. I noticed that one talk given today will address issues of security in data networks at airports.

For me, computer technology also raises identity issues – what does it mean to live in symbiosis with a machine? Someone today is talking on how absurdity in Kurt Vonnegut's fiction influences reality. Kurt Vonnegut has a lot to say about the absurdity of virtual reality and points out, "We become what we pretend to be, so we must be very careful who we pretend to be." My point here is that we need people who can stand back and provide a framework, a perspective, on the world we live in because you can't see clearly if you can't see things from alternative perspectives, and that's true in science as well as every other area of human endeavor.

Another major area where universities will play a role in the 21st century is sustainability – of resources, of our environment, of culture, and of institutions. I talked a little about how universities have had an impact on policies that led to beneficial changes for the environment – banning Freon in aerosol cans, banning leaded gasoline. Universities are currently at the forefront of the global warming debate – and that debate will continue, and should, for the foreseeable future. Universities are also at the forefront of thinking about alternative energy sources. One talk this morning deals with wind power, and I think that one of the major roles that universities can play is in helping develop alternative and sustainable sources of energy because our current economy is based on non-renewable energy sources, which, by definition, are not sustainable.

Natural resources and environmental quality are not the only things we need to sustain, of course. Universities will play an essential role in preserving cultures and languages as globalization threatens to obliterate identities, but at the same time they must train students to see beyond regional and national borders because globalization means that the human race has a global identity. Our lot as Americans is intertwined with the lots of the rest of the world, and we will move up or down together. There are several talks and posters from the Departments of Psychology, Anthropology, Sociology, and English that deal with interpretations of events, of texts, of individual behaviors. I believe this kind of research provides the training students need to think critically about personal, regional, and national identities and interests in the context of a global world.

I hope I have convinced you that research – research of all kinds – plays a vital role not only in the education of students, but in the progress and in the protection of the world we live in. It is our role to observe and interpret that world and, where necessary, to push to make that world better.

Thank you all for coming. There is a great day ahead.