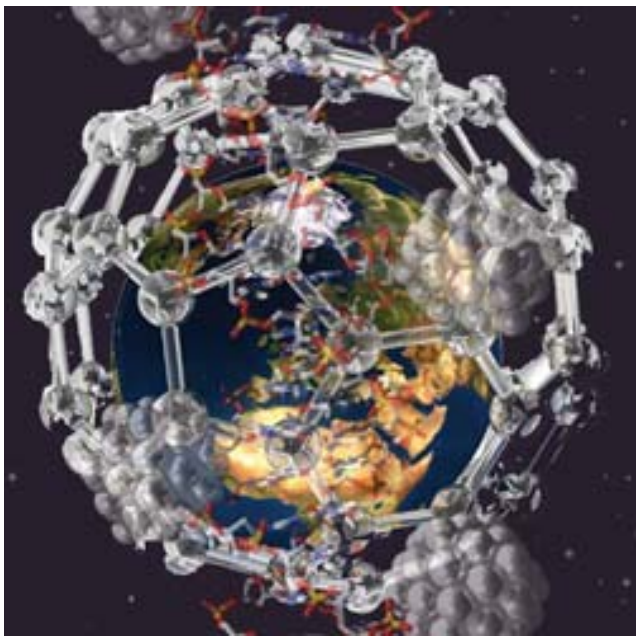
INTA 2040

SCIENCE, TECHNOLOGY, & INTERNATIONAL AFFAIRS

Spring 2018



Dr. Margaret E. Kosal
Sam Nunn School of International Affairs

3 credits
TTh 4:3-5:45pm
Molecular Sciences 1222

Office hours: TBD
& by appointment
Habersham 303
nerdgirl@gatech.edu

Teaching Assistant: Mr. Jon Schmid, jschmid7@gatech.edu

Overview

This course is an overview of science and technology as a determinant in the development and functioning of states and societies worldwide and the international context for the development of science and technology. How has science and technology impacted war, power, development, and institutions? This course will explore how science and technology affect diplomacy and international relations, especially in the areas of security, environment, energy, health, business, development, privacy, and ethics. Rapid technological changes are anticipated to occur over the ensuing decades in a globalized world characterized by complex security challenges. While emerging technologies promise scientific breakthroughs, they also generate skepticism and controversies. How will these nascent scientific and

technological developments impact governance, cooperation, and conflict; and what are the potential international impacts? The goal of the course is to equip students with the tools needed to understand the complex problems at the intersection of scientific and technical issues and international affairs. All course materials were chosen to reflect a wide scope of interests and debates. The readings and the course are designed to be self-contained and assume no prerequisite knowledge beyond basic high school science.

Learning Outcomes

- Students will understand and be able to apply the critical concepts of science & technology, e.g., theory, hypothesis, causality, correlation, accuracy, precision, and technological determinism, to international affairs.
- Students will understand causal and determinant relationships between science and technology (S&T) and international affairs across different topic areas.
- Students will understand and be able to assess relationships between organizational institutions & structures at the local, national, regional & global level and S&T.
- Students will become familiar with multiple major governance entities (e.g., international agreements and institutions) relevant to S&T and international affairs.
- Students will understand and generate a conceptual risk and threat assessment and assess capability, motivation, and vulnerability.
- Students will understand and learn about how S&T shaped history, promising S&T developments (such as information and communications technology, cognitive and biological sciences, robotics, and nanotechnology), and pressing S&T challenges for the future in an international context.
- Students will develop and be able to apply a skeptic's filter [or 'nonsense rheostat'] for bad science, techno-jargon, techno-phobic hype/hope, etc.
- Students will be able to apply theoretical concepts explaining aspects of the inter-relationships between S&T and international affairs to a new scenario or situation.

Core Area/Attributes

Social Science Gen Ed requirements:

- Learning Goal E: Social Sciences. Student will demonstrate the ability to describe the social, political, and economic forces that influence social behavior.

Course Materials

Two texts are required:

1) *Guns, Germs, and Steel* by Jared Diamond
2) *Bomb Scare* by Joe Cirincione
3) *To be determined by the class*

Other short articles will be required reading; these will be announced in class and posted on the T-square course website (https://t-square.gatech.edu).

Class Requirements

1) Proposal (15%)
2) Draft Individual Action Memo (10%)
3) Final Individual Action Memo (15%)
4) Collaborative Policy Memo (35%)
5) National Security Council Simulation (15%)
6) Self-Assessment and Final Evaluation (10%)

Proposal

Proposed topic and department representing, in the form of a 250-500 word abstract/proposal, due electronically to MEK NLT 1200, Monday 29 January.

Individual Action Memo

Draft individual action memo due electronically to MEK NLT 1800, Thursday 15 February.

Final individual action memo due electronically to MEK NLT 1800, Thursday 1 March.

Collaborative Policy Proposal & NSC Simulation

These will be done in groups of 3-4, *working together*. [The final number will be dependent on final enrollment in class.] Students may assume roles representing national defense concerns (e.g., DoD); foreign policy interests (e.g., State Dept), the intelligence community (e.g., CIA, DNI), law enforcement (e.g., DOJ or FBI), homeland security (e.g., DHS), public health (e.g., CDC), commerce, or other as discussed. Together each group will choose a topic related to the course and generate policy recommendations.

The deliverables will be (1) an individually-crafted 1 to 2-page policy info memo written from your perspective and (2) a jointly-crafted 4-5 page white paper reconciling the positions and recommending actions. Further guidance will be distributed in class.

Each group will be responsible for a presentation on their policy proposal.

Collaborative policy memo groups, departmental representation, and proposed topic in the form of a 50-100 word abstract/proposal due electronically to MEK NLT 1200, Friday, 9 March.

Collaborative policy proposal individual info memo & joint reconciled white paper is due NLT 1200, Friday 19 April and will be presented in class on Tuesday, 24 April as part of the National Security Council Simulation.

Self-Assessment and Final Evaluation

Will be due in lieu of final exam.

Late Assignment Policy

Generally, late assignments without documented excuse as outlined in Georgia Tech official policy will not be accepted. If you have a scheduling conflict, please contact me before the assignment is due.

Attendance and Participation

You are expected to make reasonable efforts to attend all classes and participate actively.

Grade Change Policy

Appeals for grade changes should be reasonable both in argument and submission time, i.e., within two weeks of return. Specific detailed information on grade change will be distributed upon return of assignments.

Academic Integrity

For all assignments, materials, and exams, you are expected to maintain the highest academic integrity.

Per the Georgia Tech Honor Code, plagiarism is an act of academic misconduct. The Georgia Tech Honor Code specifies: "'Plagiarism' is the act of appropriating the literary composition of another, or parts of passages of his or her writings, or language or ideas of the same, and passing them off as the product of one's own mind. It involves the deliberate use of any outside source without proper acknowledgment." Plagiarism ranges from the blatant – purchasing a term paper or copying on an exam – to the subtle – failing to credit another author with the flow of ideas in an argument. Simply changing a few words from the writings of other authors does not alter the fact that you are essentially quoting from them. Paraphrasing of this sort, where you use the words of another almost verbatim without acknowledging your source, is the most common form of plagiarism among undergraduate students and academics. When you state another author's viewpoint, theory, or hypothesis – especially when it is original or not generally accepted – you must also include a reference to the originator. In general citations are unnecessary when the information is considered common knowledge or a matter of widespread agreement or controversy.

Another form of cheating is to try to get 'double credit' for something, i.e., using a book, movie, guest speaker, or something from another class as the basis of an extra credit submission.

More simply put: don't cheat.

When in doubt, give credit.

For more information on the Georgia Tech Honor Code, please see http://www.honor.gatech.edu.

Accommodations for students with disabilities

Per Georgia Tech policy: if you have a significant disability, special arrangements will be made to accommodate documented needs (through the ADAPTS office). Please contact me after class, via email, or stop by my office at your earliest convenience if you have any questions or concerns.

THE SYLLABUS IS DYNAMIC AND IS LIKELY TO BE UPDATED THROUGHOUT THE SEMESTER.

COURSE CALENDAR AND CONTENT

WEEK 1

9 & 11 January

Overview of the class, syllabus, and class requirements
Introduction to science and technology
Positivism and the scientific process
Causation, correlation, accuracy, precision, fact, law, theory, & hypothesis
What is "revolutionary"?
Doomsday scenarios, risk, threat, capability, motivation, vulnerability

Required Reading:

- John Krige and Kai-Henrik Barth, "Science, Technology, and International Affairs," *Osiris,* v 21, no 1, 2006, pp. 1-21, http://www.jstor.org/stable/pdf/10.1086/507133.pdf
- John Marburger, "Perspective: Science's Uncertain Authority in Policy," Issues in Science and Technology, v 26, no 4, Summer 2010, http://issues.org/26-4/p_marburger/
- Start reading, Jared Diamond, *Guns, Germs, and Steel*, Prologue & Part 1.

Optional Reading:

- George Shultz, William Perry, Henry Kissinger, & Sam Nunn, "Next Steps in Reducing Nuclear Risks," *WSJ,* 5 March 2013, http://online.wsj.com/article/SB10001424127887324338604578325912939001772.html or http://www.nti.org/analysis/opinions/next-steps-reducing-nuclear-risks-pace-nonproliferation-work-today-doesnt-match-urgency-threat/;
- George Shultz, William Perry, Henry Kissinger, & Sam Nunn, "Deterrence in the Age of Nuclear Proliferation," *WSJ,* 7 March 2011, http://online.wsj.com/article/SB10001424052748703300904576178760530169414.html or http://www.nuclearsecurityproject.org/publications/deterrence-in-the-age-of-nuclear-proliferation;
- George Shultz, William Perry, Henry Kissinger, and Sam Nunn, "A World Free of Nuclear Weapons," *Wall Street Journal,* 4 January 2007;
- George Shultz, William Perry, Henry Kissinger, and Sam Nunn, "Toward a Nuclear-Free World," *Wall Street Journal,* 8 January 2008;
- Jean D. Reed, Statement to House Armed Services Committee (HASC) on "DoD Investment in Technology to Meet Emerging Threats," 24 July 2011, http://armedservices.house.gov/index.cfm/files/serve?File_id=103eb0bf-3944-4ba6-a678-307b158e765a;
- Michele Acuto and Parag Khanna, "Nations are No Longer Driving Globalization - Cities Are," *Quartz,* 03 May 2013, http://qz.com/80657/the-return-of-the-city-state/;

- James Stavridis, "The Dark Side of Globalization," *WaPo,* 31 May 2013, http://articles.washingtonpost.com/2013-05-31/opinions/39658000_1_chemical-weapons-mass-destruction-cartels;
- *Bulletin of the Atomic Scientists* Doomsday Clock
  - Timeline: http://thebulletin.org/timeline
  - Overview: http://thebulletin.org/overview

Optional Podcast:

- KCRW's "To the Point" 31 December 2007**,** *Starts at ~7:30 min into the podcast* "When the Soviet Union developed nuclear weapons, the magazine *Bulletin of the Atomic Scientists* created the Doomsday Clock. As the prospect of nuclear war gets more likely, the minute hand gets closer to midnight. In January, when this program first aired, the hand was moved from seven minutes until midnight to five—the closest it's been since the Cold War. But there's a new twist: global warming has been added as an imminent threat to human kind."

  http://www.kcrw.com/news/programs/tp/tp071231doomday_scenarios_wh.

WEEK 2

16 January

Positivism and the scientific process
Causation, correlation, accuracy, precision, fact, law, theory, & hypothesis
What is "revolutionary"?

18 January

The central research question of *Guns, Germs, and Steel*
Theories on disparity in human societies and development
Flora and fauna
Agriculture and the rise of civilizations
Geography

Required Reading:

- Jared Diamond, *Guns, Germs, and Steel*, Prologue, Part 1, & Part 2.

Optional Reading:

- Jean-Pierre Bocquet-Appel, "When the World's Population Took Off: The Springboard of the Neolithic Demographic Transition," *Science,* 29 July 2011, pp 560-561, http://www.sciencemag.org/content/333/6042/560.full;
- Lyudmila N. Trut, "Early Canid Domestication: The Farm-Fox Experiment," *American Scientist,* March-April 1999, http://www.americanscientist.org/issues/page2/early-canid-domestication-the-farm-fox-experiment;

- David D. Zhang, Peter Brecke, Harry F. Lee, Yuan-Qing He, and Jane Zhang, "Global Climate Change, War, and Population Decline in Recent Human History," *Proceedings of the National Academy of Sciences,* December 2007, pp 19214-19219, http://www.pnas.org/content/104/49/19214.short.

WEEK 3

23 & 25 January

Germs
Pandemics, epidemics, endemics, & re-emerging infectious diseases

Required Reading:

- Diamond, *Guns, Germs, and Steel*, Part 3, Chapter 11;
- "Disease & Intelligence: Parasites and pathogens may explain why people in some parts of the world are cleverer than those in others," *The Economist,* 1 July 2010, http://www.economist.com/node/16479286.

Optional Reading:

- Ann M. Becker, "Smallpox in Washington's Army: Strategic Implications of the Disease During the American Revolutionary War," *The Journal of Military History*, April 2004, pp 381-430; http://muse.jhu.edu/journals/jmh/summary/v068/68.2becker.html;
- Michelle Gayer, Dominique Legros, Pierre Formenty, and Maire A. Connolly, "Conflict and Emerging Infectious Diseases," *Emerging Infectious Diseases,* November 2007, pp 1625-1631, http://wwwnc.cdc.gov/eid/article/13/11/06-1093_article.htm;
- David P. Fidler, "Influenza Virus Samples, International Law, and Global Health Diplomacy," *Emerging Infectious Diseases,* January 2008, pp 88-94, http://wwwnc.cdc.gov/eid/article/14/1/07-0700_article.htm;
- Philip Munz, Ioan Hudea, Joe Imad, and Robert J. Smith, "When Zombies Attack! Mathematical Modelling of an Outbreak of Zombie Infection," in *Infectious Disease Modelling Research Progress,* J.M. Tchuenche and C. Chiyaka (eds), 2011, pp 133-150, http://mysite.science.uottawa.ca/rsmith43/Zombies.pdf.

WEEK 4

30 January & 1 February

Writing
Inventing & innovation
Dispersion of knowledge

Required Reading:

- Diamond, *Guns, Germs, and Steel, Part 3,* Chapters 12 & 13.

Required Podcast:

- WNYC's "The Gun Heard Round the World," 28 December 2007
  "The AK-47, one of Russia's most popular exports, turned 60 this year. Michael Hodges, author of *AK47: The Story of the People's Gun*, says that the weapon Mikhail Kalashnikov invented to defend his motherland has become a symbol of Third World revolutionary struggle and Islamic jihad."
  http://www.onthemedia.org/2007/dec/28/the-gun-heard-round-the-world/.

Optional Reading:

- Barry Berman, "3-D Printing: The New Industrial Revolution," *Business Horizons,*March-April 2012, pp 155-162; http://www.sciencedirect.com/science/article/pii/S0007681311001790;
- Brian Fung, "Why Cody Wilson, the 3D-printed gun maker, thinks 3D printing might not take off," *Washington Post,* 6 August 2013, http://www.washingtonpost.com/blogs/the-switch/wp/2013/08/06/why-cody-wilson-the-3d-printed-gun-maker-thinks-3d-printing-might-not-take-off/;
- Samuel H. Huang, Peng Liu, Abhiram Mokasdar, and Liang Hou, "Additive Manufacturing and its Societal Impact: a Literature Review," *Int J Adv Manuf Technol,* 2013, pp 1191-1203; http://link.springer.com/article/10.1007/s00170-012-4558-5;
- Mark Z. Taylor, "Toward an International Relations Theory of National Innovation Rates," *Security Studies, 2012,* pp 113-152, http://www.tandfonline.com/doi/pdf/10.1080/09636412.2012.650596.

Optional Podcast:

- WNYC's "A Gun You Can Print at Home," 02 November 2012
  "Cody Wilson, who leads Defense Distributed, is working on an open-source schematic that will let people print out a plastic pistol at home using a 3D-printer. Wilson talks to Bob about his project, and explains why he's not worried the guns will fall into the wrong hands."
  http://www.onthemedia.org/2012/nov/02/gun-you-can-print-home/.

WEEK 5

6 & 8 February

Organizations & institutions
Theories & characteristics of complex societies
Diamond's vision for future

Required Reading:

- Diamond, *Guns, Germs, and Steel*, Part 3, Chapter 14, Part 4, Epilogue & Afterward;
- Jason Pontin, "You Promised Me Mars Colonies.Instead I Got Facebook: Why We Can't Solve Big Problems," *MIT Technology Review,* November/December2012,

http://www.technologyreview.com/featuredstory/429690/why-we-cant-solve-big-problems/.

Optional Podcast:

- *MIT Enterprise Forum of Cambridge,* Jason Pontin on "Why Can't We Solve Big Problems?" 13 March 2013, http://video.mitef.org/u5d9/jason-pontin-on-why-cant-we-solve-big-problems/.

Optional Reading:

- "Young and Restless Can Be a Volatile Mix ," *Science,* 29 July 2011, pp 552-554, http://www.sciencemag.org/content/333/6042/552.full;
- Lynne Zucker and Michael R. Darby, "Star Scientists and Institutional Transformation: Patterns of Invention and Innovation in the Formation of the Biotechnology Industry," *Proceedings of the National Academy of Sciences,* 12 November 1996, pp 12709-12716; http://www.pnas.org/content/93/23/12709.full.

WEEK 6

13 & 15 February

Atomic physics & start of the nuclear age
Science & secrecy
Nuclear testing

Required Reading:

- Joseph Cirincione, *Bomb Scare: The History and Future of Nuclear Weapons*, Introduction & Chapter 1.

Videos:

- Trinity test: http://www.youtube.com/watch?v=l8w3Y-dskeg
- Truman Warns Japan to Give Up "Atomic Bomb Newsreel" http://www.youtube.com/watch?v=9mYRHo_dBkw
- Little Boy Detonation at Hiroshima:
  - http://www.youtube.com/watch?v=0n1rqHo4XyM
  - http://www.youtube.com/watch?v=Xs3JE4WRL-8
- Hiroshima Shockwave simulation: http://www.youtube.com/watch?v=L93f0ePO33E&NR=1
- Castle Bravo Test: http://www.youtube.com/watch?v=FSgL_z6TMPQ
- Castle Test Commander's Report: http://www.archive.org/details/CastleCommandersReport1954

Optional Podcast:

- MIT Technology and Culture Forum with Joe Cirincione on "Bomb Scare: The History and Future of Nuclear Weapons," 13 December 2011, http://techtv.mit.edu/videos/16218-bomb-scare-the-history-and-future-of-nuclear-weapons

Optional Reading:

- OTA, *Technologies Underlying Weapons of Mass Destruction* (Washington, DC: OTA 1993), chapter 4, "Technical Aspects of Nuclear Proliferation," pp. 117-195, http://www.fas.org/spp/starwars/ota/934406.pdf.

Friday, 19 February – Progress report grades due

WEEK 7

20 & 22 February

Atoms for Peace
Arms control, disarmament, and nonproliferation
The Nuclear Non-Proliferation Treaty (NPT) & other treaties
Cooperative Threat Reduction (CTR)

Required Reading:

- Cirincione, *Bomb Scare,* Chapters 2-4.

Optional Reading:

- Scott D. Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security*, Winter 1996/97, pp 54-86, http://www.jstor.org/stable/2539273;
- Sam Nunn, "Away from a World of Peril," *Survival,* February-March 2012, pp 234–244, http://www.tandfonline.com/doi/abs/10.1080/00396338.2012.657556
- Richard G. Lugar, "Nunn-Lugar: Science Cooperation Essential for Nonproliferation Efforts," *Science & Diplomacy*, March 2012, http://www.sciencediplomacy.org/perspective/2012/nunn-lugar;
- Rich Kelly, "The Nunn-Lugar Act: A Wasteful and Dangerous Illusion," CATO Institute Foreign Policy Briefing, 18 March 1996, http://www.cato.org/publications/foreign-policy-briefing/nunnlugar-act-wasteful-dangerous-illusion;

WEEK 8

27 February & 1 March

Nuclear proliferation rings & AQ Khan
The US-India nuclear agreement: *atoms for mangoes?*

Required Reading:

- Cirincione, *Bomb Scare*, Chapter 5 & 6.

Optional Reading:

- Defense Science Board (DSB), Permanent Task Force on Nuclear Weapons Surety "Report on the Unauthorized Movement of Nuclear Weapons" originally released February 2008, revised April 2008, http://www.acq.osd.mil/dsb/reports/2008-04-Nuclear_Weapons_Surety.pdf;
- George Bunn, Chaim Braun, Alexander Glaser, Edward Lyman, and Fritz Steinhausler, "Research Reactor Vulnerability to Sabotage by Terrorists," *Science and Global Security*, 2003, pp 85-107, http://www.tandfonline.com/doi/abs/10.1080/714041032.

WEEK 9

6 & 8 March

Unsecured nuclear material & nuclear trafficking
Nuclear energy
Nuclear waste

Required Reading:

- Cirincione, *Bomb Scare*, Chapter 7 & 8.

Optional Podcast:

- WNYC's "Yes Nukes?" 28 September 2007
  "With climate change looming large in the national consciousness, nuclear energy is experiencing a PR makeover. This Monday saw the first proposal for new reactors in America since the Three Mile Island meltdown in 1979. We look into the evolution of nuclear energy's image," http://www.onthemedia.org/2007/sep/28/yes-nukes/

Optional Reading:

- Adam N. Stulberg and Matthew Fuhrmann (eds), *The Nuclear Renaissance and International Security*, Stanford University Press, 2013, http://www.sup.org/book.cgi?id=21105;
- *Bulletin of the Atomic Scientists* "Development and Disarmament" Roundtable, i.e., multiple contributors from Pakistan, Russia & India; June-August 2013, http://thebulletin.org/nuclear-deterrence-and-terrorism-implications-global-security.

WEEK 10

13 & 15 March

Flex week for MEK to catch up to calendar

WEEK 11

SPRING BREAK

WEEK 12

27 & 29 March

To be determined by class

WEEK 13

3 & 5 April

To be determined by class

WEEK 14

10 & 12 April

To be determined by class

WEEK 15

17 & 19 April

To be determined by class

WEEK 16

24 April

National Security Council Simulation

1 May: **FINAL EXAM** Tuesday 2:50PM
(//or/// Self-Assessment and Final Evaluation due)

One Last Thought

Collaboration, sharing ideas, etc.

"Talk about your ideas. Help your colleagues work out their problems. Pay attention to what other people are doing, and see if you can learn something, or if you can contribute.

"Other than the mundane goal of getting your degree, you are in school to push back the frontiers of knowledge. You do this by generating and exploring new ideas. There is no way that you will ever be able to explore all of the ideas that you generate, but some of those ideas that you discard might be just what some of your colleagues are looking for.

"Human nature tends to make us want to hoard our own ideas. You have to fight against that. Human nature also tends to make us treat other people's ideas with disrespect. The closer the idea to our own area of research, the more likely some part of our brain will try to find fault with it. Fight against that even harder.

"You will find many people in academia who give in to the dark side. These Stealth Researchers never discuss what they are working on, except in vague and deceptive terms. They are experts at finding fault with the work of their colleagues. The Stealth Researcher writes papers that make very grand claims, but you can never quite figure out what they've accomplished and what they haven't. He is a master at omitting the key detail of the design or process that would enable others to follow his work. The Stealth Researcher is a knowledge diode, a roach motel for information. He has replaced the fundamental goal of discovery and publication with the twin evils of ego and empire.

"Be open about what you are working on. Be honest about what you've done, and even more honest about what you haven't. Don't ever hide an idea for fear that someone will steal it, even if you are talking to a Stealth Researcher. With patience, maybe we can cure them."

Prof Kristofer S.J. Pister
Electrical Engineering and Computer Science
UC Berkeley