JACK MCDONALD

WAR, TECHNOLOGY, & INNOVATION

Contents

Prerequisites

This is the handbook for a course that I run at the Department of War Studies, King's College London. You will find all the administrative details for the course on KEATS. This includes, but isn't limited to: venues/timings for lectures and seminars, deadlines for assessments, my office hours/location. For your convenience, this handbook is available as a pdf file, ebook, and static website.[1]

[1] Please note that the formatting of the ebook might not be optimum.

- The pdf version of this handbook is available here.
- The ebook version of this handbook is available here.
- The website version of this handbook is available here.

0.1 Auditing

My auditing policy is simple: Students may audit this course so long as it does not disadvantage students who have opted to take the module for assessment. In practice, this means that so long as there is physical room to attend the lecture series, you have the option of auditing in person. It is unlikely that there will be space for students to audit the seminar component of the module, as seminars tend to be assigned with the optimum number of students for a seminar session.

Please note that the lecture sessions involve small-group discussions. I therefore require students attending lectures in person to have done the same reading as students on the module are expected to have done for these sessions. *Failure to do so may lead to me withdrawing my permission for you to audit the module.*

Please email me with your request to audit the course prior to attending.

0.2 Tasks to Complete Before The First Class

- Skim read this handbook
- Perform the baseline reflection task in Chapter 8
- Read the readings for week 1

1
Introduction

This chapter is designed to give you a big picture overview of the course, explains the course structure, sets some expectations for behaviour, and explains how to use the handbook.

1.1 The Idea

Why does military technology matter? What, if anything, separates military technologies from other types of technology? This course builds out from these kind of abstract questions to study the relationship between war, technology, and the changing character of warfare. A key feature of this course is that it avoids specfic focus upon individual military technologies and innovations, and will require you to consider the connections between war, warfare, and a variety of technologies beyond those with specific military applications.

The idea for this course is that we will look at the connection between war and technology, and processes of change, from a variety of different angles. The centrepiece for the course is a lecture series examining the relationship between war and technology, minus the weapons. In a parallel seminar series, we'll be examining the concept of military revolutions, and changing patterns of warfare in history.[1] The course is ultimately designed for you to develop your own particular research interest, and the second term builds upon the first with a structured research series designed so that the course can discuss their own research projects and get feedback from me. You will get to engage with my own research to see how many different aspects of the course function in academic research projects,[2] and in the final research series examine some of the wider problems involved in framing patterns of change in technology and warfare.

[1] This will involve a lot of weapons.

[2] From experience, this often leads to interesting discussions, because here you get to kick me in the shins, so to speak, with what you've learned over the course.

1.2 Course Structure

The course is designed a bit differently to other courses you may take. The course has six components:

- A series of core lectures
- A seminar series on the idea of military revolutions
- A research series of 5 lectures/5 seminars on technology and warfare
- A research series of 5 lectures/5 seminars on war and technology
- Group research work
- Your assessed work

Each of these are designed to work together, but also to stand independently of one another. That way, if one thing fails (a fire alarm causes a lecture cancellation, illness prevents you from meeting for group research, etc) then the rest can carry on regardless with minimal interruption.

If you are unable to make a teaching session (lecture or seminar), please complete an asynchronous learning task (detailed below). These are designed to enable students who cannot attend a teaching session in person to engage with the course material in a productive way. They should take no more than 15 minutes to complete, so should not add to your workload in a significant manner.

1.3 The Core Lecture Series: War and Technology Without the Weapons

In a nutshell, the primary lecture series is about the relationship between war and technology, minus the weapons. The purpose of this lecture series is to provide on overview of theories about the nature of technology, as well as processes of technological change, innovation, diffusion, transformation, and so on.

Each week we'll be covering a new theory or process, as well as discussing a new technology, and looking at if and how the development of that technology influenced war and warfare, however indirectly.

Please note that the lectures will be about two thirds lecture, and one third small group discussion/full cohort discussion.

1.4 The Seminar Series: Military Revolutions

The primary seminar series for this course examines theories and explanations for changes in the conduct and character of warfare, with a focus upon (you guessed it) the role technology plays in said theories and explanations. A key theme of this seminar is the examination

of periods of apparent rapid change, usually referred to as "military revolutions". These are usually cut-off points, or periodisation points, by which people slice and dice military history into before/after categories, even if the exact boundaries of a given military revolution are hazy, and, as we'll see, it is questionable whether they even exist.

1.5 The First Research Series: Not Much Ado About AEGIS?

The research series consists of five lectures, and five seminars that cover one of my research projects that relates to the course. The lectures will demonstrate the utility of approaching a contemporary issue of war and technology (lethal autonomous weapon systems) from an historical perspective. The seminars consist of counterpoints to the lectures, examining similar issues from a different theoretical perspective.

This research series is designed to complement the final evaluation for this module, with discussions to enable you to design your own 5000 word research project. The point of this first research series is that you will be using a substantial portion of your time in class to discuss and debate your own research projects. Unlike lectures in the first term, we will be paying specific attention to the practicalities of designing and conducting a research project in each and every class. Roughly 50% of the readings for this section of the course will relate to research design and research methods.

1.6 The Second Research Series: The Dinosaur Juice Killing Spree

The second research series addresses what I term the "periodisation problem" in the study of war and warfare. Unlike the first research series, there is no paper to accompany this section. Instead, we will be working through a substantial text (Vaclav Smil's *Energy and Civilisation*) and considering how periodisations of technology align, or fail to align, with periodisations of warfare and military technology. In this series of lectures and seminars, we will focus upon the transition to "high energy societies" that accompanied the use of fossil fuels, internal combustion engines and gas turbines.

The workload in this last quarter of the course is intended to be lighter, as it is designed to give you more time to focus upon your own research essay for assessment.

1.7 Group Research Work

Group projects are a core element of the course, but they are not part of your formal assessment. The group projects are designed to get you used to performing research as a team. For this reason, don't be intimidated by the scale of the output required - it is calibrated to be too much for an individual, but easily manageable for a small group.

There are three projects: a literature review, a case study, and a study of continuity/change over a randomised 100 year time period. Full details can be found in chapter 10.

1.8 Your Assessed Work

The assessments for this course are a 2500 word literature review and a 5000 word research essay on a topic of your own choosing. I am open minded about your disciplinary approach/topic for the research essay so long as you can justify a connection to the course. The course is designed to enable you to perform both tasks. The assessed literature review comes after group work on a similar task, and guidance for the 5000 word essay is built into the lectures of term 2.

1.9 Teaching Session Structure

There are two types of teaching session on this course: lectures and seminars. They will run a little different to how you may have been taught before, or may be taught in other modules. You will be discussing questions in small groups (3-5 students) throughout both sessions. I will call on groups to explain their agreement, or disagreement, over the answer to the question in a whole-class discussion after each small group discussion. I ask that a different person explains their group's discussion each time, so that this task does not fall on one person's shoulders.

Lectures are lecture/seminar sessions. That means that you will be engaging in small group discussion at points throughout the teaching session. The other type of teaching session is the seminar. These run as small group discussions, leading to a class discussion. There are two questions each week. One is about the readings, the second is designed to connect the theory discussions to a case study. Again, please read the set question ahead of the session and consider your answer to them prior to the class.

1.10 Asynchronous Learning Tasks

Asynchronous Learning Tasks are small tasks that are designed to enable students not physically present in teaching sessions to engage with the course. If you know that you will not be able to attend a teaching session, please complete one ahead of the session. If you are unable to make a teaching session at short notice, please complete one within 2 working days.[3] There will be a post on the News forum on KEATS for each week of the class. Please reply to it to complete your Asynchronous Learning Task. Please keep posts short (150 words maximum) as this isn't intended to add significantly to your workload.

[3] I have to write this guide prior to knowing the day/time of teaching sessions, but I'm not going to ask you to work weekends. If you are ill for an extended period, please complete the task within 2 working days of being healthy.

Asynchronous Learning Tasks:

- Identify a relationship between one of the readings for this session and one from a prior teaching session that you find interesting. Explain the reason for your interest.
- Identify and explain a key argument in one of the readings from the session that you disagree with. Explain your disagreement. If possible, provide a link to a piece of academic work that supports your disagreement.
- Respond to one of the discussion questions (found in the lecture slides, or the set questions for the seminar). Remember to identify the question you're responding to!
- Identify a connection between the lecture or seminar theme and a contemporary conflict. Explain the connection and provide a link to a digital resource that enables the reader to understand the theme in the context of the conflict.

1.11 Course Expectations

Here is where I read you the riot act ahead of schedule. Just kidding. There is one hard and fast rule for this course: Stay in contact. I aim to be available via email Monday - Friday during normal work hours.[4] Please also be considerate of your fellow students when working together on group projects and don't expect them to be available outside normal working hours.[5]

[4] That's 0900-1800. Generally speaking I process my inbox once a day. I may answer emails at other times, but please do not expect immediate replies at weekends.

[5] That's 0900-1800, Monday to Friday.

As you may have noticed, this course places a heavy emphasis on group learning (small group discussions, seminars, small group projects). My starting assumption is that everyone is an adult, and is here to learn. I therefore expect that people will approach discussions and group work with respect for each other. In particular, please be aware that other students may have to balance their studies with work or care commitments. If you are unable to devise a way of working around such issues, please contact me.

The core reading for this module is intentionally short (4-5 articles/chapters total per week), and this is the amount of reading that will enable you to engage with the course. I understand that not all students are able to dedicate 100% of their time during their MA to learning, so don't worry if circumstances mean you can't do the reading for a week. Try to catch up if you can, and email me if you get into trouble. That said, reading one article is better than nothing.

1.12 Attendance and Asynchronous Learning Tasks

All elements of this course are compulsory (including attendance at teaching sessions). However, I understand that students balancing significant outside commitments may on occasion be forced to miss sessions. If you are unable to make a session, please keep up with the reading, and please keep in contact with group members for research projects.

If you have to miss a session, please let me know, and complete an Asynchronous Learning Task, detailed above.

1.13 How To Use This Course Handbook

Chapters 2 - 5 contain guides to the course readings, case studies, lectures and seminars. Chapter 8 provides a guide to developing your skills over the course of this module, including a basic guide to producing academic work. Chapters 9 and 10 are guides to the assessments for the course, and group project work. Chapter 11 provides extension material, and there is a bibliography for all work cited in this handbook.

2
Reading

War, warfare, and technology are three very big topics. Analysing the relationship between the three, and related processes of change, is, in essence, too big for a single degree, let alone a module. The idea for this course is that it provides a graduate-level foundation that will enable you to follow your own interests. Attending classes, and doing the relevant readings, will enable you to see how things mesh together. One of the key points is that you should be able to identify similar ideas, or even counterpoints, that exist in different bodies of academic literature on war and technology. This section is designed to give you some starting points. You'll find some of these works in the week by week reading for the classes, but some won't be found there. It is crafted out of false binaries for presentation reasons only.

2.1 Where do I start?

The large majority of the course material will deal with technology from the early modern period onwards, but it's good to read a general history of technology in world history to get an understanding of where bits and pieces fit together. I suggest skim reading Daniel Headrick's (2009) *Technology: A World History*, or *Science and Technology in World History* by James E. McClellan III, and Harold Dorn (2015). In addition, chapters 1 and 13 of Eric Schatzberg's (2018) *Technology: Critical History of a Concept* will give you a good idea of some of the linguistic/definitional problems going on.

From the military side of things, a lot of what we'll be reading in class is built around Wayne E. Lee's (2016) *Waging War*. Again, I suggest skimming it to get an idea of where different pieces of military history that you've heard about fit together. If you are interested in military history itself, *What is Military History?* by Stephen Morillo and Michael Pavkovic (2017) is a good place to start. If you have a spare day or two, you may enjoy reading John Keegan's (1994) *A History of Warfare*.

Finally, for the union of the two, that is, military technology, there are a bunch of "big books" that provide overviews of the history of military technology (usually heavy on weapons and weapons systems). For starters, there is Martin Van Creveld's (1989) *Technology and War*, as well as Jeremy Black's (2013) *War and Technology*.[1] If you are looking for something short and to the point, Alex Roland's (2016) *War and Technology*[2] won't take you longer than a couple of hours to get through. You can also check out Bernard Brodie and Fawn Brodie's (1973) *From Crossbow to H-Bomb*, Trevor M. Dupuy's (1984) *The Evolution of Weapons and Warfare*, and Robert L. O'Connell's (1989) *Of Arms and Man*. These latter three are a little dated by now.[3] When reading any of these texts, you should keep a couple of things in the forefront of your mind. One is the range of variables under consideration. Often this is quite small.[4] Second is the implied or described causal mechanisms. A key thing that we will be discussing over the course is the concept of technological determinism, and it can often creep in by the back door.[5] The history of weapons is on one hand a history of technologies that enable greater efficiency in killing, but it is also one of weapons and weapon systems developed in a given social/political context. A good canary-in-the-coalmine is whether the author describes the invention of the stirrup as having caused the development of shock cavalry. For an overview of why this is controversial, and contains technological determinism, read Alex Roland's (2003) review article on the subject.

[1] Who needs search engine optimisation?

[2] Okay, so I'm dropping subtitles for comedic effect, but you get my drift.

[3] This is a polite way of saying that I'm recommending you read one or two to get a feel for how this stuff is usually discussed, not for accuracy.

[4] Sometimes it's just technology and warfare and not much else

[5] Step 1: Weapon changes warfare. Step 2: Warfare changes society.

2.2 War or technology?

"I am more interested in technology than warfare."

Cool. Good starting points are George Basalla's (1988) *The Evolution of Technology*, and Wiebe E. Bijker el al's (2012) *The Social Construction of Technological Systems*. Pay attention to Basalla's use of military factors as a selective pressure (chapter 5) and Donald Mackenzie's chapter in Bijker on inventing misssile accuracy.

"Guns. Lots of guns."

Okay. Chances are that you're going to be interested in how technologies alter patterns of warfare. For history, try reading Wayne E. Lee's (2016) *Waging War*. You may, however, be more interested in technology and strategic theory, for that, try Barry Buzan's (1987) *An Introduction to Strategic Studies*.

2.3 Technology: Theory or more theory?

"I want enough to get my head around what people mean by technology."

Try chapter 1 of Mary Tiles and Hans Oberdiek's (2005) *Living in a Technological Culture* for starters. Sergio Sismondo's (2010) *An Introduction to Science and Technology Studies* features heavily in the course and gives a wide overview. You should also read Wendy Faulkner's (2001) *The Technology Question in Feminism* and my personal favourite work on the subject is Ursula M. Franklin's (1992) *The Real World of Technology*.

"I am willing to dedicate a non-negligible portion of my remaining lifespan to understanding the theoretical implications of technology."

Well, you asked for it. I'd suggest going to Robert C. Scharff and Val Dusek's (2013) *Philosophy of Technology* and reading the intro section to each collection of articles/chapters. From there, pick the sections that interest you, and go wild. Regardless of interest, I'd suggest you read Martin Heidegger's[6] (2013) *The Question Concerning Technology* and Hannah Arendt's[7] (2013) *The "Vita Activa" and the Modern Age* contained within the volume.

[6] NB: Heidegger was a Nazi, and also one of the most important philosophers of the 20th Century.

[7] Hannah Arendt was one one of the most important political theorists of the 20th Century, and definitely not a Nazi.

2.4 War: Theory or more theory?

"To tell you the truth, I have very little interest in wading through *On War*."

That's fine. Very few people make it through Clausewitz. You should, however, familiarise yourself with Clausewitz's (1984) definition of war, and Book 1 of *On War* at the very least. In addition, try reading chapter 1 of Beatrice Heuser's (2010) *The Evolution of Strategy*, and chapters 6-8 of Lawrence Freedman's (2015) *Strategy: A History*.

"Actually, this whole military theory thing seems rather interesting."

There's three kinds of theory that you might be interested in learning about. One is high level theorisation of what war is. Obviously there is the aformentioned *On War*, but you might also wish to read up on challenges to this model, such as Martin Van Creveld's (1991) *The Transformation of War* or Mary Kaldor's (2013) *New and Old Wars*. You can look at strategic theory from an historical perspective - Beatrice Heuser's book is a good place to start, and a key author to read is Jomini, who serves as something of a counterpoint, intellectually, to Clausewitz's way of thinking about war. In contemporary terms, you might also wish to wade through the works of Colin S. Gray (2006); (2010), Hew Strachan (2013), and Edward Luttwak (2001).[8] Lastly, you should read up on the definitions of war used in

[8] Luttwak, also the "give war a chance" guy because of Luttwak (1999).

political science, notably those associated with key datasets like the Correlates of War Project's COW War Data, 1816-2007, and its Militarized Interstate Disputes dataset. There is also the UCDP/PRIO Armed Conflict Dataset, and the Armed Conflict Location & Event Data Project's dataset.

2.5 Empirical Change: What kind of timeframes interest you?

"I like to look at individual case studies where theory testing is a possibility."

Hey, you're in luck. One of the building blocks of Science & Technology Studies is the study of controversies, or specific points of change. Try chapter 11 of Sismondo (2010). Equally, in military adaptation and innovation[9] attention is often focused upon key adaptations or innovations. To get a feel for it, try Nina Kollars' (2015) work on Vietnam and Iraq, or Aimée Fox's (2017) *Learning To Fight*.

[9] These are two related bodies of theory that look at military change in different ways

"I prefer long-term processes, even if cause and effect is less clear."

One of the interesting things about technological change is that the full political and social ramifications of an innovation may not be readily apparent until a century or two after the inventor or innovators have died. If these kind of long term processes interest you, it's probably better to start with a general class of technology. A good one is information and communications technology. Try James Gleick's (2012) *The Information* for a relatively easy read. We'll be reading Vaclav Smil's (2017) *Energy and Civilisation* for the course, so you could double up reading here.

2.6 Military Technology: What changes are you interested in?

"I like big battles and I cannot lie."

This isn't a course about operational art, or tactics, but it is undeniable that operational or tactical problems are a key driver for military innovation and adaptation. From a military history perspective, some of the interesting questions are how and why certain technologies gave a military force an edge in a given conflict. We'll be reading Wayne Lee's (2016) book for the course. A good case is the interplay of politics, railways, artillery, and rifles of the Franco-Prussian war, see Michael Howard's (2001) book on the subject. For a longer-term perspective, there is William McNeill's (1982) *The Pursuit of Power*, although it overplays the technology a bit. Alternately you can look at the adaptation/innovation literatures, such as Nina Kollars (2015) and

Aimée Fox's (2017) work mentioned above. In addition, you can also look at defence planning, either from a state perspective (see Colin S. Gray's (2016) book on the topic) or from the perspective of individual services. Thomas Mahnken (2010) has a good book on inter-service rivalry and weapons procurement, and Theo Farrell's (1997) book *Weapons Without a Cause* is a really good study on the wider politics of weapons acquisition.

"I'm more interested in institutions and social structures myself."

Okay, an obvious place to start is military institutions, and Mahnken (2010) is again a good place to start. Another key entry work is *The Social History of the Machine Gun* by John Ellis (1986). My (2017) last book, *Enemies Known and Unknown* looks at the relationship between institutions, norms, and technology. When looking at military technology from an institutional perspective, it's good to be aware that a lot of talk is about the transformation of institutions themselves. This is found in work on the Revolution in Military Affairs, such as Adamsky (2008) and Stone (2004a). However you should probably read wider on the concept of "military transformation" - but also in work on military transformation, see Farrell et al. (2013) for a start. Other avenues of study are critical perspectives on military procurement and innovation. Matthew Ford's (2017) *Weapon of Choice* is an interesting book on the construction of knowledge around weapon systems. Also it's good to look at critical engagements with the underlying assumptions of these structures. Cynthia Enloe's (2014) *Bananas, Beaches and Bases* is a good work to start with, as is Carol Cohn's (1987) *Sex and Death in the Rational World of Defense Intellectuals.*

3
Primary Lecture Series

In a nutshell, the primary lecture series is about the relationship between war and technology, minus the weapons. The purpose of this lecture series is to provide on overview of theories about the nature of technology, as well as processes of technological change, innovation, diffusion, transformation, and so on.

Each week we'll be covering a new theory or process, as well as discussing a new technology, and looking at if and how the development of that technology influenced war and warfare, however indirectly. Some of the technologies are weird and some of them push at the boundaries of what might be considered a technology[1] but I think there's a good case for all the technologies listed below to be considered as important as many military technologies in shaping the character of warfare.

[1] Slavery, for instance, is usually approached as a political/social/moral question, which we will consider, but we'll be more focused upon the networks of physical and intangible technologies that sustained slavery in the Americas

3.1 Course Introduction: What's the Difference Between a Coffee Mug and an F-35?

This lecture will cover the basics of the course, and there will be an opportunity to discuss administrative issues and so on. The focus of this lecture is to sketch a map of different theories of technology, and related theories about technological change and diffusion. The lecture will cover key terms, concepts, and theories.

A key feature of the lecture is a discussion of the difference between the study of science, technology, and society in general, and the discussions of technology found in military history, strategic studies, and security studies.

- Discussion Question:
  - What makes a technology a military technology?
- Reading:

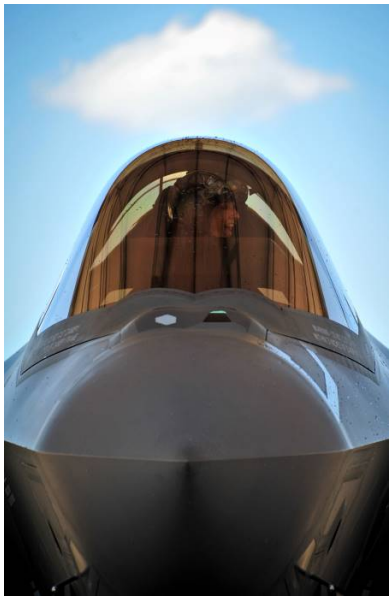

Figure 3.1: 400,000 dollars buys one F-35 helmet, or 2 months of coffee for our PhD students.

- Tiles, Mary, and Hans Oberdiek. *Living in a Technological Culture: Human Tools and Human Values*. Routledge, (2005), Chapter 1.
- Law, John. "STS as Method." In *The Handbook of Science and Technology Studies*, edited by Ulrike Felt, Rayvon Fouché, Clark A. Miller, and Laurel Smith-Doerr, Fourth Ed., 31–58. MIT Press, (2017).
- Pinch, Trevor J., and Wiebe E. Bijker. "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other." *Social Studies of Science* 14, no. 3 (1984): 399–441.

3.2 Agriculture

Okay, time to think big. I think there's a good argument that you could split the history of warfare into pre-agrarian and post-agrarian history. Why? Because it's extremely rare for large complex polities to arise without the population density that agriculture enables.

At the same time, according to some lines of thinking, it really sucked to be an early agriculturalist. By many measures, life was harder for those sticking in one place to harvest crops than for those following pre-agricultural patterns of life. So why did agriculture spread, and go on to sustain over 7.5 billion human beings? We'll look at this with a couple of theories, notably technological determinism, and theories relating to the diffusion of technological innovations.

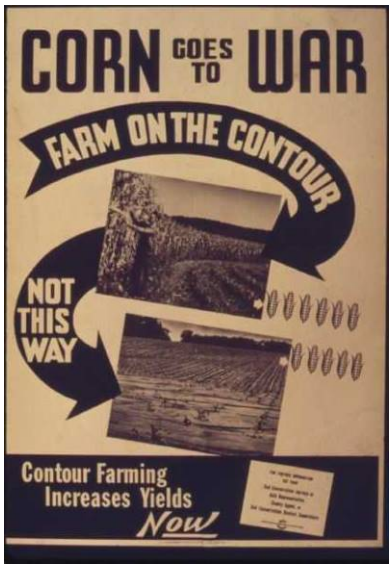

Figure 3.2: Information poster, USA, World War II.

- Discussion Question:
  - Are any technologies apolitical?
- Reading:
  - Hughes, Thomas P. "The Evolution of Large Technological Systems." In *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, edited by Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, Anniversary Edition. MIT press, (2012) :45–76.
  - Basalla, George. *The Evolution of Technology*. Cambridge University Press, (1988). Chapters 1 & 2
  - Rogers, Everett M. *Diffusion of Innovations*. Fifth Edition. Free Press, (2013). Chapter 1

3.3 Marine Chronometers

Many cultures throughout history have taken to the open waters, often using astral navigation to travel long distances in a predictable

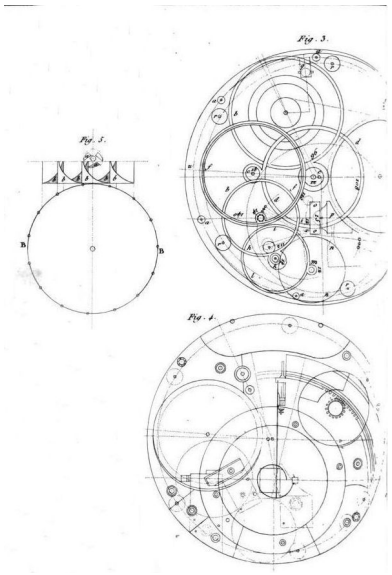

Figure 3.3: Drawings of Harrison's H4 chronometer of 1761.

fashion. Yet it wasn't until 1761 that John Harrison overcame created the first workable stable marine chronometer that enabled the precise determination of a ship's longitude. Why is that?

This week we'll be looking at how people think about, and theorise, the origins of technological innovations, as well as the structures that enable innovation. Are inventors genius figures who bring new technologies into being through intellect and imagination? Or are they simply our way of personalising somewhat random processes of tinkering and change? Moreover, we will be discussing the origins and construction of problems that technologies sometimes solve.

- Discussion Question:
  - Do inventors deserve all the credit for their inventions?
- Reading:
  - Mumford, Lewis. *Technics and Civilization*. University of Chicago Press, (2010). Chapter 1
  - Sismondo, Sergio. *An Introduction to Science and Technology Studies*. Second edition. Wiley-Blackwell, (2010). Introduction and Chapter 8
  - Rogers, Everett M. *Diffusion of Innovations*. Fifth edition. Free Press, (2013). Chapters 2 & 3

3.4 The Cotton Gin

Capitalist slavery, particularly systems of property rights that enabled ownership of human beings, incorporates many different intangible technologies alongside tangible artifacts. This week we will be studying the "Triangular Trade" which involved the enslavement of human beings in West Africa, their purchase and transportation to plantations across the Atlantic, to produce consumer products such as sugar, that were then sold in Europe for profit.

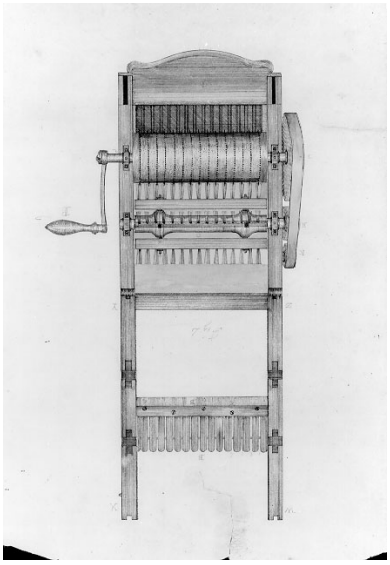

Figure 3.4: Drawing of Eli Whitney's cotton gin, circa 1795.

The focus of this week's lecture is not just upon the forms of warfare and violence conducted to sustain and protect this trade, but also upon what it means to frame and analyse social and political structures in technological terms. As we look for technologies, and seek to analyse the impact, influence, or spread of technology, what do we leave out? Here, the obvious question is how to consider the relationship between ideas of race and racism, and the core set of questions that this course is focused upon.

- Discussion Question:
  - Is it possible to study the intangible aspects of technology in the same way we study artifacts?

- Reading:
  - Winner, Langdon. "Do Artifacts Have Politics?" *Daedalus* 109, no. 1 (1980): 121–36. `http://www.jstor.org/stable/20024652`.
  - Wyatt, Sally. "Technological Determinism Is Dead; Long Live Technological Determinism." In *The Handbook of Science and Technology Studies*, edited by Edward J. Hackett, Olga Amsterdamska, Michael E. Lynch, and Judy Wajcman, Third ed., 165–80. MIT press, (2008).
  - Rogers, Everett M. *Diffusion of Innovations*. Fifth edition. Free Press, (2013). Chapter 4
  - Cowan, Ruth Schwartz. "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology." In *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, edited by Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, Anniversary ed. MIT press, (2012).

3.5 Electro-mechanical telegraphy

This week's lecture will primarily focus upon the invention of electro-mechanical telegraphy and the development of submarine communications cables. As such, we will be continuing discussions from last week upon the relationship between capital, technology, and innovation. However the primary focus of this week will be the role of information technologies in the distribution of authority within polities.

Figure 3.5: Map showing the telegraph lines in operation, under contract, and contemplated, to complete the circuit of the globe.

As a wider point, we'll be looking at the role of infrastructures, both national and international, in politics and war. The history of communications infrastructure in the 19th century cannot be readily separated from transport infrastructure. In the contemporary world, there are many different types of national infrastructure (notably sanitation and power) that are necessary to sustain human societies.[2] As such, we'll be looking at the emergence of new types of strategic targeting alongside stable infrastructures, and how these cause, and have caused, significant strategic and moral problems for differentiating between civilian and military targets.[3]

- Discussion Question:
  - Are the economic consequences of technology more important in strategic terms than their military utility?
- Reading:
  - Müller, Simone. *Wiring the World: The Social and Cultural Creation of Global Telegraph Networks*. Columbia University Press, (2016). Chapter 1
  - Beauchamp, Ken. *A History of Telegraphy: Its Technology and Applications*. Institution of Electrical Engineers, (2000). Chapter 4

[2] One should not, however, assume that government-supplied infrastructure is present in every society, nor that such infrastructure is uniform in its supply of public goods. Just ask anyone trying to watch Netflix in the rural fringes of the UK's telecommunications networks.

[3] Of course, this assumes that one cares about such distinctions, which is not true of all conflicts, e.g. the current Syrian civil war.

3.6 Nitroglycerin

The seminar series goes into considerable detail about things that go "boom" in order to kill people. In this lecture, we'll focus upon the development of industrial explosives in the 19th Century. In particular, we'll be looking at the impact that dynamite, and subsequent industrial explosives, had on increasing access to natural resources. In this context, industrial explosives also provide a good way to address the processes that made up the industrial revolution itself. We will primarily be discussing Jan De Vries' concept of the "industrious revolution" as a means of analysing when the industrial revolution really occurred.[4]

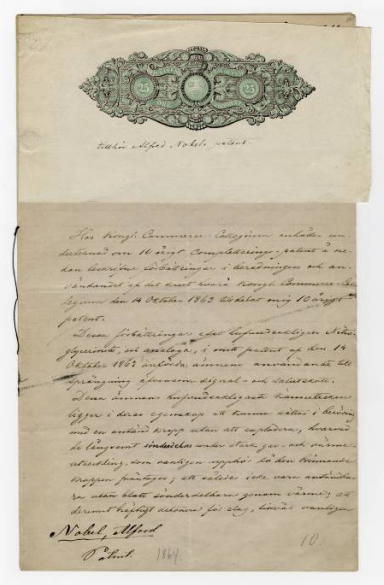

Figure 3.6: Alfred Nobel's application for patent, regarding his percussion cap and principles for initial ignition of nitroglycerine, 1864.

[4] This of course implies that something like a "revolution" did occur, which you're welcome to question.

Of course, you can't really discuss the onset of high explosives without also considering their impact on warfare. This lecture introduces the idea of the "periodisation problem" that we'll cover in more depth in term 2. In a nutshell, if you are to periodise warfare by a technology, or cluster of technologies, where do you draw the line? What does that start point do to your framing of a period of history? Typically, black powder/gunpowder is the key frame of periodisation by chemical energy. This framing foregrounds the lethality of weapon systems utilising explosives. An alternate, that I'll talk about here, is beginning

with high explosives. Why? Not just because they kill more people, but because it's the effective start point for weapon systems that kill people long after wars have ended. As such, we'll end the lecture looking at the long-term problems of unexploded ordnance, landmines, and improvised explosive devices.

- Discussion Question:
  - How does technology shape the division of the history of war and warfare?
- Reading:
  - Bayly, C. A. *The Birth of the Modern World, 1780-1914: Global Connections and Comparisons*. Wiley-Blackwell, (2004). Chapter 2
  - Vries, Jan De. "The Industrial Revolution and the Industrious Revolution." *The Journal of Economic History* 54, no. 2 (1994): 249–70. `http://www.jstor.org/stable/2123912`.

3.7 Barbed wire

In this lecture we'll look at the development of barbed wire. It is an extraordinarily ubiquitous technology, and one that exists in the present in much the same form as it existed in the past.[5] We will be discussing the political contexts of barbed wire deployment, notably in the dissection of tracts of the American west into fenced-off parcels of land. As such, we'll also discuss the impact that technological possibilities can have. Barbed wire makes it easy for human beings to create cattle pens, but it also makes corraling human beings into concentration camps a damn sight easier. The implications of this should be obvious to anyone with a passing knowledge of 20th Century history.

At the same time, barbed wire also serves as a good means of discussing the legal and political context of technological innovations. At face value, maybe we might say that barbed wire has an inherent power to control the movements of livestock and humans. However much of its practical use is to enable the enforcement of legal, political, or social authority in an efficient manner. What, then, is the relationship between power and its technological means? Moreover, when considering such questions, we often foreground specific usages of a technology, while ignoring others. Should we, for example, focus upon barbed wire's role as a technology of control, and ignore the development of rural communications networks that functioned on networks of barbed wire fences?

- Discussion Question:

Figure 3.7: The Berlin Wall, 1961.

[5] Although much of what is now called barbed wire is technically razorwire.

  - Why do some people read inherent power relationships into different technologies?

- Reading:

  - Rogers, Everett M. *Diffusion of Innovations*. Fifth edition. Free Press, (2013). Chapters 5 & 6
  - Forth, Aidan. *Barbed-Wire Imperialism: Britain's Empire of Camps, 1876-1903*. University of California Press, (2017). Chapter 4

3.8 Nomograms

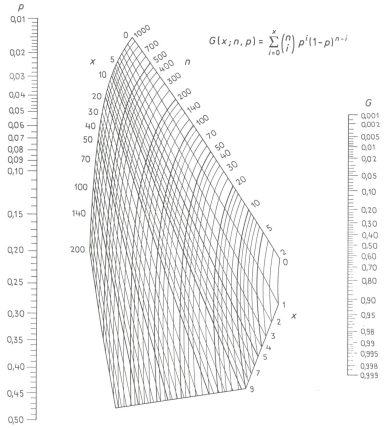

Figure 3.8: By drawing a straight line between the axes, you can solve some pretty tough equations.

In this lecture we'll be discussing what is pretty much a dead technology. Why? Well, one thing is that our histories of technology are usually biased towards inventions that we currently use, or successful technologies. We pay more attention to the processes of innovation than to processes of obsolescence. Nomographs are functionally obsolete. Once perhaps the only way to enable lots of people to do hard computation in a given domain, they have pretty much gone the way of the dodo. How did that happen? As we'll cover in class, the obsolescence of nomographs and nomography is not a straghtforward matter. Understanding the problems of replacing nomographs is also a good way to understand the limits of early digital computers.

A second reason to examine nomographs is that they are artifactual remnants of early computation. Nomographs, like many early forms of tabulated mathematical output, enabled individuals to perform calculations without needing to understand the underlying processes or theory. This becomes particularly important in a military context, like, when you need to figure out how to hit a moving target at long range with an artillery shell or rocket. As such, nomographs provide a good way to consider the ways in which technology can extend the human self. After all, if you are entirely reliant upon a technology for your day-to-day life, at what point is it better to talk of cyborgs rather than humans?

- Discussion Question:

  - What use is it to study dead, defunct, and failed technologies?

- Reading:

  - Haraway, Donna. "A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s." *Australian Feminist Studies* 2, no. 4 (1987): 1–42. `https://doi.org/10.1080/08164649.1987.9961538`. Full text can be found online here

- Rosenthal, Caitlin. "Numbers for the Innumerate: Everyday Arithmetic and Atlantic Capitalism." *Technology and Culture* 58, no. 2 (2017): 529–44.
- Light, Jennifer S. "When Computers Were Women." *Technology and Culture* 40, no. 3 (1999): 455–83.

Figure 3.9: Four level highway interchange, Los Angeles.

3.9 Reinforced concrete

Imagine what your city would look like if the tallest building was your local cathedral or castle. Over the last 150-odd years, reinforced concrete has fundamentally reshaped the urban environment, enabling everything from sky scrapers to ICBM silos. It is partly the reason why human beings are now a primarily urban species. This lecture covers the development of reinforced concrete, and surveys a handful of its myriad applications.

The theoretical part of this lecture will focus upon the idea of technological imaginaries. One of the reasons for this is that reinforced concrete has enabled generations of architects and designers to essentially run riot with their imagination, unbound from prior material constraints. We can find similarities, therefore, between reinforced concrete, bakelite, plastics, and even digital technologies.

- Discussion Question:
  - Is the technological imagination of today anything more than the technological constraints of tomorrow?
- Reading:
  - Slaton, Amy E. *Reinforced Concrete and the Modernization of American Building, 1900-1930*. Johns Hopkins University Press, (2001). Chapter 5
  - McNeil, Maureen, Michael Arribas-Ayllon, Joan Haran, Adrian Mackenzie, and Richard Tutton. "Conceptualizing Imaginaries of Science, Technology, and Society." In *The Handbook of Science and Technology Studies*, edited by Ulrike Felt, Rayvon Fouché, Clark A. Miller, and Laurel Smith-Doerr, Fourth edition. MIT Press, (2017).
  - Bijker, Wiebe E. "The Social Construction of Bakelite: Toward a Theory of Invention." In *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, edited by Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, Anniversary edition. MIT press, (2012).

3.10 Penicillin

If you put too many human beings together in one spot, then it is almost inevitable that they will begin to suffer and die from communicable diseases. Viewed from this perspective, much of the history of war consists of organising an unsustainable number of human beings, and hoping to defeat the other unsustainable mass of human beings before things like dysentery kill too many of one's own for them to be effective.

This week we'll be looking at the development of penicillin, but with a particular emphasis on the role that markets play in the maturation of technologies and innovations. We'll also examine the role that militaries play in the creation and subsidisation of markets. As such, it's a good way to discuss the impacts that war can have on the developments of technology itself.

Figure 3.10: Glass phial of British Standard penicillin.

- Discussion Question:
  - How do technologies move from the military sphere to general use?
- Reading:
  - Bud, Robert. "From Germophobia to the Carefree Life and Back Again: The Lifecycle of the Antibiotic Brand." In *Medicating Modern America: Prescription Drugs in History*, edited by Andrea Tone and Elizabeth Siegel Watkins. NYU Press, (2007). **Available online here**
  - Tyabji, Nasir. "Gaining Technical Know-How in an Unequal World: Penicillin Manufacture in Nehru's India." *Technology and Culture* 45, no. 2 (2004): 331–49. `http://www.jstor.org/stable/40060744`.

3.11 Intermodal freight transport and the TEU

This is about as close as we get to the modern day in terms of innovations/technologies in the lecture series. The final lecture is going to cover the origins of intermodal freight transport, and the development of twenty foot equivalent units. This leads us to what is, I think, one of the really interesting features of contemporary warfare and technology, which is the degree of technical standardisation and uniformity across the globe governed by a wide variety of standards organisations, economic imperatives, and political bargaining. In essence, we'll be discussing the idea of "technology as specification".

For the theoretical side of this, we'll be returning to the theme of infrastructure, but this time with an emphasis on path dependence.

We'll also look at long term consequences of innovations. For example, the advent of intermodal transport put a whole load of dockworkers out of work, and the gradual automation of the industry has increased the decline in jobs provided for by the shipping industry. At the same time, cheap shipping has enabled vastly increased volumes of consumer goods production, globally distributed supply chains, and increased economic interdependence. The question for this week, therefore, is how (or if) one can assign value judgements to the consequences of innovation, and whether such judgements can ever be objective.

- Discussion Question:
  - How do international standards shape the world we live in?
- Reading:
  - Schmidt, Suzanne, and Raymund Werle. "Coordinating Technology: Studies in the International Standardization of Communication Technologies." MIT Press, (1998). Chapter 3
  - Mesthene, Emmanuel G. "Some General Implications of the Research of the Harvard University Program on Technology and Society." *Technology and Culture* 10, no. 4 (1969): 489–513. `http://www.jstor.org/stable/3101569`.
  - Rogers, Everett M. *Diffusion of Innovations*. Fifth edition. Free Press, (2013). Chapter 11

Figure 3.11: The Suez canal, scene of a low point in the Anglo-American special relationship.

4
Research Series: Not Much Ado About AEGIS

The research series consists of five lectures, and five seminars that cover one of my research projects that relates to the course. The lectures will demonstrate the utility of approaching a contemporary issue of war and technology (lethal autonomous weapon systems) from an historical perspective.[1] The seminars consist of counterpoints to the lectures, examining similar issues from a different theoretical perspective.

[1] My argument in a nutshell is that most of the important building blocks for lethal autonomous weapon systems were in place before *The Terminator* was even filmed, let alone international campaigns to ban lethal autonomous weapon systems.

This research series is designed to complement the final evaluation for this module, with discussions to enable you to design your own 5000 word research project. The point of this first research series is that you will be using a substantial portion of your time in class to discuss and debate your own research projects. Unlike lectures in the first term, we will be paying specific attention to the practicalities of designing and conducting a research project in each and every class. Roughly 50% of the readings for this section of the course will relate to research design and research methods.

The idea behind this research series is that you will bring to each lecture your own thoughts on the topic, related to the research project that you intend to follow. You do *not* have to fix your research project ahead of schedule, and you are free to change your project. However, no matter how your idea for your own research project evolves, you should consider the question for the week's lecture in relation to your own research. In-class group discussions will involve you discussing each other's ideas, but please remember that the focus is upon constructive engagement with each other's work.

4.1 The Big Picture: Autonomous Weapon Systems and the American Way of War (Lecture and Seminar)

Please take time to consider what you would like to do for your final assessment prior to attending this class.

This lecture will introduce five of the general components for a

successful research essay: Identifying a research area, identifying an interesting research problem, constructing a theoretical framework, posing an answerable research question, and considering the implications of your research. We will be covering one of these in detail each week. In this lecture, we will discuss different processes of identifying research areas.

This lecture also provides an outline of my own research project, namely, the early development and deployment of automated and autonomous weapon systems. I will walk you through the project and my paper, but the emphasis of the lecture will be about the process of identifying a research area. The lecture will cover the current debates about the development and use of lethal autonomous weapon systems, alongside a couple of bodies of existing academic literature on military innovation and the American way of war. We will discuss ways of working from a topic of personal interest or contemporary policy problem to a research area that connects with existing academic research.

- Discussion question:
  - Do "ways of war" exist?
- Research discussion question:
  - What makes an academic research project worth doing?
- Seminar discussion questions:
  - To what extent is a "research puzzle" necessary for the research essay that you wish to do?
- Reading:
  - Echevarria, Antulio J. *Reconsidering the American Way of War: US Military Practice from the Revolution to Afghanistan*. Georgetown University Press, (2014). Introduction and chapter 1
  - Roff, Heather M. "Responsibility, Liability, and Lethal Autonomous Robots." In *Routledge Handbook of Ethics and War: Just War Theory in the 21st Century*, edited by Fritz Allhoff, Nicholas G Evans, and Adam Henschke, 352–64. Routledge, (2013).
  - Gustafsson, Karl, and Linus Hagström. "What Is the Point? Teaching Graduate Students How to Construct Political Science Research Puzzles." *European Political Science* 17, no. 4 (2018): 634–48.
  - Roland, Alex. "Technology, Ground Warfare, and Strategy: The Paradox of American Experience." *The Journal of Military History* 55, no. 4 (1991): 447–68.

4.2 Research Problem: Autonomy at Sea from NTDS to AEGIS

How do you go from an interesting area of research to an interesting research problem? In this lecture we'll discuss the identification of research gaps and research puzzles. This will guide the content of the lecture, which covers the early history of automatic and autonomous weapon systems. We will discuss the development of early cruise missiles, and the problems that they posed for the US Navy. The lecture will cover the computerisation and networking of USN ships, and the development of AEGIS and coupled weapon systems that enable surface ships to survive attacks that are too fast, or multiple, for humans to handle.

To tie this back to the previous lecture, we'll be covering a key issue with contemporary debates about lethal autonomous weapon systems - the concept of "meaningful human control" - and the relative lack of similar discussion when many systems shifted humans into (at least) a supervisory role around half a century ago. We'll go through some of the arguments against LAWS, and look at like systems and military practices that have been in place for decades. Why, therefore, are LAWS framed as a contemporary or future problem, when "killing by algorithm" has been routine in many domains for decades?

- Discussion question:
  - Did the USS Ticonderoga concretise a "quiet revolution" in weapon autonomy?
- Research discussion question:
  - Is your research descriptive, causal, or normative? Why? Why not?
- Reading:
  - Roff, Heather M. "The Strategic Robot Problem: Lethal Autonomous Weapons in War." *Journal of Military Ethics* 13, no. 3 (2014): 211–27.
  - Jenks, Chris. "False Rubicons, Moral Panic and Conceptual Cul-de-Sacs: Critiquing and Reframing the Call to Ban Lethal Autonomous Weapons." *Pepperdine Law Review* 44 (2016): 1–70.
  - De Landa, Manuel. *War in the Age of Intelligent Machines*. Zone Books, (1991). Chapter 2 (It is long, read it over Christmas!)

4.3 Theoretical Frame: Human Autonomy in Distributed Systems

We'll start this lecture by discussing what is meant by a theoretical framework, and how to figure out an appropriate research framework

to tackle a given research problem. In this lecture I'll discuss a number of different ways in which the development of autonomous weapon systems can be approached from an academic perspective, and how each would influence subsequent research questions, and research methods. We'll be covering arguments over utility and reliability from a defence planning/strategic perspective, alongside the rise of practical ethics, and military ethics, as a means of analysing emerging technologies. We will be looking at accidents, where automated/integrated systems result in the "wrong" target being destroyed, and their centrality, or non-centrality, in distinct bodies of academic research.

- Discussion question:
  - What can the controversy surrounding the Vincennes disaster tell us about the impact of technological change on command responsibility?
- Research discussion question:
  - What are the important theoretical commitments of your research?
- Reading:
  - Scharre, Paul. *Army of None: Autonomous Weapons and the Future of War*. WW Norton & Company, (2018). Chapter 10
  - Perrow, Charles. "Normal Accident at Three Mile Island." *Society* 18, no. 5 (1981): 17–26.
  - Pidgeon, Nick. "In Retrospect: Normal Accidents." *Nature* 477 (2011): 404 EP. `https://doi.org/10.1038/477404a`.

4.4 Research Question: Vietnam's Digital Battlefields

In this lecture we will discuss the role that framing research questions and hypotheses plays in shaping subsequent work. An important element of this is scoping research questions so that they are answerable in a given wordcount. As such, we'll also discuss different kinds of academic research projects and outputs. As part of this, I'll continue talking you through my own research. This research series is centred around a research paper, but we'll expand the scope from the US Navy to the wider context of the development and deployment of battlefield electronics during the Cold War. I'll discuss a number of other overlapping domains (air, land), as well as how the project could be widened to a greater temporal scope (back to the early origins of ballistics, or to the present or future). We'll look at how some kinds of questions are only really answerable in long-form work,[2] or are unaswerable. This is also a good point to reflect upon the intent behind general histories of military technology (or technology in general)

[2] Ahem, "books"

and the degree of specificity we should expect from more expansive histories.

- Discussion question:
  - How do technological capabilities shape cultural perceptions of legitimate military conduct?
- Research discussion question:
  - What are the strongest counter-arguments to your research conclusions?
- Reading:
  - Owens, Patricia. "Accidents Don't Just Happen: The Liberal Politics of High-Technology 'Humanitarian' War." *Millennium* 32, no. 3 (2003): 595–616.
  - Coker, Christopher. *Humane Warfare*. Routledge, (2003). Chapter 1

4.5 Implications: Autonomous Recognition Systems and Future Warfare

This lecture highlights three directions of future research from the same project. The point of the final lecture in this series is that it also provides each student some time to discuss how they see their own research fitting in with existing research, and how it could be taken forwards in radically different directions. This is an important thing to consider for longer research projects, and may help when it comes to your dissertation. In essence, after all is said and your analysis is done, how do you conclude a research project in a productive manner? At graduate level, it's not about saying "I'm right, because x, y, and z", it's about knowing your material so thoroughly that you are able to make constructive connections to wider research, or discern interesting pathways for future research.

The three things I will be talking about in this lecture are the strategic implications of automated and autonomous recognition systems, ethics and emerging technologies, and data ethics in armed conflict. My hope is that you will see how each of these could naturally flow from the project we have covered in this series.

- Discussion question:
  - Do ethical objections to a technology stand any chance against perceived military utility?
- Research discussion question:

  - How have your ideas for your research project evolved so far this term?

- Reading:
  - Bostrom, Nick, and Eliezer Yudkowsky. "The Ethics of Artificial Intelligence." In *The Cambridge Handbook of Artificial Intelligence*, edited by Keith Frankish and William M. Ramsey. Cambridge University Press, (2014).
  - Lodge, Julia. "The Dark Side of the Moon: Accountability, Ethics and New Biometrics." In *Second Generation Biometrics: The Ethical, Legal and Social Context*, edited by Emilio Mordini and Dimitros Tzovaras. Springer Science & Business Media, (2012).

5
Research Series: The Dinosaur Juice Killing Spree

The second research series addresses what I term the "periodisation problem" in the study of war and warfare. Unlike the first research series, there is no paper to accompany this section. Instead, we will be working through a substantial text (Vaclav Smil's *Energy and Civilisation*) and considering how periodisations of technology align, or fail to align, with periodisations of warfare and military technology. In this series of lectures and seminars, we will focus upon the transition to "high energy societies" that accompanied the use of fossil fuels, internal combustion engines and gas turbines.

The workload in this last quarter of the course is intended to be lighter, as it is designed to give you more time to focus upon your own research essay for assessment.

5.1 Energy and The Periodisation Problem

This lecture will introduce an alternate form of historical periodisation, drawn from the history of energy production and use, and changing prime movers - the humans, animals, and technologies doing the majority of the work over time. The lecture will recap Vaclav Smil's work on the topic, but the emphasis will be on identifying congruence and incongruence with periodisations of military history. If energy and productive work is so central to everything humans do, how come warfare doesn't necessarily change in step? In particular, we will be discussing the role of categorising warfare in the mid-late 19th and early 20th century, and the emergence of "total war" between nation states. We will compare the use of cut-off dates and the onset of wars and peace with the changing patterns of use of fossil fuels identified by Smil.

- Discussion Question:
  - What concept/proces best describes transitions between patterns of warfare?

- Reading:
  - Smil, Vaclav. *Energy and Civilization: A History*. MIT Press, (2017). Chapters 4 & 5 (That's like 170 pages of reading, so do it over Christmas!)
  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press, (2016). Chapter 12

5.2 War Either Side of The Great Transition

Vaclav Smil refers to the transition from phytomass fuels to fossil fuels, and from animate to mechanical prime movers, as a great transition. In this lecture, we'll be using this concept to analyse associated changes in the conduct of war. This creates an odd way of comparing the conduct of war, in that we'll be comparing the conduct of war from the end of the phytomass fuel era, where humans and animals are still doing a lot of the work, to the earliest wars where we can say that the primary source of energy is generated by mechanical prime movers running on fossil fuels. Viewing the conduct of war in this way leads one to recognise the significant overlaps that can occur. After all, if we are looking for conflicts in which animate power is not a significant factor, then we would likely have to exclude World War 2, owing to the millions of horses used by parties to the conflict.

- Discussion Question:
  - When did the internal combustion engine fundamentally alter the character of war?
- Reading:
  - Smil, Vaclav. *Energy and Civilization: A History*. MIT Press, (2017). Chapter 6
  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press, (2016). Chapter 13

5.3 Prime Movers and New Domains of Warfare

One of the features of the fossil fuel era is that human beings have expanded their use of aircraft, and taken the first steps into space. Alongside this, we've seen the aerial domain become one of the most important domains of warfare, and major powers now rely upon space-based satellites for both intelligence gathering and military infrastructure.

This leads to an interesting question: how are these domains related to energy sources and prime movers? In this lecture we'll be looking at the way prime movers both enable the exploitation of a domain,

as well as how shifts in energy use and prime movers reshape human relations to different domains of warfare.

- Discussion Question:
  - Do technologies create domains of warfare?
- Reading:
  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press, (2016). Chapter 14
  - Johnson-Freese, Joan. *Space Warfare in the 21st Century: Arming the Heavens*. Routledge, (2016). Chapter 2
  - Hallion, Richard. *Taking Flight: Inventing the Aerial Age, from Antiquity Through the First World War*. Oxford University Press, (2003). Chapter 16

5.4 The Nuclear Complication

This lecture addresses a key issue with periodising warfare in terms of fossil fuels and prime movers: nuclear physics. The discovery of nuclear fission and fusion enabled nuclear weapons, which fundamentally altered strategic competition and conflict between nuclear weapon states and their allies. The invention and development of nuclear weapons features as a significant shift in most histories of warfare and histories of technology. Does such a turning point in strategic affairs nullify the utility of periodising war in terms of energy sources? This lecture will cover the significant continuities and discontinuities of fossil fuelled warfare before and after the development of nuclear weapons.

- Discussion Question:
  - Does the destructive power of nuclear weapons matter more than prime movers?
- Reading:
  - Freedman, Lawrence. *The Evolution of Nuclear Strategy*. Basingstoke: Palgrave Macmillan, (2003). Chapters 1-6 (They are concise!)
  - Williams, Heather. "A Nuclear Babel: Narratives Around the Treaty on the Prohibition of Nuclear Weapons." *The Nonproliferation Review* 25, nos. 1-2 (2018): 51–63.

5.5 War in the Anthropo-whatnow?

This lecture looks forwards to the future a bit. It's a bleak one, since climate change is on track to kill a lot of people. We're going to discuss the impact of high energy fossil fuelled society on the world, and

the problems this poses for strategy. After all, we talk a lot about technology because for the last 100 years or so it has been the relatively unpredictable factor in a relatively stable natural environment, and the situation is going to be reversed in the near future, if it hasn't been already. This lecture will cover some critical reframings of high energy society, notably the emergence of ideas of the 'anthropocene' where human impact on the environment is noticeable and sustained.

The second part of this lecture looks at the intersection of strategy and climate change, notably the key problem that fossil fuels are (with the exception of some nuclear powered ships) the defacto way of waging war. If war will continue, then so, too, will dependence on fossil fuels. Moreover, if we look to some of the emerging strategic problems in the future (for instance, conflicts over resource exploitation in the Arctic circle once the ice melts) we can discuss some of the problems of connecting climate change to strategic analysis. Lastly, we'll finish by discussing how the periodisation of war and warfare around fossil fuels and combustion engines might help to connect strategic studies to climate change.

- Discussion Question:
  - Is it possible to imagine war after fossil fuels?
- Reading:
  - Smil, Vaclav. *Energy and Civilization: A History*. MIT Press, (2017). Chapter 7
  - Steffen, Will, Jacques Grinevald, Paul Crutzen, and John McNeill. "The Anthropocene: Conceptual and Historical Perspectives." *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369, no. 1938 (2011): 842–67.
  - Lewis, Simon L., and Mark A. Maslin. "Defining the Anthropocene." *Nature* 519 (2015): 171–80.

6
Primary Seminar Series: Military Revolutions

The primary seminar series for this course examines theories and explanations for changes in the conduct and character of warfare, with a focus upon (you guessed it) the role technology plays in said theories and explanations. A key theme of this seminar is the examination of periods of apparent rapid change, usually referred to as "military revolutions". These are usually cut-off points, or periodisation points, by which people slice and dice military history into before/after categories, even if the exact boundaries of a given military revolution are hazy, and, as we'll see, it is questionable whether they even exist. The second seminar for the course will continue with the theme of technology and periodisation.

Since this is the first time the course is running, we'll be focusing upon the classic military revolution, which (in a nutshell) relates to the changing character of war in Europe due to the introduction of gunpowder.[1] The seminar series begins *in media res*, that is, we will start with a debate between historians about "the military revolution" and then work through a number of competing theories for changes in the conduct of war, arguments over dates, focal points and geography, and general criticisms of the concept of military revolutions. To cut a long story short, we know change happened, but how, when, where, and why change happened is very much up for debate.

[1] This is a very, very simplistic way of putting it.

Do not worry if you are unfamiliar with early modern Europe and warfare - the course is designed to ease you in. That said, beyond the recommended chapters from Wayne E. Lee's (2016) *Waging War*, you may wish to read Frank Tallett's (2001) *War and Society in Early Modern Europe, 1495-1715*. For further reading, you can consult Frank Tallett and D.J.B. Trim's edited volume (2010) *European Warfare 1350-1750*. In addition, you might also want to read Merry E. Wiesner-Hanks' (2006) *Early Modern Europe, 1450-1789* to round out your understanding of the period.

This seminar series is accompanied by group work.[2] Each group will be looking at a context for the military revolution in Europe,

[2] The full details of this work is outlined in chapter 10.

focusing upon connections between the military revolution and the Americas, West Africa, the Indies and and Asia, and the Ottoman Empire. The idea behind the group work is to give you a chance at performing a literature review and getting feedback on it prior to your assessed work on the course. It also enables you to understand a single context in detail, and a seminar will be dedicated to discussing the findings of the course. Lastly, the group work is designed so that each group produces learning resources for the group as a whole, so you will benefit from the work of your peers.[3]

[3] This also means that if you really wanted to learn about West Africa but got stuck with the Ottoman Empire there will be a means available of rapidly learning about what you want by midway through the first term.

6.1 The Military Revolution Debate

The question isn't so much whether gunpowder changed the character of warfare, it is how it did so, when it did so, and when it began to do so. In this seminar we'll be discussing Michael Roberts' famous article that posited both a timeframe for the impact of gunpowder, but also identified a number of mechanisms by which the adoption of gunpowder changed warfare in Europe. Importantly, Roberts' title, and thesis, implies the existence of "military revolutions" - short(ish) definable periods of history in which warfare changes in a dramatic fashion. We'll be discussing the criticisms of Roberts' thesis, which, collectively, have questioned almost all elements of his argument.

- Discussion Question:
  - What kind of a revolution was the military revolution?
- Reading:
  - Roberts, Michael. "The Military Revolution, 1560-1660." In *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, edited by Clifford J. Rogers. Westview Press, (1995).
  - Rogers, Clifford J. "The Military Revolution in History and Historiography." In *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, edited by Clifford J. Rogers. Westview Press, (1995a).
  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press (2016). Chapter 7
  - Parker, Geoffrey. "The"Military Revolution," 1560-1660–a Myth?" *The Journal of Modern History* 48, no. 2 (1976): 196–214. `http://www.jstor.org/stable/1879826`.

6.2 How Do You Measure Change, Anyway?

In this seminar, we'll address the problem of measuring change in stable objects of analysis. One of the core features of the military rev-

olution was not just change in military organisations (and increased professionalism), but changes in the character of the state itself. In this seminar we'll be discussing problems of selection bias, but also measurement. After all, one of the defining features of Europe, and the wider world, in this period was the heterogeneity of political institutions and polity types. Is it even possible to compare these in a rational fashion, let alone measure change over time?

- Discussion Question:
  - Is an objective framework for examining changing patterns of warfare possible?
- Reading:
  - Heuser, Beatrice. "Denial of Change: The Military Revolution as Seen by Contemporaries." *International Bibliography of Military History* 32, no. 1 (2012): 3–27. `https://brill.com/view/journals/ibmh/32/1/article-p3_2.xml`.
  - Spruyt, Hendrik. *The Sovereign State and Its Competitors: An Analysis of Systems Change*. Princeton University Press, (1996). Chapter 8
  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press (2016). Chapter 8

6.3 Variables: Culture, Technology, and Warfare

In this seminar we'll look at explanations for changing patterns of warfare that examine the link between technology and culture. Cultural theories and explanations for differing patterns of warfare have been plentiful in recent years, but should also be treated with scepticisim, not least due to the nebulous use of "culture" as a variable. Here we will discuss some arguments about cultural continuities, such as the very odd notion that a "Western way" of warfare has persisted since the ancient Greeks, alongside more nuanced attempts to explain the influence of culture on warfare, as presented by John Lynn

- Discussion Question:
  - Is culture too broad a concept to provide meaningful explanations for changes in the conduct of war?
- Reading:
  - Lynn, John A. *Battle: A History of Combat and Culture: A History of Combat and Culture from Ancient Greece to Modern America*. Basic Books, (2004). Appendix (You may also want to read Chapter 4, but it is not essential)

  - Lee, Wayne E. *Waging War: Conflict, Culture, and Innovation in World History*. Oxford University Press (2016). Chapter 9

6.4 Explaining the Revolution: Competition, Technology, and Tactical Determinism

Okay, so we know change happened, and so far we've covered some problems of objects, measurement, and variables, but what about processes? In this seminar we will look at the concept of adaptation as a conscious process, and one that is perhaps inherent to war and warfare. How and why do states adapt to threats? And how does technology, and technological innovation, fit within wider drivers for adaptation? One question to consider with this week's readings is whether the tactical utility of a military technology leads us back to technological determinism, or whether the critiques of technological determinism that we've been looking at should lead us to critique the sense of tactical determinism one can get from writings about military technology.

- Discussion Question:
  - To what extent did military adaptation create existential problems for states during the military revolution?
- Reading:
  - Parrott, David A. "Strategy and Tactics in the Thirty Years' War: The 'Military Revolution'." In *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, edited by Clifford J. Rogers. Westview Press, (1995).
  - Adams, Simon. "Tactics or Politics?"The Military Revolution" and the Hapsburg Hegemony, 1525-1648." In *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, edited by Clifford J. Rogers. Westview Press, (1995).
  - Stone, John. "Technology, Society, and the Infantry Revolution of the Fourteenth Century." *The Journal of Military History* 68, no. 2 (2004b): 361–80.

6.5 Explaining the Revolution: The Sinews of War

One of the features of the military revolution is that war became more expensive to wage. Larger, professionalised armies became a key to victory on European battlefields. In this seminar, we'll be discussing the political and social changes wrought by the military revolution as states sought to extract taxes to pay for these new military capabilities. This leads to interesting questions of what we foreground as

revolutionary - was it the infantry, firearms and techniques of siege, or the reshaping of European states themselves?

- Discussion Question:
  - Can we draw a straight line from gunpowder to changing forms of taxation?
- Reading:
  - James, Alan. "Warfare and the Rise of the State." In *Palgrave Advances in Modern Military History*, edited by William J. Philpott and Matthew Hughes. Palgrave Macmillian, (2006).
  - Kiser, Edgar, and April Linton. "Determinants of the Growth of the State: War and Taxation in Early Modern France and England*." *Social Forces* 80, no. 2 (2001): 411–48. `https://doi.org/10.1353/sof.2001.0099`.

6.6 Explaining the Revolution: The Causes of War

When analysing and explaining change, it is always good to keep an eye on wider questions that may provide continuities. In this seminar we will be discussing the causes of war during the military revolution. Notably, did the causes of war in Europe change in any discernable way over the various timeframes given for the military revolution? If they did not, what does this say about the military revolution itself?

- Discussion Question:
  - Did the military revolution fundamentally alter the causes of war in Europe?
- Reading:
  - Nexon, Daniel H. *The Struggle for Power in Early Modern Europe: Religious Conflict, Dynastic Empires, and International Change*. Princeton University Press, (2009). Chapter 8
  - Holsti, Kalevi J. *Peace and War: Armed Conflicts and International Order, 1648-1989*. Cambridge University Press, (1991). Chapters 1 to 3 (They're short!)

6.7 Global Contexts for a European Revolution

This is an open seminar, designed so that each group brings their project work to discuss criticisms that the military revolution is Eurocentric. Many people now use the term "military revolution" in a manner that implies a global scope, but how did changes in Europe during the military revolution alter or re-shape patterns of warfare in

the world? Given the linkages of European states across the globe, is it possible to speak of warfare in Europe as an intra-European process?

- Discussion Question:
  - How did global linkages shape warfare in Europe? How did changes in European warfare shape the world?
- Reading:
  - Black, Jeremy. *Rethinking Military History*. Routledge, (2004). Chapter 3
- There is only one reading for this week, but you are all expected to have completed the first group project by this stage, and be able to use your work on that for the discussion.

6.8 Institutions and Professionalism

In this seminar we'll discuss the military revolution in terms of its effects on military institutions and military thought. In particular, we will be discussing the development of tactical innovations, such as volley fire, in the context of changes in military training and organisation that were required to sustain them. In tandem, we'll look at perhaps one of the more interesting and important developments of the military revolution, which was the adoption and re-use of earlier military thinkers, such as Vegetius, by Europeans in order to develop new ways of waging war.

- Discussion Question:
  - How did the military revolution reshape thinking about war?
- Reading:
  - Heuser, Beatrice. *The Evolution of Strategy: Thinking War from Antiquity to the Present*. Cambridge University Press, (2010). Chapter 4
  - Gat, Azar. *A History of Military Thought: From the Enlightenment to the Cold War*. Oxford University Press, (2001). Chapter 2

6.9 Did They Get The Start Date Wrong?

In this seminar we will loop back to some of the arguments about the appropriate starting point for the military revolution. In particular we will discuss the changing relations of cause and effect that are raised by moving the starting point of the military revolution earlier

than Roberts' original framing. This leads to the question of how we should analyse change over time - what does a search for key periods of rapid change do to the way we think about the changing character of warfare? As a counterpoint, we'll consider whether approaches that seek to trace developments over large periods of time have anything meaningful to offer.

- Discussion Question:
  - What use are approaches to the history of warfare that trace change over 250+ year periods?
- Reading:
  - Rogers, Clifford J. "The Military Revolutions of the Hundred Years War." In *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe*, edited by Clifford J. Rogers. Westview Press, (1995b).
  - Black, Jeremy. *Rethinking Military History*. Routledge, (2004). Chapter 6

6.10 Can Warfare Go Backwards?

The warfare during the military revolution was not uniform in character. However, many non-historians usually use the idea of revolution and evolution with progressive undertones, that is 'superior' forms of warfare replacing older ones. In this seminar we will be looking at warfare in the wider world, in particular North America, where European colonists found that European styles of warfare were positively counter-productive in conflicts with native Americans. We'll discuss what this kind of variation and heterogeneity says about the underlying "dominance" of ways of warfare developed in Europe.

- Discussion Question:
  - What does the abandonment of European military practice in North America tell us about the stability of the military revolution itself?
- Reading:
  - Malone, Patrick M. *The Skulking Way of War: Technology and Tactics Among the New England Indians*. Madison Books, (2000). Chapter 4
  - Grenier, John. *The First Way of War: American War Making on the Frontier, 1607-1814*. Cambridge University Press, (2008). Introduction and Chapter 1

6.11 Military Revolutions: A Zombie Concept?

This is the final seminar in the series, and we'll finish by discussing what we've learned over the term, and in particular whether the concept of military revolutions holds any validity. In particular, we'll be looking towards the present day, where many of the concepts that we have discussed this term are alive and well. We'll be discussing the American debate about the "Revolution in Military Affairs" that went into overdrive after the American battlefield successes of the First Gulf War.

- Discussion Question:
  - Why does the concept of technologically-driven military revolutions persist?
- Reading:
  - Cohen, Eliot A. "A Revolution in Warfare." *Foreign Affairs* 75, no. 2 (1996): 37–54. `http://www.jstor.org/stable/20047487`.
  - Krepinevich Jr, Andrew F. *The Military-Technical Revolution: A Preliminary Assessment*. Center for Strategic; Budgetary Assessments, (2002). **Available online here**

7
Second Seminar Series: Technology and Military Institutions

This seminar series examines the relationship between American military institutions and developments in military technology since 1945. The series is based upon Thomas G. Mahnken's *Technology and the American Way of War Since 1945*, which provides a good overview of some of the procurement battles and strategic debates. The seminar series covers the reaction of American services to the advent of nuclear weapons, a couple of key case studies in military procurement/retention that highlight inter-service dynamics, and then examine the relevance of this study for the present day.

7.1 Military Institutions in Context

What is an institution, and what differentiates military institutions from other kinds of institution? In this seminar we will look at three papers, two of which give overviews of the study of military institutions, and then use these to consider a key paper in the field of military innovation.

- Discussion Questions:
  - What is your opinion of Hacker's contention that "Historians consistently fail to distinguish war from military institutions as the object of analysis"? How important is this distinction, and why?
  - What role does technology and the nature of military institutions play in Rosen's theory of military innovation?
- Reading:
  - Siebold, Guy L. "Core Issues and Theory in Military Sociology." *Journal of Political and Military Sociology* 29, no. 1 (Summer, 2001): 140-159.

  - Hacker, Barton C. "Military Institutions, Weapons, and Social Change: Toward a New History of Military Technology." *Technology and Culture* 35, no. 4 (1994): 768-834. Accessed January 8, 2020. doi:10.2307/3106506.
  - Rosen, Stephen Peter. "New Ways of War: Understanding Military Innovation." *International Security* 13, no. 1 (1988): 134-68. Accessed January 8, 2020. doi:10.2307/2538898.

7.2 Military Ideals

How can we theorise the role that cultural ideals play in defining and constituting military institutions? In this seminar, we will compare the field of military innovation studies to specific arguments about the role that cultural ideas, models, and paradigms play in constituting military institutions. Notably (in our context) Dunivin's article does not focus upon technology, so what can we learn from it, and are there aspects we can criticise drawing upon our prior reading over this course?

- Discussion question:
  - How convincing is Dunivin's argument about the relationship between ideal types, models, and paradigms?
  - How might technology change challenge, or re-enforce, dominant paradigms or models within a military institution?
- Reading:
  - Farrell, Theo, and Terry Terriff. "The Sources of Military Change." In *The Sources of Military Change: Culture, Politics, Technology*, edited by Theo Farrell and Terry Terriff. Lynne Rienner Publishers, (2002).
  - Dunivin, Karen O. "Military Culture: Change and Continuity." *Armed Forces & Society* 20, no. 4 Dunivin (1994): 531–47.

7.3 Military Institutions After WW2

In this seminar we will begin going through the key text for the course, Mahnken's *Technology and the American Way of War Since 1945*. In this seminar we'll draw upon our prior discussions about what makes a military institution and address one of Mahnken's key arguments - that service culture fundamentally shaped the development and adoption of military technology in the US. We'll also introduce one of the key issues that we'll discuss over the next couple of weeks - the impact of nuclear weapons on military institutions - by analysing the relevance of Schelling's work for military institutions themselves.

- Discussion Questions:
  - How important was service culture in determining the responses of the US services to the development of cruise missiles and ballistic missiles?
  - If, per Rosen, victory in war is central to the legitimacy of military institutions, what should we make of Schelling's idea that "Military strategy can no longer be thought of… as the science of military victory."?
- Reading:
  - Schelling, Thomas C. *Arms and Influence*. Yale University Press, 2008. Chapter 1. Available here.
  - Mahnken, Thomas G. *Technology and the American Way of War*. Columbia University Press, (2010). Introduction, and chapter 1

7.4 Responding to Nuclear Weapons 1: Doctrine

In this seminar we'll be discussing the relationship between technology and military doctrine. In particular, we'll look at the way in which a weapons technology (nuclear weapons) perhaps challenges Posen's ideas about the sources of military doctrine. Furthermore, we'll be using these ideas to evaluate a key (failed) innovation in response to nuclear weapons - the US army's adoption of pentomic divisions.

- Discussion Questions:
  - How might nuclear weapons challenge Posen's findings about the relationship between doctrine and technology?
  - How well do the texts we have read during this term explain the US army's adoption of the pentomic division? Does Sepp's conclusion challenge any of their theories?
- Reading:
  - Sepp, Kalev I. "The Pentomic Puzzle: The Influence of Personality and Nuclear Weapons on U.S. Army Organization 1952–1958." *Army History*, no. 51 (2001): 1-13. www.jstor.org/stable/26304920.
  - Posen, Barry R. *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars*. Cornell University Press, 2014. Chapter 1, conclusion

7.5 Responding to Nuclear Weapons 2: Procurement Battles

In this second seminar dedicated to responses to the advent of nuclear weapons, we will discuss the role that military institutions played in procurement decisions during the flexible response era. The readings

for this week provide two views of how/why military systems might be procured, and we will discuss how inter-service rivalry fits into the picture.

- Discussion Questions:
  - Does the procurement of military systems in the flexible response era seem rational to you? Why/why not?
  - To what extent is inter-service rivalry a problem for defence planning?
- Reading:
  - Mahnken, Thomas G. *Technology and the American Way of War*. Columbia University Press, (2010). Chapter 2
  - Gray, Colin S. *Strategy and Defence Planning: Meeting the Challenge of Uncertainty*. Oxford University Press, USA, 2014. Chapter 2
  - Grissom, Adam. "The Future of Military Innovation Studies." *Journal of Strategic Studies* 29, no. 5 Grissom (2006): 905–34.

7.6 Maintaining Military Power: the B-52

In this seminar we will focus specifically on a single platform - the B-52 Stratofortress bomber. This aircraft was developed as a strategic bomber at the height of the cold war, yet it is likely to still be in use in 2050. As such, it is a good candidate for discussing how military institutions shape and re-shape technologies and capabilities over time. In particular, this poses a key question for those seeking to measure and judge military institutions - is it possible to measure the "power" of an institution over time, when systems, doctrine, and opponents are constantly in flux?

- Discussion Questions:
  - How plausible is it to compare military power over extended periods of time (50+ years)?
  - What best explains the continued use of the B-52H by the USAF?
- Reading:
  - The FAS guide to the B-52 (Short background) `https://fas.org/nuke/guide/usa/bomber/b-52_hist.htm`
  - Mizokami, Kyle "How B-52 Bombers Will Fly Until the 2050s" *Popular Mechanics*, September 10, 2018. `https://www.popularmechanics.com/military/aviation/a23066191/b-52-bombers-fly-until-the-2050s/`

- Roman, Peter J. "Strategic bombers over the missile horizon, 1957–1963," *Journal of Strategic Studies*, 18:1, 198-236, (1995). DOI: 10.1080/01402399508437584
- Tellis, Ashley J., Janice Bially, Christopher Layne, and Melissa McPherson, *Measuring National Power in the Postindustrial Age*. Santa Monica, CA: RAND Corporation, 2000. `https://www.rand.org/pubs/monograph_reports/MR1110.html`. Also available in print form. Chapter 7
- Ramey, Timothy L., Keating, Edward G. *United States Air Force Aircraft Fleet Retention Trends: A Historical Analysis*. Santa Monica, CA: RAND Corporation, 2009. `https://www.rand.org/content/dam/rand/pubs/technical_reports/2009/RAND_TR740.pdf`

7.7 Technologies of COIN

In the last third of the seminar series, we will be discussing a perennial problem for most major militaries - whether to optimise for potential conventional wars, or to adapt to fight low intensity conflicts. Here we'll discuss an example of this, Vietnam, where the US was torn between waging a conventional war and a pacification campaign, while simultaneously preparing and organising for potential conventional wars in Europe.

- Discussion Questions:
  - Is the difference between the types of technologies discussed by Mahnken and Gibson important?
  - What was more important as a barrier to US military innovation in Vietnam: institutional culture, or the prospect of conventional war in Europe?
- Reading:
  - Mahnken, Thomas G. *Technology and the American Way of War*. Columbia University Press, (2010). Chapter 3
  - Gibson, James William. *The Perfect War: Technowar in Vietnam*. Atlantic Monthly Press, (2000). Chapter 8

7.8 Technology and Defence Reform

This seminar focuses upon the problem of preparing for future war, and a perennial trade-off for military institutions: between a large military utilising low cost platforms, or a military reliant upon a smaller number of high tech military systems. Here we'll be particularly focused upon the role of evidence, particularly evidence drawn from suc-

cess in battle and victory in war - does success in war automatically refute those who argued against a given set of systems?

- Discussion Questions:
  - Was the result of the Gulf War enough to prove the military reform movement completely wrong?
  - To what extent are the debates of the 1970s and 1980s relevant today?
- Reading:
  - Mahnken, Thomas G. *Technology and the American Way of War.* Columbia University Press, (2010). Chapters 4 & 5

7.9 Procuring for Great Power competition

One of the big problems with studying military change in peacetime versus during war is that some states fight an awful lot of wars. This can create all sorts of problems, notably how preparing for the next war, or a "big" war, can conflict with adapting to the war a state is currently engaged in. It also creates complications when analysing processes of change, because the kinds of political battles, turf wars, and inter-service rivalry that accompanies innovation and adaptation tends to overlap in such circumstances. In the American case, this is a persistent and long-running problem. Should a state prepare for the wars it is fighting, or for looming conflicts that might pose an existential threat?

- Discussion questions:
  - What best explains the failure of the US military to adapt to insurgency in Iraq in the initial post-invasion period?
  - Is it possible to optimise a military institution for fighting both high-intensity conventional wars and low intensity conflicts?
- Reading:
  - Cameron, Craig M. "The U.S. Military's"Two-Front War," 1963-1988." In *The Sources of Military Change: Culture, Politics, Technology*, edited by Theo Farrell and Terry Terriff. Lynne Rienner Publishers, (2002).
  - Shimko, Keith L. *The Iraq Wars and America's Military Revolution.* Cambridge University Press, (2010). Chapter 6

8
Skills Development

This is written on the assumption that you want to improve your abilities.

8.1 A Roadmap for Skills Development

The first term is designed to take someone who has not written a mid-length (2500 words) academic essay before, and enable them to write one to postgraduate level. Along the way you will produce a variety of research products, each of which are opportunities to develop core transferrable research skills. The second term enables students to build upon these core skills to produce a 5000 word research essay, to postgraduate level.

If your starting point is never having written an academic essay before, then this will be hard, but it is an achievable goal. You will lack the experience that many of your peers have with academic writing, and are likely to need to put in extra effort early on to catch up with this skill. On the other hand, if you've been accepted onto a KCL MA programme without an undergraduate degree, then it is almost certain that you have significant relevant professional experience. This is something that many of your fellow students will likely lack. Academic writing is a very specific form of communication, with its own standards and expectations that may seem confusing at first,[1] but it is a skill that can be developed like any other skill. In other words, don't be intimidated!

Likewise, if you are returning to university after a significant period of time away, then it is likely that you will need to refresh your skills at writing academic essays. One particular issue here can be overconfidence - you may have excelled at university, and excelled subsequently at a job requiring intensive research, but this does not prevent your academic writing skills from declining over that period of time. Take some time early on to approach the academic research and writing process from afresh.

[1] A good example of this is the attention paid to plagiarism in academia. In the business world, plagiarism is a normal and everyday activity. In academia, plagiarism is a serious misconduct issue.

If you have gone directly from undergraduate to postgraduate, or only taken a year or two gap between the two degrees, then the academic writing element of this module is likely to come easier to you. At the same time, this is a module designed for graduates. A first at undergraduate level does not automatically translate to a distinction at MA level.[2] You will need to work to improve your academic writing skills to a postgraduate level. Equally important, you should consider the group project work as an opportunity to develop teamworking skills that will be required to translate your research skills into the professional world.

[2] From experience, the people who excel at MA level are those who put the effort in, independent of whether or not they have a prior degree or what classification that degree was

8.2 Track Your Progress

The most important step in developing skills is to identify, and reflect upon, your baseline knowledge and skills as you begin the course. This section of the handbook is primarily concerned with skills development, but we'll combine both knowledge and skills in this exercise. Take 30 minutes out of your day and work through the following questions, writing 1-2 sentences down on a piece of paper for each:

- Tasks Checklist, have you ever:
  - Read an academic article
  - Read a research monograph[3]
  - Performed a literature search[4]
  - Written an article review, or book review
  - Written a literature review
  - Written a short academic essay[5]
  - Written a mid-length academic essay[6]
  - Written a dissertation[7]
  - Researched and delivered a non-academic research product
  - Produced a basic piece of collaborative research[8]
  - Produced a substantial piece of collaborative research[9]
  - Designed a substantial piece of collaborative research[10]
- What research skills are you seeking to improve as a priority?
- How would you rate your knowledge and understanding of the following concepts:[11]
  - War
  - Security
  - Strategy
  - Technology
  - Innovation
  - Military adaptation
  - Military innovation

[3] AKA an academic book, but we like our fancy names. Monographs are usually written very differently to books for public consumption

[4] A focused trawl through available academic literature and data to identify relevant material

[5] Upto 3000 words

[6] 5000-7000 words

[7] 10,000 - 15,000 words of academic writing

[8] Something equivalent to a 10 minute powerpoint presentation on a set topic/question

[9] As above, yet more work involved

[10] As above, except you were involved in selecting the research question/topic

[11] 1-2 lines for each

  - Technology in history
  - Technology in military history
  - The Revolution in Military Affairs
- What elements of the module interest you the most?

8.3 The Basic Structure of Academic Work

This is a guide to the basic structure of academic work, and the generic set of skills that transfer across pretty much everything you will do. It is designed to get you to think about your work process, research, analysis, and communication

8.4 Iteration

The basic academic workflow is repetition. We do something, think "Hmmm" and then do it again.[12] You may see a model like: Question -> Literature Search -> Analysis -> Write Up -> Submit. This is basically a lie, because it eliminates the repeated work at each and every interval. A more accurate workflow for a response to a set question is something like:

[12] Hopefully we think more than "Hmmm" but you get the drift

1. Read the question
2. Read a couple of things to get a basic understanding of what the question means
3. Scan databases to work out who has written on that question
4. Read a couple of major works
5. Read the question again and figure out what you need to answer the question
6. Do something like a literature search
7. Read through the key articles/books/chapters in the search
8. Begin analysing your research, and realise you need to cast the net a bit wider, or fill some gaps
9. Go back and search for more articles/books/chapters
10. Analyse your material and figure out an answer to the question
11. Plan out your answer
12. Begin writing up your answer, and start to spot holes
13. Quick search to find more material, and integrate that
14. Finish writing up your answer, realise that you now have a different take on the question
15. Re-draft your answer, maybe even go and read more material
16. Submit

The point of this is to say that academic work is a creative process. Your ideas are likely to change throughout the process of creating

an academic input. The second point is that you should begin this process early, as you may find yourself looping back to almost the start of the process quite a few times.

Many people skip step 15. My advice to you is to never submit something that has not been re-drafted at least once, but preferably two or more times. Looping steps 13-15 a couple of times will do your work the world of good. Furthermore, it's in some senses the least stressful time to actually work on your argument, because if the deadline hits, then you at least have something good to go.

8.5 Building and Reducing an Argument

In the real world of academia,[13] arguments are usually presented in abstracts of about 200 words. In the real world of business, arguments sometimes have to be compressed to an elevator pitch of 1-2 sentences. A key point is that if you can explain your answer in 1-2 sentences, then it is easy to build out that answer in a logical fashion to a book-length manuscript. A well written and structured book can be distilled into an extended review,[14] short review,[15] abstract,[16] or sales pitch.[17] For this reason, my suggested workflow for developing your argument/answer,[18] is that you explain your answer in a paragraph[19], which you then reduce to a 1-2 sentence answer, and then build back out into an essay.

So:

1. Your basic answer (250 words)
2. Your distilled answer (1-2 sentences)
3. An argument that substantiates your distilled answer (250 words)
4. Your argument written out in 7-12 sentences
5. Your argument written out in 7-12 sentences, with paragraphs to support each point

The 7-12 sentences is largely arbitrary, but is the appropriate scope for a 2500-3000 word essay. The point here is that this same framework can build out to longer research. For example, a 5000 word research essay will require your answer to be answered in a small number of sections,[20], each of which contain their own argument, which can be written out in 7-12 sentences, supported by paragraph. A book can be built out by supporting the points with 5000-7000 word chapters, which each have their own argument that can be written out in a number of sentences, each supported by a section… etc.[21]

Okay, but how do you practice this? There are two key skills at work - the reduction of an argument, and building out an argument. These are related, but you can do two distinct tasks to practice each process independently of one another.

[13] We do live in the real world, but those of us who study metaphysics sometimes reject the basic assumptions of this statement

[14] The kind you get in the *New York Review of Books*

[15] The kind you will get in the book reviews section of journals

[16] Often the publisher's description of the book

[17] Alternately, the review you get from colleagues - "Have you read Professor Doe's latest book? It's about…"

[18] You'll want an argument that answers the question. An answer without an argument usually lacks coherence, an argument that doesn't answer the question is missing the point. A piece of writing that contains neither is the shortcut to a failing grade.

[19] 250 words

[20] 2-3 maximum

[21] I'm not saying this approach makes for well-written books, only that it makes for coherent ones. The jump from coherence to good writing is, however, one way. There are a great many beautifully written non-fiction books in the world that lack a coherent argument and are, for academic purposes, the equivalent of popcorn (Fun to eat, but devoid of nutritional value).

Reducing an argument: Find a journal article, read it,[22], read the abstract, then try to reduce the abstract to 1-2 sentences. Re-read the article and see if this reduced argument matches with the text. If it does, try doing this on another article. If it doesn't, try re-phrasing your distilled argument. As an extension activity, you can try reading articles, and writing your own 200 word abstracts for the articles, based upon the main text of the article.[23]

Building out an argument: Take the seminar questions for this course, and the ones that we discuss in the lecture sections as your basis. Try to write distilled arguments that express different answers to the same question. For each of these, build out to a 200 word answer, and then a 7-12 sentence answer.[24]

[22] You don't have to take notes, and feel free to skim

[23] This is a much more time intensive activity, so try the fast version first. It's better to get in a high number of repetitions, until you cease to improve between repetitions

[24] This exercise is really good for understanding how a different answer/line of argument can lead to radically different structures for essays

8.6 Supporting Your Argument

This section reflects my expectations about the use of footnotes and references for your work in this course. This can be quite a confusing area for some people. Depending upon your background, using footnotes to support an argument may appear to be obvious, or quite strange. Regardless of your opinion or intuition, you will need to support your argument in order to pass this course.

The best way to understand footnotes is to recognise the multiple roles that they can play in a single piece of work. A footnote is a formal structure that enables your reader to understand the origins of your argument in a space-efficient manner. Despite its formal structure, a footnote can point to a variety of resources. For example, a footnote might point to the source for a figure or quote. Equally, a footnote might direct the reader to a book about a particular type of research method, or it might highlight a particular author's work that your own work is engaging with. The point of a footnote is that it saves you the need to explain fundamental elements of a disciplinary approach to a question from first principles, or the need to describe a source's reliability in full if it is tangential to your argument.

But what do I need to footnote? In my opinion, you should reference everything that is necessary to build the fundamental skeleton of your essay and argument, even if a selection of this appears to be so obvious that it seems unnecessary. A useful metaphor is to think about how you'd go about climbing a cliff. You could free-climb the whole way, without any safety gear, and trust in your ability to get to the top without an accident. Alternately, you can do what most climbers do, which is use a safety rope and clip in along the way, so that if you fall, you don't fall that far (although it might still hurt). In this sense, footnotes are the safety clips - in the event that you do make a mistake in your work, at least the person reading it can

understand the origin of the mistake that you made.

A second way to think about footnotes is that they allow you to pass the buck to someone else. A research essay should require you to focus on a particular set of topics, which requires you to understand what is necessary scaffolding (research methods, where this question sits within a discipline or two), what is very important, and what is necessary to mention but otherwise ancilliary to your answer. You don't want to spend 50% of your time re-stating first principles about quantitative or qualitative research methods, so you declare your research method and explain your choice, and then point the reader towards wider works that they can look to for a fuller explanation of your selected research method. Equally, if something requires mentioning, but is ancilliary to your argument, then you want to enable the reader to understand the concept, or idea, in a short space of time, and then point them elsewhere if they want to learn more. Both of these then permit you to maximise the time that you spend answering the important elements of the question.

On a deeper level, being rigorous with footnoting is also a way of forcing yourself to pare down your argument to its essentials, and to avoid expansive, ambiguous, or hyperbolic statements. If you absolutely cannot avoid making an over-the-top statement (eg "9/11 was the darkest day in American history" or "The 2003 invasion of Iraq was the biggest strategic error of the 21st century so far"), a footnote pointing to someone else who makes it is a pretty good way to let them take the bullet for you, should your reader disagree with what you are writing.

If you come to academia from a professional background, you may be forgiven for wondering why this is all so important. Obviously, there are different standards of plagiarism tolerance in academia to the professional world. But in the professional world it is not always necessary to show your working to the degree that academics do as a matter of routine. The best explanation I can offer for this (in the space alloted here) is that underlying all academic disciplines is the question of how knowledge is formed, and why. In some disciplines, these questions are relatively settled, but in others (IR is a good example of this) there is considerable contestation about what constitutes knowledge, how it can be attained, and why that matters. Your referencing offers a glimpse of your own world view, whether you like it or not, and people can, and will, judge you by it. So it's not only a question of what the answer to a question is, but how you arrived at it, and why you chose the path that you took. References give the reader a gist of all of these, and that is why they are so necessary.

8.7 Academic Writing

Both of the assessments for this course are types of essay. Essay writing is a creative activity. It is an art, not a science. That said, art involves craft and conventions. Wherever you see creative activity, there is likely craft at work, and essay writing is no different. This applies to academic work across disciplines, but different disciplines and fields have different conventions. Understanding these conventions is important, and can be done by sight in many cases. The Department of War Studies generally draws its conventions from history, international relations, and the social sciences. Each course will have its own specific requirements (notably for reference styles) so pay attention to what your lecturers ask for. That said, there are three elements that transcend this: the technical elements of an essay, structuring your essay, and writing your essay.

Essays have technical elements. These are, in general, non-negotiable. The absence of technical elements is a signal to a reader that something is wrong. If your essay does not have a title page, the essay title at the top, consistent citations, and a bibliography, then the reader is likely to get the impression that you are unable to produce these basic elements of academic writing. These are not finishing touches, they are foundations. An essay without a title is akin to a front page news story without a headline. Inconsistent citations indicates that you are either unaware of the importance of citations, or unable—on a technical level—to use them. Essays lacking bibliographies indicate that you are either unable to produce one, or that your work on the essay is sloppy enough to forget to include one. Either looks bad.[25]

With that in mind: Please read your essay for technical mistakes before submitting it.

I advise reading your essay backwards, and from the bottom up (if using footnotes). Keep a copy of your bibliography separate and cross out an item each time you encounter a reference to it (and if it's not there when you find a reference, make sure to add to the bibliography). Check for consistency at all points, particularly with citation formatting, spelling and grammar. I am not allergic to American English, but make sure not to mix British and American English in a single piece of work. Remember that quoted material should be quoted as-is, so don't Americanise British authors, or vice-versa.

On a structural level of an essay, boring is good. Every essay that you write will contain an introduction, your argument, and a conclusion. For 2500 word essays, I advise 5-7 paragraphs. For essays of 5000 words in length, I advise that you make your argument over at 12+ paragraphs. Try to keep paragraph length consistent. Each paragraph should consist of a point requried to make your argument, and a

[25] Technical sloppiness is best compared to an unforced error. Time pressures aside, there is no real explanation for it in an academic setting, and, from experience, it is the shortest path towards a case of unwitting plagiarism, which is not where you want to find yourself at any point.

critical engagement with the evidence, theory, etc that supports that point.

Your introduction should be a maximum of 500 words or so. That's the maximum. The best way to think about this limit is that every word in your introduction is one that can't be used to make your argument. That said, there's a good reason introductions exist. Your introduction should inform the reader of your line of argument (more on that later), how you are going to explain your argument, and where you are drawing your terms and definitions from.

A second way to think about your introduction is that it serves as one big car park for every contentious issue that relates to your answer, but is unnecessary to discuss in depth for the purposes of answering the question. You don't have the space to explain and explore every single theoretical argument that is relevant or important to your answer, but the introduction is where you park every theoretical argument that doesn't need further exploration. You will be able to read advanced forms of this kind of activity in peer-reviewed articles, and the first chapter of most academic books published by university presses. Even though you might not be in a position to comprehend the range of issues that an academic parks by the end of their introduction, or first chapter, the process is similar to what is required of you in an academic essay, even at undergraduate level.

At this point you may be (rightly) wondering how you are meant to do in 500 words what your tutors do in at least a thousand words, if not many multiples for that figure. If you read academic articles, the introduction serves multiple purposes. A good one will usually identify a gap in existing literature of a given subject, an important research puzzle associated with that gap, and propose a way of investigating that puzzle. That's a lot of heavy lifting that you don't necessarily need to do. Your title is, in essence, a research problem served to you on a plate. You'll have to identify why it's important, and the parameters for answering the question, but longer introductions are unnecessary. For a 5000 word essay, you should follow your introduction with your discussion of your theoretical frame, etc.

You will present your argument in paragraphs. I use the imperative here, because if you don't present your argument in paragraphs, then you are going to have a very bad time. The first sentence of your paragraph should identify the argument that the paragraph will make, with reference to your overall line of argument, and the last sentence should connect the paragraph to the one that follows it. Everything in between those two sentences should be evidence about the point that the paragraph is making.

The line of argument in an essay is yours. It's your answer. I can't tell you what you'll be writing about, but I can tell you that it's usu-

ally expected to be logical and coherent, even if engaging with the worst excesses of post-modernist philosophy. Your line of argument is your answer to the question, and therefore the opening line of many of your paragraphs are likely to address the essay title itself. A good way of testing your line of argument is to read your introduction, and then the first and last sentence in each paragraph, and then the conclusion. If the result doesn't sound vague or gibberish (twin demons of academic work), and the conclusion is convincing based upon what precedes it, then the chances are that you have a decent line of argument.

While the introduction of an essay differs a fair bit from academic articles, the point about a line of argument doesn't differ as much. Try reading 3–4 articles in this way, and you'll get a feeling for what I'm talking about. It's particularly important to read case studies this way, before you include them in essays. You will need to be using evidence in an essay, not describing it. There is a world of difference between the two, and the easiest way to understand that difference is to read an article using case studies in International Security or Security Studies, and compare that to a descriptive account of events that you might find in a general history of the topic.

Your reader (me) will also need to know the limits of your argument. Set your argument up, then knock it down—what remains it likely to be its most defensible form. Above all, don't think that ignoring major objections to your argument is in any way persuasive. The best way to avoid major issues is by framing your argument in the introduction (see above), however contentious points need to be addressed. How you address them, and the evidence that you use to do so, is what will get you higher grades. Remember: you're being marked on your ability to provide a reasoned argument with evidence that displays your underlying knowledge of the subject matter, it's not an election or similar rhetoric-heavy exercise.

Your conclusion ties everything together. Think Star Wars not The Sixth Sense. You should remind your reader of your answer to the question, why your answer to the question makes sense and is supported by the available evidence, and maybe you can add a few lines of "Where next?"—e.g. why your answer is important or where it could be continued. Don't throw curveballs, twists, a ton of new evidence, or a lot of material that contradicts what you have just spent 2,800 words arguing (keep your conclusion short, 250 words tops). Think of the nice warm fuzzy feeling you get while watching John McClane hug Holly McClane at the end of Die Hard 2, rather than the bleak "What happens next?" of The Thing and The Italian Job. Leave your reader thinking "What a good essay" and not "What the hell?" Also, never, ever, watch re-makes and re-boots. They suck.

If you ask me, Netflix should be forced to buy more classic films, but not musicals (except The Blues Brothers). If you're thinking "Where the hell did all this advice about movies come from?", well, that's what the person marking your essay will be thinking if you start going off on a tangent at word 4830 of a 5000 word essay.

One last point:

- Don't write essays in bullet points.
- Ever.
- Because they don't connect.
- And they make for a bad argument.

8.8 Acting Upon Feedback

The standard college feedback loop is 28 days. That is, you will receive feedback for your work within 28 days of submitting it. This is a long time, but it's necessary for me to mark your work properly and return it to you. Furthermore, although I aim to return feedback sooner, this is not always possible. The problem this poses is that by the time you get feedback, you are likely concerned with the next deadline, or maybe immersed drafting already. You might even have forgotten parts of what you wrote because mentally you have already moved on from the task. Nonetheless, you will markedly improve if you set aside a chunk of time from your schedule[26] and work on your feedback.

[26] 1-2 hours per assessment

The feedback that you get from me is likely to reflect the standard of your work. As a rule of thumb:

- If your work is below 50%, your feedback is going to state what is needed for a passing mark, and explicit standards required to achieve 60% for this kind of assessment
- If your work is between 50% and 70%, your feedback is going to explain what would be needed for the next grade boundary, and for marks of 70% and above.
- If your work is between 70-75%, I'm likely to be providing you with comments about elements that are holding your work back, and commentary on drawing out thoughtful/original points in your essay.
- If your work is above 75%, I'm likely to give you comments on how to explore or reconfigure your answer to develop the areas of particular excellence.

Please note that in the British system, 70% is the equivalent of an A grade.[27]

[27] From experience, this can cause heart attacks for students who completed their undergraduate studies in America. This is prime example of transatlantic mistranslation, because a British lecturer will say "Congratulations, that was excellent work" by giving a student the worst percentage grade that they've had since high school.

A second element of the feedback that I give you is a defined set of areas to work on, for the above reasons. I strongly suggest that you

take the time to examine these areas, and undertake tasks as noted. The reason for this is that acting upon feedback in this way is an additional mechanism of learning from that same task. The tasks that I suggest in feedback are all designed to be performed in half an hour or so, as a time-efficient way of building upon your existing work to improve your overall skillset.

8.9 Tracking Your Skills Development

Finally, one of the most important things that you can do is to track your progress over time. A very good sports coach once said to me: "Everybody makes mistakes, professionals can recover." Postgraduate study is hard. There will be ups and downs. You are highly likely to fall short of your own standards at some point. The important thing is that every high and low presents an opportunity to learn and improve.

9
Assessment

Oh, the fun part.

This chapter is a guide to the expectations for assessments on this course. This guide refers to this course only, as other lecturers may require you to approach tasks similar to these in a different way. All assessments are marked according to KCL's PGT marking criteria. My intent here is to provide you with as complete a guide as possible to my reasoning for setting these assignments, factors for you to consider when completing these assessments, and something of an FAQ of common questions students have asked about these assessments in the past.

This course requires you to produce two pieces of written work for assessment. You will have to produce a literature review (2500 words, 33%), and a research essay answering a question that you define (5000 words, 67%). I have to sign off on each research essay title to make sure it's something related to the course.[1]

[1] You will be expected to have a topic in mind by January 2020, and should be able to have a precise research question by the end of January 2020

Why this assessment pattern? Why not two essays? How come I'm not allowed to pick my essay title for the second essay? 5000 words, are you crazy? To answer these questions, and maybe preempt others, allow me to explain.

As I see it, the point of graduate-level study is to expose you to a range of interesting problems/questions/topics (also areas, fields, disciplines, etc), help you to figure out specific things that interest you, and enable you to leverage existing research in relevant fields to begin developing expertise in a field/area/discipline of your choice. I say "begin" because it's unlikely that any MA/MSc will make you an expert on something, but doing one is likely to speed up the process of acquiring expertise.

As such, this course is designed for you to pretty much follow your own interests (within reason) and approach the course content from the disciplinary perspective (or perspectives) that you want to develop. The course will require you to consider a range of approaches to these topics in discussions (and I expect you to be willing/able to

engage with these) but I'm not going to require a historian to write an essay on international relations theory, just as I'm not going to require someone developing their own expertise in gender theory to write an essay on strategy (I advise you to consider how these disciplines can be combined, but that's besides the matter at hand).

There are some common elements to all of these assessments. One element to keep in mind is that your reader should be assumed to be an intelligent, but uninformed, person. Your level of explanation should reflect this. Don't assume that they automatically know the existence of detailed sub-debates. Research communication is about enabling other people to comprehend your research in an efficient manner.

Following from the point above, avoid verbiage and unnecessary wordplay. Plain and clear explanation is the goal. Of course, some ideas are hard to communicate and require extended sentences to do so, but please aim for clarity.

For the erasure of any doubt, I'm committed to disciplinary pluralism. Particularly with the topics this course covers, I don't think that any single discipline can provide "the" answer to some of the questions we'll discuss. That means you are free to approach the long essay any way you want. There are a few caveats to this. First, I don't care if you're a critical theorist or a hardened neorealist, but I do expect a clear and logical argument that uses a theoretical frame drawn from existing academic work, backed by evidence/explanation. Secondly, I suggest that you connect theoretical arguments to case studies. This isn't mandatory, and may not be applicable to all disciplines, but in my experience the best essays are those that connect with actual cases. Third, and last, the cardinal sin is presenting a straw man argument. Your essay should present the strongest counter-arguments to the position that you take, and engage with them.

9.1 Literature Reviews

A literature review is intended to communicate to the reader the academic importance of a research problem. For the highest grades in a literature review, your work will either:

- Demonstrate the originality and importance of a question to which there is currently no answer in existing work on the subject, or
- Provide an original critique of academic work on an existing question

In both cases, you are not expected to have an answer to the question yourself!

It is important to distinguish between the process of writing a literature review, and the end product. The end product (e.g. what you submit for assessment) is a 2500 word piece of work that should enable an intelligent but uninformed reader to understand the importance of a research problem, its academic importance, and the key academic debates that constitute current enquiry into the subject. This means that you will have to make a number of design decisions, notably which debates and authors to include, and those to exclude, which of those included are central, and those that can be relegated to a footnote.

A literature review in the sense of the product presented for assessment is slightly artificial. Usually literature reviews are integrated into research articles. To get an understanding of how this assessment fits within general academic work, read key journals in the field that you are working. Usually, in something like *Security Studies* or similar, an author will start with an introduction to a problem or issue, and then situate that issue within existing academic work on the topic, and in the process identifying a key question to answer.[2] They'll then go on to provide a reasoned method for answering the question, and answer it. What we're focused upon in this assessment is the first two steps.

[2] Here are some good examples of this:@@

You should title your literature review as a question. For example:

- Why do historians disagree about the starting point of the military revolution in Europe?
- Does technological determinism persist in military innovation?
- How are generations of military planes constructed?

If you are stuck for something to write about, a good formula for generating potential topics is to do some preliminary research. Ask yourself "How have X analysed Y?" where X = self-selected members of an academic discipline,[3] and Y = a case study (conflict)[4] or an element of a case study (important event/debate),[5] or disciplinary tool (ticking time bomb scenario, key theoretical discussion relevant to the course).

[3] Historians, strategists, political theorists, etc.

[4] For your own benefit, try to avoid those used as case studies on the course, it's better to use this to expand your knowledge into a new area.

[5] In the context of this course, there are no shortage of key events. Often a single, infamous, war crime forms a cornerstone for ongoing discussions about key theoretical questions.

After you have found something that looks interesting, ask yourself "Why is that important?" in the sense that you should be primarily focused upon academic importance in this assessment. Policy relevance is optional.[6] Lastly, you should be keeping in mind "Is there something important that they have missed?" because this last question is where you will find the critical engagement/originality elements that I mentioned at the outset.

[6] Outside universities this is likely to be the other way around, but you paid to take an academic course.

You are free to stick within a single discipline, but sometimes it is interesting to compare the approaches of two disciplines to the same topic. In the end, pick a topic that interests you, and that has some demonstrable academic importance. You don't get extra marks for

picking a cutting-edge or vitally important question, but without demonstrable academic importance, it is hard to score high marks in this assessment.

9.2 Research Essay

If the prospect of a 5000 word research essay worries you, please don't panic - there are effectively 10 teaching sessions to support you towards this in term 2. The basic structure of a research essay is similar to that of a research article that you will find in an academic journal, but it is likely to be shorter (most academic articles are 7000-9000 words). In short, you will need an introduction, to explain your research question, explain how and why you're going to answer it in a given way, and then provide an answer.

There are four general components for a successful research essay: Identifying a research area, identifying an interesting research puzzle, constructing a theoretical framework, and posing an answerable research question. We will be covering this in detail in the lecture series in term 2. Identifying a research area is much the same as what you do in a literature review.

Identifying research puzzles is important, because they are a good way to sharpen your thinking, and to avoid research questions with obvious answers (which means it is hard to develop original engagement with the topic). As proposed by Karl Gustafsson and Linus Hagström, research puzzles can be framed in this way:

> 'Why x despite y?', or 'How did x become possible despite y?'3 A puzzle thus formulated is admittedly a research question, but one requiring much closer familiarity with the state of the art than a 'why x-question'. The researcher considers the phenomenon x puzzling since it happens despite y – that is, previous knowledge that would seem contradicted by its occurrence.[7]

[7] Gustafsson and Hagström (2018)

However a good research puzzle might not be answerable. This is a big problem for a 5000 word essay - you don't necessarily have the space to engage at depth with some kinds of questions. One important problem is too much novelty. Here I will borrow from Michael Horowitz, a professor at the University of Pennsylvania.[8] Horowitz had a great piece of advice for choosing PhD dissertation topics that I think is also applicable to graduate-level research in general. In essence: either pick a new body of theory to analyse a pre-existing case study or substantive issue, or use pre-existing theory to analyse a new case study or substantive issue. Old theory/old case is unlikely to get you anywhere interesting, and (particularly with 5000 words) attempting to explain a new body of theory and apply it to a new case study for which there isn't much agreed evidence is the equivalent of

[8] His twitter handle is mchorowitz

a moonshot. Horowitz frames this as "High risk/high reward", here I frame it as a unicorn, because at 5000 words successful examples are pretty much figments of the imagination.

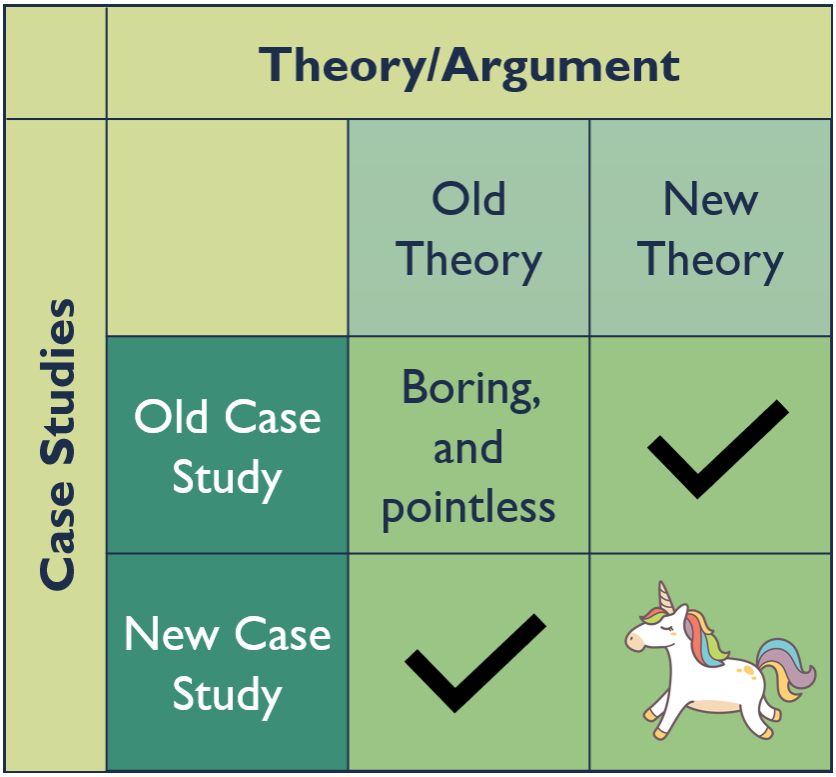

Figure 9.1: What about examples? Well, for the top left (old/old), this might be trying to evaluate whether classical or neoclassical realism best explains the origins of World War 1. For the top right (old case/new theory) this might be using emerging theories of ontological security to explain the origins of World War 1. For the bottom left, this might be applying classical/neoclassical realism to the origins of the conflict in Yemen. For unicorn status, you could attempt to apply ontological security to Yemen. I'm not saying it can't be done, but it would be very, very difficult to do in 5000 words.

Where a 5000 word essay extends on a literature review is that you are then expected to answer the question. This means that you will need to construct a theoretical framework. As above, you can pick old or new theory, but a good theoretical framework for answering a research question usually involves two competing theories or explanations, which can be used to evaluate evidence or explain events. Here it's good to research to the point where you can identify key competing explanations/authors, prior to selecting a couple to use in your essay. An important consideration here is the existence of prior work. If there is no prior work in the area, then you are going to have a really tough time. If a theory or argument is so left-field that it doesn't really connect to existing academic research, how are you going to be able to make those necessary connections *and* answer the question in 5000 words? Similarly, if the case study that you want to examine has very little written about it by reputable authors, how are you going to establish the facts of the case within the word limit? My advice is that you pick a research puzzle where there are plenty of related

pre-existing disagreements, or one that sits at the intersection of two fields/disciplines.

The last step is to consider what kind of question can be answered in 5000 words. This is primarily an issue of scoping questions. Set questions are often quite broad or vague, because part of the art of answering a set question essay is to be able to re-scope the question to something answerable in the introduction. Bear in mind when reading around for suitable questions that you are not assessed upon your ability to produce work comparable to people with a minimum of 3-5 years of professional training, but you are assessed on your ability to select a question that can be answered within 5000 words without substantial original research. To navigate this, let us turn to Greek mythology.[9]

[9] Bet you weren't expecting that line.

Per Wikipedia:

> Scylla and Charybdis were mythical sea monsters noted by Homer; Greek mythology sited them on opposite sides of the Strait of Messina between Sicily and the Italian mainland. Scylla was rationalized as a rock shoal (described as a six-headed sea monster) on the Italian side of the strait and Charybdis was a whirlpool off the coast of Sicily. They were regarded as maritime hazards located close enough to each other that they posed an inescapable threat to passing sailors; avoiding Charybdis meant passing too close to Scylla and vice versa. According to Homer, Odysseus was forced to choose which monster to confront while passing through the strait; he opted to pass by Scylla and lose only a few sailors, rather than risk the loss of his entire ship in the whirlpool.

You face two dilemmas in scoping your research question. First, whether the answer to the question is either too obvious, or frankly impossible. Second, whether the argument required to answer the question is simple, or obscenely complex. By "complex" I mean that it involves far too many factors to be able to pull them all together in a coherent manner. Per Homer, I suggest that you err on the side of difficulty and complexity, but not too much.

To give some explanation, let's say I want to write a 5000 word essay about the design of nuclear command and control systems. I pose the following question:

> Did culture affect the design of nuclear command and control systems?

The problem with the question is that it's quite clear the answer is yes. When we look at the history of nuclear command and control systems, we find lots and lots of different systems in place. The US President carries around a nuclear "football" allowing them to issue orders anytime, anywhere, while the British Prime minister writes a set of letters that go into a safe in a submarine. The Soviets tried out

a "dead man's hand" system to automate nuclear apocalypse in the event of incoming ICBMs. Fundamentally, the question as framed is so general that the answer is likely to be straightforward. A question at this level of abstraction is going to produce an answer full of generalities. Okay, attempt 2:

> How did culture affect the design of nuclear command and control systems?

Okay, now we've gone in completely the other direction. The scope of this question is such that we're now trying to explain how culture might affect the design of nuclear command and control systems across 8+1 nuclear weapon states.[10] How many different ways did culture influence the command and control setups of nine different states? I don't know. Maybe you could answer this question in a book, but it is far beyond the scope of a 5000 word essay. Oh, and the question as posed would also have to account for the influence of culture in the evolution of all of these systems. Again, you could answer this in a broad brush fashion, but not really in the detail you'd need to say something original on the topic. Time for round 3:

[10] Israel is widely suspected to have nukes, but decided being a real-life Schrodinger's Cat was better than publicly confirming this.

> How did security cultures affect the design of American nuclear command and control systems?

Better, but still not perfect. In contrast to the previous question, we've now rescoped from nine countries to one, and cut down "culture" into "security culture" - sets of cultural and institutional ideas dealing with security. However this is still too complex. The American nuclear deterrent consists of a huge variety of overlapping systems, embedded in a variety of institutional context. The question as it stands would force you to consider an extremely wide range of cases to try to provide an answer. Onto round 4:

> How did security culture affect the design of Permissive Action Links on American nuclear warheads in Europe?

This is far, far, more answerable than the previous questions. This might seem strange - the question itself is a lot longer than the one we started with. At the same time, the question is dealing with a very specific issue - Permissive Action Links that prevent the unauthorised use or detonation of a nuclear warhead - and a specific context to focus upon. It might scare you to learn that the US had nuclear weapons stationed in Europe outside their full control, protected in some cases with a mechanical lock, but looking at the transition to computerised locks is an interesting case study. This kind of question is the 'sweet spot' for a 5000 word essay, but please don't feel that you have to write on this topic, or even from a historical perspective - this is just here for an example.

Okay, so once you have a question, then you have to answer it. See the previous chapter for advice on this. But again, we'll be talking about constructing research projects in detail during term 2.

10
Group Projects

Group projects are a core element of the course, but they are not part of your formal assessment. The group projects are designed to get you used to performing research as a team. For this reason, don't be intimidated by the scale of the output required - it is calibrated to be too much for an individual, but easily manageable for a small group. You will be assigned a group by me. The projects will be organised on a OneNote notebook, which you will get access to at the start of term.

10.1 Using OneNote

OneNote is a Microsoft product that is selected for ease of use. If you have used Microsoft Word, then the general layout of the software should be familiar to you. The notebook will be accessible if you log into your KCL email through the web portal, and then select OneNote from the options pane.

The notebook will be laid out, so you don't have to do any page creation/layout. However, there are some ground rules:

- For clarity, use Harvard referencing where needed. So "The cat sat on the mat (Doe, 2013, 3)" or similar.[1]
- Don't edit other people's work.
- I'll ask you to nominate one person in your group to be the person I contact with questions.

[1] The KCL library offers referencing guides here `https://libguides.kcl.ac.uk/reference/KingsHarvardV1`

10.2 Aims

Why do this? There are three reasons that I have included this activity in the course (and like activities in other courses that I convene). First is that this activity enables you to practice and develop team-working skills. Second, this activity is designed so that you perform a related piece of group research prior to each assessment. The literature search precedes the literature review, and the case study precedes your

essay. Lastly, this activity is intended to get you to think about the possibilities inherent in open and collaborative research efforts.

10.3 Group Research Projects Timeline

All students will do 3 group projects over the course of the module.

This is the summary timeline (it may be tweaked slightly):

- Week 2: Groups assigned for Literature Search Project
- Week 6: Deadline for literature search, groups assigned for Case Study Project
- Week 12: Deadline for case study, groups assigned for the Random Revolutions Project
- Week 18: Deadline for random revolutions project

10.4 Literature Search

For this group project, each group will be looking at a context for the military revolution in Europe, focusing upon connections between the military revolution and the Americas, West Africa, the Indies and and Asia, and the Ottoman Empire. The idea behind the group work is to give you a chance at performing a literature review and getting feedback on it prior to your assessed work on the course. It also enables you to understand a single context in detail, and the seminar in week 7 will be dedicated to discussing the findings of the course. The idea here is that as a group, you should be able to identify from reading the key works in a given field much easier than you ever could as an individual.

The goal of this project is a functional output. It is designed to be something of use to your fellow students. Note that since other groups will be working on separate projects, you will be able to benefit from their work.

For a minimum of expected output:

- 2-4 key readings for introduction to the topic (not including those on the reading list)
- 30+ key works on the topic, including
- At least 5 works drawn from military history
- At least 5 works drawn from the history of technology

I realise that the above seems like a lot, but you'll be doing this in groups of 4-5 students, meaning the workload for each student is effectively locating 6-7 articles/books.

10.5 Case Study

This is a project designed to enable you to work to a project specification. In addition, it is designed to give you some background knowledge for the research series in term 2 that you arrive at through your own research. Your task is to (collectively) write a short (500-1000 word) answer to the question, that explains the central problem(s) in the academic literature, outlines competing arguments (providing key sources), and gives your group's considered opinion on the answer to the question.

- What is the best explanation for British counter battery fire innovation 1914-17?
- Why was the accuracy of Dreyer Fire Control Tables controversial?
- What can the development of the H2S, and responses to it, tell us about military adaptation?
- Which system was more innovative, the SCR-268, or the SCR-584?

10.6 Random Revolutions

Term 2 is likely to be stuffed with serious essay deadlines across your various modules. Therefore the final group task is designed to be lighthearted and somewhat reflective. Throughout the module we study different framings of change, and in the final quarter, we'll be discussing the way in which the history of warfare is periodised. We'll be studying how people put a lot of thought into periodising history in an academic manner. So for group projects, we are going to do completely the reverse. You will be put into groups at random, and each group will roll dice to select a random start date from 1200-1800.[2] As a group, you will be tasked with finding a good argument for technology as a cause of both continuity and significant change in warfare for the 100 year period from your start date. The idea is to force yourself to consider how you may have to constrain or expand your scope of investigation (state/region/globe), as well as how you deploy arguments about processes of change. This might strike you as an anti-academic exercise - it is - but the point of it is to consider the rhetorical role of the theories that we have covered. We'll be discussing these ideas throughout the last quarter of the course, so no significant written output or research is required, but you should email me 2-3 sentences on each (continuity/significant change) in week 18 to let me know your group hase finished the project.

[2] That is, if I can find a couple of ten sided dice, otherwise we'll just use a pseudorandom number generator.

11
Extended Learning

This chapter is entirely optional and contains information about my personal lab. Again, this is entirely optional, and not tied to the course. I started my lab to experiment with teaching practice and collective research projects aligned with my research interests. The idea is that lab members co-learn, develop joint research projects, and work towards publication at an appropriate level. If you are looking to round out your CV with practical experience, or develop personal research towards publication, this may be of interest.

11.1 Ethics, Technology & Conflict Lab

The lab exists to promote innovative approaches to the study of war and conflict. In practical terms, the lab is a structure to enable you to learn research skills in a short period of time, to develop your own field of expertise, to experiment with scalable research methods and digital technologies, and to get practical experience in academic research for your CV. The underlying idea is to experiment and test the limits of what is possible in a way that is mutually beneficial to all persons involved.[1]

This is my personal lab. The focus of lab work is the rather wide remit of "Culture, Technology and War".[2] If you are a student on one of my courses, the chances are that there's something you are interested in within this frame. The central idea of the lab is to provide a space to experiment with teaching methods, and to enable students to develop their practical research and communication skills through project based learning.

There are four strands of activity to engage with:

- Skills development. About a third of time spent in the lab is dedicated to the development of practical skills, most importantly experimenting with developing the skills required to undertake group or personal projects. We'll experiment with learning sprints, collab-

[1] This means no filling envelopes, no fetching coffees, or any other drudgework associated with internships.

[2] I am not good at naming things, so this may change

oration technologies, and whole-cohort research projects alongside more standard elements like drafting and editing your prior academic work to suit different audiences.

- Research projects. A fundamental aim of the lab is to enable groups to experiment with research projects[3] that are devised by lab participants. In other words, follow your nose. This element of lab activity is intended to be creative, with the idea of producing minimum viable research products, that may be the basis for further, formal, research.
- Communicating research. A third element of lab participation is the development of your work (and group work) to publication standard. This involves working through simulated peer-review processes to develop working papers, blog posts, data sets, reports, bibliographies, or further.
- Professional experience. I have a range of ongoing research projects. If you need, or would like, experience of working on academic research projects, then we can agree upon a set of tasks that would suit your CV.

[3] Ones that do not require research ethics approval.

For the 2019/20 teaching year, this means:

- A distributed research project durings terms 1 and 2. This involves learning to use a handful of digital technologies (Markdown, Git/Github, Bibtex) and using them to produce a research bibliography. The focus for this year will be conflict, strategy, and climate change.
- A research communication workshop in term 3[4]

[4] This will be a 2 hour session focused upon transforming your work into viable articles, blogposts, etc, with a view to seeking publication

11.2 Strategy and Climate Change Research project

The purpose of this project is to experiment with distributed and remote project work. That is, the primary goal is to develop ways of working together at distance, at scale, and using data formats that maximise the utility of research outputs for other researchers.

The topic is strategy and climate change. This means we will be potentially looking at three different types of literature:

- Literature on conflict and climate change, and examining it to analyse its potential consequences for strategy and warfare in the 21st century
- Literature on strategic studies, and examining it to analyse the extent to which it is informed by current scientific assessments of the impact of climate change in the 21st century
- Literature on the diplomacy of climate change, and examining it for insights drawn from, or contradicted by, existing work on grand strategy

If you are interested in working on any of those three subtopics in particular, get in touch. Equally, if you just want to learn some new skills and build up your CV, get in touch.

In theory, the schedule for 2019-20 looks something like this:

- October: Get together for a first meeting, sort out tools we will use for research projects, training projects with tools, participants select projects they want to work on.
- November: Initial literature search and scoping meetings.
- December/January/February: Build project bibliographies, meet to discuss progress each month.
- March: Meet to discuss interesting ideas, identify literature gaps.
- April: Workshop to prototype potential research projects/datasets.
- May: Writing and research communication workshop.

In short, there will be a meeting once every 3 weeks or so where we'll discuss interesting stuff about strategy and climate change.

12
Figures

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