Office of Science and Technology Policy
Grand Challenges of the 21st Century: Request for Information
April 13, 2010

The Council of Graduate Schools (CGS) is pleased to respond to OSTP's Request for Information on the Grand Challenges of the 21st Century. We believe that our nation's graduate education system is a strategic national asset that must be engaged and enhanced as part of any national strategy to strengthen our innovation and competiveness in the global economy.

CGS is the only national organization dedicated solely to the improvement and advancement of graduate education and research. Its membership includes over 500 colleges and universities in the United States that are engaged in research, scholarship, and the preparation of candidates for advanced degrees. Among U.S. institutions, CGS members award 95% of the doctoral degrees and 78% of the Master's degrees.

We understand that this request is designed to gather input related to the President's Strategy for Innovation with the goal of moving toward sustainable growth and the creation of high quality jobs.

The Strategy for Innovation notes that education and the creation of a world class workforce are primary building blocks that support innovation and the creation of high quality jobs. In this statement, we urge OSTP to consider the role of graduate education in developing the talent needed to produce the next generation of knowledge creators and the highly skilled workforce necessary to compete effectively in the world today and into the future. We specifically urge OSTP to recommend targeted investments in graduate education at both the Masters and Doctoral levels.

The Role of Graduate Education and Current Threats

For over half a century, the U.S. has benefited from its commitment to graduate education and research. We have produced the vast majority of all doctoral degrees conferred globally. For decades, our graduate schools have been considered to be the best in the world, attracting the top U.S. and international students by creating dynamic programs that foster scholarship, research, and scientific discovery. Over half the Nobel Prize winners in chemistry, physics, medicine, and economics since 1997 received their graduate degrees in the U.S.

However, there are a number of factors which together have begun to threaten our pre-eminence in higher education, especially at the graduate level. We are not preparing enough of our domestic talent pool; the percentage of U.S. students pursuing graduate study in science and engineering is declining, due in part to financial considerations. The proportion of American citizens receiving doctorates in science and engineering has dropped by 23% over the last 30 years. At the doctoral level, inadequate financial support is the most significant factor associated with failure to complete the degree.

Demographic trends present long-term challenges for graduate degree production. While 8% of U.S. working adults have earned a graduate degree, the number is much lower for underrepresented minorities: only 5% of African-Americans and 3% of Hispanics – the fastest-growing population group – have a master's or doctorate.

Additionally, the current generation of senior researchers, scientists, and faculty are approaching retirement. Current graduate school enrollment rates, especially in science and engineering, indicate that our capacity to replenish the retiring workforce is uncertain.

But mere replenishment, if achieved, is not adequate. We will need to greatly increase the number of domestic students pursing and completing graduate degrees to develop all the talent available to us if we are to even maintain the nation's current technology development and innovation capacity. College students, and even those younger, can be inspired to pursue graduate education if they are made aware of a wide spectrum of fields and the variety of exciting career opportunities available to graduate degree holders and if adequate financial support is available.

The International Environment

In certain key fields, particularly the physical sciences and engineering, we have been able to maintain our competitiveness by attracting top international students, who currently comprise over half of graduate enrollment in engineering and 16% of total U.S. graduate enrollment overall. International students perform groundbreaking research and contribute to mutual cultural understanding. Nearly three quarters of foreign doctoral recipients remain in the U.S. and contribute to our economy. Those who return to their home country often assume leadership positions and impact public diplomacy positively. They also help maintain the excellent reputations of U.S. graduate schools through research, teaching, public service or business innovation.

However, there is increasing competition for these talented students, as other countries and regions of the world are making investments in graduate education as part of their economic development strategies. The U.S. remains the top destination for international students, but our share of the global market has shrunk.

In 2000, for the first time, Europe produced more doctorates in science and engineering than the U.S. did. The countries that have traditionally been the largest sources of international graduate students in the U.S., China and India, are making substantial investments in their own graduate education systems. Based on trends last recorded in 2006, it is likely that China has now surpassed the U.S. in the annual production of doctorates in the natural sciences, mathematics, and engineering.

U.S. National Innovation Strategy

Our ability to address grand challenges of the 21st century as outlined by the Administration requires a national strategy and sustained commitment to develop human capital. Support for graduate education must be a key component of such a strategy.

The Administration has demonstrated a commitment to graduate education and its relationship to innovation and the development of a highly skilled workforce. Specific initiatives that we support include:

- The proposal to triple the number of new NSF Graduate Research Fellowship (GRF) awards made annually by 2013. The Administration's Fiscal Year 2011 budget, which proposes a 16% funding increase for the program, would maintain this trajectory.

- The RE-ENERGYSE program, a new partnership between the Department of Energy and NSF that will include graduate fellowships for both masters and doctoral students in clean energy fields. The Administration's FY 11 budget proposes funding for the program at both agencies. CGS believes it represents exactly the type of multidisciplinary research required to address grand challenges.

The humanities and social sciences play a critical role in addressing grand challenges as well. Graduate education in these fields trains scholars who can think critically, interpret events, and help provide solutions to global problems that are increasingly associated with different cultures, perspectives, and values. Graduate education programs in the humanities and social sciences help ensure that our future leaders and innovators benefit from the crucial vantage points of history, foreign language and area studies, political science, sociology, and psychology, among others.

Recommendations:

CGS strongly recommends that support for graduate education be included as a key component of a national strategy to address current and future grand challenges. Specific proposals include the following:

Federal studies: There is a need for the systematic gathering of data to help address the challenges facing U.S. graduate education. Federal government support of studies aimed at understanding and elaborating possible solutions is essential to helping successfully meet this need. These studies include:

- ***Understanding aspirations and creating career pathways for students.*** The federal government should undertake a study to understand what motivates or deters students from pursuing studies at the graduate level in critical fields such as STEM disciplines and others that align with careers in areas of national priority such as energy, healthcare, climate, and expertise in understanding other cultures and regions of the world. There is a pressing need to better understand what factors influence junior high, high school, and college students' career aspirations and to provide information as well as incentives to students about careers and education pathways that lead to a desired career. There is some evidence to suggest that factors other than student preparation may be in play, such as market forces, incentives, or other drivers.

- ***Careers in the 21st century and the pathways that lead to them.*** President Obama has said the "nation that out educates us will out compete us." In order to maintain the U.S. leadership position in producing an educated citizenry, the U.S. Departments of Education and Labor should collaborate on a study to examine the country's future workforce needs in critical areas including education (K–12 and postsecondary teaching), energy, healthcare, financial services, emerging biomedical areas, and others. These results should inform a national strategy to communicate to students, families, and the general public information about educational pathways, including graduate education, that lead to careers vital to our national needs.

21st Century Graduate Education Programs:

- **COMPETES Doctoral Traineeship Program:** A new federal program to support doctoral education in areas of national need identified by the Administration should be authorized. The program would cover direct student support of $30,000 stipends plus tuition and fees, other costs of education, and ancillary fringe costs, for a total of $80,000 per student per year. Students would be eligible for up to 5 years of support. The authorization would be for 6 years to ramp up the program, beginning with $2 billion in FY 2011 to accommodate approximately 25,000 students and building up to $10 billion in FY 2016 to accommodate approximately 125,000 students as the program reaches its steady state. The size is keyed to the level of investment in research and the associated benefits that the nation derives from such an investment, as well as compensating for states' diminished commitment to doctoral education.

  Funds would be provided in response to proposals submitted by universities for graduate programs to support doctoral students in key areas. Those submitting proposals would be required to provide data, including enrollments, completion rates, and job placement information to the funding agency as part of the ongoing accountability associated with this funding.

  This program is needed to develop highly skilled talent and is essential if we are to revitalize the U.S. innovation system and keep the nation competitive in the global economy. The looming retirement of the "baby boomer" generation in a variety of fields, from technology-based industry to teaching, also motivates investments in the development of highly skilled human talent. In essence this is preparation for a succession plan for intellectual leadership in government, industry, and the nonprofit sector.

- **Master's Degree Programs for the 21st Century:** Congress should authorize a new federal competitive grant program across agencies to build capacity at universities to inspire innovation in master's degree programs and responsiveness to workforce needs. Each successful program would be required to demonstrate maintenance of enrollment, completion rates, and job placement outcomes, as well as ongoing involvement by employers to ensure that programs produce graduates for local, state, regional, and national workforce needs. Programs will be required to secure at least two thirds of program funding from sources other than the federal government.

  Universities would propose innovative new master's programs or reinvigoration of existing programs, including professional master's programs, such as the Professional Science Masters (PSM). These programs would include strategies to increase access and create an academic pathway for students who are underrepresented in master's education programs, specifically unrepresented minority students and those from economically disadvantaged backgrounds. Such programs would be eligible for supplemental grants for need-based aid. When fully implemented this program would support development of 1,000 new or reinvented master's programs, including professional master's programs, in key areas at a broad range of 4-year institutions of higher education.

Additional Recommendations:

- Support and expand existing federal graduate education programs, including those for students in humanities and social sciences
- Encourage more U.S. students to obtain graduate degrees in key fields, especially in STEM
- Support collaborations between higher education, K-12, and the private sector to offer young people exposure to graduate education and research, in order to inspire them to pursue graduate education in STEM fields
- Support interdisciplinary graduate education and research programs
- Support comprehensive immigration policies to continue to attract top international students to U.S. graduate schools. Policy reform should support a system that welcomes immigrants with advanced education, and a new visa category should be established for students attending a U.S. graduate degree program in STEM fields

In conclusion, the Council of Graduate Schools stands ready to work with the Administration to maintain our world-class graduate education system in support of addressing grand challenges.

Thank you for the opportunity to submit comments to address the grand challenges of the 21st century. For additional information, please contact Patricia McAllister (pmcallister@cgs.nche.edu or 202-223-3791).