**NOTE: This is an unedited verbatim transcript of the Workshop on a New Government-University Partnership for Science and Security held at Stanford University on September 27-28, 2006. It was prepared by CASET Associates and is not an official report of The National Academies. Opinions and statements included in the transcript are solely those of the individual persons or participants at the workshop, and are not necessarily adopted or endorsed or verified as accurate by The National Academies.**

**The National Academies**

**Committee on a New Government-University Partnership for Science and Security**

**September 28, 2006**

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P R O C E E D I N G S [8:35 a.m.]

**Agenda Item: Introductions and Purpose of Meeting - Dr. Gansler and Dr. Gast**

DR. GANSLER: Okay, let me start off by at least again, there are a few people here who weren't here yesterday, just welcoming you on behalf of Alice Gast and myself, I'm Jack Gansler, we're the co-chairs, and our committee is aligned here along the front of the room. And we'll use the same format and so forth that we did yesterday with but we have selected individual speakers, actually outstanding speakers in terms of the relevance of the subject matter today, we have three speakers. We also want to allow some time at the end for sort of general discussion so we'll do what we did yesterday which is after each speaker allow first the committee and then the rest of the audience to comment, questions, throw tomatoes, whatever you feel like doing, and then we will have a general discussion at the end for items that you wanted to bring up that have been bothering you that didn't either come up or that you thought of while you were taking a shower this morning.

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I should remind you again that this is all recorded and so we will have a transcript on the web in a couple of weeks from this and any other information you want to get to us afterwards feel free to do so. Anne Marie is the obvious person to get that information to.

The one other point I would remind you of is when you ask a question during the discussion period if you would just identify yourself so we have that on the record as well.

So other then that I don't think of any administrative comments, Anne Marie, is there anything else I'm supposed to say? All right.

So then let's get started. Our first speaker, Sieg Hecker, is director emeritus of the Los Alamos National Labs, Sieg is a visiting professor here at Stanford and also he's at the Center for International Security and Cooperation, obviously highly relevant to this. A couple things about Sieg that I should mention that I find important here besides being a member of the National Academy, he's chair of the joint U.S.-Russian Academies Committee on Counterterrorism Challenges in

Russia and the United States, and if you remember yesterday when Bill Perry was speaking Bill mentioned the fact that even with China we should be trying to look for areas of common interest, Bill mentioned environment and energy, I would add to that even China has a terrorism problem up in their Northwest. So I think what Sieg is doing here in connection with discussions with Russia on joint counterterrorism efforts is particularly important.

Sieg is also on the National Academy Committee on International Security and Cooperation which is obviously directly relevant to what we're talking about. With that Sieg, by the way, I'm not going to read the bios of everybody because they're in the materials that you have. Sieg?

**Agenda Item: Security Concerns at National and University Laboratories - Dr. Hecker**

DR. HECKER: Thank you, Jacque, ladies and gentlemen, thank you for inviting me. I will talk about science and security at the national labs and I put in parenthesis and university labs, Artie Bienenstock called me some time ago and asked me to talk to this committee,

then I was asked to sort of expand my comments also to university labs. However, I will focus principally on my experience at the national labs and particularly at the Los Alamos National Laboratory.

So as I view the issue of science and security today the important aspect is how do we continue to provide the best science and technology in the interest of national security. And to me it means the three things that I've indicated here. Of course first and foremost is people, how do we continue to attract the best and the brightest to want to think about national security. But then there's also the issue of the institutions and the governance, in other words those people have to work in institutions and have to have a method of governance that allows them to work on issues of national security. And then we heard a lot yesterday actually about how certain government policies and practices actually undermine our ability to work on that and rather, today rather than me giving you horror stories along the lines of what we heard yesterday, and believe me I have many of those horror stores, I would rather talk about the effects of, the accumulative effects

of those government policies and practices on what it means to do national security.

As I had indicated my focus here will not be so much on the people because you've heard a lot about that in the first two sessions but more on this issue of institutions, governance and policy and practices. And the institutions that I'm talking about, I've just listed them here, that are related to national security, of course all the way from the military to the government agencies themselves, to industry, the federal and national labs, national labs here principally meaning the Department of Energy laboratories, and I will talk more specifically as I indicated about what we call the weapons laboratory at Los Alamos, Lawrence Livermore, and Sandia. And then universities and I mention NGOs and quite frankly I never really appreciated, when I was at Los Alamos I never really appreciated the beneficial important role that NGOs play in this context. But Jacque mentioned I worked a lot with the Russians, I've been over there 37 times in the last 14 years or so, and what I learned from my work in Russia is that I wished they had more NGOs and so I have a better

appreciation for the role that NGOs play especially from the standpoint of security.

Now I'm going to take you all the way back and I hope you'll excuse me for this but a little bit of history because what I want to do is use the context of what's actually happened in the nuclear program and the national labs in security and how that's evolved over the years and how that reflects on today's situations and the challenges that we face. Of course the Manhattan Project with Oppenheimer and Groves is a particularly good example of this issue as to how do we strike the right balance between science and security.

Groves wanted the scientists Oppenheimer and company to join the Army and wear uniforms and Oppenheimer said well look, my guys are not going to do that, they all came from universities, they're not going to do the uniforms. He wanted in the spirit of the military to compartmentalize everything and Oppenheimer said science doesn't work that way, science is open, you have to share things.

And in the end Oppenheimer won that battle and

the reason that because without the scientists there would have been no Manhattan project, we didn't know how to build the bomb, so in this case the risk/benefit equation was one that yes the risks were great but the benefits were everything, either you had the bomb or you didn't have the bomb and so Oppenheimer had to give in.

And so what we don't stress enough in this whole dialogue of science and security, because most of it, particularly today in the government is focused on protecting, protecting the secrets. Well we have to create the secrets in order to make it worth to protect those secrets, that's what we do at the national labs, we create those secrets, that takes an entirely different environment then to protect the secrets. Now you have to be able to do both but one has to stress the fact that you've got to create the secrets first and so that requires openness.

There's also the other risks that were major risks taken in the Manhattan project, and if you look back at the environment today, the horror stories we heard yesterday, can you imagine Oppenheimer coming in and coming with the likes of Enrico Ferme(?), Hans Bete(?), Edward

Teller(?), Eugene Wittner(?), John Von Norman(?), Leo Synard(?), it's just the list goes on and on. These are people that just come to the United States and for heaven's sakes we're going to entrust them with the world's greatest secrets.

Well it turns out we needed them to create those secrets and so the risk was taken and of course along with them, so there was the British mission, the British mission had Rudolph Pyles(?) and in fact he was part of the MAD(?) report which initially thought about the fact that one could build a bomb out of uranium, the Brits brought that to the United States. So we accepted the Brits, we accepted Pyles, but guess what, along with Pyles came this guy called Klaus Fooks(?), and Klaus Fooks gave the blueprints to the Soviets eventually. So that was a risk and of course in the end that was a risk worth taking because what those other guys brought to the project overshadowed the damage that Klaus Fooks did.

There's was also a risk in taking really young American scientists, ones that you didn't know yet how to judge their allegiance, there were guys like Theodore

Hall(?), now he was an American, now Klaus Fooks who was a German who went to England and then came here, Theodore Hall is an American. He also gave the secrets to the Soviets but along with every Theodore Hall there were also a lot of Richard Fineman(?), and by the way he was driving the security people crazy at Los Alamos cracking safes, that was the sort of the environment of the Manhattan Project, one of the times of the most crucial periods in our national history and we tend to forget that.

So that's the issue of balance and the Manhattan Project I say got it right.

Let me just trace, and this is my version, not necessarily a historians version, of what happened during the Cold War in terms of this balance of science and security. Initially our response after the Cold War was actually to protect, to guard, and so even though the Brits came with the idea we shut them out, we did not share the follow-on secrets with the Brits, they eventually tested on their own in 1952. Of course we didn't share with the Soviets either I think for very good reason but initially we want to protect.

But then Eisenhower took an enormous risk in 1953 with the Atoms for Peace Program. Until that time essentially all nuclear research was highly classified and Eisenhower made this bargain that said we will give you other countries the essence of the nuclear technologies for the peaceful use of atomic energy if you foreswear building weapons. Well again you can imagine the risk of opening up the secrets, we were clearly ahead in the world, but the benefit that Eisenhower saw was to open the potential of nuclear energy for the rest of the world. And he actually also felt that this was a way to deal with this possibility of destroying the world so to control nuclear armaments, so Eisenhower took that risk.

But as a result of Eisenhower's risk, there was a little discussion yesterday Michael Mock(?) mentioned that at MIT they had all these Iranian students, but we put the first reactor into Iran, the United States, we put the first reactor into Iraq, and we trained the Iranian scientists, that was the potential risk that was taken but nevertheless today in the world 20 percent of the energy, the electrical energy, is generated by nuclear power,

that's the benefit. So again it's a question of risk and benefit.

Now I saw us then changing our strategy from initially this protection to Eisenhower to opening up to then particularly with Sputnik and also with the fact that these other countries went ahead and got nuclear weapons anyway, the Brits in '52 followed by the French followed by the Chinese, of course the Soviets already in 1949. And so our strategy then particularly with Sputnik changes to one that I call just run faster, outrun the competition, and that's the way our laboratories grew up.

I came to Los Alamos first in 1965 as a summer graduate student and it was an environment of everything, the world was there at your feet, we were told to outrun the competition, and we set up an environment that was intellectually incredibly stimulating, and so of course we had to guard the secrets but as you know there's quite a difference in terms of the institutions, the governance, the policies and practices, when your primary strategy is one about running competition, in other words offense, versus playing prevent defense. When you're always trying

to grab someone and hold them back it's pretty difficult to run fast yourself and that's the essence of what the Cold War brought to us and how it helped to create these institutions, national laboratories.

But then the world changed and everything changed along with that and particularly for me of course one of the most important changes was this end to the Cold War. And this was the time that I was the director at Los Alamos, I was director from 1986 to 1997 and so this change in Cold War happened there right in front of our very eyes. Now there are many, many good things of course that have come from the Cold War but part of what we're suffering today in my opinion is the fact that the urgency for our national security mission has dramatically declined. And when that urgency declines then what happens is the bureaucracy and the partisanship rises and so there's also a balance we talked about yesterday, sort of a balance between strategy and moving forward and a balance between the bureaucracy and holding you back and I'll get to that in a second.

Then 9/11 of course was another major, major

change. What I see as the change in terms of what effects us today is there the sense of vulnerability increased. But what that meant is that, at least what I've seen, it's caused a shift to us protecting ourselves, so actually instead of Sputnik and some of the other events that happened which caused us to run faster 9/11 has actually caused us to retreat and run slower, become more protective. And that again in this environment of science is death in the end to science.

Now it was in that time that this Cox report, and I'll explain a little bit more about what I mean by the Cox report actually happened, and the Cox report had a greater impact on Los Alamos then 9/11, or almost for that matter perhaps the end of the Cold War although the end of the Cold War in my opinion led to what became the environment of the Cox report.

These are quotes from the Cox report and also then from Congressman Spence who was chairman of the House Armed Services Committee at that time as to what happened at Los Alamos. And just in a very, very few words, as few as I can manage, what happened in the Cox report is that in

essence one Los Alamos employee, an American citizen of Chinese nationality, was accused of spying and essentially handing everything in our arsenal to the Chinese and that's what that first quote says, in essence that he facilitated the classified information on every currently deployed thermonuclear warhead in the U.S. ballistic missile arsenal to the PRC. And Spence went on to of course say that this is just absolutely unbelievable.

Now what in fact actually happened is that this employee did indeed violate our security regulations in a major way, more so than any individual had ever done at Los Alamos before or since then. And what he did was download the various secret, the secrets of our arsenal, for use that no one has ever understood. The Cox report in the end did not pass academic scrutiny, in fact there was a report from Stanford that took on the specific comments in the Cox report, its never been demonstrated that any of the things that were downloaded and taken in the open actually went to the Chinese and particularly that anything from Los Alamos actually went to the Chinese.

However, what this particular individual did was

to violate the trust that we had placed in him and the consequence of that violation was then very serious in the aftermath of the Cox report. And it's something that I particularly am very, very sensitive to because he was a foreign born U.S. citizen and so am I, and this country entrusted in me not only citizenship but a clearance and then eventually the opportunity to run the Los Alamos National Laboratory. So in essence the way that I view it, that this country gave me the greatest gift of all, it trusted me, and so I felt it a particularly important aspect of making sure that I don't violate the trust, this Los Alamos employee violated that trust.

And so as a consequence, and I should say shortly following this Cox report, which was made public in a New York Times piece in April of 1999, there was a report from PFIAB, the President's Foreign Intelligence Advisory Board, and I have some quotes from it here, that was also damning, and in the end it said the panel found a large organization saturated with cynicism, an arrogant disregard for authority and a staggering pattern of denial. And again I don't agree with that.

Now what happened, and I call it striking the wrong balance, the Cox report and the aftermath, is we had an avalanche of what I call add on security regulation and I put the add on in quotes because we did not go back and reexamine our security strategies, we just piled on additional rules and regulation, as one Senator said when he came to Los Alamos to stop the hemorrhaging, immediate restrictions on foreign travel visitors and collaborations, and this was at a time when actually before my work with the Russians in counterterrorism most of my work with the Russians has been on helping them secure and control their nuclear materials and for some time even that program was in jeopardy. Fortunately we were able to bring that back on board.

There was an immediate call to polygraph everyone at Los Alamos, fortunately that was also eventually turned back, to some extent instead of 10,000 people perhaps 1,000 people or so were polygraphed, but nevertheless as you might imagine the research environment suffers dramatically especially when the scientists believes what the National Academies say in that polygraphs are not reliable.

Then what happened at Los Alamos was more security infractions and there was particularly one very famous case of a hard drive that was left behind a Xerox machine that was missing for a while. The FBI investigation that followed makes yesterday's story pale in comparison, it was absolutely brutal and again the effect that that had on the morale at Los Alamos, the effect that it had on breaking down the trust that you need to work between science and security cannot be overstated.

And then eventually particularly after 9/11 we began to build sort of what I call fortress Los Alamos. And the reason that I stress that is because what we had felt during these days of outrunning the opposition, in order to bring the best science to bear on these important problems related particularly to nuclear weapons, it was important to have what I call a system of short and tall fences, and it is short fences more the campus like environment to make sure that we can attract the best and the brightest. Because particularly even by the time that I got to Los Alamos and certainly in the '70s and '80s there were very graduate students in the U.S. that wanted to be bomb

designers or wanted to work on plutonium metallurgy, I didn't, it turns out my background is metallurgy but I got sucked to Los Alamos because it was such a fantastic place and I got sucked into plutonium which turned out to be the most complicated metal, the most complicated element in the Periodic Table. And that's how we brought people to Los Alamos, short fences, campus like environment.

And an enormous amount of criticism that we got, at the time of the Cox report I had built up the postdoc population at Los Alamos to close to 400 and I insisted that we get the best from wherever they came, 100 of them or close to 100 were Chinese, because at the time especially after Tiananmen Square of 1989 there was an enormous influx of Chinese graduate students, that's what the U.S. universities were producing and they were the best, and so there were a lot of Chinese. So we have the system of short fences but then tall fences around those things that really matter and what we then began to construct is taller and taller fences around the whole place and actually now rereading some of regs in Los Alamos because of the new 9/11 physical restrictions that perhaps

take it back to the pre-1957 days.

And so what I want to stress here is that all of these things happen as a result of reactive policies and practices that were in essence piled on top of this broken system. There was not a risk/benefit analysis to guide those decisions, to say does it make sense.

Okay, now some good news during this period, there was a voice of reason and it was Neil Lane, and he was asked to speak in front of National Academy's panel on October 6, 2000. This was pretty much at the height of the turmoil around Los Alamos after the hard drive incident which was associated at a time that we had the big fire in Los Alamos. And Neil Lane made these three assertions that I like so much that I put them on here, and he said national security requires scientific excellence, scientific excellence requires openness, and openness is inherently international, I think we've got to keep that in mind.

He went on to say, in fact I think quite gutsy, he looked at the situation at Los Alamos and said these sensational allegations and particularly the way that

Congress followed up reminded him of ready, fire, aim. The DOE has introduced new security measures, lie detectors, travel restrictions, visitor's access, the press coverage has created this sort of siege mentality at Los Alamos, and that it had, but believe me I do not blame the press because the press had plenty of fodder. And then what he went on to say in essence he said that he couldn't imagine how any enemy could have done to us what we did to ourselves and so he said we have met the enemy and he is us. Now that was one man's opinion, it was a very important opinion, but he was not only a voice of reason, he was also a voice in the wilderness at that time in 2000.

In 2002 a commission was set up, another national commission, this one chaired by John Hamre, and they took I think a very dispassionate look at this issue of security at Los Alamos and the national labs and I think this report is definitely worth reading in terms of what the key issues are of science and security. And as I indicated here he said that the policies and practices at the U.S. Department of Energy, let me stress now because I'll get back to this, as driven by the United States Congress, as driven by the

United States Congress, they risk undermining its security and comprising its science and technology program, the central cause in essence was this shared responsibility and the trust had broken down, and he said we risk the vitality of science in some of the best labs in the United States. And then he goes on and this would be my tie into what I consider about universities, he says if we're not careful the risk could spread beyond the government to U.S. universities and the private sector. In other words he and his panel could see that the pattern of events that had created what we had at Los Alamos at the time was much more endemic in the government then being the single case of Los Alamos.

Now compounded by the effects of the Cox report then in essence what we saw was one very good thing and that is the influx of badly needed funds and some very positive improvements in cyber security. Because in the end, I don't mean to stand here and say that there was nothing wrong with security at the national laboratories, I don't think you can say that about any institution, and certainly we needed to make improvements and particularly

the part that we had not done well enough is that the information revolution was running much, much faster then our ability to deal with it.

And I think the one criticism that I would make of myself is that all these intellectual capabilities we had at Los Alamos we didn't turn on to the problem as to how do we deal with this new environment of communications, computing, networking, in order to see how we can live better with the vulnerabilities that were open. And so some of that attention and particularly some of the funding was very helpful.

However, what we also found then was an overly prescriptive operational environment, and this is one of the most important aspects of what happened, is when you do that it keeps the secrets from the people who have to know the secrets. In other words in places like Los Alamos you don't just keep those secrets in a safe and bring them out every now and then like they sometimes do in Washington, bring them out and share them with the news media, we have to share them with the people who have to create those other secrets, you have to create the secrets, that means

you have to move information around. And those prescriptive regulations were keeping the secrets from our own people.

Also there was just a huge loss in productivity but what's much more important is actually this inability to get work done and in the end smart people don't want to work at a place where they can't work. So then it's difficult to attract the best talent and especially for the classified projects because it became so difficult to work with classified information and then in the end at Los Alamos we lost the University of California contract which had been there since the Manhattan Project and had created a system of governments that was quite remarkable and in my opinion very successful, and in the end this became then the end to that system of governance as I see it. So the financial costs were huge but in my opinion quite small in comparison compared to this loss of trust and the damage to the research environment.

I want to say at least a few words about this demise of the system of governance, the so-called GOCO, government owned contractor operated system of governance,

was created during the Manhattan Project precisely because the scientists didn't want to wear uniforms. And the government procurement system was too cumbersome to be able to do something like build the atomic bomb in 27 months. So they created this incredibly, incredibly innovative system where in essence the government owned and the contractor operated, and the contractor then did not operate with the burdens of government, at least with as much of the burden of government.

And so that system was created, that partnership was designed as I indicated here to steer between the alternatives of completely federal on one hand and private procurement operated. I like to stress that that GOCO partnership was deliberate, innovative and successful, and it has eroded over time to the point where with the last application of this Los Alamos contract we in essence have lost those benefits that we had as part of the GOCO contract.

So that erosion was gradual for many years, I think it accelerated for those of you folks with gray hair and were here before the Department of Energy was created,

it accelerated significantly with the creation of the Department of Energy out of the Atomic Energy Commission, and then as far as I'm concerned it went to a free fall with the Cox Report and its aftermath.

So here's the way that I see the world that we operate in today, the popular term these days the world is flat and indeed it is, but I would like to add it's also nonlinear and particularly in the business that we're in it's nonlinear. The slightest perturbation can have a response that is totally incommensurate with that perturbation and that is very, very dangerous in the national security business.

To enhance national security today requires improved global security. That clarity of the Cold War threat is gone, the war on terror to me resembles more the war on drugs rather than World War II and Cold War, very, very difficult. The terrorist threat is pervasive like drugs but it's magnified a million fold particularly because of nuclear weapons and I think potentially eventually because of biological weapons. And because of the way the world operates today I think the social

sciences must be tapped to complement the technological aspects of national security.

So the question is how do we mobilize today the best science and nurture the institutions that provide for our national security. So as I see science and the future of security is certainly science will continue to be essential for our security, it will be increasingly international and competitive, it will be increasingly difficult for us in this country to recruit the talent and have the institutions to bring science to bear for national security. And short of a dramatic turnaround at the national labs and in industry an increasing burden will fall on the universities.

Certainly education and research will remain the primary university focus, however security R&D will require more than basic science. And classified work will become more important rather than less important. And the intelligence programs will require more science and not less science, that's the challenge before us.

Now in my opinion the national labs, particularly the three as we call weapons labs, Los Alamos, Lawrence

Livermore and Sandia, are really at a turning point. Their missions are being questioned and today they have rather little national constituency. I could say thank goodness for Senator Pete Dominici, he's one of the important constituents.

The system of governance is broken and current reforms in my opinion are moving in the wrong direction, specifically the new contract at Los Alamos and the contract that eventually will be let for Lawrence Livermore. The accumulated burden of reactive government policies and oversight I think have seriously eroded the effectiveness of these laboratories. The prospects are grim short of a major reexamination.

I should just say as background, as I had mentioned I came to Los Alamos a long time ago, 1965, and I spent 34 years off and on at Los Alamos and I came to Stanford last year, and most of my career is really focused on Los Alamos on issues of science and national security. So I'm terribly sorry to have to paint such a grim picture but I don't really see much hope at this point. And so the best I have is that the suggestion is one for a

Congressional Blue Ribbon Panel to actually to look back at the future mission of these laboratories, the appropriate system of governance as we face things today, and the policies and practices for an operating environment that allows those laboratories to accomplish the missions more effectively.

And the challenges for universities, I think it's very important to strengthen the university participation in security programs and not because of all the horror stories that you heard yesterday, retreat and go in the other direction. Because particularly if the national laboratories become less effective and as you all know the industrial research laboratories, particularly on the more fundamental side, have scaled back substantially, that the universities are on the only place left where you can do sufficiently fundamental research that has implications to national security.

So I actually see more security related research, not less, more security related courses, I have the great pleasure of teaching this fall, I co-teach with Bill Perry a course on technology and national security trying to

bring across to the students what are the issues and Bill covered this week so far he's covered the first 4,000 years, actually 4,900 years. And then the participation and review panel such as the one that you sit on today, but the JASONS, the lab reviews, and many others are important. And then servicing on National Academies reviews, both open and classified are crucial.

But I think from a university standpoint one has to be prepared to avoid the fate of the labs, and you're talking in the title of your committee about a new partnership. And I just want to caution that partnering with the government today is a very, very difficult process, that government is not a good partner today and that government is not even a good customer today. And so I think the interface with the government is very, very important and I think that lessons that we've learned from what's happened to the national laboratories is something that universities much take a very close look at.

And then it would also be extremely helpful if somehow the universities can promote a risk/benefit analysis to guide the rules, regulations and defining the

operational environment that we have today.

And then I firmly believe that the universities must be at the forefront of strengthening foreign enrollment and foreign exchange programs, those are absolutely key.

So I think it's important to focus on a strategy to articulate the benefits of open science, who can do that better than the universities, and of course also the National Academies and particularly this panel. Because unless we understand the benefits the other system and the one that drags you back, that's protective only, is going to win out. And I maintain the history of the success of the United States has been because we've been able to outrun the competition and if we go into the defensive mode we will not be able to do that and the stakes are simply too high.

Thank you, those are the remarks that I had planned to make today, thank you.

-- [Applause.] --

**Agenda Item: Discussion**

DR. GANSLER: Okay, questions, comments?

DR. MESERVE: I have a question about one of the bullets in one of your slides, I think one of your slides you said that for security purposes that classified work is now even more important than it was, subsequently you talk about the virtues of openness and we have heard testimony from a lot of people in the bioterrorism area as an example that our best strategy is a lot of openness and running as fast as you can. I wonder if you could clarify what you meant when you emphasized more classified work, it seemed a little inconsistent with the theme elsewhere in your talk.

DR. HECKER: I very much agree with the comments that were made yesterday that it's important in essence to build very tall fences around very few things, so you do it, a classification is extremely important, but you should do it much less than it is today and yesterday the comment was made actually by Bill Perry that we should classify significant less than we do today, so I believe that. The comment that I made about more classified work, I'm sorry, that is confusing in the spirit that I presented it, is that I believe that universities, it's actually important to be engaged in more classified research rather than in

less. And the reason for that, if the national laboratories are indeed facing sort of a crisis of identity and a crisis of mission the work that they're doing is extremely important, someone has to be at the forefront of science and to interface that with practical problems and I see more of that burden actually falling on universities. So in the end in totality less of the information should be classified but the universities should be more willing to get into doing classified research. I hope that clarifies the comment.

DR. GORDON: Sieg, you've taken almost an axiomatic the idea of openness, the importance of openness, and your last chart talked about we need to strategize on how to articulate it better. I guess I'd like to underline that and simply to see if you have any ideas on how we do that, talked about the importance of it but I don't know we convince anybody else about that --

DR. HECKER: Let's see, in terms of how to get the message out --

DR. GORDON: We tend to come up and say science depends on openness --

DR. GANSLER: To people like the Congress, like you pointed out didn't see the benefit of it, that's what John is getting at.

DR. GORDON: Can you give it some meat? How do we convince the Congress?

DR. HECKER: I think one of the important aspects is to be able to convince the Congress that actually not all knowledge resides in the United States, all scientific knowledge resides in the United States. And that even areas as sensitive and as important as plutonium science that all knowledge does not reside in the United States and in spite of some of the grim pictures I painted as to what's going on one of the good news aspects has been that I just finished about a month ago the sixth annual workshop on the fundamentals of plutonium science with our Russian counterparts. And its openness that allowed us to be able to communicate with the Russian scientists to get a better fundamental understanding of plutonium. And then what we do with that fundamental knowledge, that's our business, it's the Russian's business on their side for their applications, it's our business for our side, for our

applications.

But in today's world science is everywhere and without the ability to exchange ideas and to have those ideas tested it simply doesn't hold up and you're not going to be able to have the innovations, be able to do the science and technology in the end. So I think by citing some examples of how important it is to make sure that you interface broadly, to be able to get the best science to bear on important problems, so that's one of the messages. But I agree with you --

DR. GAST: I wondered if there's, I think there's some good work on the Soviet era, scientific work that was going on in a very closed environment compared to what was going on here in a very open environment given talented people in both places, the effect of openness I thought was so unclear in the innovation and revolutionary type work that was made possible by an open environment relative to a closed, you probably know the Soviet work better than most of us, I remember a couple of international relations people working on that as a precept to --

DR. GORDON: -- [Comment off microphone.] --

DR. HECKER: That's a very good point and probably none of us has found a very good answer to that, I give you one answer for example that in the area that one would think should be one of the most closed areas yet we have benefited substantially and actually the CD I gave you earlier today, I have an article in there with the preeminent Russian plutonium metallurgist on what we call the plutonium gallium phase diagram, and what we learned after 40 years that in the end that the Russians were right and we were wrong and so it does happen, it does help to have some specific cases of saying where the interchange with the rest of the world is really important.

DR. HART: After Sputnik went up I remember one of the slogans was no Germans are better than our Germans, or it turned out our Hungarians were better than their Germans --

-- [Laughter.] --

DR. GANSLER: Other questions from the panel before I call the audience?

DR. BROWMAN: John Browman, faculty member here, you'd probably do better with an argument from a completely

different area like the pharmaceutical industry with respect to the advances that have happened in many cases have been a result of taking advantage of other people's knowledge and rather than restricting yourself to the arguments about these sorts of issues there's plenty of examples in those other areas.

DR. GANSLER: I think Alice's example was the negative side, yours is the positive side, and in a certain sense we probably need both, the Congress does understand that the Russians failed so probably using their example would not, but I think the point is very good --

DR. HECKER: If I may, John Gordon asked a very key question in particular as to how do you convince others this openness is important, I guess one of the other defenses I would have of openness, if we look at where particularly the nuclear weapons program and the scientific capabilities of laboratories such as Los Alamos, Livermore, and Sandia are national laboratories, these have been some of the best and most powerful scientific laboratories in the world and they are there because of the environment that they had is an environment that promotes openness, it

openness in doing research in many different areas and I would maintain that one way one could do this is to compare the capabilities of those laboratories that have had a significant interaction with the rest of the scientific world and to those laboratories that have not. And so generally for example a comparison of the DOE national laboratories with other federal laboratories, certainly one of the main differences is the issue of openness, the issue of how you interact with the rest of the academic community. What's on the research agenda, at Los Alamos you have everything from the human genome to the nuclear weapons and it's that environment.

But I think your comment is a good one, one should probably a better story as to how to convince the country as to why it's important to have that environment short of going in the direction that I'm afraid we're going now which is sort of squeezing out that open environment and then winding up essentially with a Watertown(?) arsenal instead of a Los Alamos National Laboratory.

DR. HORTON: I'm Larry Horton, can you tell me, you comment on how the University of California reacted, or

how you think it behaved during that recent dragging that it took in the Congress and whether there were any lessons that our own university can learn from that and where there's been a change in the way the university approaches labs.

DR. HECKER: I came to Los Alamos in 1965 because it said University of California, I mean my path in 1965 was to become a university professor. I went back to get my graduate degrees and in 1968 I had an offer to be assistant professor of University of Illinois. But then a colleague there said look, you should really go do a postdoc, so I did a postdoc at Los Alamos. But eventually I sort of got stuck and attracted by Los Alamos and by staying at Los Alamos and so I went there because it said University of California and I wanted to be a university professor.

And what I thought over most of the years of the University of California running the Los Alamos National Laboratory the single most important thing it did, if you forgive my saying so, is to stop the government from doing something really stupid. It had such enormous prestige

that it was able to keep the research environment against many of the threats that came, either from Congress or other places, and what happened in the 1990s essentially it lost that and so the University of California was no longer a really effective spokesman and I think it had to do with the fact that the Cold War went away, that the agency and the mission went away, and all of a sudden you could attack not only the national labs but you could also attack the University of California.

And so in my opinion the University of California has not been terribly effective in the last decade or so and in fact some of the things that happened at Los Alamos in terms of the security aftermath is some of the worst things that have happened in terms of the restrictive environment we've done to ourselves, the University of California and thus the lab have been to ourselves, in order to make sure that we have our house in order to protect ourselves against the federal onslaught. And so in the end I think the university has not been terribly successful and of course we just now have had the issue, and I glanced over it, University of California is again

part of the new management team because the government decided that it would compete the contract for the first time after 60 years, but this new management team is a whole different set of organizations then was the University of California by itself.

Now in the end I think it will still be positive the university is one of those rather than being just the defense contractor operation but whether it can still be effective to be able to bring in the talent and to essentially create the environment and help to preserve an environment that brings the best science to some of the nation's most important problems I'm not so convinced anymore. And so the university has had its difficult I would say over the last ten years timeframe and it's not sure, I'm not sure how it's going to play out.

DR. FRANKLIN: Lou Franklin from Stanford and Sieg's discussion I couldn't reinforce more what he said about the harm and the side effects and if you read the paper this morning you'll see that Wen Ho Lee is again in the paper as a poster child along with Chinese students and industrial espionage.

So I wanted to add a little parallel to this discussion of the laboratories and take us back to Silicon Valley and where we have an interesting security situation between the high tech companies and the universities, very close collaboration, and if you kind of yourselves in Apple's shoes or in Intel's shoes you sort of say well what have they got to give security, well, the absolute top security at Apple is what color is the iPod going to be. Now that color is a technological miracle because there's no real color, it's an biased perception of a strange use of materials that scatter light in a way that is like no other color you've ever seen in nature. And how many people knew what the color palette of Apple was going to be before the iPod came out? Nobody. But on the day it came out everybody knew.

So industrial model security is to keep your deepest secrets for the time it takes you to get the product developed, manufactured, and think of how many people during the manufacturing knew the colors, companies all over the world that were delivering parts and pieces, this is an international thing now, and still in that

environment nobody found out. Now there were some speculations so nobody was really sure.

Well what this emphasizes is security has a lifetime, no secrets are forever, and the commercial sector has the advantage of a product release because now they want to tell everybody what the color is, they have the opposite. There's a little bit of that in government but we have an industrial securities act that among things says you don't keep secrets, you keep them a certain number of years, we've all gone through the little stamps in the corner of the page releasable in 2026 or whatever the number is.

But the principle is on saving money, I don't know where this fits in your panel but the principle of security should be planning for secrets being released or exposed, whether it's by situations such as happened at Los Alamos or whether it's in the natural declassification or it's FOIA. I think the pattern is rarely is the government for any secret, whether it's political, diplomatic, it's not just technology, all of these have these same problem.

So I think what Sieg has suggested, we're

struggling with a governmental attitude that flows in this case back to research but also flows many other ways so you have an opportunity to craft a new kind of message. And I wish I was wise to suggest this message, I think Sieg's challenge to you, is we haven't sold this message of the value of secrecy and the value of non-secrecy, there's a time, because products happen in the government too, a weapons system is a product. You want your enemies to know something about that weapon system to deter them, deterrence is a very proper activity, you don't want to tell them the vulnerabilities. That's a good example of finding what secrets do you want to release, you want to release enough information of the weapons to credibly deter them, you're not waving any little flag, but on the other hand those vulnerability issues as an example, or performance deficiencies as somebody said.

Congress gets this very mixed up and maybe as Sieg said, I take no pride, I was one of the authors of the Cox critique, I take no pride in that because I and like May if he's here this morning were with a very wise editive(?), foresaw this as clear as you could see what was

going to happen, it was the 9/11 of the national labs without any question. The resurgence today of the reference to that Chinese espionage, which I suspect is probably mostly commercial espionage, they were trying to find the color of the iPod too, you just got to think about that for a minute, they're after the iPod color so they can make clones with their own name, sell them in Asia, because they're not restricted by the patents the way we are, but the news is the FBI is busy searching those people, they have stated in the Sallie this morning that Chinese students are among the suspects for this espionage, they'll open two new FBI offices, one in Palo Alto, one in San Jose, that was the announcement today, so if I was Hennessy I would be setting up a defensive strategy this morning to deal with the bad press we're going to get in this area.

So that's not a good thing but it's a pattern that's going to repeat time and time again, so this message is not only to craft a message, it's an ongoing message of these benefits and yes, we've done a poor job, probably we could all, maybe this is a good Stanford task to take it. But I will finally close this with one last reminder,

classified work in universities hasn't been talked about for quite a while but remember when we started this conference Stanford was the place that separated itself from the Stanford Research Institute which was started in the '60s, and University of California suffered enormous social unrest because of the classification clearances of the professors during the '60s, so I would say that this is also an issue that hasn't been very dealt with on the table as how can classified work even indirectly professors having clearances for example as many of us do, is not, the public is not comfortable with that, Congress is particularly uncomfortable with that. And we may want to take that issue as well and reexamine that in light of our experience with that, has that served us well or not, and maybe Stanford is a model, is this a good thing to do.

DR. HECKER: Just a quick comment, Lou gives me the chance of saying something else about University of California because as I was standing here I realized I came across too negatively because the importance of the University of California not only to the laboratory but to the nation in this business has been really substantial.

And the main aspect that I would like to stress that in spite of the fact that right now the atmosphere is very negative I'm very, very glad to see that the University of California was willing to stick in this business, to see whether it can find now a different model then the one that we had before. And so the challenge is is to how to do this correctly but we're really in new turf because a much worse alternative would have been if this contract had gone strictly to a defense contractor route, then I would have said the national labs as we know them, the DOE weapons labs, are on their way down intellectually. So thank goodness that the University of California stepped up however it's going to face a significant challenge.

DR. GANSLER: Sieg, thank you very much.

-- [Applause.] --

DR. GANSLER: Okay, what we want to do next, Jonathan Dorfan is going to somewhat balance this but from the viewpoint of a university research laboratory. Jonathan is currently the director of the Stanford Linear Accelerator Center and he's also a professor here at Stanford, and in fact he's been a professor here for 30

years in one form or another since 1976 according to the bio and so has brought a historic perspective to this as well.

The other thing I thought was very important and that he's going to actually cover is the fact that we've talked about the importance of openness both across the country and he happens to be on the Princeton Plasma Physics Lab Advisory Board and also in terms of international, he's on the Max Plonk(?) Institute Advisory Board and also on the International Committee for Future Accelerators. So you can see the sort of thing that keeps coming back in each of these discussions in terms of openness and international and their relationships. Jonathan?

**Agenda Item: International Collaborations - Dr. Dorfan**

DR. DORFAN: So thank you very much for inviting me to address this very important panel, your work is essential to the health of science and security in the nation. As Sieg said we've had a good dose of the challenges that present themselves in this milieu and some

of the horror stories as they're called. And like he I'm not going to focus on those, more my talk is a contextual talk just to remind us of one of the critical areas which is part of this interface between government and universities and between science and security which is in fact collaborative, major collaborative endeavors in science.

These points have been made but I just want to stress them again which is the U.S. system for partnering between research universities and government agencies is really unique in the world and its enormous success has been a critical factor in the economic and national security of this nation. And I think John Hennessy in his opening remarks, and I thought John's remarks were extremely powerful, stressed this point, we have a unique symbiotic relationship among government, industry and academia. This relationship is the envy of the world and a significant source of our ability to use R&D funding as an engine for both economic growth and improvements in national security.

It's also true that the health of this

partnership is critical to our future and there have been many panels that have upheld that in recent times, amongst them Hart-Rudman which said the capacity of America's educational system to create a 21st century workforce second to none in the world is a national security issue of the first order. In the recent Gathering Storm Report a similar warning, sustained and strengthen the nation's traditional commitment to long term basic research, it has the potential to be transformational, to maintain the flow of new ideas and fuel the economy, provide security, and enhance the quality of life. So it's something that has stood us in great stead and it's something that we need to protect and it's a challenge.

We should remind ourselves as Sieg I think really did, in a lot of the context Sieg made easier for me, our research base is inherently international. If you look at the U.S. enterprise one sees that it is such. Critical to the success of the research base is free and open access for foreigners to our university and research facilities. International partnerships and collaboration are also crucial. And John Gordon raised this issue about why does

one say this and how does one support this.

And I think it is a challenge to articulate that but there are certainly clear elements that one can learn from history. I don't want to be personal but the great reputation of the U.S. research university base was something known to someone like myself, my brother, in South Africa. We aspired to come here to take advantage of that research environment and we did and to the extent that we have benefited from the fact that we stayed here that is something that the system gains by its open access. The ability to attract as Sieg pointed out the best and the brightest in an open access environment.

The reliance on large scale multinational scientific and technology collaborations is growing, it's becoming more important, it obviously reflects the globalization of the society at large. But more importantly many of these ventures have grown to the size where either a region has not got the full human resources that it needs or the fiscal resources, or both. So to get these kinds of major scientific endeavors done requires on the basis of resources closer cooperation and more

collaboration.

A few examples to set the scale from some of the agencies and this is not of course complete but I just picked some, picked a project of the National Science Foundation portfolio which is the Large Millimeter Array, this is an array of antenna that will be put on a high mountain in Chile and it's a Federation of European Space Agency, the National Science Foundation, and several other nations. To set the scale, it's about a two billion dollar project and it is done in the context of a legal entity between the nations, between the partners.

An example from NASA, one that I think highlights a significant number of the things that have been discussed recently which is the gamma ray large area space telescope which is to be launched by NASA in 2007. And this has all the elements and all the challenges built in that we've been discussing in the last day. First of all it is a partnership between two of the leading agencies within the U.S., NASA and DOE, those two agencies have different ways of operating and different ways of dealing with issues of security. For instance Everett talked yesterday about the

working of the NASA environment, in this case by the way SLAC was the lead lab in this collaboration so it's something that I've dealt with a lot. Not only did we have the NASA milieu but we had the Department of Energy milieu.

But then in addition this was a collaboration between particle physicists and astrophysicists, two very different scientific communities with very different experiences and different social orders. And then in addition it was five nations. So we had all of the complexities and all of the challenges that we have been talking about today.

I talk early front and center, this telescope is not complete, it is in fact at the space vendor and it will be mounted on the spacecraft, Rachel and others here through Artie's office had to deal with all the issues. This is about a three quarters of a billion dollar size project.

There are many, many international collaborations within the National Institutes of Health and I just listed some of those just to remind us that that agency too deals with these issues.

I know the most about the Department of Energy since I live in that milieu, I live in the scientific laboratory world of that area. But again to remember this is the biggest agency in the nation with respect to spending in the physical sciences and R&D for the physical sciences, and it supports a lot of work at the universities in addition to the national labs. The lab complex has ten science laboratories, they are familiar to all of you here and then of course in addition the so called weapons laboratories and the Office of Science mandate. And if you look down the list of these you'll see that Aimes, Argon, SLAC, Princeton, are all administered, the CO in the GOCO is a university, they sit on university campuses and they are inherently then at the interface of a university/government collaboration.

So here at SLAC for instance, SLAC is a contract between Department of Energy and the Stanford Trustees, SLAC is an intimate part of the university, it's in fact a school of the university, so it lives very closely and very directly in the world of the interface between government and the agency. And in fact an open environment in the

university.

In terms of what I said before which is to say that the research base is inherently international, let me just give you some statistics, now maybe these statistics are well known to you but they often come as a surprise to people. If you look at the Office of Science Laboratories, the ten laboratories, there are about 24,000 researchers that do their research at those laboratories, it's a large number of people. Over 50 percent of these users are foreign nations, that's a large number of foreign nationals. Your instinct is to say those people are coming to work at our laboratories from abroad but no, that's not true, 30 percent of the U.S. based users are indeed foreign nationals. This is just to remind us of a point I made before which is that we import talent to this country and that talent becomes faculty members, they are students, and they're an intrinsic part of the research milieu.

If you just look for instance at some of the laboratories, I asked a couple of directors to give me some statistics, here from SLAC if I look at our particle and particle astro community, if you look by citizenship we

have about 1200 users, 750 of those are foreign nationals. Now we had one really big collaboration which is an 11 nation collaboration so that does skew that a little bit but you see that within the U.S. community, within the U.S. institutions, 280 of the 750 of the people are in fact foreign nationals.

If you look at our synchrotron radiation program which doesn't have this one particularly large major international entity which we have it's almost 50/50 between those that are foreign nationals and those that are U.S. --

PARTICIPANT: Define user.

DR. DORFAN: A user is someone whose science is involved with a facility that we either run or operate or front for the community, so if they come and do their high energy physics on one of our accelerators they are a user. Some fraction sit in the lab but a very small fraction. If they come and use our synchrotron radiation facility or if they use it from afar which is a possibility, you can actually do your research sitting in your office, but you have to propose your research to the lab, it has to be

approved, then you are a user.

In something like GRASS(?) which is a telescope we still operate and act as a center for that collaboration, for instance the Science Operation Center will be here, so then we'd also classify that as a user.

Again, if you look at the non-U.S. base you see that about 130 of these 1000 are foreign so a significant number of these foreign citizens are in fact in the U.S. university system. And you can look through, this is Fermi Lab, they don't do it by citizenship but you see almost half of their users are foreign. Brookhaven National Laboratory, if I just look at their nuclear physics program which is an accelerator based program, again you see of their 1200 or so users of that facility more than half are foreign, of the 2200 users more than half are non-citizens. So I think one is reminded strongly of the international aspect of the users who are based in this country.

I wanted to emphasize the same point that Sieg made and commend you this study that was done, chaired by John Hamre, it was commissioned by the Secretary of Energy Richardson close to the end of his term. And if you read

chapter six I think it really is a very thoughtful and practical discussion of risk versus practicality. So risk based security is presented there I think in a thoughtful and well crafted discussion, it's a balanced approach and I think it is an approach that's workable if we were to be following it.

The report invokes NSDD-189 and the report states generally however NSDD-189 affirms that fundamental research is so important to our national security and other national objectives, and openness is so important to fundamental research, that we accept the risk that others may benefit from the research as well. The point was very well by Sieg, this was NSDD-189, it rose in the heart of the Cold War, it was under the Reagan Administration and it was recognized that you accept some risk in order to get the benefits to national security, and if you haven't read that report I commend it to you.

So let me just end by looking at where these large collaborations are headed and then what are the challenges in fact that they present to us. Perhaps the coin of the realm in this area now is ITER, it's sets the

scale for multinational partnership, it's a $10 billion dollar class collaboration which like most of these ends up being a legal entity between the parties, an entity that in that sense has a certain autonomy that it wishes to protect, it's called joint Implementing Agreement in this case, it's not complete yet but that's the way it's headed. In this case this large project is hosted by France, it was a 50 percent partner, and then the other six partners are nominally ten percent partners as is the U.S., it's a large research facility to study fusion as a potential power source for future. And that now has been burst and is still having some teething problems but it indeed sets the scale.

What's lurking and looming is the International Linear Collider. This is an interesting development for particle physics which has always been inherently international but under the leadership of ICFA which I in the past four years chaired, I no longer chair, all we have taken steps to go one beyond the level of collaboration that we have had up until now.

We had a confluence that all three regions in the

world, U.S., Asia and Europe, have looked at what is it that our science, the science of high energy physics, requires as its next facility, and everybody agrees in a rather striking alignment that a TeV energy electron positron linear collider, electron accelerated this way, positron accelerated this way, they crash together as the energy of the TeV, is in fact what is needed as the next major facility for high energy physics. So everyone agrees on what they want to do next.

So under the leadership of ICFA the community has taken what is indeed a very bold step which is to design and construct the facility in a truly international way. Now what do I mean by that? Traditionally what has happened is a region has taken the lead in terms of developing a major accelerator facility, that's what happened with the large hedron(?) collider at CERN, and then others have come in and joined that activity at a later stage inheriting whatever the initial decisions and design criteria were for that facility and at the late stage reducing the burden of cost for the project.

What we're pushing here for is from the very

beginning to do the design using the integrated R&D funds of the three regions with an integrated team that is interaction, and they move from that into a construction phase hopefully smoothly, again in something that's federated from the beginning in an international way.

So ICFA established an international federal global design effort, it exists, it's run by Professor Barry Barrish(?) from Cal-Tech, and it's currently overseeing the design of the international linear collider. The GDE design pools the R&D budgets and human and physical infrastructure from all three regions. It's challenging to do that but in fact we are managing to do that.

This concept expands and it envisions realizing the construction and operation through an internationally federated legal entity again. A single nation then would be sought to host this entity. And as I tried to emphasize before the way these legal entities are constructed they have a certain autonomy, or they wish to have a certain autonomy, which is represented by the partnership, and therefore a host country is indeed being a host to this entity, and that of course presents challenges. Again, the

ILC is a sort of a $10 billion dollar class facility so we're talking about something that is ITER like.

So let me bring that into the context then of the possible U.S. involvement. Elementary Particle Physics 2010 National Academy Study concluded in April 2006, that review was called Revealing the Hidden Nature of Space and Time. It was a very interesting panel because its chair was an economists, not a physicist, Harold Shapiro from Princeton, half of the members of this panel were non-high energy physicists, they came from other areas of science or indeed from areas which are not scientific. The importance of that is that an assessment was made critically about the value of this field, this discipline, going forward, was this a discipline that the U.S. should continue to maintain a leadership role in. And it was a very critical analysis by a group of people who initially you would have called skeptical. And their conclusion was overwhelmingly that the U.S. should continue to aspire to be a leader in the field, not the leader but a leader.

And so back to the theme of my talk which was international participation, they start their report by

saying first a rare opportunity currently exists for the U.S. program to collaborate with international partners creating a joint effort that could transform today's understanding. The committee's strategy calls for a transformation in how particle physicists interact with each other, both nationally and internationally, this turning point in particle physics is extremely compelling. So this fits right in with the theme of what I've been talking about which is the role of international participation.

They made some recommendations or action items, the first was that the large hedron collider experimental program remains the highest priority. This reminds us of another element of international participation which is that not only do we have and welcome scientists into our country but in fact a good deal of our scientists work abroad and this exchange is very important in all its elements but it also is important that going forward we maintain our side of that deal. So they highlighted that and by they way about 600 of our particle physicists are involved in the large hedron collider.

The next two action items talk about the international linear collider, the United States should launch a major program of R&D design industrialization and management financing of the ILC accelerators and detectors, and then very interestingly, the United States should announce its strong intent to become a host country for the ILC and should undertake the necessary work to provide a viable site and mount a compelling bid. The conclusion of this National Academy study, NRC study, was that the U.S. should aspire to welcome this international consortium into the U.S. and seek to be the host.

I've got another transparency that talks a little bit about the ILC but I think I'll try and conclude and say that this is an example, it's not necessarily a unique example but it's one that's actually staring us in the face now. The question is should the U.S. host such a facility, what are the risk/benefit elements in a decision of that kind.

So as this panel made clear the ILC affords the U.S. an opportunity to host one of the world's greatest scientific and technological ventures. The benefits

directly from science and technology from that are clear. There are additional other potential benefits that one should consider, ILC will be a collaborative venture involving most of the technology powerhouses in the world. This ILC collaboration involves many, many nations across the three regions and China will most certainly be a significant part of this collaboration and so that takes us back to the comments that Bill Perry made yesterday, Sieg I think alluded to them again this morning, which is that the best way to compete in the technology arena with emerging China is to build alliances with them. Projects of this kind naturally build alliances of that kind for the U.S.

International partnerships always engender close long term friendships between scientists. As history has proven when adversarial positions between nations sometimes prevent formal negotiations such friendships can provide communication channels that could be essential for avoiding conflict, it's another if you will unintended consequence but it is certainly a consequence that can have major implications for the security of our nation, and has in the past.

On the challenges side, hosting this opportunity does represent issues. Certainly on the practical side proceeding would require very broad concurrence within the Administration, you can imagine the Department of Energy and National Science Foundation being the agencies involved here but clearly when you look at all the issues associated with hosting and staging such a thing it's going to involve State, Commerce, Homeland Security, clearly it will require very strong support in both Houses of Congress through the lengthy construction phase but also through what would be presumably a multi-decade operations phase, it's a long term commitment that Congress would have to make.

So while the ILC would be an international entity as I said which will protect presumably its need for autonomy it has to abide by the regulatory laws, has to abide by the policies, the national practices which are very different across regions, of the hosting country and that would be certainly true if we were the host. Probably chief amongst those are issues of safety, protection of the environment, radiation safety, to mention a few, but of course there would be all the issues associated with import

taxes, with commerce, etc.

And these kinds of issues have to be incorporated into the design phase, if you're going to protect against these safety, environment and radiation, you can't start that late, that has to go right into the design. And it's a different situation then we have now because right now we have Department of Energy laboratories that are the entities that inherit not only the national priorities but indeed are used to control these kinds of entities.

Our foreign colleagues talk about such hosting and they raised several concerns, the fidelity of the U.S. as a partner in major ventures is one of the issues they raise, shades of the SSC if you will. The vulnerability or potential vulnerability of a year by year funding is something that has to be dealt with in a large enterprise of this kind. But of course paramount is the open access to scientists of all nationalities which is presumably the biggest challenge associated with this.

All these issues must be confronted if the U.S. wishes to host one of these mega science projects and facilities, I've given you one example.

I think with that and with my cue I should stop.

-- [Applause.] --

**Agenda Item: Discussion**

DR. GORDON: Would you just comment on your recent experiences at the laboratory in -- [comment off microphone] --

DR. DORFAN: John Hennessy spoke about this yesterday and I have to agree with him, we've made a lot of progress here. In terms of the average time to get someone through the visa process, in terms of the number of these that are getting hung up, it's a large improvement, in working with State and other departments this has improved. There still remain cases which cause embarrassment and I assume with time that those will abate too but the situation has improved greatly.

DR. GANSLER: Could I ask you to expand a little bit on ICFA in terms of how it got created just very briefly but also who it reports to if anyone.

DR. DORFAN: ICFA is an interesting enterprise, so it is an arm of so-called C-11, Commission 11, of the International Union of Pure and Applied Physicists, so it

falls under IUPAP. IUPAP falls under ICSU(?) and ICSU has some federation with UNYSCO so that is the general context. IUPAP has these different commissions which operate in the various areas of physics and applied physics so in a sense it is a freestanding entity. It is constituted on the basis of a set of rules to be very international and people who serve on that come from the countries that are strongly involved in accelerator research but also those that we wish to bring into the area of accelerator research, so we try to make it, not try, it is constituted to be as multinational possible and in fact gets adjusted as more of the third world emerges --

DR. GANSLER: But it has no links to government agencies or UN or --

DR. DORFAN: It has no links to government agencies, it operates through a set of what are called ICFA statements, it's self governing in a very real sense.

DR. GANSLER: Other comments or questions? Mike.

DR. IMPERIALE: In the case of one of these collaborations that's hosted in another country what sorts of concerns are there in those countries about the kinds of

things that we're talking about here? So in terms of foreign nationals coming into those countries and working --

DR. DORFAN: I think that Sieg said it, we clearly live in an era where the threat of international terror is everywhere and it's a very serious problem and I want to reiterate what I think Rachel said yesterday which is the scientific community recognizes that and recognizes the criticality of protecting the borders. And our collaborating nations are no different, they have to deal with those issues too. They might deal with it at a somewhat different level but they're increasingly I think in our discussions have a more sensitive appreciation of the fact that it's all our borders that are at issue. And I think that bodes well for moving forward in these large collaborations in terms of having a more uniform sense of the vulnerabilities.

So they deal with it too, differently then us and it depends where, so SANE(?) is possibly the best example of something that is an international treaty organization, hosted in Switzerland on the Swiss/French border, and it

has grown up, it is a 50 year old enterprise so it certainly grew out of a different era but SANE too has had to deal with the issues, and it has close to what is diplomatic type status actually in terms of an entity but it too has to deal with these issues as we do.

In terms of our scientists going over there, I mean our scientists are abroad, they work in different milieu, they potentially could be approached by people with untoward motives and so that is something we also have to consider in these long term collaborations, and do.

DR. MEYER: Bob Meyer, I'm a teacher and researcher at Stanford University. I was going to ask Jonathan to put his first slide up but since the screen unceremoniously went up I'll have you imagine the map of the world that was on Jonathan's first slide. A year ago the Air Force Science Advisory Board asked us to look carefully at research and its importance for the defense of the United States in the context of the U.S. Air Force. What we learned from that study was about 20 years ago if you drew the map of the world with the area of the countries proportional to the amount of research and

development the United States 20 years ago represented about 50 percent of the research and development in the world and Europe and Asia picking up the balance. This last year if you redraw that map the United States represents one third of the basic research and development in the world, Europe one third and Asia one third. It doesn't take a genius to ask what it might look like 20 years from now, 20 years from now the United States will be 25 percent of the basic research and development in the world, Asia will be 50 percent of the R&D in the world, and Europe again 25 percent.

What does this mean in the context of economic security and security, defense security in the United States? It means that you must collaborate across international boundaries if you want to maintain both a strong defense, in this case a strong Air Force, as well as a strong economy. The reasons are is we can't do everything in the United States, we do some things well but other things are not on our plate, and the example of the United States Air Force if they wish to fly airplanes at Mach 7 airspeed you need high temperature ceramics, there

is no research in the United States in the field of high temperature ceramics, there is an excellent program in such research in Russia and the U.S. Air Force wisely has invested research money in that team in Russia and are benefiting greatly from that collaboration.

So it's just an example, you have to think now globally, you have to think openness is absolutely essentially, and collaboration is essential across the whole front, economic security as well as security in the defense area.

DR. GANSLER: Very good point, other comments, questions?

DR. HART: -- [Comment off microphone] -- Could I just ask a question to follow-on, is that -- proportion inevitable or -- and political leadership on our part?

DR. MEYER: I'm not sure I know what it's due to, I know it's happening, the best news out of this is that the economies of the two largest nations in the world, India and China, are of course growing and China in particular is an expanding economy. The really good news about that expansion is the fact that by the year 2050 the

world's population will finally reach a level point at about nine billion persons, I think I never would have believed in my lifetime I could make such a statement. But it says we're a part of a global economy, part of a global R&D environment, and we have to begin to behave that way rather than building walls around the United States, we have to begin to build collaborative arrangements with other countries. Bill Perry said it yesterday, he was right on the money.

DR. GANSLER: But I think, Gary, it's also an explicit policy of these countries, I know I recently met with the head of the Chinese, they have 56 I think it is research parks around the country making huge investments in that area, Singapore in their biotech center, huge investments, multi-billions of investment in these cases. We are going as was pointed out in a lot of the charts, we don't have that explicit in terms of basic research, in fact we're going the other way, we're shifting towards the shorter term investments. So as a nation we could influence I think not necessarily to get it to zero or anything like that, or even maybe back to where it was, but

we certainly are going to encourage the trend to continue if we don't do something about it.

DR. HART: Does that mean the best students in the world will be going to China in the 21st century rather than here?

DR. GANSLER: Many of the countries that are explicitly focusing, a lot of our scholars and students are going to Asia now for the advantages that they're being offered and we don't have that kind of an explicit policy directive.

DR. MAY: Michael May of Stanford, I just want to add a comment in response to your question about inevitability, I think that some of this is inevitability regardless of our will, obviously as Asian nations increase their per capita income by a factor of probably ten the money available for R&D and everything else is going to go up by a factor of ten, and since they have the same proportion of higher, really bright people and dedicated to science as anyone else that's going to go up by a large factor also, that part I think is inevitable, it's just part of economic growth.

What's not inevitable is that all bright students will go to China or India in the future, there are plenty of bright students going to London and Paris now to Oxford and Cambridge and so on because they maintain the will to keep excellence in their facilities. But the proportion is going to go down if Asian countries become prosperous, I think that is inevitable.

DR. GANSLER: Thank you very much, that was really great.

-- [Applause.] --

DR. GANSLER: What I have noticed is that a lot of people have been taking biological breaks and we didn't have that on the program for some reason and so because I really want to hear the next speaker and I want you to and I also want to have a good discussion after that let me suggest if I can a five minute break and come back at 20 minutes after. Thank you.

-- [Brief break.] --

DR. GANSLER: Okay, we have saved the best for last and this is really very important. One of the issues that has come up frequently is obviously publication issues

as well as of course university issues and so Don Kennedy is in an excellent position to be able to discuss both of these. As I'm sure all of you know that for the last six years he's been the editor-in-chief of Science, obviously I think you all know about how prestigious that is. He's also president-emeritus as I think again you all know and he was Bing Professor of Environmental Science at Stanford and continues that position as an emeritus.

He came to Stanford, I didn't realize this, in 1960, so you've been here a while, and you've been chairman of the Department of Biology and of course he is a member of the National Academy of Science and also the Institute of Medicine. What I think is important relative to the discussions that we've been having here and our charter as a committee is he's also served in the government, he was an FDA commission for a couple of years and he's also written a book titled Academy Duty that talks about some of the challenges facing American institutions of higher education, just what we just talked about at the end of the question period a few minutes ago.

With that, Donald.

**NOTE: This is an unedited verbatim transcript of the Workshop on a New Government-University Partnership for Science and Security held at Stanford University on September 27-28, 2006. It was prepared by CASET Associates and is not an official report of The National Academies. Opinions and statements included in the transcript are solely those of the individual persons or participants at the workshop, and are not necessarily adopted or endorsed or verified as accurate by The National Academies.**

**Agenda Item: National Security and Academic Publishing - Dr. Kennedy**

DR. KENNEDY: I have an embarrassment to confess and also a thank you to deliver, the embarrassment is that we had our editorial retreat at Science for the last two days and my day ended yesterday at Arlie House in Virginia and so I had to miss yesterday and everything I've heard tells me that I missed something terrific and I apologize for that. I was going to point out that if you appear at the very end of an interesting symposium you're entitled to cite Sergeant Preston's Law of the Yukon which states that the scenery changes only for the lead dog and I am really sorry that I missed yesterday.

I also want to thank Jacque and Alice and all of the members of this committee, as you were just told there's some parentage from the Academy's project on science, technology and the law and I am co-chair of that committee but as everyone knows Anne Marie really runs it and knows everything and is also staff to this committee and I thank her for all the wonderful arrangements she's made us as I know my colleagues on this committee do.

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I'm going to start with some history because it's been irresistible to the other speakers as I understand it and I want to focus on the very early 1980s when there was a considerable brouhaha involving universities and the government with respect to the employment of arms control, ITER, in the EAR(?) regulations to include restrictions on basic research communications along with the originally intended claimed purpose of those regulations which is to bar the export of military technologies and data related to military technologies that might be helpful to other countries.

It was a difficult struggle and we formed in 1981 a little project involving the Department of Defense and the universities, it was called the DOD Universities Forum, I was co-chair with Dick Delower(?), the undersecretary for R&E who succeeded Bill Perry in that role when there was a change in administration.

We were conspicuously unsuccessful I think in getting any traction on that problem early on despite Dick's considerable skill inside the Department of Defense, he had a redoubtable opponent in Richard Pearle who some of

you may remember who did not want whatever we were cooking up to happen.

Things kind of walked along and the Academies got into the game by appointing a committee chaired by Dale Corsin(?) or Cornell to begin to look at the whole question of classification and visa restriction as one set of alternatives and some kind of middle ground as the other.

The Corsin committee did a very good job I think by almost everybody's estimation at the time. They did carve out a very narrow gray area which they described as involving dual use technologies, that is technologies that in whatever hands they fall into might yield a significant human benefit but also might be used in ways disadvantageous to our national interests. That was the definition of dual use technologies, it was the so-called gray area that the Corsin committee sort of set aside but with respect to everything else what they basically said is that either classify it or use the visa process but don't adopt an ad hoc intermediate.

Then some more time passed and nobody knew as far as I can tell and I have rehearsed our experience with Jack

Crowley(?), AAU, Association of American Universities, a MIT representative in Washington who followed this case I think even more carefully than my colleague Larry Horton, but the two of them had a lot of expertise in this. And I think they will agree that it was a surprise when President Reagan signed NSDD-189 which said in effect classify it or not, it did not define an intermediate status with respect to classification. And I think the universities breathed a considerable sigh of relief at that time.

But this is a tape that we can fast forward and fast forwarding it to now here's what we have. We still have NSDD-189, how much we have it is a little bit in question. A letter from Condoleezza Rice as the national security advisor to Chuck Best at MIT seems to say we still have it, all of us have read it to say we still have it because that's exactly what we want it to say in the university community. And certainly nobody has withdrawn it so there it is.

But we still have two other terms, one of them is abbreviated SBUs, sensitive but unclassified, and the other new term that's attracting a lot of attention is deemed

exports. A difficult neologism in all kinds of ways and the occasion for a series of discussions between representatives of the university community and others and people in the Department of Commerce.

I want to set aside the deemed export problem for a moment because David McCormick from the Department of Commerce in a series of discussion has proven very thoughtful and reasonable and I think almost all of those who've have been involved in the conversation have found reason to praise him as we did editorially at Science. He has since been moved from Commerce to the White House presumably in support of the old aphorism that no good deed should go unpunished and he will presumably do something good there we hope.

I want to make two points about the way in which we now are using language, one of them is the continuing coexistence of NSDD-189 and sensitive but unclassified because people are still using the term, they are still applying it, some contract officers are thinking about it as a way of acting and negotiating contracts and somehow that is a situation that really needs to be worked out.

The other is that we now speak again as in the early 1980s of dual use technologies but there's a really different coloration to that term. In the old days dual use meant it could be good use or bad use in the same hands. Now when we're talking about dual use technologies we mean dual use in that it could produce significant benefit in the right hands but it could be used for serious mischief in the wrong hands, so now we find ourselves talking about microbes and particularly infectious agents as dual use entities and that's a real change.

So now I want to put us around 2003 where these issues are all being discussed again and of course in response to 9/11 there is concern that our own research efforts in the United States might result in knowledge, information, that might be used inappropriately to our detriment here. The National Academy of Sciences got together a couple of informal meetings and then there was a large workshop type meeting in 2003 in which members of the security community and a large number of scientists all participated.

There was a touch of tension in the air, there

were sort of mutters in the hallway on the part of scientists saying well the spooks just don't understand us at all, and on the part of the security people that the nerds are really out to lunch on this one. There was an interesting ripple in the audience when a person, someone identified with the security community, in fact he's now in John Hamre's shop, I think it was Jerry Epstein actually said to the scientists in the audience how would you like to find your latest reprint turning up in Al Qaida and Afghanistan with a lot of yellow highlighting. So the scientists were getting the message that they have to take the problem a little bit seriously and indeed I think all of them did.

The day after that meeting there was a meeting of a large number of journal editors, in fact more than I knew existed, and some scientists including scientists who had been responsible for papers that had come under some kind of analysis with respect to the question of their propensity for doing mischief. One of them was a Science paper, one was a PNAS paper, another one was a paper in an Australian journal about mouse pox, and those papers had

been considered by another National Academy of Science's committee, it's hard to keep the players straight without a program, that one chaired by Jerry Fink, which had looked at these papers and a number of others and had in general reached the conclusion well we do not see a problem with these particular publications but it's nevertheless a matter that should be kept track of, and that of course is a conclusion that has led to the appointment for example of the National Science Advisory Board for Biosecurity and there are one or two members, maybe more, on this program and in this room.

So I want to talk a little bit then about what I'm schedule to focus on primarily which is the publication, scientific publication, of these kinds of technologies. I think that almost everybody I know who is in the business of evaluating, peer reviewing and publishing scientific work realizes that they have some kind of a responsibility to reassure the public that they are conscious of this problem and watchful for it. At Science we have two or three members of what we call our senior editorial board and one or two outside it that we

will send a paper that presents those kinds of concerns to us if I and my deputy editors agree that it might present a problem. We had little or no occasion to use that mechanism but we thought it was good to have one in case we needed it.

In the meeting that took place the day after the NAS workshop editors were encouraged to develop a kind of corporate policy with respect to this in which we recognized our responsibility to be vigilant about this problem. I was sort of designated to be the primary draftsperson subject to merciless editing by my fellow editors that would state a position about the publication of scientific work that might present such problems.

There was quite a dose of motherhood and apple pie in what we came up with I will confess, there was a statement to the effect that we ought to have ways of having papers evaluated for this particular potential liability. We stated that each of us would attempt to prepare and announce a mechanism for securing security review. And that editorial as we finally worked it up was published in the editorial space in Science, in PNAS, and

in Nature because Phil Campbell and Nick Cozarelli(?) and I had all worked on it and agreed to get it out there.

Now what about the NSABB? If you look at the charter of that advisory board you will search in vain for a statement that it is responsible for the review of journal publications before they're published and I think that was a very wise and I hope deliberate omission on their part. Because if you're going to regular the potential mischief in scientific work the way to do that is at the input end and not at the tailpipe.

We had an experience with that that I think I'd like to relate because it represents a perfect example of once again of the kind of ambivalence that exists in some of the government rules that govern this kind of thing. Another example is the confusion about what is really dual use and another is the coexistence of NSDD-189 and sensitive but unclassified. The NSABB is I think a very good committee, I think its wisely composed and I think it will be very useful in reviewing research plans of the research agencies of government and perhaps to serve as a consultant for that kind of planning as it goes on in non-

government places.

But we had an interesting paper, it had been done at the Centers for Disease Control and the Armed Forces Institute of Pathology so it wasn't exactly a non-government study, and it resulted from a very clever thing that the services had done. It turned out that at the time of the 1918 Spanish Influenza epidemic the Armed Forces Institute for Pathology had saved some tissues of diseased soldiers who had fallen victim to the influenza, frozen it and kept it around. They also had an fortunate accident of having found in the far north frozen tissue from an Inuit person who had succumbed in 1918 and there was a reliable indication that they had been the problem. So they were able to recover samples of the virus and do a genomic analysis and prepare that for publication.

We were delighted to have it, after all we were sitting at the threshold of a possible new influenza epidemic from a virus of a different type, and so what we could learn about a particularly lethal and infective virus ought to be helpful in thinking about this new strain of avian influenza as it turned out it did.

So the authors had done something very responsible, after all they were government employees and government employees know one thing and that is that you don't go to press without telling the boss what you're doing and so they had to talked to Julie Gerberding and they had talked to Tony Fouchey(?) at the National Institute for Allergy and Infectious Diseases, and I checked both with Gerberding and Fouchey with Amy Patterson who is the staff person who has been staff to the NSABB and they saw no problem.

So we were at a retreat, this is exactly a year ago, we're at a retreat in West Virginia, a less desirable setting then Arlie House but never mind, and I got a call and Amy Patterson told me that the Secretary, the Assistant Secretary, had stated deep concern and said that the NSABB should vet this paper and give approval for its publication. This publication is at Brown Printing Company in Waseca, Minnesota at the time and its presses were turning around because we had done all the checking that we thought was necessary.

Amy was, I hope I'm not getting her in trouble

here, she was not only decent and thoughtful and considerate and professional, she was I think sympathetic. In any event a hasty telephone conference call on the part of the NSABB was called into me and those of you who were there know that it had to be put together in a hurry and they voted that the paper should go ahead.

Well reporters will do what reporters do and so afterwards I was asked the what if question, what if they had voted to disapprove the study? Well editors are supposed to make decisions and the decision I would have made obviously, even if the presses hadn't been running in Waseca, Minnesota, is publish. If you have the experts in the government agencies that are doing the study what can really be wrong.

So the problem was obviously that somebody needed a fig leaf and that's really the problem sometimes with government oversight, even though the documentation is okay and all the rules have been followed that it's important sometimes to give a senior official some protection, and important perhaps also to give the public an extra measure of confidence.

What I have to say is is that that's a bad way to do things. I wrote an editorial about it after. The NSABB had asked us to do an interesting thing, they had asked us to print an editorial with the paper explaining the rationale of a thoughtful molecular biologists who knew about genomes and who knew about risks, so Phil Sharp(?) bellied right up to the bar and did a wonderful editorial and we did the last editing on it by phone on a Sunday night and it made the issue, and everything worked out fine. But doing it at the 11$^{th}$ hour and putting everybody in a somewhat higher state of alarm and trouble is probably not the best way to do things.

I think that this kind of problem will be worked out. One of the things about managing a difficult interface like the interface between science and security is that you have to learn by case law and you have to learn by doing things including making mistakes. So I felt a little grouchy about that one and I felt grouchy about the science/security conflict at other times as well, that's why I gave you that little bit of history in the beginning, but I think this is a problem that can be solved and I

think it can be solved by good people working together as you all did with, many of you did with David McCormick and the Department of Commerce with respect to deemed exports, so I feel pretty optimistic. But it's not a completely novel problem, you see the repeated occurrence of the same terms to describe different phenomena like dual use and we can expect that it will come back again sometimes and that it will need to be resolved again and at least we have one pretty good model for resolution in what's happened so far with this one.

So I'll stop there and hope that you have comments and questions, there are some people who know much more about this than I do and so I hope you'll comment.

-- [Applause.] --

**Agenda Item: Discussion**

DR. GANSLER: Questions, comments?

DR. COOK: Don, do you think the proposal you have now for three editorial members to do a security review is just to make sure this doesn't happen again or to say that you have a procedure in place, and do you think that's the best way to go?

DR. KENNEDY: Well, there's a little bit of fig leaf in it for us, let's be honest about it, I think we have some good people that we can turn to and we certainly would, I mean for example I would in a minute if it were an agency on the list I would send it to a couple members of our senior editorial board but I'd probably call D.A. Anderson.

DR. GAST: Yesterday when I asked Bill Perry about biosecurity issues and asked him to contrast it with nuclear and we talked about the inability to put a fence around bio he brought up the very important point that many of these issues require a worldwide response, and I have the example of how SARS was analyzed and finally understood because of nine nations and multiple labs coming together to work on it in a concerted way, and we have many other examples. I wonder if you think, as you think about this whether there should be some international body or international oversight that would help us do the right thing and keep the right type of exchange with our collaborators open and available without it becoming just a national issue.

DR. KENNEDY: There's obviously a major need for that, Alice, obviously the WHO and other international organizations took an interest in the SARS problem, what's interesting to me is exactly what you said, that a number of labs thought it was really important to get something done and without a formal structure the genome of that virus was done in three weeks, I mean it's a record for sequencing for sure.

DR. BIENENSTOCK: Don, I hear you speaking two ways, frequently as an ardent supporter of NSDD-189 and then as an editor-of-chief setting up a world to deal with implicitly sensitive but unclassified. And I mishearing you?

DR. KENNEDY: You're not mishearing me, I think we have a public responsibility to see whether there is something about a piece of research that could present problems. What I haven't said is what I would do if that group of people said this is a real problem and then I would seek every initiative I could to get them to put it through the classification regime. I mean they can do that, it's not that hard.

DR. HART: I there anything like an international academy of science and if not should there be?

DR. KENNEDY: Bruce Alberts during his term as president of the National Academy in the United States has worked very hard to try to create a kind of world federation of academies and he's going to have some success, but I'm not sure that you're ever going to get an institution that can move as one. For example the National Academy of Sciences although it has done a good job on some of the issues connected to climate change, global warming, has been way more cautious than the Royal Society of London which is really out there. So I have a little bit of despair about creating an international even strictly scientific entity that can speak with one voice, it's always been hard.

DR. GANSLER: There's still the absence of a link off into the governments in that kind of an arrangement which is a big difference in this committee.

DR. FITO(?): My name is Ted Fito, I'm representing SPIE, the international optical engineering society, I preface my question with the education I learned

as a researcher once asking someone could they sue us for this and the answer was they can sue you for anything but whether they win is another question. There is a liability for reviewing classified information, a federal criminal liability. There is a potential civil liability for reviewing information that could lead to something especially like if it was used for something that created a major event. Have you at Science or any of the other editors had some discussions especially with your legal people about the concerns of publishing something that is unclassified but could be deemed especially by lawyers trying to get a judgment but as dual use and leading to something where your magazine might be liable?

DR. KENNEDY: Our lawyers are pretty careful about institutional liability for the AAAS. As to whether an editor who made a decision could be held criminally liable in a civil court sometime I decided to cross that bridge if I ever come to it, I'm not consulting lawyers on that one because they'd look terrible putting a guy my age in jail wouldn't they? Really.

DR. ZILINSKAS: Randy Zilinskas from RA(?)

Institute. The article that caused should I say a lot of concern and grief within the intelligence community that was published in Science was a few years ago and had to do with micro encapsulation, and I was wondering first of all why something that is more like an engineering feat would be published in Science rather than basic research. But this, what I'm wondering about has to do with, this one had to do with methodology that enabled somebody who had wanted to use this technology to micro encapsulate bacterium viruses and keep the particles within the respiratory range and so on. I'm wondering if something like this, if this article came up again with kind of applied focus but the group is Spanish, the group that published this or wrote it was a collective authors was a Spanish research group, would you still be worried about it from the international, in other words if you didn't publish it they would go to somebody else, maybe a Spanish journal or maybe a European journal, and they'll publish it. Has that kind of issues come up when you discuss these kind of whether or not to publish --

DR. KENNEDY: I don't know which paper you're

talking about, I want to make a distinction, for example Matt Messelson(?) and others, we have a news piece that we published, really an opinion piece, with respect to the anthrax business some time ago. And we don't vet opinion pieces in the way that we do research articles or reports and so in our policy forum venue or in letters or in news we do what reporters do and that is they check sources and write what their conclusions are. If we got a paper, I mean let's make this a hypothetical, if we got a paper from an overseas group that was publishing something that we thought might cross the threshold of being really high risk in terms of adverse use, and we got that opinion checking on the outside, we would ask questions of the classification authority whether, A, whether we should publish it or not, and B, if their decision is not urge that they classify it so it would not appear. Now that would not prevent that group or any other group from going to a journal in a different country that has different strictures and different rules.

PARTICIPANT: Don, which classification authority are you referring to?

DR. KENNEDY: Well that's very interesting, I've looked up the question of who is entitled to classify and it turns out that there are a set of automatic delegations that I don't fully understand so I'm counting on the fact that I can call the right person and find out who do I talk to to get something classified and if they thought I had something that was worth classifying I'm sure they'd get back to me fast, at least I pray that they would get back to me fast.

DR. GANSLER: It's even worse in the sensitive but unclassified category where essentially everybody is authorized to do it and that really gets into problems.

DR. KENNEDY: Well, contract monitors do it sometimes as the survey of all these contrasts showed and I wonder whether many universities officers have challenged those on the grounds that NSDD-189 is out there, how can you do this. And I think it's important for people to raise that point and stand up to them.

DR. GANSLER: I think this has come up a few times yesterday and I know many universities, ours included, do constantly question when the government puts

those requirements on, it's takes too long and delays the research but it's absolutely essential to do it.

PARTICIPANT: -- [Comment off microphone.] --

DR. KENNEDY: I don't think there's any restriction, my understanding is that there's no restriction on the U.S. government's capacity to classify with respect to availability in this country of any information. They tend to have to have a government imprint on it.

DR. MESERVE: The Atomic Energy Act is unique in giving the government the right regardless of the origin of the information to step in and classify, otherwise you need to have some government fingerprints on the information, government can classify its own information and it doesn't have the right to step in. If a private citizen happens to stumble on something the government would like to classify but there's no government control of it they don't have the legal authority to classify it.

PARTICIPANT: And also the atomic energy --

DR. KENNEDY: It would depend if Brother Meserve were appearing for the plaintiff or for the government.

DR. HECKER: I just wanted to follow-up on Dave's question and comment related to the issue of classification. One interesting aspect that we've gotten into in our work with the Russians, I had mentioned this workshop on fundamental aspects with plutonium science, is that the two countries have different classification guidances and so we're sitting there in a completely open meeting because we don't have any agreements with the Russians to share classified information. And so it's a very interesting dialogue of where we stay within our guidance and they stay within their guidance and yet they report things that we consider classified and vice versa. And so we're often in the international arena we get into the situation and there what you need to do is just carefully stick to your own guidance and that's what we wind up doing.

DR. GAST: It seems like a really interesting question though for the climate for international collaboration, we've grappled with what we've done in terms of visas and the way we treat people coming in, if we were to put ourselves in a positions of preventing U.S.

publication of international papers while they are published outside imagine the reverberations of the community that we're not honoring this agreement in our country and you have the right to get the journals and read the papers, it has some striking implications I'm afraid.

DR. KENNEDY: Well certainly what I just learned in addition to what we already had decided that we can do and can't do, if a paper of that kind presented a real risk of that kind came from authorship anywhere outside the United States we might get that consultation about it and it might make us decide not to publish it but we would have to realize that it might well appear someplace else. And of course that's a decision we often face when we reject a paper, will they go to Nature, that kind of thing.

PARTICIPANT: I was just going to say in response to the question about classification, I think if the study had been federally sponsored then you could begin with that agency. Some of that like NSF or NIH have no practice in this area so they'd have to scramble just like you suggested. There is an executive order but I think it's the basic executive order on classification that does

direct agencies to periodically review their portfolio to see if some of that work may be classifiable or may require classification. But to my knowledge that executive order has never been promulgated by any of the agencies to establish a public requirement in that respect so it's entirely guidance within the federal agencies, I'll try to find the executive order number for you.

DR. KENNEDY: Thank you.

DR. GANSLER: Other comments? Questions? Well, thank you very much.

-- [Applause.] --

**Agenda Item: Open Discussion: Moving Forward**

DR. GANSLER: Okay, now we're ready for the wrap-up session, Alice, you want to do this?

DR. GAST: Well we intentionally left some time on the schedule for further discussion and general discussion and we'd really like to keep this discussion going and hear from all of you if you have further thoughts about anything we've talked about in the last two days or things that we missed and things that we didn't cover. I'm particularly interested in how our conversations have led

us into thinking about some of the tools that we've been using as a nation, classification, export controls, visa reviews, and thinking about those in the new light of the current climate, the current threats and the international arena and the global world that we're working in. So I'd be interested in hearing more thoughts on these matters or anything else that anyone has on their minds.

DR. GEORGE: I'm, I'm Anne George from Stanford. I've really enjoyed the last day and a half, its been very interesting to listen to. And I'm a little hesitant to do this but I think I will since you just invited it. The one set of federal regulations that touches on national security and is starting to impinge on universities that really puzzles me is OFAC, the Office of Foreign Assets Control under the jurisdiction of the Office of Treasury which has to do with embargoed and sanctioned trade, relationships with embargoed and sanctioned countries, individuals, organizations. I'm not quite sure even how to articulate the way this affects us but I know for instance things like hosting conferences in foreign countries, distance education with a student in a foreign country,

payment for services or running an archeological dig in Afghanistan and we have to pay somebody there for housing or something. I think it just makes us nervous that there are things that we could be getting in trouble for and we're not quite sure what and I just want to put it on your plate.

DR. GAST: I think that's a very important issue, I know it impacted us at MIT with regard to workshops run in Cuba and the gray area between a short term and long term visit and what kind of things are allowed in particular with Cuba. I think its impacted the editorial and the publishing business at some point when the discussions went around whether editing was a service provided to authors from these countries and I think that was resolved at least in that case but I don't know, Don, might have some updates on that.

DR. KENNEDY: We had an evil plan at Science because we wanted to get a paper that was really abominably written from some country outside the United States that was in this category and we would then publish it with all the typos and all the mistakes and put a note at the top of

it saying we declined to offer service to this manuscript since editing is regarded as a service under this rule. Well fortunately before we had to do that not very tasteful thing we got the problem resolved, Treasury backed off and we no longer really had to face that problem.

DR. GAST: I think it's very important to put that on our list and I appreciate your bringing it up because it certainly has impacted international exchange and collaboration.

Other thoughts?

DR. NORRIS: The other piece related to embargoes, and I'm glad Anne mentioned that because I was trying to while she was talking trying to formulate my comment, is a little broader than are we nervous about the countries that are embargoed, it's whether or not we have any sense that the sense of security and protection for other then economic reasons which is the major reason OFAC exists is on the economic side, whether or not the concerns in other areas are falling over into the OFAC realm and whether we have any experience with OFAC deciding not to issue licenses on a security reason rather than just on an

economic reason.

DR. ELLIS: I'm Kaye Ellis from Okalahoma State University and I too have that OFAC problem, we recently got a license from OFAC, I got it last month, it took seven months to get a license so I think the time period is kind of ridiculous for that kind of thing. And also another point that I wanted to make or problem I guess is that we go around, and I deal with export controls at Oklahoma State, and we go around, we give presentations, we educate our faculty, we do our best, and then you deal with the enforcement officers, and I don't know if any of you have dealt with a BIS enforcement officer, but I think there's a real disconnect between what the policy makers are saying and what the enforcement officers, their understanding of it. And I can tell you I've had several dealings and its been difficult, it's almost like an education process for the enforcement officers. Anyway, that's a problem I'd also like to put on your plate.

DR. GAST: Very good, and we clearly understand that while the top leaders in some of these agencies will start having discussions at very high levels that are in

the right direction it's not percolating down and we need to make sure its pushed down in the education and the regulations reflect what we're trying to do and people are actually enforcing them properly. I think that was the sense in a lot of the work on the visas and the consular officials as well, that while there would be a spirit of cooperation at one level it wasn't being sent out to the consular posts.

DR. MESERVE: I was going to raise an issue and just see if I could get any reaction from multiple people in the audience. This question is really prompted by a comment that Don Kennedy made, we have discussed this issue about controls on scientific and technical information on our perspective that we're engaged in a war on terrorism and that reaction should be that we therefore have enhanced interest in controlling this information.

In Soviet days we were confronted by a sophisticated adversary, or as Bill Perry discussed yesterday we were highly dependent on our science and technology as giving us an edge over the numerical strength that the Soviet Union was able to marshal, and we sort of

carried the same philosophy over to the war on terrorism. And I really wonder whether there's anyone who has given any systematic thought to whether that premise really makes sense and the comment that Don Kennedy made that sort of brought this to mind was his observation that at a meeting somebody said that well what would you think of somebody in a cave in Afghanistan had a copy of Science and was doing yellow magic markers underneath it and what would you think about that. Well, I think it is highly implausible that people sitting in a cave in Afghanistan have subscriptions to Science Magazine or have the capacity to read and understand it let alone being able to use that sort of information and apply it in a way that threatens us. And I'm sort of curious whether there's sort of unstated premise for a large number of the government programs that people are dealing with really is one that's appropriate given the threat that we confront.

Now one could say that with regard to visa controls that maybe you could make a different argument, that somebody could get a student visa and come in and be a terrorist and use that as basically a university to harbor

people who might have ulterior motives but with regard to the actual application of the science and technology I just wonder whether this is really a plausible concern and that these great capacities in the bio area that we're so worried about is certainly ones that we do need to worry about but I just wonder whether that's a very likely mode of attack given the nature of the adversary that we confront.

DR. GANSLER: What I think, Dick, is the problem, and we heard it in the first meeting when the Department of Commerce testified that the threat they were reviewing was not exclusively a terrorist in a cave but actually in fact they even stated explicitly there was an economic concern about competition on an international basis and that while the terrorism is being used as the immediate rationale because of the war on terrorism that in fact many of these sensitive but unclassified categories or even security classifications and certainly in terms of the export control regime are really based upon an economic competitiveness for the growing particularly Asian concerns that some people have.

Now that doesn't say we in any way support that but that was the rationale that they were using and those people clearly do read Science and that that was one of the arguments that were being used even by the Commerce Department which is of course responsible for the economics but they were using the security rationale as the rationale for making a decision which was basically an economic competitiveness decision. And I think that's sort of the hidden thing behind this and so when we talk about what are the actions being taken and why, it's the why part that I think we probably need to address as well because I think the rationale in many cases is not the one that appears as the instant response of a terrorist in a cave in Afghanistan.

DR. IMPERIALE: I think there's another aspect to what Dick was saying and that is that while it may require a certain amount of sophistication to undertake these sorts of things the general public doesn't know that so the public is relatively uneducated in terms of science and technology and so if they see like the Batulinen(?) paper that was published in PNAS they say why are we handing the

terrorists the exact way to poison our milk supply. And regardless of what kind of sophistication it might take to carry that out the public can't make that connection and so I think an important part of this issue of dual use in the biological sciences is really going to have to involve some sort of more general education, so not just dialogue between academics and government and industry but we're going to have to somehow bring the general public's level of sophistication up to a higher place then it is right now.

DR. HART: I'd like to offer a caveat to what Richard said, it doesn't immediately apply to some acts but it is instructive. A friend of mine has written widely, and did write widely in the late '90s and early part of this century on what he perceived the, or what we called fourth generation warfare, it was the warfare of future, how things were conducted by stateless nations involving low technology, insurgencies and so forth, and his writings got very little attention in the United States in military circles even though they appeared in journals and conservative journals. But he was widely quoted on a

website and with sophisticated analysis to what he was saying, it turned out after, this is all before 9/11, it turned that was the Al Qaida website. So even in the caves they were following that non-scientific commentary very closely.

DR. GAST: I know that when Drew Windy(?) spoke to a group of us at MIT on the synthetic biology and bioterrorism issues he had brought up and we saw a map yesterday of places you could send a sequence and order DNA and then he pulled it down and show that it was in Iran. It is a global world and capabilities are all over, whether sequestering information would make any difference or do anything productive is in some sense still I think the primary question.

PARTICIPANT: -- [Comment off microphone.] --

DR. KENNEDY: I'd like to disassociate myself from the comment about the cave in Afghanistan, I used it for the purpose of setting the stage of a little confrontation between the security community and the scientific community, and by the way he did not refer to a Science paper --

-- [Laughter.] --

DR. HECKER: I'm concerned with the comment that Dave made about the possibility of something turning up in Iran, of course it will, my papers on plutonium science I'm sure turn up in North Korea, turn up in Iran, turn up in many, many other places. If we use that as a guide as to what we let out what we'll wind up doing is was what I tried to indicate is that we keep the secrets and the information from our own people and I think that has a much greater consequence than having these articles turning up around the world. Clearly there has to be some point at which you don't want to become specific to give recipes in detail but that's what classification is for. So I'm really concerned that if we begin to worry as to what shows up in other country's scientific literature and in their laboratories then we're going to cut ourselves off and I think that will be the worse aspect.

DR. MEYER: Bob Meyer again, let me make one comment about how our world is changing with regard to these regulations. A few years ago David Southwood who was a scientists at ESA(?) visited Stanford, we welcomed him,

and he gave a very nice presentation, and those of us who were in the midst of ITAR(?) discussions at the time had said as a faculty we probably won't raise the ITAR issue with Southwood, he's got enough on his mind, but of course a young graduate student in the audience stands up after the talk and says sir, would you mind to comment a little bit about ITAR and how it affects science in Europe and the United States. And I'll never forget David's words, his words were well, we thought about ITAR, we want to thank the United States for handing us the space program on a golden platter.

DR. FRANKLIN: Changing the subject a little bit, way back to Hennessy's talk when he kicked this off of how research particularly relate to national security and one point he didn't get to but I'm sure he would have in his mind is the way that our government is structured it has a large body of what we call the bureaucrats and the career employees who are climbing the ladder but they rarely climb to the top of the ladder because our system, and it partly is because we have discovered that these people are fairly incapable of making changes or seeing new landscapes or

perspectives. And we have discovered that the way to do that is bring in somebody from the outside, particularly when there's a problem and you want to make a change in course, you have to bring in this.

Where do they go to get these people that have this brand new perspective that has never been thought of by the bureaucracy? And I think it's very clearly research universities have an extraordinary import in delivering at the right time the people that have totally different ways to approach the problem and this is true in economics, in medicine, in technology and engineering, all of the particularly technical and social science areas where you want to make even social changes, you need to bring in the people who haven't been in the trenches dealing with the procedures. And I guess we have here at Stanford, Bill Perry is I think is an example, Connie Rice, knowing the people that have done service in the government and made real changes.

I don't know how that fits with that, I would guess this is an arrow in your quiver as to how do these people become qualified to become these experts at the

national level. One dimensions is you live in an international community in a research university, so these people already know that there's, and compare that to a politician from Alabama who is promoted to become a director of something who has never left this country except maybe to go to Paris, totally different experience. But secondly know exactly what so many people have said here that the value of open research, they have hit that rubber on the road, they know case after case, and therefore they have the wisdom to make good policies out of bad suggestions which are bubbling up all around them, that's a very difficult thing to do.

So I think there's a place for this in your recommendations, this is something I think universities should be very proud of, and it actually works in our form of government.

DR. GANSLER: There was the report a few years ago of how few people who were members of Congress had a passport.

DR. GAST: Well this has been a very wonderful day and a half, I'd like to thank all of our speakers, I'd

like to thank all the participants for engaging in such an interesting dialogue and I'd like to thank our committee members who are going to stay around and work for the rest of the day.

-- [Applause.] --

[Whereupon at 11:30 a.m. the open session was adjourned.]