

# **PHYS 280 Writing Lab 5**

Monday, Feb. 21

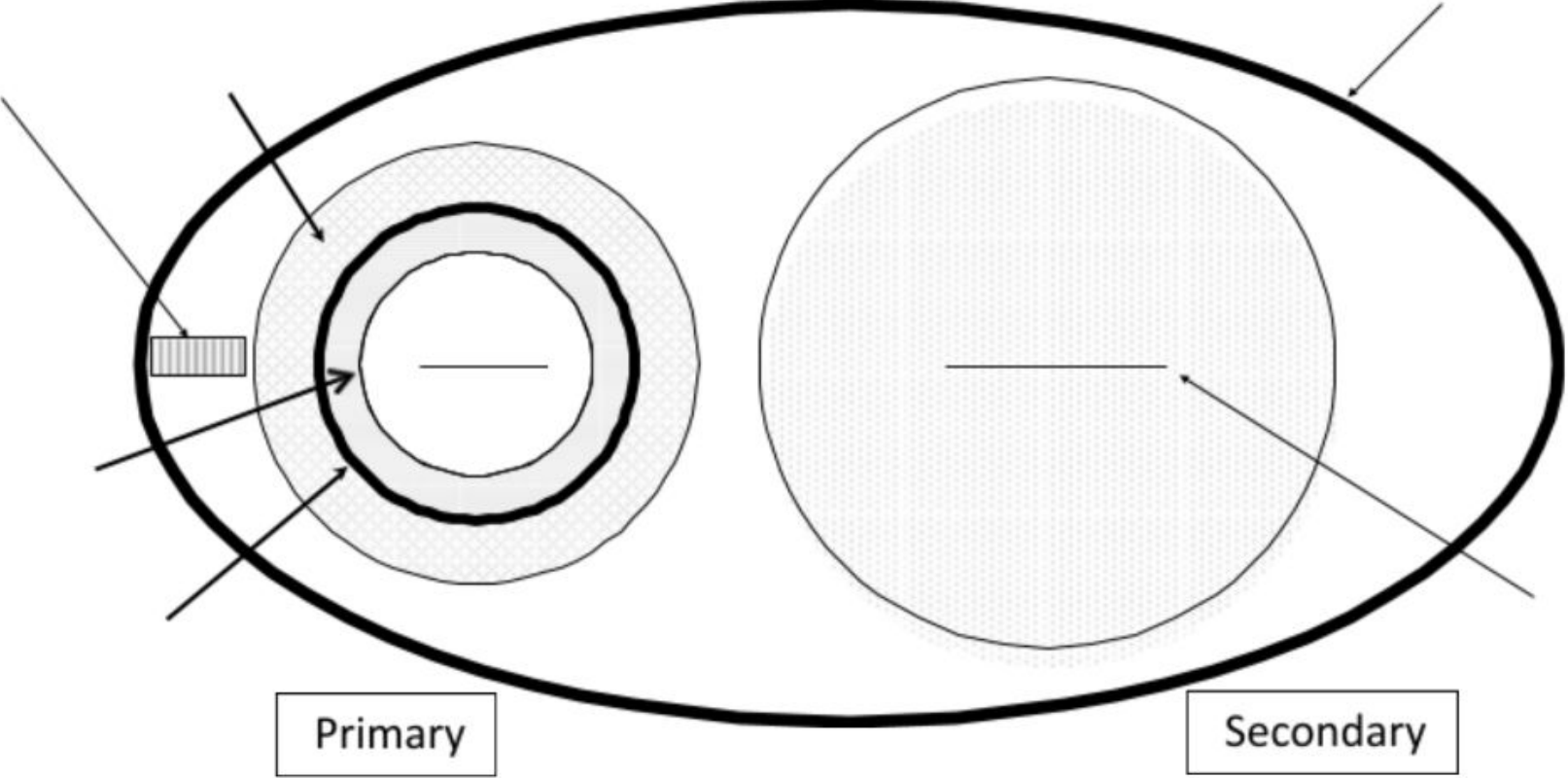
# Reminders

- If you have a HOLD on your RPPv1, you *must* come meet with a TA during office hours
  - Office hours are held on Tues (5-6) and Wed (1-4, 5-7), either over Zoom or in-person at Grainger Room 404
- RPPv2 is due 3/2
- RE3v1 is due THIS WEDNESDAY, 2/23
- More Extra Credit will become available on the website over the next few weeks

# RPPv2

- 3.0: If you received a HOLD, rework your research question and/or thesis statement.
- 3.1: Address all comments on your proposal from your Writing Lab TA.
- 3.2: Find at least three additional references.
- 3.3: Draft an opening, introductory paragraph for your research paper.
- 3.5: Expand your sentence-type outline.
- 3.6: Draft a concluding paragraph for your research paper.
- 3.7: Update your reference list and annotate each entry.
- 3.8: Produce a Writer's Memo for RPPv2.
- 3.9: If you received a second HOLD, meet with your Writing Lab TA.
- Use the website as a checklist:  
<https://courses.physics.illinois.edu/phys280/sp2022/rpp.html>

# Two-Stage Nuke



# RPPv2 Example Theses

Expert Role: Engineer

Topic: North Korea's ballistic-missile development programs

Research Question: How should the United States respond to the increasing nuclear threat of North Korea to protect its Asian allies and itself?

Thesis Statement: United States' current missile defense system may not be able to protect US and its allies from nuclear threats from North Korea. US should strengthen its missile defense system against nuclear threat from North Korea.

Expert Role: Engineer

Topic: Restricting weapons in space

Research Question: With the use of intercontinental ballistic missiles and also proposed projects such as the Strategic Defense Initiative (SDI) in the eighties calling for a demand of space-based nuclear weapons, what dangers exist from the weaponization of space?

Thesis Statement: The threat that is created from the weaponization of space may render the upper atmospheres unable to be utilized for civilian uses as debris will create an impassible wall for commercial satellites.

Expert Role: Engineer

Topic: The nuclear proliferation threat posed by laser isotope enrichment

Research Question: Given the threat that laser isotope enrichment poses to the U.S. regarding the production of nuclear explosive material, where should the focus of those working against the creation of nuclear explosive material for proliferation by states be directed?

Thesis Statement: Despite the low energy cost and compact nature of laser isotope enrichment, gas centrifuge enrichment will remain the primary tool for proliferation by states and as a result deserves the most attention.



Expert Role: Engineer

Topic: Iran's Nuclear Program

Research Question: Is the United States' treatment of Iran as a unique threat to develop and potentially use nuclear weapons justified and is their response proportional to said threat?

Thesis Statement: Iran's history of nuclear development is focused on providing civilian energy and the United States' response to Iranian actions has been disproportionate to the threat Iran poses.

Expert Role: Political Scientist

Topic: Delivery of nuclear explosives by terrorists or non-state groups

Research Question: How can nuclear powers prevent theft of nuclear weapons by non-state groups?

Thesis Statement: As time passes the threat of non-state groups obtaining nuclear weapons through thievery increases, so nuclear powers should put stricter policies in place regarding the transport and storage of nuclear materials.

Expert Role: Political Scientist

Topic: Post-Cold War proliferation of nuclear weapons to non-state violent actors

Research Question: With the increased proliferation of nuclear weapons after the Cold War, and terrorist networks increased interest in obtaining the potential to utilize nuclear weapons, how is the United States keeping these networks from obtaining these weapons, and if they were to obtain them, to what extent will they be able to use them?

Thesis Statement: Although nuclear weapons have largely been contained within states, the risk of a terrorist organization, such as al-Qaeda, obtaining one increases with proliferation; therefore, the United States, must adopt security and non-proliferation policies directed towards protecting existing nuclear stockpiles and at decreasing the likelihood of a terrorist organization from obtaining the technology necessary to develop a nuclear or radiological weapon.

# RE3v1

- Due Wednesday
- <https://courses.physics.illinois.edu/phys280/sp2022/re3.html>

A group of incoming members of Congress would like to revisit the Joint Comprehensive Plan of Action, more commonly known as the Iran nuclear deal, from which the U.S. withdrew in May 2018. These new members of Congress have asked the Congressional Research Service (CRS) to provide a report on the scientific background necessary to understand certain aspects of the deal.

As the analyst at the CRS assigned to fulfill this request, you will write a 1.5–2 page report (single-spaced) that

1. begins with a brief summary,
2. provides an introduction that discusses some of the most important nuclear-explosive nuclides,
3. describes the science and reasons about its implications (see below for more detail about required body sections), and
4. concludes with a brief explanation of why restricting the availability of nuclear explosive nuclides is the most effective way to prevent the spread of nuclear weapons.

<b>Key Requirements and Actions Mandated by the JCPOA</b>	
<b>Enrichment</b>	<ul style="list-style-type: none"> <li>• For 10 years operating centrifuges reduced to 5,060 IR-1 machines, total machines is 6,104 IR-1s</li> <li>• Excess centrifuges (over 13,000) dismantled and stored under IAEA monitoring</li> <li>• For 15 years level of uranium enrichment capped at 3.67 percent uranium-235</li> <li>• For 15 years enrichment only at Natanz</li> <li>• For 10 years no production of additional IR-1 centrifuges</li> <li>• Between years 11-13 Iran can replace IR-1s with the equivalent capacity of IR-6 and IR-8 machines and limits lasting to years 14-15</li> </ul>
<b>Uranium Stockpile</b>	<ul style="list-style-type: none"> <li>• For 15 years the stockpile is kept under 300 kilograms of 3.67 percent enriched uranium in total (all forms)</li> <li>• Excess enriched uranium sold, shipped abroad for storage, or diluted to natural uranium levels</li> <li>• Uranium oxide and scrap material enriched up to 20 percent fabricated into fuel for Tehran Research Reactor, blended down, or shipped out</li> </ul>
<b>Fordow</b>	<ul style="list-style-type: none"> <li>• Converted to research facility for stable isotope production with Russian cooperation</li> <li>• 1,044 IR-1 centrifuges in six cascades will remain here, 328 for production, the remaining 700 are idle</li> <li>• For 15 years no introduction of uranium at the facility</li> </ul>
<b>Advanced Centrifuge Research and Development</b>	<ul style="list-style-type: none"> <li>• For 8.5 years Iran may conduct research with uranium on a single IR-4, IR-5, IR-6 and IR-8 centrifuge at Natanz</li> <li>• After 8.5 years test up to 30 IR-6s and 30 IR-8s</li> <li>• After 8 years manufacture up to 200 IR-6s and 200 IR-8s centrifuges without rotors</li> <li>• For 10 years Joint Commission review and approval of changes to the research and development plan</li> </ul>
<b>Arak Reactor</b>	<ul style="list-style-type: none"> <li>• Remove and disable the original core of the Arak reactor</li> <li>• Replace the core of the Arak reactor to reduce weapons-grade plutonium output, certified by the Joint Commission</li> <li>• For 15 years no reprocessing of spent nuclear fuel with an intention to never reprocess</li> <li>• Permanent commitment to ship out spent nuclear fuel</li> <li>• For 15 years no heavy-water reactors in Iran</li> <li>• For 15 years no accumulation of heavy water in Iran</li> <li>• Construction of hot cells or shielded glove boxes of certain specifications subject to approval of the Joint Commission</li> </ul>
<b>Monitoring and Verification</b>	<ul style="list-style-type: none"> <li>• By 15 October 2015 Iran fully implements PMD "roadmap" agreed with IAEA</li> <li>• For 10 years approval of the purchase of dual-use materials by the Joint Commission working group</li> <li>• For 25 years continuous monitoring of Iran's uranium mines and mills</li> <li>• For 20 years continuous monitoring of Iran's centrifuge production facilities</li> <li>• For 15 years Joint Commission oversight of IAEA access requests to inspect undeclared sites</li> <li>• Permanent prohibition of certain weaponization related activities</li> <li>• Implementation and eventual ratification of an additional protocol to Iran's safeguards agreement</li> <li>• Permanent implementation of modified Code 3.1 of the Subsidiary Arrangements to its Safeguards Agreement</li> </ul>

# Arak Heavy Water Reactor & Natanz Uranium Enrichment Facility



*centrifuges*

# Practicing Thesis Statements & Introductions

## Thesis Statement

- Clear
- Arguable
- Interesting
- Informed

## Introduction

1. Provides a context (broad but not too broad) for the problem being investigated (what is it? why does it matter? what's your angle / how are you approaching it?)
2. Implies or states a research question -- identifies a gap in our understanding
3. Answers research question directly with a thesis statement
4. Forecasts the organization of the body of the report in a final sentence ("launching point")



# Sample RE3v1 Introduction

**[context]** Since the Joint Comprehensive Plan of Action (JCPOA) agreement became public knowledge in 2015, Americans and citizens of other UN Security Council nations have become increasingly aware that non-nuclear countries could develop nuclear weapons under the guise of benign industry. To counter this concern in the case of Iran, permanent Security Council members and member nations of the EU negotiated the Iran nuclear agreement (JCPOA), restricting Iran's development and use of heavy water reactors, centrifuges, and the reprocessing of spent nuclear fuel. **[research question]** Were these measures technologically necessary and sufficient to contain Iran's nuclear threat? **[thesis]** To ensure global and national security, this report suggests continuing to limit Iran from developing and retaining certain nuclides with high potential for the creation of nuclear weapons. **[transition followed by "launching point"]** Congressional review is required to execute the suggested procedures. To assist in this review, the following report explains how the materials used in the manufacture of nuclear weapons are developed, the weapons designs into which they are incorporated, and whether and how civilian nuclear technologies use can pose a threat by doubling as platforms for weapons development.