KEYNOTE ADDRESS

SCIENCE AT A TIME OF NATIONAL EMERGENCY: BE BOLD, THINK BIG, THINK OUT OF THE BOX

Martin Apple, President and CEO
Council of Scientific Society Presidents

I will address five key points: 1) we are at the nexus of tense coexistence of multiple eras of societal evolution and of disparate generations of our people; we must work together to solve several major national emergencies, not just 9-11, 2) the role of the university is to create enduring value; we ensure this by being the fountain of really bold new thinking under a renewed social contract, 3) everyone loves a tax cut, but did Washington really misplace $5 trillion dollars, and what does it mean for science in the coming decade? 4) science and secrecy are polar opposites, and their growing tension needs resolution now, 5) homeland security requires a new defense paradigm, a streamlined, high agility, increasingly competitive operational system and different sets of expertise to address prevention as well as mitigation.

What Does it Mean to be at a Time of National Emergency?

World leadership requires us to lead the world to a better tomorrow. Because of this, we are indeed in a time of national emergency, but not just a post 9-11 response. There are several national emergencies in the United States today; they are all important and many interact. Each one undermines our future and many challenge our right to lead.

Here are some examples:

- We repeatedly fail to plan and sustain an effort for sustainable energy autonomy.
- Our children finish high school at the bottom of the world in math and science.
- In many cities, a majority of births occur in one-parent families.
- We squander unique opportunities provided by the last decade of economic growth.
- Addicting street drugs and sexually transmitted diseases are runaway epidemics.
- Our personal privacy and Constitutional rights are fast becoming historic relics.
- Justly judged guilty and sentenced to death has become “oops, another mistake.”

- Half our citizens ignore all evidence and condemn the teaching of evolution as “heresy.”
- Although the global standoff on whether we should annihilate all life on Earth has ended (Cold War), it has now evolved into perpetual tribal warfare, with us as the world’s policeman.
- We overfish coastal areas, causing catastrophic eco-collapses, while invasive species remake or destroy our landscape, and limit its future productivity.
- Fresh, clean water is moving from being a commodity to being a crisis and we despoil the air, the water, the land, to avoid the expense of converting the nation to sustainable systems, and thus severely limit the future of our children.
- Networks of smart, resourceful, imaginative, impatient, fanatic murderers from the pre-industrial age devastate the infidels who dare to live happily in the post-industrial age.

What is the Role of Universities?

Society has problems, while universities have departments. Scientists need to be absorbed in many pressing issues, not just the latest problem of national security. It is time for universities to assert their leadership. While all our institutions and commercial enterprises operate in the present, we, in contrast, are the constituency for the future. Many universities are giving up their most useful role – the perpetual stimulation of new ideas. This is where breakthroughs happen. Universities are becoming redirected as a temporary answer to today’s corporate R&D malaise, serving short-term profits. We should reach the pinnacle of our journey as universities by adding the maximum value to society. Too often we confuse success with excellence, and stop along the way measuring proxies of value (e.g., awards, money, rankings) and then become arrested into the pursuit of these proxies instead of value.

We live in a period in which we have a contentious interaction of coexisting pre-agrarian, agrarian, newly industrializing, industrial and post-industrial societies around the world. At the same time, we have colliding generations in the U.S. (named by Lynne Lancaster): the traditionalists, baby boomers, generation-X and the new millennials – each shaped by a wholly different history and expressing a strongly held, very disparate, world view. Each appears confident that they are right, and the other folks will “see the light” as they have, in due time.

Thus we are at a time in which the universities are challenged to assert their leadership, to experiment with very new ideas, to lead – not follow – the evolution of our free society. Adding one more national emergency, even this one, is never a time to fail in this obligation to our society; instead it makes the case for doing so even more compelling.

Now is the time for each of you to build the intellectual underpinnings for the long-term capacity to be a free and just society. Each university should be pursuing a bold, imaginative, even startling research agenda.

This is the time to examine and clarify these questions: What should be the twenty-first-century social contract between society and universities? …between government and universities? ….between industry and universities? ….between virtual education and personal interaction?

Contributions of Science

What is the mission of the twenty-first century university? How do we define it? When will we put behind us the elements of the industrial revolution that no longer fit? When will we institute, and when should we begin to replace, the elements of the information society?

Scientists need to develop and widely communicate the grand challenges of the twenty-first century. All science is foundational. From this foundation, we generate more new ideas and knowledge and can create new amenities. Scientists, in the everyday course of doing research and inquiring into Nature, create much change. The ability to transplant genes, grow whole mammals from any cell nucleus, and hundreds of other discoveries, occur far more rapidly than the ability of our institutions to cope with the implications of the changes created.

Scientists have generated considerable value to the society. In the twentieth century we saw so many revolutions that they often overtook us. A century ago, we did not imagine such advances as these, but they were achieved:

- synthetic hormones and antibiotics
- producing human insulin in bacteria
- humans living in a space station far from earth
- cracking the universal genetic code
- conceiving a baby in a test tube
- discovering lasers and NMR and using them as medical lifesavers
- the transistor, personal computers
- walking on the moon
- conducting electricity without resistance
- the Internet
- storing an encyclopedia on a credit card
- flying a jet across the ocean in 2 hours
- live broadcasts by color TV from around the world in real time
- transplanting hearts from the dead to the living
- remote digital copiers and cell phones

Scientists save lives, create jobs, and provide a unique workforce that can overtake our challenges. Thus scientists are always a constituency for the future. We live at the edge of knowledge and can have the thrill of stepping off into the unseen and the unknown – the future – every day. We can envision the future we would like to create and it is exciting. We will make important new discoveries that benefit humankind. We will create new sciences never thought of before.

Grand Challenges of the Twenty-first Century

Some overarching goals for our future are:

- Discovering new truths of nature;
- Enhancing the value of universities to society;
- Converting the nation, even the world into entirely sustainable systems;
- Developing all the human cognitive capabilities and potentials to learn;
- Healthier lives, built on pre-emptive prevention, rather than treatment, of disease;
- Stimulating our economic engines and inventing new economic paradigms that prosper without further population growth and environmental damage;
- Developing affordable, sustainable, distributed, universal energy autonomy;
- Understanding and fully developing affirmative and beneficial human behavior.

Federal Resources

The White House and the Congress told the American people last year that we would accumulate a $5 trillion surplus in the next decade and that we should pay down the debt and return one-third of it in tax cuts now. Office of Management and Budget (OMB) data projected that over the next decade we would spend $800 billion in interest on the National Debt, but then it would be fully paid off. So we voted to cut taxes only to find out that it was not true, and we will be saddled with debt interest payments of $1.8 trillion over the next decade, and the debt will still be there, and the growing government debt is competing with business expansion for new capital. Last year's Bush budget left no margin for error in forecasting the next decade of surpluses. If we look over the last four decades of deficits and surpluses, covering the Johnson, Nixon, Ford, Carter, Reagan, Bush-I, Clinton and Bush-II eras, we find that war and defense were not the factors that produced the largest federal deficits; in the only two cases that the deficit spun out of control, the Reagan-Bush-I and Bush-II periods, it was from enacting a huge tax cut that was not required to be linked to actual federal revenue gains to prevent huge deficits.

2003 Federal Budget: Revenues and Allocations

	FY 2001	FY 2002	FY 2003
US GDP	$9,745	~$10,360	~$10,920

The burden of tax payments is not on corporations in America, but on us.

2003 Federal Budget: Federal Revenues

Tax Burden on Individuals:	$ in Billions (all figures rounded)
Individual income taxes Payroll taxes Excise taxes Estate taxes Miscellaneous	1,100 720 75 30 45
Tax Burden on Corporations:	
Corporate and profits Customs	220 25
Total Federal Tax Revenues	2,050

Notes from Martin Apple

The non-defense appropriations are the only real discretion that the White House and Congress have in determining how the huge federal revenues are spent.

Allocations of Proposed Federal Budget

	FY2001	**FY2002**	**FY2003 estimate**
Federal Budget	$1,865	$2,050	$2,130 ($ in billions)
Tax Receipts	1,990	1,945	2,050
Allocations: **Entitlements** (Medicare, Medicaid, Social Security)	1,056	1,189	1,233
Debt Interest	206	178	181
Discretionary - Total Defense Non-Defense	657 309 348	741 348 393	789 379 410

Notes from Martin Apple

Did Washington really lose $5 trillion of our planned surplus in less than 2 years?

Ten Year Real Surplus (excluding social security) in Trillions of Dollars

White House Report Date	**Projection for 2002-2011**	**Update for 2003-2012**
April 2001	+$3.046 Trillion	
August 2001	+$0.575 Trillion	
February 2002	-$1.650 Trillion	-$1.464 Trillion

Data from OMB

When you manage to lose $5 trillion, it is quite appropriate to demand to know where it went. We all assume, based on the deliberate daily Washington press spin that it has gone into our new defense requirements. But that turns out not to be the truth. For example, analysis of the OMB's own data shows that the big tax cut created about 45% of the new projected deficit already, the slowing economy accounted for about 25-30%, and all other legislative actions – including all defense buildups – accounted for only about 15-17% of the deficit.

Historical Defense Buildups as Percents of GDP

Buildup Episode	**Prior Low**	**Buildup Peak**	**Increase**
World War II	1.7% (1940)	37.9% (1944)	36.2%
Korea	3.6% (1948)	14.1% (1953)	10.5%
Vietnam	7.4% (1965)	9.4% (1968)	2.0%
Reagan	4.6% (1979)	6.2% (1986)	1.6%
Current	3.0% (2001)	3.5% (2003)	0.5%

Prepared by the staff of the House Budget Committee Source: OMB 2/26/02

In addition, we see a growing squeeze on discretionary spending.

High Growth Sectors are Increasingly Squeezing the Federal Budget
($ billion)

Federal Outlays	**1970**	**1980**	**1990**	**2000**	**2003 est.**
Entitlements	$61	$262	$568	$951	$1159
Defense	$82	$135	$300	$295	$ 379

Projected for FY 2003 Federal Science and Technology
[Discovery of new knowledge]
Proposed Budget - $billions

AGENCY	**FY 2001**	**FY 2002**	**FY 2003**
NIH	$20.4	$23.4	$27.3
NASA	7.8	8.1	8.7
Energy	4.9	5.1	5.0
Defense	4.9	4.9	4.9
NSF	4.4	4.8	5.0
Agriculture (+USFS)	1.9	1.9	1.9
Commerce (OAR+NOAA+NIST)	0.8	1.0	0.9
Interior	0.9	0.9	0.9
EPA	0.7	0.7	0.8
Transportation	0.5	0.7	0.5
Education	0.3	0.4	0.4
TOTAL	$48.1	$52.3	$57.0

Not adjusted for inflation
Notes from Martin Apple

Federal Research Trends (NAS and NSF Data)

The 1990s economy prospered, the 1990s federal budget surplus was generated, but…

Fields with Severe Funding Cuts since 1993

Academic Disciplines	1993-1997	Academic Disciplines	1993-1999
Physics	-27.8%	Physics	-24.6%
Electrical Engineering	-35.0%	Chemical Engineering	-25.9%
Mechanical Engineering	-49.8%	Electrical Engineering	-29.0%
Geology	-20.1%	Mechanical Engineering	-53.9%
Agriculture Sciences	-17.1%	Geology	-25.9%

Full Time Graduate Students in many Key Sciences has Declined
(data from NAS study)

FIELD OF RESEARCH	1993	1999	% Change
Physics			
Graduate Students	12,397	9,661	-22.1%
Federally Supported Graduate Students	4,916	3,807	-22.6%
Federally Supported Research Assistants	4,103	3,248	-20.8%
Geosciences			
Graduate Students	5,970	5,239	-12.2%
Federally Supported Graduate Students	1,647	1,263	-23.3%
Federally Supported Research Assistants	1,338	1,040	-22.3%
Ocean Sciences			
Graduate Students	2,177	2,130	- 2.2%
Federally Supported Graduate Students	1,037	932	-10.1%
Federally Supported Research Assistants	865	788	- 8.9%
Mathematical Sciences			
Graduate Students	14,530	11,792	-18.8%
Federally Supported Graduate Students	1,474	1,104	-25.1%
Federally Supported Research Assistants	736	594	-19.3%
Materials Engineering			
Graduate Students	4,249	3,537	-16.8%
Federally Supported Graduate Students	1,605	1,336	-16.8%
Federally Supported Research Assistants	1,393	1,202	-13.7%

What Does This Portend for U.S. Science?

New projections by the Bush Administration will have profound implications for our twenty-first century world leadership and the growth of scientific research.

Preliminary Agency Projections 5 Years Ahead
$ billions of *constant* dollars

AGENCY	**FY 2002**	**%Change by FY 2007**
NIH	$22.8 BN	+16% (most of it this year)
NASA	10.2 BN	+ 9% (most of it this year)
DOD (6.1+6.2+6.3)	10.0 BN	+ 9%
Energy	8.4 BN	- 2%
NSF	3.5 BN	+ 3%
Agriculture	2.3 BN	- 7%
Commerce	1.1 BN	- 1%
Interior	0.7 BN	- 6%
Transportation	0.8 BN	- 6%
EPA	0.6 BN	+ 6%
Non-DOD, minus NIH	$26.9 BN	+ 1.6%

Notes from Martin Apple

Congressional research appropriations are concentrated into eight sub-committees that make all discretionary financing decisions. The members of these subcommittees will decide soon. They need to hear from the science and university communities about the consequences.

Subcommittee that Decides	**Total Spending ($ billions)**	**Research Investment**
Labor, HHS, Education	$131BN	$27.7 BN
VA, HUD, Independent Agencies	93 BN	15.8 BN
Defense (6.1+6.2+6.3)	360 BN	10.0 BN
Energy and Water	25 BN	7.6 BN
Agriculture	17 BN	2.0 BN
Interior	20 BN	1.9 BN
Commerce, Justice	41 BN	1.2 BN
Transportation	20 BN	0.7 BN

Notes from Martin Apple

Why Do We Believe We Cannot Fall Behind in Crucial Leadership?

Recent examples tell us a different story.

Supercomputers

Year	Fastest Computer	Micro-Processors, if used	Number of processors	Speed in Gigaflops*
2002	NEC Earth Simulator		5,104	35,600
2001	I.B.M. ASCI White-Pacific	I.B.M. SP Power 3	7,424	7,226
2000	I.B.M. ASCI White-Pacific	I.B.M. SP Power 3	7,424	4,938
1999	Intel ASCI Red	Intel Pentium II Xion	9,632	2,379
1998	I.B.M. ASCI Blue-Pacific	I.B.M. SP 604E	5,808	2,144
1997	Intel ASCI Option Red	200 MHz Pentium Pro	9,152	1,338
1996	Hitachi CP-PACS		2,048	368
1995	Intel Paragon XP/S MP		6,768	281
1994	Intel Paragon XP/S MP		6,768	281
1993	Fujitsu NWT		140	124
1992	NEC SX-3/44		4	20
1991	Fujitsu VP2600/10		1	4

* Billions of mathematical operations per second
Source: Jack Dongarra, Univ. of Tennessee

The New National Crisis – Responding to 9-11: Key Actions for Scientists

The most important challenge may not be eliminating the bad guys. It may be preserving the freedoms and values we are trying to protect while we are doing so.

Office of Homeland Security

It would be helpful to get the Office of Homeland Security organized in a way that shows practical streamlined functioning. The official version does not lend itself to this. It puts the cart before the horse – it first defines who will be collected together, and then decides what they will do and when, by whom, etc. In the process, it leaves out crucial scientific and intelligence capabilities. Here's an example: if all on one day a major and different type of incident of terrorism occurs in a U.S. harbor, and a football stadium, and on three dozen farms, and at hub airports, and on a block of urban skyscrapers, and a senior official of each group named in the new HSO hierarchy were coincidental witnesses at each site, who would be in charge of the next five steps of action? How would their actions be coordinated over the next hour? The next 24 hours? What is the plan of action they would follow? It is now nine months since 9-11 and no one seems to know the answer to this simple query. Our defense strategy needs a new paradigm. Business as usual by the Department of Defense, the state governors, and local police is not likely to be optimally effective.

Here are the lessons taken from the twentieth-century wars around which we built the U.S. Department of Defense:

1. Negotiated truces almost always fail and decisive military victories almost always redirect the future to the victors.
2. Winners of wars are those who have the most surviving military people, the most weapons, and/or the most willingness to continue killing. Losers lack one or more of the three.
3. War requires both sides to protect, defend, or lose territory, and both opponents must live within those defined territories.
4. Bigger is better – more troops, more tanks, more ships, more warheads; bigger guns, bigger tanks, bigger ships, more computer power, etc.
5. Project enough force abroad and new wars will be prevented, or if they occur, they will be conducted on the enemy territory, not our homeland.

I suggest we need these attributes for rethinking our new self-defense paradigm:

- Decisive victories, not truces
- Time is the enemy, not a friend
- Agility, not hierarchy
- Dispersion, not concentration
- Brain, not brawn
- Networks, not armies
- Perpetual learning, not doctrines
- Systems vulnerabilities, not obvious targets
- Deep knowledge across disciplines, not narrow expertise
- Imagination, creativity, not replay of prior victories
- Instant information and analysis, not meet next week
- Pernicious insiders, not foreign armies

Security, Secrecy and Science

Another major concern is the growth of secrecy and its impact for both science and security.

The system of science knowledge is based on evidence that must be tested and confirmed by others. To succeed, all scientists must share data, methods and materials. The free exchange of ideas is the indispensable prerequisite that makes science grow and prosper. In recent years our focus on commercial profits for faculty and universities – and now security concerns – may be stifling and eroding the quality of our scientific enterprise, and it may eventually dismantle the integrity that ensures quality and leadership. Unless we maintain leadership, we will ultimately decrease our security.

This is the major conundrum for science and for universities:

- The free exchange of information and ideas is an essential element of scientific research and university effectiveness.
- Access to information is essential for the democratic process to function and succeed.
- Information about key defense technologies can gravely compromise security.
- Current homeland security plans could handcuff U.S. science.
  -- adapted from H. Kelly

Currently, the FBI and the Defense Threat Reduction Agency (DTRA) must frequently screen the research in technology areas, because there will be some instances of potential risk. They classify it as secret when the risk warrants, but limit excesses of secrecy. The Council of Scientific Society Presidents suggests that fundamental science should remain >99.9% open with a very small percentage of restrictions. Senior scientists can evaluate research in progress at any institution and determine security risks. Journal editors and reviewers are the second line of defense.

We need to restructure how the U.S. computer-technology research system obtains, evaluates and utilizes all future relevant information. This requires three developments that are needed now:

1. A system of much faster computers and searching that ties together all the relevant databases in the world, even the ones that do not at first appear to be directly useful for such research.
2. New online knowledge management processes that intelligently store, retrieve and mine data, and discover and report continuously to the user not only answers to predefined questions, but all new and unique patterns, having remotely scanned thousands of databases in minutes. Such a high-IQ next generation search engine can be jointly developed with university artificial intelligence labs or appropriate software companies.

3. Upgrading all our global GIS systems to provide a fully analyzed 24/7 real time surveillance of pre-defined risks from space while coordinating novel undisclosed networks of highly sensitive new ground sensors that can track in real time a variety of inputs (whatever is needed) whenever it is needed. Oversight of this activity is needed.

Tens of thousands of documents freely available on the world wide web in 2001 have been removed, and the library files and CD collections confiscated and destroyed. The FBI follows-up to ensure that libraries comply with this order to destroy data, and under the law there is no appeal. Such actions are certain to hamper Counter-Terror efforts severely.

The Need for More Agility and Perpetual Learning Systems: SWAT Team Model

The Council of Scientific Society proposes a Counter-Network SWAT Team model:

1. The necessary process is not a moral crusade, and the enemies should not be called “terrorists” (that term gives them power over us – to turn us into “fearful victims”). The process should focus on simultaneously preventing harm from and eliminating a specific target that we could call “networks of fanatic murderers.”
2. The countervailing force includes organized networks of teams that create and develop Scientifically Weighted and Analyzed Tactics (“SWAT-Teams”)
3. CSSP SWAT team networks are each composed of leading Ph.D. scientists with degrees and expertise in dozens of science disciplines (e.g.: chemistry, forensics, risk analysis, psychology, geology, toxicology, optics, operations research, computer science, acoustics, physiology, meteorology, mathematics, microbiology, physics, etc.) who collaborate via a secure Internet.
4. SWAT teams will each start with a *modus operandi* and an agenda of topics that will provide firm initial guidance, but these teams will then each evolve independently.
5. CSSP SWAT teams use a systems approach – define a whole system; discover and rank the importance of its vulnerabilities; and determine the optimal deterrence, threat-reduction, vigilance and mitigation processes.
6. SWAT team scientists are verifiably successful in applying these processes – discovering/defining problems, finding patterns and analogies, creative brainstorming, hypothesizing testable explanation, investigating logically and systematically, reasoning both deductively and inductively, critically evaluating, making effective decisions, transferring understanding to new situations.
7. SWAT teams each select several special additional members who serve as confidential 2-way information conduits – and buffers – that ensure the identities of the SWAT team participants are protected: one each from the

FBI, CIA, DTRA, and the homeland security agency. Each of the four special members will provide their SWAT team a modest budget. These four serve as the regular liaison to all other federal agencies (and other relevant groups). The team may add leaders of relevant industrial organizations.

What are Some Advantages of the SWAT Team Strategy?

CSSP SWAT teams should ideally be able to develop the following attributes that could develop routine superiority. They would represent a unique part-time "National Guard" – a strategy team whose membership is based only on high intellectual competence and advanced knowledge.

- They are always fully dispersed and live and travel independently.
- They set their own goals and pace.
- They are always on a rapid learning curve.
- Their leadership can rotate perpetually and randomly.
- They can have hundreds of independent and highly sophisticated "antennae."
- They stay hard to identify since no two teams start or evolve identically.
- Each team can grow and reproduce by division.
- More than one team can deploy against any one threat or vice-versa.
- Each team may create unique tactics whose sum exceeds the potential and learning rate of their target network of fanatic murderers.
- Based on science underway in their large community of scientists every day, they can discard today's best solutions and create better ones overnight.

Security Questions We Need to Answer

A. U.S. Food System Security

Why should this be a model? It was designed to be expedient, not impregnable. It represents $1.3 trillion of the GDP. There are many sites of vulnerability to chemical-bioweapons.

These are the questions we should ask:

1. What does the quantitative 4-D dynamic model of the whole U.S. food system look like?

- Where are all the vulnerability points in the system?
- What are the quantitative relative risks and consequences of attacks?
- What new procedures or materiel can erase or circumvent these vulnerabilities?

- What are the costs vs. benefits of various strategic interventions that prevent attack?
- How to best protect each target type/location?
- Which are the earliest and best threat indicators?

2. Response preparation: What we need to know now

- How to manage responses to overwhelming surges of activity?
- When/how will we know we are under bio-attack?
- What new biosensor systems can identify a bio-agent with certainty in minutes?
- How ready is our USDA extension network to define risks and spot key events?
- Consequence management – What processes? People?
- Shortest search process to find and nullify those who caused the damage?
- Deter and prevent – best use of current resources?

B. One Subset of Food Security: High-Consequence Pathogen/Toxin Security

1. The issues, questions, and practical threat reduction:
   – modified from Salerno (personal communication)

- Pathogens at restricted laboratory facilities exist in nature and can be obtained from many, even hundreds of laboratories around the world.
- The absolute amount of any given organism in an active biological or medical research facility cannot be reliably quantified from day to day.
- A strategically significant quantity of pathogenic material can be obtained from a single cell because it can be easily cultured with commercially available equipment.
- Smugglings of high consequence pathogens are not identified by current Customs procedures, technology, or Infectious Agent Laboratory practices.

2. What is a high-consequence pathogen/toxin? What is critical high consequence pathogen (HCP) information?

- What are the scenarios of an inappropriate HCP acquisition?
- What and how much can be known, how far in advance of a damaging prerelease event?
- What are the possible routes of transport and smuggling of each HCP?
- What alters and what happens to each agent after release (terrain-specific scenarios)?
- What terrestrial and atmospheric dynamics alter the level of hazard after release?
- What are the high consequence target scenarios?

- What are the most cost-effective damage-preventing changes in each of the points of bio-agent vulnerability in the U.S. food system that can be made this year? In each of the next three years?
- What number of expert personnel can provide definitive answers for these questions during 2002?
- What R&D can be defined in advance to aim at needed answers to these questions?
- What fundamental research areas need enhancement to ensure our world leadership with knowledge about human/plant/animal pathogens and pathogenesis?
- What types of research should be reported, and what agency should have oversight responsibility?
- How should we define HCP information that should be protected? (e.g: formulas and processes for weaponizing pathogens; formulas and processes for creating new lethal organisms.)
- What is the best monitoring system for locations that store, use, and/or transport high-consequence pathogens and toxins for organisms; individuals; research?
- Who would try to steal or divert a HCP? How could they succeed?
- What vulnerabilities exist at every specific relevant facility or system?
- What technologies, policies, and procedures will reduce risk to a very low level?

Restrictions and delays should not impede quality research. Threat assessment should drive security system design, and insiders must be considered part of the risk.

We see that we need a very different set of people, tactics and actions to prevent an event than to mitigate damage from a malicious event that has just occurred – which seems to be most of our focus so far in Washington.

A recent survey by Research!America showed that 9/10 of the people across America believe it is extremely or very important to have scientific research help prepare for and respond to biological and chemical terrorism in the United States.

This is our time to lead. We can do it best by thinking big, being bold, and thinking out of the box.