

“Global Nuclear Hot Spots and the Role of Scientific Diplomacy”

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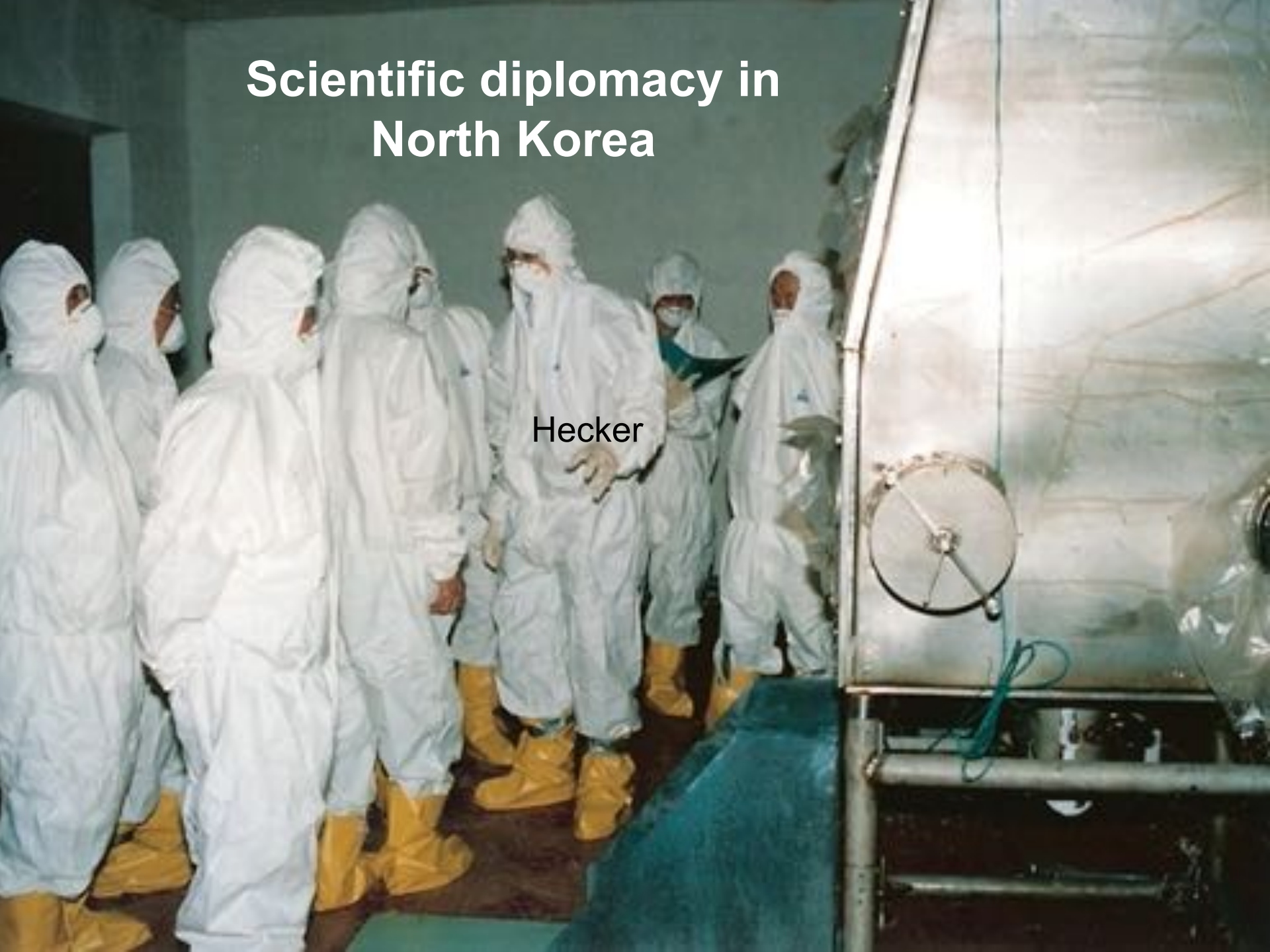
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Scientific diplomacy in North Korea



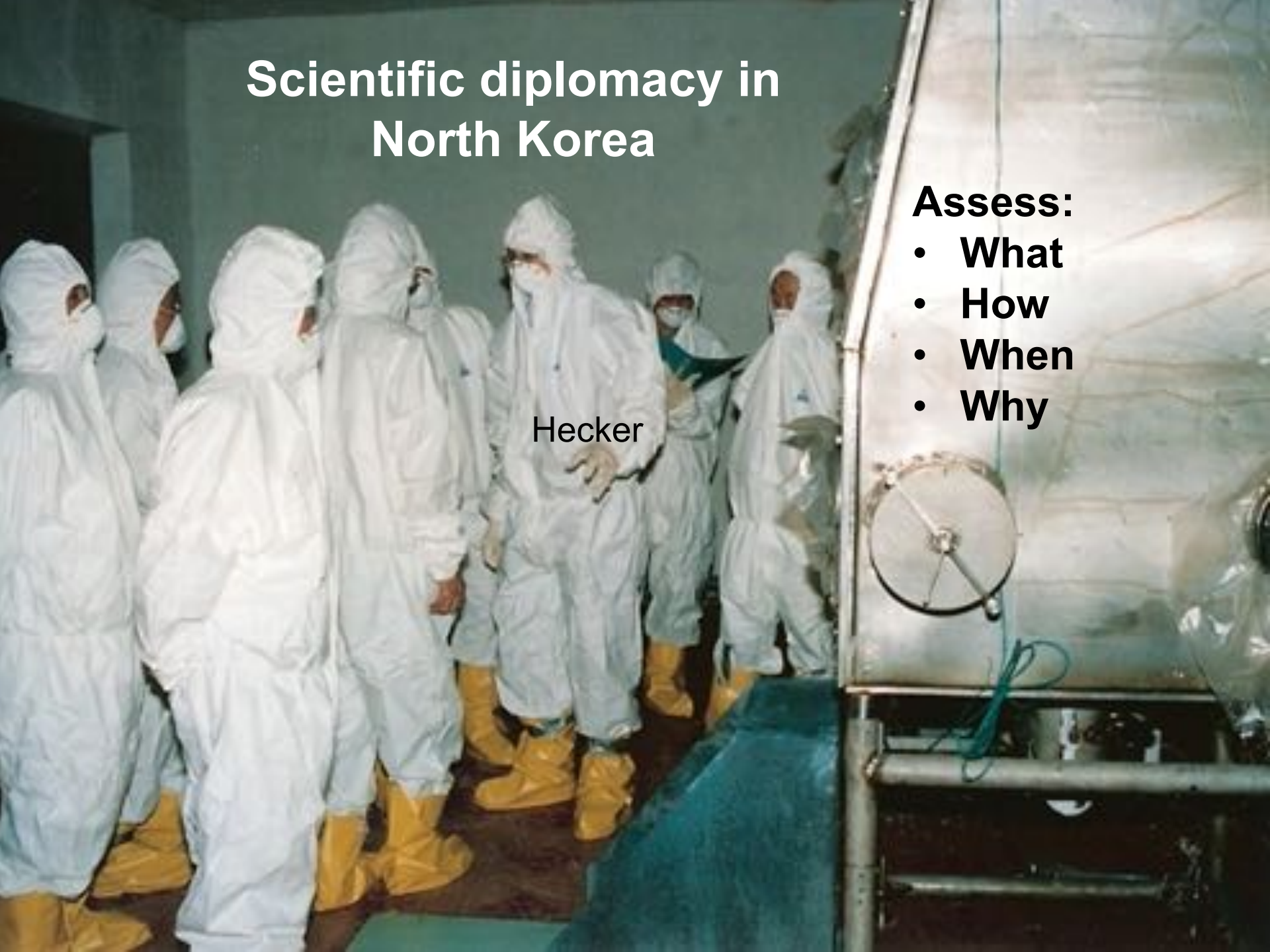
Hecker

Scientific diplomacy in North Korea

Assess:

- **What**
- **How**
- **When**
- **Why**

Hecker



Six visits to North Korea helped us assess the program



The seventh brought a big surprise

Modern centrifuge facility was a game changer

Purely illustrative - this is not Yongbyon, but close to what we saw (Nov. 12, 2010)
Piketon, Ohio Centrifuge plant, 1984 (Department of Energy)



No outsiders have been in Yongbyon since Nov. 2010

**With a little help from Kim Jong-un
we make best estimates**



A bit more help – all pretense of peaceful rocket launches dropped



And a little more- a miniaturized warhead and missile?



North Korea nuclear program

- **WHAT?**
- **HOW?**
- **WHEN?**
- **WHY?**

North Korea nuclear program

- **WHAT?**
- **HOW?**
- **WHEN?**
- **WHY?**
- **And What Now?**

The North Korea Challenge for U.S. Presidents



Don't build the bomb
Succeeded – but NK built a hedge



Don't build the bomb
Failed. ~ 6 nukes by end of term.
No successful missile tests



Don't build a nuclear arsenal.
Denuclearize
Failed. ~ 20 – 25 bombs now
Successful missile tests



Trump Challenge:
Prevent use of nuclear weapon
on Korean peninsula.
Denuclearization comes later

**That's why U.S. must
talk to NK now.**

Beginning of the end for USSR – Aug. 18 to 21, 1991

Zaria, Crimea



U.S. view of 1992 clear and present danger in Russia

- **Loose nukes**
 - **Tens of thousands nuclear weapons**
- **Loose nuclear materials**
 - **~ 1,400,000 kg fissile materials**
- **Loose nuclear people**
 - **Several hundred thousand in nuke complex**
- **Loose nuclear exports**
 - **Huge complex, with economy in chaos**

It had the making of a perfect nuclear storm

Cooperative Threat Reduction



“Soviet Nuclear Fission: Control of the Nuclear Arsenal in a Disintegrating Soviet Union,” A. Carter, K. Campbell, S. Miller, and C. Zraket, Nov. 1991. Harvard Belfer Center.



Nov. 1991: Cooperative Threat Reduction (Nunn-Lugar) Legislation



Many in academic and NGO community reached across the political divide during this time

Yu. B. Khariton greets Los Alamos and
Livermore Visitors in Sarov, 23 February 1992



Lab-to-lab cooperation

Cooperative U.S.- Russia nuclear threat reduction

- **Nuclear weapons**
- **Nuclear materials**
- **Nuclear workers**
- **Nuclear infrastructure**
- **Nuclear terrorism**
- **Nuclear energy and environmental issues**
- **Scientific research**

Great spirit of cooperation in the 1990s.

Was it worth it?

- **Loose nukes**
 - **Tens of thousands of nuclear weapons**
 - **No loose nukes**
- **Loose nuclear materials**
 - **~ 1,400,000 kg fissile materials**
 - **Very little “leakage”**
- **Loose nuclear people**
 - **Several hundred thousand in nuclear complex**
 - **No significant nuclear brain drain – stable now**
- **Loose nuclear exports**
 - **Huge complex, with economy in chaos**
 - **No major problems**

A large, intense nuclear explosion with a massive, billowing cloud of fire and smoke rising from a body of water. The sky is filled with bright orange and red flames.

DOOMED

TO *COOPERATE*

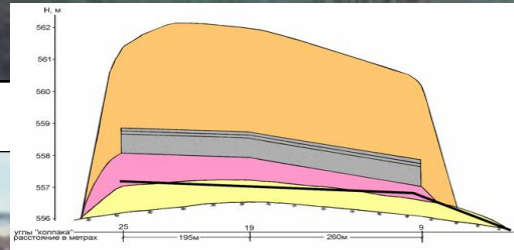
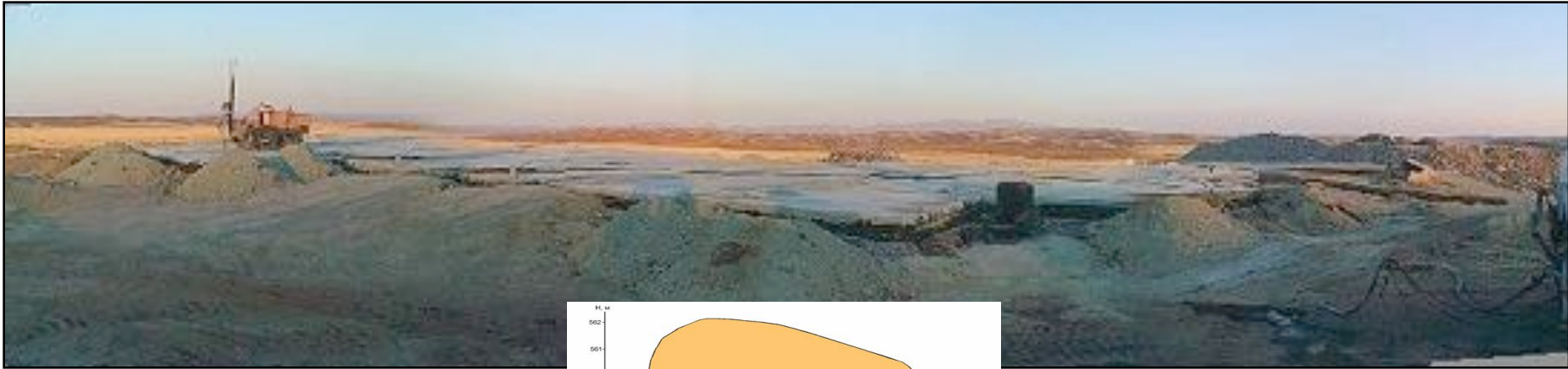
How American and Russian
scientists joined forces to
avert some of the greatest
post-Cold War nuclear dangers
Volume I



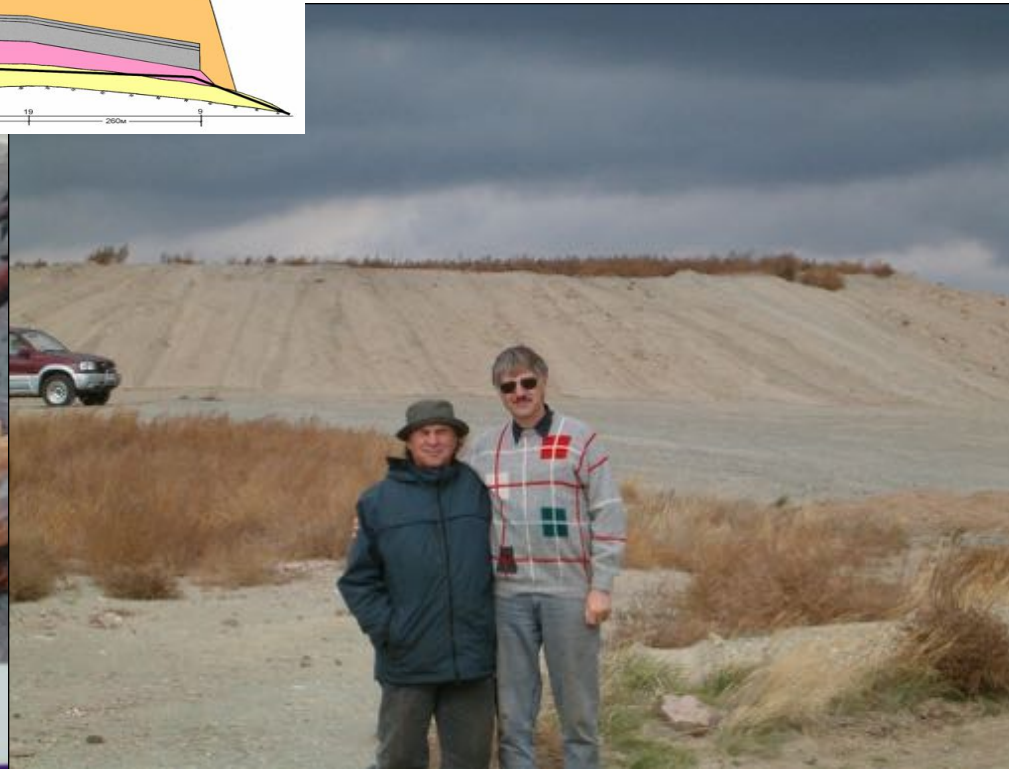
Semipalatinsk Test Site – April 19 - 20, 1998



Operation Groundhog – a trilateral success



GROUNDHOG PROJECT, sites A-B





**Beijing
U.S. – China workshops
on nuclear terrorism
June and August 2016**





BARC, Mumbai

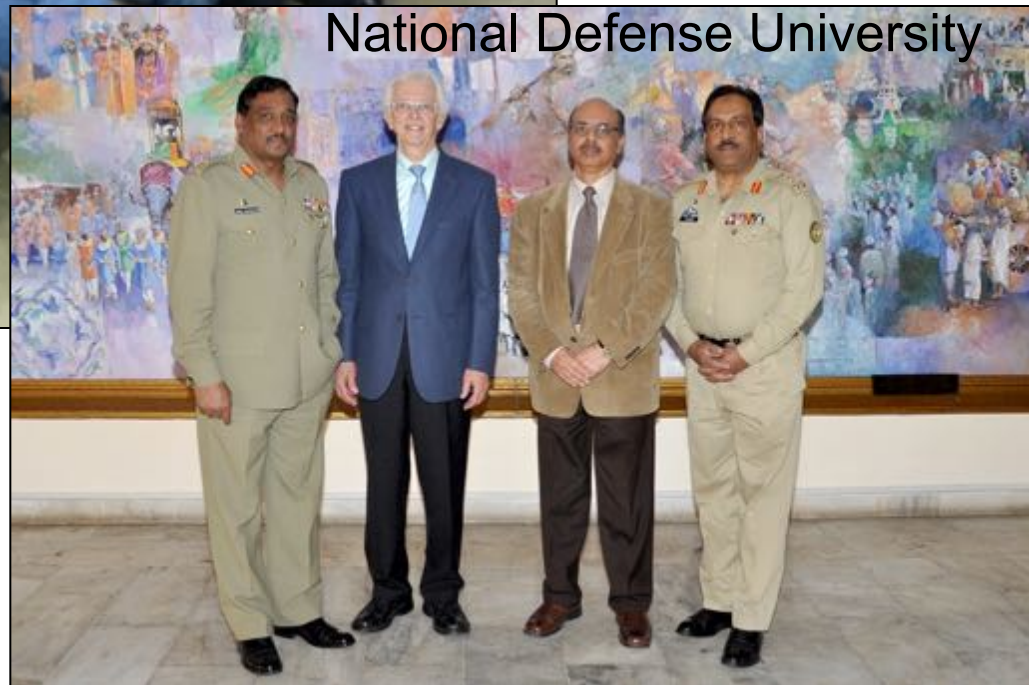


IGCAR, Kalpakkam

Quaid-i-Azam University



National Defense University



Islamabad, March 18, 2015



Civilian - military divide:
Is it a wide gap or a fine line?

Iran Embassy in The Hague
August 1, 2008

Joint Comprehensive Plan of Action July 14, 2015



**DOE Secretary Ernest J. Moniz
with Ali Akbar Salehi, Head, IAEA**

Technical dialogue

Scientific diplomacy

- **Common cause, common language, professional respect lead to trust**
- Do “good” together, not just prevent the bad
- Sharing a sense of global responsibility for nuclear
- The human dimension – personal relations



Photo by Jewel Samad/Getty

June 17, 2013

Phil Hemberger (Los Alamos) with Yuri Styazhkin (VNIIEF) Cooperation in Semipalatinsk Nuclear Test Site



Scientific diplomacy

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Magnetic flux compression experiments lead to world-record magnetic fields (28 Megagauss)



From Megatons to Megagauss



Scientific diplomacy

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- **Sharing a sense of global responsibility for nuclear**
- **The human dimension – personal relations**



Don't demonize the people



Pyongyang, 2005

Instructions, discipline and friendship in Middle School #1



Islamabad, March 16, 2015



Scientific diplomacy

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- **Do “good” together, not just prevent the bad**
- **Sharing a sense of global responsibility for nuclear**
- **The human dimension – personal relations**

Of course there are risks, but benefits outweigh risks