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PLENARY OPEN SESSION

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National Science Foundation
Arlington, VA 22230

**Presentation by Dr. Neal Lane
Recipient of the 2013 Vannevar Bush Award**

DR. ARVIZU [Dr. Dan Arvizu, Chairman of the National Science Board]:
The Vannevar Bush Award recipient, Dr. Neal Lane, good friend of the Foundation, is here with us. So let me just mention that the Vannevar Bush Award honors exceptional lifelong leaders in science and technology, have made substantial contributions to the welfare of the nation through public service activities in science, technology, public policy; was established in 1980 in memory of Vannevar Bush who served as the science advisor to the president Franklin Roosevelt and helped create the National Science Foundation.

So Dr. Lane is the Malcolm Gillis University Professor, Senior Fellow with a James A. Baker, III Institute for Public Policy, and Professor in the Department of Physics and Astronomy at Rice University. Citation reads: for unsurpassed dedication to the scientific enterprise at all levels as a creative researcher, aspiring educator, a wise mentor, and willing advisor, as a remarkable leader in advancing the National Science Foundation to new levels, as a tireless champion of science and technology in the halls of power, and as exemplar of the concept of civic scientist.

His lifelong distinguished service includes assistant to the president for Science and Technology in direct with the White House Office of Science and Technology Policy during the Clinton administration and the NSF director 1993-1998, and professor at Rice University for several decades. He is a fellow of American Academy of Arts and Sciences, also APS and AAAS, and the Association for Women in Science, has been awarded over a dozen honorary degrees, received his PhD in physics from the University of Oklahoma.

And so help me welcome our 2013 Vannevar Bush Awardee, Neal Lane.

[applause]

DR. LANE: Thank you, Dan. I told Kelvin we'd sing "Boomer Sooner" in here.

[laughter]

But no, yeah, I knew I was going to get that. The Dallas football game, right? Thank you so much. I certainly want to thank the selection committee and the board for choosing me for the Vannevar Bush Award and of course a wonderful evening that we can celebrate with family and friends and my fellow awardees, extraordinary leaders in their areas. I also want to acknowledge the wonderful NSF officers and staff. Cora Marrett was here as AD and SV, and a wonderful working time with Cora. We fought wars together in those early years and it was just a terrific time. The air is thin up here and the views vary from the 12th floor, but the work of this place goes on all over the building. And of course we all understand that but we must never let our good colleagues around the Foundation fail to understand how important they

all are.

Now in January 2010 I had the pleasure of joining some past NSF Directors at an annual meeting of AAAS in San Diego in which we celebrated the 60th anniversary of the National Science Foundation, had the cake and sort of all the rest of it. And we were invited to share our reflections, whatever we wanted to say. It was really risky to get a bunch of old timers together --

[laughter]

-- what they're going to say. My remarks were titled, "The Future of Science; NSF Still Sprinting After 60 Years." So I want to borrow a little bit from that occasion even though I don't remember exactly what I said; but I think some of my remarks here are consistent with it, I hope at least and may be relevant to some of the things we're looking at today. So in the end I want to focus on future of American science. Where is it going in the coming decades? And I am going to use science here in the broadest context in which we understand it at the National Science Foundation. And our mission here in all of the kinds of things that we support; so research and evidence-based knowledge in all fields of science, mathematics and engineering.

Now I first want to say that looking back on these five years at NSF, really I view as the high point in my career. These are really golden career years. They were very exciting, very rewarding. They were totally exhausting. I even have vivid memories of this room and many of those were very pleasant as well.

[laughter]

President Clinton and Vice President Gore were both high on science and on NSF in particular. They both knew about the foundation and how extraordinary an agency it really was. Jack Givens, who was the president's science advisor, was a very strong ally in the White House, and we argued for our budgets and our programs and often got what we asked for; not always, but that's the way of Washington. But we were always treated fairly, even during some fairly tough budget cycles.

Now a lot happens with these jobs. And many things stand out in my memory. Some are best shared over drinks so I'll spare you those. But I would like to offer a few reflections on some things that I think make this agency special and then turn to the issue of the future.

I joined the Clinton administration in the fall of 1993. House and Senate were controlled by Democrats at that stage. When I arrived and started to talk to people on The Hill, I found there was strong support for NSF; but there was also a view that the foundation maybe should be doing some things differently; they maybe ought to be funding more research that's directly relevant, that we could see is being relevant to American society and some of the challenges that we had. Maybe we ought to reorganize the foundation to look a little more like NIH, you know, have a director of technology or manufacturing or so forth. Some of this might sound familiar.

[laughter]

Now then there was the election of 1994 and the Republicans took the House and the Senate; kind of a low point for President Clinton, I think. I wasn't in the White House at that point. I was over here. So the chairs all changed. The staff, the leadership positions changed. People moved around offices. The agendas shifted, and so now we're working with a whole new group of folks many of whom were still very supportive of the National Science Foundation. And so we weathered all of that. We didn't cancel any grants. We didn't remove any programs at the request of Congress. We didn't reorganize the place to look more like agency A, B, or C.

Now in the snowy winter of 1995-96, president and Congress had trouble agreeing on a budget, so the government shut down. So some of us were allowed to come to work but a lot of people had to stay home. It was a very bad period for NSF. Anne Petersen was deputy director in those days. She and I were allowed to come because we were not essential workers anyway, so --

[laughter]

-- we were not covered by the law. So we were answering the phone, "Hello, NSF. Please hold."

[laughter]

Anyway, so we all had gone back to work and NSF staff -- which is the way they work -- they came back to here. They put the place back together as quickly as possible; just amazing. And so I think we kind of didn't miss a lick even though it was an extremely difficult period for everybody.

So after we got back to work things got back to normal and we actually got quite a lot done, I think that many of us feel very good about it. We got the funding for the new South Pole -- Amundsen-Scott South Pole Station which was completed, of course, some years later because it takes a long time. We got the money for one of the Gemini Telescopes, which was completed. We established the CAREER Program, restructured the Supercomputer Center Program, revised the review criteria, adding broader impacts which you may or may not like. We established the Child Development Center. We launched Fast Lane, not named for the directorate --

[laughter]

-- wrote NSF's first strategic plan, and several other things. So we felt pretty good about all of those things.

Now in the fall of '98, President Clinton asked me to come over to the White House following Jack Givens who served a good long time as Science Advisor. I had committed to the president to be at NSF for six years, which is a term, and had fully intended and wanted to do that. But he was the boss. So I moved downtown. Now when I was at NSF I couldn't really understand how the White House worked. And then I got to the White House and I said, "Oh my god, this is how the White House works." So --

[laughter]

-- there is a very different kind of an environment, that both jobs were fascinating. And clearly I felt very privileged to serve in both positions and work with the terrific people there as well as here. Artie Bienenstock was running the Science Division when I was there and Jack Givens, in fact, had recruited a number of really terrific people that I had the opportunity to just go work with.

Now the economy got better. The budgets got better. And Clinton's last budget -- fiscal 2001 -- NSF -- he requested for NSF almost double the largest dollar amount the agency had ever received. And the Congress approved most of that. That was also the beginning of the National Nanotechnology Initiative. Many of us worked hard on that. But the budget increase was not all nanotechnology. And our hope was that that would be the beginning of some doubling cycles for NSF but not just NSF, also science parts of various other agencies like DOE and NASA and the NIH and other agencies.

Now, before I come to the question I posed earlier about the future, let me just share a few personal thoughts about why I think NSF is so special. You'll all have your own list and your list may be much better than mine, but let me just mention some things. The mission. I

think NSF special broad mission and six decades of dedicated directors and boards have led to very wise policies and programs that, by emphasizing basic research, get the most out of the tax payers' money, and I think most people sort of understand that that's what we do and that that's happening. And from a management perspective, NSF probably still is the most efficient -- one of the most efficient agencies in the federal government.

The brand: NSF has established its brand in the public eye -- at least those who are paying attention to science and technology, in this country and around the world, as a place that supports the best people with the best ideas to answer fundamental questions about the natural, social, and the engineered world; knowledge for its own sake, and of course, knowledge for use. That brand is coveted by other countries in an attempt to repeat the NSF approach and experience.

The partnership: NSF has a strong, longstanding partnership with the nation's top economic research scientists, engineers, and educators, and investigators, and reviewers, and ensures that the excellent research that is supported is supported through a process that's transparent and fair. I think that's what Vannevar Bush had in mind, and of course, ONR, Office of Naval Research, was the sort of model that NSF learned from in the early days.

The staff: the staff at all levels, but especially the scientific staff, the program officers, career staff and rotators provide the most critical interface between the Foundation and the research community, and they make that partnership work. But the other NSF professional staff and support staff make the agency function, make it work well, and they do a wonderful job, which needs to be always appreciated.

NSF independence: you know, as an independent agency, NSF's enjoyed six, now seven, really, decades of support from presidents and members of Congress of both parties based on their respect for the Foundation and their confidence that the agency will continue to steer clear of partisan politics, base its funding decisions strictly on competitive peer review process that is transparent and treats everyone fairly. So, these attributes and more -- but these: the unique mission, the respected brand, the excellent staff, the academic partnership, and independence provide a very strong foundation that allows the agency to weather most any storm. But there are always clouds, if not storms, and the Foundation is pressured in many, if not all these areas, including, I think, too much political meddling, such as the recurring attacks on the social sciences and efforts to manipulate peer review.

The board, as well as the White House, must stand with the director when things get tough. President Obama has made his support clear in a recent speech at the National Academy of Sciences, and looking around the room, I know that this board cares and is fully engaged.

Now, the second point I want to make specific to NSF is that decades of success led -- have led to increased expectations and pressures to do more with the same or even less. NSF's always expected to do something new and then do something newer, and often, the only way to do that is just make tradeoffs between some excellent research and some other excellent research. This is very difficult for people to understand, particularly our research community, when we try to explain why we go about doing that. And if it weren't for the cross-cutting programs are -- I mentioned nanotechnology, which is partly my fault, anyway, and we -- some of the blame goes to Artie, I guess. Anyway, that program's worked extremely well.

But these cross-cutting programs all erode over time from the base, from the most fundamental questions in many fields of science. That's a debatable issue but is something to keep in our minds all the time, because we've all got ideas about a great cross-cutting,

interdisciplinary program, and some of them are extremely important, but we have to keep in mind that what we lose out of this is some of the fundamental discoveries at the base of these different disciplines. In all these areas of science -- in the mathematical and earth science, physical sciences, the life and environmental sciences, engineering, computational, social, economic, behavioral, and education -- the board's advice and support are just absolutely critical to getting this balance right. There is no secret way to do this. Now, I know you worry about all these pressures I'm talking about -- that they really take a toll on the program managers -- with a critical interface, as I said before with the research community. And so, I encourage the board to work with the director to find ways to ensure that their jobs are rewarding, and that their special service to science is appreciated. Given all that's going on, your job is as important as any time I can remember in history, and I fear it's not going to get any easier. So, just in case nobody thanked you recently, you do have my thanks and my appreciation. I don't think you do it for the money, power, and the glory.

[laughter]

So, I'm going to close now by turning to the question I posed at the outset: the future of science, where's American science going in the coming decades? Because I have no idea. I really doubt anybody else does either, but after the end of my stint in Washington, I kind of thought, "This is the way it is. This is our messy form of democracy. And there are good times and bad times, and ups and downs, and so forth, but science -- American science will emerge strong." I no longer feel that way. Rather, I think American science -- certainly the support for science -- to make the science itself -- has been losing ground for quite some time. It doesn't happen suddenly; a little erosion here, a little erosion there, and then you begin to see it. I think it's going to continue to slide unless science, in this process of discovery, by asking fundamental questions, somehow emerges in the public's mind as a higher priority than it has been in recent decades. And in so doing, it becomes politically important -- I mean that in a very positive way -- politically important to men and women who serve, or who want to serve, in Congress or another high office.

There are a few reasons for my concern: first, federal research funding has not been a high priority since Apollo. There have been periods of growth, and so forth. The more you stand back and look at it, it's been sliding from Apollo. It's lost ground as a percentage of GDP and of the overall federal budget. At the same time, the cost of doing research and the capacity to do extraordinary research has been rising much faster than any available funds. Two: the Rising Above the Gathering Storm Report, 2007, had a lot -- a scary list of indicators, and it got some traction, but it all seemed to get lost with the recession and the hysteria over deficits. Remember, over half of members of the House were not there when the 2007 report was released. They haven't heard the arguments about the investment -- the importance of investment in research; and half of the Senate is in the same situation. It's astonishing how quickly things have changed. Community has a lot of work to do on the Hill.

My third point: while NSF and NIH both saw a lot of growth between 1980 and 2003, the last decade's really been dismal. In spite of the president's efforts, NSF and NIH have just been struggling along with the rest of discretionary spending, and the caps in the sequestration -- the direction is downward. I think any policymaker that thinks that this is all in the best interest of the country need to look for another job. I find the NIH situation particularly surprising: that even the arguments that we need to cure cancer, and heart disease, and Alzheimer's, and Parkinson's, and other afflictions that touch every family in America, just is not getting enough attention to make a difference in supporting the basic research. That's a

change; I mean, that's not what we saw in earlier decades. Many of the nation's -- my fourth point: many of the nation's universities are facing almost a perfect storm coming from all directions of pressures, and demands, and so forth. And, of course, K-12 education got experts in the room on that, you know, parts of the -- large parts of that are still operating in a process mode. But anti-science movements are alive and well in America in our homes, schools, legislatures, Congress; I believe any attack on any science, whatever it is -- climate, biology, geology, political science -- should be treated as an attack on all science, because at a fundamental level, there's not all that much difference between one area of science and another, and you move in with a move in a negative direction in one, eventually you can get the others. And teaching our kids incorrect science in the home or the school should be treated as a form of child abuse. The community has to respond to these attacks on science even if it risks drawing fire. American -- fifth -- sixth: American people don't know much about science. We've got a job to do -- a lot of talk now about jobs; we understand that. I don't hear much talk about the value of knowledge or liberal education of the culture.

Last on my list, but it could be longer: the U.S. is stuck in neutral, or maybe even reverse in terms of progressive ideas, and that's what science is all about. Other countries are not. China intends to be the leader in science and technology; it's important for us to pay attention to that. And there are great opportunities for cooperation, but it's also very important for us to have more activity here at home. So, for these reasons and others, I conclude that American science is in some degree of trouble, and the science policy apparatus that was designed after World War II is not working well anymore. I'm not saying, "Stop giving the Vannevar Bush Award," please -- his extraordinary contribution, but the times have changed. I'm not saying the present science advisor is not doing a good job, or the heads of agencies, but - - and there are some champions in Congress, but fewer all the time. But the system's tired, it's out of sync, and it needs some serious attention. Short of reorganizing governments -- fun to talk about, but it could always go badly -- we need some new ideas. Some of us are talking about it. I don't know what the new ideas ought to be. One thing's clear to me: industry needs to play a greater role -- an unprecedented role, I think, in support of science.

What can the board do? A lot. I think you can play a particularly important role. First, keep doing what you're doing. It's very important -- stay out of management, but boy, do the kinds of things that you have been working on. Second: weigh-in on the larger issues, especially where you get data, like the NSF supports and will support your position, and your reports are excellent, and they're timely. Third: you might consider reaching out to other organizations, science, engineering, science societies, education societies of other kinds to see if there's not a common message people can agree on, and a kind of mechanism to engage the community -- to get the community engaged with the public, deliver that message. And finally, keep an eye on the reauthorization; bad bill is worse than no bill at all. Confidence you'll have other ideas better than mine.

Any good news? I think there is some good news. The good news to me is when I meet young people on my campus around the country, I'm blown away by how smart they are, their access to technology, knowledge that didn't even exist when I was a kid. They know about the world, they're comfortable working with everybody born everywhere; I feel very good. They know the world's got problems, they want to be a part of solving them, and that's -- I know that's a select group, university students, but they're the leaders of tomorrow. So, I feel good about that. Next thing, you know, the federal government's role has continued to slide in research and development. We have a president that really does get it, and a Congress that still

has some champions, and the private sector understands this is important. We just need them to be a little louder in their support, and involved. President Clinton -- and finally, I think -- I don't want to miss this: I think all the things that made this nation great -- fundamental American values -- I think they're not gone; they're under the surface a little bit. We don't hear a lot of talk about them anymore, but in particular, that one of pushing the frontiers, I think it's still there, but -- in the American spirit, and I think it will emerge again.

Clinton always the optimist that -- he was always the optimist, and he told me, "Neal, remember the American people always get it right." Well, maybe, I thought -- still. I think Winston Churchill said, "You can always count on Americans to do the right thing after they've exhausted all the other possibilities."

[laughter]

Thank you, so much, and thank you for your service.

[applause]

DR. ARVIZU: Thank you, Dr. Lane, for that most sobering, informative, enlightening, challenging discussion about things that we can do better, and, perhaps, the opportunity for us to do things better. I know there are probably a number of questions. We've got time for a couple of questions. Anyone want to --

DR. CERF [Dr. Vinton Cerf, Member, National Science Board]: You can always count on me for questions

DR. ARVIZU: We got one from Vint, so...

DR. CERF: Neal, you pointed out a couple things here that I'm very disturbed by. One of them is an apparent belief that the only way you can justify doing science is to demonstrate its practicality. It feels to me like -- that we fundamentally lost an understanding in our society that research, and understanding, and knowledge are fundamental to everything. Is there some way that we can reverse that?

DR. LANE: I think -- I mean, when I bothered Vint Cerf I know I've done something, maybe wrong. No, that is the -- that's what I believe the current situation is, but I should be quick to say, if you ask the American people in polling, they're still quite positive about science. I think they sort of -- they're thinking about how it benefits their lives, but -- and they don't have an opportunity -- most people don't have an opportunity to talk much about the value of knowledge, and I certainly don't hear anybody else talking about it, certainly in the Congress and the state legislatures, but I think it's not missing totally. But in part because of the recession -- and people lose their jobs, or they're afraid of losing their jobs, or their kids will move back in with them because they can't get jobs, and they've still got a debt that they owe their law school, or medical school, or whatever; it's distracting. And so, I think in that environment we've got to be careful -- strategic to pick the timing to try to do certain things, and you've got the wisdom around the board here and in other quarters to know how to do that. I think timing is very important. You know, there's no point going to the Hill with a big banner when all hell's breaking loose up there.

So, finding the right timing -- but I try to emphasize finding the right message and some commonality. The congress would be astonished to find the science community -- they keep hearing about the science community, and they say, "Where is it?" You know, the chemists command more money, physicists want more money, but where's the science community? So, we don't have that sense. So, I think engagement with the public by our community, some commonality of message -- there's a lot of things we'll all agree on. And then some, maybe, soft strategy; just keeping in touch and figuring out what the right timing is and what the right

strategy is to deliver the message. I think those things will help. And then, of course, we care about future generations; and so, we must focus on this issue with our teachers, and our classrooms, and our districts.

DR. CERF: Thank you.

DR. ARVIZU: That's great. Thank you, Dr. Lane, once again, and we really, really do appreciate all that you've done for the Foundation.

DR. LANE: Thank you so much.

[applause]

DR. ARVIZU: This concludes the plenary open session.