national center for ontological research
ncor

University at Buffalo
The State University of New York

Foundations: Part 1

John Beverley

Assistant Professor, *University at Buffalo*
Co-Director, National Center for Ontological Research
Affiliate Faculty, *Institute of Artificial Intelligence and Data Science*

Outline

- Intelligence Successes and Failures

- Characterizing Intelligence

Outline

- Intelligence Successes and Failures

- Characterizing Intelligence

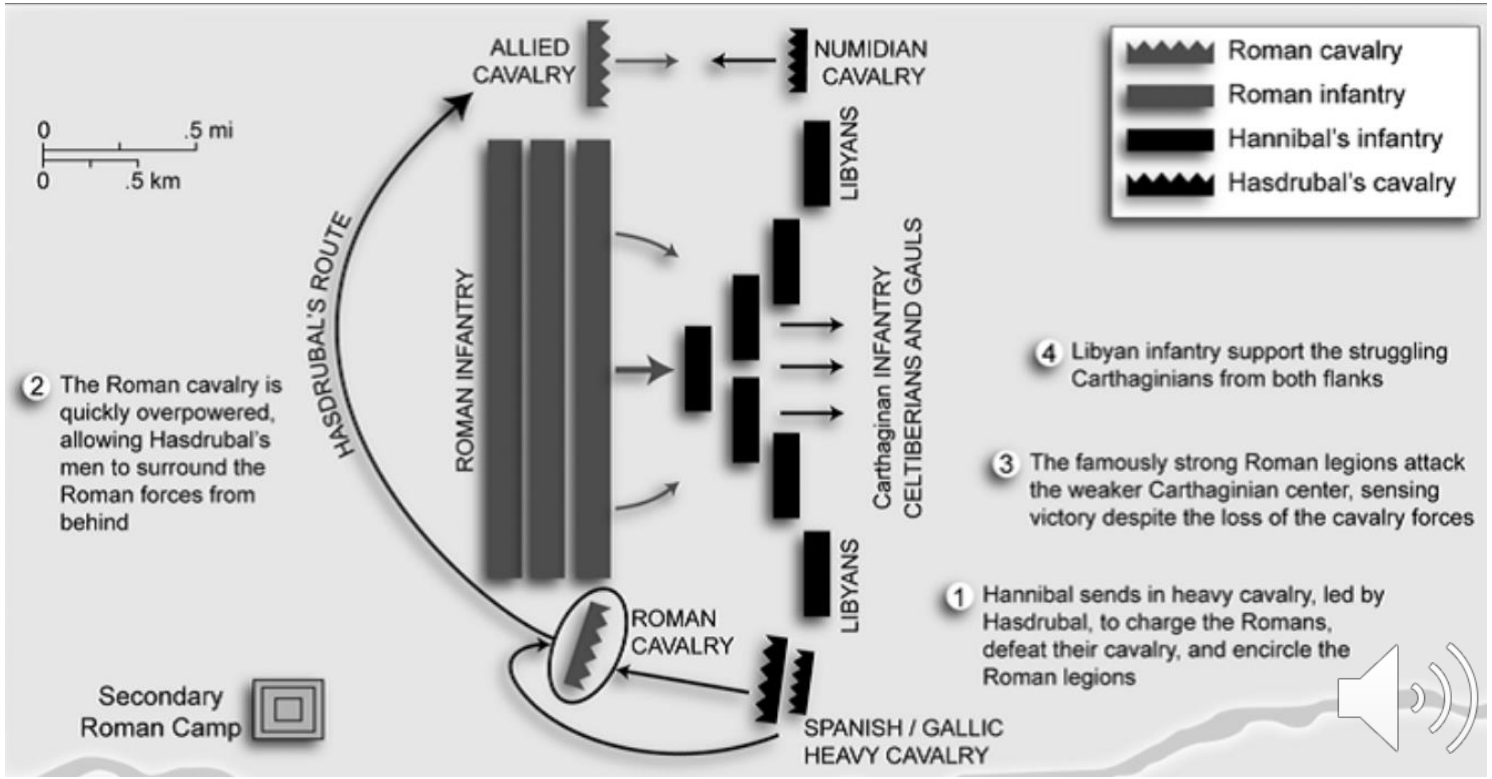
Battle of Cannae

- 216 BCE Second Punic War
- Romans raised an army of ~70,000 troops to push Hannibal from the pennisula, some of whom were Celtic warriors from nearby regions
- Some of whom were spies for Hannibal...

Battle of Cannae

- Romans had experienced soldiers push through the center of Hannibal's troops, with the goal of splitting his army

- Hannibal placed weakest troops in the center, flanked by elite troops

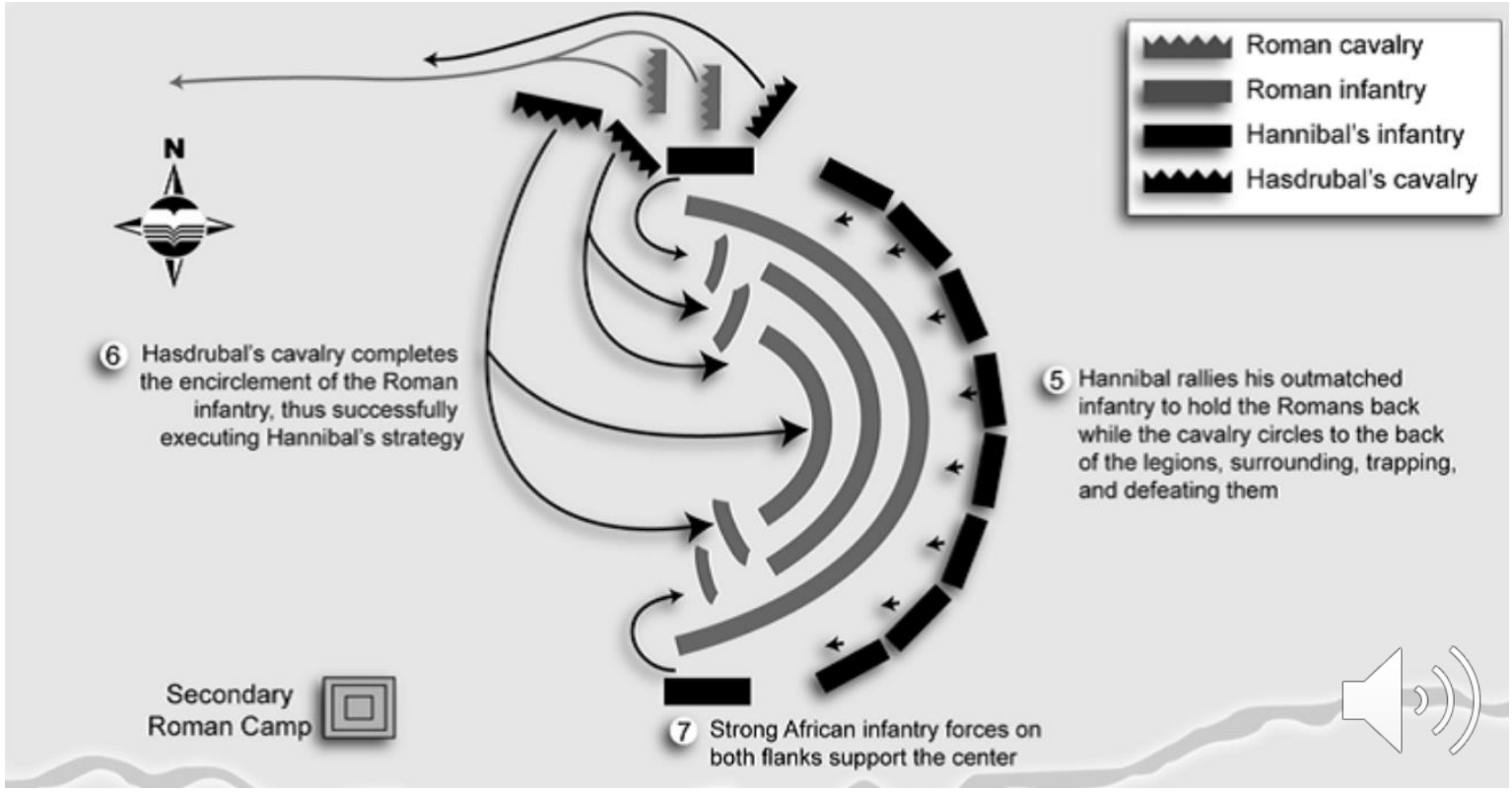


Battle of Cannae

- As the Romans pushed the center, Hannibal's weakest troops gave ground and the elite troops moved to encircle the Roman army

- 60,000 Roman soldiers were killed in this battle

- ~20% of adult male Roman population



Japan Invades the Philippines

- 1942 during World War II, just after the U.S. had entered the war
- Douglas MacArthur, commander of the United States Armed Forces in the Far East, stationed in the Philippines, was forced to retreat
- Long-term strategic planning by Japanese military resulted in spies infilitrating U.S. and Philippine organizations
- For example, it is reported that a gardner for the Philippine governor was a high-ranking Japanese military officer

THE WEATHER
Yesterday's Max.: 37.0 C. or 98.6 F. at 4:40 P. M. Min.: 23.5 C. or 74.3 F. at 6:35 A. M.

The Tribune

5 Centavos
4 Pages

MANILA, PHILIPPINES, FRIDAY, APRIL 24, 1942 YEAR XVIII

BATAAN COMPLETELY OCCUPIED BY JAPANESE

Japanese Forces Take Cebu

15 Generals Among War Prisoners

TOKYO, April 11 (Domei).—Imperial Headquarters announced at 4:10 o'clock this afternoon that Japanese forces since the

Japanese Flag Planted In Cebu City

ABOARD A JAPANESE [illegible]SHIP, April 11 (Domei):— [illegible]ach units of Japanese bluejackets at 10 o'clock yesterday morning af-

Double-Edged Sword

- These examples illustrate both intelligence analysis **failures** and **successes**

- The **failure** of Roman consuls to acquire and leverage intelligence while battling Hannibal was compounded by Hannibal's proclivity for **leveraging intelligence**

- The intelligence **failures** of the U.S. and Philippine military forces were magnified by the long-term **intelligence strategies** deployed by the Japanese military

9/11

- 2001, four U.S. commercial airplanes were hijacked by members of Al-Queda intending to crash them into the Twin Towers, the Pentagon, and Washington D.C.

- All were successful with the exception of the planned crash in D.C.

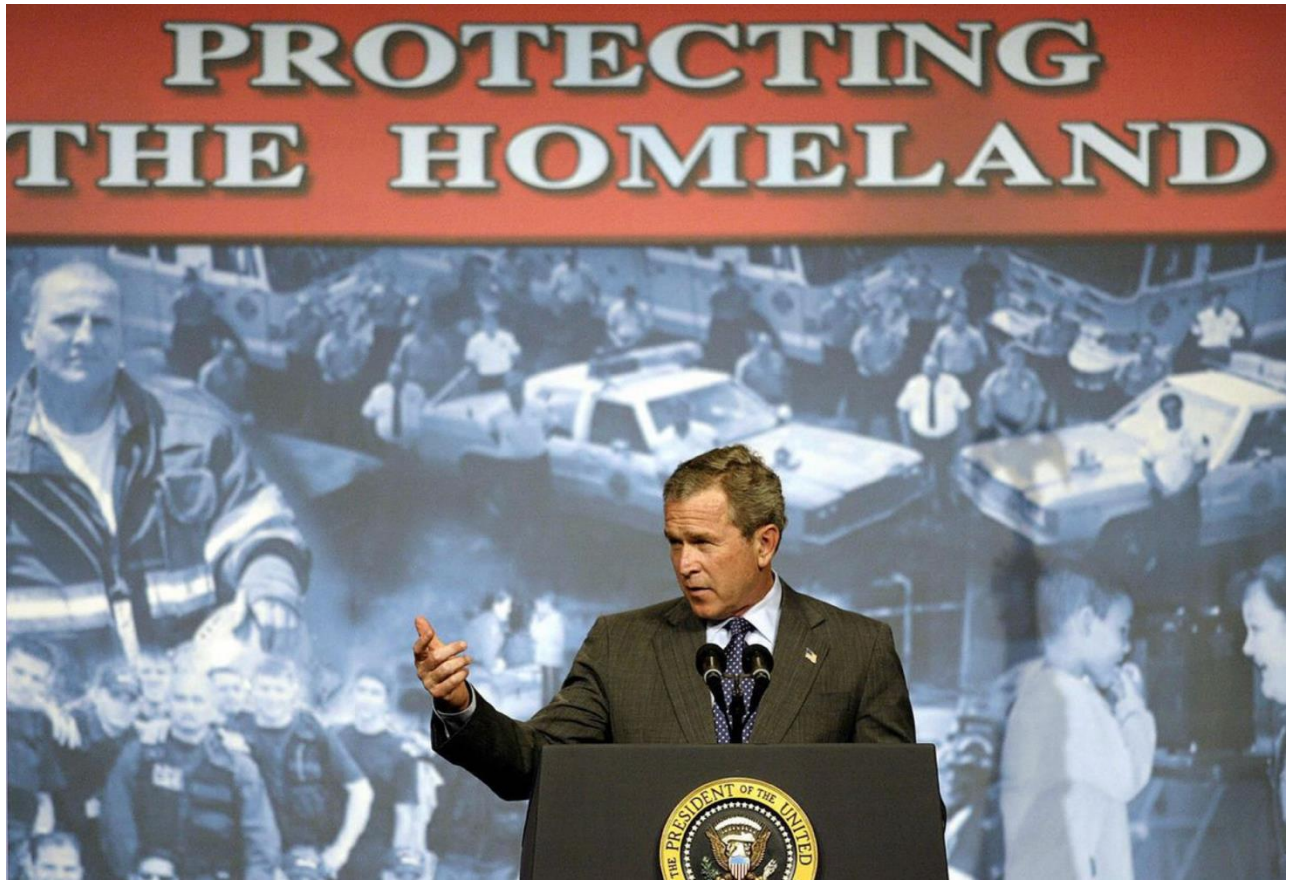
- The Twin Towers collapsed; nearly 3,000 people were killed in the attacks

9/11

- Resulting investigations revealed U.S. intelligence agencies knew Al-Queda was mobilizing, but information was not shared freely across agencies

- At the time the NSA considered itself an intelligence curator; if an agency asked whether Al-Queda was mobilizing, they'd confirm

- Few people knew to ask...



Double-Edged Sword

- The 9/11 attacks were magnified by **failures** of intelligence sharing across U.S. government agencies

- The U.S. government established the Patriot Act to ensure such failures did not happen again

- Expanding surveillance capabilities of law enforcement and easing information flow between agencies

Intelligence

- Intelligence permeates these examples…
- Leveraging intelligence led to more **informed decision making** during crisis
- On the other hand, when intelligence was:
  - **Absent**, e.g. Japanese invasion of Bataan
  - **Present but ignored**, e.g. Roman loss at Cannae
  - **Present but siloed**, e.g. 9/11
- Relevant decision making resulted in **devastating losses**

Outline

- Intelligence Successes and Failures

- Characterizing Intelligence

"Intelligence" in Natural Language

- "Intelligence" is spoken of in many ways

- **Entities** can be considered intelligent, e.g. Einstein, Aristotle, Fido the dog, Hal the computer

- **Or exhibit intelligence**, e.g. performing well on an exam, read a defense, offer a quick quip

- **Activities** can be considered intelligent as well, e.g. chess strategy, Hannibal's encirclement strategy

"Intelligence" for our Purposes

- Even putting aside these uses of "intelligent" and "intelligence", the sense of "intelligence" within our scope is **also** spoken of in many ways...

- Traditionally, such **intelligence** has been viewed – roughly – as a 'strategic process to guide decision-making and avoid surprises'

- This is not incorrect, but does not capture the full picture of intelligence; there is a **need for more precision**

Sample Characterizations of Intelligence

- Form or power, not unlike military power or economic power (Herman, 1996)

- Information that allows policymakers or operational commanders, to make more effective decisions (Warner, 2002)

- Either a process through which intelligence is requested by superiors, then collected, analysed, and fed to the consumers, or a product distributed through multilevel secure electronic databases, or institutions, e.g. intelligence services (Lowenthal, 2019)

Sample Characterizations of Intelligence

- Form or power, not unlike military power or economic power (Herman, 1996)

Underspecified, what differentiates it from other powers?

- Information that allows policymakers or operational commanders, to make more effective decisions (Warner, 2002)

Does not distinguish information from intelligence; too narrowly focused on policymakers, etc.

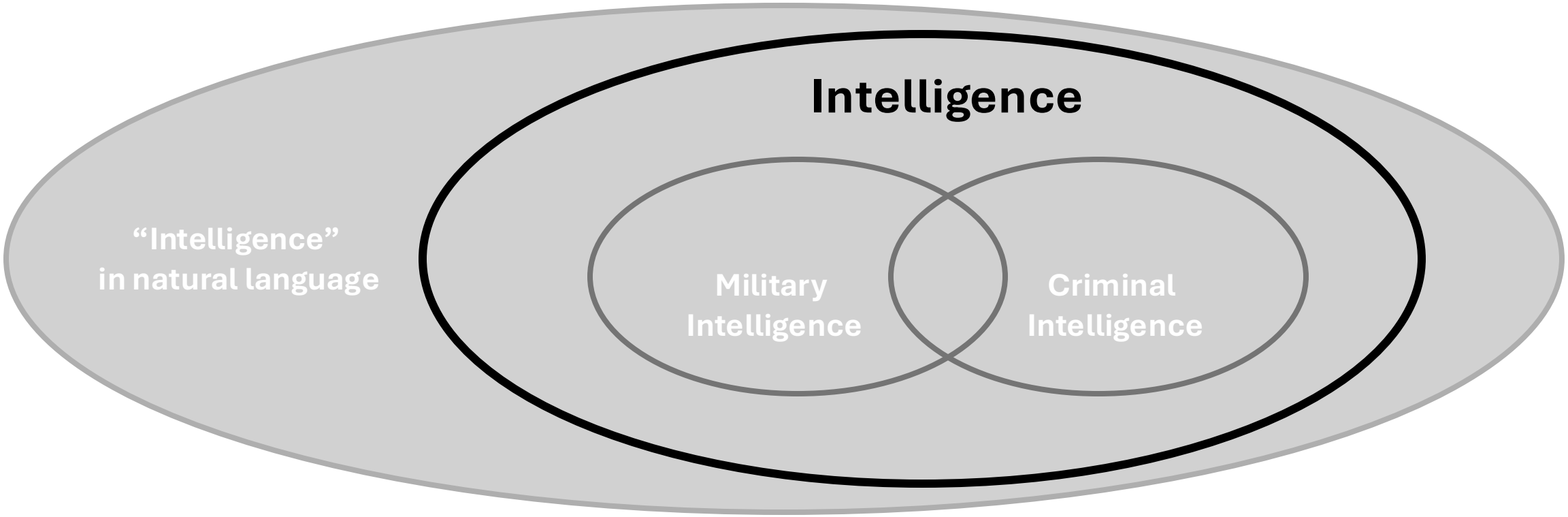
- Either a process through which intelligence is requested by superiors, then collected, analysed, and fed to the consumers, or a product distributed through multilevel secure electronic databases, or institutions, e.g. intelligence services (Lowenthal, 2019)

Can't one have intelligence not requested by superiors or distributed in databases?

Are *institutions* really understood to be "intelligence"

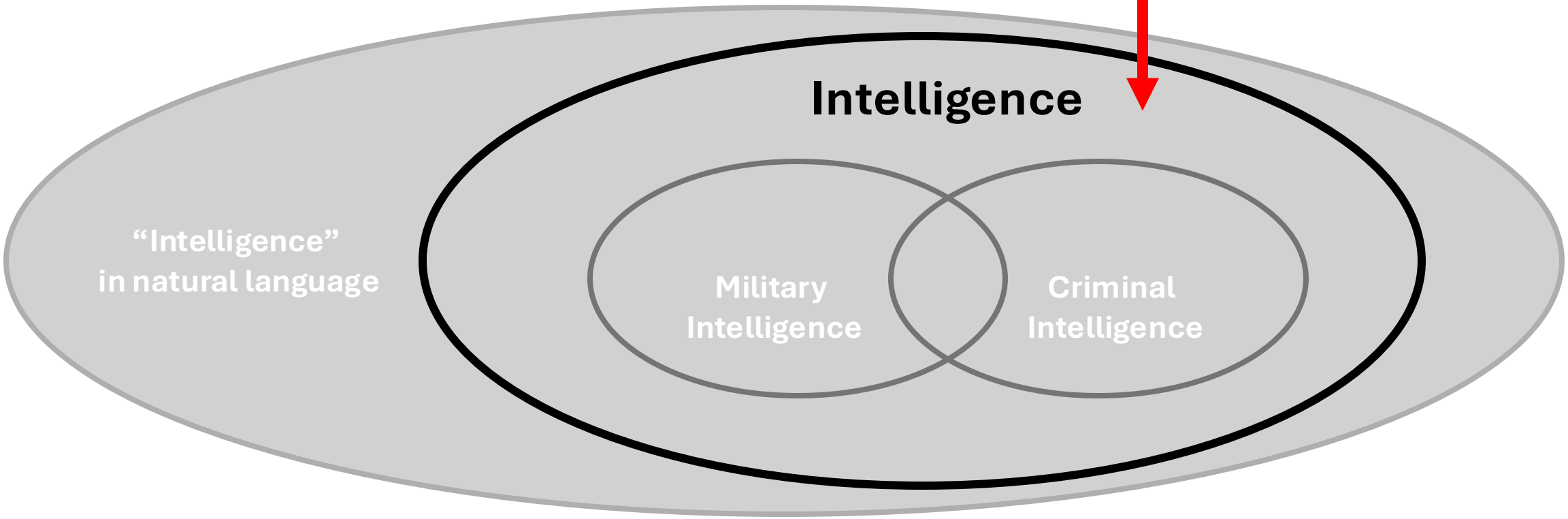
Definition Construction 101

- We are aiming towards a precise definition of "intelligence" that is narrow enough to exclude many natural language uses, but broad enough to serve as a common starting point for more specific definitions



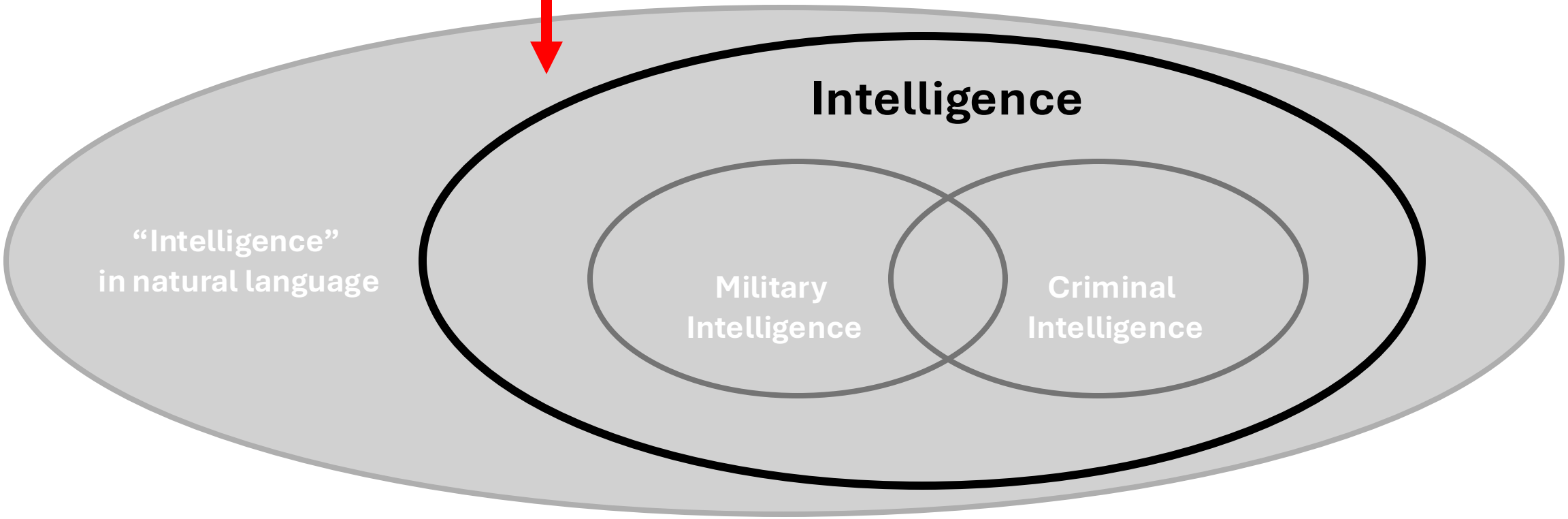
Definition Construction 101

- We are aiming towards a precise definition of "intelligence" that is narrow enough to exclude many natural language uses, but broad enough to serve as a common starting point for more specific definitions



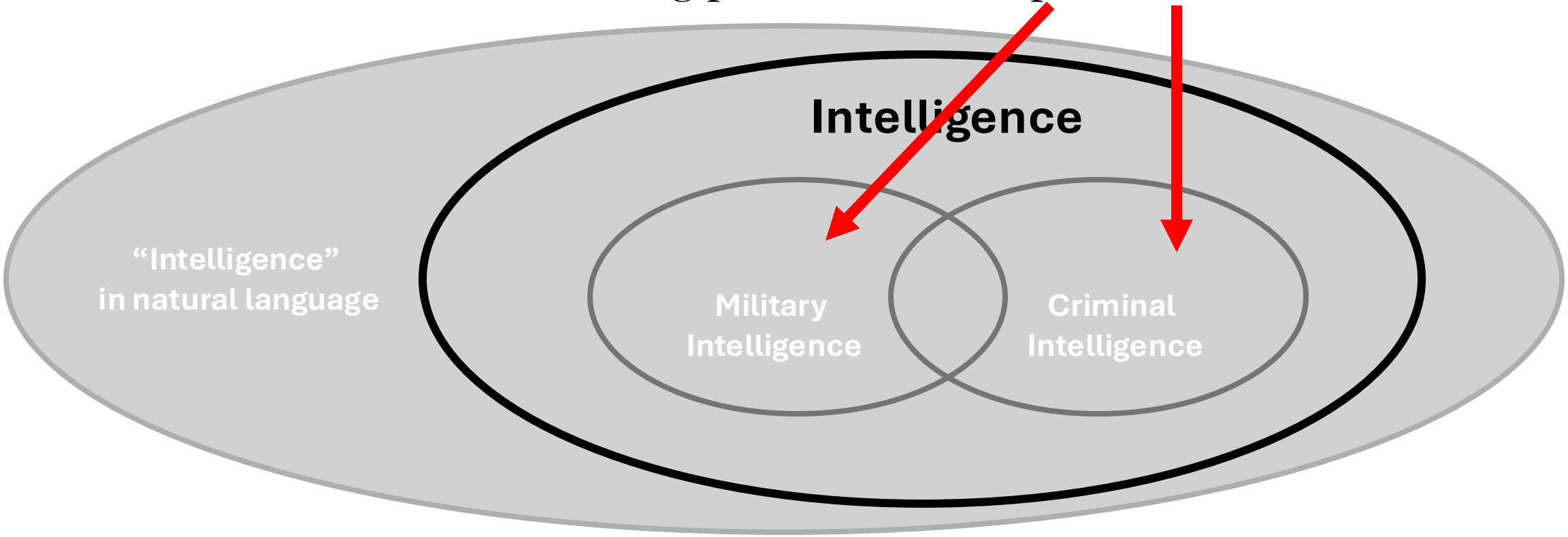
Definition Construction 101

- We are aiming towards a precise definition of "intelligence" that is narrow enough to exclude many natural language uses, but broad enough to serve as a common starting point for more specific definitions



Definition Construction 101

- We are aiming towards a precise definition of "intelligence" that is narrow enough to exclude many natural language uses, but broad enough to serve as a common starting point for more specific definitions



Definitions 101

- For any definition there is a term defined – T – and the expression or expressions – E – defining that term

- A definition is a pair <T, E>

- For any definition and any domain, T is true of that domain just in case E is true of that domain

Triangle $=_{def}$ A polygon with three edges and three vertices

Evaluating Definitions

- Evaluating a definition then involves at least two steps:
  - Assume T is true of a domain, attempt to find a scenario in which E is not
  - Assume E is true of a domain, attempt to find a scenario in which T is not

Triangle $=_{def}$ A polygon with three edges and three vertices

- The preceding is a good definition; any triangle is a polygon with three edges and vertices; any polygon with three edges and vertices is a triangle

Evaluating Definitions

- Evaluating a definition then involves at least two steps:
  - Assume T is true of a domain, attempt to find a scenario in which E is not
  - Assume E is true of a domain, attempt to find a scenario in which T is not

Human Being $=_{def}$ A featherless biped

Evaluating Definitions

- Evaluating a definition then involves at least two steps:
  - Assume T is true of a domain, attempt to find a scenario in which E is not
  - Assume E is true of a domain, attempt to find a scenario in which T is not

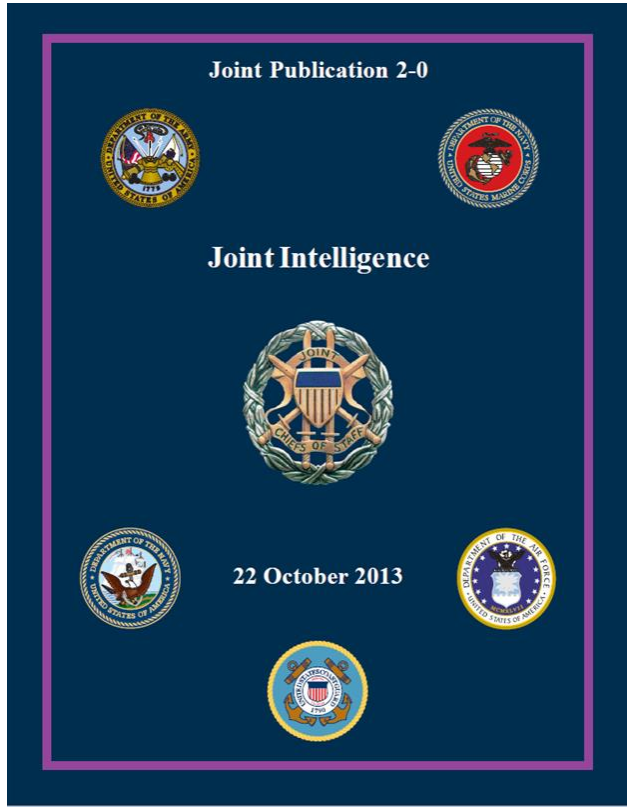
Human Being $=_{def}$ A featherless biped

- The preceding is an infamous definition attributed to Plato; Diogenes the Cynic famously plucked a chicken and proclaimed "Behold, a man!"

Joint Publication 2.0 Definitions

- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

- *Joint Intelligence* $=_{\text{def}}$ Intelligence produced by elements of more than one service of the same nation.



Joint Publication 2.0 Definition

- *Intelligence* $=_{def}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

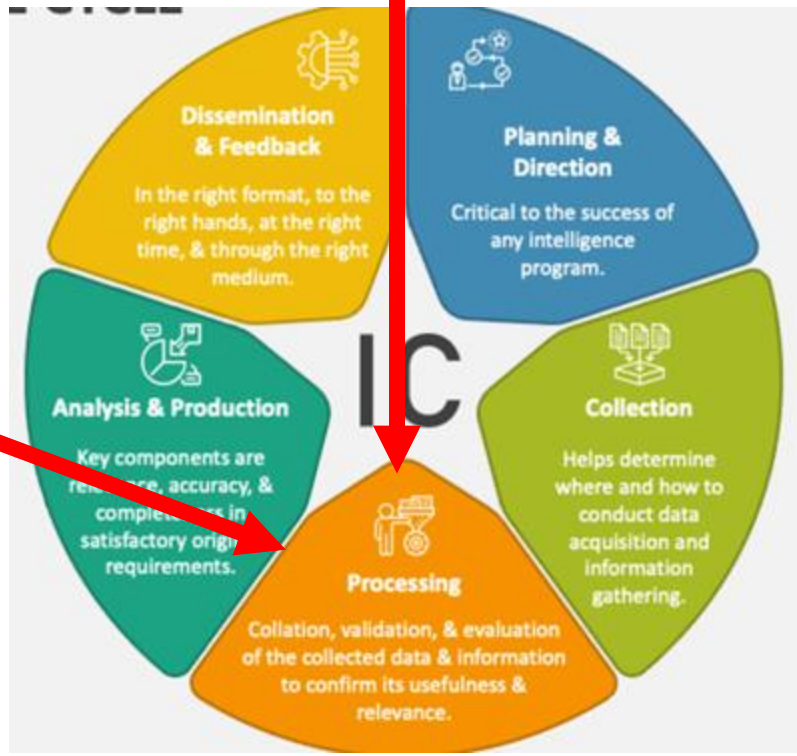
- **Intelligence Cycle**

Joint Publication 2.0 Definition

- *Intelligence* $=_{def}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

Joint Publication 2.0 Definition

- *Intelligence* $=_{def}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.



Joint Publication 2.0 Definition

- *Intelligence* $=_{def}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

Joint Publication 2.0 Definition

- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

- Implicit is that there must be some *reason* members of agency ABC believe forces are, for example, potentially hostile

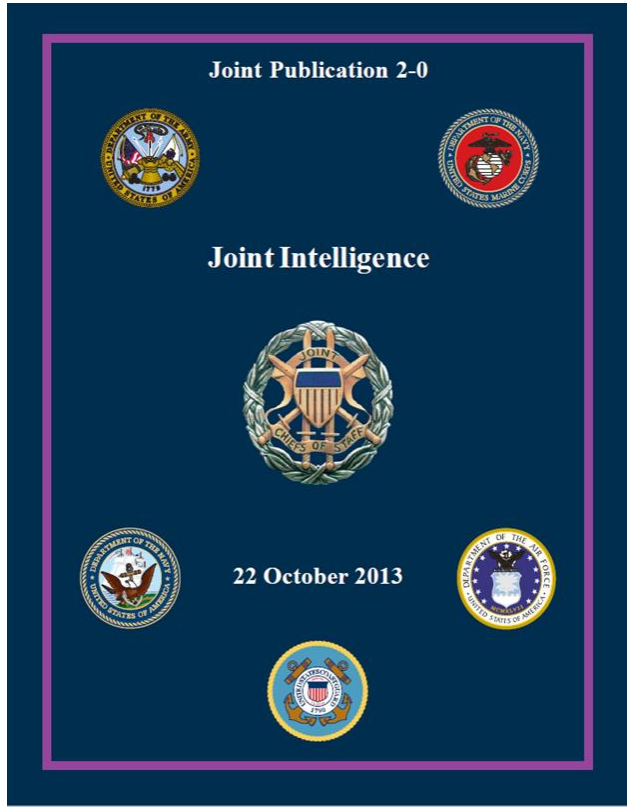
Joint Publication 2.0 Definition

- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.

- These reasons for gathering intelligene are *importantly* distinct from intelligence itself

Joint Publication 2.0 Definition

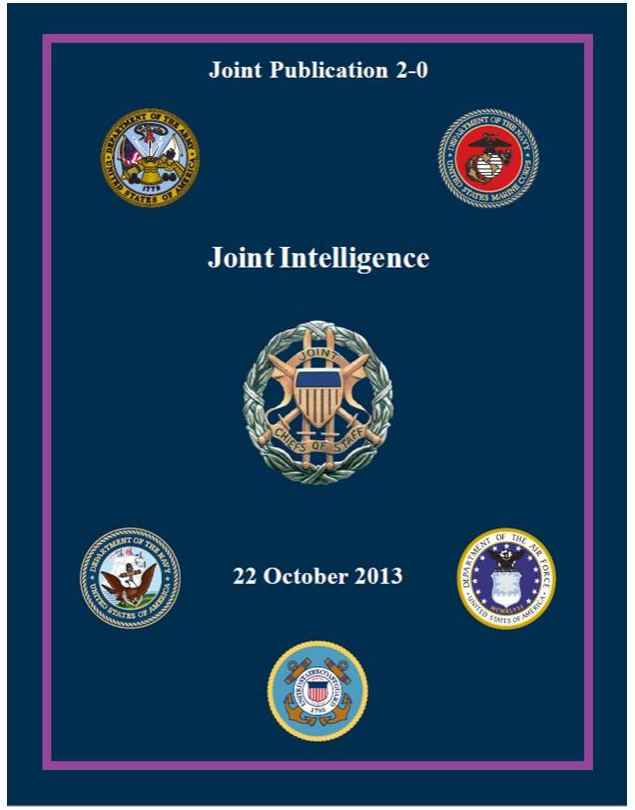
- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.



- Counterexamples:
  - Intelligence ≠ Intelligence Gathering Activity
  - Agents getting proper sleep shouldn't count as intelligence

Joint Publication 2.0 Definition

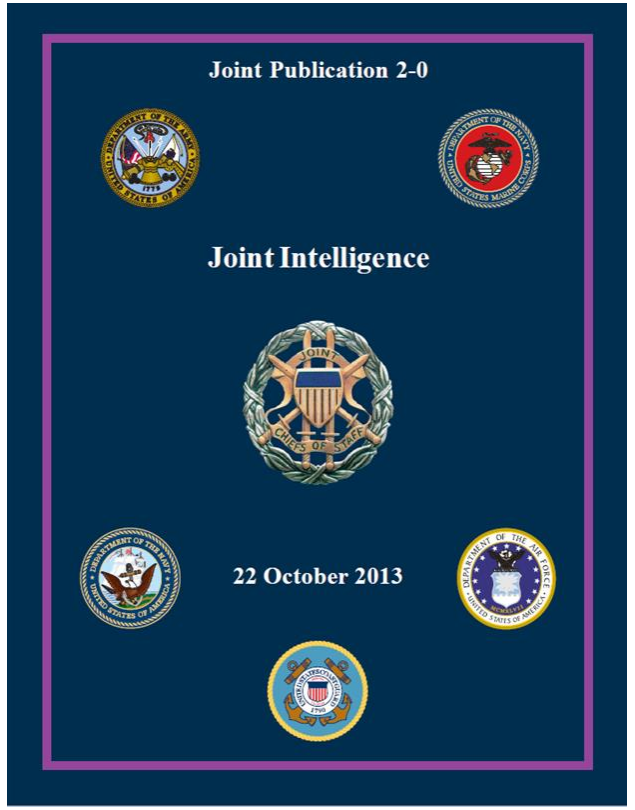
- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.



- Counterexamples:
  - The CIA itself is not intelligence; it gathers intelligence
  - An agency's HR department doesn't gather intelligence

Joint Publication 2.0 Definition

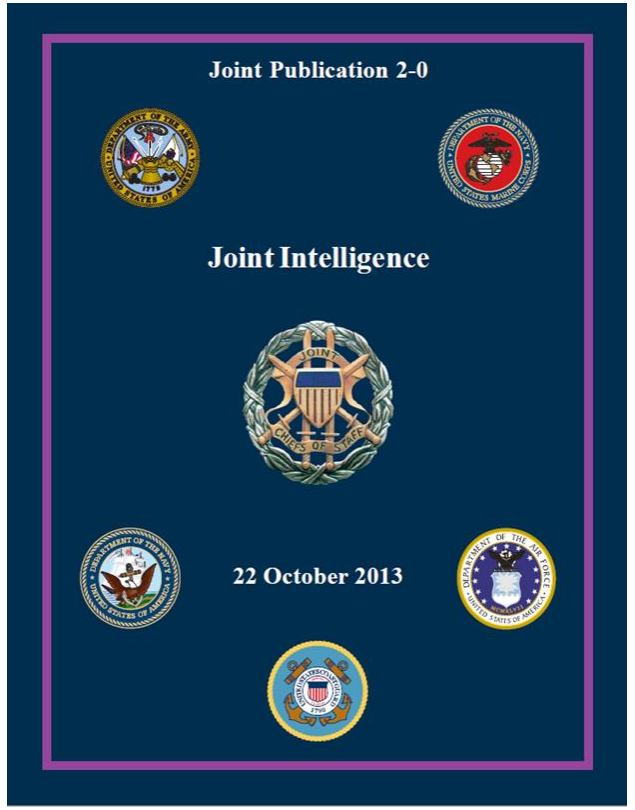
- *Intelligence* $=_{def}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.



- That aside, this is **clearly specific** to military intelligence, and so could not serve as a general definition

Joint Publication 2.0 Definition

- *Intelligence* $=_{\text{def}}$ The product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations, as well as the activities that result in the product and the organizations engaged in such activities.



- Counterexamples:
  - Police gather intelligence on domestic criminal activity
  - Companies gather intelligence prior to merger

Complicating our Terms

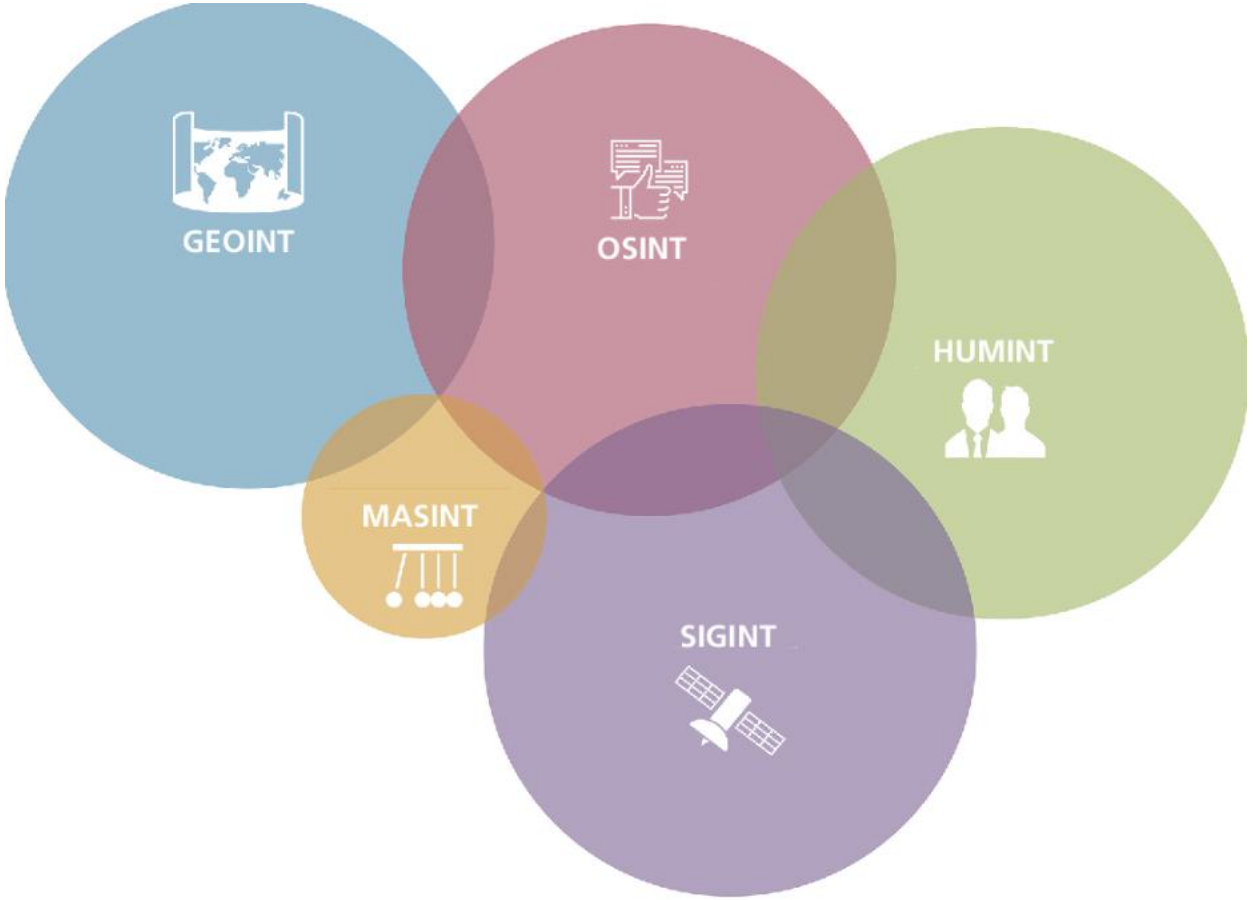
- In addition to cutting across different **users**, intelligence cuts across numerous **targets**:
  - Criminals
  - Corporations
  - Nations
  - Militaries
  - Non-profits
  - You

Complicating our Terms

- In addition to cutting across different **users**, intelligence cuts across numerous **targets**:
  - Criminals
  - Corporations
  - Nations
  - Militaries
  - Non-profits
  - **You**

Complicating our Terms

- As well as cutting across numerous **sources**:
  - Open-Source (OSINT)
  - Human (HUMINT)
  - Imagery (IMINT)
  - Signals (SIGINT)
  - Measurement (MASINT)
  - Geographic (GEOINT)



Summary

- In this lecture, we outlined foundations on which to begin our study of the intersection of ontology engineering and intelligence analysis

- We have witnessed intelligence successes and failures, better and worse definitions of intelligence, and refined the shape of our target definition

- We will expand our toolkit during the next lecture which will emphasize more the ontology engineering aspect of this course

Readings

- National Security Intelligence Activity: A Philosophical Analysis

- Rethinking Intelligence Practices and Processes