

DR. SKOLNIKOFF: Good morning. It wasn't clear to me what would be the most useful subjects to cover today, notwithstanding the title. But I have a series of more or less connected remarks, some of which might not appear quite so connected, but we'll see. And I must say I would welcome and hope to get some reactions from most of you here, particularly from the industry side.

Those of you who had dinner here last evening heard a most interesting talk by Jacques Gansler, referring to, among other things, the study that the National Academy conducted "Beyond Fortress America." For those of you who have not seen it, it is a superb analysis of a very complicated subject—technology export controls. I have been a long-time observer and critic of US policy on the subject, but was not on the committee, though one of my students was. Having played in this game of export controls and visas and flow of knowledge for many years, this is not the first, but it is the best report I've seen that really deals with many of the subtleties and the issues that are involved. I commend it to you. I'm not going to summarize it here because Gansler did that last night.

There are a couple of additional aspects of the subject worth discussion. One deals with the ITAR (International Traffic in Armaments Regulations) munitions list which is intended to indicate which military-related technologies can be exported and which not. I don't know if most of you in this room are familiar with how it originated. It is a set of controls dating from Cold War days, laid out with the idea of keeping technological information from the Russians, from

the Soviets. But times have changed. It has become a very different situation today and, if anything, we're concerned about, or at least some people are concerned about, China as the "new" enemy. I'll come back to that in a minute

Just a few years ago, in 2004, there was a report by the Inspectors General of six different federal agencies; DOD, CIA, Commerce, Energy, State, and HSD, the major agencies that deal with movement of ideas, technology, and information abroad. That report brought to the fore the idea of what is called "deemed export." That is, inside the country, if you want to give information that might be on the munitions list to, say, foreign students, scientists, or any foreign national in classes or seminars, it is considered to be the same as exporting that information, so that you must first apply for and obtain a license.

This conclusion carried sufficient weight in the last administration that the Department of Commerce actually proposed regulations in the Federal Register to take effect after the required waiting period. If they had come into force, it would have created a situation basically requiring badging of everybody at universities who was dealing with information that was on the munitions list or could possibly be on the munitions list, or more generally might have a military use.. That is, requiring prior clearance before you could get into any laboratory dealing with information or equipment that might possibly be controlled. How the regulations would have affected teaching or lectures or seminars with foreign students or scientists attending could have been disastrous.

It would have been a major blow to many universities, and I'd like to think that had it come into effect the universities, and certainly mine at MIT, would have revolted by forcing a legal confrontation. The idea that you would start having to clear and badge people to enter laboratories where there is no classified work of any kind underway, true at the entire MIT campus and that of most universities, requiring various kinds of clearance and identification, would be highly destructive to the value of an open university. We came very close..

The universities strongly objected to the proposed rule but with little immediate effect. I don't know exactly what would have happened, but in a time-honored Washington way, the individual in the Department of Commerce who was responsible for these proposed regulations was moved to another job, apparently not because of any connection with this issue. The new official looked at the issue and proposed regulation, said this is absolute nonsense and withdrew the proposed regulations. So we dodged that bullet. But it is not dead. The legislation exists, the ideas exist, and the concept of "deemed export" is real; to repeat, if there's some information that may require a license to be passed on outside the United States, then if you give that to somebody inside the United States it is considered to be the same as exporting it. The concept is not irrational, but it has to be thought about in sensible terms, recognizing the costs as well as the purported risks, which this proposal was far from doing.

By the way, part of that proposal was also that the US government would determine the nationality of individuals by their country of origin, not their country of citizenship. So that if an Indian became a British citizen, he would be treated as an Indian not as British, similarly

Chinese, and others, Iranians for example. The political effects of that with our allies would have been embarrassing, to say the least, to say nothing about the effect on individuals.

Well that's dead for the moment. But I'm concerned. I think it could easily rear its head again.

Beyond Fortress America doesn't discuss that specifically, but it does call for a series of steps for the White House, for the President, for the administration to take. It makes several specific suggestions to improve the existing legal export control situation. The problem of course is that even an improved export control process is inadequate in today's world.

The actual legislation that authorizes the controls has expired, I believe in 2001 (before 9/11). Congress has never been able to pass it again. So we're operating under rules that go way back and, as I say, were created to serve a quite different situation.

I'm afraid that many who ought to know better, particularly in the Congress, appear to have a view of the technological world that is now long out of date; an obsolete view of where the United States stands in terms of its relative pace of scientific and technological development. We are no longer the sole technological leader in weapons-related fields, by a long shot. The Beyond Fortress America report makes that very clear. In some areas we are trailing, in others we are still the leader. It is not that export controls aren't necessary, it is rather that they are much too broad and do not in fact serve to strengthen our security. That is the primary point of the argument: the existing controls not only do not strengthen security but actually reduce to our security by .actually damaging the strength of our scientific and technological enterprises.

On the visa situation, other issues of concern arise. The visa procedures are much better than they were a few years ago, but even though a university graduate from abroad can stay on if he or she has a job, they must leave within five years. Thus, those we might most want to keep must leave. Since that rule is known in advance, it inevitably discourages many from coming in the first place or trying to stay. It turns out the impact is clear; that many of the foreign born scientists who go through our universities become some of the most effective entrepreneurs in American society. More than half of new startup technological companies have one or more foreign scientists as one of the leaders of the company.

The Kauffman Foundation, which focuses on and studies innovation, has shown that on the average, foreign students and foreign scientists who come here have a more impressive entrepreneurial record than their American peers.

Part of the difficulty, not dealt with in the report, is China. We've become dependent on China, intrigued by China and many are worried about China as a future threat. In today's newspaper, typically, it is reported that China is buying up substantial natural resources in Australia and has recently bought Hummer from General Motors. (I'm not sure if the latter is a good or a bad thing for China to have done. Nor can I imagine why they wanted to do so.)

Often China is the country that worries some members of the Congress the most. There are two current Congressional commissions focused on China matters. One is quite negative and pessimistic about China; the other more neutral and liberal in assumptions about the future with China, typical competing attitudes found throughout the Congress. The Academy report does

assert that Congress has to take hold of this issue. But it does not say anything further about it, focusing rather on what the Executive Branch must do.

One of the interesting points about movement and exchange with China is that the second highest number of foreign students at American universities are Chinese. One result is that when American scientists visit laboratories in China, they feel they're stepping into an American laboratory. The Chinese have been assiduous in bringing back those who study in the United States, setting them up with good jobs, senior jobs, often at higher pay than they could get in the United States, surprisingly enough. In other words, making an actual career opportunity for them to return and providing them with laboratories and plentiful research facilities.

I think this is very good for China. And, it's actually very good for the US. It makes scientific cooperation with the Chinese very much easier, and it makes it easier to keep abreast of the often leading scientific developments in China.. In effect, we speak the same language in science and technology. Perhaps the most interesting political question is what the long-term political implications in China will be, Most of the Chinese leaders are trained as engineers, so they have some understanding of what technology is about and, in contrast to many American leaders,. Have a sense of how this could affect political futures. What those political futures will be over time in China, is of course impossible to predict with any confidence, but their leader's understanding of science and technology will likely stand them in good stead. This is in contrast to the Soviet Union, whose leadership was also trained as engineers. But, their engineering training was comparatively poor, narrow and with little understanding of how what they learned

in technology related to other aspects of their life. The Chinese seem to be well ahead on this score.

The fact of the matter is we've got to cooperate with China. On issues like climate change, it's not the G8 or G20, it's the G2. the United States and China. These are the two countries that have to reach agreement. We have to recognize that and we've got to deal with it. It involves not just negotiations at the highest political level, it also involves interaction and cooperation among the scientific and technological communities.

In the Congress there are two big concerns about China. One is obviously a security concern - whether they will ultimately pose a military threat to us. The other is about economic competition, in effect a form of protectionism . And those two are coming together among those who are most concerned about China. They not only see China as a flourishing enemy, but also see China as a redoubtable competitor likely to do us in economically. And in the current financial crisis, this is not a minor question. In fact I believe that over time, it is the economic competition that will become the more serious issue.

When it comes to the more general question about international scientific cooperation, not necessarily with China but with anybody, the world has changed. With globalization and the loss of America's dominant position in science and technology international cooperation becomes essential. Much of it is today carried out by industry. As a matter of fact, it can be said that international cooperation in science and technology is conducted, by and large, outside the purview of the United States government, except to the extent visas or controlled movement of

knowledge come into play. Most technological companies are engaged in international scientific cooperation or, more often, technological cooperation, either within branches of the company or in cooperation with other companies in other countries.

But it remains true that the scientific and technological enterprises, certainly in the United States, and basically in any major country, are essentially nationally oriented. I do not mean they are necessarily supported by governments, although they may be, but that they are heavily affected by national influences in their development: influenced by regulations, controls, subsidies, export support, tariffs, taxes, all the variety of measures that governments are responsible for, that in fact greatly influence the direction of technological development.

What that means in part is that what international cooperation goes on usually requires some kind of support, financial support, encouragement, incentives. Some cooperation happens naturally. Obviously in some fields, the interaction with foreign colleagues is not only easy, it is required. You can not do research in the ocean without becoming involved with oceanographers in other countries. But in many fields that is not automatic and then the question is should there be special incentives that encourage international scientific cooperation? I believe that given the globalized state we're in now and likely to be in the future in which we require knowledge of what others are doing, needing their people and the input of their knowledge, coupled with ours, that international cooperation becomes steadily more important..

The United States Government provides some support and incentives to stimulate such cooperation, but not a great deal. Should there be a serious interest on the part of agencies to

foster international cooperation that is needed now and will be increasingly in the future? I would argue it ought to be a higher priority than it is at present, but that's not going to happen without some push from the White House to overcome agency inertia.

It is worth noting that the European Union does have a program to support international research, on the order, of about \$200-\$250 million a year, largely to encourage scientists within the European Union to engage third country scientists, including either the United States or developing countries. They see that as a major goal, and of course, the nature of the EU, amalgamating so many states, would naturally see greater cooperation as essential.

Lastly let me talk briefly about the universities themselves who have a critical role in all this. It is clear that engineers will need more global competence and multi-national skills in the future. This is quite a new phenomenon; basic scientists are used to interacting internationally with their peers around the world, typically much more so than engineers. As a result, engineers tend to be more parochial, particularly engineers in industry where there are special problems of corporate secrecy and intellectual property rights that constrain and discourage interaction, but it is even so among engineers in many universities.

International cooperation is not always easy, sometimes creating difficulties that slow progress, sometimes requiring more money, often requiring meshing disparate bureaucratic and budgetary procedures from different countries. It is not surprising that often it seems easier to do it yourself.

An encouraging development is that universities, including science and engineering schools, are now emphasizing international education and involvement. It has become a prominent development whether it be junior years abroad or actual campuses in other countries or various joint mutual cooperative projects with others. MIT, largely under the leadership of the current and immediate past president, (Chuck Vest, the current President of the National Academy of Engineering, has been particularly keen to further international involvement. The result, is that there have been incentives and encouragement from top administrators.. MIT now has a variety of special programs, including putting all MIT courses, without charge, on the web. These have now some two million hits a month, half of those from abroad, which gives some sense of the scale of this international global community that we're talking about. We also have an almost unique programthat makes it possible for MIT students to work abroad, not to study abroad, but to work as interns in companies and universities and laboratories abroad. They first have to learn the language, and study the culture, and then are placed in a laboratory or other work environment for either a summer, a couple of summers, or a whole semester. These programs are conducted now with nine countries, and well over 300 students are involved each year. It is emblematic of internationalization of the whole university.

I have reached my time limit— I had wanted to make a comment about State Department and science attaches but will leave it for another time. Thank you.

(applause)