Nuclear Disarmament and Civil Society: The Treaty on the Prohibition of Nuclear Weapons and the Nobel Peace Prize for ICAN 2017

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University of Hamburg
Research Group Climate Change & Security

1st Jeremiah Sullivan Memorial Lecture
ACDISIS and Department of Physics
University of Illinois, Monday, April 30, 2018
History of Physics 280

- First offered in Spring 1982
  - Course development motivated by concern about the growing threat of nuclear weapons and nuclear war
  - Taught by a team of 13 faculty volunteers from the Physics, Astronomy, and (then) Nuclear Engineering departments

- Second offering in Spring 1983
  - Co-taught by Frederick Lamb and Jeremiah Sullivan
  - Submitted and approved as a regular course

- Has been taught every spring semester since
  - Has served as model for courses elsewhere
  - Most courses elsewhere have died off
  - Physics 280 is arguably the longest running course of its kind
Form the Manhattan project to Hiroshima and Nagasaki
Chain reaction of nuclear proliferation

A Chain Reaction of Proliferation

“The Nuclear Express,” a new book on the history of the atomic age, describes the interlocking web of influence and espionage behind the proliferation of nuclear technology. This diagram gives a summary of the authors’ tracking of the transfers of nuclear technology and secrets.

United States 1945

U.S.S.R. 1949

Canada 1952

France 1960

China 1964

Pakistan 1980

U.K. 1960

Nuclear states
Circles represent nuclear states, arranged on the timeline by the year of first nuclear detonation (or, for Israel and South Africa, the year they could have tested).

Connections show the flow of information and technology, by intended transfer, leak or espionage. Some were one-way transfers; others were two-way.

Sources: Thomas C. Reed and Danny B. Stöhrn

Abandoned nuclear programs
Hexagons represent states that have abandoned their nuclear weapons programs. Other states, not shown, that have ended their weapons programs include Sweden (1970), Switzerland and Taiwan (1988), and Argentina and Brazil (1994).

Aspiring states
Squares represent states that the authors say have embryonic nuclear weapons programs. All the nations deny any ambitions to develop atom bombs.

Germany's V2 missile program
Proliferation network of ballistic missiles after WW 2
"In view of the fact that in any future world war nuclear weapons will certainly be employed, and that such weapons threaten the continued existence of mankind, we urge the governments of the world to realize, and to acknowledge publicly, that their purpose cannot be furthered by a world war, and we urge them, consequently, to find peaceful means for the settlement of all matters of dispute between them."
Göttingen Manifesto of 18 nuclear scientists (April 12, 1957)

“The undersigned nuclear researchers are deeply concerned with the plans to equip the Bundeswehr with nuclear weapons. …

1) Tactical nuclear weapons have the same destructive effect as normal atomic bombs. …
2) There is no natural limit for the development of life-threatening effects of strategic nuclear weapons. Today a tactical nuclear weapon can destroy a small city, and a hydrogen bomb can render an entire region such as the Ruhr Valley uninhabitable.”…..

“Our profession, i.e. pure science and its application, through which we bring many young people into our fold, leaves us with the responsibility for the potential effects of these actions. We believe that a small country such as West Germany is best protected, and world peace most assisted when nuclear weapons of any type are banned. In any case, none of the undersigned are prepared to **participate in the creation, testing or deployment of any type of nuclear weapon**. At the same time we feel it is extremely important that we continue to work together on the peaceful development of nuclear energy.”
Scientists movement against nuclear arms

9,000 Scientists of 43 Lands Ask Nuclear Bomb Tests Be Stopped

Petition for International Accord Given U. N. Chief by Linus Pauling

By THOMAS J. HAMILTON Special to The New York Times
UNITED NATIONS, N. Y., Jan. 13—More than 9,000 scientists from forty-three countries joined today in urging immedi-

HISTORIC SIGNING OF ATOM TEST BAN TREATY

Supervised by
LOUIS TETUNIC

NARRATED BY
PHIL TONKEN

We Have No Right To Test

a^2 + b^2 = c^2

HOBEL PEACE PRIZE
Missile debate and peace movements of the 1980s
Scientists for Peace
Mainz 1983, Göttingen 1984
Ways Out of the Arms Race
Hamburg 1986
In an open letter to Chancellor Helmut Kohl 350 German scientists declare to abstain from collaboration in the Strategic Defense Initiative (SDI) (July 3, 1985).
The report concludes… that the amount of progress in directed energy weapons—which include intense lasers and energetic particle beams—is too little at present to judge the ultimate technical feasibility of such weapons in an overall SDI system. That makes questionable what panel member Jeremiah Sullivan of the University of Illinois termed "the general view, especially from SDIO, that directed energy weapons are the long-term hope.... The justification for early deployment of kinetic energy weapons cannot be the idea that [the more complex] directed energy weapons will come through in the long term."
Reagan and Gorbachev: Missile defense or nuclear abolition?
Strategic Defense vs. Nuclear Disarmament

Free the world of nuclear weapons: What Gorbachev offers if Reagan gives up SDI

Source: DER SPIEGEL 1986
Transition & chaos in nuclear arms race: From armament to disarmament
Perception parameter w = -1 worst case, w=1 best case)

Source: Scheffran (1989) Strategic Defense, Disarmament and Stability
Global nuclear arsenals

Source: Bulletin of Atomic Scientists
WORLD’S NUCLEAR ARSENALS

215 UNITED KINGDOM

300 FRANCE

80 ISRAEL

7,000 RUSSIA

140 PAKISTAN

260 CHINA

110 INDIA

8 NORTH KOREA

UNITED STATES

6,800

ARMS CONTROL ASSOCIATION

A history of nuclear tests and disarmament treaties

Since the first nuclear explosion in July 16, 1945, there have been a total of 2,056 tests conducted by eight nuclear-armed states.

- USA (1,030)
- USSR/Russia (715)
- UK (45)
- France (210)
- China (45)
- India (3)
- Pakistan (2)
- North Korea (6)

1950 - 1960
- Nuclear Non-Proliferation Treaty
  - Signed and enforced
  - Parties to the treaty: USA, Russia, UK, France and 187 other states
  - Non-parties: India, Pakistan, North Korea, Israel and South Sudan

1970
- Comprehensive Nuclear Test Ban Treaty
  - Signed but not enforced
  - Parties to the treaty: USA, Russia, UK, France, China and 178 other states
  - Non-parties: India, Pakistan, North Korea and 10 other states

1996

2000 - 2020

2017
- Nuclear Weapon Ban Treaty
  - Open for signing
  - Will go into force if 50 states sign the treaty

Sources: Arms Control Association, UNODA, CTBTO
International Network of Engineers & Scientists Against Proliferation (INESAP)
Information
International Network of Engineers and Scientists Against Proliferation
Bulletin

Proliferation and Counterproliferation

IS THERE NO END OF THE CHAIN REACTION?

Threat and Counterthreat

Missile Danger and Missile Defense

Catching the Bomb
10 Years Networking in INESAP

Targeting the Law

The Proliferation of Umbrellas in Northeast Asia

Last Exit Disarmament
World at the Crossroads
Beyond the NPT: A Nuclear-Weapon-Free World

Document prepared on the occasion of the 1995 NPT Review and Extension Conference

Preliminary Findings of the Study Group 'Beyond the NPT'

April '95
All nuclear weapon states should declare - in Treaty form - that they will never be the first to use nuclear weapons. This would open the way to the gradual, mutual reduction of nuclear arsenals, down to zero. It would also open the way for a Nuclear Weapons Convention. This would be universal - it would prohibit all possession of nuclear weapons. The time has come to formulate guidelines for the ethical conduct of scientist, perhaps in the form of a voluntary Hippocratic Oath. This would be particularly valuable for young scientists when they embark on a scientific career. I appeal to my fellow scientists to remember their responsibility to humanity.
Abolition 2000 AGM
Vienna, Austria. May 1, 2017

Abolition 2000 updated their cover photo.
Wednesday, March 15th, 2017 at 7:58am
Model Nuclear Weapons Convention

Model NWC on the Prohibition of the Development, Testing, Production, Stockpiling, Transfer, Use & Threat of Use of Nuclear Weapons and on their Elimination

Konvention über das Verbot von Entwicklung, Erprobung, Herstellung, Lagerung, Transfer, Einsatz und Drohung mit dem Einsatz von Kernwaffen und ihre Abschaffung
Model Nuclear Weapons Convention

Convention on the Prohibition of the Development, Testing, Production, Stockpiling, Transfer, Use and Threat of Use of Nuclear Weapons and on Their Elimination

PROJET DE CONVENTION RELATIVE AUX ARMES NUCLÉAIRES

Projet de convention sur l’interdiction de la mise au point, de l’essai, de la fabrication, du stockage, du transfert, de l’emploi ou de la menace d’emploi d’armes nucléaires, et sur leur élimination

CONVENCIÓN TIPO SOBRE ARMAS NUCLEARES

Convención sobre la prohibición del desarrollo, los ensayos, la producción, el almacenamiento, la transferencia, el empleo o la amenaza del empleo de armas nucleares y sobre su eliminación

الاتفاقية النموذجية للأسلحة النووية

اتفاقيّة حظر استخْدَام الأسلحة النووية وتجريبيها وانتاجها وتخزينها ونقلها واستعمالها والتهديد باستعمالها وإزالة تلك الأسلحة

关于禁止发展、试验、生产、储存、转让、使用和威胁使用核武器及消除此种武器的公约

草案
UN Resolution on Nuclear Weapons Convention  

Paragraph 3: "Underlines the unanimous conclusion of the Court that 'There exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control' ".

Paragraph 4: "Calls upon all States to fulfil that obligation immediately by commencing multilateral negotiations in 1997 leading to an early conclusion of a nuclear weapons convention prohibiting the development, production, testing, deployment, stockpiling, transfer, threat or use of nuclear weapons and providing for their elimination".

Yes: 115 States
No: 22
Abstentions: 32
Transformation into a Nuclear-Weapon-Free World

Disarmament and non-proliferation regime

NPT ABM Treaty INF START CTBT NW-Free Zones CWC CFE

Anti-nuclear chain reaction

NPT extension Abolition 2000 Anti-testing protest Hiroshima anniversary
1995 Nobel Peace Prize ICJ advisory opinion Canberra Commission G-21 program
Generals UN resolution NPT review Model NWC

Nuclear disarmament negotiations
comprehensive-incremental approach

Risk reduction No First Use START
Fissile NW-Free Tactical CUTS
Cut-Off Zones Delivery Disarmament

Verification

International security

Technical Societal Cooperation Compliance

International agency Confidence Joint action

Nuclear Weapons Convention

General Definitions Declarations Phases for Individual Rights Nuclear Delivery
Obligations Implementing Implementation Rights Material Vehicles
Entry into force Financing Disposal

Nuclear-Weapon-Free World
Model Nuclear Weapons Convention: Basic Obligations


**Negative Obligations**

States Parties undertake never to

- use or threaten to use nuclear weapons
- engage in any military or other preparations to use nuclear weapons
- [research], develop, test, produce, otherwise acquire, deploy, stockpile, maintain, retain or transfer nuclear weapons or delivery vehicles
- produce, stockpile, retain, transfer, or use nuclear weapons grade fissionable or fusioneable material (except medical, etc.)

**Positive Obligations**

States Parties undertake to

- Destroy nuclear weapons and destroy or convert facilities in the production, testing, and research of nuclear weapons as well as nuclear weapons delivery vehicles
- Participate in activities aimed at transparency and education for purposes of detecting and preventing prohibited activities
- Report violations of the Convention, cooperate with the implementing Agency, and enact domestic legislation for implementation.
Phases of the Model Nuclear Weapons Convention

Phase I [1 year]
- Each State Party would submit to the Agency plans for the implementation of the NWC
- All nuclear weapons and delivery vehicles would be de-alerted and disabled
- Targeting coordinates and navigational information for all nuclear weapons delivery vehicles shall be removed

Phase II [2 years]
- All warheads removed from delivery vehicles
- Weapons and delivery vehicles removed from deployment sites
- Agreements for preventive control negotiated

Phase III [5 years]
- All nuclear weapons would be dismantled
- All nuclear weapons delivery vehicles destroyed or converted
- All nuclear weapons would be destroyed except a fixed number of warheads in the stockpiles of Russia and the US, with proportional cuts by China, France and UK
- Similar provisions for other States known to possess nuclear weapons

Phase IV [10 years]
- More cuts in the number of nuclear weapons
- [All reactors using plutonium as fuel would be closed or converted]

Phase V [15 years]
- All nuclear weapons would be destroyed
- The powers and functions of the Agency would be reviewed and adjusted
International Launch

Securing our Survival: The Case for a Nuclear Weapons Convention and the International Campaign to Abolish Nuclear Weapons (ICAN)

Monday, April 30, 2007
1:15 – 2:45 pm
Plenary Room A, Austria Center

Sponsors:
- International Physicians for the Prevention of Nuclear War (IPPNW)
- International Network of Engineers and Scientists Against Proliferation (INESAP)
- International Association of Lawyers Against Nuclear Arms (IALANA)

Co-Sponsor:
- Government of Malaysia

Speakers:
- Felicity Hill, ICAN
- Ron McCoy, IPPNW
- Jurgen Scheffran, INESAP
- Carlos Vargas, Costa Rica
- Alyn Ware, IALANA

Please join us on the opening day of the 2007 NPT PrepCom for the release of a new edition of The Case for a Nuclear Weapons Convention and for the launch of a new civil society campaign for nuclear abolition.

Securing our Survival (SOS) outlines the rationale for the comprehensive prohibition and elimination of nuclear weapons. The book, hot off the presses, contains an updated text of the Model Nuclear Weapons Convention, which demonstrates that nuclear disarmament is practical, verifiable, enforceable and achievable.

The International Campaign to Abolish Nuclear Weapons (ICAN), a new initiative of IPPNW, will generate political will for global nuclear disarmament through educating and engaging the public and policy makers and by highlighting the feasibility of nuclear abolition through a Nuclear Weapons Convention.
Towards A Treaty Banning Nuclear Weapons

A Guide to Government Positions on a Nuclear Weapons Convention

International Campaign to Abolish Nuclear Weapons

The Case for a Nuclear Weapons Convention

The International Campaign to Abolish Nuclear Weapons (ICAN) is a new campaign of International Physicians for the Prevention of Nuclear War (IPPNW), a federation of medical professionals in 60 countries. The organisation received the Nobel Peace Prize in 1985 for uniting doctors across the Cold War divide to raise awareness of the threats posed by nuclear weapons. The physician group's prescription for survival was, and remains, the complete elimination of nuclear weapons.

ICAN focuses on the roots of the nuclear weapons problem – the continued possession of nuclear weapons by a small minority of countries, who risk their use by design, accident, miscalculation or by acts of extremists, and whose weapons are an incentive to others to also become nuclear armed.

ICAN aims to achieve a Nuclear Weapons Convention to ban the development, possession and use of nuclear weapons. A Model Nuclear Weapons Convention already exists.

What is a Nuclear Weapons Convention?

A Nuclear Weapons Convention (NWC) will be an international treaty signed by governments. It will be similar to other international treaties banning entire categories of weapons such as the Chemical Weapons Convention, the Biological Weapons Convention and the Landmines Convention.

No such treaty exists yet for nuclear weapons, but demands for one have increased in recent years, as have more general demands for complete nuclear disarmament. 125 of 181 governments voting in the 2006 UN General Assembly want negotiations to commence immediately. Vast majorities in public opinion polls want a nuclear weapon-free future. In a 1998 Angus Reid poll 93% of Canadians expressed support for a global ban on nuclear weapons.

The Nuclear Weapons Convention would be the implementation of the universal societal condemnation of nuclear weapons and all weapons of mass destruction. It would delegitimize nuclear weapons and support their prohibition. Its impact will therefore be deeper and more far-reaching than the treaty language itself. Such a treaty would reflect a broader social and political movement away from reliance on weapons of mass destruction and military solutions to conflicts, and would incorporate the desires and responsibilities of global civil society for a less militarized world.

A Nuclear Weapons Convention:
- Defines terms in precise detail to establish thresholds and limits
- Creates rules so that everybody understands what is prohibited and what is allowed
- Establishes a schedule for sequenced steps to remove the threat of nuclear weapons by their dismantlement
- Outlines patterns of behaviour and cooperation that will enhance the communication and transparency in implementing the treaty, and those that will arouse suspicion and sanctions
- Establishes verification measures to make sure that no one is cheating.
Support for a Nuclear Weapons Convention

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On the fence: 22

| Andorra | Armenia |
| Austria | Australia |
| Belarus | Canada |
| Croatia | Cyprus |
| Finland | Germany |
| Georgia | Iceland |
| Japan | Kyrgyzstan |
| Korea | Macedonia |
| Marshall Islands | Micronesia |

Don’t support: 26

| Albania | Belgium |
| Bulgaria | Czech Republic |
| Denmark | Estonia |
| France | Greece |
| Hungary | Israel |
| Italy | Latvia |
| Lithuania | Luxembourg |
| Monaco | Netherlands |
| Portugal | Romania |
| Russia | Slovakia |
| Slovenia | Spain |
| Turkey | United Kingdom |
| United States | }

* The support expressed by these nations is qualified. See position descriptions.

ICAN 2012: NWCGuide
UN Secretary General plan to rid the world of nuclear weapons

My own five-point plan ... begins with a call for the NPT parties to pursue negotiations in good faith - as required by the treaty - on nuclear disarmament, either through a new convention or through a series of mutually reinforcing instruments backed by a credible system of verification. ...

Ban Ki-moon, 3 August 2009 (www.un.org/sg/articleFull.asp?TID=105&Type=Op-Ed)
“As the only nuclear power to have used a nuclear weapon, the United States has a moral responsibility to act. We cannot succeed in this endeavor alone, but we can lead it; we can start it. So today, I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons. This goal will not be reached quickly -- perhaps not in my lifetime. It will take patience and persistence."
Blog: Countdown to nuclear ban negotiations

UN negotiations to outlaw nuclear weapons will begin on 27 March 2017. This blog will keep you informed of key developments in the lead-up.
An Open Letter from Scientists in Support of the UN Nuclear Weapons Negotiations

Nuclear arms are the only weapons of mass destruction not yet prohibited by an international convention, even though they are the most destructive and indiscriminate weapons ever created. We scientists bear a special responsibility for nuclear weapons, since it was scientists who invented them and discovered that their effects are even more horrific than first thought. Individual explosions can obliterate cities, radioactive fallout can contaminate regions, and a high-altitude electromagnetic pulse may cause mayhem by frying electrical grids and electronics across a continent. The most horrible hazard is a nuclear-induced winter, in which the fires and smoke from as few as a thousand detonations might darken the atmosphere enough to trigger a global mini ice age with year-round winter-like conditions. This could cause a complete collapse of the global food system and apocalyptic unrest, potentially killing most people on Earth – even if the nuclear war involved only a small fraction of the roughly 14,000 nuclear weapons that today’s nine nuclear powers control. As Ronald Reagan said: “A nuclear war cannot be won and must never be fought.”

Unfortunately, such a war is more likely than one may hope, because it can start by mistake, miscalculation or terrorist provocation. There is a steady stream of accidents and false alarms that could trigger all-out war, and relying on never-ending luck is not a sustainable strategy. Many nuclear powers have larger nuclear arsenals than needed for deterrence, yet prioritize making them more lethal over reducing them and the risk that they got used.

But there is also cause for optimism. On March 27 2017, an unprecedented process begins at the United Nations: most of the world’s nations convene to negotiate a ban on nuclear arms, to stigmatize them like biological and chemical weapons, with the ultimate goal of a world free of these weapons of mass destruction. We support this, and urge our national governments to do the same, because nuclear weapons threaten not merely those who have them, but all people on Earth.
Supporters for the Ban Treaty
The United Nations prohibits nuclear weapons

July 7, 2017

After a decade-long effort by the International Campaign to Abolish Nuclear Weapons (ICAN), and 72 years after their invention, today states at the United Nations formally adopted a treaty which categorically prohibits nuclear weapons.
ICAN receives 2017 Nobel Peace Prize
Elements of the Ban Treaty

**Article 1** contains prohibitions against the development, testing, production, stockpiling, stationing, transfer, use and threat of use of nuclear weapons, as well as against assistance and encouragement to the prohibited activities, and direct or indirect "control over nuclear weapons or other nuclear explosive devices".

**Article 2** requires each party to declare whether it had nuclear weapons of their own or deployed on its territory, including the elimination or conversion of related facilities.

**Article 3** requires parties that do not possess nuclear weapons to maintain their existing IAEA safeguards and, to accept safeguards based on the model for non-nuclear-weapon states under the NPT.
Elements of the Ban Treaty

**Article 4:** general procedures for negotiations with an individual nuclear armed state becoming party to the treaty, including time limits and responsibilities. If the state has eliminated its nuclear weapons before becoming a party to the treaty, an unspecified "competent international authority" will verify that elimination, and the state must also conclude a safeguards agreement with the IAEA to provide credible assurance that it has not diverted nuclear material and has no undeclared nuclear material or activities.

If the state has not yet destroyed its arsenal, it must negotiate with "competent international authority" a time-bound plan for verified and irreversible elimination of its nuclear weapons programme, which will submit it to the next meeting of signing states or to next review conference, whichever comes first.

**Article 5:** national implementation.

**Article 6:** environmental remediation and assistance for victims of the use and testing of nuclear weapons.
Elements of the Ban Treaty

**Article 7:** states should assist each other to these purposes, with special responsibility of the nuclear powers; all state parties shall cooperate

**Article 8:** fixes meetings of states parties,

**Article 9:** costs are shared by the states.

**Articles 10–12:** possibility of amendments, the settlement of disputes and the "goal of universal adherence of all States to the Treaty".

**Articles 13–15:** Treaty was open for signature from 20 September 2017 at the UN headquarters in New York and "shall enter into force 90 days after the fiftieth instrument of ratification, acceptance, approval or accession".
### Main tasks for nuclear disarmament verification

<table>
<thead>
<tr>
<th>Baseline information exchange and data gathering:</th>
<th>Disarmament:</th>
<th>Prevent rearmament:</th>
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<tbody>
<tr>
<td>Identify the current status of the nuclear-weapons complex with reasonable accuracy without proliferating sensitive information.</td>
<td>Monitor the agreed path of reducing nuclear arms and eliminating the nuclear-weapons complex within tolerable limits of uncertainty and sufficient confidence.</td>
<td>During the transformation to and within a nuclear-weapon-free world, observe any objects and detect any activities that might indicate a nuclear-weapons capability.</td>
</tr>
</tbody>
</table>
Integrated verification concept
Instruments for monitoring and verification

- On-site inspections
  - UV Lidar
  - Radar
  - Infrared
  - Electro-optical
- Societal verification
  - Aerial overflights
  - Ground/ship-based sensors
  - Reconnaissance satellite
- Institutional verification
  - Information exchange
  - Environmental sampling
  - Preventive control
  - Non-intrusive detectors (gamma, x-ray, neutron)
  - On-site inspections
  - Space tracking
  - Space objects
  - Missle track
  - Space objects
  - Environmental sampling
  - Preventive control
  - Non-intrusive detectors (gamma, x-ray, neutron)
  - On-site inspections
  - Space tracking
  - Space objects
Remote sensing

Example: Natanz, Iran

Apparent attempt to hide an underground uranium centrifuge enrichment facility

Source: F. Lamb, M. Kalinowski, J Scheffran, Nuclear Weapons and Arms Control (Physics 280), spring 2005, University of Illinois
Portal monitors

Source: F. Lamb, M. Kalinowski, J Scheffran, Nuclear Weapons and Arms Control (Physics 280), spring 2005, University of Illinois
Nuclear forensics

Fingerprints and forensic analysis have played important roles in criminal law for well over a century.

Nuclear forensics: analyze the nature, use and origin of nuclear materials to determine material characteristics with high accuracy.

Nuclear fingerprint:

- radioisotopes
- isotopic and mass ratios
- material age
- impurity content
- chemical form
- physical parameters

→ Trace small quantities accurately in international safeguards
Sampling and analysis of atmospheric gases

Need: To detect the presence and nature of nuclear fuel cycle process activities at suspected locations

Application: Away-from-site (stand-off) detection

Proposed Solution:

Use on-site LIBS to determine the nature and history of compounds and elements

Laser-Induced Breakdown Spectroscopy (LIBS)

Need: To determine whether, or not, an undeclared location has been used previously for storing radiological material

Proposed Solution: Use OSL to measure the radiation-induced signature retained in many common building materials.

Application: On-site verification; Complementary access inspections

Cooperative verification procedures

- Nuclear archaeology
- Initial declarations and data exchange
- Identification & item counting of objects (tagging, fingerprinting, registration)
- Confidence-building measures, transparency
- Joint overflights (Open Skies)
- Accountancy, control and surveillance
- Preventive controls at nuclear facilities
- Baseline and routine inspections
- Challenge inspections of suspected facilities (anytime-anywhere)
- Personal observation of destruction and suspected activities
Institutional and societal verification

Institutional verification

- International Agency for verification
- Cooperative fact finding on compliance
- Consultations
- Dispute settlement

Societal verification

- Open sources, scientific knowledge
- Espionage
- Citizen reporting and protection, whistle-blowing
### Activities and instruments for verification

<table>
<thead>
<tr>
<th>Activity vs. Verification instrument</th>
<th>Remote sensing</th>
<th>Non-intrusive technical</th>
<th>Data exchange</th>
<th>Transparencym</th>
<th>Envir. Sampling</th>
<th>Inspec-tions</th>
<th>Space surveil-lance</th>
<th>Institution Operative verification</th>
<th>Social verification</th>
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Overview of Nuclear Weapon-Free Zones and countries with national nuclear prohibition legislation
Nuclear and Missile Crisis in North Korea
A nuclear-weapon-free Korean peninsula?
A Northeast Asia NWFZ
A Realistic and Attainable Goal
An Asia-Pacific Approach to the Nuclear Weapon Free World
Hiro Umebayashi

An Analysis of the North Korean Missile Launch of 31 August 1998

Model Treaty on the Northeast Asia Nuclear-Weapon-Free Zone

■ Hiromichi Umebayashi
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■ Cheong Wooksik
Power Grid Interconnection for a Nuclear Free Korean Peninsula

■ Jungmin Kang
Energy and Security: From Conflict to Cooperation

■ Jürgen Scheffran and Clifford Singer

The Proliferation of Umbrellas in Northeast Asia

The Challenge of Hiroshima

■ Proliferation and Security in Northeast Asia
■ Challenges for Nuclear Disarmament
■ Energy and Security
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■ News and Publications