

**INTL 8288:  
TECHNICAL BACKGROUND FOR WMD NON-PROLIFERATION POLICY PRACTITIONERS**

**Fall 2017**

**Mondays, 12:30-3:00PM, CITS 1<sup>st</sup> Floor Conference Room (Holmes/Hunter Academic Building)**

Dr. Sara Z. Kutchesfahani: [szk@uga.edu](mailto:szk@uga.edu)  
Holmes/Hunter Academic Building: Room 120B

**Office Hours: Friday 9:00 – 11:00AM (Please email to schedule an appointment)**

**COURSE DESCRIPTION:**

This class is designed to introduce MIP ISN students to the technology behind various types of WMDs and the associated technical requirements for an effective WMD non-proliferation policy. Specifically, it will explain why certain items are controlled and the challenges associated with maintaining such controls. The unique aspect of this course is that it will offer a STEM-based understanding of the issue area, an increasingly essential component in the competitive government/NGO job market. The course will be taught by experts with practical experience in each of the WMD silos.

After this course, students will have acquired an understanding of technical topics related to WMD technology, including:

1. An overview of basic science for nuclear, biological, and chemical processes for social scientists
2. Nuclear fission
3. Nuclear fusion
4. The nuclear fuel cycle
5. Enrichment
6. Reprocessing
7. Reactor types
8. Detector technology
9. Chemical weapons agents and technology
10. Biological weapons agents and technology
11. Missile delivery systems

**INSTRUCTORS' BIOS:**

**Ms. Pamela McKinsey** (B.S., M.S. Microbiology) will cover the biological weapons sections of the class. She has over 30 years of experience in many aspects of biology, biochemistry, and chemistry – environmental, medical, detection, and instruction. She is currently a Senior Technical Advisor in the Nonproliferation Policy Support group at the Savannah River National Laboratory (SRNL) at the DOE's Savannah River Site (SRS) near Aiken, SC. For much of her career, Ms. McKinsey's work focused on applied and environmental microbiological research including development of bio detection technologies, environmental cleanup through biological processes, and characterization of subsurface microbial populations. Since 2004, her work has centered on strengthening US and global efforts to prevent the proliferation of WMD/CBRNe related materials, equipment and technologies with special focus on biological and chemical

commodities of WMD/CBRNe concern. Email: [micromamma48@yahoo.com](mailto:micromamma48@yahoo.com)

**Mr. Walter Sansot** (B.S., M.S. International Policy Management) will cover the nuclear weapons and missile aspects of the class. He has more than 37 years' experience in the nuclear field, with more than 15 years operating and managing U. S. Department of Energy (USDOE) nuclear material production facilities. He currently provides support to the USDOE's International Nonproliferation Export Control Program. Mr. Sansot is employed by Battelle, the manager of the Pacific Northwest National Laboratory in Richland, Washington. Prior to his service with Battelle, Sansot was a Program Manager for Westinghouse Savannah River Company, operator of the Savannah River Site in Aiken, South Carolina, where he managed the operation of several nuclear material production facilities. Mr. Sansot has worked in the commercial nuclear industry as well as almost ten years in the United States Navy Submarine Service. Email: [wsansot@gmail.com](mailto:wsansot@gmail.com)

**Dr. Julie Thompson** (Ph.D. and M.S. Inorganic chemistry; B.S. Chemistry) will cover the chemical weapons sections of the class. She has over 20 years of experience in the field of chemistry, and has worked on non-proliferation projects for the past ten years. She worked on chemical security and nonproliferation projects at the Center for International Trade and Security (CITS) at the University of Georgia from 2014 to 2016. Prior to her work at CITS, Dr. Thompson worked at Los Alamos National Laboratory for twelve years. She supported the International Nonproliferation Export Control Program as a technical expert in chemicals and chemical equipment. Dr. Thompson has also worked in industry developing technology to remove heavy metal ions from industrial process streams, managing materials analysis, and evaluating patent applications. Email: [juliethompson01@msn.com](mailto:juliethompson01@msn.com)

#### **TOPICAL OUTLINE FOR THE COURSE:**

The course syllabus is a general plan for the course; deviations announced to the class by the instructors may be necessary. A detailed course schedule and reading assignments can be found in the following pages, but a topical outline for the course includes lectures on the following:

1. Introduction of the course
2. Overview of WMD Technology
3. Overview of global WMD non-proliferation efforts
4. Dual-use items
5. Controlling dual-use items
6. Challenges with controlling dual-use items
7. International WMD organizations (including IAEA, OPCW, NSG, AG, etc.)
8. Nuclear Weapons Technology
9. Chemical Weapons Technology
10. Biological Weapons Technology
11. Missile Delivery Systems

#### **ATTENDANCE AND CLASS BEHAVIOUR POLICY:**

This class will be highly interactive. As such, class attendance, punctuality, and participation are required in order to succeed. Therefore:

- **Regular attendance** is expected. 2 unexcused absences will be permitted, but the professor must be notified of each absence ahead of class. ½ final letter grade penalty

will incur for each additional unexcused absence. Valid excuses include illness (doctor's note required) and family emergencies.

- **Punctuality** to class is a must. Late arrivals to class interrupt both your fellow students and your professor. If you have a situation where you will be habitually late, please notify the professor as soon as possible. Repeat latecomers will incur a ½ final letter grade penalty.
- **No computer use during class.** You must silence, and put away, any and all wireless devices you bring to class.
- **Each student is responsible for contributing to a positive learning environment:** students are expected to behave in a courteous, professional manner towards each other and towards the professor. While in class, students are expected not to fall asleep, use laptops unless permission is given by the professor, carry on personal conversations, read the paper, use cellular phones/text, or complete assignments other than what the class is working on. If you engage in any of these behaviours, you may incur a ½ final letter grade penalty for each occurrence.

#### **ASSIGNMENTS:**

The course is assessed by four modules – outlined below. **You are responsible for assignments whether or not you are in class the day they are due.** Should you miss class and wish to receive credit for an assignment due that day, you are required to turn in the assignment to the professor **before class**. I will use the 100-point grading system. Students will receive a letter grade for their final grade according to the following cutoffs:

A≥93; A- ≥90; B+ ≥87; B ≥83; B- ≥80; C+ ≥76; C ≥70; C- ≥68; D ≥60; F <60

#### **1. Topical Quizzes (20%)**

There will be 3-4 topical multiple choice quizzes throughout the semester. These will not be announced ahead of time, which is why reading for every class is important, as well as mandatory attendance to each class. **If students are absent during any of these topical quizzes, they will receive a grade of zero for this assessment.**

#### **2. Seminar Presentation (30%)**

On the last day of class, students will present their end of semester presentations to the rest of the class and all instructors. Presentations should be no more than 30 minutes long and should outline which of the issues discussed in class pose the biggest threat to U.S. and international security, and why. Specific issues areas will be assigned to the students at the beginning of the semester to avoid any repetition. **Powerpoint presentations need to be emailed to Dr. Kutchesfahani by 9AM on December 4. Late submissions will result in a grade of zero for this assessment.**

#### **3. Policy Briefs (30%)**

Students will prepare 2 policy briefs that address a historical (for the first brief) and contemporary (for the second brief) WMD policy and technical challenge – there are many from which to choose. Students may select any WMD-related policy issue that has an international dimension, but it must discuss both the policy and technical challenges. These 10-page (double-spaced) briefs are to be written for the NSC Chairman, which allows you to go into greater

depth. You will be expected to (1) outline the technical and policy scope of the issue, (2) assess international implications, and (3) offer policy recommendations with justification.

- Policy brief 1 is due in class on Monday, September 25: Historical WMD policy and technical challenge.
- Policy brief 2 is due in class on Monday, November 6: Contemporary WMD policy and technical challenge.

**These assignments will be collected in class at the beginning of the class – 12:30PM. None of them will be accepted electronically. Late submissions will result in a grade of zero for this assessment.**

#### **4. Weekly Question and Class Participation (20%)**

Active class participation is required. Students who are not presenting will be expected to keep up with the readings and to participate actively in the discussions. **Participation is based on class behaviour, preparedness, and engagement with the material presented in class.**

**All students will be required to come to class each week (except August 14, August 21, September 4, and December 4) with one question to pose to the rest of the group about the week's topic. These questions will be collected in class at the beginning of the class – 12:30PM. They will not be accepted electronically. Failure to do so will result in a grade of zero for this assessment.**

#### **DEADLINES:**

These deadlines are absolute – **NO EXTENSIONS ARE GIVEN**. Failure to turn in any of the assignments by the due date will result in a grade of zero for that particular assignment. In order to avoid a penalty for late submission of a paper, you must have evidence of extenuating circumstances (e.g., a doctor's note for illness). This must be submitted to the professor prior to the time of the deadline.

#### **ACADEMIC HONESTY POLICY:**

As a University of Georgia student, you have agreed to follow the University's academic honesty policy, "A Culture of Honesty," and the Student Honor Code. All academic work must meet the standards contained in "A Culture of Honesty" found at: <http://ovpi.uga.edu/academic-honesty/academic-honesty-policy>. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the professor.

All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense. "Academic Honesty" means performing all academic work without plagiarism, cheating, lying, tampering, stealing, receiving unauthorized or illegitimate assistance from any other person, or using any source of information that is not common knowledge. "Academic Dishonesty" means performing any academic work that does not meet this standard of academic honesty. Assistance by another, when authorized by the Faculty Member, will not be considered academically dishonest, nor will using information that is fairly attributed to the source.

### RETURN OF GRADED BRIEFS

The aim is to return graded briefs within 2 weeks after the submission date. Papers will be returned to you with an indicative letter grade, ranging from A-F. **ONCE A GRADE IS AWARDED, UNDER NO CIRCUMSTANCE WILL IT BE CHANGED.**

### FERPA

The Family Educational Rights and Privacy Act (FERPA) protects the privacy of your educational record. Please e-mail me to make an appointment during my office hours to discuss your grades should you have any questions or concerns. I will not discuss your grades in class.

### Course Schedule and Deadlines:

DATE	TOPIC	DEADLINES
August 14	Introduction and class overview	
August 21	<b>NO CLASS</b>	
August 28	Overview of WMD Technology and Global WMD non-proliferation efforts:	<b>Weekly question</b>
September 4	<b>NO CLASS – LABOR DAY</b>	
September 11	International WMD organizations (including IAEA, OPCW, NSG, AG, etc.)	<b>Weekly question</b>
September 18	Nuclear Weapons Technology – 1	<b>Weekly question</b>
September 25	Nuclear Weapons Technology – 2	<b>Weekly question</b>
October 2	Nuclear Weapons Technology – 3	<b>Policy brief #1 AND weekly question</b>
October 9	Chemical Weapons Technology – 1	<b>Weekly question</b>
October 16	Chemical Weapons Technology – 2	<b>Weekly question</b>
October 23	Biological Weapons Technology – 1	<b>Weekly question</b>
October 30	Biological Weapons Technology – 2	<b>Weekly question</b>
November 6	Missile Delivery Systems	<b>Policy brief #2 AND weekly question</b>
November 13	Challenges with controlling dual-use items	<b>Weekly question</b>
<b>THANKSGIVING BREAK: November 20-24</b>		
November 27	<b>CLASS DISCUSSION:</b> Current WMD Proliferation Challenges	<b>Weekly question</b>
December 4	<b>SEMINAR PRESENTATIONS</b>	

### REQUIRED READINGS:

A list of readings has been provided for each week. Students are expected to read everything on the list since the readings will facilitate class discussion and enhance understanding of the topics covered in class. Students are expected to come prepared to class each week to discuss the issues raised from what they have read with their fellow students and instructor(s).

### CLASS OVERVIEW AND READING ASSIGNMENTS:

**Week 1 (August 14):** Introduction and class overview – Dr. Sara Z. Kutchesfahani

- Overview of class, grading, expectations, etc.

**Readings:**

- Please read the syllabus and come to week 1's class with any questions you may have about the syllabus and the class

**Week 2 (August 21): NO CLASS**

**Week 3 (August 28):** Overview of WMD Technology and Global WMD non-proliferation efforts – Mr. Walter Sansot

- What is a WMD?
- Why is an understanding of this topic important?
- Definitions/differences
- History
- Use
- Proliferation methodology
- WMD Conventions
  - NPT
  - CWC
  - BTWC
- Convention Implementing Organizations
  - IAEA (including a discussion on the AP)
  - OPCW (including a discussion on the OPCW-UN Joint Mission)
- UNSCR 1540

**Readings:**

- Video: "Nuclear Tipping Point" (54 minutes): <https://vimeo.com/20532059>
- "Weapons of Mass Destruction": <https://www.hampshire.edu/pawss/weapons-of-mass-destruction>
- NRC Fact Sheet on Dirty Bombs, December 2012: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-dirty-bombs.html>
- 26 Countries' WMD Programs; A Global History of WMD Use: <http://usiraq.procon.org/view.resource.php?resourceID=000678>
- Text of the NPT: <http://www.armscontrol.org/documents/npt>
- Text of the BWC: <http://www.armscontrol.org/treaties/bwc>
- Text of the CWC: [http://www.armscontrol.org/act/1997\\_04/cwctext](http://www.armscontrol.org/act/1997_04/cwctext)
- Eric R. Terzuolo, "How the Iran Deal Erodes the Nonproliferation Treaty," *The National Interest*, August 5, 2015: <http://nationalinterest.org/feature/how-the-iran-deal-erodes-the-nonproliferation-treaty-13492>
- IAEA Safeguards Serving Nuclear Non-Proliferation, June 2015: [https://www.iaea.org/sites/default/files/safeguards\\_web\\_june\\_2015\\_1.pdf](https://www.iaea.org/sites/default/files/safeguards_web_june_2015_1.pdf)
- Fact Sheets: Treaty Membership and Signatory Status of NPT, CWC, BWC: <http://www.armscontrol.org/factsheets/treatymembership>

**Additional Reading:**

- Kenneth Katzman and Paul K. Kerr, "Iran Nuclear Agreement," Congressional Research Service, May 31, 2016: <http://fas.org/sgp/crs/nuke/R43333.pdf>
- Text of the JCPOA: <http://www.iaea.org/sites/default/files/gov-2015-72-derestricted.pdf>

- George Perkovich, Mark Hibbs, James M. Acton, and Toby Dalton, “Parsing the Iran Deal”: <http://carnegieendowment.org/2015/08/06/parsing-iran-deal/iec5>
- Ramesh Thakur, Jane Boulden, and Thomas G. Weiss, “Can the NPT Regime be fixed or should it be abandoned?”, *Dialogue on Globalization*, Occasional Papers No. 40, October 2008: <http://library.fes.de/pdf-files/iez/global/05760.pdf>
- IAEA Safeguards in Practice: <https://www.iaea.org/safeguards/safeguards-in-practice>

**Week 4 (September 11):** International WMD organizations – Mr. Walter Sansot & Dr. Sara Z. Kutchesfahani

- Main WMD multilateral regimes:
  - Nuclear Suppliers Group
  - Missile Technology Control Regime
  - Australia Group
  - Wassenaar Arrangement – Basis of Control List Structure used for Dual-Use Items
- Other programs:
  - Proliferation Security Initiative
  - Container Security Initiative
  - World Customs Organization
  - Interpol

**Readings:**

- The Missile Technology Regime: <http://www.mtcr.info/english/public.html>
- Multilateral Export Control Policy: The Coordinating Committee: <http://www.princeton.edu/~ota/disk3/1979/7918/791810.PDF>
- Nuclear Suppliers Group: <http://www.nuclearsuppliersgroup.org/en/>
- Australia Group: <http://australiagroup.net/en/>
- Mark Hibbs, “Toward a Nuclear Suppliers Group Policy for States Not Party to the NPT,” Carnegie Endowment for International Peace, February 12, 2016: <http://carnegieendowment.org/2016/02/12/toward-nuclear-suppliers-group-policy-for-states-not-party-to-npt/itxg>
- World Customs Organization: <http://www.wcoomd.org/en/topics/enforcement-and-compliance/instruments-and-tools/guidelines/wco-strategic-trade-control-enforcement-implementation-guide.aspx>
- Proliferation Security Initiative: <http://www.state.gov/t/isn/c10390.htm>
- Container Security Initiative: <https://www.cbp.gov/border-security/ports-entry/cargo-security/csi/csi-brief>
- Container Security Initiative in Summary, May 2011: [https://www.cbp.gov/sites/default/files/documents/csi\\_brochure\\_2011\\_3.pdf](https://www.cbp.gov/sites/default/files/documents/csi_brochure_2011_3.pdf)
- Interpol: <http://www.interpol.int/Crime-areas/CBRNE/CBRNE>
- Jeffrey Muller, “Shields up!” *CBRNe World*, April 2015: [http://www.cbrneworld.com/uploads/download\\_magazines/Shields\\_up.pdf](http://www.cbrneworld.com/uploads/download_magazines/Shields_up.pdf)

**Additional Reading:**

- MTCR Annex and Annex Handbook: <http://www.mtcr.info/english/annex.html>

- “What the Missile Technology Control Regime is All About,” News18.com, June 8, 2016: <http://www.news18.com/news/tech/what-the-missile-technology-control-regime-is-all-about-1253600.html>
- NSG Documents: <http://www.nuclearsuppliersgroup.org/en/nsg-documents>
- NSG Guidelines: <http://www.nuclearsuppliersgroup.org/en/guidelines>
- Australia Group Common Control Lists: <http://australiagroup.net/en/controllists.html>

**Week 5 (September 18): Nuclear Weapons Technology 1 – Mr. Walt Sansot**

- Radiological and Nuclear Principles
- Nuclear Fuel Cycle
- Nuclear Material Production: Nuclear Reactors

**Readings:**

- The Nuclear Fuel Cycle Overview – World Nuclear Association: <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/introduction/nuclear-fuel-cycle-overview.aspx>
- Stages of the Nuclear Fuel Cycle, NRC: <http://www.nrc.gov/materials/fuel-cycle-fac/stages-fuel-cycle.html>
- Radiation Protection, NRC: <http://www.nrc.gov/about-nrc/radiation.html>
- Plutonium Manufacturing and Fabrication: <http://nuclearweaponarchive.org/Library/Plutonium/>

**Additional Reading:**

- Technical Description of Fuel Cycle Facilities and Evaluation of Diversion Potential: <http://www.princeton.edu/~ota/disk3/1977/9586/958607.PDF>
- Kelsey Hartigan, Corey Hinderstein, Andrew Newman, Sharon Squassoni, “A New Approach to the Nuclear Fuel Cycle: Best Practices for Security, Nonproliferation, and Sustainable Nuclear Energy,” CSIS/NTI, February 2015: [http://www.nti.org/media/pdfs/150320\\_Squassoni\\_NuclearFuelCycle\\_Web\\_final.pdf?\\_=1426863720](http://www.nti.org/media/pdfs/150320_Squassoni_NuclearFuelCycle_Web_final.pdf?_=1426863720)

**Week 6 (September 25): Nuclear Weapons Technology 2 – Mr. Walt Sansot**

- Nuclear Material Production
  - Uranium Enrichment
  - Reprocessing

**Readings:**

- Uranium Enrichment, NRC: <http://www.nrc.gov/materials/fuel-cycle-fac/ur-enrichment.html>
- Uranium Enrichment, World Nuclear Association: <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/uranium-enrichment.aspx>
- How uranium ore is made into nuclear fuel, World Nuclear Association: <http://www.world-nuclear.org/nuclear-basics/how-is-uranium-ore-made-into-nuclear-fuel.aspx>



- Processing of Used Nuclear Fuel. World Nuclear Association: <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx>
- Nuclear Proliferation and Safeguards, Office of Technology Assessment, June 1977: <http://www.princeton.edu/~ota/disk3/1977/7705/7705.PDF>

**Additional Reading:**

- Civilian HEU Reduction and Elimination Resource Collection, NTI: <http://www.nti.org/analysis/reports/civilian-heu-reduction-and-elimination/>
- William F. Shughart II, "Why Doesn't U.S. Recycle Nuclear Fuel?" *Forbes*, October 1, 2014: <http://www.forbes.com/sites/realspin/2014/10/01/why-doesnt-u-s-recycle-nuclear-fuel/#3691456c7db4>
- Nuclear Reprocessing: Dangerous, Dirty, and Expensive, Union of Concerned Scientists: <http://www.ucsusa.org/nuclear-power/nuclear-plant-security/nuclear-reprocessing#.V3K41Vfw8RF>
- George Perkovich, Jessica T. Mathews, Joseph Cirincione, Rose Gottemoeller, Jon B. Wolfsthal, *Universal Compliance: A Strategy for Nuclear Security*, March 2005: [http://www.nti.org/media/pdfs/analysis\\_carnegie\\_universalcompliance\\_2005.pdf?\\_id=1316466791](http://www.nti.org/media/pdfs/analysis_carnegie_universalcompliance_2005.pdf?_id=1316466791)

**Week 7 (October 2): Nuclear Weapons Technology 3 – Mr. Walt Sansot**

- Nuclear Weaponization
  - Process
  - Testing
- Detection Technologies
  - Nuclear testing
  - Radiation Detection

**Readings:**

- Detecting Radiation, NRC: <http://www.nrc.gov/about-nrc/radiation/health-effects/detection-radiation.html>
- Radiation Detection and Measurement: <http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/rdtec.html>
- How Can You Detect Radiation? Health Physics Society: <http://hps.org/publicinformation/ate/faqs/radiationdetection.html>
- Detecting Radioactivity: <http://www.darvill.clara.net/nucrad/detect.htm>

**Additional Reading:**

- "CTBT at 15: Status and Prospects," Arms Control Association, October 2012: [http://www.armscontrol.org/files/ACA\\_CTBT\\_Report\\_Vienna\\_2012.pdf](http://www.armscontrol.org/files/ACA_CTBT_Report_Vienna_2012.pdf)
- Text of the CTBT: <http://www.armscontrol.org/node/2491>
- Nuclear Testing Fact Sheets: <http://www.armscontrol.org/factsheets/nucleartesting>
- How to Detect a Secret Nuclear Test (<4 minute video): <https://www.youtube.com/watch?v=daZ7IQFqPyA>

**Week 8 (October 9): Chemical Weapons Technology 1 – Dr. Julie Thompson**

- Intro to chemical weapons

- History
  - WWI Use
  - WWII Use (Germany and China)
  - Iran-Iraq War – impetus for CW nonproliferation
  - International response: CWC and AG
  - Syria
- Physiological Effects
- CW vs Explosives
- CW vs TICs
- Chemical precursors
- Management of CW precursors in trade

#### Readings:

- Sarah Everts, “When Chemicals Became Weapons of War”: <http://chemicalweapons.cenmag.org/when-chemicals-became-weapons-of-war/>
- Sarah Everts, “Who was the Father of Chemical Weapons?”: <http://chemicalweapons.cenmag.org/who-was-the-father-of-chemical-weapons/>
- Chemical Weapons Then and Now: <http://cen.acs.org/content/dam/cen/93/8/09308-cover3timeline.pdf>
- Elaine Seward and Sarah Everts, “How Chemistry Changed WWI”: <http://chemicalweapons.cenmag.org/how-chemistry-changed-wwi/>
- Controlled Chemicals, OPCW: <https://www.opcw.org/our-work/non-proliferation/controlled-chemicals/>
- OPCW Scheduled Chemicals: <https://www.opcw.org/chemical-weapons-convention/annexes/annex-on-chemicals/>
- Australia Group Chemical Equipment Control List: Chemical Weapons Precursors: <http://www.australiagroup.net/en/precursors.html>

#### Additional Reading:

- First-hand Accounts of the First Chlorine Gas Attack: <http://chemicalweapons.cenmag.org/first-hand-accounts-of-the-first-chlorine-gas-attack/>
- Jonathan B. Tucker, “Trafficking Networks for Chemical Weapons Precursors: Lessons from the Iran-Iraq War of the 1980s,” CNS Occasional Paper No. 13, November 2008: [http://cns.miis.edu/opapers/pdfs/op13\\_tucker\\_edited.pdf](http://cns.miis.edu/opapers/pdfs/op13_tucker_edited.pdf)

#### Week 9 (October 16): Chemical Weapons Technology 2 – Dr. Julie Thompson

- Chemical process to make chemical agents
- DU Equipment
- OPCW Facilities declarations
- Controlled chemical DU equipment and industry

#### Readings:

- World Customs Organization Strategic Trade Control Enforcement Implementation Guide – p.41-42: [www.wcoomd.org/en/topics/enforcement-and-compliance/instruments-and-tools/guidelines/wco-strategic-trade-control-enforcement-implementation-guide.aspx](http://www.wcoomd.org/en/topics/enforcement-and-compliance/instruments-and-tools/guidelines/wco-strategic-trade-control-enforcement-implementation-guide.aspx)

- Australia Group Chemical Equipment Control List: [http://www.australiagroup.net/en/dual\\_chemicals.html](http://www.australiagroup.net/en/dual_chemicals.html)
- Jannis Brühl, "Where Did Syria's Chemical Weapons Come From?" *ProPublica*, September 25, 2013: <https://www.propublica.org/article/where-did-syrias-chemical-weapons-come-from>
- Iraq Survey Group: Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD, 30 September 2004, Volume III of III: <https://www.gpo.gov/fdsys/pkg/GPO-DUELFERREPORT/pdf/GPO-DUELFERREPORT-3.pdf>

#### **Additional Reading:**

- Mary Beth D. Nikitin, Paul K. Kerr, Andrew Feickert, "Syria's Chemical Weapons: Issues for Congress," Congressional Research Service, September 30, 2013: <http://www.fas.org/sgp/crs/nuke/R42848.pdf>
- Christopher M. Blanchard, Carla E. Humud, Mary Beth D. Nikitin, "Armed Conflict in Syria: Overview and U.S. Response," Congressional Research Service, October 9, 2015: <http://www.fas.org/sgp/crs/mideast/RL33487.pdf> (p.25-27)

#### **Week 10 (October 23): Biological Weapons Technology 1 – Ms. Pamela McKinsey**

- Intro to Biological Weapons
- Historical Overview of Biological Weapons
  - WWI through WWII
  - Cold War era
  - Bioterrorism
- Bioagents of weapons concern
  - Agents targeting humans
  - Agents targeting agriculture
- Bioweapon Discussion Topic
  - Prevention vs Deterrence vs Aggression

#### **Readings:**

- V. Barras, G. Greub, "History of Biological Warfare and Bioterrorism," *Clinical Microbiology and Infection*, Vol. 20, Issue 6, June 2014: 497-502: <http://www.sciencedirect.com/science/article/pii/S1198743X14641744>
- Australia Group Common Control Lists: Human and Animal Pathogens and Toxins: [http://www.australiagroup.net/en/human\\_animal\\_pathogens.html](http://www.australiagroup.net/en/human_animal_pathogens.html)
- Australia Group Common Control Lists: Plant Pathogens: <http://www.australiagroup.net/en/plants.html>
- Mary Beth D. Nikitin, Amy F. Woolf, "The Evolution of Cooperative Threat Reduction: Issues for Congress," Congressional Research Service, June 13, 2014: <http://fas.org/sgp/crs/nuke/R43143.pdf> (p.1-6; 37-42)
- "Lugar applauds opening of Nunn-Lugar Bio-Threat Laboratory in Tbilisi, Georgia," US Senate Committee on Foreign Relations, March 17, 2011: <http://www.foreign.senate.gov/press/ranking/release/lugar-applauds-opening-of-nunn-lugar-bio-threat-laboratory-in-tbilisi-georgia>
- Patrick Goodenough, "Russian Official Accuses U.S. of Using Lab in Caucasus for Bio-Warfare," *CNS News*, October 15, 2013: <http://www.cnsnews.com/news/article/patrick-goodenough/russian-official-accuses-us-using-lab-caucasus-bio-warfare>

- Mike Wheatley, “Russia Accuses U.S. of Placing Bio-Weapons Labs on its Borders,” *Russia Insider*, June 17, 2015: <http://russia-insider.com/en/politics/russia-accuses-us-placing-bio-weapons-labs-its-borders/ri8082>
- *Puccinia graminis* (stem rust of cereals), *Invasive Species Compendium*: <http://www.cabi.org/isc/datasheet/45797>
- Cyrille Saintenac, Wenjun Zhang, Andres Salcedo, Mathew N. Rouse, Harold N. Trick, Eduard Akhunov, Jorge Dubcovsky, “Identification of Wheat Gene Sr35 That Confers Resistance to Ug99 Stem Rust Race Group,” *SCIENCE*, Vol. 341, Issue 6147, 16 August 2013: 783-786: <http://science.sciencemag.org/content/341/6147/783.full>
- Pathotype Tracker - Where is Ug99? [http://rusttracker.cimmyt.org/?page\\_id=22](http://rusttracker.cimmyt.org/?page_id=22)
- Wheat Stem Rust – Ug99: <http://www.fao.org/agriculture/crops/rust/stem/rust-report/stem-ug99racettksk/en/>
- Kerry Grens, “Putting Up Resistance,” *The Scientist*, June 1, 2014: <http://www.the-scientist.com/?articles.view/articleNo/40085/title/Putting-Up-Resistance/>

**Week 11 (October 30):** Biological Weapons Technology 2 – Ms. Pamela McKinsey

- Processes for bioagent to bioweapon
  - Dual Use Equipment
  - Is it really “easy”?
- Bioweapon concepts
  - Biotechnology
  - Biological research fueled by bioterrorism concerns
  - Ethical considerations

**Readings:**

- Australia Group Common Control Lists: Control List of Dual-Use Biological Equipment and Related Technology and Software: [http://www.australiagroup.net/en/dual\\_biological.html](http://www.australiagroup.net/en/dual_biological.html)
- Hilary Rodham Clinton, Remarks at the 7<sup>th</sup> Biological and Toxin Weapons Convention Review Conference, Geneva, Switzerland, December 7, 2011: <http://www.state.gov/secretary/20092013clinton/rm/2011/12/178409.htm>
- Capabilities Analysis of Bioterrorism: Roadblocks Facing Non-State Actors’ Use of Bioweapons, *Global Biodefense*, May 20, 2014: <http://globalbiodefense.com/2014/05/20/bioterrorism-roadblocks-facing-non-state-actors-use-of-bioweapons/>
- Michael J. Selgelid, “Governance of Dual-Use Research: An Ethical Dilemma,” *Bulletin of the World Health Organization* 2009, 87: 720-723: <http://www.who.int/bulletin/volumes/87/9/08-051383/en/>
- Stephen Strauss, “Ebola Research Fueled by Bioterrorism Threat,” *Canadian Medical Association Journal*, November 4, 2014; 186 (16): 1206: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4216251/>
- Crystal Boddie, “Federal Funding in Support of Ebola Medical Countermeasures R&D,” *Health Security*, February 1, 2015; 13 (1): 3-8: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4389695/>

**Week 12 (November 6):** Missile Delivery Systems – Mr. Walt Sansot

- Ballistic and Cruise Missile Technology

- Unmanned Aerial Vehicles
- Missile subsystems
- Missile Technology Control Regime

#### Readings:

- Karl Tate, "How Intercontinental Ballistic Missiles Work (Infographic)", Space.com, February 1, 2013: <http://www.space.com/19601-how-intercontinental-ballistic-missiles-work-infographic.html>
- Trajectories: <http://hyperphysics.phy-astr.gsu.edu/hbase/traj.html>
- HyperPhysics Concepts: <http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html#mechcon>
- The Materials Ballistic Missiles are Made of: <http://missilethreat.com/the-materials-ballistic-missiles-are-made-of/>
- Missiles of the World (Ballistic, Cruise, All): <http://missilethreat.com/missiles-of-the-world/>

#### Additional Reading:

- Kelsey Davenport, "Iran's Missile Tests Raise Concerns," *Arms Control Association*, April 2016: [http://www.armscontrol.org/ACT/2016\\_04/News/Irans-Missile-Tests-Raise-Concerns](http://www.armscontrol.org/ACT/2016_04/News/Irans-Missile-Tests-Raise-Concerns)
- Kelsey Davenport, "Worldwide Ballistic Missile Inventories," *Arms Control Association*, July 2014: <http://www.armscontrol.org/factsheets/missiles>

#### Week 13 (November 13): Challenges with controlling dual-use items – Mr. Walt Sansot

- Dual Use goods – historically controlled based on control lists created by supplier states
- How to effectively engage industry
  - In light of other pressing international security measures, can we expect governments and companies to focus on DU goods like corrosion resistant valves for example?
- In an age of expanding international trade and production, what does controlling Dual Use goods mean? Idea of supplier states may be becoming obsolete.
- How is new technology affecting idea of "controlling DU goods"? E.g. 3-D printing? Micro chemistry? Interface of bio and chemistry?

#### Readings:

- Sybille Bauer and Mark Bromley, "The Dual-Use Export Control Policy Review: Balancing Security, Trade, and Academic Freedom in a Changing World," EU Non-Proliferation Consortium Non-Proliferation Papers, No. 48, March 2016: [https://www.sipri.org/sites/default/files/EUNPC\\_no-48.pdf](https://www.sipri.org/sites/default/files/EUNPC_no-48.pdf)
- Renaud Chatelus, "The Role of Customs in Strategic Trade Controls: Challenges and Potential. Taking a States' Enforcement Perspective," CITS/UGA: [http://cits.uga.edu/uploads/documents/chatelus\\_customs.pdf](http://cits.uga.edu/uploads/documents/chatelus_customs.pdf)
- "3D Printing may lead to export control crackdown," *The Export Compliance Journal*, November 27, 2013: <https://www.ecustoms.com/blog/?p=67&p=67>
- David Ivey, "Perspectives on Challenges/Problems in Export Control Compliance," October 29, 2015:

[http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pgas\\_169005.pdf](http://sites.nationalacademies.org/cs/groups/pgasite/documents/webpage/pgas_169005.pdf)

- Stephanie Lieggi and Diana Lee, "Tracking Growth in Dual Use Commodities in Southeast Asia: Keeping Ahead of Proliferation Networks," May 20, 2015: <http://www.nonproliferation.org/tracking-growth-dual-use-commodities/>
- Jonathan B. Tucker, ed., *Innovation, Dual Use, and Security: Managing the Risks of Emerging Biological and Chemical Technologies*, Cambridge, MA: MIT Press, 2012: 235-248.

**Week 14 (November 27):** Current WMD Proliferation Challenges – Class discussion moderated by Mr. Walter Sansot & Dr. Sara Z. Kutchesfahani

Possible issues for consideration, but students are welcome to raise other topics:

- Nuclear
  - Declared NWS – Modernization and increasing arsenals and stockpiles
    - China, US, Russia, UK, France
  - India, Pakistan
  - DPRK, Iran
- Biological
  - Technology advances
  - Lack of verification mechanism
- Chemical
  - Incomplete CW stockpile destruction
  - Continued use of CW in Syria and Iraq
  - Prevalence of chemical industry throughout the world and need for dual-use equipment
- Non-state actors
- Role/responsibility of scientists in non-proliferation
- Controlling technology – is it even possible?

**Week 15 (December 4):** Student end of semester seminar presentations

Students will present their end of semester presentations to the rest of the class and all instructors. Presentations should be no more than 30 minutes long and should outline which of the issues discussed in class pose the biggest threat to U.S. and international security, and why. Specific issues areas will be assigned to the students at the beginning of the semester to avoid any repetition. **Powerpoint presentations need to be emailed to Dr. Kutchesfahani by 9AM on December 4. Late submissions will result in a grade of zero for this assessment.**