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Interview with Arden L. Bement, Jr. Director, National Science Foundation



Arden L. Bement, Jr. became the Director of the National Science Foundation (NSF) in November, 2004. Dr. Bement has had a long and distinguished career in academe, industry, and government, including serving as director of the National Institute of

Standards and Technology (NIST) prior to assuming the helm at NSF. Dr. Bement was the David A. Ross Distinguished Professor of Nuclear Engineering and head of the School of Nuclear Engineering at Purdue University, and was a member of the National Science Board (NSB) from 1989-1995. He now serves as an ex-officio member of the NSB. Dr. Bement received his Ph.D. in metallurgical engineering from the University of Michigan. He was interviewed for this article on March 22, 2006.

Question: The role of the National Science Foundation is a special one, with recent circumstances highlighting its role. A wide variety of reports have identified significant challenges for U.S. competitiveness and innovation. It must be a gratifying time to be leading the NSF with the strong budgetary support contained in the President's American Competitiveness Initiative. Could you discuss your thoughts about the influence of this proposed agenda for next year and into the future?

Dr. Bement: We are very pleased to be included in the President's American Competitiveness Initiative budget proposal. It is a strong vote of confidence in our contributions to the American innovation system. One of the most important contributions we make to innovation and economic development is the training of graduate students. The Foundation has always integrated research and education, so that when our graduate students go out into the private sector they take with them what they have learned in terms of new research methods and expanding the frontier in terms of science and engineering developments. We see this as transferring technology through the door rather than over the transom.

As we achieve increases in our budget, a lion's share will be translated into the education of additional graduate students. So, the eight percent we see in the President's request for next year would translate into the training of 1,100 new graduate students and 245 postdoctoral students.

As we look ahead at the prospect of doubling our budget over the next 10 years, we would expect that these numbers will continue to increase. There is a vast difference in the need for funding of graduate students and the available funding so we hope that will steadily continue to go up.

As that occurs, we have to focus more energy on increasing the ratio of domestic to international graduate students. To do so, we have to continue to focus on broadening participation by bringing in more women, minorities and persons with disabilities. This will be our continuing challenge.

Question: Following up on the issue of broadening participation, you spoke recently at the Alliances for Graduate Education and the Professoriate (AGEP) conference about the relevance of graduate education as a key component of our competitiveness strategy and the need to broaden participation from under-represented groups. This is a critical area for graduate education and with regard to the future STEM [Science, Technology, Engineering, Math] workforce. Would you expand on your thoughts in this area?

Dr. Bement: Starting with the bigger picture, every industrialized nation and most developing nations in the world now are trying to increase their research intensity. The investment in research and education is a key driver for economic growth in a knowledge

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Interview with Arden L. Bement, Jr.

economy. There is going to be an increasing shortfall in the availability of top STEM talent throughout the world. Many countries today are developing strategies to move from “brain drain” to “brain gain.” This means we have to pay a lot more attention, if we are going to be successful and competitive, to attracting the best and brightest to STEM fields in graduate education. The AGEP program is one that focuses on increasing the number of domestic graduate students in STEM fields. It does this by building institutional alliances and partnerships, and by trying to develop new structural strategies for attracting more under-represented groups and minorities. Such partnerships are with Historically Black Colleges and Universities as well as Minority-Serving Institutions, and include mentoring and retaining Ph.D. students in STEM.

All of these things taken together have made AGEP very powerful and successful. We want to build on that momentum and those best practices.

Question: Support for graduate students has been a hallmark of NSF since its founding in 1950. The Council of Graduate Schools is dedicated to advancing graduate education and to the development of best practices. The CGS Ph.D. Completion project is addressing issues surrounding Ph.D. completion and attrition and is identifying best practices and intervention strategies to evaluate the impact of projects on doctoral completion rates and attrition patterns. What are your thoughts on the larger issue of Ph.D. completion and attrition?

Dr. Bement: First of all, NSF and CGS have had a close working relationship in this area and we welcome the opportunity to learn from the CGS study and factor this into our future program planning.

This is an area where much more needs to be understood and we applaud you for taking on this project. There are many reasons for the current attrition rates. Some students drop out because of job opportunities, some because of family obligations, and some drop out because they just get discouraged because it takes too long to complete. This can be stressful both emotionally as well as financially. In this latter category, faculty and departments need to pay much more attention to keeping the time required for completion of the Ph.D. within reasonable limits. In other cases, additional financial assistance, mentoring and counseling can also be very helpful in retention and reducing the attrition rate. Anything we can do to reduce the waste in the system, due to the loss of good people for reasons that could be corrected, is worthy of attention.

Even for those who don't complete the Ph.D., they should not necessarily be looked upon as a failure because we would hope they would stay in the STEM fields. Perhaps some would go on into other professions or continue to be valued members of the science and engineering workforce. So, I don't think we should stigmatize failure to complete the Ph.D.

Question: As you know, the NSF has several important graduate

support programs including the Graduate Research Fellows (GRF) program, the GK-12 Program, and the Integrative Graduate Education and Research Traineeship Program (IGERT). Would you discuss these programs and how they complement NSF's role in enhancing U.S. competitiveness and innovation?

Dr. Bement: All three programs you cite support domestic students. The GRF is our oldest, flagship graduate program and its purpose is to seek out the very best and brightest for fellowship support. We have had the program for 50 years and it has demonstrated very strong support by providing portable funding directly to students. So, this is the type of funding a student can take with him or her and use as a means of picking the right program and the right faculty advisor. For that reason universities seek these students out.

The IGERT program prepares students to do interdisciplinary and collaborative research – not only at the cutting edge of some STEM fields, but also in the “white space” between STEM fields, to explore new emerging areas and also to work under multiple mentors. These mentors are not only in science and engineering but may come from industry or entrepreneurial activities. So far that program has supported 3,000 trainees since we began it in 1998. The recently completed impact study indicates that it has been highly successful in not only recruiting talented students but in stimulating interdisciplinary research and in preparing doctoral students for careers.

The GK-12 program represents an innovative approach to integrate STEM research with education. There is a requirement under this program that the recipient devote some time to working in K-12 schools. This is a win-win situation. First, the graduate student gains in several ways by having to communicate research and the science involved to a diverse audience; that requires good communication skills. The children gain because they are exposed to a role model, obtain an understanding of what a scientist or engineer actually does, and experience the excitement of research. Teachers gain because they get to work with a resource provider.

This is someone who can inform the class and the teacher about recent developments in science and engineering, develop exciting curriculum and work projects, and motivate students by encouraging hands-on, inquiry-based learning. And we find that some of the faculty mentors gain because often for the first time they gain an understanding of what is going on in K-12 schools and what their graduate students are contributing. In some cases, the faculty mentors get interested and involved. So, this is a good partnership that bridges teaching at the university level with teaching at the K-12 level.

Question: NSF has as its first priority “advancing the frontier.” The support of innovative science and engineering in funding peer-reviewed proposals includes, of course, funding graduate students. What are your thoughts concerning the best way to prepare graduate students for the 21st century workforce and specifically concerning research that is supported through NSF grants?

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Data Sources: Pressing Issues Survey and Carnegie Classification

Pressing Issues

In order for CGS to stay current with changing trends in the lives of its members, we conduct periodic surveys to ask: "What are the three most pressing issues on your desk?" We have just completed the latest survey and this article summarizes the major findings.

Over 120 deans responded to this survey. The responses were coded, and these comments were then grouped into broader categories reflecting general concerns such as research, program development, and graduate school management. Our analysis (See Table 1) revealed that the three most pressing issues confronting deans in 2006 are: funding for graduate students, enrollment management, and graduate school management.

Funding for Graduate Students
Funding for graduate students has been the dominant issue facing graduate deans for the past five years. In 2006, 52% of respondents listed some variant on funding for graduate students

as one of their most pressing issues, including concerns for funding teaching and research assistantships, fellowships, and other forms of support. One typical response stated, "Competitive funding packages to recruit and retain top students, and in particular students from under-represented fields such as the sciences and mathematics." The competitiveness of funding/financial packages was a consistent theme throughout the responses.

Enrollment Management

Enrollment management has also been a consistent pressing issue for graduate deans over the last several years. This year was no different, as half of the respondents (50%) indicated that some variation of enrollment management was a pressing issue for their graduate school. Of particular concern is the complex prediction of future student demand and resulting future planning for growth or decline in certain graduate programs. One respondent wrote, "Predicting and planning enrollments at a master's institution. The majority of our programs focus on education and our enrollment remains highly elastic to labor market dynamics, population shifts, state education mandates, etc."

Interestingly, similar numbers of respondents raised the issue of enrollment declines as enrollment increases.

Graduate School Management

Graduate school management issues rose in relative importance since last year. In 2005, 21% of respondents listed this as an issue, while in 2006 half of respondents (50%) did so. Typical responses focused on managing the transition from a master's-focused to doctoral institution, reviews of graduate standards/policies, and restructuring from centralized to decentralized systems.

Other Major Issues

International student issues remain a pressing concern for many graduate deans, though for fewer than last year. Forty-percent of respondents indicated some concern about international applications, enrollment, or visa processes. This is somewhat lower than last year, when half of respondents listed international issues as pressing. Unlike previous years, however, the issue of international

admissions and the Bologna Process, rather than visa delays and the SEVIS program, seemed to dominate concerns.

Program development is another clear area of interest. Nearly a third (29%) of respondents listed some type of program development (certificates, interdisciplinary programs, online programs) as a pressing issue. This level of response is significantly larger than last year when only 16% included program development

issues. Of particular interest seem to be joint programs and interdisciplinary programs.

The issue of graduate student services and health care appears to be of growing concern to graduate deans. How the graduate school will pay for these benefits, maintaining equity across fields and disciplines, and health care for the dependents of graduate students were all listed as pressing issues.

The NRC Assessment of Research Doctorate Programs, retention and completion issues, and managing information systems were also listed numerous times.

Overall, these results reveal both the consistency of concerns facing graduate deans and the evolution of certain issues. For example, while the international student issue was not listed by as many respondents this year as last, the specific type of concerns has shifted. Awareness of the Bologna Process and treatment of three-year degrees has emerged as an important component of the international student issue.

Further, the responses to this survey help CGS make many critical decisions. They inform decisions regarding the topics and speakers for Annual Meeting plenary and concurrent

	2002 rank	2003 rank	2004 rank	2005 rank	2006 rank
Graduate student stipends, assistantships, fellowships	1	2	2	1	1
Enrollment management	5	3	6	3	2
Graduate school management - planning, fundraising, recruitment	3	4	3	4	2
International students - enrollment, visa issues, SEVIS, funding	9	5	4	2	3
Program development, - certificates, interdisciplinary programs	4	8	8	9	4
Student services - health benefits, career counseling	7	7	7	5	5

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Data Sources

sessions, as well as for the Summer Workshop. The findings also help shape CGS's government relations agenda.

Carnegie Classification

The higher education community has been following the evolution of the Carnegie Classification system. The Carnegie Foundation for the Advancement of Teaching has recently released a new version of its basic classifications of colleges and universities as well as a Graduate Instructional Program classification. The multi-year process of revision has led to an extensive reorganization of the framework for categorizing institutions. The new version classifies 4,321 colleges and universities, a significant increase from the previous effort in 2000.

For CGS members, the most relevant changes come in the reclassification of doctoral-granting and master's-granting institutions.

In the past, the Carnegie Classification system divided doctoral institutions into "Doctoral Extensive" and "Doctoral Intensive." The new system includes three groups, based on the amount of research activity: "Research Universities (very high research activity)" all previously known as "Doctoral Extensive"; "Research Universities (high research activity)" primarily those classified in the past as "Doctoral Intensive"; and "Doctoral/Research Universities" a combination of those previously classified as either "Doctoral Intensive" or "Master's I."

Master's-granting institutions have been divided into three categories based on the number of master's degrees awarded. They have included institutions that conferred at least 50 master's degrees in 2003-04 yet fewer than 20 doctorates. Larger (>200), Medium (100-199), and Smaller (50-99) are the new master's institution categories.

A new Graduate Instructional Program classification system was also created, which focuses on the programmatic mix at the graduate level. Institutions are divided into those that confer doctorate degrees and those that do not. Within each of those broad categories institutions are divided by the academic field offerings and overall emphasis. For instance, "Arts & Sciences Dominant," "Business Only," and "Comprehensive Humanities, Social Science, STEM, Professional" are three sub-categories within the "Without Doctoral Program" category. "Comprehensive Humanities, Social Science, STEM, Professional with Medical/Veterinary," "Stem Dominant," and "Education Only" are three examples from the "With Doctoral Programs" category.

For more information, go to:
www.carnegiefoundation.org/classifications

by Heath Brown, Director of Research and Policy Analysis

CGS Welcomes New Staff

Eleanor Babco joined the staff at CGS in January as a senior consultant to the Professional Master's Initiative. Among her activities at CGS will be an evaluation of current data collection associated with the Professional Science Master's. In this endeavor, she will join Carol Lynch, Paul Tate, and Helen Frasier to foster the growth and acceptance of the PSM as a regular feature of graduate education.

Eleanor was the Executive Director of the Commission on Professionals in Science and Technology (CPST), a nonprofit corporation in Washington, DC, until her retirement at the end of 2005. At the Commission, she was the editor for CPST publications; the principal investigator on two projects supported by the Sloan Foundation: 1) the STEM Workforce Data and 2) a project to revitalize the master's degree in science, with particular attention to the PSM degree; and was the co-PI on a NSF-funded project to study Career Trajectories of Master's Degree Recipients in the Sciences. She will continue to consult for CPST on various grant-supported projects.

Eleanor was educated as a chemist at Immacula College and Catholic University, but has devoted her professional career to the analysis and interpretation of education and employment data about scientists and engineers. She received the WEPAN-sponsored Betty Vetter Award for Research in 2001 and was named an AWIS fellow in 2002.

Nominations Sought for CGS Board of Directors

Nominations are being accepted for membership on the CGS Board of Directors. If you are interested, or if you would like to nominate a colleague, please contact:

Suzanne Ortega
chair of the CGS Nomination Committee
c/o Cheryl Flagg at cflagg@cgs.nche.edu
on or before July 1, 2006.

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Interview with Arden L. Bement, Jr.

Dr. Bement: This is an area that needs constant attention. Looking to the future we need to teach students to be more agile, more adaptive, more versatile, and to have the capability of working collaboratively and comprehensively across the boundaries of disciplines in order to expand career opportunities. We will continue to need highly educated graduate students to train the next generation of STEM talent at the graduate level. Our NSF programs have a long tradition of enabling students to train under the best scientists and engineers in the world.

On the other hand, we have got to provide other options for students who may want to go into the private sector or who may opt for more than one career in their lifetime. Educational versatility is important. There are some students who may want to pursue uncharted territory and they may want to play a stronger role in selecting their topics and they may not want to just add the next four columns of data on a table. I think more students will want to be creative about their research experience. It is a challenge for graduate schools to provide this variety and different pathways for students. And, in some cases it requires a mentor who will allow some flexibility in graduate education. Of course, we look upon the variety of programs and the emphasis that we give on interdisciplinary research -- in particular the IGERT program -- to provide opportunities for this broader range of educational opportunities.

Question: The Professional Science Master's (PSM) degree is an exciting new development in graduate education. These degrees are explicitly configured to meet the needs of non-academic employers of scientists and linked to regional and national STEM workforce needs. What role can NSF play in helping to advance this innovative graduate degree as part of our larger national competitiveness strategy?

Dr. Bement: NSF was not directly involved with the development of this program although we certainly applaud it. It is a program whose time has come and it is probably long overdue because it increases the number of pathways to bring people into the STEM workforce -- especially those who may not be research-oriented but want to pursue a professional career. They may also wish to interface with professionals in other fields such as medicine, business, or law. We certainly need well-trained people in all these fields who have a STEM background and who have an understanding of what technology is all about. Some individuals may want to go into consulting fields while others may want to go into project management.

I think this is a program that would fit into several areas that NSF is supporting and is another area where CGS and NSF can work together. For example, if research at the master's level is involved, we could provide support for that. We have some support programs for students who may want to tack on a teacher certification to a PSM degree, and these

will probably grow. We certainly want to encourage and grant support for these types of initiatives. There are some universities that will provide flexibility to get certification in a dual master's with some additional time necessary to learn pedagogy. The Robert Noyce Scholarship Program serves this purpose.

Question: How can the Council of Graduate Schools, the only non-profit organization devoted solely to improving graduate education, work more closely with NSF to improve our competitiveness and national security in the years ahead? More specifically, what would you advise deans of America's graduate schools to do?

Dr. Bement: Graduate deans are among our constituents and they are people we want to listen to. Having a close working relationship with graduate deans is very important because they have a very strategic position -- not only in encouraging more interdisciplinary work and supporting the education of graduate students, but also in developing new STEM programs that address emerging or converging fields. They recognize that this is a dynamic process, not a static one.

Deans have enormous influence and can provide leadership and support for innovative ways of pursuing graduate education research. Deans are in a position to increase the strength of mentoring programs, seek out new pathways into graduate schools such as pursuing new partnerships with minority serving institutions and Historically Black Colleges and Universities in order to broaden participation. They can provide incentives to attract more under-represented faculty as well as students. This is very important because the way to attract under-represented students is to have some role models on the faculty who are very good.

Deans can also provide connections between STEM education, other professional fields, and other research opportunities. This is especially important in this day and age where we are focused on competitiveness and finding ways to shorten the time between discovery of new concepts to the application of these new concepts to entrepreneurial activities. Entrepreneurship and the creation of centers that can engage with industry are very important to our future. The creation of new technologies and new patents has to be done within ethical boundaries. Increasingly, graduate schools and departments are seeking students and faculty who can work across the spectrum and this requires good communication skills. Some of the most exciting start-ups and killer applications are created around major research universities. This is not by accident. Research universities must continue to evolve and provide the cutting edge research and discoveries that are so vital to our future.

As former President John F. Kennedy noted, "of those to whom much is given, much is required." Our nation's graduate schools have the opportunity to contribute to eradicating health problems, enhancing homeland security, and educating the next generation of our nation's citizens.

Interview conducted by Patty McAllister

New Deans and Titles

Pablo Arenaz is the Interim Dean of the Graduate School at the University of Texas at El Paso. He replaces Charles Ambler.

Janice R. Bellace is Associate Provost at the University of Pennsylvania.

James A. Benson is Vice Provost, Graduate Studies & Research at St. John's University. He replaces Willard P. Gingerich.

Mark Brenner is Dean, Graduate School and Vice President, Research at the University of Nevada, Reno. He replaces Marsha Read.

Patricia Calarco is Interim Dean at the University of California, San Francisco. She replaces C. Clifford Attkisson.

Catherine Canney is Interim Dean, Graduate and Continuing Education at Fitchburg State College.

Robert Carlton is Interim Vice Provost, Research and Dean, College of Graduate Studies at Middle Tennessee State University. He replaces Abdul Rao.

Roxanne Cullen is Associate Vice President, Academic Affairs at Ferris State University. She replaces Thomas E. Oldfield.

Fernando P. Delgado is Dean, College of Graduate Studies and Research at Minnesota State University, Mankato. He replaces Terrence Flaherty.

Dianne K. Dickerson is Interim Dean, Division of Graduate Studies at California State University, Fresno. She replaces Vivian A. Vidoli.

Linda N. Edwards is Provost and Senior Vice President (Acting) at the City University of New York Graduate Center. She replaces William P. Kelly.

Jonathan Engel is Associate Provost at Seton Hall University. He replaces Frederick Travis.

Placido Gomez is Vice President, Academic Affairs and Graduate Studies at New Mexico Highlands University. He replaces Clarence Sanchez.

Steven G. Horton is Acting Dean, Graduate Studies and Research at Northwestern State University of Louisiana. He replaces Martha Henderson.

Dawn Iwamoto is Dean, School of Advanced Studies at the University of Phoenix. She replaces Craig Swenson.

Lance Janda is Director, Division of Graduate Studies at Cameron University. He replaces Lloyd Dawe.

Eileen Kaplan is Interim Dean, Graduate School at Montclair State University.

Eugene Kintgen is Interim Co-Dean at Indiana University. He replaces John T. Slattery.

Jolynn S. Kuhlman is Interim Dean, School of Graduate Studies at Indiana State University. She replaces Kweku Bentil.

Deirdre M. Mageean is Vice Chancellor, Research and Graduate Studies at East Carolina University.

Christopher L. Markwood is Dean of Faculties and Provost at the University of Wisconsin-Superior. He replaces Rosemary Keefe.

James F. Matta is Assistant Vice President and Dean, Graduate Studies and Research at Bloomsburg University of Pennsylvania. He replaces Richard M. Angelo.

Bruce D. McCombe is Vice Provost, Graduate Education and Dean, Graduate School at the University at Buffalo, SUNY.

Stephan L. Mintz is Interim Dean, University Graduate School at Florida International University. He replaces Douglas Wartzok.

Sandra Murray Nettles is Interim Dean, Graduate Studies at Georgia Southern University. She replaces Charles Hardy.

Richard Pitre is Dean, Graduate School and Research at Texas Southern University. He replaces Joseph Jones.

Susan Place is Dean (Interim) at California State University, Chico. She replaces Robert M. Jackson.

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New Deans and Titles

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Carol Simpson is Provost and Senior Vice President at Worcester Polytechnic Institute. She replaces William W. Durgin.

Don Stansloski is Dean, School of Pharmacy at the University of Findlay. He replaces Marie Loudon-Hanes.

L. Randy Strickland is Senior Vice President for Academic Affairs at Spalding University. He replaces Steven Hardin.

Bradd Stucky is Dean of Graduate Studies at Marian College of Fond du Lac. He replaces Larry A. Robinson.

Stein Sture is Interim Vice Chancellor, Research and Dean, Graduate School at the University of Colorado at Boulder. He replaces Susan Avery.

Julie H. Sullivan is Vice President and Provost at the University of San Diego. She replaces Anne M. Donnellan.

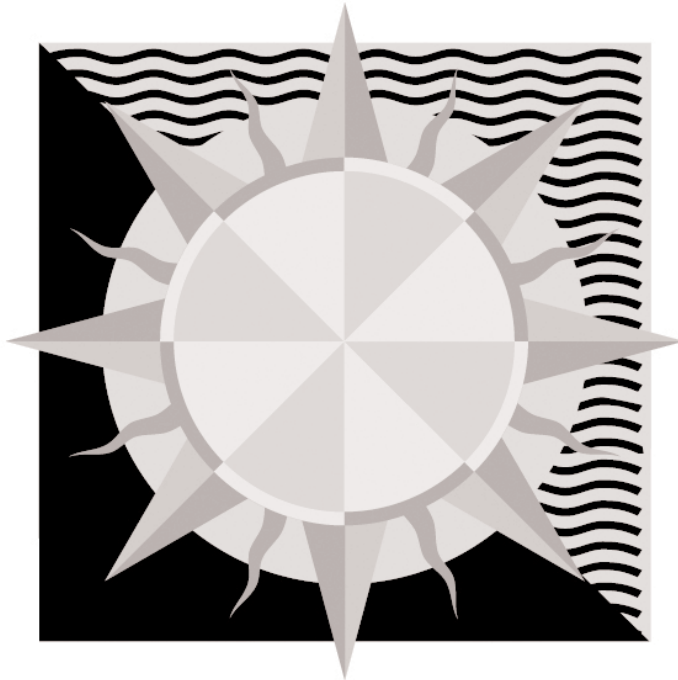
Marlin U. Thomas is Dean, Graduate School of Engineering and Management at the Air Force Institute of Technology. He replaces Robert A. Calico, Jr.

Frederick F. Travis is Provost at Seton Hall University. He replaces Thomas Lindsay.

Ben Ware is Dean, Graduate School and Vice President, Research at Syracuse University. He replaces John Mercer.

Amy B. Wohlert is Interim Dean, Graduate Studies and Associate Provost at the University of New Mexico. She replaces Teresita E. Aguilar.

Robert A. Young is Associate Vice President, Academic Programs at California State University, Fullerton. He replaces Keith O. Boyum.



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