July 2, 2003

Dr. Joseph A. Miller, Jr.,
Chair, Task Force on National Workforce Policies for Science and Engineering National Science Board
The National Science Foundation
4201 Wilson Boulevard
Arlington, Virginia 22230

Dear Dr. Miller:

On behalf of the Association of American Universities (AAU) and the National Association of State Universities and Land-Grant Colleges (NASULGC), we write to commend you and the National Science Board (NSB) Task Force on National Workforce Policies for Science and Engineering (S&E) for the draft report that was released for public comment on May 22, 2003. The draft report lays the foundation for a constructive and critically important discussion about the role of the federal government in helping understand and then to develop and implement policies to meet our nation's current and future S&E workforce needs.

We especially applaud this statement contained in the draft report: "The Federal Government and its agencies must step forward to ensure the adequacy of the U.S. science and engineering workforce. All stakeholders must mobilize and initiate efforts that increase the number of US citizens pursuing science and engineering studies and careers."

As stakeholders in the adequacy of the U.S. S&E workforce, we look forward to working with the NSB, the National Science Foundation (NSF), other federal agencies, and non-governmental stakeholders to achieve the policy goals laid out in the draft report. It is in this vein that we offer the following specific comments to the report's five major findings and recommendations.

<u>1) Undergraduate Education in S&E</u>: The report recommends that the federal government direct substantial new support to students and institutions in order to improve success in S&E study by American undergraduates from all demographic groups. This support would include scholarships and other forms of financial assistance; incentives to institutions to expand or improve the quality of their S&E programs in which degree attainment nationwide is insufficient; financial support to community colleges to increase the success of students transferring to 4-year colleges and universities; and funding for programs that benefit women and minorities.

Comment: The report correctly notes that the federal government has long supported graduate S&E education through fellowships, traineeships, and research grants, but that responsibility for development of the S&E workforce at the undergraduate level has largely been shouldered by the states and public and private institutions of higher education. Unfortunately, state funding for higher education has declined dramatically in many states in recent years and, as a

result, institutional support has been threatened. The federal government has a legitimate interest in and responsibility for workforce development, and we strongly support the finding and recommendations contained in this section of the report.

In addition to the specific recommendations in this section of the report, we would add the following:

- We support the growth and expansion of existing NSF undergraduate programs such as the Research Experiences for Undergraduates (REU) and the new programs created in response to the recently enacted "Technology Talent Act." These grants support researchers and campuses that are working to involve undergraduates directly in research early in their college careers. Additional resources should be devoted to the evaluation of the effectiveness of such programs in helping to retain students with an interest in pursuing scientific and technical degrees.
- We suggest that a new program or programs be established administered directly by the NSF or the multiple federal agencies that support science to provide scholarships to the best and brightest graduating high school students and/or current undergraduates. The scholarships could be modeled after the current graduate fellowship program administered by the NSF. It is worth noting that the recent program created by the new Department of Homeland Security S&T Directorate includes an undergraduate scholarship program in addition to the graduate fellowship program. Other federal agencies with major scientific responsibilities and interests would be well served by adopting the DHS model.

<u>2</u>) Advanced Education in S&E: The report recommends that federal support for research and graduate education promote a wider range of educational options. These would include federal stipends and benefits for graduate students and postdoctoral students that are competitive with opportunities in other venues, as well as support for investing in innovative approaches to doctoral and masters education that prepare students for a broad range of careers in academia, government, and industry.

Comment: The federal investment in graduate education fills the same crucial funding gap that federal support provides for basic research. Talented students with master's or Ph.D. degrees are a highly mobile national resource. For that reason, states are reluctant to invest in graduate education. When the federal government makes the investment, the nation reaps the dividends regardless of where in the country the recipient of the assistance ends up working. Further, many graduate students have borrowed heavily to finance their undergraduate educations. Without support from the federal government, many of these students will not choose to pursue or will be unable to afford to complete a master's or Ph.D. degree. Federal support for graduate education must be at a level that recognizes students' economic choices and makes pursuing an advanced S&E degree a viable option for them.

In 1998, AAU released a report on graduate education which said, "We wish to affirm the importance of federal support of graduate education and the sound grounding of that support in the national interest. The federal government provides extremely valuable support for graduate

education through competitively funded fellowship and traineeship programs, research assistantships funded through the federal research project grant system, and student loans that augment and fill gaps in other sources of financial support. Although some adjustments may be warranted in the balance among these support mechanisms, all these forms of support meet important needs in graduate education and should be continued." We continue to support this conclusion today.

In addition to the specific recommendations contained in this section of the draft NSB report, which we endorse, we would encourage additional recommendations that would:

- Further highlight the role that direct federal research support plays in support of graduate education. While the current draft report speaks to the importance of federal stipends, an equally important source of support for graduate students in S&E comes through federal research grants, out of which research assistantships are provided. As noted by RAND in a paper that was presented to the National Academies CUIRR Pan-Organizational Summit on U.S. Science and Engineering Workforce in November 2002, one of the most direct strategies to address S&E workforce shortages would be to "steadily and predictably increase federal research obligations for the S&E fields of concern." Notes the report, "There is nothing so directly under the control of the federal government as its budget, and probably little that has so direct an effect on the attractiveness of an S&E career."
- More prominently highlight postdoctoral education within the text of this recommendation. While the sub-recommendations of the report speak to postdoctoral education, we suggest that it be included in the text of the primary recommendation so this reads "Federal support for research, graduate and *postdoctoral* education should ..."

<u>3) Pre-college Teaching Workforce for Mathematics, Science, and Technology:</u> The report recommends that in partnership with other stakeholders, the federal government increase efforts to attract and retain an adequate cadre of well-qualified pre-college teachers of mathematics, science, and technology. This should be done through compensation comparable to other trained S&E professionals; increased recognition as a valuable part of the S&E professions; expedited teacher certification for scientists and engineers; and integrating faculty and curricula of schools of science and engineering with schools of education.

Comment: We support the report's recommendations on teacher education. In June 1999, AAU presidents and chancellors approved a resolution on teacher education that encouraged member institutions to more fully integrate teacher education and professional development programs into the rest of the university; explore the development of sound alternative certification routes for those working in other professions; make more research experiences available to current and future elementary and secondary school teachers, especially in the areas of math and science; better utilize institutional research capabilities to improve teaching and learning in teacher education programs; and provide the kind of educational experience to all students that would attract more of them, including those who have not been advantaged by present systems, to teaching as a career option.

In October 2001, AAU held a Teacher Education Forum in which teams from a number of member universities spoke of ways they try to integrate faculty and curricula of schools of science and engineering and the schools of education. The topic remains current and continues to be of interest to many of the deans of education at AAU institutions.

Concerning the specific recommendations contained in this section of the NSB draft report we would recommend that:

• An additional recommendation be added which focuses on the need to provide federal programs and resources that would help enable existing pre-college math and science teachers to receive additional training. Such programs might allow teachers to spend a summer working directly with researchers on projects in the National Laboratories or at universities.

4) U.S. Engagement in the International S&E Workforce: The report notes that during the current reexamination of visa and other policies concerning the mobility of scientists and engineers, it is essential that future U.S. policies strengthen the capacity of U.S. research universities to maintain their leadership in S&E education; support opportunities for U.S. students and faculty to participate in international education and research; and maintain the ability of the U.S. to attract internationally competitive researchers, faculty, and students, while accommodating national security concerns.

<u>Comment</u>: We strongly agree with and support the recommendations contained in this section of the draft NSB report. They recognize the need for us to continue to attract the best and brightest foreign talent to our universities and to allow American students and faculty to participate in international S&E education.

Today, higher education and science are international activities and require international participation. If the U.S. is to remain the world's leader in higher education, science, engineering, and technology, it cannot conduct its scientific efforts in a vacuum devoid of international participation. To this end, the nation must have a visa system that is secure, timely, efficient, transparent, and predictable and that will also permit educational and scientific exchange and collaboration. We therefore fully support the recommendations contained in this section of the report.

<u>5) The Knowledge Base on the S&E Workforce:</u> The report recommends that the federal government increase substantially its investment in research to understand the dynamics of the international S&E workforce. It also should lead efforts to build a base of information on the status of national S&E skill needs and strategies for attracting high-ability individuals to S&E careers.

Comment: As the report notes, most of the current strategies for addressing the S&E workforce are based on incomplete understandings of the S&E workforce as a whole. AAU agrees that having a greater understanding of the variables and interrelationships would help avoid policies and strategies that are ineffective or that unintentionally undermine the health of U.S. science and engineering.

In conclusion, we appreciate having the opportunity to comment on this report and look forward to seeing the final version when it is completed. We also look forward to continuing to work with the NSB, NSF, OSTP, and others to better understand and to address the S&E workforce challenges that confront our nation.

Cordially,

Nil beaulur

Nils Hasselmo President Association of American Universities

C. Reter Magnett

C. Peter Magrath President National Association of State Universities and Land Grant Colleges

 Cc: Dr. John H. Marburger, III, Director, Office of Science and Technology Policy Dr. Rita Colwell, Director, National Science Foundation Dr. Judith A. Ramaley, Assistant Director, Education and Human Resources, NSF Dr. William Berry, Director, Basic Research, Department of Defense