

INTRODUCTION AND OPENING REMARKS

Dr. George Langford, Chair of the Education and Human Resources Committee of the National Science Board, opened the proceedings by outlining the major goals for the workshop. Dr. Langford placed the workshop into context by presenting statistics regarding the number of minority students in science and engineering. He then challenged audience members to consider questions on how to bring together a diverse population of both faculty and students to broaden participation in science and engineering research and education.



Hello and welcome. I am delighted to see all of you here today to participate in the broadening participation workshop. We have over 100 registered guests, not counting the numerous NSF staff that are in attendance today. Thus, we have an excellent group of individuals to talk about some very important issues facing the nation. The ideas and issues identified at this workshop will guide the development of a set of recommendations by the Education and Human Resources Committee¹ for presentation to and approval by the whole Board. This is not a workshop about National Science Foundation programs *per se* but about ideas to guide policy development that will lead to new program development.

This workshop has two major objectives. The first is to celebrate the progress that we have made in broadening participation in the science, math and engineering fields by women and persons of color. Our universities, in fact, have made significant progress and it is something that we can be very proud of. The second objective is to identify strategies to achieve faculty diversity at our colleges and universities. We would like to find ways to bring about structural changes at universities: changes that will lead to the hiring and retention of faculty of color in the sciences.

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Most institutions have up to 30-35 percent students of color at the undergraduate level. So not only have universities achieved significant progress in student diversity, our institutions have developed programs and have staffed offices to facilitate the success of students in the academic disciplines. For example, Jim Wright at Dartmouth College established an Office of Pluralism and Leadership² a couple of years ago and this office has full-time advisors for students, minority students, Asian students, Hispanic,

African American, Native American, gay, lesbian, bisexual and transgendered students. This is a far cry from the early days when students of color arrived on our campuses. The recent Supreme Court decision and the ruling in the Michigan Case, should keep us on course for the near term. Furthermore, because of the changing demographics in the country, we anticipate that the percent of students of color on our campuses will grow.

The numbers that I have seen estimate that the percentage of students of color will climb to about 40-45 percent within a decade or two. So this is all good news for us. We have made significant progress at the NSF and federal agencies have played a significant role in this achievement.

On the other hand, the numbers for faculty of color continue to lag behind those for students and this lag is not due to a lack of trying. It is quite clear to me that universities have found successful strategies for achieving student diversity but have failed to come up with a successful strategy for hiring and retaining faculty of color. The lack of faculty of color, I think, is linked to another unfortunate trend on our college campuses. Whereas about a third of white students major in the sciences, the percentage is closer to 15 percent for students from groups that have been traditionally underrepresented in the sciences. For Hispanic, for Native American, for African American students, the percentage expressing an interest in science upon entering the university is about the same as for whites. However, the number who actually choose to major in science is less by a factor of two.

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This trend away from science and engineering is a significant concern as the relative numbers of minority students increase on campus. We have to get those numbers up.

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To achieve a diverse workforce in the sciences, we need a diverse faculty at our liberal arts colleges and at our research universities. Students have to be cajoled and pushed, encouraged and followed, shown role models and successful career paths to enter the sciences. Unfortunately, what students too often find is disinterest and sometimes suspicion that they are not quite up to the task. One minority faculty is not going to do it. I was hired at Dartmouth in 1991 and I remain the only faculty of color in the science division including chemistry, biology, physics, computer science, geosciences. There is one colleague in the math department.

How do we provide incentives to our faculty to diversify? What

are the structural barriers? Why have universities succeeded at the undergraduate level but failed at the graduate student level, I should mention as well as at the faculty level? What policies can federal agencies such as the NSF put into place to change the culture and the hiring practices of university faculties? We have with us today a stellar group of panelists sitting around the table with me. I am absolutely thrilled at the group who have agreed to participate, to share their ideas at this very important workshop and I want to thank each of the panelists for agreeing to do so. We can all anticipate a lively and substantive discussion of these issues.

I have a lot of people that I want to thank for help with organizing and implementing this workshop. I want to thank Dr. Warren Washington, chair of the National Science Board, for his support and encouragement for this effort. Warren has a key personal interest in the topic of this workshop and his support is greatly appreciated. I want to thank the members of the Education Human Resources Committee for their help in planning the workshop. This wonderful list of panels that we have here came through recommendations from the Committee.

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I also want to thank the other members of the Board for their support and guidance during the planning phase of the workshop and thanks also for being here today. I want to thank the NSF management and staff; Drs. Colwell and Bordogna were on board with us from the very start of this effort. Rita has placed education and the workforce high on her priority list and she has advocated for the inclusion of women and minorities in science from the day she assumed the directorship of the National Science Foundation. Thank you very much, Dr. Colwell.

Dr. Bordogna was so enthusiastic that we drafted him to be one of the panel moderators. Joe speaks about these issues from personal experience and there is no stronger voice for broadening participation than his. I thank you, Joe. The real work of putting on a workshop like this one falls on the shoulders of the NSB's office personnel and we at the NSB are very fortunate to have a very competent and dedicated staff. The person who took on the lion's share of the work was Dr. Robert Webber. You all got lots of emails and communications with Bob. I have put on a few workshops in my day and I have never had a more competent and efficient person to work with in organizing a workshop. I thank you very much, Bob. There were other people in the NSB office³ as well and I am pleased to recognize their contribution to this effort.

I now have the pleasure of introducing the Director of the National Science Foundation, Dr. Rita Colwell.

¹ National Science Board. Active Committees. Education and Human Resources Committee, <http://www.nsf.gov/nsb/committees/ehrcmte.htm>

² Dartmouth College. Office of Pluralism and Leadership, <http://www.dartmouth.edu/~stulife/StuLifeDiversity.htm>

³ National Science Board Staff, <http://www.nsf.gov/staff/subdiv.cfm?key=27>

***Dr. Rita Colwell**, Director of the National Science Foundation, discussed some of the challenges and successes of the NSF. Dr. Colwell pointed out that while the United States has trained scientists and engineers from around the world in its first-rate academic institutions, there remains an untapped resource of “home grown” talent, including underrepresented minorities, women, and persons with disabilities. Having discussed the importance of science and engineering for shaping innovation and the progress of ideas, Dr. Colwell concluded by stating that if each of us realizes the importance of broadening participation in the science and engineering workforce, then, “we will be on our way to creating a new generation of scientists and engineers with the capability to lead us into the future, whatever it may hold.”*



Thank you and good morning to all of you. My assignment today is twofold. First, I am delighted to welcome you on behalf of the National Science Foundation. We are honored to host this distinguished group that has gathered here today to address an issue of vital importance to the nation.

My second task is to express to you the continuing and strong commitment of NSF to our collective endeavor: ensuring that *all* the nation’s talent can reach its full potential in science, engineering, mathematics and technology.

The word “*all*” is key. For decades, the U.S. has excelled in building and sustaining institutions of higher education that attract science and engineering talent from around the world.

As a nation, we have done less well in encouraging and developing homegrown talent - our mostly untapped potential of underrepresented minorities, women, and persons with disabilities - America’s “ace in the hole” or “competitive edge” for the 21st century. For too many years, our progress has been too slow, and has come at too high a cost - a cost in lost talent and fresh ideas that we are only now beginning to calculate.

But I believe that is changing. Although broadening participation in the science and engineering is by no means a new objective, the circumstances of our times have given it new salience that strengthens year by year. A heightened sense of urgency now accompanies the task of identifying new learning and institutional

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strategies that will open the portals of science and engineering to the full diversity that is the face of America.

Education has always been vital to the success of individuals. In our knowledge-based economy, it is also an investment in our *collective* future as a nation and a society. Science, engineering and technology play an increasingly vital role in enabling and shaping progress. These realities, taken together with new demographic realities, have raised the stakes for diversity dramatically.

Our nation's future depends more and more on the quality of our new ideas, the vitality of our intellectual discourse, and the innovative use of new knowledge generated through our research and education enterprise. This is the bedrock that underpins our prospects for economic prosperity and improved well being.

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These truths of our times and our broader national values demand that we embrace the *imperative* of preparing people to take advantage of these opportunities. If we allow anyone to be left behind, we create a formula for our nation to be left behind. We are talking about opportunities not only for individuals. We are also talking about ways to create expanded opportunities for the U.S. to compete and prosper.

Thus, our overarching objective is one vital to our nation's prosperity. It is *our* collective necessity to encourage, educate, and enlist citizens into jobs and professions that drive the new knowledge economy, contribute to social well being, and safeguard the basic values of our society. That is no small task!

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Fewer of today's students are choosing science and engineering career paths. And fewer than half of those who embark on these paths, actually graduate. Among those who graduate, we hear anecdotal evidence that more are considering abandoning science and engineering to seek alternative careers. This gives a whole new meaning to voting with your feet!

We know that students face many potential hurdles to careers in science and engineering - financial, social, and cultural. But we know all too little about how these actually affect individual student choices.

Do students believe they can't break through historically prevalent glass ceilings? Are they deterred by uncertain job prospects in academic research institutions or industry? Are they choosing more lucrative learning and career paths, or ones they believe offer more scope for creative contributions?

We don't know the answers to these questions, although research is beginning to address them. The answers are likely to be highly complex and involve a mixture of these and a host of other factors.

We *do* know that minorities, women and people with disabilities face particular challenges that require greater insight to unravel and to address.

Our ability to meet these formidable challenges depends in part on our capability to renew the institutions we have designed for this purpose. NSF is one of these institutions, and so is the nation's superb higher education network - our universities, colleges, and community colleges. Industry and the non-profit sector have important roles to play as well.

To put some meat on the bones of my remarks, I will describe some of NSF's efforts to address these issues.

At NSF we are committed to identifying and supporting innovative programs to broaden the participation of underrepresented minorities, women, and persons with disabilities in the science and engineering workforce.

Our mandate to ensure the health and vitality of the U.S. science and engineering enterprise explicitly includes this responsibility. In fact, as a matter of policy, NSF returns – without review – any proposal for funding that does not address the broader impacts of the proposed work on society, including how well the activity broadens the participation of underrepresented groups.

NSF's approach is to incorporate diversity initiatives throughout NSF's scientific and educational programs. That means identifying NSF's most successful programs to encourage minority participation and bringing them together with other highly successful NSF programs.

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NSF is focusing on two particular issues – improving science, technology, engineering, and mathematics education capacity at all Minority Serving Institutions, and improving the education of all minority students and encouraging them to pursue science and engineering careers in academia, government, and industry. In our new budgets we are intensifying and sharpening these aims.

Here is one example. The Louis Stokes Alliances for Minority Participation Program⁴ (or LSAMP, as we say) has developed a number of approaches to improving minority enrollment and retention in science and engineering.

It is worth quoting some figures here, because they show what can be done with a sustained effort. Institutions receiving funds through this program have produced 174,000 minority bachelor degrees in science and engineering since 1991.

In 2001 alone, the LSAMP institutions produced 21,704 minority S&E graduates - 70% of all minority S&E baccalaureate graduates that year.

A new challenge is to develop improved strategies to recruit and retain an increasing number of these students in graduate science and engineering programs.

The idea is to weave together what are now separate but complementary efforts and to integrate these activities across and among institutions. The innovation the community brings in response to this challenge is key to moving beyond our current performance to fresher, more inclusive, more productive, educational systems.

Another example is ADVANCE,⁵ NSF's newest program to bring more women into science and engineering. ADVANCE is not limited to women; we need the efforts of *everyone* to achieve greater diversity in science and engineering. The program intends to spark system-wide changes that will foster a more positive climate for women to pursue academic careers.

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NSF's *Workforce for the 21st Century* priority area aims to broaden participation in science and engineering through this integrative approach. In many institutions, including minority-serving ones, the focus will be on drawing elements from existing NSF programs and challenging collaborators at these institutions to

design programs that develop an innovative and seamless route of advancement for the students they serve.

Retaining promising students in science and engineering fields is a difficult challenge. We need a better understanding of the factors that influence career choices, and of the quality and productivity of the traditional and non-traditional paths that students use to prepare for or advance science and engineering careers.

We know that women and minorities face experiences - from pre-K through postgraduate - that make successful careers particularly challenging. NSF will support research to determine what experiences or strategies are most effective in realizing this objective.

NSF has a long tradition of support for innovation in science, engineering, mathematics and technology education. We will continue to build on what we have learned in the past to develop even more effective efforts in the future.

NSF has done *less* well in integrating diversity concerns across the entire spectrum of NSF programs - directorate by directorate. That is one of our *new* challenges at NSF, and one we gladly embrace.

NSF's Undergraduate Mentoring in Environmental Biology⁶ program is an example. The announcement for this year's competition, posted only a few weeks ago, emphasizes projects that increase minority participation. The field of environmental biology is one in which the need to increase minority participation is particularly acute. The larger payoff is apparent: we need diverse perspectives and experiences to guide the research and education that will help inform our environmental policies in the decades ahead.

I don't have to remind this audience that the very best ideas always come from the science and engineering research and education community. This workshop is a good example of collaborative efforts that bring together people with the passion, experience, and knowledge to set strategic directions.

NSF's competitive grants process and merit review are fundamental to eliciting and supporting the most promising new directions in research and education in the community. Our challenge is to point investigators toward significant ends, while allowing them maximum elbowroom for innovation. That is your job, and it's essential.

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As scientists and engineers, we understand the processes and values of discovery and innovation in our very bones. We know how to formulate questions, devise answers, and put them to the test. We are adept at looking for the surprising as well as the universal. These are the skills we now need to apply to our search for effective learning paths and institutional strategies that will bring minorities, women, and persons with disabilities into the science and engineering fold.

The need to develop *all* the nation's science and engineering talent demands a commitment that goes beyond policy and polemic. It will require a comprehensive and collaborative effort. That means hard work and getting things done.

If each of us recognizes the imperative to broaden diversity in science and engineering, and accepts responsibility for acting upon it, we will be well on our way toward a future in which we match excellence in research with equity in education. We will be on our way to creating a new generation of scientists and engineers with the capability to lead us into the future, whatever it may hold.

I want to assure you that NSF is committed to undertaking this challenge. We can only do so with your help. I look forward to learning more about your ideas for new directions and strategies. The challenge is formidable, but working together, we can meet it.

⁴ National Science Foundation. The Louis Stokes Alliances for Minority Participation, <http://www.ehr.nsf.gov/ehr/hrd/amp.asp>

⁵ National Science Foundation. ADVANCE, <http://www.nsf.gov/home/crssprgm/advance/>

⁶ National Science Foundation, Undergraduate Mentoring in Environmental Biology, <http://www.nsf.gov/bio/progdes/umeb.htm>