

**THE CARNEGIE ENDOWMENT FOR
INTERNATIONAL PEACE**

“PREVENTING CATASTROPHIC TERRORISM”

SPEAKERS:

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JON WOLFSTHAL: We are only a couple of minutes late, so if we could go ahead and get started. My name is Jon Wolfsthal, I am a Nonproliferation Fellow at the Center for Strategic International Studies, and it's an honor for me to chair this panel today on Preventing Catastrophic Terrorism. Many of you may know that until recently I was the Deputy Director of the Carnegie Nonproliferation Project, and when I informed Joe and Jessica that I was leaving, I asked them for a severance pay, and they said "Great! you can share a panel." So, this is it for me, but I could do a lot worse than getting an opportunity to appear up here with such distinguished company. My MO as a panel chair is very light, I am here to keep time and make sure that we have as much time as possible to hear from and speak with the very distinguished people we have on the panel. I'm not going to spend much time at introductions, they're in your agenda. The order that we will go in today is first to hear from Dr. Carter (Harvard University), excuse me, John F Kennedy Center, Harvard University, from there we will hear from Congressman Schiff, after that we will hear from Rose Gottemoeller and then batting clean-up is Christopher Chyba.

The focus of today's panel is broadly defined Preventing Catastrophic Terrorism, but following on both of the theme of this conference 60 years after and also picking up from I think, the very useful paradigm that the Carnegie Nonproliferation Center has been trying to set up getting away from the term of weapons of mass destruction and trying to talk about the individual components of what those - that term usually refers to. This panel will focus on Catastrophic Terrorism, which in this context focuses mainly on nuclear and biologic terrorism since those have the greatest potential to cause the greatest harm, but we may also from that draw lessons related to chemical and even beyond that as well. So, with that I will start the time and I will move immediately to Dr. Carter.

ASHTON CARTER: Thank you, Jon, and thank you all for being here and thanks to Carnegie for including me again this year. This is a conference, it's about nonproliferation but I'm gratified that there is at least one panel, maybe there are others, on the connection between nonproliferation and terrorism, and that's the theme of my remarks. The President has said that keeping the worst weapons out of the hands of the worst people is his highest priority, and he is absolutely right, that is an American President's highest national security priority now and as far into the future as I can see. But, I would argue that while - and by the way, the worst people are terrorists because you can't count on any of the normal breaks on their behavior that we associate with state possession of weapons of mass destruction. But, I would argue that we have done a lot about the worst people since 9/11. But, the theme of my remarks is that we have not only not done nearly enough about the worst weapons since 9/11, but we are going backwards in some critical respects since 9/11.

Now, said differently, and I've used this language before, we have a global war on terrorism, but there is no war on weapons of mass destruction yet, just think of what we've done in our government to restructure, pull our socks up, organize ourselves to

deal with the worst people since 9/11. And, you may not consider all those successful or necessary or whatever, but at least we have been active, we have taken military action in Afghanistan, arguably the – and at least in some political sense we invaded Iraq in some connection with 9/11. We have established a new Cabinet Department of Homeland Security. We are in the process of turning inside out and then outside in, once again our intelligence community as a reaction in part to what happened in 9/11. The FBI under Bob Mueller is an entirely different organization from what it was before 9/11. The defense budget's gone up a 100 billion in the baseline since 9/11, that's not even counting the supplementals associated with OIF and OEF, and we are spending, I guess, another \$25 billion a year on Homeland Security relative to the baseline before this. That's a lot of activity. And again I'm not saying it's all the right activity, that's a lot of activity associated with the worst people since 9/11, now I would argue that if you try to make a comparable list about the worst weapons since 9/11, you're going to be very hard pressed to see a comparable level of initiative and action.

When I – most of my remarks are going to be about the weapons of mass destruction that really deserve that title, namely nuclear and biological, and I won't bother to go into that with this audience why chemical and radiological – are in a different class in terms of fearsomeness.

As we think about nuclear terrorism and bio-terrorism, the approaches to those two forms of Catastrophic Terrorism, to use the title of this panel, are entirely different. For nuclear, all the action is at the front end, all the action is in prevention, and for bio, not all but most. For bio, most of the action is at the tail-end in response. That may be obvious to most people in this audience, but the reason is very simple at – to make nuclear weapons you need plutonium or highly-enriched uranium, without that you don't have a bomb. Those materials are not found in nature, have to be man-made, it turns out that nature has been kind to us and they are a nuisance to make, both of those materials, and therefore making them is beyond the reach of terrorist groups, and if you can stop terrorists from getting those materials, then you're not going to have nuclear terrorism. On the other hand, once they get them, you've had it, now I know we have a Nuclear Detection Office being set up in the Department of Homeland Security, somebody used to work for me and he's the head of that office, a very capable person, and I think that's all great but basically if they get out, we're not going to reliably find them before they go off. And, you can give it a shot and you can try to fool a few people some of the time, but fundamentally we're cooked once the material's out.

Bio, just the opposite, there are no special materials, no exotic materials associated with the production of biological weapons and, therefore, prevention in the literal sense isn't in the cards. On the other hand nature, gives you a precious window in time between the attack and its effect in the case of bio, which it doesn't give you in the case of nuclear, and exploiting that precious window for detection and public health response is the great hope for bio-terrorism. So nuclear-bio inverses of one another in terms of response and, as a consequence, our goals in this meeting for those two weapons types are very different. I would like to see us position ourselves so that 10 years from now, an American President can credibly turn to you and say I have eradicated the danger

of nuclear terrorism - eradicated, or the world turn to you and say we have eradicated and that's a big word, eradication. I'll return to why that is – you can at least see how that could be done. I would like American Presidents to be positioned with respect to bio-terrorism to tell you a very different statement, but also a reassuring one, which is we – our response – our public health response to a bio-terrorism attempt on us will be a fizzle. We'll see it, we'll catch it, we'll treat it, and they won't succeed in making it an event of mass destruction. So eradication for nuclear and fizzle for bio, that's where we want to be.

Let me concentrate on nuclear for the remainder of my remarks because I'm short of time and I know Chris Chyba will do a better job on the bio front, but the point I want to make in this context is I used to give talks about nonproliferation or counter-proliferation, as I like to say, and then and say – but you know, we shouldn't just worry about proliferation, we need to worry about terrorism as well and then you launch into terrorism. If I used this well before 9/11 and everybody's eyes would glaze over, not in an audience like this, but in a general audience.

Now, I find myself having to go the other way and say we can't just talk about weapons of mass destruction terrorism because in the nuclear front, there is a link to nonproliferation and the link is this - only governments make plutonium and highly-enriched uranium. So the path to terrorism is through proliferation. And so, if you don't lick proliferation, you are never going to lick nuclear terrorism, you are never going to do eradication. Eradication means making sure that every kilogram of plutonium or highly enriched uranium anywhere in the world is secured against terrorists. That's a visualizable objective, maybe it's even a doable objective, and that's why I say eradication is the right mental image to have of what we're up to. But if you think about the eight countries that have gone, that have gone nuclear in the nuclear age - this is our 60th birthday, right that's what this is all about - eight countries, four of them, half of them have undergone or are undergoing or will predictably undergo substantial turmoil and therefore risk of diversion to terrorists. The Soviet Union collapsed. North Korea can't keep going the way it is. Disneyland will end one way or another, sometime, and it can't be too long from now. Pakistan I worry about every single day, you can hardly describe that as a stable situation. And I will remind you that China went through the Cultural Revolution, I mean I don't know how many people thought at that time about the level of political instability and radicalism in China at a time when it was a nuclear power. But, anyway that's the record, eight countries, four of them very substantial political turmoil, and what that tells you is that the wheel of history turns very quickly, but the wheel of plutonium for example turns very slowly, the half life of plutonium-239 is 24,400 years. How many Cultural Revolutions, how many Islamic Fundamentalist Movements, how many Kim Jong-Ils, how many of that – how much of that stuff goes on in 24,000 years of human history - way too much.

And therefore, you can't have this proliferation going on and expect to be safe from nuclear terrorism, what's the record of the last few years, when North Korea is a runaway program, a program that was in a box for eight years, not a great box but a box for eight years runaway. Now, six party talks, zero results in the course of several years,

North Korea that is a path to – to their material getting out in so many ways collapse, sail, a domino effect of proliferation in East Asia. And since 9/11, they have gotten away with murder, and I think the North Koreans are now emboldened. And I think that we are Bill Perry, who I'm honored is in the audience today, and you did a great deal to try to keep that situation contained, I think relative to where he had them in 2000, they must just think they, their breath must be taken away, and how far they – how would they have gotten away with it the last few years, and therefore I am concerned that we are not going to get them back in the box. That has led me and in collaboration with Bill to think about Plan B, which is not a pleasant thing. We thought about it in 1994, where it took the form of the possibility of an air strike on Yongbyon. Today, it's a different situation, but we have to get serious about what we are going to do if Plan A which is a diplomatic path doesn't succeed. I don't believe we can tolerate a nuclear North Korea.

Iran was mentioned earlier today, that's a different situation because the Iranians to quote - I guess it's our constitution - seem to have a decent respect for the opinions of mankind. And you see them walking the edge and they drive us crazy by constantly walking the edge of global tolerance. On the other hand that bespeaks a certain sensitivity to global tolerance, which the North Koreans are entirely lacking, I can tell you, and that's, therein lies the hope in the Iranian case.

Third thing that's going on in the last couple of years, the President came out and announced that he was going to do something about the International Fuel Cycle. And he – and that was a great idea and there are lots of implementations of that. I am the Co-Chairman of Richard Lugar's Policy Advisory Group, Senator Lugar, he asked us to look at that, we wrote a report, he sent the report to the President and basically the reports had a great speech, how about following up on the great speech.

And then finally, there is the matter of the events of the last couple of months with respect to India, there is another panel going on at this time. I have expressed my views on that at a hearing before the Senate Formulations Committee last year, last week rather, and I won't repeat them now, particularly since others are speaking about it in the same hall, but that's a very significant matter either. I don't think it's – by any means – a catastrophe for nonproliferation, but it was a tradeoff of nonproliferation for other objectives. So that's the record since 9/11 on nonproliferation as the necessary conduit to nuclear terrorism.

At the very time we became sensitized to the danger of nuclear terrorism, we began to move backward in the area of nuclear proliferation, I think that's very unfortunate. I will just close by asking you, where do you think we will be 60 years from now, and I can think of two worlds with respect to nuclear terrorism. One is the world in which I'd like to live in which nuclear terrorism has been eradicated in the sense that there are fissile materials being made only in a few locations of the most stable and safeguarded and internationally-surveilled locations, made and stored. And leaders around the world can safely – can plausibly tell their citizenry, don't worry about that. Another world in which the – the most aberrant human motivations, which are the ones that appear in individuals and small groups, not states, but the real weirdos show up in small

groups and individuals have access to that kind of destructive power. In that circumstance, you can't run a society of the kind that we want to live in. It would be a society of constant fear, recrimination, wild retaliation, and as a myth every time somebody attacked us. Those of us in the security business which includes everybody in this room or whatever your role— we owe it to the cause we serve to make sure that future doesn't eventuate, and yet that's the path we are on, I fear, for 60 years from now. Thank you.

Mr. WOLFSTHAL: Thank you very much, Ash. It's now my pleasure to introduce Congressman Schiff.

CONGRESSMAN ADAM SCHIFF: Thank you very much. It's a pleasure to join you here today, and I want to start off with the good news because after sitting through a number of presentations in the past on Nuclear Proliferation or WMD, I don't know about you, but I feel like locking myself up in the basement with cans of food, bottled water, and rolls of duct tape. So, I would like to start off with the good news, and the good news is that the threat of mutually assured destruction has receded into the distance. We no longer face the potential or imminent likelihood of annihilating ourselves as a race. So that's the good news. Now, that we've dispensed with the good news, we can get into the not-so good news. I had a chance to sit down with some members of the Duma and the Russian Academy of Sciences, Mr. Ivanov, who I know is present today. And we are marveling at the fact that while the chance of our destroying ourselves through a nuclear exchange had receded, the likelihood of attacks on our populations or civilian populations devastating attacks had tragically and ironically gone up and moved in the other direction, as we have seen with September 11th, that we've seen with the bombings in London and Spain and around the world. And I fully agree with the sentiments that the President expressed during the debate with Senator Kerry that Ash referenced and that Senator Kerry expressed that this is the number one threat facing the country, that nuclear material gets into the wrong hands. And I also agree that once the material is out of the barn, there is little chance of stopping Al-Qaeda or anyone else from delivering a nuclear weapon. The technology is old. I used to say that any two students from Caltech could design a bomb, it's pretty old technology, but as Caltech is in my district, I think I have to move to using MIT as an example. But the technology is old, and in terms of our ability to prevent a nuclear bomb from getting in the country that is extremely limited. Albert Carnesale, the Chancellor of UCLA likes to say, well how would you get a nuclear weapon in the United States, well, you could smuggle it in, in a bale of marijuana, and I think that shows the magnitude, the difficulty of keeping that out.

We know that Osama Bin Laden wants the bomb, we know that he has expressed his desire to have an American Hiroshima, and indeed would you look at the number of people he wants to kill, it's impossible to do through the unconventional 09/11 style attacks, you really need nuclear weapons to reach the kind of deterrent impact that he has openly avowed his interest in having. And I think this is his Mein Kampf, and we really ignore this at our own peril, when Jim Ossey testified before the Subcommittee on Homeland Security Nonproliferation on a sit on - I asked him if a nuclear weapon went off tomorrow in Washington or New York or elsewhere, who would the number one

suspect be? And he thought about it for a moment and he said Al-Qaeda. And I think that's exactly right, but if Al-Qaeda is the number one suspect, then the most likely delivery system is not a missile, but a crate, and if that's the case, as indeed I think it is, then we in Congress have to ask ourselves, are we allocating our resources to deter to prevent the most likely threat. And from my point of view, if you look at the level of expenditures, for example, on National Missile Defense or the contemplated expenditures compared to the investment in CTR and other efforts, it doesn't look like we feel that Al-Qaeda is the number one threat, but indeed I think it is, and while there has been some progress made within the administration and in Congress, that progress has been very halting, and it's certainly not the level of progress you would expect if indeed the administration and the Congress were truly convinced of what the President said during the debate. Just the last few months, when you consider the debate that we've had in the country over the avian flu and when you consider the level of expenditure, and I think an appropriate one, that is now being advocated both in administration and Congress to deal with the threat of avian flu, you would conclude that that threat if based on nothing more than the spending involved and trying to combat it, that threat is six or seven times greater than what the President called the greatest threat facing the country just a year ago. So we don't act as if this is the number one threat.

A part of the problem is the Congress, part of the problem is the administration. The part in the Congress I can address and there is some overlap, I think, with the challenges that we face both in Congress and the administration. In part the problem in Congress is we are a very reactive body, we tend to be mobilized when we have had the catastrophe, we don't tend to mobilize in advance of the catastrophe, but of course when we are talking about a catastrophe on the scale of a nuclear incident of some kind, we cannot afford to wait. The debates that we have had, for example, in the Congress about the Patriot Bill, about how we balanced civil liberties against the need to give law enforcement greater powers to investigate, to prosecute, all of that discussion would be muted if there were a nuclear incident of some kind. This country would become a radically different place overnight and I think this is the contingency against which all efforts have to be made.

Another challenge we have in the Congress in dealing with this is that, this is an enormously technical field. The concepts are difficult, they are not easy to discuss within the legislative committees, and indeed there are several committees that have overlapping jurisdiction that don't often act in a very informed or collaborative way. One, for example, we had in the International Relations Committee that I sit on, the 9/11 Reform Bill come up, I offered several members the 9/11 Bill, designed to strengthen our nonproliferation efforts that were adopted by the International Relations Committee, many of which were designed to implement what I thought were some of the most important recommendations for the 9/11 Commission that dealt with nonproliferation. They didn't get much of the focus that always centers around reorganizations of departments. So most of the focus of the 9/11 Commission's recommendations focussed on our intelligence reforms, but they had equal, if not more significant reforms to propose in their nonproliferation. But while my amendments were adopted in the International Relations Committee, they were later stripped out by the Rules Committee due to an

objection by the Armed Services Committee which claimed that they should have been incorporated in the Armed Services Committee, not in the International Relations Committee. Of course, when they were offered in the Armed Services Committee, they were defeated on the basis that they were not remained to that committee either. So it appears that nonproliferation amendments are not to remain anywhere. This is the problem of a lack of coordination or centralization within the Congress. It's also true in the Executive, when you have The Energy Department, The Defense Department, The State Department, all with their piece of the puzzle, but no Central Office of authority that has as its primary task in mission dealing with this problem and that has the ear of the President, something that you would think if this in reality was the number one threat faced the country, would be already a fact.

We have had some progress this year, we've had some increases in funding, again I think it's been very incremental, Chris Shays and I introduced, with the help of many of you here in this audience, an Omnibus Bill on Nonproliferation, and the bad news is the bill has gone nowhere, the good news is that a lot of the components of the bill have been incorporated into bills affecting The Defense Department, The State Department, and The Energy Department. And so we have had the legislation, hopefully moving along that we'll waive the certification requirements under CTR. We've had some increases in global clean-out funding. We've had an expansion of the geographic range covered by Nunn-Lugar. We have had, I think, some important steps, but there is far more that needs to be done and I wanted to - among other things today, just encourage your active consultation with the Congress, yet it may not seem at times like it matters, like it has an impact, but it does. It certainly had an impact on my work and many of my colleagues'. When you write our pads that you think are sent out into the ether and no one reads them, well, there are people who read them. Rose may not remember, the first time I spoke to Rose, was after I had (inaudible) years ago, that I believe was on the subject of deaf forgiveness for nuclear clean-out and that became the genesis of legislative ideas. Ash Carter probably doesn't remember, I think we first met in George Miller's office when he called you in to consult with the caucus. Laura Holgate from NTI was of great help to Chris and I in formulating the bill along with Matt Bunn at Harvard, Bill Hayne at Ransack, and many others whose work will never be attributed because it doesn't appear in the Congressional findings when we draft these things, but we do pay attention to your work and please continue to be very proactive, let us know your thoughts.

We have probably one of the most important issues coming before the Congress in the next year on the subject of nonproliferation. I think that we will have for great many years and that is how the Congress responds to the President's proposal vis-a-vis India. I think this will have a tremendous impact on nonproliferation on the NPT and this is an area where the President cannot act without Congressional participation. Indeed at the hearings that we've had so far on India, I found a rare - well, I received the rare impression from the administration witnesses sitting at the table that they were actually keenly interested in what the members had to say, because they couldn't take the votes for granted, so that's some progress. So we have got some very important and difficult decisions ahead of us and we've very much benefited from your insight and I want to encourage you to continue to have your thoughts heard.

Thank you very much.

Mr. WOLFSTHAL: Great, thanks. You want to bet that the Congressman gets extra Christmas cards from Laura and Bill and (inaudible) this year for the audible mention. Before getting to our next speaker, I just want to add a personal note, that it's been my pleasure to work with Rose directly for the last five or six years at Carnegie and before that for several years at the Department of Energy. I just want to congratulate her on her new announcement that she will be taking over the Carnegie Moscow Center. I think it's great for the Center, I think it's great for the work and I know that she looks forward to working with you in that new capacity, and with that I'll turn this over to Rose.

ROSE GOTTEMOELLER: Well, thank you Jon, and I am looking forward to Moscow. People keep asking you, why are you moving to Moscow in January, and I have to say maybe the timing is not ideal, but nevertheless it's a wonderful opportunity and I think it will be, I hope a good thing for US-Russian relations, we'll see. Congressman, just as you started with the good news, I thought I would start with the bad news because I have noted an attitudinal problem in nuclear policy emerging that affects the issues we are talking about in this panel, but then I wanted to come around to the good news, because I actually believe that we have in hand already a set of very effective tools for working some of our most serious and difficult nonproliferation problems. I'm going to talk about using co-operative threat reduction in North Korea, but first I wanted to start by really underscoring my agreement with Ash's message, that is that eradication of nuclear terrorism is possible and is something that we should seriously focus on in coming years. I was very pleased when the Bush administration put in place a deadline on their material and warhead protection programs with Russia, that these programs should be completed at least in terms of the physical work to be done by 2008, because after that it's a matter of sustainability, but getting everything locked down by 2008 is a very, I think, excellent goal and one we should all support and applaud. But I also very much agree that the path to terrorism is through nuclear proliferation and that is why these kinds of efforts are so important. And the bad news in my view is that there is a kind of relaxed attitude toward nuclear proliferation emerging in certain policy and expert circles.

We noted last year in Universal Compliance, the major Carnegie Nonproliferation Study actually was published in March of this year but we had an earlier version at our previous conference, you may recall. We noted how the Bush Administration has adopted a good guy-bad guy approach to nuclear weapons. Well, bad guys such as Iran and North Korea must be pushed back from nuclear capability. It is okay if good guys such as Japan want to consider nuclear weapons. This attitude when translated into policy undermines the longstanding international norm against nuclear weapons acquisition and use. But even more troubling for me in recent times has been a new theme that has been emerging, that is nuclear weapons produce a rush to stability. If Iran acquires nuclear weapons, then other countries in the region will rush to acquire them too and before you know it, we'll have a good old-fashioned US-Soviet type strategic

balance. Pretty soon, even India and Pakistan might have such a strategic balance and, in fact, they are sometimes cited as early evidence of this phenomenon. But I find the whole idea of a rush to stability to be profoundly troubling, such stability will be weak and ephemeral and lead to the worst dangers in this very arena we are talking about this afternoon, Catastrophic Terrorism. The stability of the Cold War seemed solid until the Soviet Union broke apart and then we faced a worse threat, that nuclear materials or weapons from the Soviet arsenal might fall into the hands of terrorists. The retreat from the Cold War balance has been extremely costly and complicated to manage as Russia, the United States, and other countries in the region have worked hard and spent millions to ensure control, protection, and elimination of fissile material and warheads in the former Soviet Union.

So, if we want to avoid catastrophic terrorism involving nuclear weapons, we cannot afford to have broad dispersal of nuclear weapons and fissile material. Pakistan is often cited today as a country to be concerned about, what will happen if the Musharraf regime falters, who will gain control of those nuclear weapons, and will we know about it. Last Friday, Nobel Laureate Thomas Schelling spoke at the 25th Anniversary Celebration of the National Academy of Sciences Committee on International Security and Arms Control. In his straightforward rational way, he stressed that we need to be thinking of an Iran with nuclear weapons. If Iran breaks up with nuclear weapons in its arsenal, who will gain control of the warheads, Schelling asked. These are stark examples, but they show we must be cautious about seeking some ephemeral stability involving nuclear weapons, it is dangerous. We cannot afford chaotic retreats from weak and ephemeral nuclear stability. My solution to this problem is I think to turn to some of the tools we have available and try to work very hard at prevention, and in that, I would like for the remainder of my remarks to illustrate the concept I'm talking about by considering what we hope will be a near term policy challenge, working with North Korea to close down and eliminate its military nuclear program. In fact, I think that we are in a place at this time where if things go well in the Six-Party Talks, we might have an opportunity to actually succeed mildly in nonproliferation and threat reduction effort.

The key question to consider and it is a question for all of us working on threat reduction over the years is whether the experience gained in Russia and other newly independent states can now be turned to other states and regions of the world. I believe that the lessons learned in dealing with the aftermath of the Soviet breakup are important and can help us to move quickly and effectively to work tough cases such as North Korea. However, I want to stress that not all of the lessons of the US-Russian experience are relevant. For one thing, as difficult as the programs have been to implement, there have been essentially cooperative efforts between our two countries. In North Korea, we may be facing essentially uncooperative threat reduction. However, we have the experience of working in the 1990s to can up those 8000 fuel rods at the Yongbyon reactor, in fact John Wolfsthal worked on that project. So, we know that even in very difficult circumstances it is possible to make progress with the North Koreans. Second, the United States and Russia are both nuclear weapon states under the nonproliferation treaty and have quite a bit of joint experience in arms reduction, monitoring, and verification. They, therefore, began the cooperative threat reduction process with similar

technical baselines and some degree of mutual confidence. This will not be the case with North Korea. I, therefore, believe that it is important to remember these essential differences, but then to think forward about what may be accomplished. I think because of the lack of mutual confidence between our two sides, it will be important in the first phase, again assuming that the Six-Party Talks achieves success to develop ways to quickly build mutual confidence. One of the most effective ways we have found to do this in the US-Russian context and in the NIS context, was through scientists-to-scientists exchanges, and indeed Bob Joseph talked at lunch today about the role that scientists-to-scientists exchanges has had and scientists in even direction has had already in Libya. I have argued in a recent New York Times op-ed that the United States already has at hand a program that could serve as a conceptual underpinnings for a scientists-to-scientists program with North Korea, that is the Department of Energy Sister Lab Program which emphasizes expert exchanges and training on subjects such as Environmental Remediation and Health Physics. The goal is to develop out of such exchanges long-term technical collaborations. This is a low-cost program and it has already been important in effectively engaging the Libyans.

The Sister Lab Program allows me to highlight one of the most important factors that I have seen in the success of threat reduction programs, all parties have to have something to contribute to bring to the table. North Korean nuclear scientists and technicians have a great deal of experience with Health Physics and therefore would have something to bring to an exchange of best practices even at an early stage and I think this is a very important factor to consider once again in the whole confidence building realm. Another factor that lends to success is broadening the community of partners. The momentum that was established early by the United States, Russia, Kazakhstan, Ukraine and other countries in the region began to build, once the G-8 agreed in 2002 to embrace these issues in the global partnership against the spread of weapons and materials of mass destruction. I therefore believe that in considering how to work with North Korea, we must consider who will be effective partners. Some countries such as South Korea and China are participants in the Six-Party Talks with North Korea and so they will have a great interest in this effort, but they have not been on the front lines of the Cooperative Threat Reduction Program or the G-8 Global Partnership thus far, although South Korea did recently join that group. So they will need some familiarization with threat reduction means and methods and this can be accomplished through any number of means briefings, workshop, site visits and so forth. I think that this will be an important stage to bringing in some new partners to the work in North Korea, but we should be thinking now about how to accomplish that familiarization with new partners in the region. But, another class of partners is those that have already become experienced in threat reduction work. I have a long belief that we should not limit ourselves to working on a bilateral basis with North Korea, which by the way as you well know is the position shared by the Bush Administration, but further I believe that we should not limit ourselves to working only with Russia as a partner in developing threat reduction projects in North Korea.

There are other countries in the region with relevant experience which have also had special cultural and historic ties with North Korea. Let's take the example of the

Yongbyon Reactor. This will be a key site to be covered in any agreement with North Korea to eliminate its nuclear program. Kazakhstan has removed fuel from a reactor at Aktau on the Caspian Sea, prepared the fuel for shipment and begun the process of shutdown and decommissioning of the reactor. This experience is relevant to the shutdown and decommissioning of the Yongbyon Reactor, but its more in Kazakhstan this is not known in many circles, but Kazakhstan has a long historic and cultural ties with Korea and there is a large indigenous Korean population living in Kazakhstan. These ties and this expertise could contribute to more rapid progress with North Korea, than we might otherwise have been able to accomplish. And thus we should be considering Kazakhstan as a partner in our threat reduction work. In sum, I think there is good news out there, I think we are actually very well positioned to work successfully with North Korea assuming that we can buildup a level of mutual confidence, fairly quickly, and proceed to some actual threat reduction projects. As we know from our experience, working with North Korea in the 1990s this will not be easy, but it will be possible and in this way I think we will not only take a giant step to supporting the goals of nuclear nonproliferation, but also be taking a gigantic step to avoiding Catastrophic Terrorism involving nuclear weapons. Thank you very much.

CHRISTOPHER CHYBA: Good afternoon. These things happened. Great, it is not my intention today to present something like a comprehensive strategy with respect to biological terrorism. I share Ash's comments that comprehensive strategy has to, in the case of biological weapons, has to focus much more on disease surveillance and response than it does on traditional nonproliferation approaches. About the topic of today's panel is Preventing Catastrophic Terrorism. So, in fact, I am going to focus my remarks on prevention.

I think there are two points to note the outset of any discussion of about biological terrorism, and the first is illustrated by this first slide. About 15 million people depending on exactly how you do the accounting, die every year from infectious diseases. Infectious diseases are the leading cause of death in the developing world and a significant cause of death around 5th or 6th so, in the developing world. So for in the developing world one here drops down to this level. The 1918 influenza epidemic in the growing risk of avian flu reminds us, as if after AIDS and SARS any further reminders were needed. Those global pandemics can have devastating consequences. Any biological security strategy has to address both issues and take that is natural outbreaks in biological terrorism and take as much advantage of the way we use capabilities as possible. The second fact to notice at the outset is that historically there have been very few bio-terrorist attacks. We know that Al-Qaeda had and likely still has interest in biological terrorism. Although to the extent one can tell from the open literature they seem not to have progressed very far. We know that the Aum Shinrikyo in Japan tried years before their successful sarin nerve gas attack, to attack Tokyo using anthrax repeatedly to attack Tokyo. They failed fortunately and there are lessons to be drawn from that failure, but they did attempt and there could have been a mass casualty attack. And, there are really only two other important recent examples, that of the Rajneeshee salmonella attack in 1984 and of course the anthrax attacks in fall 2001. It clearly is

important to understand the reasons that biological attacks have been so rare. The reasons I think involve both capability and intent.

One of the themes of my talk today will be that the capability to do dangerous things biologically is growing at a rapid rate, and becoming increasingly available to small groups of the technically competent. This has important implications for terrorism prevention. But it only makes it more important to understand other reasons why so few groups have shown motivation for biological weapons. I currently co-chair the Threat Assessment Group in the ongoing Princeton Project on National Security. Our group surveyed nine recent threat assessments, both government and private, going back to just before 9/11. The papers of all these groups are posted on the Woodrow Wilson School's website. We were struck, it had little attention in most cases, was paid in recent threat assessments to motivations, compared to the attention paid to capabilities. The contrast was striking with George Kennan's famous "X" article that framed the strategy of containment at the outset of the Cold War. The document that was almost exclusively about motives rather than capabilities. Indeed let me say that I share Ash's comments and Jon Wolfsthal's – (clipped audio) nonproliferation deterrence and defense required by an effective strategy against each was so different that lumping them together as WMD was more misleading as clarifying. If nuclear weapons are at the left end of a continuum, then cyber weapons are at the far right and chemical and biological weapons are somewhere in between the two. That is biological terrorism shares as many or more characteristics with cyber terrorism, as with nuclear terrorism, and the trajectory of biotechnology is such that these similarities are only likely to grow. Bio is moving closer to the cyber end of that continuum. It's important at this point, I think, to distinguish among different levels of concern with respect to biological terrorism or other types of biological attack. Let me delineate five. Emerging diseases, so if you will attacks from the natural world, state programs, sub-state programs, non-state programs such as the Aum Shinrikyo and finally hackers, this last by analogy to the hackers often evidently young males, that we have become familiar within the room of writing or copying and unleashing computer viruses onto the internet, or attacking particular computer or infrastructure systems. Any comprehensive biological security strategy has to address all these levels, and must concern itself with the unintended consequences of a response relevant to one level or for all the others. That is, our approach has to have strategic oversight, where difficult tradeoffs are made, for steps to address one or another of these levels head on may raise, increase dangerous in another.

An important challenge we face in the medium term future is the challenge posed by the exponentiation of biotechnology. By this I mean, that the ability to manipulate organisms to do harm, to make them more harmful, is becoming increasingly available, inexpensive and automated. At the same time, the biotechnology that's advanced and spread throughout the world carries enormous promise for advances in public health, food security, and consumer products.

This next slide shows the discovery kids DNA explorer, you can order it on the web for \$75, I have. At one point, I set it up in my office as a kind of icon.

ROSE GOTTEMOELLER: Does that work?

CHRISTOPHER CHYBA: Yes it works. You see it's for ages 10 and up and allows, let me show, for those of you who have taken college microbiology, this is a little electrophoresis gel chamber, it allows a little 10-year-old to do rudimentary DNA sequencing, it runs entirely on batteries.

Mr. WOLFSTHAL: Lock the doors make sure we are not raided at this point.

CHRISTOPHER CHYBA: Of course, this is just a toy. It does rudimentary DNA sequencing. Rose asked if it does work? Yes, it does, but it's just a toy. The next slide is not, it shows a DNA synthesizer, a machine to make short DNA sequences to order on sale for eBay for under about, I think for about \$4000. And in case you miss the point, the next slide shows an advertisement that accompanied this machine on eBay, spring blowout clearance sale like new. But, this too was just an anecdote and really hard, it's really and fairly harmless. It's this next slide after a paper by Carlson in 2003 in bio-security and bio-terrorism that really shows objectively what's happening. This slide show the exponential increase in two types of power in comparison, computational power and biotechnological power through the past few decades. The red triangles line that's this line here – it shows Moore's Law, the doubling of computer power every 18 to 24 months. That is computer power has been exponentiating for several decades, and that's why each of us can now have a laptop machine that carries with it vastly more computational power than was available, say to the early nuclear weapons design projects. The other lines all show the time required to either sequence or synthesize DNA. The speed at which we can synthesize DNA has also been exponentially increasing as seen by these lines. Biotechnology got a later start than computer technology, but this graph shows that it too is increasing exponentially. And with an exponent that is as fast or faster than Moore's Law in computing. So you want to think about where we were in computing say in 1980, we are pretty much all working on big Mainframe computers then and what computing looks like now 25 years later when I can have this kind of laptops sitting up here. That's the kind of qualitative change we will see in biotechnology in the next 25 years.

In particular, in 1980 I did not imagine that some small fraction of high school or college students would become hackers, capable of writing or copying from websites and then modifying computer code to produce viruses that they could then unleash on the Internet. As the ability to manipulate microorganisms through biotechnology increases and as it becomes more and more automated, we are moving towards a world in which biological hacking will become possible. As with computer hacking, much of this was simply piggyback on procedures broadly available on the web or elsewhere. Just one example, at a recent meeting I participated in at the National Academy of Sciences, a colleague who works in this area said "its mind boggling how faster reverse genetics is moving to cook up viruses in the laboratories. If you have the genetic sequence you are in the game." So, for example with the now published genome of the 1918 influenza virus, it's possible to synthesize the virus. And, what's challenging or cutting edge today will become commonplace before law exactly because of this exponentiation is taking

place. These advances, for example determining the genetic code of the 1918 virus and recreating it in the laboratory as was done, will allow terrific advances in fundamental understanding of avian flu viruses, a huge natural threat and in the rapidity of vaccine production should that become necessary. Other more exotic defenses will also be enabled by this work. But, there is a dark side that comes with this kind of research in terms of the ability to use technical advances for nefarious purposes as well as defensive ones. But, we should be careful not to suggest that such attacks are somehow inevitable or that creating pathogenic organisms in the laboratory will be easy. The Aum Shinrikyo and Al-Qaeda did not find it so and modifying an organism to be pathogenic and being confident that the organism is pathogenic would require a testing program. The sort of program that will be far more likely to be detected in bench research itself, and you have to do all this in your laboratory without killing yourself and your colleagues. So, I don't need to suggest that it's necessarily trivial, but it's clearly going to become easier for small groups that are technically competent to do potentially enormously dangerous things.

Finally, as we devote substantial resources to defensive measures intended to help protect ourselves against what might be cooked up in some offensive minded state or terrorist program or even in the medium term future by some hacker. We need to weigh extremely carefully the overall impact of our approach and the possibility that if misperceived, it could feed the very kind of state-driven biological arms race that we all have an interest in ensuring never again threatens the world. It would prove difficult for a non-state group or individual hacker to produce large quantities of weapons grade aerosolizable material that could cause mass casualties without involving a contagious organism. And, ultimately any release of a highly virulent and contagious organism thereby sidestepping the aerosolization step would hurt much of the rest of the world far, far more than any developed world city that may have originally been its target.

I will end by noting that as with nuclear programs there is no silver bullet solution to our problems. We have to rely on a web of prevention where each strand of the web is clearly and will be clearly inadequate in itself. We have to be conscious of the fact that strengthening some strands in the web may weaken others, and we have to make strategic decisions therefore about how to proceed and then the effective approach will necessarily include a strong international component. In this context, the implementation of UN Security Council Resolution 1540, which among other things requires all countries to criminalize irresponsible biological hacking even if it's not put exactly in those terms as well as to adopt appropriate measures to safeguard the most dangerous pathogens and the transfer of the synthesized DNA sequences is a step in the right direction, which pathogens or sequences are best rightly, strongly controlled and which are better made broadly available for the purposes of research and to whom is just one example of the kind of careful strategic thinking that must go into any such planning. I think broadly speaking, it's safe to say that not enough careful strategic thinking has been done. Let me just standby taking advantage of Congressman Schiff's presence today to note that another step that I think would be very important in the United States with be passage of the Global Pathogens Surveillance Act in effort to improve disease surveillance and ultimately response throughout the world recognizing that international flight travel times

are shorter than many incubation times. That Bill has in the past once passed the Senate, it never come up for a vote in the house, I think it would be terrific if it would pass both chambers. Thank you.

Mr. WOLFSTHAL: Well, now that we are all cheered up, we have got about 25 minutes for question and answers. Ash has asked me to apologize he is going to have to leave relatively soon because he has a flight and I think in a visible demonstration of how we maybe focussing on the wrong issues. He is going to get through TSA, but his result will be deprived of his insights for as much as we would like to have them, so we have mikes on either side of the room. We are happy to take questions. Please try to keep them short and do identify yourself when you ask your question, when we start over here on the left-hand side.

And I'm sorry, and please if you would like to have a specific person on the panel respond please address the question to them.

Q: Thank you. My name is Berhan Andemicael and I'm a former representative of the IAEA and presently I work for the Security Council in connection with the resolution which deals with weapons of mass destruction and terrorism, but I'm making this comment in my personal capacity because I have been involved in detailed research on verification for the elimination of weapons of mass destruction using the IAEA model for comparing the practice of the other organizations. Now, for my research what I found out was that the building of regimes in the nuclear field, chemical field, and biological field has been going on although the regimes are not complete. There are domes established but right now there is a weakness at the level of building domes that seems to be arrested and there is also a weakness in implementing the various agreements that are enforced. In other words, implementation measures, national legislation, criminalizing what governments have agreed upon. Now, is there any comments anyone of you could make on how to look at the broader picture at the regime level and at the implementation level? So, this is my maiden question. The other one is no comments have been made on chemical weapons, we have covered nuclear and biological, but nothing on chemical.

Mr. WOLFSTHAL: Thank you very much Berhan. When we start with dealing mainly with the first question and talk a little bit Congressman let me ask you, from your sense of implementing the international norms that we have signed up to in the United States there obviously have been longer term questions about, did we implement the chemical weapons convention quickly enough, how we are doing from your sense on Capital Hill are we moving fast enough to implement the actual obligations we have and then maybe actually before you go if you give sense on how we are doing internationally and sort of maintaining the norm and moving a little bit more quickly?

CONGRESSMAN SCHIFF: Well, it both comes in a great surprise, I don't think we are doing enough at all and one of the best indications of the lack of I think congressional initiative in this area and lack of administration initiative is when we look at the supreme opportunity we had with the NPT review and how very little came out of that. This was an opportunity I think for the United States to demonstrate some real

leadership to strengthening aspects of the NPT that we felt allowed regimes to evade its provisions that allowed countries to travel on the path which is nuclear energy and then simply opt out of the NPT to investigate proposed solutions like Dr. Elbaradei discussed earlier by creating a uranium bank but instead of really making progress on any of those issues, I think the NPT conference was a failure. And, we have the opportunity in Congress to hold the administration's feet to the fire months before the conference to find out what were the objectives of the administration, what was it telling to trying to achieve we didn't do that, we had I think one relatively perfunctory hearing around the time of the NPT review. We basically did not keep administration's feet to the fire and they made little use of the opportunity. I have some skepticism about whether the administration really wanted to accomplish much at the NPT review given the fact that it was about to announce this agreement with India, which came shortly thereafter. I'd have beefed up and strengthened the NPT, it might not have been consistent with what is been proposed vis-a-vis India but the long and the short of it is I think there is a greater, more that Congress can do, the administration can do to strengthen parts of the nonproliferation regime that aren't working as well as they need to, and we missed this supreme opportunity this past May.

Q: Thank you.

ASHTON CARTER: I will just add that I too have heard around town particularly Washington in the last few years the following argument. The regimes are useless, because you don't need them for the good guys and the bad guys either don't sign or sign and cheat, so what's the point. That argument is wrong for two reasons. The first reason is that the world doesn't divide into good guys and bad guys. There is an in-between category and that in-between category has been represented in recent history by Ukraine, Kazakhstan, Belarus, South Africa, South Korea, Taiwan, Argentina, Brazil, and the nonproliferation norm which you described which is enshrined in these regimes has been important in the decision making of countries that like otherwise have been nuclear that are not bad guys but we are possibly headed towards not being good guys anymore either, so simplistic to think that the world as good guys and bad guys.

Secondly, even when it comes to the bad guys, we are stronger in going after them, yes the North Koreans don't give a fig about the NPT, but we are stronger in going after them, because we have behind us the opprobrium of human kind for these weapons that is enshrined in these agreements, so even with respect to the bad guys they are useful but they are not everything and I think we need to be realistic and that in fighting this fight I have talked about the toolbox. There are a number of things that one has to do and of which these arms control agreements are only one in order to win this fight. And it's so important to win that we can't afford not to make use of every tool we have and we can't afford to denigrate any tool that we have. So, I know the regimes are not a silver bullet, but to go around trashing them I think is destructive. With respect to the India deal, my personal judgment is that, that does not trash the nuclear nonproliferation treaty. It does some appreciable damage to it in certain respects. And one hopes that is offset by the greater promise of drawing India out of it's sort of non-align movement old fashion thinking and into strategic for speaking from Washington's point of view,

strategic partnership with Washington, I mentioned earlier that I gave testimony on that to the Senate Foreign Relations Committee, I know that the hearing on at the week before as well and I have here copies of my statement which I will leave and it will give TSA one last thing to examine when I leave and the rumors of my death I was at Mark Twain are premature I have got another few minutes, but as I depart and I apologize and don't mean to be impolite, but in reality I am going to drop these at the edge of the stage and anybody interested in the India deal are welcomed to take one.

CHRISTOPHER CHYBA: I might make just a brief comment with respect to the biological realm which and as you all know that the protocol with Scott, the question is how do we move on, I think that you know the Bush Administration raised a number of specific objections to the protocol. I have to say that I actually think those objections all contained elements of truth, nevertheless it's the case I believe that the United States made it very difficult for itself to be an actor in this round by torpedoing the protocol. Having said that, one very important point that I think we want not to lose is that with the rapid evolution of biotechnology and I think you see some of this in the chemical realm as well. We have a kind of mismatch between the speed with which the landscape is changing because of the exponentiation of the technology and the speed at which the Global International Multilateral Treaty System can possibly react to that changing landscape. That's most severe in the biological case, it's less severe in the chemical, but even the NPT, is needing rapidly, to somehow evolve in response to the changing technologies. Therefore, I think we might in the biological realm need to look towards something more like a building block approach, where we add different modules rather than trying to negotiate one enormous comprehensive regime all at the same time.

Mr. WOLFSTHAL: Thank you. Time is ebbing away, so I will keep taking questions, but I will urge you please to keep your questions short and the panel to try and be very concise in their responses, please.

Q: Okay, my question is to Mr. Carter. My name is Amelica (inaudible). I am at a student at (inaudible) College. You mentioned the substantial turmoil of nuclear powers that could lead to a compromised security of nuclear weapons. Several scholars such as Graham Allison, Scott Sagan have cited different cases that reaches within America's own nuclear facilities and Allison states are part of this is to due to a sharing of information between buddies or guards or soldiers to ensure successful war games exercises and as a result there is a lack of clear intelligence about the security of American fissile, material, and weapons. Do you feel that this is an issue to which we should lend importance and if so what can be done to convey the importance of accurate exercises for the sake of improving security to guards?

ASHTON CARTER: Well thank you and its an excellent question and I don't know, my friend and colleague Graham Allison actually said, but what he might have said and should have said - would all say which is that I think the United States, you know, we have a solemn responsibility to be an exemplar of responsible custodianship. And, to my knowledge which extends over the DOD system, when I had some responsibility for that, we I think were in a very good shape to the extent that I don't look

at this country and say Jesus! I worry that we might be the source of loose nukes on the contrary, I don't, at the same time if something got to work at constantly and we do work at it constantly you know, all the rules, you are not allowed to be alone with a nuclear weapon, you are not allowed to work on a nuclear weapon by yourself without somebody who isn't rated in the same specialty, the personnel who deal with these weapons subject themselves to a level of scrutiny of their personal lives that other service members don't do and then of course there are comparable things in the DOE complex, where I think 9/11 made us more conscious was with respect to the insider problem, where you have two or three conspiring insider people conspiring with an outside assault team and you know, you have to ask yourself, how big of threat might there be in the United States in that regard. Five people inside and a battalion outside you know, well then maybe we are in trouble too, but if its one guy on the inside and a couple of people in black pajamas on the outside trying to get in at night, we can probably handle that. That's called the design bases threat and both for the DOE facilities and the DOD facilities, one has to do that well. I believe we are doing that quite well, so I am comfortable.

Mr. WOLFSTHAL: Rose, do you have any perspective from the DOE side?

ROSE GOTTEMOELLER: Well, I agree with Ash's comments and there has been a quite a bit of work done in recent years recognizing that some of the exercise scenarios were quite subject to tweaking in the way you were talking about. So, I think it has been a problem in the past, I am not saying it's a problem that's been totally resolved, but I do think there has been a major amount of attention to this problem over the past half dozen years or so. So, I am hopeful that progresses in the right direction that said here is an area where I think, you know, frankly the United States too can benefit from exchanges, the best practices with other countries like the Russian Federation and others. So, it's not like we are Simon Pure and could not improve our own systems in this regard.

Mr. WOLFSTHAL: Please.

Q: Dori Ellis, Sandia National Laboratories. After the anthrax attacks in 2001, we were called upon to assist the US government in protecting our biological laboratories and since then have worked with CDC and World Health Organization for physical protection for biological facilities. It is a real frustration Congressman and if you could respond to this, as far as we can identify there is no US agency who has a real broad responsibility for bio-nonproliferation efforts including bio-security. Is that on anybody's radar and if so, what agency would you suggest would be the right one to take on this responsibility for the US?

CONGRESSMAN SCHIFF: Well, you know, it is certainly on people's radar, but I think it's been eclipsed certainly in the last six months by a concern over avian flu and I am not sure that I can give you a good answer about where I think the central responsibility ought to lie and that may be my colleagues have some thoughts on that. But the Senator Feinstein and I worked on some legislation a couple of years ago in trying to strengthen the security our labs and part of that I did move through the Congress, but there certainly hasn't been anywhere near the level of focus, I think as in

the nuclear area or more recently in the natural disaster of avian flu, but I am not at all surprised by your observation given the lack of centralization in dealing with the nuclear problem that would also be a problem in the biological area, but would be happy to defer to my colleagues, Christopher if you –

CHRISTOPHER CHYBA: I don't in fact have a good answer to your question, I would say though that there needs to be a comprehensive rethinking of exactly what agents we restrict and how because we are currently in a position of making it very difficult for ourselves to work with certain agents. There are clearly some agents that need to be extremely carefully protected such as smallpox and reconstituted 1918 influenza. There are others though that we're currently I think making things much harder for ourselves and the threat justifies. I am afraid I don't know wherein the executive branch to poke at to try to resolve that problem.

CONGRESSMAN SCHIFF: If you want to leave your information with me, I'd be happy to try to get back to you some further information.

Q: I'm glad to do that, thank you.

Mr. WOLFSTHAL: So you ask, we will respond.

Q: Hello, William Dressler, Center for International Trade and Security, my question is also for Congressman Schiff, about your comments about the most likely delivery system for a terrorist nuclear weapon being a crate instead of a missile. I'd like to get your opinions on the various customs and border protection programs about that?

CONGRESSMAN SCHIFF: Well, you know, I just had a just sit-down with our former commissioner Barnard about that and more recently with members of the staff to follow up on the status of the portal technology and while I think that there have been some considerable strides that have been made, I would hate to rely either now or in the foreseeable future on that technology keeping the material out of the country. If we are lucky, we might catch it, but we'd have to be very lucky and those that seek to smuggle nuclear material in the country, if they encase it in lead, it makes the, at least I think that the current state of the technology pretty incapable of detecting it and I am not sure how soon we're going to break that technological barrier. And, so the far more, easier less expensive, more cost effective way is to prevent the bad guys from getting material to begin with. Once they get it, I'd just think the capability of stopping at the border is very remote unless we get very lucky, but we are investing in the technology, the technology is improving, we are using multiple methods, not just technological, some old technologies like dogs, but we have a long long way to go before we have anything other than very porous borders.

Mr. WOLFSTHAL: Thank you.

Q: Mark Fitzpatrick from the International Institute for Strategic Studies, I would just be interested if any of the panelists could comment a bit about risk analysis of

catastrophic terrorism, the consequences of terrorist use of a nuclear weapon or manipulating a DNA I think have been well discussed today, but not so much the probability of that say in comparison with terrorist use of a chemical weapon, terrorist use of radiological dispersal device, which probably would cause as much economic consequence and actual terror among the population as did the anthrax attack in 1991. Previous questioner did ask about chemical weapons, perhaps we don't have experts on the panel about this, but I'm just, you know, looking at the nexus between terrorism and WMD, it seems like some risk analysis would be relevant in considering policy options.

ROSE GOTTEMOELLER: That's an excellent question Mark and I think the way we think about it in policy terms is that, you know the chance of a nuclear detonation occurring, a terrorist nuclear detonation occurring is very, very small, but the risks are so enormous and the dollar impacts are so high that we have to take the threat very, very seriously. Now, in terms of the point you make about radiological dispersal device going off or chemical weapons attack, the degree to which that kind of attack could deny, you know, the economic use of a certain region of a city for a considerable period of time in the case of a radiological or dirty bomb for very long times indeed. I think, you know, those certainly are questions that people are concerned about and recognize, but the question is whether there would be a global effect and there seems to be in my review of expert discussion of this, there seems to be a consensus that, there would be an enormous global impact from the detonation of a nuclear weapon for example, in lower Manhattan, well, that would have the effect of wiping out Wall Street, but there has been a lot of redundancy now built into those systems since 9/11 so it's not like that alone would have the effect, but just the overall impacts on the worldwide economy are sometimes accounted for at levels of 3 trillion dollars. I have no means of commenting as to whether that's a good number or not, but numbers of that magnitude are out there, so for that reason, we have to take the very small risk of a nuclear detonation very, very seriously, but we also then have to pay attention to the other threats as well, but it's a very good issue to think about as we do our planning for how to address these threats, because otherwise we will never have an answer to how much is enough.

CONGRESSMAN SCHIFF: Okay, I could just jump in on that, I think it's an excellent question as well because one of the things I think we really haven't done is a comprehensive threat assessment, trying to identify what are the most likely, and more grievous risks to the country, how do we prioritize our resources to address those in that order. I mentioned one at the outset that I thought investing as much as we would, at least administration would like to National Missile Defense, when that's a more remote threat, it doesn't make sense to me, but I guess I am a little bit more of the Graham Allison school of thinking that a nuclear incident of some kind may just be a matter of time if we're on the present trajectory and one of the things that concerns me about the professor's presentation on bio-terrorism, which, really is a I think fascinating, if terrifying way to view it, the similarities with cyber terrorism is that there seems to be a second law of thermodynamics operating here, where the information, the technology and the material seem to be approaching greater randomness around the world over time and that doesn't make me terribly optimistic about our ability to avoid the use of either nuclear or biological or chemical. I think in Congress we tend to be a little less

concerned about chemical, perhaps because there is a sense that it would be less devastating, and it may not be an accurate sense, but I think that is the functional point of view, so more of our focus is on the biological than the nuclear, but I am not aware of any really well thought out and therefore the basis of legislative action, estimation of, you know what are the hierarchy of risks and are we approaching it rationally from that point of view.

Mr. WOLFSTHAL: We have four questioners left so, I am going to ask the panelists to get out their pens, and we are going to take all four questions and then I will let the panelists sum up, so Siegfried, please.

Q: Sig Hecker, Stanford University. The question is a bit rhetorical, but I will turn it into a real question, so bear with me for just a second, we were told that the biggest concern is to keep the worst weapons out of the worst hands and we heard from the panel this afternoon, there are good new stories about doing that and we also heard at lunch that lots of things are being done, and so I was sitting here and wondering, I have been in the nuclear business for a long time, how come I don't feel better?

(Laughter)

Mr. WOLFSTHAL: There are some people that are never satisfied.

Q: And so that turned us into a real question is, you know, if you are in the nuclear business, you recognize that today there about 1.9 million kilograms of highly enriched uranium in the world, also around 1.9 million kilograms of plutonium in the world, much of that is in a form that's not very attractive to terrorists and if we are worried about a few tons of kilograms getting into the hands of terrorists, I don't see much optimism and the programs that we currently all put together, and, so my question are we really doing everything that we should be doing, if we are trying to keep a few tons of kilograms of fissile materials out of the wrong hands?

Mr. WOLFSTHAL: Sally?.

Q: Sally Horn from the Department of State. This is a general question. This morning, we heard about the importance of multilateral engagement and the importance of working with other countries and working with organizations such as the IAEA and I would submit, that would include the NPT review conference. This afternoon, we have been focussing in on how do we prevent catastrophic terrorism among those issues being nuclear terrorism. The question that I have comes from the Congressman's comments about the frustration about the NPT Review Conference and as a participant in that conference, I can say that the United States and many of our friends and allies were quite frustrated because of the activities of a couple of nations that prevented their refusal to agree to consensus for two and half weeks, so we spent two and half weeks twiddling our thumbs and not being able to get down to brass tacks. This is an issue that we have as well in other multilateral organizations. Do you have any prescriptions or any thoughts about how we deal with the multinational organizations, how we can work with them to

get a focus on issues of catastrophic terrorism when they generally run by consensus and that means one state can prevent all states from dealing the serious issues.

Mr. WOLFSTHAL: Thank you. Charles?

Q: Charles Ferguson, Council on Foreign Relations. My question is for Rose. Rose, I am glad you raised this attitudinal problem issue, but I would like you to comment on perhaps a different attitudinal problem, that is the belief I think among some Russian and perhaps some American and Pakistani government officials, that it's incredibly difficult for terrorists to make a nuclear bomb and if we can't get across that belief system hurdle then we can't make substantial progress in eradicating nuclear terrorism and I am quickly picking back on to that, you mentioned that, you share Ash Carter's vision of eradicating nuclear terrorism in the next 10 years, and I know we are running out of time, but I would like to know in more detail, what does that vision entail, just locking down nuclear material, it's weapons usable, or actually eliminating 'the' material, so that we truly go down to zero risk. Thank you.

Mr. WOLFSTHAL: Last question please.

Q: And then regarding this, entirely in the (inaudible) for international peace. Ms. Rose mentioned about the probability of countries creating this partnership as the US with Russia and having this facility with India and Pakistan and in the morning, Mr. Bohlman from the US Department of Energy, was prospective of how important is nuclear energy as a way to creating save an environmentalist nuclear energy and especially as an important alternative power for a growing economies and Mr. (inaudible) also told us this morning about the possibility of a central nuclear facility, so it seems that the way of eradicating a nuclear terrorism comes to way of monitoring or distributing a nuclear energy or nuclear research in a global level, not just in a national level and I would like to know your opinions on what is that probability that the US would consider this idea?

Mr. WOLFSTHAL: In many ways that's an excellent question to end on because the idea of 60 years after, we haven't touched upon any of the issues related to say adverse for peace, and what we have done in the past. So if people want to comment on whether, we maybe be looking forward, using some of our past experience. Then we will start with Congressman Schiff and then we will move down the panel.

CONGRESSMAN SCHIFF: Well I will just try to touch on a couple of the questions to the gentleman from Stanford who asked why don't I feel better well, probably because you aren't safer. How many people here feel safer than they did four years ago vis-à-vis the problem of nuclear material or WMD. Not many? Well, I don't feel better, I will let Rose explain why she feels better, I don't feel particularly better you know, we have made some progress in cleaning up some sites and in better securing others, but at the same time I think, the number of, and the motivation of those who would do us harm has multiplied in a way that overall it makes us less safe. And, we are on a certain timeline that I think is probably a 15- to 25-year timeline of securing and

locking down this material which I don't think is fast enough I don't think we have that much time. And to the gentleman who asked what do we mean by, you know, really address this probably within 10 years, I would be delighted in 10 years if we beefed up the security at these vulnerable sites, and rendered some of the material inoperative I would be delighted with that in 10 years but I think even that is not quick enough, very quickly on how do we deal with multilateral organizations which operate on the basis of consensus, when some holdouts prevent the group from reaching consensus. And I am not going to suggest that I think the NPT conference was going to be easy, but I think it required probably a year of intensive effort to prepare for it and I don't have the sense of that kind of effort went into it by the administration to anticipate the challenges that were confronted there and I think I am kind of reminded on this subject of something Tom Freedman said, prior to the Iraq war, when he was asked about how do we deal with the problem with Iraq and in particularly the lack of getting help from the rest of the world, he said, well it reminds me a little bit of the New York cop who was asked directions by a tourist, how do we get to a certain location and the cop says, well to begin with I would start from here. And this is a little bit how I feel in terms of our ability to get the rest of the world to work with us on nonproliferation it's very hard to start here. When we haven't shown as much interest in the agenda of the rest of the world in terms of multilateral agreements, its hard to provide the leadership that I think, we really need to provide. So a few thoughts but I want to thank you all again for the opportunity for participating.

Mr. WOLFSTHAL: Thank you. Rose?

ROSE GOTTEMOELLER: I am optimistic because I remember where we were in 1992, when we had absolutely no cooperative relationship established with Russia and the other newly independent states at that time, Soviet Union recently having fallen apart and I have seen how far we have been able to come in the last decade, now almost an half. So, yeah Sig I agree with you, how come you don't feel better it's because there was still a lot of stuff out there and I agree with that absolutely. But, I do believe that, we have been able to make some significant progress and that example is ever before me as I think of what further needs to be done and that is an enormous amount of work that needs to be done. Charles was asking about the, you know, overall vision I think, you know, I standby what we said in Universal Compliance that we must, in the first instance, place emphasis on physical protection, the fissile materials and warheads but that we also must move smartly to eliminate, particularly by down-blending highly enriched uranium, low enriched uranium and getting high enriched uranium back from research reactors around the world. And so I applauded very much what Bob had to say today in terms of the US making those additional commitments to that from its own stockpile materials, so those are some positive trends, positive directions that I think we need to build on. Are we there yet? - absolutely not, we are still in a maelstrom, that is very difficult to control particularly when we think of some of the new threats out there, North Korea I talked about in my own remarks, and I am not sure we are going to get to yes, in the six party talks but the signals look hopeful at the moments so let us proceed on the basis of a little bit of optimism. Sally Horn's question is a very good one and I have been thinking about this question quite a bit. I think we do have plenty of examples of where the UN

community itself has been able to pull together in recent years really over the past decade and come up with some important measures in the nonproliferation realm, the additional protocol after the fiasco with Iraq and the failure of safeguards in that instance, the additional protocol of the resolution 1540 just a year ago so and indeed the extension of the nonproliferation treaty a decade ago. These are all important steps that I think do point to the ability to work in a multilateral context, as long as there is not a failure of leadership. And to be honest, I see a failure of leadership not only in some other countries, but also right here in the United States as well. So we need to I think, examine our own house as we work on the problems of multilateral diplomacy. Thank you.

Mr. WOLFSTHAL: Chris you get the last word.

CHRISTOPHER CHYBA: Thank you, and briefly two comments one with respect to Sally Horn's discussion. I think UN Security Council Resolution represents in part an effort just sort of bypass, I don't think inappropriately, but the bypass the NPT, you are seeing opportunity and you try to approach it in a radically different way which is security council of law making, kind of remarkable new approach and I think it's essential, that there will be follow up and that security council resolution be seem to have real implementation consequences and it's not clear currently whether or not that will be the case. I also agree with Rose that what we have seen in effect with respect to buttressing the NPT as a kind of modular approach, there's the Zannger Committee, the Nuclear Suppliers Group, the Proliferation Security Initiative, the additional protocol, many of those are not full, obviously not full global approaches to the problem, but they are multilateral. And they become more and more recognized as multilateral approaches over time. I think that sort of modular approach to modifying treaties may become increasingly important and especially important in fast moving realms. I'll close just by saying that I think the claim that it's very difficult to make a nuclear bomb at least if one has access the HEU is technically incorrect, but it is very difficult to know how to speak about this, one remembers, Al-Zawahiri's remark about how Al-Qaeda only became aware of biological weapons when the enemy drew their attention to them. So it's difficult to know exactly how much to dwell on these catastrophic outcomes, but if one does, I think one wants to follow up on a comment that has often made it with that one which has you know, and even if it....