CBRN dual-use technologies and transfer risks

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The Trench

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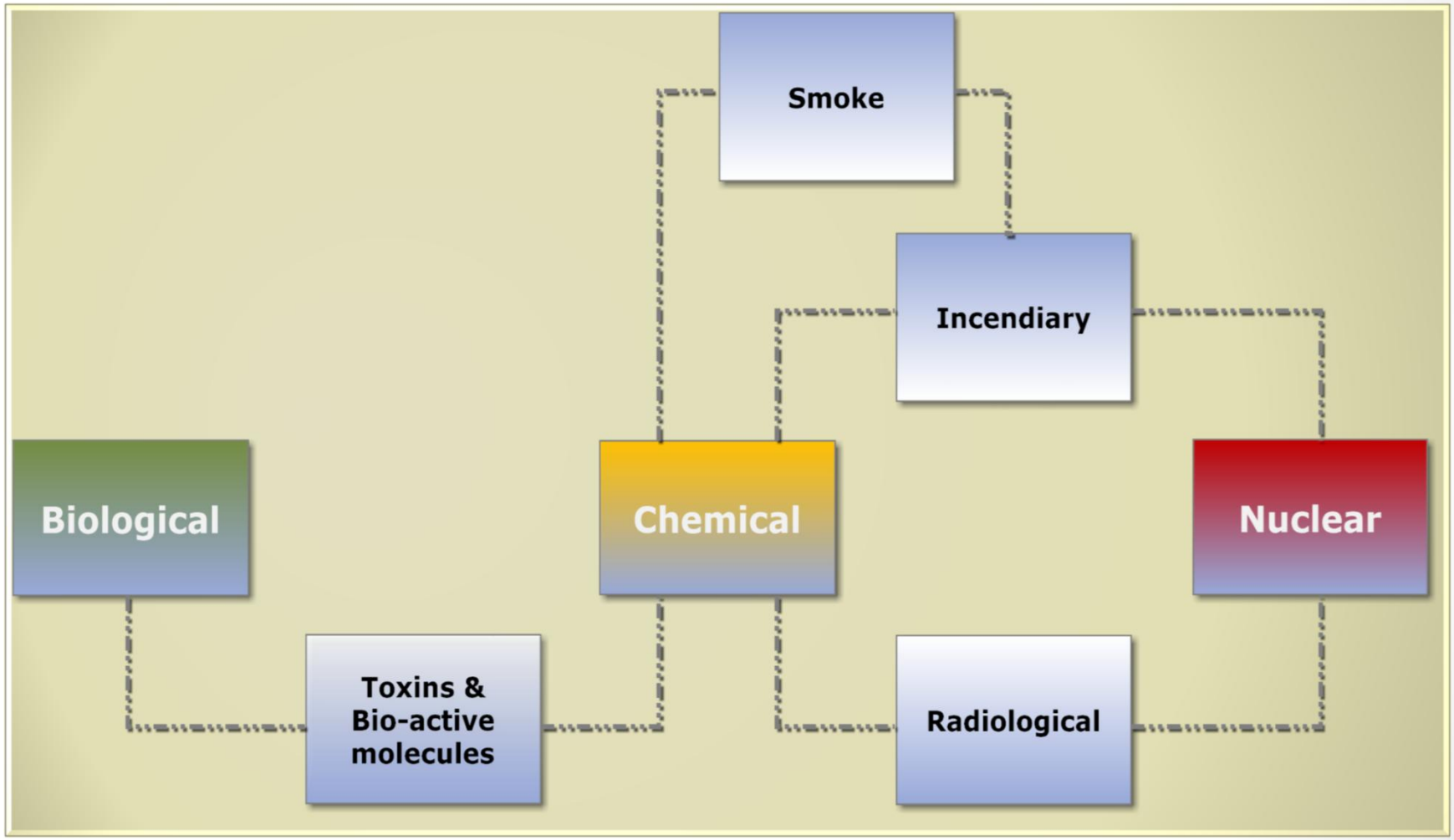
Part 1

CHEMICAL, BIOLOGICAL, RADIOLOGICAL & NUCLEAR (CBRN) WEAPONS

The CBRN spectrum



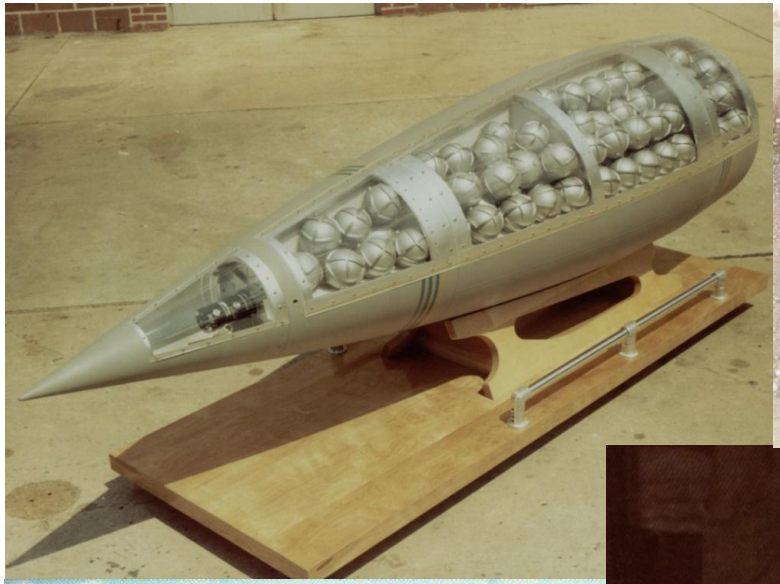
What is chemical warfare?

Intentional application for *hostile* purposes of *toxic* substances against humans, animals and their environment

- *Blood agents*: prevention of oxygen transfer to tissues (e.g. phosgene)
- *Choking agents*: interfere with breathing (e.g. chlorine)
- *Nerve agents*: attack the central nervous system (e.g. sarin)
- *Vesicants*: produce blisters (e.g. mustard agents)

- *Incapacitating agents*: induce temporary physical disability or mental disorientation (e.g. LSD, BZ, Fentanyl)
- *Irritating agents*: induce temporary irritation (e.g. tear gas)
- *Anti-plant agents*: herbicides, growth inhibitors, etc.

Images of chemical warfare



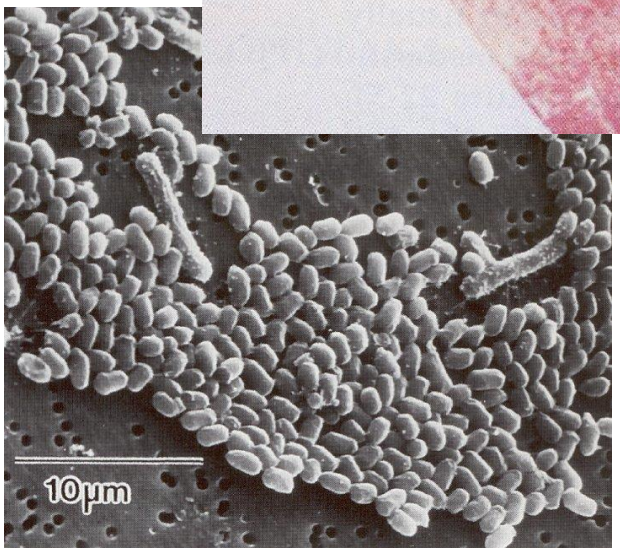
What is biological warfare?

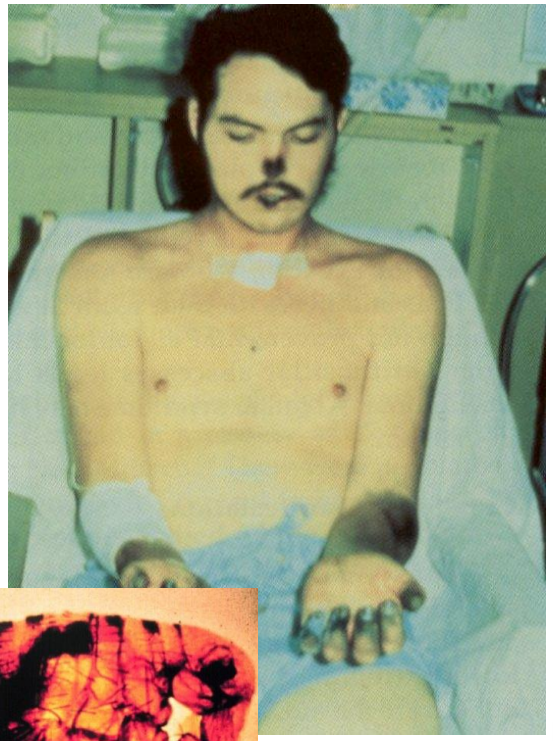
Intentional application against humans, animals or plants for *hostile* purposes of

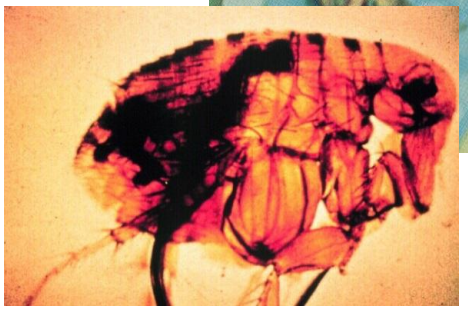
- *Disease-causing micro-organisms* (e.g. bacteria);
- *Other entities that can replicate themselves* (e.g. viruses, infectious nucleic acids and prions)
- *Toxins*, poisonous substances produced by living organisms (and their synthetically manufactured counterparts), including
  - micro-organisms (e.g. botulinum toxin),
  - plants (e.g. ricin derived from castor beans), and
  - animals (e.g. snake venom)

Visions of biological Warfare

Anthrax

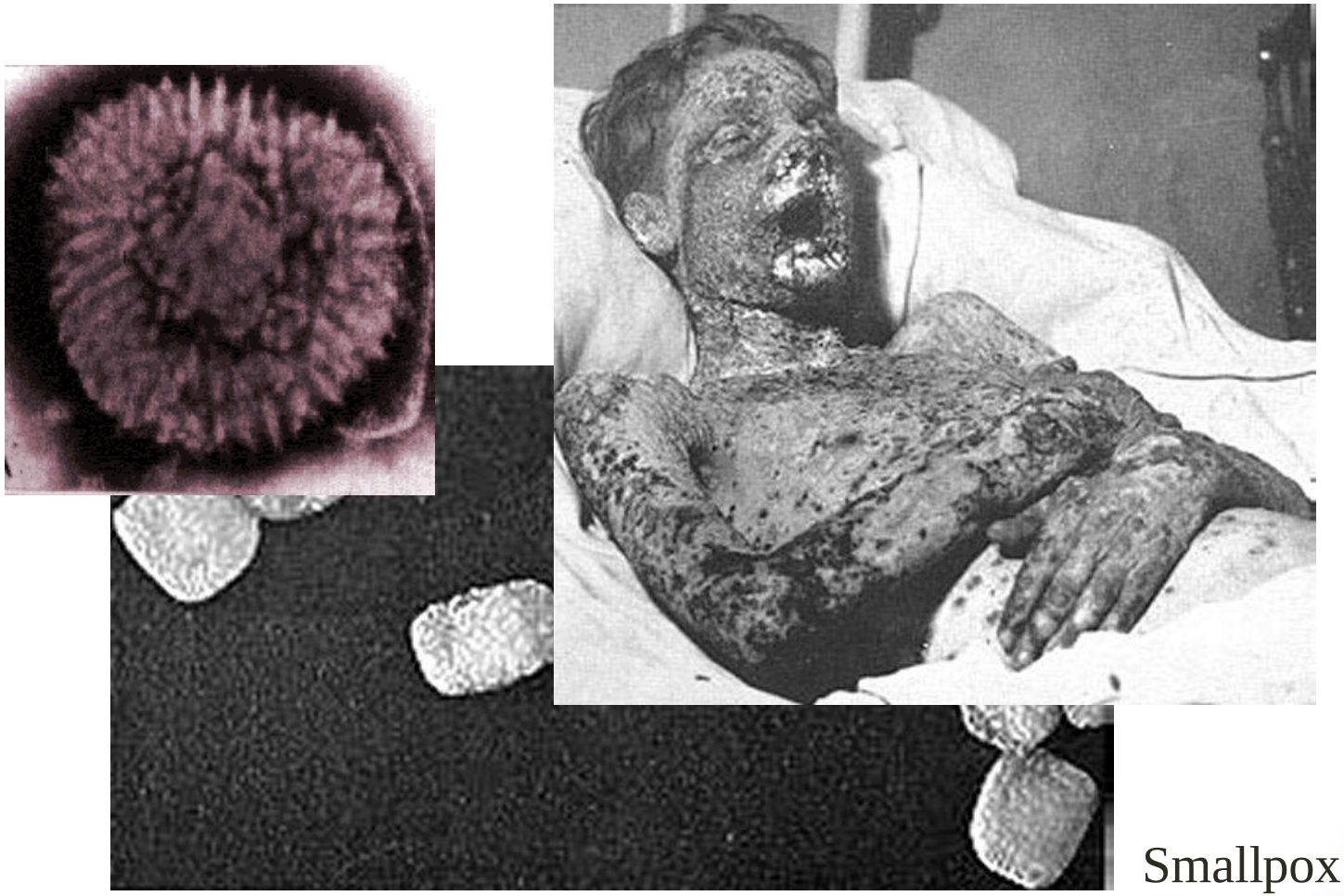






Plague

Visions of Biological Warfare – 2



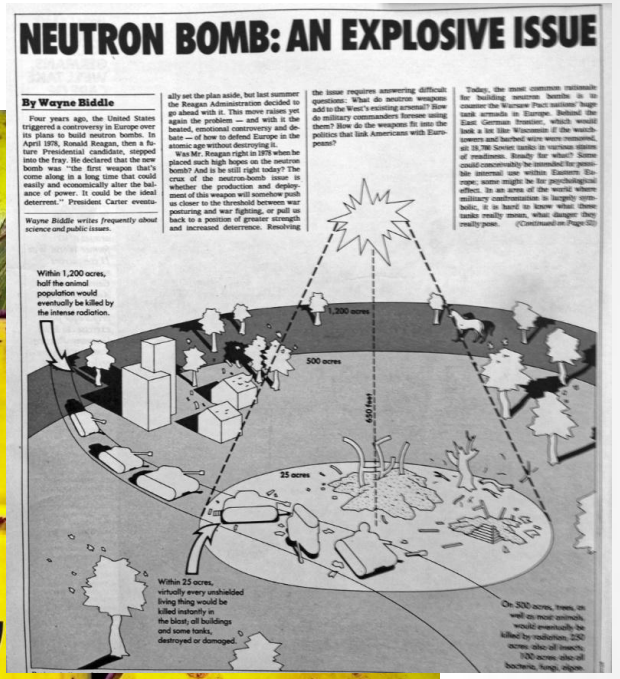
Smallpox

What is radiological warfare?

Intentional exposure of living organisms to a radiation source or radioactive contamination of an area for hostile purposes

- *Radiological weaponry* (e.g. enhanced radiation weapon or neutron bomb, proposed by USA in late 1970s);
- *Deliberate targeting of people* (e.g. assassination)
- *Rendering areas inaccessible*, forcing major decontamination operations (e.g. economic warfare or terrain denial)
  - Highly radioactive sources would require major sanitation of area/infrastructure and possibly complete reconstruction of area
    - Possible dispersal by means of an explosive device (so-called 'dirty bomb')
  - Radioactive waste dispersal could also require major decontamination operations (if only to counter psychological impact)

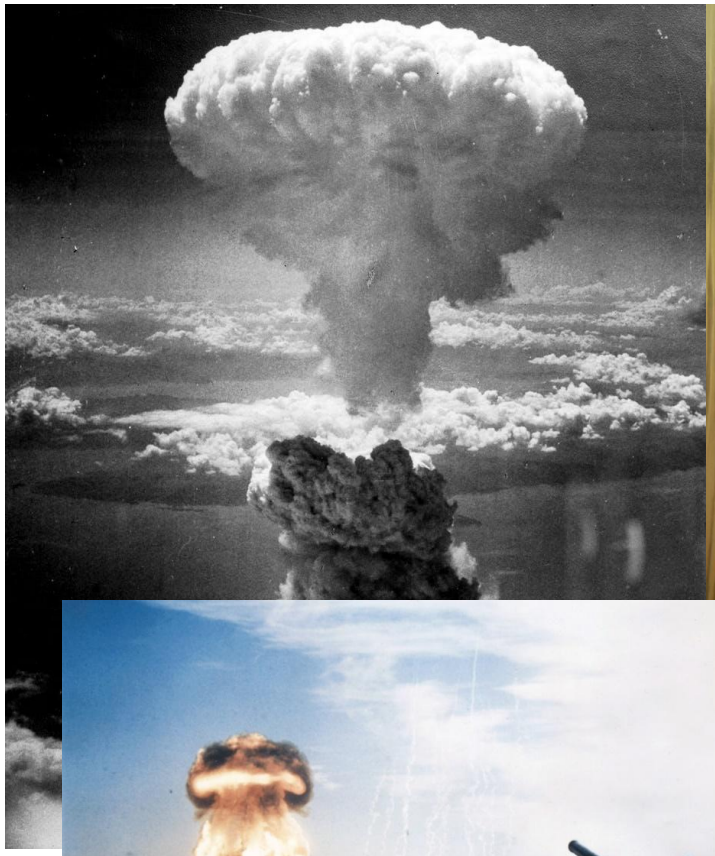
Visions of radiological warfare



What is nuclear warfare?

- Use of nuclear weapons in an armed conflict
  - In a *limited* way
    - Tactical use on the battlefield
    - Escalation prevention (intra-war deterrence)
    - Escalation dominance (part of ‘flexible’ deterrence)
  - In an *unrestricted* way
    - Pre-emptive (decapacitating) strike
    - General nuclear warfare
- Limited past use
  - Hiroshima and Nagasaki (August 1945)
  - However
    - Nuclear testing and its human cost and environmental legacy
    - Nuclear deterrence, strategy of non-use based on willingness to use NW

Visions of Nuclear Warfare



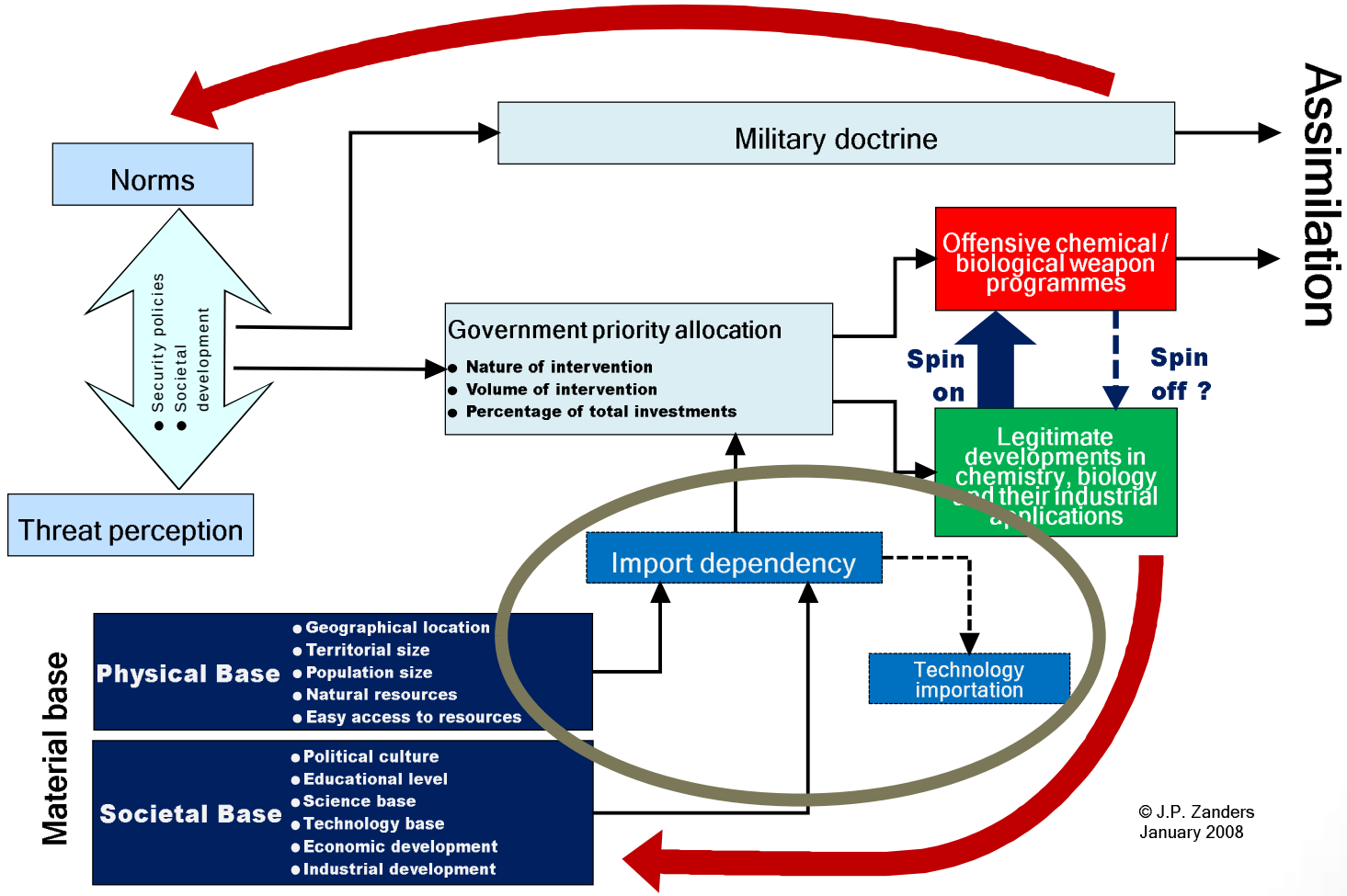
Part 2

OUR CHALLENGE: TECHNOLOGY TRANSFERS

CBRN weapons & transfers

- There is no or hardly any trade in CBRN weapons
  - Extremely dangerous for the people involved in trafficking
  - 'Weapons' are bulky (munitions; storage containers) and therefore difficult to move
    - Requires specialised equipment
    - In some instances, large volumes would have to be transported (e.g. CW)
  - Complex & highly specialised networks required
    - Unusual requests become visible to intelligence agencies
    - Activities at weapon research, production and storage are under observation (e.g. satellites)
- Transfers therefore mostly involve technologies underlying CBRN weapons
  - Materials: toxic agents & their precursors, pathogens, radioactive sources, …
  - People: scientists, engineers, technicians, … (education, experience & expertise)
  - Research: equipment, software, methodologies and results
  - Production: equipment and processes
- Consequently, there are many dimensions to controlling technology transfers

Place of technology transfers in the armament dynamic (Demand side)



Part 3

TECHNOLOGY AND DUAL-USE

What is '*technology*'?

'Technology comprises

- the *ability* to recognise technology problems,
- the *ability* to develop new concepts and tangible solutions to technical problems,
- *the concepts and tangibles* developed to solve technical problems, and
- the *ability* to exploit the concepts and tangibles in an effective way.'

Errko Autio and Tomi Laamanen, 'Measurement and evaluation of technology transfer: Review of technology transfer mechanisms and indicators', *International Journal of Technology Management*, Vol. 10, Nos. 7/8 (1995)

Tangible and intangible technology

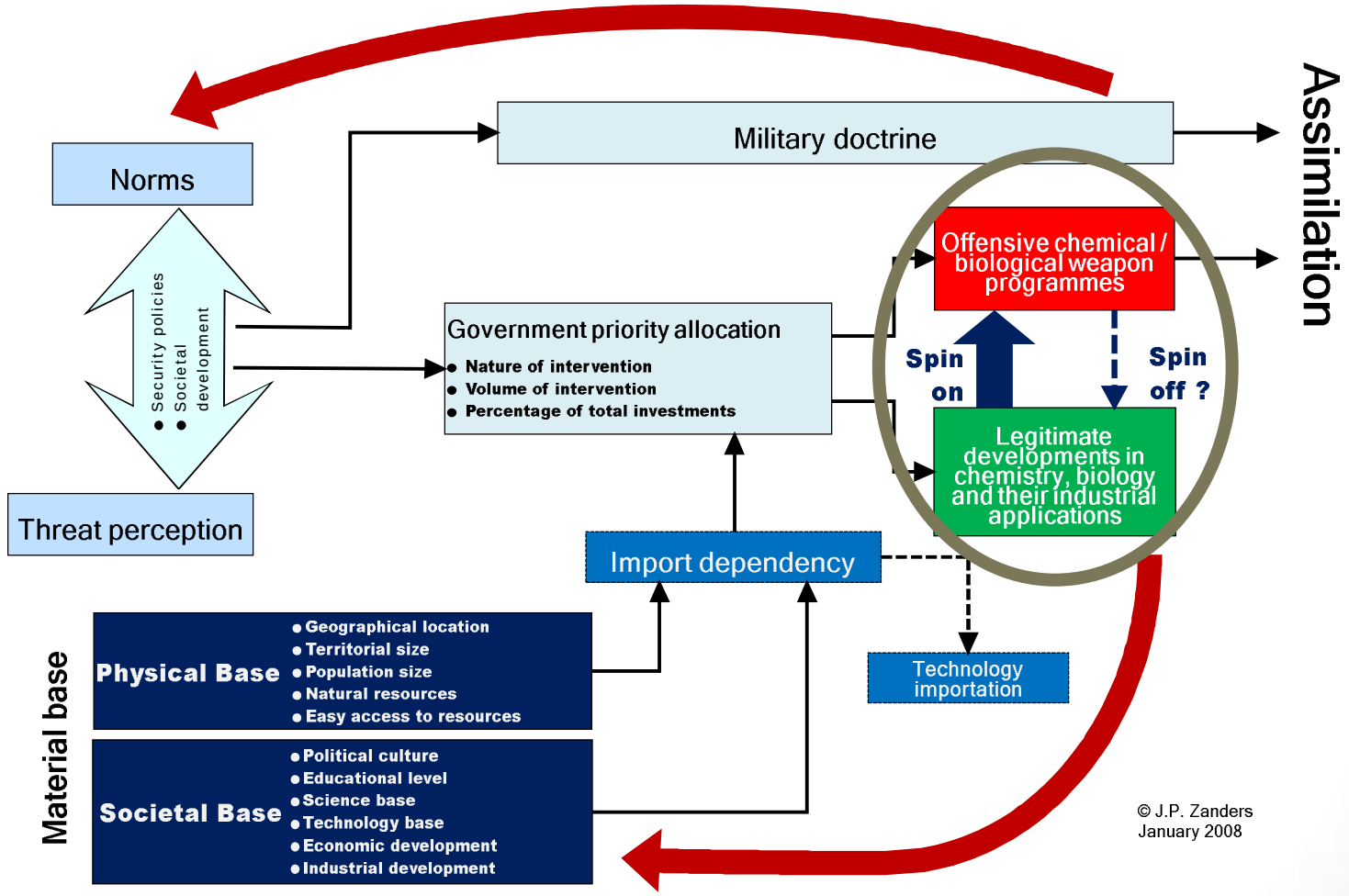
- Tangible objects or artefacts
  - Pathogens, chemicals (including precursors), toxins, radioactive sources
  - Laboratory equipment
  - Fermenters, centrifuges, production equipment, installations and facilities
  - Delivery systems, special equipment associated with weapon use
  - Etc.

- Intangible technologies
  - Data
  - Processes
  - Knowledge
  - Expertise and skills
  - Etc.

What is ‘dual-use’ technology?

- Dual-use technology: a technology that has the *potential* to be applied for a *purpose* other than the one for which it was originally intended
  - *Spin-on*: military application of technology originally intended for civilian purposes
  - *Spin-off*: civilian application of technology originally intended for military purposes
- Single-use technology: a technology that lacks such potential
  - e.g. the weapon itself

Long-term technology transfers in the armament dynamic



Part 3

OBJECTIVES OF A COURSE IN TECHNOLOGY TRANSFER CONTROLS

Technology transfer types to consider

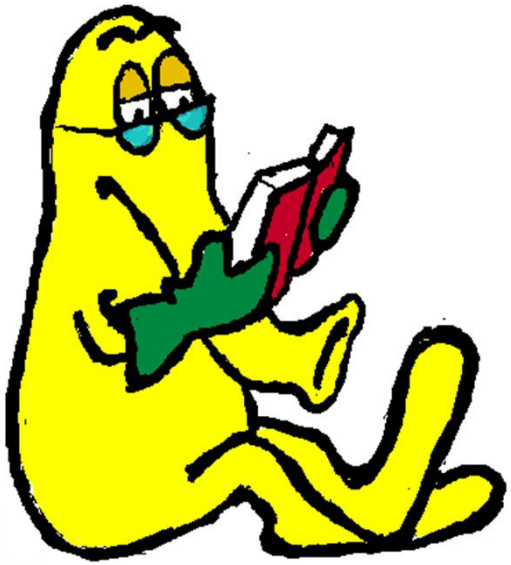
- Across borders between different economic units
  - Export
  - Import
  - Transit
- Across borders within the same economic unit
  - e.g. intranet
- Between economic units inside state borders
  - No export or import
    - Relevant to counter terrorist or criminal use of CBRN-relevant dual-use technologies

Challenges before us …

- Huge range of technologies to capture in technology transfer controls
  - Lachrymatory agent; salmonella ↔ Vanya (Tsar Bomba – 58 megaton detonation in 1961)
  - Many aspects we may not immediately think of
  - Many aspects may not be of immediate relevance to everyday activities
- Technology transfer controls
  - Many different tools and approaches, often depending on weapon category under consideration
  - Each weapon category has its own legal regime, whose characteristics differ from each other

- Question: how to build a *shared* strategy to prevent proliferation?

Elements to consider in a course



- Having basic knowledge about CBRN and underlying technologies
- Identifying and understanding threats and risks
- Knowing relevant international prohibitory and regulatory frameworks
- Understanding transfer patterns and controls
- Knowing the country to whom you intend to transfer (dual-use) technology
- Knowing clients and transaction partners
- Understanding personal responsibilities

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