Grand Strategy Session One
Introduction to Grand Strategy and Unit and Systemic Influences
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Objectives

- Introduction to grand strategy
- Why is it important
- Grand strategic options for the U.S.
- Systemic Influences
- Unit Level Influences

What is grand strategy?

- How a state defines its
  - Interests
    - Fundamental interests of the state
  - the threats to those interests
    - Internal threats
    - External Threats
  - The means to address threats
    - Diplomatic
    - Economic
    - Military

Interests

- Essential Interests
  - Protection from external and internal threats
  - Economic growth
  - Coherence of society, culture
  - Spreading ideology, democracy?
- Desirable Interests
  - Environmental
  - Humanitarian

Threats

- External Threats
  - Peer competitors, e.g. China
  - Major state threats, e.g. Russia
  - Nuclear proliferators, other WMD, e.g. Iran
  - Terrorism
- Internal Threats
  - Terrorism
  - Domestic Unrest

Means to address threats

- Diplomatic (State Department)
- Economy (Commerce and State Department)
- Ideology (State Dept., Hollywood, popular culture)
- Military
  - Airpower (Air Force)
  - Seapower (Navy)
  - Landpower (Army and Marines)
  - Covert Action/Forces (Special Operations Command-CIA)
  - Conventional vs. strategic forces (nuclear weapons, missile defense)
- Intelligence Community
  - CIA-Central Intelligence Agency
  - DIA-Defense Intelligence Agency
  - NSA-National Security Agency, the biggest intelligence agency
  - NRO-National Reconnaissance Office
  - NGA-National Geospatial-Intelligence Agency
- Allies (NATO)

Why Is Grand Strategy Important

- Big Impact on International Politics—Makes War or Peace More Likely
- Fundamental Issues
  - What Motivates the United States to Act as It Does
  - With Whom Does U.S. Ally
  - When Does U.S. Fight Wars, Use Force, Intervene
  - How Much Force (Including Nuclear Weapons)
- Big Impact on Your Life—Terrorism, Iraq, maybe Iran, Possibility of Nuclear War with China
- So, You May Not Be Interested in Grand Strategy but Grand Strategy May Be Interested in You

Grand Strategic Options

- Primacy
  - Emphasis on maximizing power, every area of the world matters, and military commitments there
- Selective Engagement (and Offshore Balancing)
  - Emphasis on sufficient power, only areas of economic power matter, military commitments there (no landpower commitment for offshore balancing)
- Isolationism
  - Emphasis on power for physical security of U.S., no military commitments

Levels of Analysis

- The car crash—the driver (individual), the car (state), or environment, road conditions (system)
- First level of analysis—The individual
  - Psychological approaches, great men theories
- Second level of analysis—The state
  - Attributes of states—ideology, economic system
- Third level of analysis—The international system
  - The result of anarchy in international politics

State (Unit Level) Interests

- Interests
  - Security
  - Debate over how to achieve security—power sufficiency or power maximization
  - Kenneth Waltz, defensive neorealism, sufficiency, selective engagement
  - John Mearsheimer, offensive neorealism, maximization, hegemony, primacy

State Threats

- Depends on Interests
  - Fewest threats for isolationism—America fundamentally secure
  - Fewer threats for selective engagement—America and Allies relatively easy to defend
  - More threat for hegemony—interests are universal, many threats, great concern for credibility, e.g. Iraq, Vietnam

The Impact of the Int’l System

- Big Impact on grand strategy
- Anarchy causes the security dilemma
  - Under anarchy, the steps a state takes to make itself secure (arming, alliances) cause other states to arm: making all states armed but not secure
  - Influenced by geography (New Zealand) and military technology (nuclear weapons)
- Concern for security requires arming (creating militaries, intelligence communities) and forging alliances
- Constant security competition and sometimes war

System Causes Dominant State to be Concerned over Rising Powers

- The Theory of Hegemonic War
  - 4 aspects: Hegemonic war, stability, divergent growth rates, increased security competition, hegemonic war
  - Athens and Sparta, Rome and Carthage, Germany and Russia, Britain and Germany
  - U.S. and China

Systemic Problems of Alliances

- The Abandonment Problem
  - Weaker state's concern that the stronger will abandon it
  - Poland, Georgia, today
- The "Chain Gang" Problem
  - A state's security depends on its ally
  - Germany, Austria-Hungary in World War One
- The "Buck Passing" Problem
  - States want others to address the threat
  - France and Great Britain in World War Two

Unit Level Influences

- Ideology
- Culture/Strategic Culture
- History
- Economic System
- Nationalism
- Technology
- Interest Groups
- Military Effectiveness
- Type of military power—Conventional or Strategic (Nuclear, Biological or Chemical [NBC] Weapons, also called Weapons of Mass Destruction [WMD])

Unit Level Influences: Nuclear Weapons

- Deterrence may be nuclear or conventional
- Three theories of nuclear deterrence (1-mutual assured destruction [Jervis], 2-counterforce [Kahn], 3-manipulation of risk [Schelling])
- Primacy requires counterforce capabilities
- Nuclear deterrence
  - Secure second strike capabilities allow deterrence to obtain
    - Nuclear forces
      - Survivable Triad
    - Nuclear command and control
      - Detection of attack, dissemination of orders, connectivity
    - Low risk of nuclear inadvertence

Nuclear Forces

- Multiple delivery systems—Triad
  - Intercontinental ballistic missiles (ICBMs)
  - Submarine launched ballistic missiles (SLBMs)
  - Bombers, cruise missiles
- Accuracy vs. Survivability
- Counterforce vs. Countervalue
- New Triad—Triad plus defenses and responsive infrastructure

Command and Control

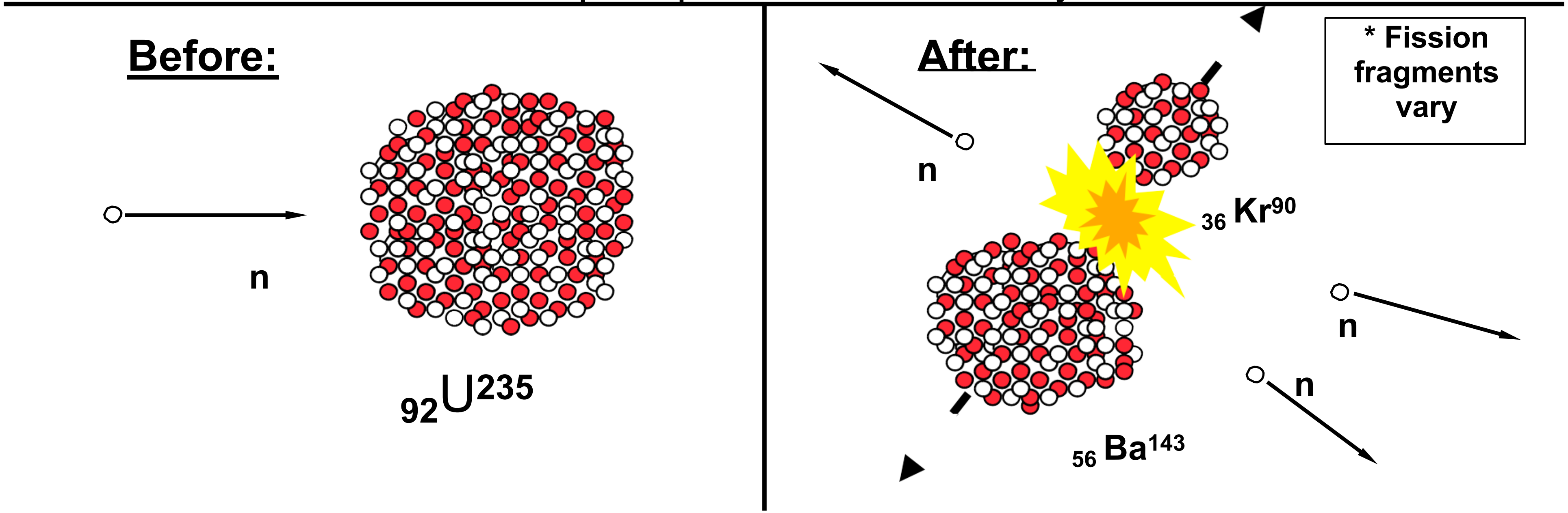
- Always/Never Dilemma
  - Nuclear must always be able to be used with proper authority but never otherwise
- Possibility of decapitation
  - Destroying the command and control system to prevent ability to detect and respond to attack
- To prevent decapitation, advanced detection (BMEWS, DSP) and command (Looking Glass, E-6 aircraft, ELF, much redundancy)

Safeguard against nuclear inadvertence

- Ensure always/never dilemma
- Risks of stolen nuclear weapons, accidents, and unauthorized launch
- Environmental Safety Devices (ESDs)
- Permissive Action Links (Pals)

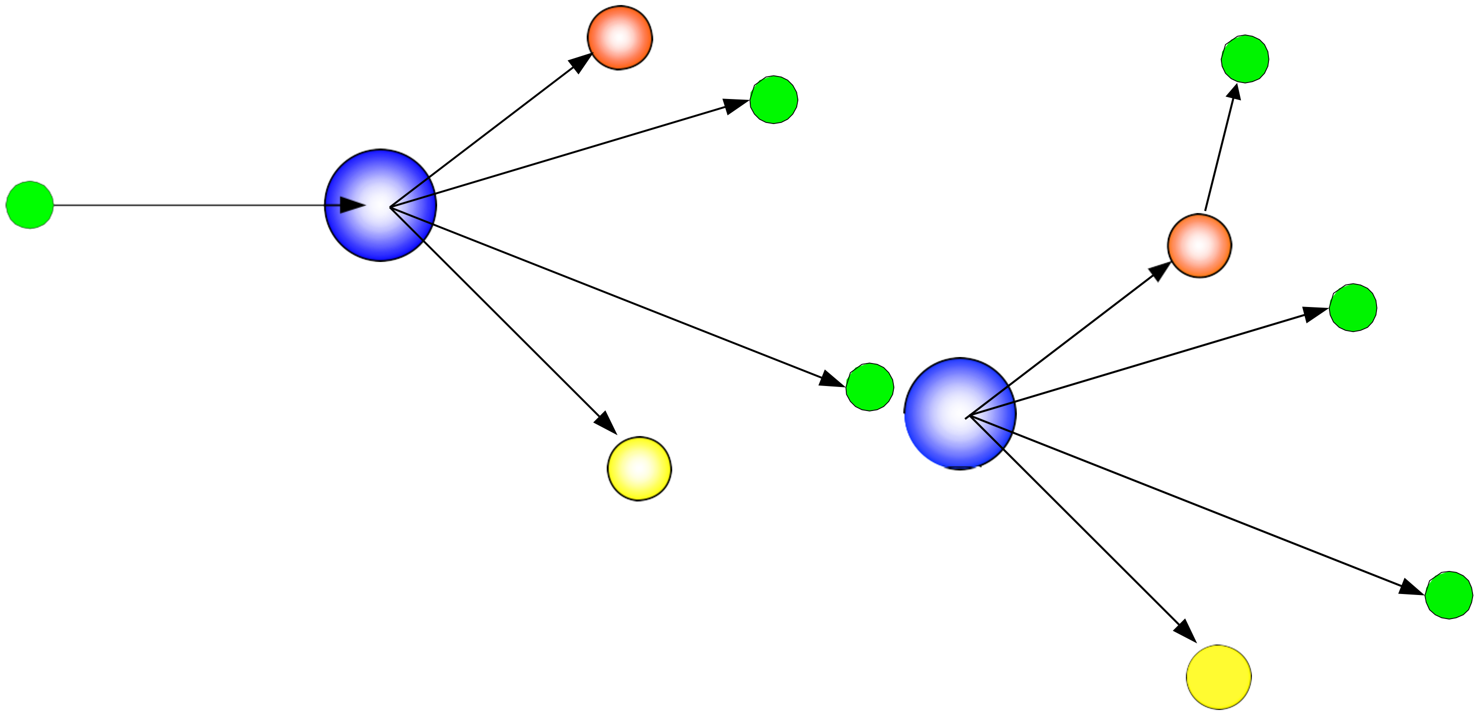
Basic Neutron Reactions

- Fission
  - the splitting of a nucleus into two parts (called fission products), accompanied by the release of energy and neutrons
  - Fission fragments are intensely radioactive and tend to have excess neutrons
  - Most neutrons are "prompt," some are "delayed"



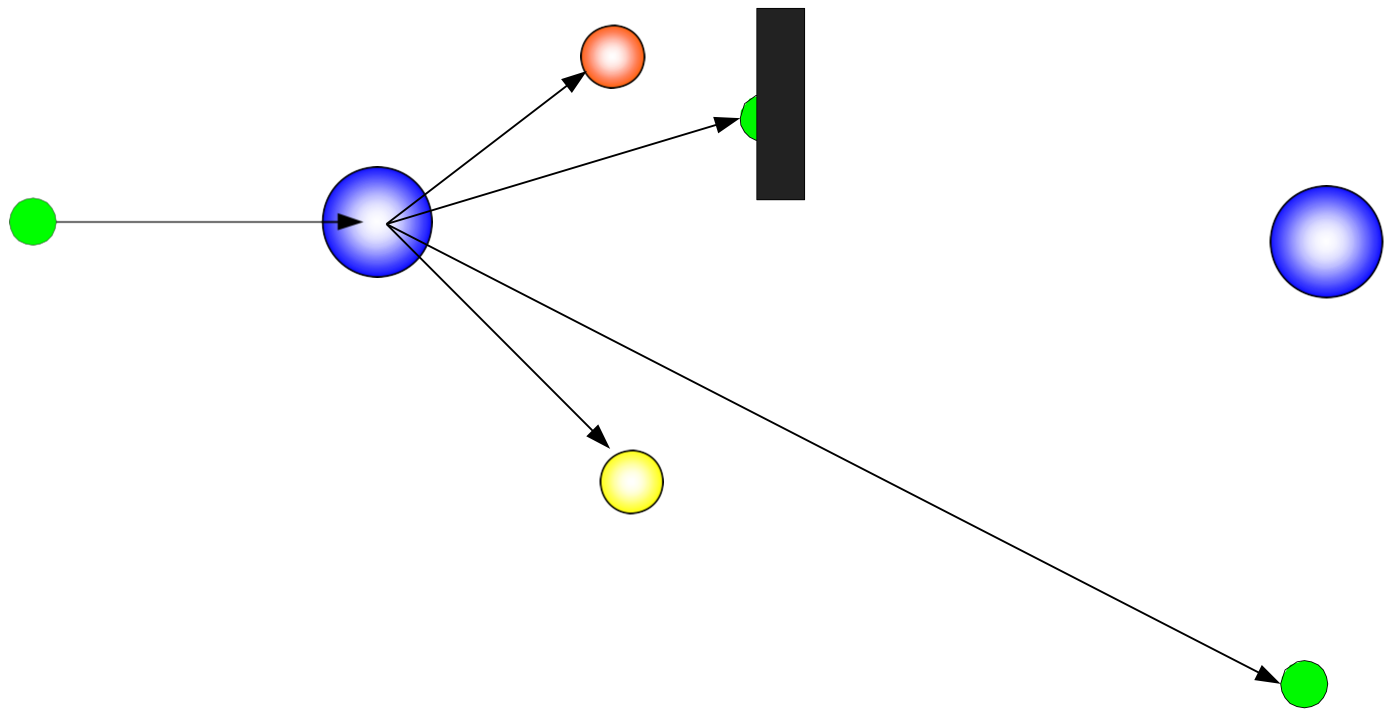
Chain Reactions

- Neutrons produced in the fission reaction can go on to cause more fissions.



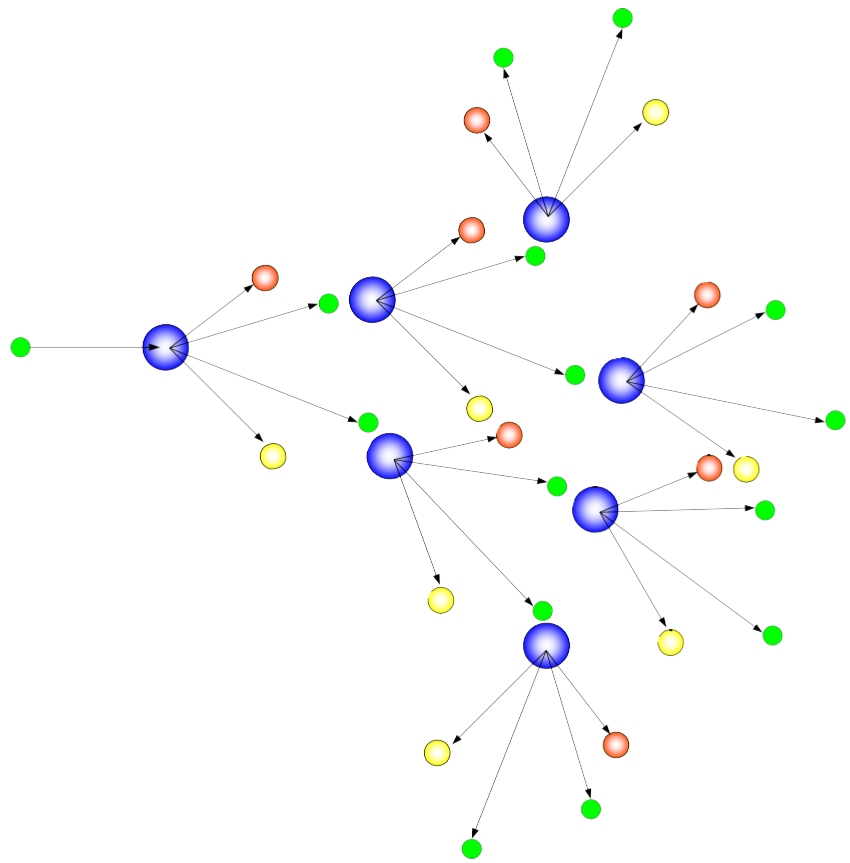
Chain Reactions - Termination

- If the neutron escapes the system or is captured by another process, the chain reaction terminates.



Chain Reactions - Branching

- If more than one neutron from each fission goes on to produce more fissions, the chain reaction can grow rapidly.
- Delayed neutrons make control of this rate of branching possible.

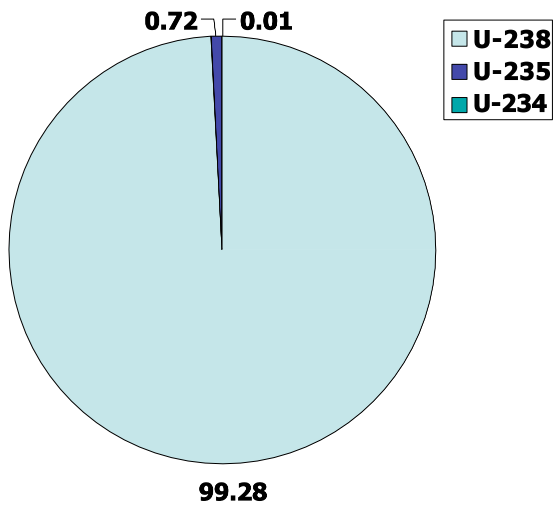


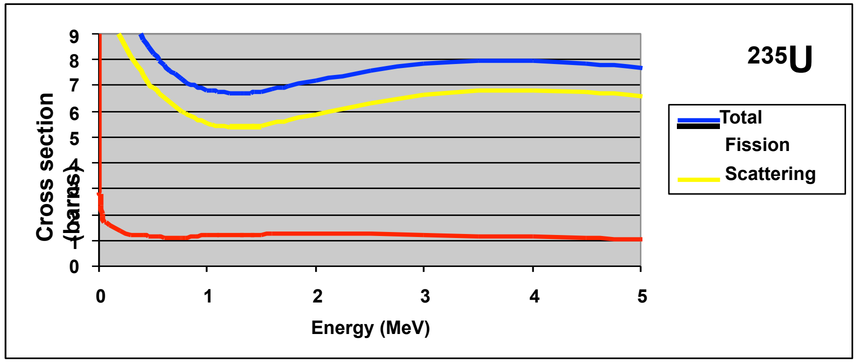
Chain Reactions

- To maintain a critical state, must balance neutron production with losses (from leakage and capture)
  - To increase branching, limit termination
    - Remove materials that compete for the neutrons
    - Reflect escaping neutrons back into the system
    - Increase the density of the nuclear fuel
    - Increase the probability that the target material will capture the neutron and then fission (e.g., use a moderator to slow the neutrons down to energy where the fission cross section is larger).
  - To limit branching, increase termination
    - Introduce materials that absorb neutrons
    - Arrange the system to allow more neutrons to escape to the outside

Uranium

- U-235 is the only naturally occurring fissile isotope.
- However, it is less than 1% of naturally occurring uranium.
- U-238 competes with U-235 for neutrons, thus interfering with the chain reaction.
  - enrichment separates these isotopes to increase the proportion of U-235.
- U-238 can absorb neutrons to produce Pu-239, which is also fissile.





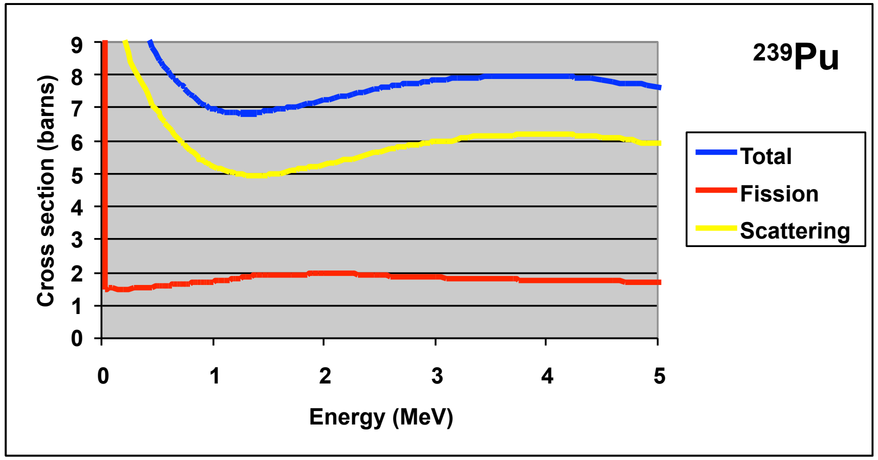
Plutonium

- U-238 absorbs a neutron, becoming U-239, which decays to Pu-239.
- When exposed to neutrons, some of the Pu-239 will fission and some will absorb neutrons to become Pu-240, which presents problems in a weapon.
- Therefore, to obtain relatively pure Pu-239, one must limit time in the reactor.

$$^{1}_{0}n + ^{238}_{92}U \rightarrow ^{239}_{92}U + ^{0}_{0}\gamma$$

$$^{239}_{92}U \rightarrow ^{239}_{93}Np + ^{0}_{-1}\beta + ^{0}_{0}\nu^{*}$$

$$^{239}_{93}Np \rightarrow ^{239}_{94}Pu + ^{0}_{-1}\beta + ^{0}_{0}\nu^{*}$$

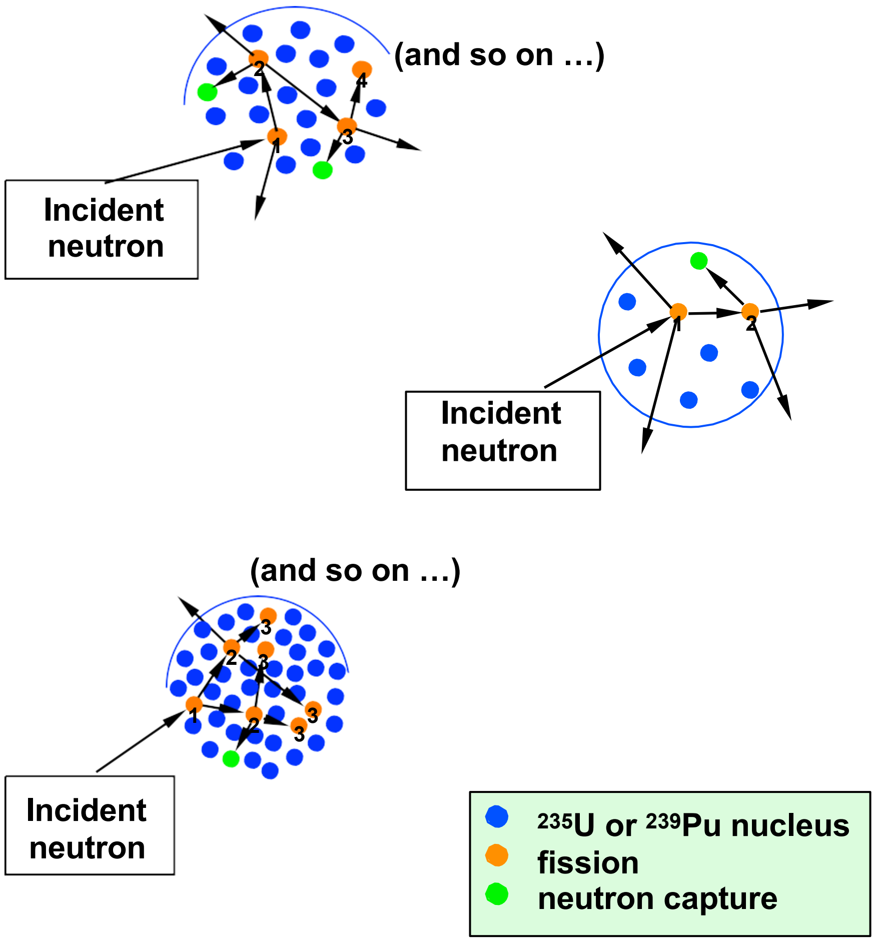


Fission Nuclear Materials - 2 Basic Choices

- Uranium Enrichment
  - To get fissile U-235, must enrich natural uranium.
  - Because all isotopes of Uranium are chemically identical, enrichment must utilize the slight mass difference.
- Plutonium Production & Reprocessing
  - Since all other fissile materials must be produced through neutron absorption, they can only be found in material previously irradiated in a reactor.
  - Reprocessing refers to chemical processing of irradiated material, which is needed to extract the fissile material.

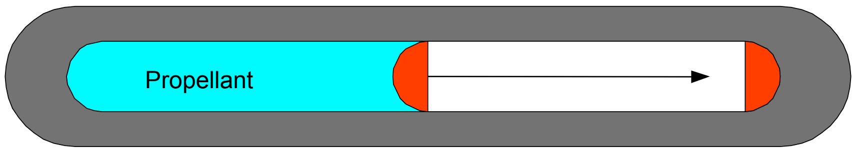
Criticality

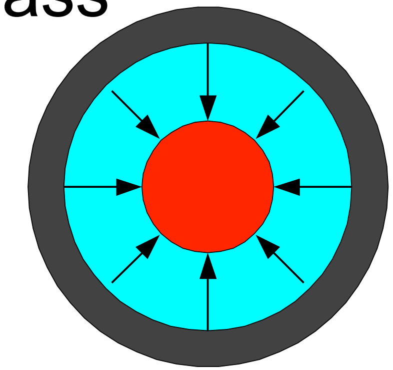
- **Critical -** Net of one neutron per fission (prompt + delayed) produces another fission (stable)
- **Sub critical** - Net production of neutrons is less than is needed to sustain chain reaction
- **Super critical** - Net production of neutrons is more than sufficient to sustain chain reaction
- **Prompt Super Critical** - Production of prompt neutrons alone are more than sufficient to sustain the chain reaction (delayed neutrons are excess)



Fission Weapon Concepts

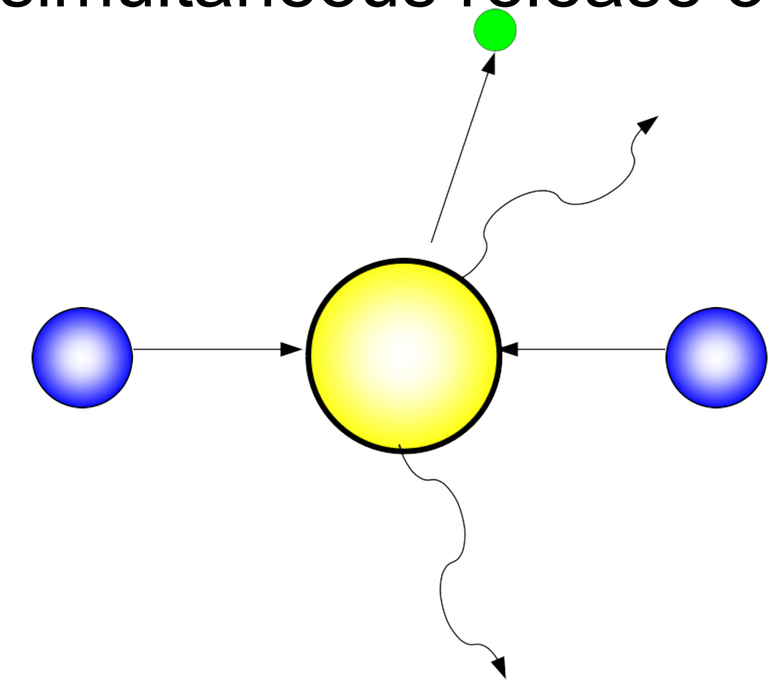
- Gun Type
  - rapidly bringing together two subcritical masses to achieve a prompt supercritical mass
- Implosion Type
  - compressing a subcritical sphere of special nuclear material to form a prompt supercritical mass





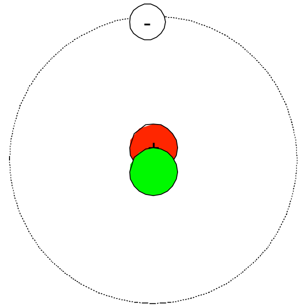
Fusion

- Process in which nuclei of lightweight elements combine to form a more tightly bound nucleus with the simultaneous release of energy

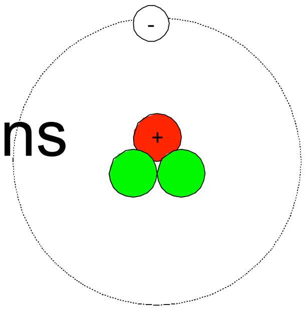


Fusion Fuels

- Deuterium (H-2, “D”)
  - 0.015% of naturally occurring Hydrogen
  - separable from water as D_2O



- Tritium (H-3, “T”)
  - produced by bombarding lithium with neutrons
  - half-life of 12.3 years



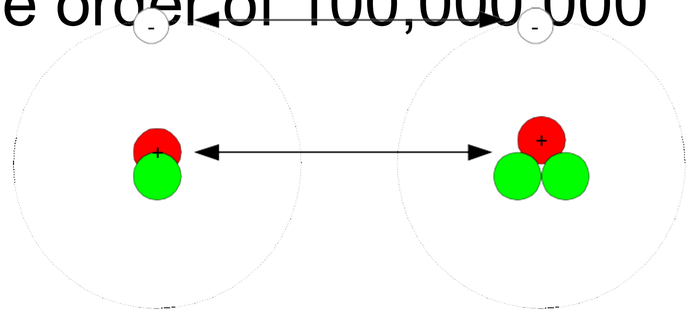
- Energy produced per kg of fuel in “D”-”T” fusion is four times that of U-235 fission

$$ {}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n $$

Fusion Reactions

- These reactions don't take place simply by mixing the ingredients together
  - The nuclei (not neutrons) must come together
  - Very strong electrostatic repulsion must be overcome
  - Thermonuclear reactions can be induced by high density and high thermal energy, requiring temperatures on the order of 100,000,000 °K

(180,000,000 °F!)



Fusion Weapon Concepts

- A nuclear fission reaction is needed to produce the necessary temperatures for nuclear fusion to take place
- X-rays from the fission reaction are used to compress the secondary to cause fusion before the primary disassembles