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Science or Pseudoscience? Theory or Conspiracy Theory? Critical Thinking in Practice

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Science or Pseudoscience? Theory or Conspiracy Theory?

SCIENCE OR PSEUDOSCIENCE? THEORY OR CONSPIRACY THEORY?

Critical Thinking in Practice

COASTAL CAROLINA UNIVERSITY
HONORS STUDENTS

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Figure i.1.1. Wooden case containing 60 small phrenological heads, by William Bally, Manchester or Dublin, 1831. Library reference: Science Museum A642804; photo number: L0058692. CC-BY.

Introduction

Dr. Sara Rich

In Coastal Carolina University's Honors Program, students

are offered numerous variations of the seminar Critical Methods of Inquiry (HONR 105). The course was originally designed as an introduction to the Paul-Elder Model of Critical Thinking that students could apply to other coursework and to their Honors thesis. But as the Honors Program developed, its faculty have augmented the course with themes that correspond to their own areas of expertise: e.g., rhetoric, contemporary social issues, critical theory, and pseudoscience.

The topic of pseudoscience offers a rewarding way for students to learn the value of thinking critically, even as they get to argue things, like Flat Earth Theory and astrology, that may seem trivial at first. Inevitably, upon closer inspection, each has serious implications: belief in astrology has implications for free will versus determinism; phrenological beliefs tend to support claims of scientific racism and sexism; and even belief in ancient astronauts seems to rest on the prejudicial assumption that ancient civilizations, especially those outside of Europe, could not possibly have developed monumental architecture, writing, or astronomy without the help of extraterrestrials. And belief in one pseudoscience often leads to belief in many, including those that outright deny the scientific facts of global warming, the event of the Holocaust, the age of Earth, and the arrival of the first Americans from Asia.

Given the importance of this subject matter for understanding accurately the reality that we share,

epistemology is a fundamental concept to the act of critical thinking. How do we know Earth is round? How do we know if celestial bodies decide our future or not? How do we know anything that we think we know? It is from this basis that we set forth to evaluate the truth value of empirical claims on the basis of how well they correspond with observable, measurable, verifiable, reality.

In the fall of 2021, my pseudoscience students started creating this open educational resource (OER), which has been built upon by subsequent classes. Our intention is to create a free textbook for this course that might also be used by students of critical thinking elsewhere and of all ages, whether in a classroom or not. Our growing, interactive textbook employs the Paul-Elder Model and other critical-thinking resources, and is freely available to all, learners and educators alike.

We opted for a choose-your-own-adventure style of textbook so that users can select the pseudoscience of interest from the Table of Contents and then choose a question that that they might also have about that pseudoscience. Once in that chapter, readers can reason through that question along with the chapter's authors in a fully transparent thinking and writing process. The options for adventures in pseudoscience will continue growing as more research teams revise and add

to the textbook, so users will certainly want to keep checking back for additions and improvements.[1]

With this project, students are not only learning how to apply various critical thinking toolsets to common pseudosciences and conspiracy theories in order to discern fact from fiction, reality from fantasy, truth from falsity. They are not only learning to identify logical fallacies and how to structure a sound argument. They are not only learning how to formulate a question and conduct research, following the evidence wherever it may lead in order to arrive at the most accurate, unbiased answer to that question. They are also learning the value of contributing to the public body of knowledge.

At a time when truth is understood as largely subjective, we have, not surprisingly, seen a resurgence in the popularity of pseudosciences and conspiracy theories, which many consider to hold significant truth value, just as valid as physical evidence. It is our aim here to demonstrate the reasoned analysis process—weighing truth, belief, opinion, and fact—so that others may be able to replicate this process and reason through their own questions about vaccines, extra-terrestrials, genetic modification, or the first people to arrive in the Americas.

While we are concerned with the public body of knowledge,

1. Update 14 August 2024: Although the project reached a stopping point, we hope that others will build on this volume and take these ideas into new and open educational contexts.

on a personal note, I also hope that my students emerge on the other side of their invaluable contributions to this project with a sense of empowerment, equipped with the confidence that they have what they need to reason through difficult problems of personal, social, and scientific natures. My gratitude is extended to all the students who have helped and continue to help with this project and who have helped me to become a more critical thinker too.

Figure i.2.1. *Lost City of Atlantis*, by George Grie, CC BY-SA 4.0, via Wikimedia Commons.

Introduction to the Paul-Elder Model of Critical Thinking

Dr. Sara Rich

Before choosing your own pseudoscience adventure to think critically through, let's take a moment to explain our

methodology. Namely, we have used the Paul-Elder Model of Critical Thinking to work through each question at issue and to arrive at a well-reasoned conclusion. This process has been made transparent for our readers: each section of each chapter represents one step of the Paul-Elder Model, which leads up to the written research component where all those steps are put together into a coherent argument. Each unit concludes with some critical thinking exercises pertaining to that particular pseudoscience, inspired by Gerald Nosich's *Learning to Think Things Through*. This will help readers to further think and apply their learning to the pseudoscience of interest.

Step 1: Elements of Reasoning

The first step of the Paul-Elder Model is to proceed through the Elements of Reasoning (Figure i.2.2). When going through the Elements of Reasoning, you will start by identifying the key question—also know as the question at issue—that you have about a given topic. Why? All answers first require a question. Furthermore, starting with the question at issue also sets up the thinker with a sense of epistemic humility. In other words, with every question asked, there is an implicit recognition of a gap in knowledge. The questioner becomes like Socrates, who recognized all the things that he did not know. There are limits to human knowledge, and no one knows everything. Critical thinkers recognize the gaps in their

knowledge and use ambition and curiosity to rectify them with integrity and responsibility.

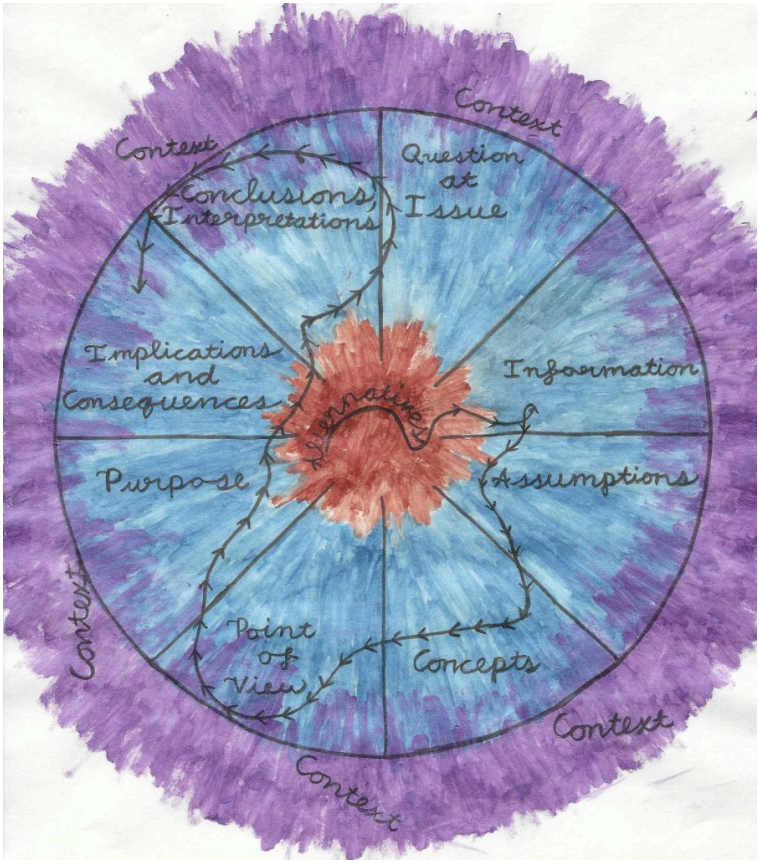

Figure i.2.2. Elements of Reasoning according to the Paul-Elder Model of Critical Thinking. Courtesy of Charis Williams, 2023.

Once the question at issue is established, the critical thinker

should proceed around the wheel of the 8+ Elements of Reasoning (always considering the context that undergirds the problem as a whole and alternatives to each element), until finally arriving at conclusions and interpretations. Arriving at a conclusion or interpretation is arriving at a reasoned answer to the question at issue. To go one step further, the critical thinker may return to implications and consequences in order to understand the real-world effects of the conclusion drawn. Many pseudosciences, including science denialism and the conspiracy theories that inform them, are highly consequential on individual and societal scales.

Step 2: Disciplinary Lenses

To further fine-tune the conclusion reached in Step 1, the critical thinker should use relevant disciplinary lenses to think about the problem the way an expert would (Figure i.2.3).

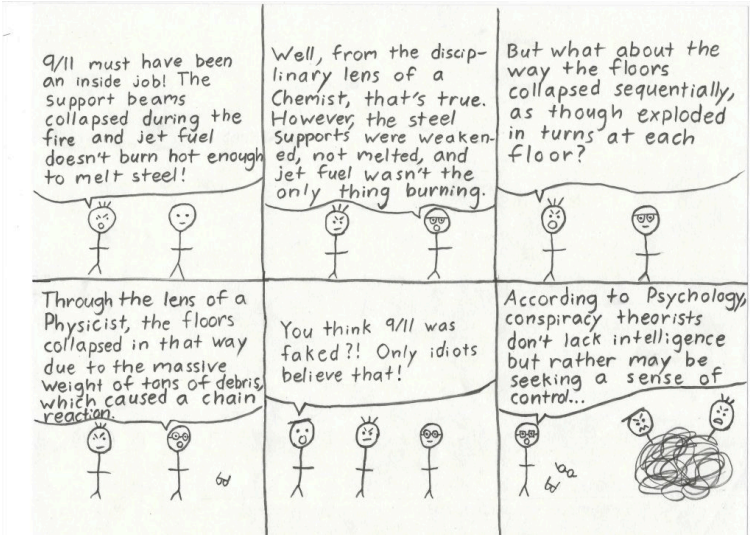

Figure i.2.3. Using the disciplinary lenses to think through the 9/11 conspiracy theory. Courtesy of Charis Williams, 2023.

To provide another example, if your question is about Atlantis, some relevant disciplinary lenses to think with would be history, geology, and archaeology. Using the disciplinary lenses is like taking on the point of view (one of the elements of reasoning) of unbiased experts in relevant fields of study. It also offers the opportunity think using different types of reasoning: namely inductive (history), deductive (geology), and abductive (archaeology). This practice will help ensure that final conclusions are drawn from all the relevant evidence (primary source documents, geological data, and archaeological excavations), that they are placed in context (historical, geological, and archaeological), and that they demonstrate a

complete understanding of the most important related concepts (Platonism, plate tectonics, artifact typologies, etc.).

Step 3: Standards of Critical Thinking

Once the fine-tuned conclusion is reached through the adoption of different disciplinary lenses, it should be self-evaluated using the Standards of Critical Thinking (Figure i.2.4). These standards can be used to evaluate any empirical claim and the evidence used to support it, but it again requires a certain level of epistemic humility to apply them to your own argument. How well an argument holds up against the standards is a good indicator of how well it has been reasoned.

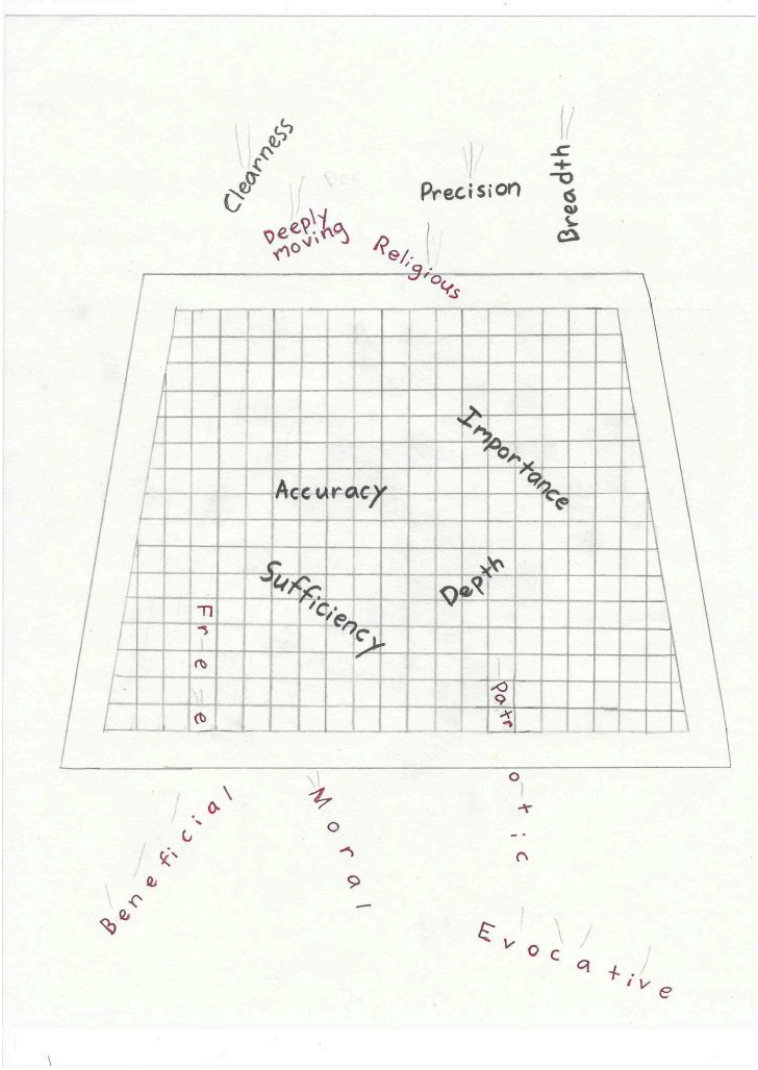

Figure i.2.4. The Standards of Critical Thinking according to the Paul-Elder Model. Courtesy of Charis Williams, 2023.

All relevant empirical claims should also be inspected for weak inductive, deductive, or abductive reasoning. Relevant

claims and arguments should also be scrutinized for logical fallacies. Pseudosciences and conspiracy theories are generally brimming with logical fallacies, and learning to identify them can even be a fun pastime for the critical thinker! To learn more about logical fallacies, we recommend the open-access textbooks by Matthew Van Cleave, *Introduction to Logic and Critical Thinking*, and Andrew Lavin, *Thinking Well*.

Step 4: SEE-I Method

The SEE-I method is an outline for creating a complete and coherent argument (Figure i.2.5). The SEE-I method can consist of as few as four sentences, or an entire doctoral dissertation can be organized this way. Effectively, the thesis statement—or concise response to the research question—comes first, followed by further elaboration and explanation (provision of context, definition of key concepts, address of the counterargument, etc.). The next section of the argument consists of examples, each in support of the thesis statement. The final step is to illustrate the thesis statement by using an analogy.

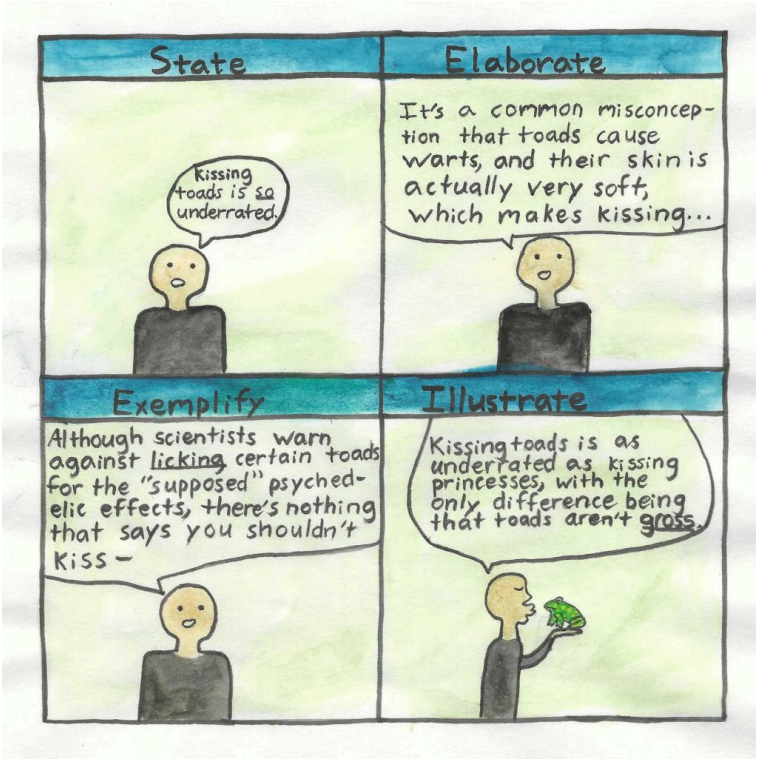

Figure i.2.5. The SEE-I method of the Paul-Elder Model of critical thinking exemplified. Courtesy of Charis Williams, 2023.

Analogy drives home the purpose of the argument and leaves an unforgettable image in the mind of the audience. Analogies compare two dissimilar things in order to make a point; in this way, analogy is different from metaphor or simile, which often function to beautify or elaborate a concept. Composing strong analogies is difficult for many people because it works at the intersection of critical and creative

thinking. But as with all things, with some practice, composing original and powerful analogies to illustrate your point will become second nature, and the quality of your arguments will increase as a result. However, always be wary of the false analogy, a common logical fallacy that bring into comparison two things that only share traits in common on a superficial level. Strong analogies still work even after digging deeper into the connections and commonalities between these two dissimilar things.

Step 5: Counterarguments

Now that the argument is structured, it should again be inspected for weak points. This step requires changing your point of view to that of an audience member hearing your argument. If you were presenting this argument at a professional conference, how might a naysayer in the audience counter your claims? If you were a lawyer presenting this argument in a court of law, what might the opposition point out in your argument to prove their own case? What would a skeptical reader find fault with about your argument? Make note of those weak points and counterarguments and address them.

Step 6: Composing the Final Argument

Combining all the above steps, the final step is writing out the complete argument in the form of a research paper (Figure i.2.6). All the relevant information and evidence has been gathered and evaluated. The argument has been reasoned through and outlined with the SEE-I model. The standards of critical thinking are upheld in every instance. Counterarguments and weak points have been addressed and rectified as needed. Now it's time to communicate the answer to your research question and how you followed the evidence to arrive at that conclusion.

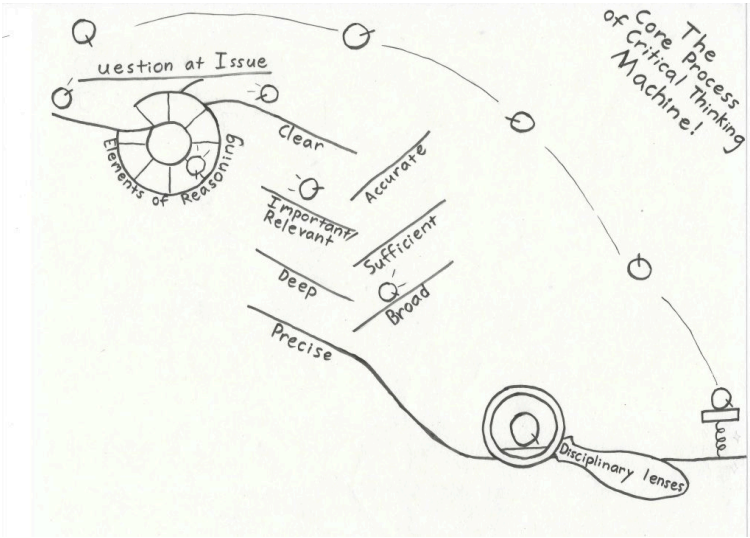

Figure i.2.6. Putting it all together in the core process of critical writing. Courtesy of Charis Williams, 2023.

Embarking on a research project is like setting out on a journey to a place you've never been; you may have some idea of the destination, but the path will almost certainly change courses many times, with unexpected encounters along the way, and where you end up will almost certainly be a little different from the idea you first had in mind. So enjoy the adventure!

Editorial Note

This textbook is a work in progress, and it is expected to continue growing and developing with new generations of (mostly) freshman Honors students at Coastal Carolina University. Although each chapter has undergone several stages of review by highly skilled student editors, some errors and inconsistencies may still remain. We welcome you to contact us with suggestions for improvement and to let us know how you have experienced using the book. Thank you for reading, and for thinking with us!

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PART I
UNIT 1: HOMEOPATHY

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CHAPTER 1.1: IS HOMEOPATHY A RELIABLE ALTERNATIVE MEDICAL PRACTICE?

Written by Zachary Williams, Isabella Wilson, Riley Forrester, Casey Higgins, Zaviyonna Benthall-Lewis

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1.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

Is homeopathy a reliable alternative medical practice?

Evidence and Information:

- Analysis of how established medical practices work
- The different types of homeopathic treatments
- Knowing what constitutes an effective medicine
- Information about how the placebo effect impacts homeopathic studies

- Distinction between homeopathy and other types of alternative or experimental medicine
- Details on the safety of homeopathy

Assumptions:

- That homeopathic practices have the capability of having documented, scientific results
- That the placebo effect often impacts results of homeopathic studies

***Concepts*:**

- Medical treatments
- Medical conditions
- Law of Similars and Law of Minimum Dose
- Placebo
- Effectiveness
- Homeopathic practices

***Context*:**

- Parallel practices of homeopathy and

standard medicine over the past 200 years

Point of View:

- Homeopaths
- Scientists
- Medical professionals

Purpose:

- To discern whether homeopathic treatments are a safe, effective, and legitimate medical practice

Implications and Consequences:

- Findings on whether homeopathy is reliable or not could consequently result in the difference between life and death if homeopathy is found to be harmful to one's health.

Conclusions and Interpretations:

Homeopathy has little clinical evidence and is possibly dangerous.

Disciplinary Lenses

Botany

***Question at Issue*:**

How can plants be used in medicine?

***Evidence and Information*:**

- Past studies
- Data analysis
- Experiments

***Assumptions*:**

- Plants have medicinal properties.
- Plants can be accurately studied.

***Concepts*:**

- Plants
- Ecology
- Herbalism

***Context*:**

- Geographical
- Biological
- Phytological
- Medical

***Point of View*:**

- Botanists
- Doctors
- Patients
- Homeopaths

***Purpose*:**

- Discovering effective ways to use plants for medicine
- Attaining knowledge of plants

***Implications and Consequences*:**

- If plants have healing qualities, then homeopathy has the potential to have healing qualities.
- If proven effective, homeopathy could increase the use of diluted

plants in medicinal practices.

***Conclusions and Interpretations*:**

Plants can be observed, tested, and accurately assessed for their usefulness in the medical field.

Chemistry

***Question at Issue*:**

How is chemistry used to generate active ingredients in medicine?

***Evidence and Information*:**

- Written research
- Lab reports

- Experiments

***Assumptions*:**

- When two elements are combined, a new product is formed.
- The field of Chemistry is forever growing and changing, but the extent of its current knowledge is well-tested.

***Concepts*:**

- Chemicals
- Cellular reactions
- Equilibrium
- Elements
- Active ingredients
- Inactive ingredients
- Dilution

***Context*:**

- Scientific
- Medical

- Biochemical

***Point of View*:**

- Chemists
- Patients
- Doctors
- Homeopaths

***Purpose*:**

- To avoid creating harmful substances
- To understand how elements react with one another
- To understand what constitutes an active ingredient in medicine

***Implications and Consequences*:**

- Chemistry can either support or refute claims of alternative medicines, specifically homeopathic treatments.

***Conclusions and Interpretations*:**

Chemistry can help determine whether homeopathy is a legitimate medical practice or a pseudoscience.

Biology

***Question at Issue*:**

How do homeopathic treatments affect human biology?

***Evidence and Information*:**

- Lab results
- Clinical trials
- Controlled observations
- Documented biological research up

until this point

***Assumptions*:**

- People's natural biological makeup can be impacted by the botanical elements used in homeopathic remedies.
- Patients can experience positive results from homeopathic remedies.
- The human body can heal itself.
- It can be ascertained why a substance causes a certain response.

***Concepts*:**

- Cells
- Hormones
- The body and its processes

***Context*:**

- Scientific
- Medical

- Historical

***Point of View*:**

- Biologists
- Doctors
- Patients
- Homeopaths

***Purpose*:**

- Analyze how the body naturally fights sickness.
- Examine how types of homeopathic remedies can be used in order to heal an ailment.
- Determine how homeopathic treatments could treat a person on a biological level.

***Implications and Consequences*:**

- Biology can determine how different treatments affect different patients and if a certain treatment is

effective.

***Conclusions and Interpretations*:**

Biology can help determine whether or not homeopathic treatment has any actual effects on patients.

Pharmacology

***Question at Issue*:**

How do pharmaceutical treatments compare with homeopathic treatments?

***Evidence and Information*:**

- Lab reports
- Clinical trials
- Experiments

- Documented long-term outcomes of pharmaceutical treatments

***Assumptions*:**

- Research that has led to the current knowledge in the field of pharmacology accurately portrays the medicinal effects and applications of certain substances.

***Concepts*:**

- Medicine
- Natural remedies
- Diagnosis
- Vaccines
- Side effects
- Active ingredients

***Context*:**

- Historical
- Medical

***Point of View*:**

- Doctors
- Pharmacists
- Patients
- Homeopaths

***Purpose*:**

- To explain whether or not homeopathic treatments are considered medicine and why

***Implications and Consequences*:**

- Identifying a homeopathic product as medicine instead of an ineffective supplement could be dangerous to the consumer.
- Because homeopathic treatments tend to be cheaper, if they prove to be just as effective as pharmaceutical medicine, there could be a decline in the

consumption of pharmaceutical products.

***Conclusions and Interpretations*:**

The study of pharmacology can describe the effectiveness of homeopathic products and determine their efficacy as a medical treatment.

Psychology

Question at Issue: What role does psychology play in homeopathy?

***Evidence and Information*:**

- Peer-reviewed research on the placebo effect

- Studies of long-term effects of placebo on patients
- Studies of psychosomatic effects of placebo

***Assumptions*:**

- Psychology can explain why people believe that homeopathy is effective.
- It is possible to accurately determine the positive and negative effects of the placebo effect on people's attitudes about their health.

***Concepts*:**

- Placebo
- Autonomy
- Manipulation
- Persuasion

***Context*:**

- Behavioral
- Historical

***Point of View*:**

- Psychologists
- Patients
- Homeopaths
- Medical doctors

***Purpose*:**

- To describe how behavioral tendencies may influence belief in homeopathic practices
- To uncover how the placebo effect may be influencing patients' beliefs of homeopathic treatments' "effectiveness"

***Implications and Consequences*:**

- Evidence may show that homeopathy's success is derived from its fundamental basis in

manipulation and the placebo effect.

***Conclusions and Interpretations*:**

Psychology shows that, collectively, individuals who engage in homeopathic ideas have similar behaviors and attitudes about their health.

Empirical Claims

Inductive Reasoning

True Premise 1: Homeopathy utilizes the Law of Infinitesimals.

True Premise 2: Many homeopathic products are so diluted that no molecules of the original substance remain (Smith, 2012).

Weak Inductive Reasoning: Regardless of whether or not the substance claimed as medicine is present, as long as patients find success in homeopathy (via the placebo effect), the treatment is still legitimate.

Logical Conclusion: Homeopathy cannot be considered a legitimate medical practice because the substances claimed as medicine are not even present in the solutions sold.

Deductive Reasoning

True Premise 1: Homeopathy's substance's dilution is so high as to make the 'medicinal' aspect of the solution non-existent.

True Premise 2: Pharmacology shows that physiological responses to medicine are dose-dependent.

Weak Deductive Reasoning: Since there is technically some amount of the substance still present in the solution, any documented results (according to the Law of Minimum Dose) can be attributed to the presence of that substance, however small.

Logical Conclusion: Homeopathy can have no physiological effect on its users.

Abductive Reasoning

Observation: Hahnemann's experiment in the early 19th century on himself: "In an attempt to discover why quinine relieves the symptoms of malaria, he took some cinchona bark (the source of quinine) and developed a fever and other symptoms common to malaria" (Smith, 2012, p. 399).

Weak Explanation: "From this experience, he concluded that a substance that produces particular symptoms in healthy individuals can

be effective against a disease that has the same symptoms" (Smith, 2012, p. 399).

Best Prediction: "The 'provings' of Hahnemann et al. were conducted in the early 19th century, an era in which the fundamental principles of clinical trials [...] had not been established. Thus, the observations that form the basis of current homeopathic practice were not conducted in a reliable fashion" (Smith, 2012, p. 399).

Logical Fallacies

Genetic Fallacy

Homeopathy supporters like to reference the fact that this alternative medicine has been around since the late 18th century and that the basic principles have not altered over that period.

The Bandwagon Appeal

In recent years, social media has played a big part in convincing people to replace mainstream medicine with alternative medicines such as homeopathy.

Post Hoc Ergo Propter Hoc

Homeopaths believe that recovery after taking a homeopathic substance indicates that said recovery was due to the homeopathic treatment. This is not necessarily true due to other factors such as the placebo effect and the fact that most patients will approach a doctor when their symptoms are at their peak (which is when the symptoms tend to start decreasing).

Non Sequitur

We see this present in the reasoning of the Law of Similars and the Law of Infinitesimals, which are both invalid bases for anything scientific.

Cherry-Picking

"Hahnemann derived [the Law of Similars] from a single observation involving himself" (Smith, 2012, p. 399).

"... many clinical trials of homeopathy are rendered invalid by serious flaws, such as low subject numbers, poor design and slipshod execution" (Smith, 2012, p. 400).

Ad Hoc

"Some modern homeopaths deal with this epistemic problem by employing the ad hoc notion that the water used for dilution retains a 'molecular memory' of the original substance" (Smith, 2012, p. 400).

1.1.2 SEE-I MODEL

State

There are no homeopathic remedies that have documented and proven medical effects because homeopathy is a pseudoscience and not a legitimate medical practice.

Elaborate

Homeopathy is a therapy based on two principles: the Law of Similars and the Law of Minimum Dose. This means that homeopaths believe that a very minuscule dose of the substance that causes a person's symptoms will in fact be the cure for that very same illness. However, other than the fact that the non sequitur logical fallacy comes into play with the Law of Similars, another key flaw in this argument is that the dosage of homeopathic remedies is "so diluted as to be indistinguishable from pure water" (Oxford University Press, n.d.). In other words, homeopathy uses the placebo effect to create the illusion that it is effective, when in reality, there is no basis for this approach to medicine.

The only documented instances of success with homeopathy consist of isolated, unconvincing testimonies

with little to no scientific explanation for the reported success. Homeopathy is not medicine, but rather a therapy based on coincidental results alone. Real, effective medicine works in the form of antibiotics with the knowledge that the body cannot always heal itself (as homeopaths believe). Antibiotics fight bacterial infections in the body by "attacking the wall or coating surrounding bacteria" and "blocking protein production in bacteria" (Healthline Medical Network, 2018), while vaccines use antigens to imitate an infection and essentially train the body how to fight it. Homeopathy, on the other hand, does not share any of these principles.

Exemplify

- **Medical Lens:** An example of homeopathic treatment with allegedly successful results was found in a long-term study published by BMC Public Health (Witt, 2008). Between 1977 and 1999, nearly 4000 people were recruited for a study in which their severity of pain and quality of life were measured before and after 8 years of homeopathic treatment for conditions like allergic rhinitis and atopic dermatitis. In 2006, a total of 2,722 patients responded to the study with a perceived decrease in pain and an increase in quality of life. There is a major logical problem with this study: severity of pain and quality of life are both incapable of truly being measured. They are subjective, they can change every

day, and they vary from person to person and illness to illness. Asking participants to grade their own pain and quality of life with no means of accurate or consistent measurements is not a valid method of study.

- **Psychological Lens:** As discussed in Kolbert's (2017) article, "Why Facts Don't Change Our Minds," our brains are trained to believe what we are told. If people are told that homeopathy is supposed to make them feel better, they are most likely going to believe that they feel better regardless of whether or not their health status has even changed. This placebo effect is the largest contributor to alleged documented medical effects of homeopathy, and there is no scientific backing to reports of medical success with homeopathy outside of the placebo effect, meaning that the only true curing homeopathy does is completely psychological.

- **Ethical Lens:** Since homeopathy can reasonably be categorized as an alternative medicine with no biochemical and physiological effects, this means that when a person buys homeopathic treatments, thinking they are saving money, choosing a safer treatment, and/or making an autonomous decision outside of the mainstream medical world, then on the first two points they have been greatly deceived. On the third point, the biggest ethical issue is that if a patient chooses alternative

medicine as a means of feeling independent in their decision, they risk their health if their condition requires effective treatment.

Illustrate

In terms of the aforementioned study, picture this: a child falls off a bike and scrapes her knee. You ask how she feels, and she responds poutingly that she doesn't feel good at all. Then you give her a candy bar and once again ask how she feels a little while later. Suddenly, both her day and her pain have drastically improved because of your candy bar. Is it now a reasonable hypothesis to say that candy bars can cure skin abrasions? Of course not. This is an example of the placebo effect, which allows the mind to determine how the body feels. Rather than legitimate data, this placebo effect is what causes the so-called "success stories" of homeopathic treatment. Sugar does not have the same effect that Neosporin, a Band-Aid, and a little bit of time have on a knee scrape, although the results may be perceived as the same. That is why homeopathy is a pseudoscience.

1.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: By choosing to utilize homeopathic treatments, patients can exercise autonomy.

Rebuttal: Professional medical advice is valuable; it's important to make the most informed and scientifically validated decisions when it comes to your health.

Argument: Even in mainstream medicine, treatments are given to patients that doctors know are ineffective, such as "antibiotics for viral infections, B vitamins for multiple sclerosis, and

saline injections for various complaints" (Smith, 2012, p. 402)

Rebuttal: When professionals prescribe a medicine or treatment with an undocumented medical effect, they are doing so for the benefit of the patient (i.e. improving the psychological state, or with the understanding that the treatment may offer limited relief for some patients). If a patient is purchasing medicines they believe to be effective because a homeopathic doctor prescribed it to them, knowing that the effects are null, then the prescription has dubious ethical standing.

Argument: Homeopathy is widely popular (even among some medical professionals) and has been around since the early 19th century.

Rebuttal: While ideas can have a snowball effect and grow as they 'catch on,' that does not necessarily indicate their accuracy (see genetic fallacy and bandwagon appeal in 1.1.1).

Argument: Homeopathy claims similarity to vaccines, as they use whatever ailment is being treated as a part of the solution.

Rebuttal: "Vaccines contain much larger quantities of active substance than do homeopathic preparations. Moreover, the active substances in vaccines are directly quantifiable and elicit a measurable response (production of antibodies), features that do not apply to homeopathic preparations. Finally, the analogy fails in respect of the altogether disparate usages of vaccines and homeopathic medicines. Immunization is preventive,

unlike homeopathy which is used to treat existing ailments" (Smith, 2012).

Argument: Homeopathic treatments are more environmentally friendly as well as more cost-effective

Rebuttal: "Low cost is nullified by ineffectiveness, since ineffective medical treatment is of zero value. Moreover, because homeopathic practice entails a financial cost (in terms of premises, facilities, and remuneration), this becomes a disutility" (Smith, 2012, p. 400).

Homeopathic Argument: Homeopathic medicines are sold in mass quantities in pharmacies such as CVS, Walgreens, RiteAid, etc.

Rebuttal: Despite being sold in pharmacies, these products are not medicine and are classified as supplements by the FDA. Just because something is sold in a pharmacy, does not mean that it has documented effects.

1.1.4 RESEARCH PAPER

Introduction

In the U.S. alone, 2.7 billion dollars are spent annually by the six million Americans who prefer homeopathic remedies for their ailments (NCCIH, 2020). Homeopathy is

> a complementary therapy based on the theory that 'like cures like.' It involves a belief that conditions may be treated with a tiny dose of a substance (so diluted as to be indistinguishable from pure water) that in larger doses would normally cause or aggravate that condition. A second principle is a process of dilution and shaking known as 'succussion'. Homeopathy was developed in 1796 by a German doctor, Samuel Hahnemann (1755–1843). (McFerran 2021).

The practice of homeopathy has been used for years, but there is not much evidence that substantiates it as a logical or effective choice over regular medicines. There are no homeopathic remedies that have documented and proven medical effects, which means that homeopathy is not a legitimate medical practice but rather, a pseudoscience.

To elaborate, homeopathic practices are based on two principles. The first is the Law of Similars, which is the idea that symptoms caused by a substance can be cured by that

same substance. The second is the Law of Minimum Dose, which is the idea that the lower the dose of medicine, the greater the effectiveness; both of which are not scientifically proven to yield results comparable to standard medical practices. To put it simply, homeopathic remedies rely on the placebo effect rather than chemical or biological effects that are demonstrably medicinal in value and able to heal ailments and mollify symptoms. We are going to explore in greater details why homeopathy is not a legitimate medical practice from a medical lens, psychological lens, and ethical lens.

Medical Lens

One example of homeopathic treatment with allegedly successful medical results was published in a long-term study by *BMC Public Health*. Between 1997 and 1999, nearly 4,000 people were recruited for a study in which their severity of pain and quality of life were measured before and after eight years of homeopathic treatment for conditions like allergic rhinitis and atopic dermatitis. In 2006, a total of 2,722 patients responded back to the study with a perceived decrease in pain and an increase in quality of life (Witt et al., 2008). Since low-dose treatments following the Law of Similars appeared to improve the health conditions of patients in this and other studies, homeopathic practitioners argued that this alternative medicine was comparable to a live-virus vaccine. However, this analogy fails to consider the cellular biology behind how vaccines work. As explained by Kevin Smith in *Bioethics*, "the

active substances in vaccines are directly quantifiable and elicit a measurable response (production of antibodies), features that do not apply to homeopathic preparations. Finally, the analogy fails in respect of the altogether disparate usages of vaccines and homeopathic medicines. Immunization is preventive, unlike homeopathy which is used to treat existing ailments" (2012, p. 400).

While it is clear that homeopathy does not share the same chemical components of healing as traditional medicine, Sven Ove Hansson, in "Science Denial as a Form of Pseudoscience," held these pseudoscientists accountable for neglect of refuting information. "Science evolves with time, and the assimilation of new knowledge refuting what was previously believed is an essential part of the scientific process. Pseudoscientists are remarkably reluctant to give up their cherished ideas. For instance, homeopathy is still unaffected by the knowledge obtained in chemistry in the last two centuries." (Hansson 2017, p. 41). The blatant cherry-picking of successful results fails to hold up against the depth and breadth standards of critical thinking by refusing to dig into other alternatives, like the proven science that is medicine.

Dr. Gerald M. Nosich describes the importance of seeing more than one side of an argument through alternatives. "Whenever you reason, there are alternatives. ... Thinking outside the box means envisioning alternatives where before there seemed to be only the inside of the box. Getting in the habit of searching for alternatives allows us to see many

potential paths ahead of us, where before there seemed to be only one" (Nosich, 2012, p. 61). Homeopaths would find their small body of proof to be largely outnumbered if they considered other explanations for "successful" medical results. Some of these homeopathic alternatives to medicine are coincidence (post hoc ergo propter hoc) or psychological manipulation of results. Either way, the disregard of and refusal to interpret medical data from a different perspective makes homeopathy far from a legitimate science.

That being said, the original analysis of the *BMC* study results focusing on the comparison to vaccines should not be the only interpretation to be considered. Another alternative is to examine the study from a standards of science point of view to discredit the study's means of measurement. The two quantifying factors, severity of pain and quality of life, are both incapable of being precisely measured. They are subjective, can change every day, and vary from person to person as well as illness to illness. Asking participants to grade their own pain and quality of life with no means of accurate or consistent measurements is not a valid method of study.

To illustrate the aforementioned study, picture this: a child falls off a bike and scrapes her knee. A witness asks how she feels, gives her a candy bar, and once again asks how she feels a little while later. Suddenly, both the child's day and pain have drastically improved because of that candy bar. This does not mean that a logical conclusion to reach is that candy bars can cure skin abrasions. Sugar is not the same as Neosporin and

a bandage, nor is homeopathy the same as medicine, though the results may be perceived the same. Thus, there is no significance to the study's results.

Psychological Lens

Success in homeopathic remedies is often derived from psychological concepts such as manipulation and the placebo effect. To exemplify, Edzard Ernst, in the article "Should doctors recommend homeopathy?" from the *British Medical Journal,* argues that homeopathic treatments are often diluted to the point at which they cannot have any effect (2015). He mentions that "One of the most commercially successful remedies, for example, is based on an extract of duck liver in the C200 'potency.'" This "potency" can be translated to a dilution at the ratio of 1:1×10399. Ernst goes on to explain that "the likelihood of a single active molecule being present in a homeopathic pill is effectively zero" (2015). Without a single active molecule, the only feasible explanation for the success of this remedy is through some sort of psychological manipulation, which in this case would be the placebo effect.

Patients are naturally subjected to report positive results by falling under confirmation bias. A New Yorker article titled, "Why Facts Don't Change Our Minds," described this bias as "the tendency people have to embrace information that supports their beliefs and reject information that contradicts them" (Kolbert, 2017). To clarify, the brain is essentially trained to accept only what it is told. If people are told that

homeopathy is supposed to make them feel better, they are more likely to believe that they feel better regardless of whether or not their health status has changed. This is an example of the placebo effect or, as described by Harvard Health Publishing, "the idea that your brain can convince your body a fake treatment is the real thing … and thus stimulate healing" (2019). Upon deeper analysis of documented reports of homeopathic success, it's clear to see that this psychological effect is the largest contributor to alleged documented medical effects of homeopathy.

Psychology can also be used to explain why and how people think the way that they do. As such, psychology can explain the thought processes behind the belief of homeopathy through the use of logical fallacies, which are often the cornerstone of pseudoscientific theories. An example of one of these fallacies is the genetic fallacy. Andrew Lavin, in his textbook *Thinking Well: A Logic and Critical Thinking Textbook*, describes the genetic fallacy by explaining that "The genetic fallacy occurs when an arguer critiques the origin of a claim or argument rather than the claim or argument itself" (2020, p. 89). Conversely, this fallacy can also be used as a way to accept or justify a belief. Homeopaths, when defending the efficacy of homeopathy, often reference the fact that homeopathy was founded in the late 18th century. Their fallacious argument is that, due to the age of the practice, it must be effective. Another significant logical fallacy in the argument for homeopathy is the false cause, otherwise known

as post hoc ergo propter hoc. Lavin describes this fallacy as the idea that because one event takes place after another, the first event must have influenced the second (2020, p. 110). In the context of homeopathy, the typical thought process is that since the patient recovered from their illness, the remedy must have been effective. A more probable conclusion as to how the symptoms of illness were relieved is through either the placebo effect or the fact that patients commonly seek medicine when their symptoms reach their peak, which typically means that those symptoms will begin declining soon.

A final, and arguably the most significant, logical fallacy regarding homeopathy is the bandwagon appeal. As defined by Lavin, the bandwagon appeal is "appealing to the popularity of a thing or idea or practice in order to justify that thing or idea or practice" (2020, p. 97). To elaborate, homeopathy has been established for a long time and was practiced a considerable amount. However, in recent years this practice has exploded in popularity due to the use of social media. Through the use of social media, homeopaths are able to spread awareness of their practice by displaying the "results" of their remedies, as well as testimonies from patients who were treated with homeopathic remedies. These results and testimonies are not accurate and are used only as a way to sell more homeopathic products. The fact that homeopathy relies heavily on these logical fallacies in order to determine its effectiveness suggests that the practice is pseudoscientific.

Ethical Lens

Homeopathy has many ethically questionable components as well. The ethics of homeopathy must be taken into consideration when evaluating whether or not it is a pseudoscience because, as Pigliucci said in his article, "How to Behave Virtuously in an Irrational World," "Skepticism of pseudoscience shares its core values with science, values that include intellectual honesty, humility, and the other epistemic virtues..." (2019, p. 16). To be considered a real science, homeopathy must be based on epistemic virtues such as these, but if it fails to do so, it is one more point of evidence which points to it being a pseudoscience.

If, for the sake of this argument, we were to assume that the strong research and information indicating homeopathy has absolutely zero biochemical or physiological effects on the body is accurate (National Center for Complementary and Integrative Health [NCCIH], 2021), then there is obvious reason to suppose patients of homeopathy are cheated and given a false sense of autonomy.

To elaborate, supporters of homeopathy often reference the benefits of privacy, cost-efficiency, and autonomy, for example, as reasons homeopathy is an ideal alternative medicine. If homeopathy had clinical trial results providing ample evidence that it is an effective medical treatment, then certainly, these points of privacy, cost-efficiency, and autonomy could be considered legitimate benefits. However, the benefits of privacy, cost-efficiency, and autonomy are all negated if

homeopathy has no biochemical or physiological effect on its patients, which research strongly indicates, as there is no information providing sufficient evidence (Smith, 2012, p. 400).

Since homeopathy can reasonably be categorized as an alternative medicine with no biochemical and physiological effects, this means that when a person buys homeopathic treatments, thinking they are saving money, choosing a safer treatment, and/or making an autonomous decision outside of the mainstream medical world, then on the first two points they have been greatly deceived. On the third point, the biggest ethical issue is that if a patient chooses alternative medicine as a means of feeling independent in their decision, they risk their health and safety if their condition requires effective treatment. Professional medical advice is valuable, and it is important to make the wisest health choices in order to avoid dangerous situations. This is the ethical dilemma on this point, as homeopathy is often presented to the public as completely harmless and effective, when this cannot be true if this deceit leads to an ill individual not seeking established medical advice (Smith 2012, p. 405).

As for the supposed "benefit" of saving money, this can quickly be negated, since as Smith put it in his article, "Against Homeopathy," "low cost is nullified by non-effectiveness, since ineffective medical treatment is of zero value. Moreover, because homeopathic practice entails financial cost (in terms of premises, facilities and remuneration), this becomes a

disutility." The same argument applies to the promise of non-invasiveness in homeopathy. Since a non-effective treatment is no treatment at all (unless in placebo terms), the logical conclusion is that it cannot be a non-invasive treatment because it does not qualify as treatment (Smith 2012, p. 402).

Another ethical problem with homeopathy is that it is a waste of resources. This is true in two senses, the production of products and the consumption of products. With the production, it is clear that if a product is non-effective, then it's creation will most likely be wasteful. Since homeopathy has "rather minimal" (Smith 2012, p. 405) benefits, that means that the money and resources put into the production of homeopathic substances, regardless of how small, are a waste of resources, and thus an environmental and economic waste. As for the consumption of homeopathic products, as Smith (2012) says in his article:

> Considering that homeopathy represents an intrinsically ineffective form of treatment, any resources expended on homeopathy represent a waste of resources that could otherwise have been expended on more effective healthcare. The utilitarian logic is clear: such expenditure is unethical.
>
> Homeopathic preparations are (or should be) inexpensive, since they contain no active agents. However, homeopathy is associated with additional costs, including the cost of homeopathic consultations and the provision of specialist hospitals and clinics. Moreover, when no clinical benefit is obtained from homeopathy, patients are likely to

> return to conventional medicine: in this way, the public purse pays twice (p. 406).

Overall, homeopathy has underlying ethical problems that are concerning and should not be overlooked when evaluating the practice. In all medical fields, ethics is not an after-thought, as the practice of medicine is primarily concerned with not just curing the patient, but also helping the person to the best of its ability and as humanely as possible. The Hippocratic Oath, which physicians swear to when entering the medical field says at one point: "I will remember that there is art to medicine as well as science, and that warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drug" (Marks, 2021).

It can fairly be interpreted that treating a patient with "warmth, sympathy, and understanding" requires an ethical approach where the patient is not being deceived. Because homeopathy in many ways is based on deceit, it can reasonably be concluded that it cannot be considered ethical from a medical point of view since it essentially goes against the very standard of medical practice, which furthers the argument that it cannot be considered a legitimate medical practice.

Conclusion

Because of the lack of documented evidence to support the practice of homeopathy from the perspectives of the medical field, psychology, and an ethical standpoint, homeopathy must be concluded to be a pseudoscience. The very premise of this

practice, the idea of "like cures like," is in and of itself preposterous as it facilitates the ad hoc fallacy (Lavin, 2020, p. 238), meaning the argument has an illogical base. While homeopathy may have some value as a placebo medicine—and doctors do at times prescribe ineffective medicine for placebo-result purposes—it can be seen from an ethical perspective that this supposed value can easily be negated by the fact that self-prescribed treatment outside of professional medical advice could very well lead to further complications if the initial ailment requires serious medical attention. As science continues to make advancements over time, homeopathy becomes less credible as a source of treatment, and it can fairly be asserted that this eighteenth-century practice can be left in the past as a creative idea with no scientific results.

References

Edzard Ernst. (2015, June 23). *12 bogus arguments about homeopathy*. https://edzardernst.com/2015/06/12-bogus-arguments-about-homeopathy/

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A, 63*(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

Harvard Health Publishing. (2019, August 9). *The power of the placebo effect*. https://www.health.harvard.edu/mental-health/the-power-of-the-placebo-effect.

Healthline Medical Network. (2018, December 7) *How do antibiotics work?* Healthline. https://www.healthline.com/health/how-do-antibiotics-work#how-they-work.

Kolbert, E. (2017, February 20) *Why facts don't change our minds*. The New Yorker. https://www.newyorker.com/magazine/2017/02/27/why-facts-dont-change-our-minds.

Lavin, A. (2020). *Thinking well: A creative commons logic and critical thinking textbook* (3rd edition). Course Hero.

https://www.coursehero.com/file/68307737/Thinking-Well-Lavin-Edition-3pdf/.

Marks, J. W. (2021, March 3). *Medical definition of Hippocratic Oath*. RxList. https://www.rxlist.com/hippocratic_oath/definition.htm

McFerran, T. (2021). Homeopathy. In J. Law (Ed.), *A Dictionary of Nursing*. Oxford University Press. https://www.oxfordreference.com/view/10.1093/acref/9780198864646.001.0001/acref-9780198864646-e-4063.

National Center for Complementary and Integrative Health. (2021, April). *Homeopathy: What you need to know*. US Department of Health and Human Services. https://www.nccih.nih.gov/health/homeopathy.

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Pigliucci, M. (2020). How to behave virtuously

in an irrational world. *Disputatio. Philosophical Research Bulletin, 9*(13), 1–19. DOI: https://doi.org/10.5281/zenodo.3567251.

Smith, K. (2012). "Against homeopathy—A utilitarian perspective." *Bioethics*, 26(8), 398–409. https://doi.org/10.1111/j.1467-8519.2010.01876.x.

Witt, C. M. (2008, December 17). *How healthy are chronically ill patients after eight years of homeopathic treatment? – Results from a long term observational study.* BMC Public Health. https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-8-413.

UNIT 1 CRITICAL THINKING EXERCISES

1. Examine your assumptions of what homeopathic treatments consist of. How many of these do you engage with on a daily basis? How effective do you think they are? And how do they differ from true homeopathic remedies (based on Law of Similars and Law of Smallest Dose)?

2. Talk to someone who uses homeopathic treatments. What is that person's rationale? Why do you think this person continues to seek such treatments instead of confirmed medical intervention?

3. Conduct a survey. What are some opinions on homeopathy? How many have tried homeopathic remedies? For what kinds of ailments? What are

some common misunderstandings of homeopathy? How many surveyed think of homeopathy as a pseudoscience? What are demographic differences (age)?

4. Put yourself in the point of view of someone how seeks homeopathic treatment. What are some logical fallacies or examples of weak reasoning that you might find yourself using to justify continuing homeopathic treatments?

5. How would you describe homeopathy to a friend or stranger who knows nothing of the topic? How would you explain why it should be characterized as pseudoscience?

PART II
UNIT 2: ALCHEMY

CHAPTER 2.1: SHOULD ALCHEMY STILL BE CONSIDERED A PSEUDOSCIENCE?

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2.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

How did alchemy help develop modern chemistry?

Evidence and Information:

- Comparisons and contrasts of the principals of alchemy and chemical sciences
- Examples of alchemical experiments
- Types of equipment used in alchemy
- Identities of known alchemists

Assumptions:

- Alchemy is considered a pseudoscience, but it contributed to modern chemistry.
- Alchemy's associations with witchcraft and sorcery may have given alchemy an undeserved negative reputation.

Concepts:

- Chemistry
- Scientific method
- Alchemy
- Philosopher's stone
- Pseudoscience
- Sorcery
- Witchcraft
- Transmutation

Context:

- Early Modern Europe
- Middle Ages
- Ancient Egypt
- Islamic science
- Enlightenment

Point of View:

- Chemists
- Alchemists
- Religious
- Scientific

Purpose:

- To evaluate the degree to which alchemy contributed to modern chemistry in order to see whether or not alchemy should still be considered a pseudoscience

Implications and Consequences:

- If alchemy should no longer be considered a pseudoscience, then it is possible that other practices now considered to be pseudoscientific might in the future be recognized as legitimate science; it could also change the way that the field of chemistry is viewed.

Conclusions and Interpretations:

The basic principles of alchemy can be shown to be linked to the foundation of chemistry.

Disciplinary Lenses

Chemistry

Question at Issue:

How does a substance transform into something else?

Evidence and Information:

- How chemicals react to each other to form new substances
- Research on whether it is possible to transform one metal into another
- If experiments claiming to be able to transmute a base metal into gold are replicable
- Which types of substances can be

transmuted into different substances

Assumptions:

- The basic principles of chemistry can be found in alchemy.
- It is possible for one substance to change into another.

Concepts:

- Chemistry
- Molecules
- Bonds
- Compounds
- Transmutation

Context:

- History of science
- Enlightenment

Point of View:

- Chemists
- Alchemists
- Historians of science
- Philosophers of science

Purpose:

- To evaluate a main alchemical principle using contemporary scientific criteria

Implications and Consequences:

- Alchemy would be reconsidered as a science rather than a pseudoscience.
- Alternatively, alchemy and chemistry developed independently and should be understood as distinct practices.

Conclusions and Interpretations:

The alchemical concept of transmutation

of metals contributed to modern chemistry.

History

Question at issue:

How has alchemy been viewed in the past?

Evidence and Information:

- Primary source records like alchemical texts and commentaries on alchemy by contemporary writers or scientists
- Secondary sources like modern histories of alchemy and science

Assumptions:

- The perception of alchemy has evolved over time

Concepts:

- Magic
- Religion
- Philosopher's stone
- Enlightenment, science
- Alchemy

Context:

- Medieval history
- Middle Ages
- History
- Alchemy
- Chemistry

Point of View:

- Historians
- Alchemists

- Philosophers of science

Purpose:

- To understand the progression of alchemy, how it developed and may have influenced chemistry, and why it was and is viewed differently from chemical sciences

Implications and Consequences:

- The history of alchemy paints alchemy in a negative light, causing it to be viewed as a pseudoscience in modern times.
- Alternatively, alchemy has always been considered a pseudoscience.

Conclusions and Interpretations:

The perception of alchemy is changing on the basis of new historical information.

Empirical Claims

Our claim: Alchemy helped to develop modern chemistry by serving as an avenue for chemical exploration, and therefore should not be considered a pseudoscience.

- **Clarity:** This claim is represented clearly through the examples and historical background provided.
- **Accuracy:** This is accurate, as the argument is based on many peer-reviewed sources, and thus, it represents the current scholarly consensus (albeit subject to change with new information).
- **Importance and relevance:** It is relevant to today in understanding the origins of chemistry.
- **Sufficiency:** This is sufficient as the claim is backed up with several examples to enhance the overall

argument and understanding.

- **Depth:** The argument provides a relatively deep investigation into the long history of alchemy.
- **Breadth:** The argument looks into multiple aspects of alchemy, from religion to scientific views and alchemical practices.
- **Precision:** A large number of recently published scholarly, peer-reviewed sources repeatedly support this claim.

Opposing claim: Alchemy is a pseudoscience steeped in magic.

- **Clarity:** The claim is clear due to the modern connotation of alchemy in pop culture as dealing with magic.
- **Accuracy:** It is accurate with respect to the part of the alchemy that was devoted to finding immortality, but is inaccurate in

regards to other aspects of alchemical research.

- **Importance and relevance:** It is relevant to the understanding of early modern history and scientific advancements of the Enlightenment.
- **Sufficiency:** It is not sufficient, as many aspects go unexplained or ignored, and the claim is not based on a contemporary understanding of all aspects of alchemy.
- **Depth:** The claim does not dive deep into the subject of alchemy and makes the claim based on popular reputation rather than scientific research and consensus.
- **Breadth:** It lacks some breadth, as it ignores the scientific achievements of alchemists and the scientific processes they used.
- **Precision:** It generalizes the entire practice on the basis of a few poorly

understood elements, so the claim is imprecise.

2.1.2 SEE-I MODEL

State

Alchemy helped develop modern chemistry through scientific experimentation conducted by prominent scientists in the Middle Ages and Renaissance.

Elaborate

The Art Students League (2022) defines alchemy as "a medieval forerunner of chemistry, based on the supposed transformation of matter." Alchemy can be linked to chemistry through the techniques and tools used, how alchemists' experiments showed an understanding of chemical properties, and the experts who practiced it.

Exemplify

- **Ex. 1:** In their pursuit of transforming metals, alchemists used techniques such as distillation and tools such as flasks and funnels, all of which are still used in chemistry today. We see this demonstrated in illustrations shown in *Alchemy*, by E. J. Holmyard

(1968), which shows tools that appear and function similarly to modern chemistry tools and equipment still used today.

- **Ex. 2:** Not only that, but Robert Boyle, the father of modern chemistry, was an alchemist. Furthermore, an experiment of Boyle's was replicated in recent years, and his results were found to be accurate, though his conclusion was slightly off because of the knowledge of the time. Isaac Newton was also an alchemist and practiced it on the side of his more "acceptable" work.

- **Ex. 3:** Chemistry seeks to understand the behavior and properties of substances; one property is the changing of states, which is parallel to alchemy's objective to transform metals.

Illustrate

In conclusion, one might say that alchemy's relationship to chemistry should be considered analogous to astrology's relationship to astronomy: that is, astrology and astronomy were initially the same practice, but they diverged over time, leaving astrology as a pseudoscience and astronomy as a science. However, this analogy ignores the nuanced development of alchemical practice and how, unlike astrology,

alchemy did change over time and led directly into the science of chemistry before being abandoned altogether.

So a more complete understanding, according to Coudert (2008), is that "alchemists were like bakers who transformed flour into bread or vintners who turned grapes into wine; they improved on nature" (p. 233). This analogy demonstrates that alchemy was a science, in much the same way that baking and wine-making are sciences. Likewise, the practices of baking and wine production are only possible through chemistry, much like the processes and experiments of alchemy were.

2.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: Alchemy is just a mystical practice from a long time ago.

Rebuttal: The history of alchemy demonstrates that the practice has drastically changed throughout the years. The popular perception of alchemy was that it was based on mystical nonsense. At best, it was perceived as a pointless chase after gold that added little to the evolution of science. Alchemy is now mostly accepted as an important component of the evolution of science. However, there are still some critics who raise concerns involving whether alchemy has truly contributed to modern-day chemistry.

Argument: Alchemy has too strong of a tie with religious/occult practices to be anything scientific.

Rebuttal: Originally, alchemy was connected with witchcraft, necromancy, and other practices and notions labeled the 'occult,' or occult sciences. Some believe that, by trying to re-establish alchemy as a science, alchemy's original roots in magic and the occult are being dismissed. Some believed that those who practiced alchemy, like Francis Bacon, also sought a means to connect it with their religion. However, by doing this, they were engaging in an activity that was unorthodox, according to their institution's rules. In *Franciscans and the Elixir of Life*, Z. A. Matus (2017) claimed that alchemy was constantly outlawed in a succession of Franciscan ordinances passed between 1260 and 1337. While alchemy included many different practices, there are some recurring themes in the reports from 1295 to 1318. These reports link alchemy to the occult (Campbell, 2018). Those who are hesitant to recognize alchemy's significance in the formation of modern chemistry are not completely rejecting

alchemical results. Rather, they are stating that those who postulate a link between alchemy and chemistry are oversimplifying things that pertain to a complex topic.

Argument: Alchemists discovered concepts that led to chemistry by accident and did not use scientific methods like a hypothesis in their experiments.

Rebuttal: A common misconception is that alchemists stumbled upon results that were later proven by chemists (Principe, 2011). This was a common way to interpret historical evidence in the late 18th and early 19th centuries. Eventually, the prevailing theory was that the accomplishments of alchemists were neither chemistry nor science and, in some cases, had nothing to do with the physical realm. Many historians have attempted to measure

alchemy's achievements by tracing the first documented emergence of a product or method. However, it was pointed out that these outlying "firsts" only further supported the idea that alchemists discovered things by mistake. These historians go on to say that the retrieval of such useful contributions left the majority of alchemical texts, theories, and procedures largely unclear. Biased behavior and outdated theories of alchemy are mostly to blame for obstacles in realizing that alchemy played a major role in what we now consider chemistry and critical procedures in science that are still used today.

Argument: The analogy of astrology and astronomy to alchemy and chemistry

Rebuttal: Another counterargument is that

alchemy's relationship to chemistry should be considered analogous to astrology's relationship to astronomy: that is, that astrology and astronomy were initially the same practice and they diverged over time, leaving astrology as a pseudoscience and astronomy as a science. However, this analogy ignores the nuanced development of alchemical practice and how, unlike astrology, alchemy did change over time and led directly into the science of chemistry before being abandoned altogether.

2.1.4 RESEARCH PAPER

Introduction

From the outside, alchemy seems to have nothing but pseudoscience about it according to Hansson's (2017) criterion of what constitutes pseudoscience. Upon deeper research, alchemy has contributed to modern chemistry and thus should not be labeled as pseudoscience. Alchemists have always been interested in exploring and trying to understand nature and chemical reactions. Hence, chemistry has always been an aspect of alchemy. But beginning in the 1980's, scholars and historians began questioning the reputation of alchemy as a pseudoscience and instead began to investigate the legitimacy of alchemy as a contributor to modern science. The question at issue is why exactly has alchemy recently been accepted as an important contributor to modern chemistry, leading to its current identification as a science instead of a pseudoscience? The answer lies in the complicated history of alchemy and the way historical sciences have recently examined that history without the biases of its occult reputation. This paper presents evidence that alchemy helped develop modern chemistry through scientific experimentation conducted by prominent scientists in the Middle Ages and Renaissance.

Aspects of Alchemy

Alchemy is divided into two parts. The first half is exoteric alchemy, which is the study of the transmutation of one base metal (lead, tin, copper, iron, and mercury) into a more precious metal (gold and silver). The changing of one metal into another, also known as transmutation, is based on the theory that everything is made up of certain elements in different amounts. Assuming this is true, then breaking down a piece of matter into its basic elements, separating them, and changing their proportions will lead to an underlying shift in the substance's chemical structure. Basically, one substance can actually transform into another. Exoteric alchemy evolved to be considered practical alchemy by the mid-18th century after the idea of alchemy being able to make gold had been disproven. Making gold was never the main objective for alchemists; the production of an immortality elixir was considerably more essential and appealing to them (Maxwell-Stuart, 2012). This leads to the other side of alchemy, the esoteric one, which is a spiritual quest for the creation of an elixir that could cure illnesses and even achieve immortality.

Once regarded as a secret of divine power, the philosopher's stone was an important aspect of alchemy. It was said to be made of a reddish powder from a mineral that is broken into three elements and then recombined into a solid stone that can be melted by wax. To start, pontic water must be used to cleanse the original substance of its darkness. The body,

soul, and spirit must next be purified, resulting in a liquid known as mercurial water. Then the liquid is separated into five portions. Two should be put aside while three of them should be blended together and added to one-twelfth of the gold weight. Once the gold and water are mixed, a solid amalgam is formed. Meanwhile, the amalgam is added to one of the two saves of the mercurial water in a tear-shaped phial. Then add the last portion of the water in seven small installments and cover the phial. After forty days, the contents of the phial will be black (this step is known as the "raven's head"), and then seven days later, at a little higher heat, powdery bodies form, followed by a circle around the substance. Finally, the soul and spirit combine with their bodies to produce an everlasting essence under the force of fire. Assuming this is valid, the philosopher's stone's essence was said to have the ability to turn any metal touched by it into gold and restore health and immortality to anyone who ate it (Holmyard, 1968). This idea that immortality "could be obtained through divine grace and favor" (Holmyard, 1968, p.15) resulted in esoteric alchemy, in which the tedious process of transmutation became a representation of turning sin into perfection of man through faith and God's will. This half of alchemy has been much more hidden from public perception.

There are different sectors of religious alchemy that are considered esoteric because they involve similar basic beliefs. The religion of Taoism, which is thought to have originated

around 300 B.C., served as the foundation for Chinese alchemical theory. The Taoists desired a long life, so they started preparing for Paradise, and to this end, they practiced meditation, breathing exercises, different physical activities, and fasting. Followers were drawn to alchemy as a desire for a longer lifespan, which evolved into the goal of immortality (Holmyard, 1968). The Taoists' desires and goals are somewhat similar to those of Christianity. Both praised their gods in ways to help them reach Heaven (praying) or Paradise (meditation, fasting, etc.), and both wanted to achieve immortality and reach Heaven (or Paradise for Tao). Other forms of religious alchemy followed similar desires but sometimes used different methods to achieve their objectives.

In its prime, from about A.D. 800 to the middle of the 17th century, alchemy was practiced by kings, popes, and emperors as well as minor clergy, parish clerks, smiths, dyers, and tinkers. While metal transmutation was a permanent aspect of alchemy, other prominent areas included medicine distillation, metalworking, chemical process analysis, and the production of items such as dyes, inks, imitation gems, gums, resins, acids, and beauty products (Coudert, 2008). All of these elements of alchemy were similar in their effort to turn physical materials into something better than they were originally.

During the 12th century, Christians spent a lot of time and effort attempting to figure out which practices were appropriate in the eyes of the faith and what the best way to

do so was. During this time, alchemy was rarely considered as a potentially dubious art that required the practitioner to make contact with demons in order to achieve its intended effects. As a result, it was never a point of contention with the Church authorities, although Christians were slightly worried about alchemy's practical consequences. In 1123, the Fathers of the First Lateran Council passed a canon that stated, "Whoever knowingly makes or intentionally spends false money is to be separated from the community of the faithful, as the cursed oppressor of poor men, and also as a disturber of the civitas" (Tarrant, 2018, p. 213). Despite the fact that the canon made no mention of alchemy or transmutation, it authorized the use of church sanctions to penalize individuals who made or used counterfeit coins, and that made alchemists nervous as they dealt with metal. As early as 1376, Nicholas Eymerich created the Directorium Inquisitorum, an alternate view of alchemy. The notion that an alchemist was seeking to achieve naturally impossible goals prompted Eymerich to conduct a more thorough inquiry into their operations. Eymerich compared alchemy to astrology, which many Christian leaders condemned, claiming it "required the invocation of demons in order to achieve its practitioner's desired outcome" (Campbell, 2018, p. 206). The Directorium Inquisitorum led to a turning point in the Church's stance on alchemy during the late 16th century.

Religion heavily influenced scientific theories in the medieval

and early modern periods. Moreover, alchemists and theologians were studying various parallels between alchemy and Christianity when alchemical writings and concepts began to spread in European intellectual circles during the Renaissance. Some found parallels between Biblical texts and the development and functioning of alchemical substances. They also compared the effects of alchemical remedies on regular bodies to the effects on the bodies of divine individuals such as Adam, Mary, and the saints. Many devoted church-goers were offended by alchemy's presentation as a spiritual practice, seeing the union of alchemical principles and Christian faith in the works of spiritual alchemists as harmful, or even sacrilegious. Scandalous parallels were made between the two, but the comparison of Christ to the process of the philosopher's stone was one of the most shocking examples. This comparison said that "Christ had to be crucified in order to redeem humanity" (Nummedal, 2013, p. 314). The alchemist's substances had to go through similar sufferings, including death and revival, before the substances could "'redeem' base metals as the philosopher's stone" (p. 314). This type of analogy was unheard of. Spiritual alchemists associated Christ with the philosopher's stone and implicated themselves with both! Assuming that the philosopher's stone can be compared to Christ (and vice versa), then other aspects of alchemy must be regarded as potentially able to provide salvation in some way. Other allegorical alchemical interpretations are frequently problematic in matters of

religion. Symbolism's language allows for a lot of creative license while also creating a lot of danger in terms of religion's credibility, thus endangering the power of the Church. Another point of tension between the Church and alchemists was that the entire purpose of alchemy was to improve elements of nature, which, in the eyes of the Church, was an attempt to improve God's creation. This notion of 'improving upon nature' was considered a threat to the Church and God, so it was seen as an attack. Spiritual alchemists' outright political dissent and critique had the greatest impact on the decline of alchemy.

In the 17th century, alchemy was considered a subset of chemistry. This changed in the 18th century, when, in an effort to disassociate from alchemy and make chemistry more respectable, scientific communities cast alchemy out as an "intellectual taboo" (Principe, 2011, p. 306), its followers as uneducated and troublesome, and its materials as foolishness. Writers commonly selected nonsignificant individuals or ideas, using them as a reflection of the entire or mixed fragments of work that was separated from its context. Doing so made alchemical works seem like jumbled pieces of nonsense (Principe, 2011). This demonstrates the logical fallacies of cherry-picking information and hasty generalizations that were used to dismantle alchemy in order to make room for chemistry. According to Vacura (2019), if scientific publishing practices do not match rigorous analytical quality standards,

they spread lies and misinformation. He goes on to explain that people become "overwhelmed by scientific facts that may sometimes seem contradictory or may have a commentary or context that creates a completely misleading image" (Vacura, 2019, p. 5). To put it in context, if the public is repeatedly told by a reliable source that alchemists are unstable introverts who hide in their dingy basements mixing nefarious ingredients by candlelight in the pursuit of communicating with demons, then obviously it will provide a false and damaging image. Vacura further explains that the "facts" presented will have been "replaced by [social] media 'fictionalization'" (Vacura, 2019, p. 12). In other words, through logical fallacies such as cherry-picking and hasty generalizations, an image is created that helps only the people who made it.

Despite not having advanced technology, the spread of misinformation through word of mouth during the 17th and 18th centuries managed to connect alchemy with outdated conceptions of the occult and pseudoscience to this day and still hinders people from accepting alchemy as creditable. The slander of alchemy during the late 16th century onward was very effective because the public accepted the warnings from both the Church and the scientific community. As a result of society's rejection and the Church's fury, both the study of alchemy or claiming to be an alchemist became increasingly dangerous. Scared of anti-counterfeiting regulations, excommunication, imprisonment, ridicule, or kidnapping by

powerful individuals wanting to learn transmutation, alchemists kept their heads low in order to keep existing. In turn, this made alchemists extremely secretive and paranoid of other alchemists trying to steal their work.

Alchemy, like modern science, had its own signs, symbols, and technical phrases that seemed incoherent to the untrained mind. Alchemists were concerned with secrecy, so they wrote their experiments and writings in code that included allusions to astrology and nature. Alchemy used symbols in literal and allegorical ways to expand a thought and explain its history. There was no universal vocabulary of alchemical symbolism. Sometimes alchemists used the same symbol in a variety of ways, and a symbol could have multiple meanings within the same work. While certain symbols had core 'meanings,' their importance has to be determined from the symbolic context in which they occur. This has made translating and comprehending alchemical texts difficult, but translation efforts have proven that alchemists made significant contributions to the body of knowledge in the field of chemistry.

Around 1416 to 1425, Franciscan friars compiled the Tabula Medicine, an "encyclopedic handbook of medicine" (Jones, 2018, p. 234), as a source for a variety of treatments to sickness, many of which are alchemical. The creators of these remedies assumed that Tabula Medicine readers were willing to make their own alchemical medicines rather than buying them.

Furthermore, Tabula Medicine demonstrates practical alchemy in treating illness with techniques accessible in the medical capacity, ignoring the themes of spiritual alchemy and putting practicality first (Jones, 2018). This development was the beginning of publications produced by alchemists providing readers with technical details about mining, metalworking, and a variety of methods for making steel and glass, distilling mercury, and crystallizing saltpeter, salt, and vitriol. While there were many manuals mainly for the male audience, there were also some specifically for women. The Books of Secrets was a type of genre that gave instructions on how to remove stains, fuse and color metals, fashion imitation gems, manufacture new colors, make shoe polish, and even lotion to lighten the skin and eliminate wrinkles (Coudert, 2008). This ushered in the era of scientific and technical reference books, which are still widely available in the DIY sections of bookstores today.

In the history of alchemy, there have been numerous individuals from different religious branches of alchemy who have changed our understanding of alchemy and modern chemistry. One of the most well-known and respected Islamic alchemists (or alchemists in general; the word 'alchemy' is derived from the Arabic, al-kimiya) is Abu Bakr Muhammad ibn Zakariyya, also known as Al-Razi (825–925), who became a physician at the age of 30 and helped contribute to chemistry and other sciences today. Al-Razi took an interest in practical

alchemy and transformed alchemy by flipping the significance of experiments and speculation. His writing, "The Book of the Secret of Secrets," was suggested for use as a laboratory manual. Moreover, Al-Razi was the first to encounter substance division when he devised a framework for the categorization of alchemical substances. Al-Razi's concentration on practical alchemy undoubtedly contributed to developments in medicine. The thoroughly observed work of Al-Razi helped to demonstrate that alchemy resulted in an ever-increasing amount of reliable chemical knowledge (Holmyard, 1968). Alchemy is no longer hiding in the dark, but rather it is being re-evaluated as an important and relevant part of the history of science.

Influences on Modern Chemistry

Looking into specific examples of alchemy's influence on the modern world, an alchemical experiment conducted by Hennig Brandt is crucial. Hennig Brandt was a German physician working to create the philosopher's stone. His experiment consisted of "heating a mixture of sand and charcoal with a tar-like substance produced by boiling down about 1,200 gallons of urine over two weeks" (Hansen, 2019). He maintained the mixture at a constant temperature at the maximum his furnace could go. After hours of boiling the mixture, white vapor began to form. This white vapor condensed into thick drops. These thick drops sparkled for hours. Because of this, Brandt named his creation phosphorus

which means “things that give off light” in Latin (Hansen, 2019). This alchemy experiment led to the development of a new chemical element that is still on the modern Periodic Table of Evidence. Brandt’s experiment led to the discovery of an element that is now used in essential items in modern-day society such as matches, fertilizer, and bombs. Now, though, mineral phosphates have replaced urine as the best source material for phosphorus. (Hansen, 2019).

Alchemists’ experiments were also very beneficial for the development of early forms of modern chemistry equipment. During the time period when alchemy was extremely popular, alchemists had to be creative and come up with their own processes and resources for their experiments. Examples of equipment that have been a result of alchemy experiments are flasks, funnels, beakers (Holmyard, 1968), and Bunsen burners. All of these have origins in alchemy and early forms were created by alchemists. A female alchemist, Mary the Jewess, was given the credit for the invention of the tribikos, which is a piece of equipment used for the early process of distillation. The tribikos and other forms of it consists of a bottle where the liquid is held during the distillation. This “bottle” later evolved into the flask which is now seen in modern chemistry labs. Flasks are common for holding solutions and are extremely important in the modern chemistry world (Holmyard, 1968). The experiment that led to the founding of phosphorus, as mentioned before, also used

early stages of a very common piece of chemistry equipment, specifically the Bunsen burner. In order to create the white vapor that would condense into the phosphorus, Brandt boiled his solution on top of his furnace for an extended period of time. In modern chemistry, Bunsen burners are used to heat up solutions through the use of a flame (Hansen, 2019).

Evidence of alchemical practice and its influence on science and chemistry can be found even earlier than Hennig Brandt or Mary the Jewess. In the third or fourth century C.E., a group of Graeco-Egyptian papyri known as "The Leyden and Stockholm papyri," was written (Caley, 2008). The documents thoroughly describe the practices of alchemy that were used in chemical experiments during the Graeco-Roman period of Egypt. The papyri document 75 methods of purifying metals, including experiments with gold, silver, tin, copper, lead, mercury, arsenic, antimony, and zinc. The "recipes" recorded in the papyri were originally for making alloys and various new metals. It wasn't until later in the Middle Ages that alchemy became distorted and associated with magical and religious practices, and because of this, the Leyden and Stockholm papyri have the highest historical importance as a record of ancient chemical practices using alchemy.

Some notable experiments in this document include the purification/hardening of lead, manufacture of asem, and more. In the purification/hardening of lead the experiment was as follows: "melt it, spread on the surface lamellose alum

and copperas reduced to a fine powder and mixed, and it will be hardened" (Caley, 2008, p. 18). To produce asem they would "take soft tin in small pieces, purified four times; take 4 parts of it and 3 parts of pure white copper and 1 part of asem. Melt, and after the casting, clean several times and make with it whatever you wish to. It will be asem of the first quality, which will deceive even the artisans" (Caley, 2008, p. 20). Both experiments show an understanding of the scientific process as well as chemical processes. In the first experiment, the alchemists are said to "melt" and "mix" reactants to form a solid product (Caley, 2008); this is an example of the physical properties of elements. In the next experiment, they are shown to use measurements, four and three parts, an important part of any experiment so that results can be replicated accurately.

To further clarify that alchemy wasn't just an art practiced by uneducated fools, it's important to mention that there are several famous scientists who participated in alchemy. Francis Bacon was one of these scientists. Bacon was an English philosopher and a well-known political figure in England. Aside from his political work, Bacon was a natural philosopher. Natural philosophers were people concerned with the natural world and physical science. Bacon was often critical of earlier philosophers and found problems with people such as Plato and Aristotle (Klein & Giglioni, 2012). For instance, he believed that Aristotle's work lacked a general theory of science, a theory that could be applied to all branches

of science. With this thought, Bacon strived to find a way to standardize science and how truth was found. To do this he began with what he called "Idols", or fallacies in which humans wrongly accepted information. Some of examples of these "Idols" included Idols of the Tribe, Idols of the Cave, and Idols of the Market Place. After Bacon had defined why humans had wrongful thoughts, he then proceeded to create his scientific method. His method became known as induction. This method was focused on gathering information from multiple instances and then bringing that information to a consensus. Because of this method, Bacon has been credited as the father of the scientific method we use today.

Even though Francis Bacon was a man of science and law, he dabbled in alchemy. Bacon held stock in the achievements of alchemists but shunned them for their belief in the spiritual or their traditional nature (Cintas, 2003). Nevertheless, he believed that their process produced chemical results. For example, Bacon agreed that it was well observed by the Arabic alchemists that sulfur and mercury were large components of matter. Bacon would also take an interest in the substances that the alchemists of his time were using and conduct his own experiments with them. In one of his books, Bacon even states that if a person wanted to turn silver to gold, they would only need the knowledge of guidance. This supports the alchemist idea of transmutation. However, Bacon rarely focused on

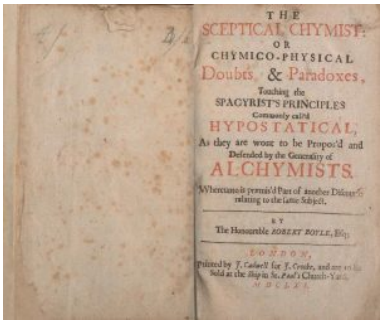
transmutation as he was more concerned with what the world did naturally.

Robert Boyle is another reputable scientist, known as one of the first modern chemists. Boyle was a very religious man and carried that thought throughout his work (MacIntosh & Anstey, 2018). In the year 1649, Boyle began taking an interest in experiments and purchased his own furnace. He is most famous for his law on ideal gases. The law states that pressure times volume will equal a constant. This means that the pressure and volume of a gas are inversely proportional. While Boyle's results are used today to express a law, Boyle at the time did not generalize this idea to all ideal gases. By not generalizing his one experiment for all gases, Boyle took inspiration from Francis Bacon's scientific process of induction. Boyle added to Bacon's ideas principles are still used by scientists today and will continue to be used in the future.

Figure 2.1

The Sceptical Chymist

Many believe that Boyle rejected alchemy due to a piece he wrote called *The Sceptical Chymist*. However, L. M. Principe et al. (2000) argue that Boyle did not reject alchemy. He says that Boyle believed in transmutation and conducted experiments while studying other alchemists' work. It is also said that Robert Boyle borrowed work from a famous alchemist, Daniel


THE
SCEPTICAL CHYMIST:
OR
CHYMICO-PHYSICAL
Doubts & Paradoxes,
Touching the
SPAGYRIST'S PRINCIPLES
Commonly called
HYPOSTATICAL,
As they are wont to be Propos'd and
Defended by the Generality of
ALCHYMISTS.
Wherunto is permis'd Part of another Discourse
relating to the latter Subject.
BY
The Honourable ROBERT BOYLE, Esq;
LONDON,
Printed by J. Cadwell for J. Crooke, and are to be
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Note. Boyle, Robert. (1661). The sceptical chymist or, Chymico-physical doubts & paradoxes. Printed by J. Cadwell for J. Crooke. Retrieved from https://library.si.edu/digital-library/book/scepticalchymis00boyla

Sennett, in order to carry out certain chemistry-based experiments (Coyne, 2012).

Isaac Newton is also an incredibly famous scientist who studied alchemy (Smith, 2007). Newton was an English scientist most known for his theory of gravity which he described in his book called *Philosophiæ Naturalis Principia Mathematica*. In this work, he also describes his three laws of motion. Along with physics, Newton was a pioneer in mathematics and greatly contributed to calculus. Newton also followed in the footsteps of the previously mentioned scientists by being committed to creating hypotheses and only accepting them when there was enough information to back it up. This line of thinking allows most of his work to stand the test of time.

Alchemy can be found within the many disciplines in which Newton worked (Gregory, 1989). While attending Cambridge, Newton had his own alchemy lab where he conducted many experiments, had a private collection of books, and where he wrote his own findings. Antimony, also

known as regulus or "little king," an element discovered by alchemists, particularly intrigued Newton. Newton connected this metal to the star in the Leo constellation. In doing so he then thought that antimony and celestial gravity could remove mercury from other metals. Despite all the time he spent on alchemy, Newton never published any works relating to it. This could partly be due to his fear of what alchemy could do. In 1675, Isaac Newton met Robert Boyle, and during that time, Boyle claimed that sulfur could heat gold to a dangerously high degree, a degree that Newton thought could harm the world.

Conclusion

In conclusion, these scientists are respected among their fields and their contributions to the scientific world are still used today. If men of such high regard in the history of science could participate in alchemy, it must not be as foolish as people may believe. Additionally, when it comes to chemistry, it is important to think of alchemy as a seed to a tree. This metaphor demonstrates that alchemy is the starting point of chemistry, or in other words, the seed. Over time, this seed grows into the tree, the practice of chemistry. The tree becomes strong and stable, much like how chemistry is reliable and factual because it is based on the scientific method and a lot of experimentation. This is due to the foundation that the seed of alchemy set with its trial-and-error-type

experimentation, and the alchemist's basic ideas surrounding isolation of elements, techniques, and tools.

As a counterargument, one might say that alchemy's relationship to chemistry should be considered analogous to astrology's relationship to astronomy: that is, that astrology and astronomy were initially the same practice, but they diverged over time, leaving astrology as a pseudoscience and astronomy as a science. However, this analogy ignores the nuanced development of alchemical practice and how, unlike astrology, alchemy did change over time and lead directly into the science of chemistry before being abandoned altogether. So a more complete understanding, according to Coudert (2008), is that "alchemists were like bakers who transformed flour into bread or vintners who turned grapes into wine; they improved on nature" (p. 233). This analogy demonstrates that alchemy is chemistry because its goals were similar to those of the two other disciplines. The disciplines of baking and wine production are only possible through chemistry, much like the works of alchemy were.

Despite the stereotype of alchemists who were narrowly seeking the philosopher's stone, many alchemists gathered, shared, and experimented with a range of methods, and most practitioners diversified their actions to include pharmaceutical and commercial growth. This diversity makes it hard to formulate an exact claim about the significance of alchemy's findings, and it ensures that new information will

continue to be learned about the topic in years to come (Principe et al., 2000). Alchemists did not just talk about ideas; they put their theories to the test with a specific aim in mind, whether it was transmutation, or the production of the philosopher's stone, or another experiment. Alchemical methods involved cultivating results that led to the investigation of various aspects of the natural world (Coudert, 2008). This is similar to the objective of current scientific inquiries. Not only have alchemists conducted experiments with similar scientific processes to modern scientific experiments, but alchemy has also influenced what we consider modern medicine, chemistry, and other aspects of everyday life.

References

Caley, E. R. (2008). *The Leyden and Stockholm papyri: Greco-Egyptian chemical documents from the early 4th century AD* , (W. B. Jensen, ed.). University of Cincinnati. https://homepages.uc.edu/~jensenwb/books/Leyden%20&%20Stockholm%20Papyri.pdf

Campbell, A., Gianfrancesco, L., & Tarrant, N. (2018). Alchemy and the mendicant orders of late medieval and Early Modern Europe. *Ambix*, *65*(3), 201–209. https://doi.org/10.1080/00026980.2018.1512778

Cintas, P. (2003). Francis Bacon: An alchemical odyssey through the novum organum. *Bulletin for the History of Chemistry, 28*(2), 65–75. https://acshist.scs.illinois.edu/bulletin_open_access/v28-2/v28-2%20p65-75.pdf

Coudert, A. (2008). Moran, distilling knowledge [Review of the book *Distilling Knowledge: Alchemy, chemistry, and the scientific revolution*, by B. T. Moran]. *Aries, 8*(2), 232–235. https://doi.org/10.1163/156798908X327357

Coyne, G. L. (2012). Lead to gold, sorcery to science: Alchemy and the foundations of modern chemistry. *The People, Ideas, and Things Journal, 3*(2012). https://pitjournal.unc.edu/2023/01/15/lead-to-

gold-sorcery-to-science-alchemy-and-the-foundations-of-modern-chemistry/

Gregory, R. L. (1989). Good as gold: Sir Isaac Newton's alchemy. *Perception, 18*(6), 697–702. https://doi.org/10.1068/p180697

Hansen, B. (2019, August 6). *Hennig Brandt and the discovery of phosphorus.* Science History Institute. Retrieved December 5, 2021, from https://www.sciencehistory.org/distillations/hennig-brandt-and-the-discovery-of-phosphorus

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science, 63*(June 2017), 39–47. http://dx.doi.org/10.1016/j.shpsa.2017.05.002

Holmyard, E. J. (1968). *Alchemy*. Dover Publications

Jones, P. M. (2018). The survival of the *Frater Medicus*? English friars and alchemy, ca. 1370–ca. 1425. *Ambix*, *65*(3), 232–249.

https://doi.org/10.1080/00026980.2018.1512780

Klein, J., & Giglioni, G. (2012, December 7). Francis Bacon. In *Stanford Encyclopedia of Philosophy*. Retrieved December 5, 2021, from https://plato.stanford.edu/entries/francis-bacon/#Bio

MacIntosh, J. J., & Anstey, P. (2018, November 4). Robert Boyle. In *Stanford Encyclopedia of Philosophy*. Retrieved December 5, 2021, from https://plato.stanford.edu/entries/boyle/

Maxwell-Stuart, P. G. (2012). *The chemical choir: A history of alchemy*. Continuum.

Matus, Z. A. (2017) *Franciscans and the elixir of life*. University of Pennsylvania Press. http://www.jstor.org/stable/j.ctv2t4c6h

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Nummedal, T. (2013). Alchemy and religion in

christian europe. *Ambix, 60*(4), 311–322. https://doi.org/10.1179/0002698013Z.00000000036

Principe, L. M. (1998). *The aspiring adept: Robert Boyle and his alchemical quest.* Princeton University Press. http://www.jstor.org/stable/j.ctv36zpwn.10

Principe, L. M. (2011). Alchemy restored. *Isis, 102*(2), 305–312. https://doi.org/10.1086/660139

Smith, G. (2007, December 19). Isaac Newton. In *Stanford Encyclopedia of Philosophy*. Retrieved December 5, 2021, from https://plato.stanford.edu/entries/newton/#NewWorInf

Tarrant, N. (2018). Between Aquinas and Eymerich: The Roman inquisition's use of Dominican thought in the censorship of alchemy. *AMBIX, 65*(3), 210–231. https://doi.org/10.1080/00026980.2018.1512779

The Art Students League. (2022, December 5). *The Alchemy of Oil Painting.*

https://www.artstudentsleague.org/exhibitions/the-alchemy-of-oil-painting

Vacura, M. (2019). Emergence of the post-truth situation: Its sources and contexts. *Disputatio. Philosophical Research Bulletin 9*(13), 1–17.

UNIT 2 CRITICAL THINKING EXERCISES

1. If alchemists had truly just stumbled upon their findings without using a scientific method, how would this change the contribution alchemy has made to the world of science? Would their findings be less valuable? Why?

2. In your own words, explain how the analogy between astrology and astronomy versus alchemy and chemistry differ.

3. Consider how alchemy's initial relation to religion and the occult may have tainted its reputation and its perceived potential to be a scientific practice. Why might this be the case? Should religion and science be kept separate? Why?

PART III
UNIT 3: CRYPTOZOOLOGY

CHAPTER 3.1: HOW MUCH EVIDENCE IS THERE FOR BIGFOOT, EL CHUPACABRA, OR THE LOCH NESS MONSTER?

Written by Bailey Sweitzer, Ayden McCarter, Charlotte Sadler, Alexandra Greco, Aja Shriver, Caitlyn Flemmer, and Gray Serviss

With Additional Works and Edits by Isabella Wilson and Aysia Walton

3.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

How much evidence is there to support cryptozoological claims of the existence of Bigfoot, El Chupacabra, or the Loch Ness Monster?

Evidence and Information:

- Eye-witness accounts
- Testimonials
- YouTube videos
- Folklore/legends/myths

Assumptions:

- Bigfoot is real.
- The Loch Ness monster (aka the "brain-sucking river monster" or "Nessie") is real.
- El Chupacabra is real.
- There are people who don't believe in cryptozoology.
- The unexplained can be chalked up to cryptozoology in one way or another.
- Cryptids should be considered animals.
- If the cryptid creatures exist, there would be DNA evidence supporting their existence.

Concepts:

- Accuracy of evidence
- Bigfoot
- El Chupacabra
- Loch Ness monster
- Myths/legends
- Mystical Creatures
- The timeline of sightings

Context:

- Historical
- Legends/myths
- Research papers
- False information
- The beginning of cryptozoology
- Cultural differentiation
- Underlying beliefs behind cryptozoology

Point of View:

- Scientists
- Anthropologists
- Cryptozoologists
- The average person
- Historian

Purpose:

- To prove that there is an adequate amount of evidence supporting the fact that cryptozoology is indeed a pseudoscience

Implications and Consequences:

- Often, people blindly believe in what they

think to be true, such as cryptozoology, because of the misleading information that is available.

- The fantastical ideas of cryptozoology could possibly cause issues and problems between groups of people and/or cultures.
- If cryptids were to exist, then they would not be considered mythical; rather, the legends surrounding them would be seen as historical. Many legends could potentially be reevaluated for their factuality.
- Zoology would be transformed by the discovery of the existence of one or more cryptids.

Conclusions and interpretations:

- There are more logical explanations for the existence of "evidence" that some claim to support the existence of cryptids.
- There is no definitive evidence that proves the existence of cryptids such as Bigfoot, El Chupacabra, and the Loch Ness monster.

Disciplinary Lenses

Genetics

Question at Issue:

Does genetics support Cryptozoology?

Evidence and Information:

- Osteology
- Skeletal remains
- DNA evidence
- Fur
- Scales
- Skin
- Saliva
- Blood

Assumptions:

- Mutations in genetics and DNA can result in cryptid creatures.

Concepts:

- Chromosomes
- Mutations
- Cells
- Genes

Context:

- Genetic context
- Biological context

Point of View:

- Osteologists
- Geneticists

Purpose:

- To discover the influence that genetics, specifically DNA, has on cryptozoology

Implications and Consequences:

- Interpretations of DNA and genetics can be manipulated in favor of the

belief of cryptozoology.

Conclusions and Interpretations:

- DNA and genetics can be analyzed and studied to determine if there is evidence to support the cryptozoological perspective maintaing that cryptids are the result of a human mutation.

Anthropology

Question at issue:

What role does Anthropology play in Cryptozoology?

Evidence and Information:

- Human biology
- Bones
- Fossils
- Diets and environment of preexisting humans

Assumptions:

- There is little to no anthropological evidence to be found in cryptozoology.
- From an anthropological perspective, cryptozoology's argument has no factual backing to support its assertions about humanoid creatures.
- Cryptids are manmade.

Concepts:

- Imagination
- Culture
- Evolution
- Humanity

Context:

- History of humans
- History of evolution
- Cultural histories

Point of View:

- Anthropologist
- Evolutionary
- Biologists
- Geneticists
- Ethnography

Purpose:

- To understand if there is any indication from the research in anthropology that humans have the potential to evolve into a cryptid
- To assert the origin of cryptozoology

Implications and Consequences:

- Anthropology can either help support or deny the existence of cryptozoology.
- Studying human behavior and cultures can help explain the origin of cryptozoology.

Conclusions and Interpretations:

- Anthropology can help us understand why cryptozoology might have first begun.
- Anthropological evidence disproves the idea that cryptids could be human-born in any way other than from the imaginations of humans.

Folklore

Question at Issue:

Do folklore and Cryptozoology go hand-in-hand?

Evidence and Information:

- Ancient tales/myths/legends
- Word of mouth
- Cultural beliefs/traditions

Assumptions:

- The myths and legends that stem from folklore often have a metaphorical meaning rather than a literal one.
- Fiction is understood in the context of cultures.
- Eyewitnesses cannot always be a trusted source.
- Stories passed down through generations can slowly become

exaggerated and overall divert from the original story.

Concepts:

- Stories
- Oral history
- Traditions
- Legends
- Myths
- Lessons through storytelling
- Deceivability
- Misconception

Context:

- Traditional aspects of different cultures
- History
- Psychology
- Witness statements

Point of View:

- Cultural beliefs

- Oral stories
- History
- Folklore/legends/myths

Purpose:

- To understand how folklore has influenced the beliefs behind Cryptozoology
- To establish how folklore is often interpreted as fiction

Implications and Consequences:

- Beliefs in legends and myths that stem from folklore can lead to people believing in cryptozoology.

Conclusions and Interpretations:

- Folklore, as it is nearly entirely based on fiction, should not be taken literally to be used as evidence.

Zoology

Question at Issue:

How can zoology shed light on the divergences of cryptids from the current observations about known animals, their evolution, and their patterns?

Evidence and Information:

- Research/studies
- Animal DNA
- Bones/fossils

Assumptions:

- Cryptids are often described as being “one-of-a-kind” creatures, rather than a part of a species.

- There are still many undiscovered species.
- A species requires other of its kind in order to reproduce and exist.
- Certain species have a particular habitat in which they reside and thrive.
- Every species has a predator of some sort, and physical evidence of dead individuals of a species is likely to show up in a search for a species in their habitat.

Concepts:

- Reproduction with animals
- Similar features of animals
- Evolution of species
- Habitat
- Circle of life
- Predators

Context:

- Geographical
- Zoology
- Cryptology

Point of View:

- Zoologists
- Cryptozoologist
- Environmentalist

Purpose:

- To show how current knowledge of animal patterns and evolution may indicate whether or not cryptids such as Bigfoot, the Loch Ness Monster, or Chupacabra have any features that are realistically possible
- To understand what real animals might get confused for a cryptid

Implications and Consequences:

- If it were to be discovered that

some kind of cryptid did truly exist, it may indicate that there are species with undiscovered abilities, such as reproduction with small numbers.

Conclusions and Interpretations:

- If a cryptid such as Bigfoot, which has been sought after for so many years, has not been discovered dead or alive then it does seem likely that this cryptid is still alive if it were to ever exist.
- There are identified species that could be mistaken for a cryptid, such as a bear for Bigfoot or a hyena for el Chupacabra.

Empirical Claims

Inductive Reasoning

True Premise 1: Bigfoot is similar to other folklore creatures such as the Sasquatch in Native American folklore, the Yeti in Himalayan folklore, and the Yowie in Aboriginal Australian folklore.

True Premise 2: There have been numerous claims of Bigfoot sightings across America.

Weak Inductive Reasoning: These sightings and folkloric references prove the existence of Bigfoot, as multiple accounts have been made. (This ignores the anthropological and social purposes of folklore and ignores counter-evidence.)

Logical Conclusion: Widespread folkloric references and evidence of sightings can be accounted for by cultural taboos and general wariness and suspicion surrounding heavily forested, dark, or dangerous areas.

Deductive Reasoning

True Premise 1: All animal species have specific genetic sequences.

True Premise 2: The Loch Ness monster is classified as an animal, so it should have a genetic sequence.

True Premise 3: DNA analyses of Loch Ness (the lake where the Loch Ness monster reportedly lives) turned up no mysterious or unknown sequences; only the DNA sequences of giant eels.

Weak Deductive Reasoning: Therefore, the search for evidence of the Loch Ness Monster should continue through other means since this is just one failure. (This ignores conclusive evidence.)

Logical Conclusion (with resulting inference): Therefore, there is no DNA evidence for the Loch Ness monster, and alleged sightings

of Nessie are best explained as the momentary presence of giant eels at the surface of the lake.

Abductive Reasoning

Observation: The first Chupacabra sighting was in Puerto Rico in 1995. The witness claimed to have seen a "beast which had two legs and a spiky back" (Seigel, 2020). In the same year, a movie called *Species* came out, and the Chupacabra descriptions had a "strong resemblance to the alien-human hybrid creature" in *Species* (Seigel, 2020). The witness confessed to watching the movie prior to the claimed sighting.

Weak Explanation: The eyewitness testimony confirms the existence of the cryptid El Chupacabra.

Logical Explanation: While the witness may have indeed believed he saw a Chupacabra, it is much more likely that his judgment was influenced by the movie *Species* and he imagined

he saw a creature resembling the monster from *Species*.

Logical Fallacies

The Bandwagon Appeal

In recent years, social media has further influenced the appeal of cryptids as "evidence" is more readily shared and displayed, such as first-hand accounts of "sightings" or blurry pictures taken. Often, the sensationalization of cryptozoology on social media leads to the bandwagon appeal.

Cherry-picking

Supporters of cryptozoology tend to focus on

evidence and information that supposedly supports their theories, and they often ignore the opposing evidence and information (even though it carries much more weight).

Appeal to Authority

The cryptozoologist community has many self-proclaimed "experts" who are often people of a non-scientific background or who have a background in a science that is irrelevant to cryptozoology.

Anecdotal Fallacy

The anecdotal fallacy, or, in other words, testimony over statistics and logic, is maybe the most used fallacy in cryptozoology because of the "sightings" listed as evidence.

Burden of Proof

Rather than providing substantial evidence that can stand alone, cryptozoologists argue their theories are true until proven to be false.

3.1.2 SEE-I MODEL

State

There is no documented authentic evidence supporting the existence of cryptids; therefore, cryptozoology is a form of pseudoscience that best fits Hansson's (2017) criteria for pseudo-theory promotion.

Elaborate

There are two strong indicators to consider when determining whether cryptozoology might be a pseudoscience: it is not considered a branch of zoology, and it does not follow the scientific method. Most zoologists consider cryptozoology to be the fabricated study of unknown, legendary, or extinct animals whose existence is not supported by empirical evidence. The only documented evidence has either been identified as a hoax or is anecdotal: proclaimed sightings by unreliable sources and cases of mistaken identities. Cryptids are not real animals, but rather made-up creatures whose stories have been passed through the generations. Real animals leave behind physical evidence, as there are specific DNA

sequences associated with each species. Other physical evidence—such as hides or kills, fecal matter (scats), and clear photographic evidence—is key to the classification of real animals. Cryptids, on the other hand, do not provide any of this substantial physical evidence to any degree.

Exemplify

- **Loch Ness Monster:** The Loch Ness Monster is one example of a cryptid whose existence lacks reliable evidence. This creature is described as a sea animal that originally was said to have lived in Loch Ness, Scotland. There have been several incidents where evidence has been brought up that supposedly proved the existence of this creature but was eventually determined to have been falsified after further examination. A DNA analysis was done on Loch Ness Lake, where this monster was proclaimed to be located. The DNA was found to be that of giant eels: "juvenile eels, known as elvers, arrive in Scottish rivers and lochs after migrating more than 3,100 miles (5,000 km) from the Sargasso Sea near the Bahamas, where the animals spawn and lay eggs" (BBC News, 2019). This DNA analysis proves these giant eels are what actually reside in this lake, not the Loch Ness Monster. Eye witness accounts of this cryptid could possibly be the mistake of confusing an eel for the Loch

Ness Monster. In addition to this, an easy way to be deceived by the supposed "evidence" for the Loch Ness Monster is through manipulated photographs, videos, or other media. The most famous picture of this cryptid, known as the "surgeon's photo," was later shown to be a hoax, which is all too easy to pull off in the age of Photoshop and other photo-editing software (Tikkanen, 2020). The Loch Ness Monster, inside the umbrella of cryptozoology, fits the criteria of pseudoscience as defined by Hansson (2017) for the following reasons:

  - 1) it involves the broad spectrum of science and scientific research,
  - 2) it offers no reliable evidence or trusted sources, and
  - 3) multiple sources and crytpozoology "researchers" try to persuade the public that the Loch Ness Monster is indeed real and that there is reliable evidence supporting its existence despite there not actually being any supporting evidence.

- **El Chupacabra:** The cryptid El Chupacabra originated in Puerto Rico after its first fight with a farmer who claimed the beast had sucked the blood from his goats, leaving uneaten carcasses. The farmer's description of the cryptid after he saw it in 1995 had some remarkable similarities to the alien featured in the movie *Species*, which was released the same year (Seigel, 2020). The cryptid El Chupacabra's description can also be

explained by a disease present in coyotes and raccoons (Tomecek et al., n.d.). This disease is caused by mites and is called mange, also known as scabies. Its effects include hair loss and rashes that cause disfiguring. There is also a loss of appetite which further disfigures the features, as the bones are more defined. The only remaining hair is on the back by the neck, and this accounts for the trademark look of El Chupacabra, which has little to no hair, disfigured bones, and a mane-type look on the back of their body. As this is a debilitating disease, the animal is forced to look for easier prey, which is often livestock. The infection also causes them to be less mentally stable, which can account for the irregular movements and some attacks on humans. El Chupacabra, also included in cryptozoology, fits the criteria of pseudoscience as defined by Hansson (2017) for the following reasons:

  - 1) it involves the broad spectrum of science and scientific research,
  - 2) it offers no reliable evidence or trusted sources, and
  - 3) multiple sources and crytpozoology "researchers" try to persuade the public that El Chupacabra is indeed real and that there is reliable evidence supporting its existence despite there not actually being any supporting evidence.

- **Bigfoot:** Bigfoot is a trademark cryptid in the Americas that is described as a cross between an ape and a human

with immense fur. It is said to inhabit the woods of North America. This cryptid is also known as Sasquatch. The biggest piece of proclaimed evidence many Bigfoot supporters cite is the discovery of unusually big footprints by a mysterious creature. They claim that these supposed footprints can only be explained by the existence of Bigfoot. A popular article in Newsweek in the 1980s covered this story as "four sets of footprints" that were found that showed "dermal ridges, the foot's equivalent of fingerprints" (Dennett, 1989, p. 264). It was agreed that these footprints were only caused by Bigfoot, as the "experts" proclaimed "it would be impossible to fake prints with dermal ridges," and the footprints were over 15 inches and showed "detailed microscopic anatomy that was absolutely perfect" (p. 264). This evidence was later highly discredited as the "experts" were proven to have no degree or reliable credibility to discuss or comment on these discoveries, and the footprints were, in fact, likely made by an impression cast. Bigfoot, a cryptid, fits the criteria of pseudoscience as defined by Hansson (2017) for the following reasons:

- 1) it involves the broad spectrum of science and scientific research,
- 2) it offers no reliable evidence or trusted sources, and
- 3) multiple sources and crytpozoology

> "researchers" try to persuade the public that Bigfoot is indeed real and that there is reliable evidence supporting its existence despite there not actually being any supporting evidence.

Illustrate

Almost every child has at least heard of Santa Claus, the mythical man who delivers gifts on Christmas Eve. Anyone who has heard of him knows at least a couple of basic facts: he brings toys to all the good children around the world, he wears a red coat and has a white beard, he loves cookies, and he is from the North Pole. Is it logical to think that one man travels the world and brings toys to all in one night? While the existence of Santa Claus is obviously irrational, family traditions keep the idea of Santa alive, causing people of all backgrounds to have the same or similar knowledge and beliefs about him, even though Santa Claus is not truly real. This similarly keeps the allure and beliefs of cryptozoology alive as the magic one feels when hearing these stories about mythical creatures is just like stories of Santa. These stories may feel real, but the feeling is not physical evidence. Furthermore, we may want them to be real, but that is just wishful thinking. This is why cryptozoology is a pseudoscience: because there is no physical evidence to support the claims, and theories

surrounding cryptids do not follow the scientific method, which makes them pseudo-theories (Hansson, 2017).

3.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: There is no absolute evidence that proves cryptids *don't* exist.

Rebuttal: This argument uses the "burden of proof" fallacy, where one side (in this case the cryptozoology side) says that it is the responsibility of their opposition to prove why cryptozoology is wrong. On the contrary, it is critical for any scientific argument to provide sufficient evidence that would strongly support its argument. There is more evidence that supports the claim that cryptozoology is a pseudoscience than there is to prove cryptozoology has any scientific sustenance to it

Argument: There are many eyewitness accounts from civilians who have seen a cryptid.

Rebuttal: People "see," describe, and report the creatures they do because they interpret their recollections, sightings, and encounters within the cultural framework in which they were raised. It is an inevitable consequence of being human that we imagine large, frightening creatures that lurk beneath the surface of the water or human-shaped beasts in forests and other wild places.

Rebuttal: Psychedelics/hallucinogens and other mind-altering substances have been around for millennia and may explain many sightings of cryptids. These substances cause the mind to shift and distort things, or even make up things that aren't there at all.

Rebuttal: Cryptozoology has a tendency to over-emphasize the value of eyewitness data, and this is one of its primary flaws; anecdotal evidence alone would not be effective in a court of law, and it is also ineffective in scientific inquiry.

3.1.4 RESEARCH PAPER

Introduction

Many people consider cryptozoology to be a pseudoscience, as it is neither considered a real branch of zoology nor does it follow the scientific method. It is a group of theories about unknown, legendary, or extinct animals whose existence is not supported by empirical evidence. Cryptozoology was originally founded in 1950 by zoologists Bernard Heuvelmans and Ivan T. Sanderson, who are now known as the "Fathers of Cryptozoology." In 1982, the International Society of Cryptozoology (ISC) was founded in Washington, DC. The first ISC meeting took place at the Smithsonian National Museum of Natural History with the Department of Vertebrate Zoology. It published a peer-reviewed journal called *Cryptozoology: The Interdisciplinary Journal of the International Society of Cryptozoology*. This journal presented the ideas of cryptozoology as a subunit of both zoology and biology. This yearly journal and the ISC as a whole were discontinued in 1998 as cryptids were seen more as a pseudoscience in the scientific community although they remained generally popular by public opinion (Rossi, 2016, pp. 573-575). Overall, cryptozoology is mainly supported by

firsthand accounts, but there is no physical evidence to support these accounts.

Cryptozoology heavily relies on testimonies as evidence, which in many professional, critical cases, is considered an unreliable source of information and evidence. Many of these supposed sightings are either disproven or later revealed as a hoax. Cryptids are not real animals, based on the standard of what makes a creature an animal, but rather, cryptids are fictional creatures whose stories have been passed through folklore and legends. Real animals leave behind physical evidence, as there is a specific DNA sequence associated with each species and usually a subsequent record of this unique DNA sequence. Additionally, evidence such as skins or pelts, fecal matter, and other physical evidence are key factors in the classification of real animals, but cryptids have none of these. Despite the cryptozoology community's attempts at creating a subbranch of zoology, there is no substantial physical evidence that it is necessary for cryptozoology to be considered a real branch of science. Therefore, cryptozoology is a pseudoscience. Three cryptids that exemplify the reasons cryptozoology is a pseudoscience are the Loch Ness Monster, El Chupacabra, and Bigfoot.

Loch Ness Monster

One of the more well-known examples of a cryptid is the Loch Ness Monster. Although there have been many accounts from

eyewitnesses claiming to have seen the Loch Ness Monster, there is not enough evidence to prove its existence. The first account of the Loch Ness Monster was on August 22, 564 CE by Saint Columba in Scotland (National Geographic Society, 2020). With that being said, there has been much debate among some historians on the accuracy of the date on which this eyewitness account took place. Furthermore, no other evidence has come up to prove anything from this encounter other than the testimony of Columba. If, theoretically, the Loch Ness Monster was real and Columba really did see it some thousands of years ago, then its body would have begun deteriorating slowly until it eventually would have died and left some sort of skeletal evidence to be found. Unfortunately, this was not the case, as no such skeletal remains were discovered that could explain the existence of such a creature.

While it is certainly possible that the skeletal remains are still out there somewhere, waiting to be found, other evidence indicates that no amount of searching could unearth the remains for Nessie (a common nickname for the Loch Ness Monster). For instance, an analysis of the DNA in Loch Ness Lake—Nessie's alleged residence—done a few years ago revealed no unknown DNA sequence. On the contrary, the DNA evidence that was found was actually the DNA from giant eels that reside within the lake. As explained by the researchers, "juvenile eels, known as elvers, arrive in Scottish rivers and lochs after migrating more than 3,100 miles (5,000

km) from the Sargasso Sea near the Bahamas, where the animals spawn and lay eggs" (BBC News, 2019). This DNA analysis proves these giant eels are what actually reside in this lake, not the Loch Ness Monster. This might explain why some eye-witness have claimed to see what they believe to be the Loch Ness Monster, when in fact, they saw a giant eel on the water's surface.

Likely the most famous "proof" of the Loch Ness Monster was a photo taken in 1934 by English physician Robert Kenneth Wilson called "the surgeon's photograph." In this photo, there appeared to be the sloping neck of a brachiosaurus-like creature swimming in the water. Later on, it was confirmed that the silhouette picture of Nessie was just a hoax (Tikkanen, 2020). While eyewitness accounts and photographs may seem real at first glance, under a critical thinking lens, most of the accounts are debunked. Simply put, the physical evidence needed to support this cryptid's existence has yet to be found. Without the necessary evidence, the Loch Ness Monster has no place in the scientific world, and it must be categorized as pseudoscientific, furthering the argument that cryptozoology as a whole is a pseudoscience.

El Chupacabra

El Chupacabra is a cryptid that is theorized to be primarily located in South America, where it mainly prays on farmers' livestock. The descriptions of the South American legend can

actually be explained by a disease present in mainly coyotes and raccoons. This disease is caused by mites and is called mange, also known as scabies. Its effects include hair loss and severe rashes that can cause disfiguring. There is also a loss of appetite, which further disfigures the features as the bones are more defined. The only remaining hair is on the back by the neck. All of these unique features that come from mange align with the trademark looks of El Chupacabra, which are little to no hair, disfigured bones, and a mane-type look on the back of their body. As this is a debilitating disease, the animal it is forced to look for easier prey which is often livestock. The infection also causes them to be less mentally stable, which can account for the irregular movements and some attacks on humans (Tomecek et al., 2021).

The first account of El Chupacabra was in Puerto Rico in 1995. The witness claimed to have seen a creature that had two legs and spikes on its back (Boutland, 2018, p. 9). Maybe not so coincidentally, in the same year, a movie called *Species* was released. This movie featured a monster to which the Chupacabra held a "strong resemblance to the alien-human hybrid creature." The witness confessed to watching the movie prior to the claimed sighting (Seigel, 2020). Even though the sighting was widely refuted, the report fueled other proclaimed sightings from people who also said they had seen the Chupacabra (Boutland, 2018, p. 10). Not surprisingly, their reports also matched the creature from the movie *Species*.

Most likely, all of these reports were just influenced by the movie, as it was recent in the minds of the eye-witnesses. This goes to show how the Chupacabra originated from the imagination of a farmer who had recently seen the thriller *Species* and happened to spot what was likely an animal with mange.

When left with uncertainty, the human brain likes to try and find answers, even when there might not be an answer. As one author puts it,

> science does not have answers to everything, not even in issues that clearly belong to its domain. This should be clearly recognized since an honest defense of science must refer to what it can really do, not to some idealized version of science that has answers to all questions. (Hansson, 2017, p. 5).

When people are left with uncertainty, our brains are programmed to find patterns and answers. When people come across things that are unfamiliar to them—and possibly even frightful—our brains try to find the reason behind whatever it is that is so confusing or unfamiliar. Sometimes this means that, despite the physical evidence that might indicate the answer is something more natural, people jump to the conclusion that they have spotted a cryptid in order to ease the uncertainty in their brains. The truth of the matter is that, with the lack of evidence there is for the existence of these cryptids, scientists must conclude that they do not exist.

Bigfoot

Bigfoot is another cryptid that many people know about and have heard stories about. Bigfoot is a trademark cryptid in the Americas that is referenced as a cross between an ape and a human with an immense amount of fur. It is rumored to inhabit the woods of North America. This cryptid goes by many names, another common name being Sasquatch. There are numerous documented reports of Bigfoot sightings, and there are still alleged sightings being reported today. Regardless of all these supposed sightings, however, there is still not enough evidence to show that the creature Bigfoot really exists (Cressey, 2013). One instance of a Bigfoot sighting involved a woman reportedly seeing an 8ft tall mysterious creature directly after she had left the gym. She described this creature as "seven or eight feet tall and covered in gray fur, racing back into the woods about 30 yards away" (Hunnell, 2021). With only an eyewitness account, and a lack of any solid evidence, instances such as this one do not automatically support the creature's existence. Psychedelics and hallucinogens have been around for centuries and could be one explanation as to why people have seen cryptids such as Bigfoot. These substances cause the mind to shift and distort things or even make up things that aren't there at all.

Through a historical lens, Bigfoot is largely passed down through folklore from vague, first-hand accounts of supposed sightings. These accounts, rumors, and stories are passed down

from generation to generation, keeping the stories of Bigfoot alive. When these stories have been passed down from generation to generation, there's a sort of egocentrism that prevents people from standing down from their beliefs no matter the evidence, or lack thereof, presented to them. As one author puts it, "egocentrism interferes with critical thinking on all levels, from the deepest to the most superficial. It stands in the way of the empathy that is such an important part of critical thinking" (Nosich, 2012). In other words, a person might be so narrowly centered on their own perspective and environment that these stories that are ingrained in either their ethnic or home culture have an element of egocentrism that makes it harder for this person to be convinced there isn't at least some element of truth to them.

The biggest piece of proclaimed evidence many Bigfoot supporters are known to use is the discovery of uncannily big footprints found in 1987. Supporters claim that these footprints can only be explained by the existence of Bigfoot (thus the name). A popular article from the same year in the magazine Newsweek told the story of "four sets of footprints" found that showed "dermal ridges, the foot's equivalent of fingerprints." The article indicated that these footprints could only be caused by Bigfoot, as the "experts" cited in the article claimed "it would be impossible to fake prints with dermal ridges," and the footprints were over 15 inches and showed "detailed microscopic anatomy that was absolutely perfect"

(Dennett, 1989, p. 264). This evidence was later highly discredited as the "experts" were proven to have no degree or credibility necessary to discuss or comment on these discoveries. In fact, these footprints were later discovered to have likely been made by an impression cast. These examples just show that while there may be "evidence" of Bigfoot, it is either unreliable, not credible, or proven to be a hoax. Bigfoot, a cryptid, fits the criteria of pseudoscience as defined by Hansson (2017) for the following reasons:

- 1) it involves the broad spectrum of science and scientific research,
- 2) it offers no reliable evidence or trusted sources, and
- 3) multiple sources and crytpozoology "researchers" try to persuade the public that Bigfoot is indeed real and that there is reliable evidence supporting its existence despite there not actually being any supporting evidence.

All of these factors combined make it undeniable that the cryptid Bigfoot is pseudoscientific.

Conclusion

Based on Hansson's criteria, Cryptozoology—which includes the Loch Ness Monster, El Chupacabra, and Bigfoot—should be considered a pseudoscience. There is not enough valid evidence or empirical evidence to show that any of these cryptids are in fact real. Any evidence or sightings used by

Cryptozoologists are either not credible or later falsified. Superstition is nothing new. And, as previously stated, the human brain tries to solve any puzzles that are presented to it, but that does not mean that the correct conclusion is drawn every time. In fact, all too frequently the human brain deceives itself into believing something that does not make logical sense. Eye-witness claims are the main type of evidence given for Cryptozoology, but when the human brain easily deceives itself, this cannot be considered a credible source of evidence, especially from a critical-thinking point of view. This is why the scientific community asks for more convincing evidence than testimonies; there has to be physical evidence. Other than some hoaxes spotted throughout cryptozoology's history, there does not seem to be any physical evidence available to prove—or even infer—the existence of cryptids such as the Loch Ness Monster, El Chupacabra, and Bigfoot. Because these cryptids are presented to the general public as if they were real, regardless of their lacking the necessary evidence, the logical conclusion is that cryptozoology is a pseudoscience.

References

BBC. (2019, September 5). *Loch Ness monster*

may be a giant eel, say scientists. Retrieved May 30, 2022, from www.bbc.com/news/uk-scotland-highlands-islands-49495145

Boutland, C. (2018). *El Chupacabra the bloodsucker and other legendary creatures of Latin America*. Gareth Stevens Publishing LLLP. https://ebookcentral.proquest.com/lib/coastal/detail.action?docID=5539808&query=Boutland

Cressey, D. (2013). Cryptozoology: Beastly fakes. *Nature*, *499*(7459), 406. https://doi.org/10.1038/499406a

Dennett, M. R. (1989). Evidence for Bigfoot?: An investigation of the Mill Creek 'Sasquatch prints.' *The Skeptical Inquirer*, *13*(3), 264–272. Retrieved May 29, 2022, from https://skepticalinquirer.org/1989/04/evidence-for-bigfoot-an-investigation-of-the-mill-creek-sasquatch-prints/

Hansson, S. O. (2020). How not to defend

science: A decalogue for science.*Disputatio. Philosophical Research Bulletin. 9*(13), 1–29.

Hunnell, C. (2021, May 20). *Bigfoot?: Woman reports Sasquatch encounter outside gym in Ashland*. Richland Source. Retrieved April 26, 2022, from https://www.richlandsource.com/news/Bigfoot-woman-reports-sasquatch-encounter-outside-gym-in-ashland/article_e16ec08e-ac17-11eb-b715-ebc258717644.html

List of cryptozoologists. (2022, April 13). In *Wikipedia*. https://en.wikipedia.org/wiki/List_of_cryptozoologists

National Geographic Society. (2022, May 20). *Aug 22, 564 CE: Loch Ness monster sighted*. Retrieved May 30, 2022, from https://www.nationalgeographic.org/thisday/aug22/loch-ness-monster-sighted/

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Rossi, L. (2016). A review of cryptozoology: Towards a scientific approach to the study of "hidden animals." In E. M. Angelici (Ed.), *Problematic Wildlife (pp.* 573-588). 10.1007/978-3-319-22246-2_26

Seigel, R. (2020, July 26). *Mythical facts about the strange world of cryptozoology*. Factinate. Retrieved May 30, 2022, from https://www.factinate.com/things/cryptozoology/?headerimage=1

Tikkanen, A. (2020, May 4). Loch Ness monster. In *Encyclopaedia Britannica*. Encyclopædia Brittanica, Inc. https://www.britannica.com/topic/Loch-Ness-monster-legendary-creature

Tomecek, J. M., Henke, S., & Hensley, T. (2021, December 7). *El Chupacabra: The science behind a Latin American mystery*. Texas A&M AgriLife Extension. https://agrilifeextension.tamu.edu/library/wildlife-nature-environment/el-chupacabra-the-science-behind-a-latin-american-

mystery/?msclkid=e3954833c59811ec9a67223fb9ddf4df.%20Accessed%2022%20Apr.%202022

UNIT 3: CRITICAL THINKING EXERCISES

1. Have you ever had an odd experience where you suspected something "otherworldly?" If so, why do you think you suspected that? Thinking back to that experience, can you think of three other possible answers to the strange experience?

2. Why do you think the human brain tends to try and solve every puzzle it comes across? Could this sometimes be a bad thing?

3. If one cryptid was proven to be undoubtedly real, how would that change how cryptozoology is generally viewed? Should every cryptid be reevaluated for its legitimacy if this were to occur? Would this make cryptozoology less of a pseudoscience?

PART IV
UNIT 4: LEY LINES

CHAPTER 4.1: WHAT EVIDENCE IS THERE FOR LEY LINES?

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4.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

What evidence is there for ley lines?

Evidence and Information:

- Analysis of the cultural significance of ley lines
- The psychology behind the belief of ley lines
- The correlation between some religions and ley lines

Assumptions:

- Ley lines, or some equivalent, have appeared throughout history as a belief among different peoples.
- Patterns can be drawn from random coincidences.

Concepts:

- Ley lines
- Major religions
- Geographical locations
- History
- Anthropology
- Superstition

Context:

- Pseudoscientific belief in ley lines
- The cultures in which ley lines are significant

Point of View:

- Ancient civilizations
- Historians
- Geographers

- Anthropologists

Purpose:

- To discover why ley lines have been culturally significant

Implications and Consequences:

- Ley lines may reflect the superstition of a certain culture, or they could increase the superstitions surrounding ancient cultures.

Conclusion and Interpretation:

- Ley lines have been culturally significant because they are able to be used in a variety of arguments pertaining to pseudoscience and religion.
- Ley lines have been used by different cultures and peoples in order to fit certain worldviews and reinterpret randomness.

Disciplinary Lenses

History

Question at Issue:

How can the historical significance of ley line sites shed light on the probability of the ley line theory holding any weight?

Evidence and Information:

- Historical records
- Timelines

Assumptions:

- Historically important sites were aligned, even though many of these sites were created in different time periods.
- Ley lines are widely disputed.
- Ley lines are not scientifically plausible and should instead be viewed from a historical standpoint

to determine their cultural impact.

Concepts:

- Stonehenge
- Churches in England
- Other historical sites
- Bronze and Iron Age trade routes
- Supernatural or alien intervention

Context:

- Late Bronze and Iron Age trade routes
- Historical

Point of View:

- Alfred Watkins
- Historians
- Ley line conspirators

Purpose:

- To understand the historical

significance of important sites linked to ley lines
- To view and understand the timeline of the creation of so-called "ley line sites"

Implications and Consequences:

- If ley lines were in mind during the creation and planning of these important sites, there could be supernatural influence throughout history

Conclusions and Interpretations:

- There are no accounts or evidence from ancient civilizations proving that important historical sites were built on ley lines.
- It seems extremely unlikely that any historical sites were built to create a geographical pattern.

Geography

Question at Issue:

How does the geography of ley line sites support ley line theories?

Evidence and Information:

- Maps
- Records of ley line sites
- Terrain
- Climate

Assumptions:

- If ley lines existed, then the disciplinary lens of geography would be one of the primary sources of evidence for the theory's support.
- Patterns can be drawn between endless sites because of the sheer number of sites.
- Ley lines are widely disputed.

Concepts:

- Ley lines
- Geography
- Patterns
- Coincidence

Context:

- Geographical
- Ley lines

Point of View:

- Geographers
- Ley lines conspirators

Purpose:

- To understand how the distance between the different ley line sites discredits the ley line argument
- To see—due to the number of sites, not the geographical location—how patterns that could be drawn up

between historically significant sights are endless
- Determining whether ley lines are pseudoscientific or have a basis in reality

Implications and Consequences:

- Scientific evidence of ley lines would mean that ley lines would no longer be in the realm of the supernatural and would instead be a scientific fact.
- Even if ley lines are fictional, they may still have meaning among different cultures.

Conclusions and Interpretations:

- There is no geographical evidence at present that proves the existence of ley lines.

Anthropology

Question at Issue:

How can anthropology help explain the cultural significance of ley lines?

Evidence and Information:

- Research and case studies
- Psychology
- Culture
- Superstition

Assumptions:

- Humans are in the habit of finding patterns in almost everything, including randomness.

Concepts:

- Ley lines
- Anthropology
- Human psychology
- Past generations of humans

- Patterns

Context:

- Human psychology
- Human capability
- Cultural context

Point of View:

- Anthropologists
- Believers in ley lines

Purpose:

- To understand past and present cultures and societies and the role ley lines have or have not played in them
- To understand human behavior, specifically in terms of superstitious behavior
- To understand why humans have created historical sites such as the pyramids of Giza

- To understand the intellectual capability of past generations
- Learning what impact ley lines have had culturally

Implications and Consequences:

- If ley lines have had a significant cultural impact, they are worth observing through the lens of history and/or anthropology
- If ley lines were proven to be real, then this could mean that past cultures were more advanced and coordinated than they were ever previously understood to be

Conclusion and Interpretation:

- Ley lines have been used by different people groups and religions to fit certain worldviews and explain unrelated patterns.
- Ley lines should not be seen as

historically or culturally significant, as they are nothing more than an interesting conversation topic and a superstitious theory.

Empirical Claims

Inductive Reasoning

True Premise 1: Trade routes have been used to connect populated areas throughout history.

True Premise 2: Cities tend to grow around trade routes, such as San Francisco and Baltimore.

Weak Inductive Reasoning: With most trade routes being ley lines, the growth of cities

around them clearly indicates the high earth energy that draws people to it.

Logical Conclusion: Cities tend to grow around trade routes due to the potential profitability

Deductive Reasoning

General Premise 1: Patterns have been found around culturally significant sites.

General Premise 2: Ley lines are patterns.

Weak Deductive Reasoning: Because ley lines are patterns, culturally significant sites must fall on ley lines, indicating the coordination and fundamental significance of ley lines.

Logical Conclusion: Through the lens of psychology, ley lines are revealed to be patterns that people's brains have found in attempts to reinterpret randomness when, in reality, there is no significant evidence that ties together the concepts of ley lines and culturally significant sites.

Abductive Reasoning

Observation: A pattern has been found along sites that are significant to Christian and pagan beliefs.

Weak Prediction: This pattern must be due to ley lines because it is clear that either earth energy or extraterrestrial influence pointed followers of these religions to plant sites in such a pattern.

Best Prediction: "The pattern had been accidentally preserved here and there due to the Christianization of certain pagan sites which were markers along the old straight tracks" (The Society of Ley Hunters, n.d.).

Logical Fallacies

Cherry-Picking

The ley lines conspiracy is just one more way ancient alien supporters try to argue that the pyramids of Giza and Stonehenge, for example, were only possible through the assistance of aliens. The locations claimed to be evidence of ley lines are easily chosen to fit the pattern.

Magical Thinking

Earth energies from ley lines have no scientific premise, and ley lines are a stretch to prove them.

Non-Sequitur

In reality, straight lines can be drawn between endless locations, regardless of their historical significance. And the argument that because

someone decided to draw up some lines connecting some historical marvels found that—if the right ones are chosen—a pattern can be formed, it does not logically follow that these lines hold any significance.

Hasty Generalization

The ley line argument does not provide sufficient evidence for Earth energies or ancient aliens.

Appeals to Ignorance

When something doesn't quite match up, it's open to pretty much any theories or ideas. Believers in ley lines argue that, since no one really knows who built Stonehenge or what the exact purpose was, there's no one to say it couldn't be a site of healing and magical lines running through the earth.

4.1.2 SEE-I MODEL

State

The theory of ley lines has no significant evidence backing it other than what one might imagine is evidence through magical thinking.

Elaborate

The ley line theory is not all that complicated to understand. A man in the early 20th century noticed that completely straight lines could be drawn from different historically significant sites to another to create patterns. From this observation, it was concluded that these "patterns" must have some significance. It has been shown, however, that the human brain is apt to find patterns in nearly anything it sees. For instance, in a slice of Swiss cheese, one might see a face from the different holes in it. Other than through superstition and magical thinking, this does not logically lead one to believe there is significance to the cheese looking this way. In a similar way, there are, no doubt, countless patterns that could be drawn up between different historical sites, but this does not logically indicate that these lines or patterns have any significance. The only

thing ley lines logically can lead us to believe is that the human brain has an extraordinary knack for finding patterns. As one author put it, "whether ley lines exist or not, the fact that many people believe they do provides insight into the human brain's amazing capacity for finding patterns in the world around us" (Radford, 2013).

Exemplify

One way that the ley line theory seems to be intertwined with magical thinking is how ley lines are used as evidence for ancient astronauts. Ancient astronauts (or aliens) are another example of pseudoscience, so it is no surprise that something like ley lines would be used as support. It is theorized by ley line conspirators that the supposed patterns created by ley lines are maps, guides, or creations of extraterrestrial life. Historical sites such as the pyramids of Giza or Stonehenge are already theorized by believers of ancient astronauts to have been created by aliens. To such believers, the association between these sites and ancient astronauts makes it seem even more probable that ley lines have some deeper significance—likely because of the aliens—considering those same sites fall on ley lines. But ley lines, like ancient astronauts, have no scientific backing, and their reliance on one another does not improve their arguments. In fact, the connection between the two seems to point to how each is grasping at straws, so to speak, to find ways in which they can solidify their arguments. After

all, the ley line conspiracy is simply an observation of straight lines from different historical sites to another, that, when considered by the human brain, seem to create patterns, but to think that a deeper meaning follows is magical thinking.

Illustrate

In Greek mythology, many of the myths end in a tragedy of some sort. For instance, the life of demi-god Hercules comes to an abrupt end when his wife is tricked by a spiteful centaur to put hydra poison on Hercule's lion pelt robe, which, once put on, kills Hercules. According to the myth, after his death, the lead god Zeus puts his body in the sky in the form of a constellation, as he does with other fallen heroes as well.

Greek mythology is appropriately named. It is obviously all myth, yet we see the constellations up in the sky that are depicted in Greek mythology, such as the Hercules constellation. This may persuade some that the Greek myths may actually be true because otherwise, the constellations would not be there.

When observed through critical thinking, however, it becomes clear that the outline of Hercules in the stars was observed first by the Greeks, and the myth came after as folklore of sorts. And it's not that the stars were designed to be shaped like Hercules; it is simply that the Greeks observed a pattern in the sky. In a similar way, ley lines patterns are not supporting

evidence for aliens, earth energies, or even past civilizations' coordination, but simply a pattern observed from the randomness that had meaning added to it later on. As one author puts it, "ley lines exist in the same way that astrological constellations exist. You can draw (or imagine) lines connecting certain stars to form the horns of the Taurus constellation, the scales of the Libra sign, or the Big Dipper. But that doesn't mean that those points were placed there to make that pattern" (Radford, 2013).

4.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: It seems unlikely that there would be perfectly straight lines from one significant historic site to another unless there was some deeper meaning behind them, especially when the patterns are taken into account.

Rebuttal: Trade routes have been around for centuries, and they often are fairly straight paths from one location to the next. As for the patterns, science and statistics have proven that given a large number of random points, an even greater number of alignments can inevitably be found.

Argument: Mysterious structures such as Stonehenge and the pyramids of Giza fall on ley lines, which furthers the argument that ley lines have a deeper significance, such as proof of extraterrestrial life.

Rebuttal: This argument utilizes both the logical fallacy of magical thinking and non sequitur. Magical thinking is utilized in that alien presence has no logical premise, only a "magical" or "wishful" one. The conclusion that a pattern connecting these sites was designed for or by aliens is a conclusion that does not follow the argument (non sequitur).

Argument: The Ley line argument has been around for about a hundred years. If there was no evidence for it, then it would have died out a long time ago.

Rebuttal: This argument utilizes the genetic fallacy, meaning it relies on the age of the theory to support its argument, which does not add any real strength to it. Due to the idea receiving bandwagon support, it's not uncommon for an idea with no scientific basis to continue to receive support long after the scientific community has debunked it.

4.1.4 RESEARCH PAPER

Introduction

The concept of Ley lines has been around for nearly a hundred years. While supporters still exist today, the Ley line theory has been strongly criticized in the scientific world. As critical thinkers, we must ask ourselves: what evidence supports this theory, and why do people still uphold it? Furthermore, we must evaluate whether ley lines are pseudoscientific in nature or merely a misunderstood theory lacking a proper argument. Research shows that, through a critical thinking lens, the ley lines theory has no evidence supporting its existence that would merit it being considered scientific in nature unless one were to utilize magical thinking.

In essence, ley lines are supposed energy fields or 'roads' that run unseen across the earth. They are believed to connect spiritual or historical sites, such as churches. Even though there is no concrete evidence for ley lines, a wide range of peoples and groups have tied the concept of ley lines into their religions, conspiracies, and traditions. This paper seeks to cover how ley lines have been used as support for different beliefs, and it will explain why this is an example of circular reasoning and does nothing to uphold the ley line argument.

In fact, the only thing that the theory of Ley lines proves is that human beings have an excellent capacity for 'connecting the dots' or finding patterns in the world around us.

History

To understand how the ley line argument originated and gained traction, it is necessary to cover the history of how ley lines were first introduced. The idea of ley lines was first presented by Alfred Watkins in 1921, who believed that straight lines could be drawn between historic sites around Britain and that these lines represented the trade routes used by ancient British societies (Watkins, 1922).

The sites Watkins referred to were from Roman, prehistoric, and medieval time periods. He surmised that the straight tracks fell out of use during the Bronze and Iron Age. For context, the Bronze era took place between 3300 and 1200 BCE, while the Iron Age was between 1200 BCE and 600 BCE. According to the Society of Ley Hunters website, "the pattern had been accidentally preserved here and there due to the Christianization of certain pagan sites which were markers along the old straight tracks" (n.d.). These pagan sites were believed to have been taken over by Christians and are now consequently replaced with Christian landmarks such as churches.

A common argument in favor of ley lines reasons that, since many major cities are located along trade routes, there must be evidence of these trade routes being formed from ley lines and therefore providing a kind of unseen energy source on which the cities are built. It's not difficult to see how this line of reasoning comes about since trade routes were most certainly used in the placement of cities. This, for example, is why port cities like San Francisco and Baltimore exist. Cities naturally tend to grow on and around trade routes, driven largely by money and resources, and the pattern of cities popping up around major trading spots has been consistent throughout history. However, a natural progression and growth of highly populated areas along trading routes does not prove anything concerning ley lines, and it shows weak inductive reasoning on the part of the ley hunters who have not taken into account the logical reasoning behind the growth of such areas. This line of thinking is obviously circular: ley lines exist, so trade routes must be because of ley lines; cities are located on trade routes, so cities must be placed along ley lines; therefore, ley lines exist.

Figure 4.1

F.C. Tyler

Note. Image Credit: Wikimedia Commons

According to B. Radford, "in the 1800s on the British Isles, many people believed in mysterious 'fairy paths,' trails connecting certain hilltops in the countryside. It was considered dangerous (or, at the very least, unwise) to walk on those paths during certain days because the wayward traveler might come upon a parade of fairies who would not take kindly to the human interruption" (Radford, 2013). These fairy paths were a popular belief at the time, and many ley line believers assumed fairy paths were a natural equivalent to ley lines. While there are some obvious similarities, these fairy paths were not believed to be "energy roads" connecting important sites, but were instead thought of as certain parts of the landscape that were said to be used by a supernatural

entity. Therefore, this theory connecting fairy paths to ley lines would be an example of cherry-picking since the argument selectively chooses unconnected evidence to support a faulty claim (Lavin, 2020, p. 108).

While ley line theories have mostly been put forth in a historical context, there are examples showing that some of the sites purported to be evidence of ley lines can be as simple and ridiculous as telephone booths. To prove this, a man by the name of Richard Atkinson was once able to "connect" all of the telephone booths in Great Britain (Burl, 1984). As ley lines are believed to connect significant sites throughout the world, telephone booths being notably absent from this category, there is no credible reason for such places being connected through unseen energy lines. In fact, they are connected by very real and tangible 'energy lines' which enable their use. Furthermore, phone booths are typically placed where people need them and are mostly placed at random. It would be just as easy to find patterns around every fire hydrant or play connect-the-dots with power lines.

The existence of ley line theories is not yet a thing of the past. In the modern day, there exists a Society of Ley Hunters (mentioned above), which is a group of people that are continuing to expand Alfred Watkins's ideas and search for ley lines, attempting to prove their existence and use throughout history. This group of people regularly convenes in online forums, one being their website: The Society of Ley Hunters.

In this society, there appear to be online meetings, where the members chat with each other about ley lines. But if there is truly an extant group or groups that support this theory, surely there must be some evidence to back it up? While this may seem like a common sense assumption, the world of pseudoscience is not so simple. The strange nature of these beliefs is exemplified by the complete lack of geographical evidence for ley lines, which appear to exist only in a fictional narrative.

Geographical Context

Geographically, ley lines are believed to act as straight lines, which is not something that always occurs when it comes to trade routes. J. Thurgill details his own experience of "deep mapping" in order to find a ley line, which is simply a process of walking between two significant sites and finding that there are landmarks between them that lie on a straight path. He says, "I had begun to map 'deeply,' navigating a route by studying, moving, and sensing my surroundings, by noticing the way a path 'unfolded' before me" (Thurgill, 2015, p. 646). Obviously, the easiest way to get from one place to another is by walking a straight line. Ley lines are not the first or only entity that has figured that out, as walking in a straight path is something humans have been doing for quite a long time. Therefore, the geographical evidence that "proves" ley lines is merely a series of coincidental placements along a path that has

been used previously by other people. As one can imagine, this sort of reasoning doesn't hold up under much scrutiny.

When discussing "significant sites," it's necessary to mention that a so-called important site for ley lines can be natural developments such as a pond, hill, or copse of trees. According to Thurgil (2015), "ley lines enrich history through a deepening of our interrelation with the natural world and of greater import still, they provide a way of getting back into the landscape, of mapping, retracing, reimaging and resurrecting our position within and amongst places" (p. 641). For like-minded people, ley lines create a sense of being connected to the land and help to understand the world around us. In that context, it makes more sense for leys to be viewed as a spiritual connection rather than having a physical manifestation in our world. For this reason, ley lines have more historical use and context, while geographically, ley lines have little meaning or evidence supporting the theory. The cultural importance of ley lines circularly stems from these sites' historical context, even though ley lines have apparently played no role in the placement of these important sites.

Neolithic Britain

The disciplinary lens of anthropology is used to analyze cultures and history in order to understand human nature and learn more about our past. As such, it is useful to look

from an anthropological standpoint at examples of where and when Ley lines have been used to determine their influence in recent history and culture. Perhaps the most popular example is the monument of Stonehenge, a site that has been culturally significant in a large variety of ways.

Stonehenge is a world-famous monument that is located on the Salisbury Plain in Wiltshire, UK. Many modern historians claim that Stonehenge was not built by a singular group of people. Since the monument took over 1,000 years to build, it is currently believed that multiple tribes of people over several hundred years contributed to the construction of Stonehenge (History.com Editors, 2010).

There is a plethora of research and archaeological evidence showing that Stonehenge was used as a burial site and a religious ceremonial site for a large part of its history. Stonehenge is a commonly used example of "evidence" for ley lines, and for many years, the mystery shrouding the site allowed for pseudoscientists and conspiracy theorists to utilize Stonehenge for their arguments or claims. According to StonehengeNews (2020), Stonehenge is believed to have at least 14 ley lines converging at the site. Many believe that the strong energy that the Stonehenge ley lines give off is the reason that ancient people were able to transport the stones used in construction for over 160 miles. Furthermore, the site is believed to have powerful earth energy because the stones perfectly align with the sun at midsummer and midwinter.

It is also said that if you go to Stonehenge and "harvest" its energy you will improve your own physical health. There are methods that you can use to "recharge" yourself, and guides will help you with restoring your energy through methods such as crystal charging, meditation groups, and even a method called handfasting. Handfasting at the stones is an ancient ritual for marriage where the couple places both of their hands on the stone which symbolizes an eternal union. This is by no means an extensive list of the rituals and spiritual practices done at and in the name of Stonehenge, but it gives an idea of just how popular the site is for these types of beliefs. In that light, it seems almost fitting that ley lines should be lent a small portion of Stonehenge's pseudoscientific fame.

The theories and practices surrounding Stonehenge are notable examples of an appeal to ignorance (Van Cleave, 2016). The fallacy states that when something doesn't quite match up, it's open to pretty much any theories or ideas. Since no one really knows who built Stonehenge or what the exact purpose was (although this is no longer true), there's no one to say it couldn't be a site of healing powered by magical lines running through the earth. Numerous documentaries and claims have been made about Stonehenge, so it's no wonder why its cultural impact runs so deep. In this instance, ley lines are being used as an example of one of the many mystical properties surrounding Stonehenge, along with crop circles, energies of the cosmos, and various other earth energies. Once

again, ley lines are not something that seem to stand on their own as an unconnected belief but rather are used to support and strengthen other pseudoscientific arguments. While Stonehenge is obviously a historically significant spot, both for archeologists and pseudoscientists, there are other examples showing the supposed importance of ley lines in recent culture and history.

Feng Shui

Many supporters of the ley line theory argue that this belief is not a new revelation isolated to European superstition. While Alfred Watkins was, indeed, the person who coined the term "ley lines," there have supposedly been a variety of cultures that hold similar, if not the same, beliefs in the phenomenon of ley lines (although under different names). One example of this apparent convergence is Feng Shui (also spelled Fung Shui) (Game Frog, 2009). The Forbidden City is a classical example of a city designed with Feng Shui in mind, balancing the city using yin and yang principles (Donovan, 2024).

According to the article D. Waters (1994), the complexities of this ancient belief seem to go much deeper than the ley line theory and are applicable to almost every part of life: "Fung Shui doctrine embraces magnetism, cosmic waves, radioactivity, the mysteries of heaven and earth, the natural sciences, logic, higher mathematics, chemistry, geology,

geography, philosophy, astronomy, psychology, ecology, architecture, spatial orientation, and ergonomics" (p. 59). While that extensive list is hard to summarize, the general idea seems to be living in tune with the earth and its respective energies. The article details how this is a very prevalent idea in Chinese culture (although it seems younger generations might be more skeptical) and can influence even the smallest portion of life such as furniture arrangement in rooms (p. 62).

Obviously, the cultural impact of Feng Shui is a great deal older and more developed than the ley line theory, which is relatively young in comparison. It seems remarkably shallow to take a time-worn belief that has had a significant influence on Chinese culture and say that it is the equivalent of ley lines. This appears to be a weak attempt to gain credence for ley lines, which do not hold up under any scrutiny. The purpose of this clarification is not to try and prove or disprove Fung Shui, but to point out that the belief in Fung Shui cannot reasonably be attributed as equivalent to ley lines. There have been altogether too many instances of Westerners cherry-picking bits and pieces of Asian culture in order to fit certain narratives, but unfortunately, the threadbare connections don't stop there. Western religions have been relatively untouched up to this point, but now must be considered as an important selling point of the ley line theory.

Christianity

Due to the theory's origin in a Christian-dominated landscape, ley lines are most commonly used to "connect" Christian sites. The best example of this is England's churches, one of which is discussed in the article "The Church, its Crypt and the Ley Lines" (Lester, n.d.). Lester gives a broad overview of some relevant publications, seemingly attempting to build support for the theory of a ley line running underneath St. Mary's crypt, which is located beneath Lastingham Church in York. The author begins by saying that this idea is a "tradition" and that it is unwise to dismiss "folk tales, legends or traditions as they are usually based on some fact from which they originate" (Lester). This unique reasoning then leads to the claim that a ley line's "properties can be scientifically verified as being lines of natural energy." It is also worth pointing out that there is no scientific evidence or sources offered following that statement, which is only supported by a series of secondhand accounts concerning how a variety of people sensed invisible forces when entering the crypt beneath Lastingham Church. This account shows, if nothing else, that ley lines can sometimes be used in tandem with religion by groups claiming to find some sort of supernatural energy related to their beliefs or place of worship.

According to C. Street (2010), as stated in *London's Ley Lines: Pathways of Alignment:*

> in a Christian sense, [leys] are pathways of the Holy Spirit, a web of divine power between places of worship or sacred

> celebration. Their origins and essence, of course, are pre-Christian, but many of their current mark points are fully functional as today's local parish churches and their services, prayers, sacred music, and bell ringing all seem to play a role in boosting the energy of the ley system and keep it flowing, just as the rituals and activities of the pre-Christian temples before them did. (p. 4).

Evidently, it is a common belief in these circles that ley lines were discovered long before the spread of Christianity. It therefore follows, according to this argument, that the leys are not coincidentally connected by churches but are rather the reason for the churches' placements. This is either because of some kind of supernatural draw to those places or simply because pagan sites were built over and replaced with Christian ones during colonization. While theories vary, the general principles are the same for many believers of the supernatural: ley lines and the Christian faith are intertwined.

Psychology

Having covered some examples of the cultural influence of ley lines, it is necessary to illustrate why humans tend to believe in things such as ley lines to make sense of the world around them. Looking through the disciplinary lens of psychology, which studies the mind and human behavior, will help explain the final aspect of the question at issue. More specifically, it will help explain why human nature tends to find seemingly

unconnected patterns in the surrounding world and why people use these patterns to fit their beliefs.

Pattern-seeking is such a well-known aspect of the human mind that it has already been given its own term: apophenia. According to an article on the subject, apophenia is "the tendency to perceive meaning in unrelated events" (Fyfe et al., 2008, p. 16). While severe cases of apophenia are often linked with schizophrenia, the general term is applicable in a wide range of study. Ley lines are a magnificent example of apophenia: drawing (literal) connections between important sites that have no relation to one another. Another quote from Fyfe et al. (2008) highlights this phenomenon: "perceiving meaning in randomness and, more particularly, attributing mental states where none are indicated, may be important factors in the formation of paranormal and delusional beliefs" (p. 1316). One can imagine an intense movie scene where the main character is standing before a board of evidence strung with red yarn, quickly connecting pieces of news articles linking the villain's evil plot. While the idea of making important world-saving realizations is appealing for a variety of reasons, there are few moments in day-to-day life that have such lightbulb moments. Ley lines offer such an experience of "connecting the dots" so to speak, as long as those doing the connecting are willing to ignore the lack of evidence and scientific support for these fictional rivers of energy.

"Whether ley lines exist or not, the fact that many people

believe they do provide insight into the human brain's amazing capacity for finding patterns in the world around us" (Radford, 2013). This quote beautifully summarizes the principle purpose of the disciplinary lens of psychology. It does not ask whether something is necessarily right or wrong, but why that "something" persists in human behavior. In this case, ley lines are the "something" being questioned. As mentioned before, there is no geographical evidence to prove ley lines exist, so why do such ideas still exist in this day and age? The answer is linked to confirmation bias, which, according to Allahverdyan and Galstyan (2014), is "the tendency to acquire or evaluate new information in a way that is consistent with one's preexisting beliefs" (p. 1). Again, it is easy to see how this description fits the concept of ley lines; they are commonly used as 'evidence' for a theory or even religion. Rarely do they stand on their own as a separate entity or claim, making leys an excellent candidate for confirmation biases. It's like putting up a sheet of paper with tear-aways at the bottom that says, "take one for whatever you need! Ley lines support Stonehenge, Christianity, you name it!" Confirmation bias as demonstrated in the ley line theory is an example of cherry-picking (or Texas sharpshooter fallacy) in order to support one's claims (Lavin, 2020, p. 108). Finding and reinterpreting randomness, then using that supposed 'evidence' to make a claim that there are pathways of energy throughout the earth is not as strong of an argument as one might think.

Conclusion

The claim that ley lines are pseudoscientific has already been made at several points, but the question still stands as to whether they fall under pseudo-theory promotion or science denialism as outlined by Hansson (2017). Ley lines appear to fall under the category of pseudo-theory promotion as they do not line up with most of the qualifications for science denialism. Most of the arguments made for ley lines have to do with the spiritual and mystical aspect, rather than a false pretense of science.

A research paper from the journal Disputatio summarizes the conclusion that may be drawn from the disciplinary lens of psychology: "psychologists exploring the fallibility of testimony and studying human propensities to believe in supernatural agency find a rich source of data" (Edis, 2019, p. 3). This is well-aligned with the claims made about ley lines; it is human nature to find patterns in everyday life and use wishful thinking to support what one believes. Ley lines are simply a more extreme example of apophenia and confirmation bias plucked from the realm of pseudoscience. With that, it is possible to finally answer the question of why ley lines have been and continue to be culturally significant: they are easily manipulated, making them excellent candidates to add false weight to many viewpoints. This in turn makes leys conveniently applicable to almost any argument pertaining to pseudoscience and conspiracy theories.

References

Allahverdyan, A. E., & Galstyan, A. (2014). Opinion dynamics with confirmation bias. *PLOS ONE*, *9*(7), 1–14. https://doi.org/10.1371/journal.pone.0099557

Burl, A. (1984). The alignment of ancient sites conference, Cambridge 1983. *Antiquity*, *58*(222), 48–49. ProQuest.

Donovan, B. (2024, May 25). feng shui. Encyclopedia Britannica. https://www.britannica.com/art/fengshui

Edis, T. (2019). A revolt against expertise: Pseudoscience, right-wing populism, and post-truth politics. *Disputatio. Philosophical Research Bulletin, 9*(13), 1–29. doi.org/10.5281/zenodo.3567166

Fyfe, S., Williams, C., Mason, O., & Pickup, G. (2008). Apophenia, theory of mind and schizotypy: Perceiving meaning and intentionality in Randomness. *Cortex*, *44*(10), 1316–1325. https://doi.org/10.1016/j.cortex.2007.07.009

Game Frog. (2009). What *are ley lines or leys*. Basic Chinese Horoscope. http://chinesehoroscop-e.com/fung-shway/feng-shui-ley-lines.php

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A, 63*(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

History.com Editors. (2010). *Stonehenge*. History. https://www.history.com/topics/european-history/stonehenge

Lavin, A. (2020). *Thinking well: A creative commons logic and critical thinking textbook* (3rd edition). Course Hero. https://www.coursehero.com/file/68307737/Thinking-Well-Lavin-Edition-3pdf/.

Lester, E. (n.d.) *The Church, It's Crypt and the Ley Lines.* The Friends of Lastingham Church. http://www.lastinghamfriends.com/the-church-and-its-ley-lines.html.

StonehengeNews. (2020). *New age Stonehenge tours*. Stonehenge Guided Tours. https://stonehengetrips.com/tag/ley-lines/

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Radford, B. (2013, November 20). *The lore and lure of ley lines*. LiveScience. https://www.livescience.com/41349-ley-lines.html

Street, C. E. (2010). *London's ley lines: Paths of enlightenment.* Earthstars Publishing. https://books.google.com/

books?id=2I4yAgAAQBAJ&printsec=frontcover#v=onepage&q&f=false

The Society of Ley Hunters. (n.d.). *About*. http://www.leyhunters.co.uk/about.html

Thurgill, J. (2015). A strange cartography: Leylines, landscape and "deep mapping" in the works of Alfred Watkins. *Humanities*, *4*(4), 637–652. https://doi.org/10.3390/h4040637

Van Cleave, M. (2016). *Introduction to logic and critical thinking*. Open Textbook Library.

Waters, D. (1994). Foreigners and fung shui. JOURNAL OF THE HONG KONG BRANCH OF THE ROYAL ASIATIC SOCIETY, *34*(1994), 57–117. https://www.jstor.org/stable/23889984

Watkins, A. (2008). *Ley lines: Early British trackways, moats, mounds, camps and sites*. Forgotten Books.

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UNIT 4 CRITICAL THINKING EXERCISES

1. Identify and analyze other significant cultural aspects that a believer in Ley lines might claim to be connected to this pseudoscience.
2. Research Ley lines yourself and find a blog or article written by someone who believes in Ley lines. From there, identify any logical fallacies you can find and explain your reasoning.
3. Analyze the research supporting ley lines and use cherry-picking to explain how a Ley line believer might explain these patterns.
4. What examples of pattern finding do you experience in your everyday life and how can you relate that to the thinking of someone who believes in Ley lines?
5. What other beliefs or pseudoscience might coincide with believing in Ley lines?

PART V
UNIT 5: BERMUDA TRIANGLE

CHAPTER 5.1: HOW CREDIBLE ARE THE DIFFERENT THEORIES ABOUT THE BERMUDA TRIANGLE MYSTERIES?

Figure 5.1

A depiction of the Bermuda Triangle from space

Note. From The Bermuda Triangle [Photograph], by NOAA's National Ocean Service, 2010, Flickr (https://www.flickr.com/photos/usoceangov/) CC BY 2.0.

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5.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

How credible are the different theories about the Bermuda Triangle mysteries?

Evidence and Information:

- Historical records of ship/plane disappearances
- Scientific theories from peer-reviewed resources
- Pseudoscientific theories from other sources

Assumptions:

- Some explanations, such as UFOs and sea monsters, are not credible. The more reasonable theories, such as rogue waves and the Gulf Stream, provide better explanations to the mystery.
- Sources like Yelp and Good Reviews are not credible but interesting to see the civilian and popular point of view.

Concepts:

- Oceanography
- Shipwrecks
- Plane crashes
- Legends
- UFOs
- Weather patterns
- Weather anomalies
- Physics
- Myths
- Cryptozoology
- Navigation

Context:

- Historical

- Geographical
- Technological
- Supernatural

Point of View:

- Oceanographers
- Sailors
- Captains
- Pilots
- Geologists
- Physicists
- Journalists
- Meteorologists

Purpose:

- To determine the credibility of certain theories regarding the mystery of the Bermuda Triangle and to find more likely alternatives

Implications and Consequences:

- If the superstitious theories around the Bermuda Triangle were shown to be non-

credible, this would mainly result in the reduction of the stigma behind the alleged mystery of the Bermuda Triangle.

- On the other hand, if the theories around the Bermuda Triangle were shown to be true, then this could result in the triangle becoming an illegal traveling site due to the dangers. Possibly, it could even become a research site for scientists.

Conclusions and Interpretations:

Many theories surrounding the Bermuda Triangle, including UFOs, Atlantis, and Sea Monsters, are not credible and are not valid explanations for the occurrences within the Bermuda Triangle.

Disciplinary Lenses

Physics

Question at Issue:

How does the study of the physical world and its anomalies help to understand the interactions between planes/ships and the Bermuda Triangle?

Evidence and Information:

- Laws of physics
- Laboratory experiments
- Field experiments

Assumptions:

- Physics can be applied to help in understanding the formation of rogue waves and can be used to understand the concept of time warps, though it seems unlikely that there are any time warps in the

Bermuda Triangle.

Concepts:

- Waves
- Polarity
- Newton's Law of Motion
- Gravity
- Momentum
- Energy
- Black Hole/Time Warp Theories
- Math

Context:

- Historical context (what we know now vs. in the past)
- Scientific context
- Physical context

Point of View:

- This would be from the point of view of a physicist trying to examine the possibility of time

warps in the Bermuda Triangle and how physics plays into other theories.

Purpose:

- To understand the physical world and determine if there is a direct correlation between the Bermuda Triangle and its interactions with ships/planes
- To understand how more credible concepts such as wave patterns and polarity work

Implications and Consequences:

- Physics can be used to explain virtually every theory involved, but the main consequence of using physics as a disciplinary lens would be disproving the theory that there are time warps in the Bermuda Triangle.

Conclusions and Interpretations:

According to the laws of physics, it is very unlikely that there are any time warps in the Bermuda Triangle, as time warps themselves are only theoretical. If they were in our ocean, we would know. However, physics can help to explain other theories, such as the formation of rogue waves or the magnetic anomaly that disrupts compasses in certain areas of the Bermuda Triangle.

Oceanography

Question at Issue:

How can the general study of the ocean

help our understanding of how the ocean operates and causes unusual activities?

Evidence and Information:

- Historical records
- Individual accounts
- Myths and legends
- General scientific data of the Bermuda Triangle area (analysis of plate tectonics, geological oddities, and weather patterns)

Assumptions:

- Dangerous interactions between man and the sea are common and are usually the result of storms and even rogue waves. They are likely not the result of sea monsters (or an undiscovered species of marine life).

Concepts:

- Biology

- Weather patterns
- Species variation
- Geology
- Ship travel
- Sea monsters
- Waves
- Gulf Stream
- Current
- Myths/legends

Context:

- Biological context
- Historical context
- Geological context
- Meteorological context
- Mythological context

Point of View:

- This would be from the point of view of an oceanographer trying to understand how the effects and inner-workings of the ocean can

lead to disaster.

Purpose:

- To understand the biological, geological, and meteorological aspects of the ocean and their relation to ships disappearing.

Implications and Consequences:

- The main consequences would be an increase in our understanding of what goes on out in the open ocean and how scientists can work to better predict and prevent tragedies.

Conclusion and Interpretation:

Many of the disappearances out in the ocean, especially in the Bermuda Triangle, are likely the result of bad storms, rogue waves (once thought to be mythical, but they have been proven true), and strong

currents—not because of any mythical sea creatures such as the Kraken or sirens.

Engineering

Question at issue:

How can the study of ship/plane mechanics help us understand how these machines operate and function when going out to sea?

Evidence and Information:

- Historical documents
- Records of ship/plane disappearances
- Principles of mechanics/engineering
- Individual accounts

Assumptions:

- Technical issues are common in most aircraft/ships, and it is possible that a combination of technical failures and bad weather resulted in many of the reported incidents in the Bermuda Triangle. Other possibilities, such as attack from an enemy vessel or explosions within certain ships, should also be considered

Concepts:

- Aviation
- Seamanship
- Mechanics
- Physics
- Wreckage

Context:

- Physical context

- Historical context
- Mechanical context

Point of View:

- This would be from the point of view of a mechanical engineer trying to understand if these ships and planes disappeared because of technical issues.

Purpose:

- To understand how the handling and operation of aircraft and ships are related to their disappearances in the Bermuda Triangle

Implications and Consequences:

- The consequences/implications would be a better understanding of how these ships/planes went down and what improvements can be made to modern ships/planes to

prevent further incidents from happening.

Conclusions and Interpretation:

It is entirely possible that some of these disappearances were the result of mechanical failures, bad weather, or both. Despite this, there is no supernatural explanation for the failure of mechanics in the Bermuda Triangle. However, hexagonal clouds, which generate sea surface wind reaching nearly 100 miles per hour, and storms can certainly have negative effects on ships or planes.

Empirical Claims

Our Empirical Claim

The more commonly known theories concerning the Bermuda Triangle—such as UFO's, sea monsters, time warps, and Atlantis—are not valid explanations as to what happened to certain planes/ships. There are many more scientifically plausible and well-researched theories to explain these events, such as the Gulf Stream current, hexagonal clouds/air bombs, rogue waves, and magnetic anomalies.

Our Claim under the Standards of Critical Thinking:

- **Clarity:** Our claim uses clear and precise wording to get the point across.
- **Accuracy:** We used accurate

sources and presented information as accurately as we could.

- **Precision:** Our research used narrow searches and terms to find the best and most specific information.
- **Importance:** Our findings are not exactly life-changing, but they are a start to forming solutions of how to prevent more wrecks and to possibly bringing closure to disappearances.
- **Relevance:** Our research could shine a light on how to find wreckage and remains from Bermuda Triangle disappearances. We used evidence and theories all relevant to OAI.
- **Sufficiency:** Our claim should have sufficient scientific evidence to counter many popular pseudo-theories regarding the Bermuda Triangle.

- **Depth:** Our research does not go into too much depth regarding certain mysteries, but instead covered basic information.
- **Breadth:** Our claim covers a wide variety of theories to explain examples of disappearances of the Bermuda Triangle, both pseudo-theories and accepted scientific theories.

Inductive Reasoning

True Premise 1: There are reports of UFO sightings in the Bermuda Triangle.

True Premise 2: Ships and planes have gone missing in the Bermuda Triangle.

Weak Inductive Reasoning: Therefore, UFOs must have been responsible for the

disappearances of ships and planes. (Argument relies on uncorrelated, unfounded claims.)

Logical Conclusion: Rather than depending on the pseudoscientific theory of extraterrestrial life to explain the disappearances, it's much more reasonable to find answers in things that can be scientifically proven, such as the Gulf Stream current, hexagonal clouds/air bombs, rogue waves, and magnetic anomalies. Additionally, it should be considered that eyewitness accounts of UFOs hold no scientific weight in proving their existence.

Deductive Reasoning

True Premise 1: Columbus reported seeing a 'great ball of fire' crash into the ocean in the Bermuda Triangle.

True Premise 2: UFOs are sometimes described as balls of light or fire.

Weak Deductive Reasoning: Therefore, the

"great ball of fire" seen by Columbus must have been a UFO.

Logical Conclusion: The premises here do not lead deductively to the conclusion that Columbus saw a UFO (in the extraterrestrial sense) due to there being a lack of evidence for UFOs and the fact that not all UFOs are described this way (meaning there is no way to know whether a ball of light/fire is indeed a UFO).

Abductive Reasoning

Observation 1: The ocean is very deep.

Observation 2: We know very little about the ocean, and have only explored a very small portion of its waters.

Weak Explanation: Since we know so little about the ocean, there is no way to prove that yet-to-be-discovered sea creatures are not lurking in the deep waters of the ocean. (Argument makes an appeal to ignorance.)

Logical Explanation: While we may know very little about the ocean and its contents, there is not sufficient evidence to prove this theory of unknown sea creatures causing wrecks in the Bermuda Triangle. The listed observations only point to how difficult it can be to discover the remnants of ships and planes that go missing.

Logical Fallacies

Cherry Picking

For many pseudo-theories, such as UFO's and time warps, supporters rely heavily on picking out certain pieces of evidence, such as reported sightings and misinterpretation of individual accounts (ex. Columbus's journal), and they usually don't consider any of the evidence that counters their argument/theory.

Appeal to Ignorance

This fallacy is present for all pseudo-theories covered, as supporters of each argue that, since the theories can't be completely disproved, they should be viewed as legitimate possibilities.

Circular Reasoning

Supporters of the Sea Monster theory argue that sea monsters do exist because there are stories about them saying they are real, but those stories can't be proven either.

Hasty Generalization

Many conspiracy theorists who talk about the Bermuda Triangle seem to think that all or most ships/planes that enter the area disappear because of a few examples, which is not true by any means.

5.1.2 SEE-I MODEL

State

Throughout this research, six credible/scientific theories for the disappearances in the Bermuda Triangle were found as well as an alternative five pseudo-theories that have little to no credibility.

Elaborate

Many theories have been made to try to explain the weird occurrences ranging from magnetic anomalies to wormholes and other creative theories/pseudo-theories. Other theories include sea monsters, Atlantis, aliens, the Gulf Stream, ship traffic, hexagonal clouds, and rogue waves. The figure below will go through different disappearances and anomalies that have occurred in the Triangle.

There are many different theories relating to the Bermuda Triangle, and they all vary in credibility. The table provided includes a summary of the various mysteries (refer to section 5.1.4 for table 5.1).

Exemplify: Pseudo-Theories

- **Sea monsters** – Many pseudoscientists have theorized that there are large marine organisms that have grown to outrageous lengths and have been able to destroy or capsize different ships. It's hard to determine the validity of this theory in some cases. There have been confirmed sightings of giant squid in very deep water, but this is due to gigantism as a result of high levels of dissolved oxygen in the lower depths of the ocean. However, many of the other supposed sea monsters found in pseudo-theories have no evidence backing the validity of their existence.
- **Atlantis** – The lost city of Atlantis is a well-known myth about a civilization that was destroyed and brought to the bottom of the ocean due to its failures and greed. Atlantis enthusiasts have speculated that the lost city could be located in the Bermuda Triangle and that this could be a reason behind the various disappearances of ships and planes. The myth of Atlantis has been proven wrong time and time again by oceanography and the lack of written records (outside of Plato's account) of such a civilization ever existing. Even if Atlantis were at the bottom of the Bermuda Triangle, it's unclear as to how this would affect the passage of sailors and pilots.
- **UFOs/Aliens** – UFOs have been blamed for the

disappearance of many planes and ships that have gone missing in the Bermuda Triangle (ex. Flight-19). "Sightings" of UFOs in the Bermuda Triangle go back as far as Columbus, who said he saw a "great ball of fire" crash into the ocean during his voyage (likely a meteor). Other ships have also reported seeing strange lights in the sky while sailing through the Triangle. Some also believe that UFOs are responsible for the magnetic anomaly in the Triangle that disrupts compasses. Because of the overall lack of evidence for the existence of extraterrestrial life on Earth, this theory is very clearly of a pseudoscientific nature.

- **Time-warp/Wormholes** – It is theorized that wormholes exist in the Bermuda Triangle, and that the existence of such wormholes explains why wreckage is hard to find after the disappearances. Wormholes are believed to be a shortcut through both space and time that could allow time travel. In other words, if a boat or plane were to accidentally come across a wormhole, it could be transported to another time and/or place. Though wormholes have not yet been proven to exist, they have been thrown into the controversy of the Bermuda Triangle.

Exemplify: Scientific Theories

- **Gulf Stream** – One of the most important questions to

ask when investigating a disappearance is, where did the evidence go? If Flight 19 crashed in the ocean and the BC Super Fortress sank, then surely there would have been some evidence left behind to entail that such events ever occurred; however, this isn't necessarily the case, or at least not in the way one might imagine. As many sea captains have described, the Sargasso Sea can have a calm appearance that puts sailors at ease. In fact, it was so calm at times that in the crews' negligence, ships would get stuck in seaweed, unable to move. While the ship is temporarily disabled, a violent current, formed by different temperature seas clashing, lurks underneath. This current is so powerful that it could easily pull any evidence of a crash up north by hundreds of miles in a short amount of time before the wreckage would even hit the seafloor. This would explain the "disappearances" that largely add to the mystery of the Triangle. There is a vast graveyard in the North Atlantic that could more than likely hold the wreckage of these ships and planes, and they have just been yet to be discovered.

- **Hexagonal Clouds and Air Bombs** – The bizarre cloud formations that are known to form over the Bermuda Triangle are known as "Closed Rayleigh-Benard Convection Cells." These clouds form because of heating at the base of the cloud and cooling at the top. The "Rayleigh Number " is used to explain how the convection and the heat in the clouds are moved through

both the center of the cell and edges, causing the distinct "honeycomb" shape. These clouds are essentially thunderstorm clouds that can produce "air bombs," or micro blasts, which are bursts of air up to 150 mph that can cause incidents with aviation.

- **Rogue Waves** – Rogue waves: such an ominous title for something and for good reason. These waves were once considered to only be the stuff of legend: waves so enormous that sailors described them as the gaping maw of a monster trying to engulf them. However, recent science has found that these waves do exist and could quite possibly explain what caused ships or even some planes to sink in the Bermuda Triangle. Rogue waves are described as shear walls, and satellite imaging has found these "walls" to be up to one-hundred feet high from trough to crest and much larger than surrounding waves. Some of the waters in the Bermuda Triangle are notoriously violent, known for their hurricanes and tropical storms that could easily create a rogue wave large enough to sink any ship or even low-flying aircraft.
- **Magnetic Anomaly** – There are many forms of magnetic disturbances or anomalies, ranging from geomagnetic storms and high deposits of iron ore that cause man-made instruments to malfunction. These disturbances can cause compasses and other magnetically powered instruments to act strangely because of the extra magnetism in either the storm or the pull from the

excessive ore in the ground. Because of the change in the magnetic pull, instruments such as compasses are nearly impossible to use in areas where there is a magnetic anomaly.

- **Methane Gas** – Off the coast of Norway in 2016, scientists discovered craters in the area of the Bermuda Triangle that had methane gas radiating from them. When methane gas is released into the water, it has the potential to sink ships and bring down planes extremely quickly; this would hypothetically give victims no time to communicate for help. Further research by these scientists has also determined that some parts of the ocean contain more methane pockets than others, which would explain the fact that more incidents occur in this specific location over others.
- **No Mystery** – As people search high and low for answers to the question of why disaster seems to reign in the Bermuda Triangle, perhaps many have failed to take into account the fact that there may be no mystery at all. The Bermuda Triangle is one of the most traveled areas in the ocean, and it follows that with higher levels of traffic, there will come higher levels of disastrous incidents. And because it can be difficult to differentiate between a fact and theory, pseudo-theories confuse the issue and create the ambiance of "mystery" around this area. In reality, however, the ocean continues to be a place scientists know very little about, and the different

scientific theories listed above may just be the tip of the iceberg when it comes to explaining the Bermuda Triangle's disappearances.

Illustrate

There are many theories that are used to help explain the disappearances that have been happening in the Bermuda Triangle. Many of the scientific theories offer reasonable explanations for most of the disappearances that have occurred, but some still need to be solved and will hopefully be solved as knowledge about the Bermuda Triangle expands. As for the pseudo-theories, most of them have very flimsy arguments, and they mainly rely on an appeal to ignorance.

The ocean is much like space in that there is little that scientists know about both places. But while the information available might be comparatively little, there are general rules that scientists know about both places that help them understand different phenomena that occur. For example, scientists know that there is no oxygen in space, and from this, they can defer different scientific conclusions. Something that scientists must always have in order to support a theory is evidence. Just like extraterrestrial life in space has no concrete evidence to back it, the pseudo-theories surrounding the Bermuda Triangle simply can't stand in the face of the standards of science and critical thinking. Using the argument of "if it can't be proven to not

exist, then it exists" does not work in the world of science, but only in the pseudoscience one.

5.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: If we can't find the missing vessels or the people on them in the Bermuda Triangle, we can't know whether or not the disappearances were caused by aliens or wormholes. In other words, there is no way to say that they were not sent to a parallel universe or abducted by aliens if we find no remains of the wreckage.

Rebuttal: As of right now, no observable evidence has been found in support of the theory that aliens exist, and without any basis to prove their existence, there can be no reasonable conclusion that aliens have abducted anyone or anything from the Bermuda Triangle. There has also been no evidence of the anomalies called "wormholes" either. No atmospheric or pressure anomalies

pointing to the occurrence of a wormhole have been observed near or on Earth.

The disappearances could have been due to the aforementioned magnetic anomalies. These could have caused a ship to lose its way, and then it could have hit either turbulence or rocks, causing it to sink in the water and be moved by the strong currents of the Gulf Stream away from the Bermuda Triangle.

Argument: There are many legends and folktales featuring sea monsters that are detrimental to sailors. Even though many of these are refuted because there is no "substantial evidence," creatures once thought to be myths such as the giant squid have been proven to exist, which could be the case for countless "mythological" creatures.

Rebuttal: While it is true that countless sea creatures could exist, the basic flaw with this argument is that the evidence necessary to make this theory stand in the scientific community is not available. By the same logic of this conspiracy argument, one might say that because the supposed "mermaids" seen by Columbus have been shown to likely have been seals sunbathing, then there is equal probability that accounts of sea creatures could be fallacious as there is for them being factual.

Argument: Atlantis is mentioned in a work by Plato, who is revered as a genius in ancient Greece and throughout history, providing substantial evidence that this lost city exists.

Rebuttal: Plato's tale of Atlantis is tightly woven

with Greek mythology, and his account is the only one in existence that references Atlantis. On further examination, it seems much more probable that Plato was speaking of Atlantis in a metaphorical way, rather than a literal one, in order to teach a lesson about greed.

5.1.4 RESEARCH PAPER

Introduction

The great mystery of the Bermuda Triangle, sometimes referred to as the Devil's Triangle, has intrigued society for over a century. The triangular section of the North Atlantic Ocean has borders stretching from Bermuda, Miami, and Puerto Rico. But what is so mysterious about a section of the ocean that, on the surface, seems like any other? It is the vast number of ships, planes, and people that have "vanished" on this sea. Reports of flying spheres of light and magnetic anomalies have been reported by Christopher Columbus himself. Tales of sea monsters, aliens, and more have been told by sailors since the age of exploration to help bring forth this mystery. Pseudoscientific theories on the various "oddities" of the Triangle have arisen over time, including sea monsters like the Kraken, alien abductions, time/space warps, and Atlantis. Scientific claims such as rogue waves, the Gulf Stream, heavy ship traffic, hexagonal clouds, and more have also been used as theories to explain the mysteries of the Devil's Triangle. This begs the question of which theories are more credible and why?

Sea monsters, aliens, and Atlantis are a lot more exciting than

heavy ship traffic or the Gulf Stream. However, is there any real evidence to back these claims? Unfortunately, most of these claims are built on anecdotal evidence and stories passed down, which are unreliable most of the time. If a detective is doing a murder investigation, they start by looking first at the crime scene before speaking to any eyewitnesses. If there is not a lot of physical evidence, eyewitness accounts are a great place to start. However, if a suspect is brought to court, they cannot be prosecuted based on the eyewitness account alone; there must be a sufficient amount of physical evidence to prosecute them for the crime. It is the same with evaluating a theory. While the pseudoscientific theories are based almost entirely on eyewitness accounts, the scientific theories are built on physical evidence found through the disciplines of oceanography, seamanship, and meteorology. It is for this reason that scientific theories are more credible than their pseudoscientific counterparts.

Background

As mentioned previously, the Bermuda Triangle is notorious for having many mysterious events that have occurred. Unsurprisingly, this has inspired many theories to explain the mystery. Each theory takes a shot at trying to uncover what is so significant about the sea between Bermuda, Miami, and Puerto Rico. Christopher Columbus wrote one of the earliest accounts of the oddities in the Devil's Triangle. He journaled that, when sailing the Bermuda Triangle, his

compass malfunctioned, and a strange orb of light fell into the ocean. This is where the mystery began (Robinson, n.d.). The second mystery on record is the disappearance of the Mary Celeste in 1872. The ship was an oil tanker with thirty-nine souls on board. After nineteen days of searching, the only debris from the ship found were life jackets and other survival equipment (Blumberg, 2007). In 1918, a similar event occurred with the American Warship the USS Cyclops. After departing from Barbados for Baltimore, the ship was never seen or heard from again. No distress call was ever sent out by the ship, adding to the mystery (Frost, 2019). Flight 19 is another well-known mystery from the Bermuda Triangle. It refers to the "disappearance" of five Avenger planes that departed Wednesday, December 5, 1945, at around two p.m. Two hours later, distress calls were heard over the radio. The planes were flying directly above the Bermuda Triangle, and the conditions were very dangerous. The last call from the planes came at around seven p.m. when the planes had only an hour's amount of fuel left, and nothing was heard from them again. No wreckage, no evidence, and not a single body was left behind to point to what happened (Wilkes, 1987, pp. 1A–2A). More recently, in 1970, Bruce Gernon reported an intriguing event that took place during his flight directly over the Bermuda Triangle. He claimed that he encountered a large tunnel of clouds that spun counterclockwise. He alleged that he was in the tunnel for up to two hours or so before arriving in Miami thirty to sixty minutes early (Bhattacharya,

n.d.b). Other disappearances and oddities have occurred in the Bermuda Triangle as well.

It is estimated that over fifty ships and twenty airplanes have disappeared in the Bermuda Triangle, which is not that out of the ordinary, especially when considering the sea's harsh environments combined with the heavy ship/air traffic that occurs in the area (The Editors of Encyclopaedia Britannica, 2021). The Bermuda Triangle is notorious for its storms and intense ocean conditions, which form because of diffraction heat patterns (Njau, 1995). The conditions of these storms have been proven to create water spouts, rogue waves (enormous, outlying waves that have been found by satellites to go up to one hundred feet tall), and hexagonal clouds (thunderstorm clouds that can produce "air bombs," or micro blasts, that burst air up to 150 mph) (National Weather Service, n.d.). Along with these conditions, the area of the Bermuda Triangle includes an incredibly strong gulf stream and the Sargasso Sea (a free-floating "rainforest" of seaweed that can physically stop ships from moving when there is a lack of airflow) (Coddington and Kelly, 2017, pp. 26–29). Given these conditions, it is understandable how ships and airplanes could go down and be carried away in this ferocious sea.

Rough weather and ocean conditions, however, are not satisfactory answers for everyone. There are those who believe in the theories aforementioned; namely, Atlantis, sea monsters, UFOs/aliens, and wormholes. In this research paper, a select

few of the collective theories will be examined further in order to find the credibility of each. To go about checking each individual theory's accuracy, the examples will be paired with applicable disciplinary lenses in order to determine whether the theory is scientific or pseudo-theory promotion. In Table 5.1, seven examples of Bermuda Triangle mysteries have been listed for reference:

Table 5.1

Bermuda Triangle Mysteries

Vessel/Plane	**Date**	**History/Background**

Boeing B-29-25-MO Superfortress 42-65289	11/16/1949	The Boeing B-29 Superfortress w reliable strategic bomber used du WWII that was capable of flying across the Atlantic Ocean. Unfortunately, B-29 42-65289 w unable to make its route from California to the UK during a ro training exercise. The plane was running low on fuel and eventua radioed in that they needed to st and resupply. After two to three hours, the plane did not return. base sent out search parties. The had 2 fatalities, and the ship was destroyed in the crash landing. M of the crew said that they though they were heading in the vectors given, but they never got to the destination (Aviation Safety Network, 2022).

USS Cyclops	March 1918	The USS Cyclops was an Americ warship that vanished in the Bermuda Triangle during WWII was sent to deliver tons of manga ore to Baltimore after it had resupplied in Barbados. Howeve never arrived and left no trace of happened to it. No distress call w ever sent out by the ship, adding the mystery (Frost, 2019).

Flight 19	12/5/1945	Flight 19 refers to the mysterious disappearance of the five Avenge planes that departed Wednesday, December 5, 1945, at around 2:0 p.m. Two hours later, distress cal would be heard over the radio. T planes were flying directly above Bermuda Triangle, and the conditions were very dangerous. last call from the planes came arc at 7:00 p.m. when the plane only an hour's worth of fuel remainin No wreckage, no evidence, and r one body was left behind to poir what happened (Wilkes, 1987).

DC-3	12/27/1948	According to T. Morson (n.d.), t DC-3 was there one second and from the radar the next. The spo where the DC-3 disappeared was above 20-foot deep water, and m aircraft would be clearly visible a going down in such a shallow are However, the aircraft was unable be found. The rescue crews work that night to try and find the wreckage but eventually had to s their search due to no evidence t crash happened in the area.
Mary Celeste	12/5/1872	The Mary Celeste was an Ameri merchant ship that was found in 1872 completely abandoned off Azores Islands. It was labeled as a "Ghost Ship." The crew's person belongings were all still on the sh including 1500 barrels of alcoho there was no trace of the crew. However, the lifeboat and captai log were gone as well (Blumberg, 2007).

Marine Sulphur Queen	2/4/1963	The Marine Sulphur Queen was oil tanker that was carrying 15,0 tons of oil at 275 degrees Fahren with thirty-nine crewmen on bo On February 4th, the ship sent a radio transmission that seemed t inconsequential in nature, but th was never heard from again. Afte days of combing surface waters f any evidence, the search party co only find debris from the ship su life jackets and other survival equipment. It was a well-known the ship needed some extreme maintenance fixes, even being described as a "floating garbage c (Bhattacharya, n.d.a).
Gernon's Plane	1970	Bruce Gernon was a veteran pilo was making a routine run from t Andros Islands to the coast of Florida. About 3 miles off the co of the island he was surrounded tunnel of clouds. As he was trave through the tunnel, lines appear and the tunnel began spinning i counter-clockwise manner, propelling his plane forward. Du this, there was a sensation of zero gravity, and electronic systems be to fail. He arrived 30 minutes ear than what it typically takes to fly route (Bhattacharya, n.d.b).

Pseudo-Theory and Scientific Theory Comparisons

One of the popular theories associated with the Bermuda Triangle is that sea monsters are rampant in these waters. The

supposed monsters include creatures such as the Kraken, sirens, and other large monstrosities allegedly roaming the deep. A popular disappearance often associated with sea monsters is the USS Cyclops, which was a freighter during World War One. The mysterious disappearance of this large ship left many people baffled as to what could be the cause. It is theorized that sea monsters are responsible for the lack of shipwreck remains, but the mystery has slowly been pieced together since the disappearance. In order to find an explanation for this strange incident, various discoveries made by oceanographers have been examined in hopes of coming to a scientifically sound conclusion. According to our research, the most likely explanation is that the ship encountered a rough storm, sank, and the pieces of the wreckage were carried away from the storm by the powerful Gulf Stream, creating the illusion of a disappearance (Frost, 2019).

Sea monsters are also said to have the ability to raise massive waves that could swallow ships. But science once again has untangled the mystery of these monsters of the depths. Rogue waves were once thought to be mythological, but after further research, it was found that they are quite real and can reach up to 100 feet in height and cause severe damage to ships of all sizes (The Week Staff, 2019).

> British researchers used lab and computer models to simulate the effects of rogue waves more than 100 feet tall on ships as part of an investigation into the Bermuda

> Triangle. Ships that were sufficiently long could get caught suspended between two wave peaks with nothing supporting them from below and snap in half. (Scharping, 2021).

These lab tests are meant to simulate wave conditions that can be found in the Bermuda Triangle due to its naturally dangerous location. Being in the western portion of the North Atlantic puts this section of the ocean in the direct path of many hurricanes and other large storm cells that form over the warm, tropic water. Another major flaw of the sea monster theory is that many of the creatures are of mythological origin and have no indisputable evidence to prove their existence. Many people who believe these theories to be true are using the logical fallacy of appealing to ignorance (Lavin, 2020, pp. 98–99).

The legend of Atlantis has also been used to explain both sea monsters and Bermuda Triangle mysteries. It is said that some sea monsters such as the Kraken emerge from Atlantis and rise to the surface to attack sailors or low-altitude aircraft. The belief of Atlantis being the cause of some disappearances is primarily used by believers in the lost city to push their dying idea. The myth has been proven to be incorrect time and time again by oceanographers and historians, using scans of the ocean floor where the city allegedly sank as well as the historical understanding that Plato came up with the story as a metaphor for ancient Greek society (Gill, 2021). The argument for

Atlantis is similar to that of the sea monsters in that it has no physical proof to support its claims. The Atlantis theory lacks depth, and, ironically, remains a very "surface-level" argument. Typically, cherry-picking is used to formulate a case in favor of Atlantis (Lavin, 2020, pp. 103–105).

Another working theory that circulates the Bermuda Triangle is that the area is a hotspot for UFOs, aliens, and paranormal activity. The alleged sightings of UFOs date back to Christopher Columbus and the Age of Exploration. Columbus recorded in a journal how he had seen a large bright orb fall from the sky into the ocean (Robinson, n.d.). There have also been disappearances that were blamed on these alien encounters. Some say the famous Flight 19 had an encounter with aliens. But when taking a closer look, there is evidence of other possible reasons behind these strange occurrences. An explanation for Columbus' famous tale would be the obvious solution of a small asteroid lighting up upon entry into Earth's atmosphere and crashing into the ocean at a distance. These asteroids are known to make brilliant light as they enter the atmosphere, and this would probably be an unknown phenomenon for him and his crew. For Flight 19, it was revealed in later years after the crash that Flight 19 was a training flight, and human error and a bad storm caused the pilots to lose control and crash their aircraft:

> Where the planes went down, there was no moon; it was the proverbial dark and stormy night; the winds were high

> and seas were turbulent; and all was blackness. ... While there were other contributing factors, the principal cause for the loss of Flight 19 was an error by Charles Taylor. (Wilkes, 1987, p. 2A).

The theory of extraterrestrial life and/or UFOs shows traits of a red herring fallacy in how it brings different arguments into question rather than further examining the known facts (Lavin, 2020, pp. 89–91). There is a lack of depth or breadth in the entire theory, and there is no indisputable evidence supporting the theory of extraterrestrial life.

Another theory about the Bermuda Triangle is that of spontaneous wormholes appearing and possibly transporting people and vehicles to a different dimension, place, or even time. One of the more popular cases of this supposedly occurring is Bruce Gernon's experience, where he encountered a tunnel of clouds that "transported" him to his destination ahead of schedule. This incident occurred in the early 70s. Since then, the idea of wormholes has been popularized. It's become clear after further research that electronic fog is most likely the culprit of this event. Electronic fog can cause devices to malfunction, and this was something that Gernon reported in the aircraft. Electronic fog can also cause low visibility, and it is likely that the tunnel that formed was because of the aerodynamics of the aircraft and he perceived it as a tunnel (Bhattacharya, n.d.b). Wormholes lack the necessary data, information, and evidence to be considered a functioning

theory even in space, let alone in the Atlantic Ocean (Jones, 2021). The result of all these facts is a very weak argument in favor of wormholes, one that is based on mere speculation rather than compelling evidence.

The last theory (of sorts) to bring up after examining all these fallacious theories and their scientific counterparts is that there may be no mystery at all. This is a point that may sometimes be overlooked in a situation so dramatized by conspiracy. But the down-to-earth fact is that the Bermuda Triangle is a highly trafficked area with the perfect weather conditions to create dangerous traveling conditions. Additionally, human error cannot be overlooked (Serpette, 2021). For example, in the case of Flight 19, evidence strongly indicates that Charles Taylor, the pilot of the doomed plane, made irresponsible choices that led to his and the crew's demise (Wilkes, 1987, 1A-3A). The National Oceanic and Atmospheric Administration from the U.S. Department of Commerce contends that "the U.S. Navy and U.S. Coast Guard contend that there are no supernatural explanations for disasters at sea. Their experience suggests that the combined forces of nature and human fallibility outdo even the most incredulous science fiction" (NOAA, 2010). It should not come as a surprise that an area more highly trafficked would report higher levels of incidents, especially when taking into consideration the dangerous conditions of that area and the unpreventable mistakes of people.

Conclusion

The ocean is much like space, in that there is little that scientists know about both places. But while the information available might be comparatively little to, say, land masses on Earth, discoveries that scientists have made up until this point allow them to understand both areas in a general sense, helping them explain different phenomena at times. For example, scientists know the patterns in which the planets rotate around each other and the sun, information that they can then use to explain the pattern of the seasons. In order to make these derivations, however, scientists are required to have sufficient evidence to support their theories. Just like extraterrestrial life in space has no concrete evidence to back it, the pseudo-theories surrounding the Bermuda Triangle simply can't stand in the face of the standards of science and critical thinking. Contrary to what pseudo-theory promoters might say, it is not science's job to prove why something doesn't exist, but only to show how it does.

After examining all of the evidence supporting and refuting the different theories around the Devil's Triangle, it almost seems as though the people who believe in the pseudo-theories on this topic must either be blatantly ignoring the science available or simply unaware of the information on the science. In his journal article about the discrepancies uncovered in the reports of a Bermuda Triangle "expert," M. Dennet concludes his criticisms by quoting another investigative author, who said,

> the less a writer knows about his subject, the better equipped he is to write a mystery about it. Ignorance of the subject is, in fact, a major technique in writing about the mystery of the Bermuda Triangle and other subjects in the so-called paranormal. (1981, pp. 50–51).

It seems that the best way for one to be a pseudo-theory promoter in the case of the Bermuda Triangle is to simply be ignorant of the science available.

After looking closer into these different theories and the science that either debunks or supports each, we can solidify our argument. The overall purpose of our argument is to see which theories have validity after being scrutinized under a scientific lens. The theories such as wormholes, aliens, Atlantis, or sea monsters that attempt to explain the mysteries surrounding the Bermuda Triangle are simply pseudo-theory promotion and not scientific in nature. Though these theories are long-standing arguments, their credibility is nearly negligible. Not only do the various theories lack evidence, but the supporters of these claims use arguments that are littered with logical fallacies that damage the very structure of the argument and taint any attempt at credibility. It seems that critical thinking in today's world is on the decline. In the words of one author:

> We are living, it is often said, in a time that is characterized by the rise of irrational beliefs and the disregard of scientific knowledge. However, our time is

> also characterized by the praise—at least in words—of critical thinking against unreflective gullibility. It is doubtless necessary to take various factors into account in order to explain this apparent paradox. ... The emphasis of cognitive autonomy both by philosophy and by the divulgation of critical thinking turns out to be harmful in two respects. On the one hand, the praise of cognitive autonomy may cause the rejection of scientific knowledge that contradicts our personal experience. This is perhaps most clearly seen in the case of those who believe in pseudo-theories. On the other hand, the emphasis on autonomous reflection contributes to the formation of a false confidence in biased reasoning. (Gascon, 2020).

It can't be understated how crucial it is to critical thinking to be sure to put research before anecdotal evidence, and furthermore, critical thinkers must be steady in remaining unbiased and not developing a false confidence. If all people could manage to be critical thinkers that followed these guidelines, then most likely, pseudo-theory promotion (such as that with the Bermuda Triangle) might not be so rampant, or at least not quite as successful in its deception. After examining the Bermuda Triangle's many conspiracy theories, as well as the ones well-grounded in science, the logical conclusion seems to be for the mystery of the Devil's Triangle to be characterized as a mist confusing the waters of the issue

with the scientific theories acting as a gust of wind that can clear the fog over the misty, murky waters.

References

Aviation Safety Network. (2022, May 14th). *16 Nov 1949 Boeing B-29 Superfortress 42-65289.* Flight Safety Foundation. Retrieved July 14, 2022, from https://aviation-safety.net/wikibase/59009

Bhattacharya, R. (n.d.a). *Disappearance of Marine Sulphur Queen in Bermuda Triangle.* Bermuda Attractions. https://www.bermuda-attractions.com/bermuda2_000066.htm

Bhattacharya, R. (n.d.b). *Electronic fog Hutchison effect in Bermuda Triangle?* Bermuda Attractions. Retrieved July 14, 2022, from https://www.bermuda-attractions.com/bermuda2_0000b3.htm

The Week Staff. (2019, April 10). *Bermuda Triangle: Six conspiracy theories about the mystery*. The Week. Retrieved November 13, 2021, from https://www.theweek.co.uk/95557/

bermuda-triangle-five-theories-on-the-mysterious-disappearances

Blumberg, J. (2007, November). *Abandoned ship: The Mary Celeste*. Smithsonian Magazine. https://www.smithsonianmag.com/history/abandoned-ship-the-mary-celeste-174488104/

Coddington, A., & Kelly, D. (2017). *Paranormal investigations: The Bermuda Triangle, Stonehenge, and unexplained places* [eBook edition]. Cavendish Square Publishing LLC. https://ebookcentral.proquest.com/lib/coastal/reader.action?docID=5405043&ppg=4

Morson, T. (n.d.). DC-3, *UFO's & the Bermuda Triangle*. The DC-3 Hanger. Retrieved November 11, 2021, from http://www.douglasdc3.com/dc3ufo/dc3ufo.htm

Dennett, M. R. (1981). Bermuda Triangle, 1981 model. *Skeptical Inquirer, 6*(1), 42–52. Retrieved November 11, 2021, from

https://skepticalinquirer.org/1981/10/bermuda-triangle-1981-model/

Frost, N. (2019, December 20). *Bermuda Triangle mystery: What happened to the USS Cyclops?* History. Retrieved November 11, 2021, from https://www.history.com/news/bermuda-triangle-uss-cyclops-mystery-world-war-i

Gascon, J. A. (2020). Autonomous thinkers, irrational thinkers. *Disputatio: Philosophical Research Bulletin*, *9*(13), 00–00. Retrieved July 14, 2022, from https://disputatio.eu/vols/vol-9-no-13/gascon-thinkers/

Gill, N.S. (2021, February 16). *Atlantis as it was told in Plato's Socratic dialogues*. ThoughtCo. https://www.thoughtco.com/platos-atlantis-from-the-timaeus-119667

Jones, R. (2021, January 31). *10 best theories that explain the Bermuda Triangle.* ListVerse. Retrieved July 14, 2022, from

https://listverse.com/2021/01/31/10-best-theories-that-explain-the-bermuda-triangle/

Lavin, A. (2020). *Thinking well: A creative commons logic and critical thinking textbook* (3rd edition). Course Hero. https://www.coursehero.com/file/68307737/Thinking-Well-Lavin-Edition-3pdf/.

Njau, E. C. (1995). The Bermuda Triangle mysteries: An explanation based on the diffraction of heat waves. *Renewable Energy*, *6*(8), 1017–1022. https://doi.org/10.1016/0960-1481(95)00098-X

Robinson, K. D. (n.d.). *Bermuda Triangle demystified?* The New York Times. Retrieved November 11, 2021, from https://archive.nytimes.com/www.nytimes.com/fodors/top/features/travel/destinations/bermudaandcaribbean/bermuda/fdrs_feat_29_8.html?n=Top/Features/Travel/Destinations/Bermuda+and+Caribbean/Bermuda

Scharping, N. (2021, March 11). *The Bermuda*

Triangle: What science can tell us about the mysterious ocean region. Discover. Retrieved November 11, 2021, from https://www.discovermagazine.com/planet-earth/the-bermuda-triangle-what-science-can-tell-us-about-the-mysterious-ocean

Serpette, S. (2021, June 30). *Top 7 theories behind the mysterious Bermuda Triangle*. 30A. Retrieved November 11, 2021, from https://30a.com/bermuda-triangle/

The Editors of Encyclopaedia Brittanica. (2021, June 10). *Bermuda Triangle*. Encyclopaedia Britannica. Retrieved November 11, 2021, from https://www.britannica.com/place/Bermuda-Triangle

National Weather Service: Nation Oceanic and Atmospheric Administration. (n.d.). *What is a microburst?* Retrieved November 11, 2021, from https://www.weather.gov/ama/microbursts

NOAA. (2010, January 4). *What is the Bermuda Triangle?* National Ocean Service. Retrieved

November 11, 2021, from https://oceanservice.noaa.gov/facts/bermudatri.html

Wilkes Jr., D. E. (1987). In 1945 Flight 19 flew to its doom through a large cloud of mystery. *The Athens Observer, 14*(47), 1A–3A. Retrieved November 11, 2021, from https://digitalcommons.law.uga.edu/fac_pm/19/

UNIT 5 CRITICAL THINKING EXERCISES

1. Before reading this information about the Bermuda Triangle, what did you know about this area in the ocean? Was there a conspiracy woven through the stories or theories you knew of?

2. How does information from false experts play a part in the pseudo-theories?

3. Why are personal testimonies and eyewitness accounts not considered satisfactory evidence in a court of law or in scientific research? Do anecdotes have a place in either setting? Why or why not?

PART VI
UNIT 6: ANTI-VAX

CHAPTER 6.1: IS NATURAL IMMUNITY MORE EFFECTIVE THAN IMMUNIZATION THROUGH VACCINES?

Figure 6.1

Syringe and Pills on Blue Background

Note. Image credits: Syringe and Pills on Blue Background by Anna Shvets, Pexels, Free to Use.

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6.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

Is natural immunity better than immunization through vaccines?

Evidence and Information:

- Studies and research of vaccines
- Historical and current use of natural remedies
- Study of the immune system, human body, ethical and political history

Assumptions:

- Vaccines are better and more effective, natural immunity is not guaranteed, and people prefer natural immunity due to their religious, political, or cultural beliefs.
- Natural immunity is effective in some cases, there is some merit to natural medicine.

Concepts:

- Vaccines
- Viruses
- Natural and modern medicine
- Herd immunity
- Vaccine hesitancy
- Centers for Disease Control (CDC)
- World Health Organization (WHO)

Context:

- Religious
- Political
- Scientific
- Cultural
- Historical
- Medical

Point of View:

- Biological
- Psychological
- Political
- Ethical

Purpose:

- To understand and decipher which type of immunity is more effective through research
- To reason through why the anti-vax community exists and what causes people to fear modern medicine/ vaccines

Implications and Consequences:

- An individual cannot control natural immunity, symptoms are not standardized and can vary.
- Vaccines have an adverse effect, some people may react negatively to vaccines. Vaccines offer a high probability of gaining immunity through being studied.

Conclusions and Interpretations:

There are pros and cons of both methods, but immunity through vaccines is often more effective and safer than natural immunity.

Disciplinary Lenses

Biology

Question at Issue:

How do vaccines affect the human body and immune system?

Evidence and Information:

- The functions of the body's immune system
- The human body's vulnerability to illnesses
- Modern vaccine efficacy
- Standardization of vaccines vs. unpredictability of natural immunity

Assumptions:

- Vaccines are the safest, most effective way to be immune from diseases and viruses.
- Each individual's body reacts differently, so a vaccine for one person may be the best option, while natural immunity may be better for another.

Concepts:

- Pathogens
- Antigens
- Antibodies
- Memory cells
- The immune system

Context:

- Public health
- Controversy over vaccines

- Covid-19 Pandemic

Point of View:

- Medical professionals
- Virologist
- Biologist

Purpose:

- To understand exactly how vaccines work to prevent illnesses
- To understand how antigens and antibodies work to fight off and destroy pathogens

Implications and Consequences:

- Vaccines reduce the uncertainty that comes along with natural immunity and the risk incurred when getting sick.
- Natural immunity can be effective on an individual level, however, the health and safety of the general population must be considered as well.

Conclusions and Interpretations:

Vaccines utilize the body's method of creating immunity—without it being necessary to obtain the illness itself. As with all medicine, there is some risk incurred when

receiving vaccines. It is substantially less than the risk involved with natural immunity.

Psychology

Question at Issue: What role does psychology play in vaccine hesitancy?

Evidence and Information:

- Social media algorithms and influence
- Individualistic views and conspiratorial thinking
- Fear of side effects from vaccinations
- Distrust in for-profit medical companies

Assumptions:

- There is little reason to fear vaccinations and modern medicine due to the rigorous scientific research done to ensure safety for the general public.
- The spread of misinformation through social media or news outlets can cause people to distrust the medical system.

Concepts:

- Superstition
- Nonconformist behaviors

- Herd immunity

Context:

- Isolation during the Covid-19 pandemic
- Misinformation through social media
- Mental health in times of crisis

Point of View:

- Anti-vaxxer
- Psychologist
- Medical professionals
- Social media influencer

Purpose:

- To understand why people would prefer herbal or natural remedies, what influences that preference
- To understand what causes hesitation and fear regarding vaccinations and modern medicine

Implications and Consequences:

- Many see natural immunity as being tried and true, whereas the controversy around vaccines often leads people to believe there must be something wrong.
- Since there is disagreement over the topic, people can

often feel as though those of the opposing viewpoint (pro- or anti-vaccines) are enemies. This can lead to a sense of isolation from one's community or social group.

Conclusions and Interpretations:

There is an overwhelming amount of evidence to demonstrate that vaccines have a positive effect. Therefore, vaccine hesitancy is often caused by fear or suspicion of the government, herd mentality, and misinformation.

Political Science

Question at Issue:

How do politics influence a person's decision to accept or reject a vaccine?

Evidence and Information:

- Governmental intrusion on autonomy
- Political polarization
- Foreign disinformation
- Propaganda targeting minorities

Assumptions:

- Political views heavily influence opinions regarding vaccine regulations and policies.
- Individuals will make up their own minds about

vaccines regardless of what governments, scientists, and celebrity influencers may say about them.
- Vaccine hesitancy is found on both sides of the political spectrum.

Concepts:

- Bodily autonomy
- Politicization of health

Context:

- Political tribalism
- Mandated health procedures

Point of View:

- Politician
- Legislator
- Civilian

Purpose:

- To understand how people's political views influence their choices and beliefs regarding vaccinations
- To understand what role politics plays in the development and administration of vaccines

Implications and Consequences:

- The required administration of vaccines can violate an individual's bodily autonomy and cause people to distrust politicians and governmental policies.
- When allowing people to choose whether to get vaccinated, there is more risk associated with the spread of illnesses.

Conclusions and Interpretations:

In general, people tend to follow the views and opinions of their political party regarding vaccination policies. One's political views are not always definitive but can have a strong influence on decisions regarding health.

Ethics

Question at Issue:

What moral values and beliefs are relevant when deciding for or against vaccines?

Evidence and Information:

- Religious groups' stances on vaccines
- Religious leaders' justifications for or against vaccines
- Role of individualism vs. community values in predicting stances on vaccines

Assumptions:

- People's morals are often heavily dependent on their religious and political beliefs.
- People's principles tend to become more conservative when their children are perceived to be in danger.
- Religion can be an integral part of how people find community and form opinions.

Concepts:

- Ethics
- Morals
- Cultural/religious differences
- Faith
- Faith healing

Context:

- Religious
- Cultural
- American
- Covid-19 pandemic

Point of View:

- Believers of various faith groups
- Agnostics or atheists

- Philosophers

Purpose:

- To understand what underlying principles and differing ideas can influence the avoidance of vaccination
- To understand what underlying principles and differing ideas can influence an individual to get a vaccination

Implications and Consequences:

- A religious believer may have strong opinions regarding vaccinations based on their respective religious text and how they interpret their own right to religion and bodily autonomy.
- Someone who is not strongly influenced by religion will likely turn to differing sources of information regarding vaccinations and bodily autonomy. For example, recent scientific research or their own personal moral code.

Conclusions and Interpretations:

Individuals often form personal beliefs based on their religious background, which can heavily influence their decisions when it comes to getting a vaccine.

Empirical Claims

Inductive Reasoning

True Premise 1: I utilized a natural remedy to overcome a sickness.

True Premise 2:I felt better as I was taking the natural remedy, then became healed.

Weak Inductive Reasoning: No one needs the vaccine because the natural remedy healed me and made me immune. (Argument relies on anecdotal evidence and makes a hasty generalization, drawing a grand conclusion on the basis of a sample size of one.)

Logical Conclusion: While I might be lucky to have experienced relief with a natural remedy (on the basis of my body's chemistry or genetics, or overcoming the small viral load I was carrying), my personal experience does not counteract the vast numbers of people quickly and effectively immunized through vaccines, nor the vast numbers of people falling gravely ill because they were not immunized.

Deductive Reasoning

True Premise 1: Natural remedies can boost the immune system to help heal sicknesses.

True Premise 2: People have been using natural remedies to heal the sick for thousands of years.

Weak Deductive Reasoning: Therefore, humans should rely on natural remedies to achieve natural immunity. (This

argument relies on the genetic fallacy; just because people have been using natural remedies for a long time doesn't mean that is the best or safest method now.)

Logical Conclusion: We now have vaccines, which are much more consistently effective. Especially for people with underlying health issues, natural remedies may not be strong enough, so vaccines are the safest and most efficient option to achieve immunity.

Abductive Reasoning

Observation: My friends and family members who got the COVID-19 vaccine got sick a few days after they got the shot.

Weak Prediction: The shot is more dangerous than the disease. (Argument ignores relevant evidence.)

Best Prediction: Side effects from vaccines are common, temporary, and very mild in most cases, especially in comparison to the number and duration of symptoms and even fatalities resulting from the disease itself.

6.1.2 SEE-I MODEL

State

Immunity through vaccinations has been proven to be more effective and safer than natural immunity for most individuals.

Elaborate

The political and religious division has led to a great deal of controversy surrounding vaccines, which seems to almost completely subvert the medical community and research that has been conducted. While not all anti-vaxxers are completely against vaccinations, there can be a multitude of hesitations about vaccines. This may result in delays when getting vaccinated and potentially lead to more outbreaks of certain diseases.

Exemplify

- **Biology:** The pushback of the measles, mumps, and rubella (MMR) vaccine sparked considerable backlash due to its alleged association with autism. The backlash stemmed from a publication in "The Lancet" by British

former researcher and physician Andrew Wakefield. Wakefield used flawed research methods to draw conclusions. In 2013, the CDC published a study confirming that vaccines do not cause autism. The study focused on the number of antigens produced from vaccines during the first two years of a child's life. The results showed that the total amount of antigen from the vaccine was the same between children with autism and those who did not have autism (DeStefano et al., 2013).

- **Psychology:** Misinformation and persuasion on social media are some of the biggest causes of vaccine misconception. A study by Mitra et al. (2016) found that many parents who choose not to vaccinate their children get their information from social media rather than from a professional source. It was also discovered that people who carry anti-vax ideas are more likely to use conspiratorial, group-focused language on social media. This attracts those who "show similar conspiratorial ideation and suspicion toward the government even before they start expressing anti-vaccine attitudes."
- **Political Science:** In 2019, public schools began requiring more vaccines, and the suggestion to get seasonal flu shots was becoming strongly encouraged. However, with the COVID-19 pandemic also came conspirators and many others who questioned the "requirement" of the mandate. Similarly, the claim that

the government is trying to gain control or track the abilities of the citizens of the United States is based on conspiracy and distrust of governmental authority.

- **Ethical:** A study conducted by the Departments of Sociology at both Columbia University and Stanford University measured the vaccination intentions of participants, their intentions to encourage others to vaccinate, and their trust in medical experts. The study found that these three ideas were significantly related to the individual's religion. The universities then highlighted the religious identities of many medical experts, proving that their ideas are complementary to those of the participants. The results of the study concluded that "invoking common religious identities with medical experts can lead to increases in vaccination intentions and willingness to encourage vaccination..." (Chu et al., 2021, p. 3).

Illustrate

The anti-vax idea is similar to when pest control comes to spray for bugs in a home in hopes of killing them. The homeowner could opt to use a more natural pest control method in hopes of deterring the bugs, though if pest control comes to spray for the bugs it would have a more effective, timely, and controlled result. However, if the homeowner experiences any kind of adverse effects from the pesticides being used, it might be more

beneficial to continue trying to use natural methods. The pest control in this scenario can be compared to a vaccine. Individuals could hope natural immunity will be achieved if they get sick, whereas vaccines allow one to have a defense against the sickness beforehand and are more effective in achieving immunity. Just like the analogy, however, vaccination is not 100% effective or safe for every individual and some may need to take extra care when making a decision about their health. This is part of why herd immunity is so important: to protect those whose immune systems are already weakened or may not be able to get a vaccine.

6.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: If immunity can be achieved naturally without vaccines, then why are vaccines necessary?

Rebuttal: While immunity can be achieved naturally, it may not be the smartest option for some people, such as children, the elderly, those with underlying health conditions, etc. Vaccines are more efficient because they prevent illness or strongly reduce symptoms. They are standardized and administered in a controlled and safe environment.

Argument: Vaccinations are only created so that for-profit medical companies can take advantage of the situation for their own gain.

Rebuttal: The medical professionals who create the vaccines have values and regulations that they must follow in order to test and approve the vaccine. These professionals are working in the best interest of society and would not encourage vaccination if it was not up to standard.

Argument: Vaccine mandates and legislation limit a person's right to choose and have bodily autonomy.

Rebuttal: Vaccine mandates are set in place for the greater

good of society. Political propaganda on various media platforms creates warped ideas about the purpose of vaccine mandates, swaying people on whether or not to follow them. Everyone has the fundamental right to bodily autonomy and to make their own healthcare decisions. However, since these rights are not absolute, they do not include the right to inflict harm on others. Therefore, vaccines are a justifiable intrusion on an individual's autonomy.

6.1.4 RESEARCH PAPER

Introduction

In recent years, the anti-vax community has grown significantly in light of the coronavirus pandemic. The community is not new, as opposition to vaccines and the anti-vax presumptions can be seen as far back as the 18th century. These ideas originated primarily due to religious, moral and political reasons. Members of the anti-vax community believe that there are safer and more effective routes to take toward immunity and would rather refrain from getting vaccines. Anti-vaxxers may not reject vaccinations entirely, but their skepticism and concerns often lead to a huge delay in vaccination. Natural remedies are typically their first resort, which are used to strengthen the immune system and hopefully gain immunity naturally rather than through the aid of vaccines.

Said natural remedies include cinnamon, honey, cranberry juice, tea tree oil, grapefruit, garlic, and eucalyptus, to name a few. Cinnamon, for example, is said to have anti-inflammatory properties, antioxidants, anti-HIV, and insecticidal activity. Naturopathic doctors who study non-toxic ways to prevent illness recommend herbal decoctions to improve respiratory health and protect against viral infections. According to the

practice of Ayurveda, a plant-based science, the use of cinnamon and honey alone can treat almost any health problem (Arora et al., 2021).

Natural methods are also quite common when it comes to the prevention or cure of a urinary tract infection (UTI). For urinary tract infections, cinnamon prevents the spread of bacteria and reduces the inflammation that causes painful urination. Cranberry works like a natural antibiotic and tea tree oil fights against the bacteria that causes a UTI. Garlic is said to reduce inflammation and provide support for the immune system (Pulipati et al., 2017). Evidently, natural remedies are multi-purposeful when it comes to their different healing methods and illnesses that they affect. Such plants or concoctions can be used to treat skin irritations, arthritis pain, bladder infections, gums, and tooth infections. They can regulate cholesterol, help with weight loss, prevent fat buildup, and soothe the cold and flu.

Obviously, these natural practices can have many health benefits, though they may not work for every person or every illness. In some cases, natural alternatives are not strong enough to fight off infection, and antibiotics are needed. For example, some people drink tea with honey when they have a cold to help their throat. Honey is thought to help soothe one's throat and the sugar in it aids in providing them energy. However, in many instances, people also take cough medicine or Advil to help their body fend off the ailment. Though tea and honey can help soothe someone's throat, it is common

that stronger methods are needed to quickly recover or ensure the sickness does not get worse.

A common belief held by many anti-vaxxers is the idea that natural remedies can and should be used in practically all situations. While this seems a wonderful notion, the reality is that natural remedies are not consistent and reliable enough to ensure the best health for everyone. For example, natural medicine may not be strong or efficient enough for people with underlying health issues, such as an autoimmune disease. Those who are part of the anti-vax community may reason that, since they felt better or experienced reduced symptoms while utilizing a natural remedy, there is no further need for a vaccine. Incorrectly associating the reduction of symptoms with being cured, they may reach the conclusion that a vaccine is unnecessary. However, this is not always the case. In the process of getting sick in order to develop natural immunity, the person is not only liable to serious health concerns (depending on the severity of said illness), but they also run the risk of spreading the disease to other friends and family through contact.

Biology

To understand the role of vaccines in health and wellness, it is first necessary to understand how exactly the immune system works. According to the World Health Organization (2020), pathogens are disease-causing organisms that infect the body and immune system, leading to illness. Each type of pathogen

has specific parts called antigens, which are what trigger the formation of antibodies. Antibodies act as the soldiers of the immune system in order to fight off pathogens; the human body has hundreds of different antibodies that act as protection from many different pathogens. When exposed to a pathogen, it takes the body time to respond and produce new, specific antibodies in order to dispose of the pathogen. The time it takes for the body to produce antibodies is the time it takes to get sick. Since each antibody is specific to a certain pathogen, the immune system does not have any prior antibodies to fight off the new pathogen. Once the body produces antibodies that are specific to the pathogen, the antibodies produce memory cells. These memory cells remain in the immune system even after the pathogen has been destroyed, and act as protection against the possibility that the same pathogen infects the body. Memory cells help keep people from getting sick with the same illness because the body already knows how to respond.

Vaccines contain weakened, inactive pieces of the antigen that trigger an immune response, which is the production of antibodies. Rather than getting sick and waiting for the immune system to go through the process of creating new antibodies, newer vaccines contain instructions on how to produce antigens. Receiving a vaccine will not cause the disease in the individual, but rather make the body's immune system respond as if it was infected with the actual pathogen. In some instances when multiple doses of a vaccine are needed,

the purpose is to allow for the production of longer-lived antibodies and the development of memory cells.

Vaccines are also more standardized and give people the ability to choose when they receive them. Conversely, an individual does not have control over natural immunity, and it can have a large range of effects whereas "vaccines are designed to create the most significant immune response without safety concerns" (Dinerstein, 2022).

Vaccines are one of the most effective methods in preventative medicine to protect society from diseases and infections. They have been proven to help decrease the amount of common childhood diseases, and have helped to almost completely eliminate some diseases, such as polio, worldwide (World Health Organization, 2020; Leung et al., 2018). The most recent misconception surrounding vaccines is the pushback to getting the measles, mumps, and rubella (MMR) vaccine because of the supposed connection to autism. The backlash against the MMR vaccine is partially due to a publication in *The Lancet* by British former researcher and physician Andrew Wakefield. Since the original article was published, there have been extensive amounts of research and studies done to disprove this misconception. Wakefield used flawed and unethical research methods to draw conclusions, which made it easy for other researchers to disprove his paper and the supposed association between the MMR vaccine and autism. In 2013, the CDC published a study confirming that vaccines do not cause autism. The study helped prove this

by focusing on the number of antigens given via vaccinations during the first two years of a child's life. The results showed that the total amount of antigen from the vaccine was the same between children with autism and those who did not have autism (DeStefano et al., 2013).

However, given that the debate surrounding autism and vaccines is still ongoing, it is clear that the fear-mongering idea has taken hold. There has also been some speculation about an ingredient commonly used in vaccines called thimerosal. Thimerosal is a mercury-based preservative that prevents germs from contaminating vials of vaccines. According to a study done in 2004, it has been shown that there is no relationship between thimerosal and autism. The scientific review concluded, "the evidence favors rejection of a causal relationship between thimerosal-containing vaccines and autism" (Institute of Medicine, 2004, p. 152). In addition to this study, there have been nine studies done since 2003 that disprove the connection between autism and vaccines, specifically the MMR vaccine.

There are more factors to consider when discussing the benefits of vaccinations. For example, herd immunity is the phenomenon in which everyone in a community becomes vaccinated to protect the well-being of the community as a whole. It creates a bubble of protection around the weaker or immuno-compromised members of the community. "Reaching herd immunity can protect entire communities and prevent pockets of disease from persisting" (Salim, 2012, 93).

However, due to increasing travel and global communities becoming more connected, there is a higher probability of pathogens getting passed on. Herd immunity protects against such a rapid infection; if everyone is vaccinated, then the likelihood of widespread sickness is limited and prevents future outbreaks of diseases (Hussain, 2018).

Psychology

The science of psychology studies how the human mind functions and can explain how external factors influence the way one thinks or acts. This is a vital area of study when considering anti-vax ideology, as it's important to understand why people think the way they do about vaccinations and furthermore, what causes vaccine hesitancy or fear. Social media is a fairly recent development that has altered many things about the current political and social world. Pertaining to the topic of vaccines, it has also been greatly influential in the spread of misconceptions and false information. A study by Mitra et al. (2016) has found that many parents who choose not to vaccinate their children get their information from social media rather than from a professional source. It was also discovered that people who tout anti-vax ideas are more likely to use conspiratorial, but group-focused language in their social media posts. This can be an attractive gateway to those who "show similar conspiratorial ideation and suspicion toward the government even before they start expressing anti-vaccine attitudes." Thus, misinformation and persuasion on

social media are some of the biggest causes of vaccine misconception.

When discussing the topic of vaccinations, it's easy to think that one might be able to convince those with vaccine hesitancy simply by throwing facts and information at the problem and expecting a result. However, it has been proven that this method is not only ineffective but can actually make the resistance to vaccines stronger in the individual addressed (Hornsey et al., 2018). Thus, it is important to recognize that those with anti-vax beliefs are not necessarily less educated or less intelligent than others, but rather that they are seeking and listening to sources of information that confirm their conspiratorial ideas. It is also evident that fear or hesitancy regarding vaccines often stems from a general mistrust in the government and healthcare industry. One example is the Vioxx and Bextra incident, where the seemingly harmless release of pain medications unknowingly caused an increase in mortality in those who took it. This and other incidents caused understandable mistrust among Americans toward the healthcare industry (Kim, 2018). However, though it is easy to see why such concerns are being put forth, the general fear regarding vaccines such as the COVID-19 vaccine has detrimentally decreased the rate of herd immunity. This leaves many members of society vulnerable to infectious diseases and overall creates a much greater risk. It is true that every vaccine will have possible side effects, just like every other medicine. There is always a consideration of potential costs and benefits

in healthcare, but vaccines are fortunately one of the safest methods in preventative medicine. By having a greater understanding of the role that psychology plays in anti-vax beliefs, the better chance there is of being able to prevent further spread of misinformation and increase vaccination rates.

Political Science

As the US becomes increasingly more politicized, so do topics concerning issues such as vaccinations. Political parties on both sides of the issue have strong opinions about the rules and regulations surrounding immunizations. Especially with the rapid sense of urgency that came with COVID-19 vaccines, people are now more than ever conflicted about what is the right course of action.

State governments have the power and right to change certain laws depending on what they believe will contribute to the greater good of their state. Vaccine mandates fall into this category, which means that there is not a cut-and-dried policy across the United States. Publications about public health often follow the LRA, or Least Restrictive Alternative Principle when discussing topics like immunizations and autonomous rights. The LRA Principle states that "one should choose the policy option that least restricts liberty," given that said options are equal in other respects (Navin & Atkin, 2019, p. 1044). The state governments have been cracking down on vaccination mandates since before the

pandemic. In 2019, public schools began requiring more vaccines than they previously did and the suggestion to get seasonal flu shots was becoming highly encouraged in larger populations. However, with the pandemic came conspirators and many others questioning the "requirement" of the mandate. Similarly, the claim that the government is trying to gain control or track the citizens of the United States is based on conspiracy and distrust of governmental authority.

The propaganda surrounding vaccinations has become extreme and harmful to the health and safety of the United States population. When making a decision regarding vaccinations, it is necessary to consider not only one's health and physical well-being but also those with autoimmune diseases or otherwise compromised immune systems. As a number of people may be negatively affected, the consideration is of great importance and should be made using scientifically proven information. As discussed by Colgrove et al., (2010), being too forceful regarding vaccine mandates may lead to backlash, which "[...]underscores the need for careful, individualized assessment of the risks and benefits of each new expansion of the state's reach into citizens' health decisions" (p. 791). Unfortunately, many seemingly neutral conversations on vaccines have become increasingly politicized. Rather than listening to a leader of a specific political party for education on vaccinations, it is important for people to conduct their own research stemming from credible, unbiased, and trustworthy sources.

Ethics

Another factor contributing to the spread of the anti-vax mindset is a combination of religious and personal beliefs. Religious upbringing, political beliefs, as well as one's morals and values all play a role in the formation of opinions regarding vaccines. Recently, there has been a growing amount of religious communities refusing to vaccinate their children. Due to this and other reasons for vaccine hesitancy, the rate of vaccination for infectious diseases such as measles continues to drop below the World Health Organization's recommended threshold (Giubilini, 2020; Salim, 2012). There has been a long-running debate in the Jewish religious community concerning whether or not the vaccination of children is morally sound according to their beliefs. A number of such communities "justify their resistance to inoculation on various religious grounds and make common cause with secular groups who oppose vaccination for their own reasons" (Rashi, 2021, p. 2964).

Christianity has also had an increasingly strong influence on anti-vax ideas, due to the fact that Christian beliefs often conflict with the ideas of science or medical experts. Studies have found that individuals are more persuaded by people who share common interests and values; therefore, Christians often look to other Christians when it comes to decisions regarding vaccinations. This bandwagon effect is not only seen in

religious groups but also in political parties as previously discussed (Lavin, 2020, pg. 95).

Figure 6.2 and 6.3

Religious individuals protest the mask and vaccine mandate during the Covid-19 pandemic

Note. Image Credit: Paul Bekker, 2020, Flickr, CC BY 2.0. Courtesy of Emma Shane, 2024.

The claim that "medical experts can build trust and motivate vaccination among religious groups by invoking a common religious identity" was tested in a recent study from the Departments of Sociology at both Columbia University and Stanford University (Chu et al., 2021, p. 2). NIH Director Francis Collins is an unvaccinated (to COVID-19) Christian who was put to the test in this study. He began his video by proclaiming his "trust in Jesus as the source of all truth" (p. 2). The study then measured the vaccination intentions of participants, their intentions to encourage others to vaccinate, and their trust in medical experts. The study found that these three ideas were significantly related to the individual's religion. Because of these results, Stanford University and Columbia University highlighted the religious identities of

many medical experts, proving that their ideas are complementary to those of the participants. The results of the study concluded that "invoking common religious identities with medical experts can lead to increases in vaccination intentions and willingness to encourage vaccination, even in a highly vaccine-hesitant population" (Chu et al., 2021 p. 3). If an individual's beliefs overlap with the beliefs of a medical expert, then that person will likely develop more reliability and trust in the medical experts, leading to a decrease in the anti-vax mindset.

Minority groups are also highly likely to have some level of vaccine hesitancy. African Americans turned out to be the ethnic group that was least likely to get the COVID-19 vaccine, which is directly linked to the doubt and suspicion of science and medical systems (Huang and Green, 2022). In a recent study, it was determined that the Coronavirus vaccine hesitancy was much higher in minority participants compared to white participants. Within these minorities there was a mistrust in the benefits vaccines offered, worries over the future effects of the vaccine, concerns about encouraging the vaccine just for profit, and the desire for natural immunity instead (Gerretsen et al., 2021). Previously, there has been a large degree of "exploitation and persecution" found in the United States healthcare system that has significantly affected the Black population. Examples of this exploitation can be found during the period of slavery. It was unfortunately common practice for physicians to use enslaved peoples for

"involuntary medical experimentation for both developing cures and profit" (Rusoja & Thomas, 2021, p. 1). Essentially, African Americans were terribly used as trial runs. It has been theorized that the distrust from Black communities concerning healthcare stems from this original discrimination and unequal treatment. The various racial injustices in America have unfortunately "created a culture of mistrust in medical research, clinical trials, and medical innovations within Black communities" (Restrepo and Krouse, 2021, p. 1148).

In his paper, "Science denial as a form of pseudoscience," Sven Ove Hansson (2017) establishes a spectrum among pseudosciences that is based on whether they deny known science or promote lesser-known pseudo-theories. The anti-vax movement does not start any new theories and it is much more widely believed than anything else that falls under pseudo-theory promotion. This would qualify the belief as science denial, being that it goes against the proven science of vaccinations. Those in the anti-vax community deny that vaccines are the safest and most efficient way to get immunization. Instead, they reject scientific evidence and turn to natural remedies.

Hansson's criteria for science denial makes it even more clear that anti-vax ideas fall very closely to the science denialism side of the spectrum. It meets the three criteria that Hansson outlines for science denialism: it pertains to the science of vaccinations (which largely involves biology and virology),

most anti-vax information comes from unreliable sources such as people without any scientific or medical credibility, and those who are anti-vax often refer to themselves as the most reliable sources on the subject. The anti-vax pseudoscience also matches Hansson's epistemological characteristics. People who are anti-vax often cherry-pick lots of information, such as the small percentage of blood clots that resulted from the COVID-19 vaccine. This example also shows how they neglect refuting information. They tend to fabricate fake controversies, such as how the government supposedly tracks people with microchips put in vaccines. Finally, anti-vax also meets the deviant criteria of assent characteristic because members of that community are known to reject any evidence given to them that disproves their beliefs. They always demand more information. Recognizing the anti-vax movement as science denialism is important when it comes to getting individuals to recognize the truth about vaccines; one must try to see their side of the matter and not act as if science is infallible and all-knowing (Hansson, 2019).

In some instances, it can be understandable why people have the anti-vax mindset, though it is vital for an individual to look into the matter carefully before deciding not to get a vaccine. Talking to health professionals and getting personalized medical advice is one of the best ways to receive all of the necessary information regarding vaccines. Medical professionals are knowledgeable of the most up-to-date information and can help people make the best decision

possible for themselves and the community. In recent decades, herd immunity has become increasingly important to society as a whole. If there are enough people vaccinated against fast-mutating, highly contagious diseases, it is easy to prevent future outbreaks from occurring. Based on this knowledge and the information outlined thus far, immunization through vaccines is more efficient, effective, standardized, and safer when compared with natural immunity.

References

Arora, S., Gusain, M., Kaushikb, R., Sinha, P., & Kumar, D. (2021). Cinnamon: A clinical approach as multifarious natural remedy with absolute immunity. *European Journal of Molecular & Clinical Medicine, 8*(3), 2331–2345. https://www.academia.edu/94387454/Title_Cinnamon_A_clinical_approach_as_multifarious_natural_remedy_with_absolute_immunity

Centers for Disease Control and Prevention. (2021, December 1). *Autism and vaccines*. https://www.cdc.gov/vaccinesafety/concerns/autism.html

Chu, J., Pink, S. L., & Willer, R. (2021). Religious identity cues increase vaccination intentions and trust in medical experts among American Christians. *Proceedings of the National Academy of Sciences*, *118*(49). https://doi.org/10.1073/pnas.2106481118

Colgrove, J., Abiola, S., & Mello, M. M. (2010). HPV

vaccination mandates—Lawmaking amid political and scientific controversy. *New England Journal of Medicine*, *363*(8), 785–791. https://doi.org/10.1056/nejmsr1003547

DeStefano, F., Price, C. S., & Weintraub, E. S. (2013). Increasing exposure to antibody-stimulating proteins and polysaccharides in vaccines is not associated with risk of autism. *The Journal of pediatrics, 163*(2), 561–567. https://doi.org/10.1016/j.jpeds.2013.02.001

Dinerstein, C. (2019). Is natural immunity or vaccination better?*American Council on Science and Health.* https://www.acsh.org/news/2021/03/19/natural-immunity-or-vaccination-better-15409

Gerretsen, P., Kim, J., Quilty, L., Wells, S., Brown, E. E., Agic, B., Pollock, B. G., & Graff-Guerrero, A. (2021). Vaccine hesitancy is a barrier to achieving equitable herd immunity among racial minorities. *Frontiers in Medicine*, *8,* 1-9. https://doi.org/10.3389/fmed.2021.668299

Giubilini, A. (2020). Vaccination ethics. *British Medical Bulletin*, *137*(1), 4–12. https://doi.org/10.1093/bmb/ldaa036

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A, 63*(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

Hansson, S. O. (2020). How not to defend science. A Decalogue for science defenders. *Disputatio, 9*(13), 197–225. https://studiahumanitatis.eu/ojs/index.php/disputatio/article/view/hansson-science

Hornsey, M. J., Harris, E. A., & Fielding, K. S. (2018). The psychological roots of anti-vaccination attitudes: A 24-nation investigation. *Health Psychology*, *37*(4), 307–315. https://doi.org/10.1037/hea0000586

Huang, Y., & Green, M. C. (2022). Reducing COVID-19 vaccine hesitancy among African Americans: The effects of narratives, character's self-persuasion, and trust in science. *Journal of Behavioral Medicine*, *46*(1–2), 290–302. https://doi.org/10.1007/s10865-022-00303-8

Hussain, A., Ali, S., Ahmed, M., & Hussain, S. (2018). The Anti-vaccination Movement: A Regression in Modern Medicine. *Cureus, 10*(7). https://doi.org/10.7759/cureus.2919

Institute of Medicine. (2004) *Immunization Safety Review: Vaccines and Autism.* Washington, DC: The National Academies Press. https://doi.org/10.17226/10997.

Kim, J. (2018, September 23). *The psychology of Anti-Vaxxers*. Psychology Today. https://www.psychologytoday.com/us/blog/culture-shrink/201809/the-psychology-anti-vaxxers

Lavin, A. (2020). *Thinking well: A creative commons logic and critical thinking textbook* (3rd edition). Course Hero. https://www.coursehero.com/file/68307737/Thinking-Well-Lavin-Edition-3pdf/.

Leung, T., Campbell, P. T., Hughes, B. D., Frascoli, F., & McCaw, J. M. (2018). Infection-acquired versus vaccine-acquired immunity in an SIRWS model. *Infectious Disease*

Modelling, *3*, 118–135. https://doi.org/10.1016/j.idm.2018.06.002

Mitra, T., Counts, S., & Pennebaker, J. (2021). Understanding anti-vaccination attitudes in social media. *Proceedings of the International AAAI Conference on Web and Social Media*, *10*(1), 269–278. https://doi.org/10.1609/icwsm.v10i1.14729

Navin, M. C., & Atwell, K. (2019). Vaccine mandates, Value Pluralism, and Policy Diversity. *Bioethics, 33*(9), 1042–1049. https://onlinelibrary.wiley.com/doi/full/10.1111/bioe.12645

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Pulipati, S., Babu, P., Narasu, M., & Anusha, N. (2017). An overview on urinary tract infections and effective natural remedies. *Journal of Medicinal Plants Studies*, 5(6), 50–56. https://www.plantsjournal.com/archives/2017/vol5issue6/PartA/5-6-7-566.pdf

Rashi, T. (2021). The moral and religious obligation to vaccinate children in Jewish ethics. *Acta Paedetricia, 110*(2), 2964–2967. https://www.researchgate.net/profile/Tsuriel-Rashi/publication/353094640_The_Moral_and_Religious_Obligation_to_Vaccinate_Children_in_Jewish_Ethics/links/60f41cc70859317dbdee5f5b/The-Moral-and-Religious-Obligation-to-Vaccinate-Children-in-Jewish-Ethics.pdf

Restrepo, N., & Krouse, H. J. (2021). Covid-19 Disparities and Vaccine Hesitancy in Black Americans: What Ethical Lessons Can Be Learned?*Sage Journals,* 166(6), 1147–1160. https://journals.sagepub.com/doi/full/10.1177/01945998211065410

Rusoja, E. A., & Thomas, B. A. (2021). The COVID-19 pandemic, Black Mistrust, and a path forward. *eClinicalMedicine, 35*. https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(21)00148-6/fulltext

Salim, F. (2012, May). Culture, politics, and religion: Exploring resistance to vaccinations in South Asia. *Institute of Development Studies, 1*(1), 91–104.https://www.researchgate.net/publication/236856175_Culture_Politics_and_Religion_Exploring_Resistance_to_Vaccinations_in_South_Asia .

World Health Organization. (2020, December 8). *How do vaccines work?* https://www.who.int/news-room/feature-stories/detail/how-do-vaccines-work

UNIT 6 CRITICAL THINKING EXERCISES

1. Prior to gaining more knowledge regarding anti-vax ideas, what were some assumptions that you had? Did these assumptions change after reading this chapter?
2. Using metacognition, have you found that you have changed your thought process regarding vaccines and immunity?
3. Create your own illustration regarding anti-vax ideas.
4. How could someone exemplify to an anti-vaxxer that there could be better options for immunity?
5. Do you think that herd immunity should be a top priority for someone trying to decide whether or not to get a vaccine?

PART VII
UNIT 7: THE ILLUMINATI

CHAPTER 7.1: HOW DID THE MODERN CONCEPT OF THE ILLUMINATI COME TO BE AND WHY DOES IT STILL EXIST?

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7.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

How did the concept of the Illuminati come to be and why do people still believe in it?

Evidence and Information:

- The history of the Illuminati
- Modern-day belief in the Illuminati as a world power
- The psychology of what contributes to the conspiratorial belief in the Illuminati

Assumptions:

- The Illuminati does not exist today and is not a world power.
- Society's belief and acceptance of the Illuminati can have negative consequences.

Concepts:

- Bavarian Illuminati
- Governmental power
- Psychological and social issues
- Media and popular figures

Context:

- Historical
- Cultural
- Political

Point of View:

- Psychologists
- Sociologists
- Historians

Purpose:

- To understand why people believe in the Illuminati as an all-powerful secret society
- To identify the consequences of believing in the Illuminati

Implications & Consequences:

- Due to the influence of pop culture and media on society, multiple conspiracies such as the Illuminati have been given life.
- The belief in such conspiracies negatively influences society and can bring about unnecessary fear and suspicion.

Conclusions & Interpretations:

The Illuminati was a secret society that existed in the past, but there is no evidence that it exists today. Given this lack of evidence, it can be deemed as a conspiracy theory that continues to negatively affect believers.

Disciplinary Lenses

History

Question at Issue:

What sparked the creation of the Bavarian Illuminati and how has the perception of it changed?

Evidence and Information:

- Formation of the Bavarian Illuminati
- The Illuminati in pop culture

Assumptions:

- The original goal of the Illuminati was to enlighten the public through opposing superstition, religious influence, and abusive state power.
- While the Bavarian Illuminati started out with a reasonable goal, the current perception of the now-imaginary society is extreme.

Concepts:

- Political power
- Influence of religion on government

Context:

- Religious
- Political

Point of View:

- Members of the Bavarian Illuminati
- Historians

Purpose:

- To understand the origins of the Illuminati and its goals
- To understand how the belief in the Illuminati has evolved over time

Implications & Consequences:

- Religious fear of persecution is still prevalent in politics, therefore the concept the Illuminati continues to be a pervading threat in the minds of many.
- If there is any merit to the concept of a secret world power, there currently exists no tangible historical evidence to prove such a claim.

Conclusions & Interpretations:

The Bavarian Illuminati was originally intended to change the relationship between government and religion, but the perception of the group's influence has now become larger than life.

Psychology

Question at Issue:

How does the belief in secret societies affect individuals psychologically?

Evidence and Information:

- Conspiracies in conservatism
- Confirmation bias in pop culture
- Mental coping strategies

Assumptions:

- The belief in the Illuminati develops from a state of fear or distrust.
- Conspiracies may be a method of coping for some people but typically end in longterm damage.

Concepts:

- Pop culture
- Cynicism
- Herd mentality

Context:

- Social
- Mental

Point of View:

- Psychologists
- Conspiracy theorists

Purpose:

- To understand why individuals believe in secret societies, specifically the Illuminati
- To understand how this belief impacts people, either positively or otherwise

Implications & Consequences:

- Due to the belief in the Illuminati, many individuals may find themselves further isolated from social groups, leading to a self-perpetuating cycle.
- Conspiracy theorists tend to have less trust in the government and frequently develop more extremist views.

Conclusions & Interpretations:

Belief in the Illuminati is often due to social isolation which can lead to a need for cognitive coping mechanisms.

Sociology

Question at Issue:

Why is anti-semitism so prevalent in conspiracies such as the Illuminati?

Evidence and Information:

- Historical accounts
- International conspiracies
- Modern-day prejudice

Assumptions:

- Anti-semitism is a form of racism and is a prevalent

social issue even today.
- Like other forms of racism, anti-semitism is illogical and fear-based, making it an easy candidate for conspiratorial relations.

Concepts:

- Critical race theory
- Ethno-religious people
- Anti-semitism

Context:

- Cultural
- Religious

Point of View:

- Holocaust deniers
- Jewish people
- Sociologists

Purpose:

- To analyze the social obstruction of anti-semitism and its ties to the Illuminati
- To explore how anti-semitism has evolved throughout history

Implications & Consequences:

- Anti-semitism is equally as irrational as conspiracy theories but can become more damaging to members of society. This is due to the involvement of bias and prejudice against people of Jewish descent as opposed to mistrust of unseen forces.
- International conspiracies such as the Illuminati conspiracy may act as a kind of cover-up for the underlying racial/religious prejudices of certain individuals. When a conspiracy theorist is already inclined to mistrust a certain group, even the outlandish seems plausible.

Conclusions & Interpretations:

The Illuminati, much like aspects of anti-semitism, is a fear-based conspiracy regarding a controlling world power. Many such conspiracies involve powerful governmental influence, similar to how much of anti-semitism revolves around fear and suspicion. International conspiracies will almost always have ties to this centuries-old prejudice.

Empirical Claims

Inductive Reasoning

True Premise 1: The success of the Rothschilds acts as an example of an exceedingly influential and rich Jewish family.

True Premise 2: There is a stereotypical and biased trope throughout history that presumes that Jewish people are usually bankers or are societally influential.

Weak Inductive Reasoning: Jewish people must have great generational power from families like the Rothschilds, which enables them to have worldwide influence through organizations such as the Illuminati. (Argument extrapolates based on a common racial prejudice rather than actual fact.)

Logical Conclusion: Racial prejudice concerning Jewish people has evolved so that the belief in power or riches is enhanced by fear and hatred. The merits or successes of such people are therefore discredited and promote cause for undue distrust.

Deductive Reasoning

True Premise 1: Popular conspiracies involving the government and influential people have sometimes turned out to be true.

True Premise 2: The Illuminati conspiracy has gained a lot of traction.

Weak Deductive Reasoning: The amount of traction the idea has gained would suggest that there must be some truth to the idea that the Illuminati is controlling worldwide powers. (Argument uses the bandwagon fallacy to incorrectly claim that just because the belief is common, it must be true.)

Logical Conclusion: The occasional exposure of governmental secrets or operations has understandably led to a deep mistrust for many people. This makes even outlandish ideas like the Illuminati seem plausible, although there is no credible evidence.

Abductive Reasoning

Observation: The dollar bill depicts the eye of providence on the back of it, which is a symbol commonly associated with the Illuminati.

Weak Explanation: The Illuminati must be in charge of the country because this symbol is on a piece of national tender. (Argument makes wild assumptions based on a single, uncorrelated observation; post hoc ergo propter hoc)

Logical Explanation: The eye of providence has many different interpretations and meanings, often associated with God or Christianity. Its presence on the dollar bill serves to represent the hopes of the nation, rather than a secret society controlling the government.

Logical Fallacies

Appeal to (False) Authority

There has been a popular theory that a celebrity, Jay-Z, is a member of the Illuminati. Since the theory emerged, Jay-Z has publicly flashed the Illuminati symbol and has included

Illuminati-related symbols and phrases in his clothing line (Bebergal, 2014). Jay-Z has not denied his involvement with the Illuminati, which is confirmation in the eyes of many that the organization survives to this day.

Appeal to Ignorance

Some may say that the Illuminati's continued existence has yet to be disproved; therefore, it must still exist today. This nullifies any argument against it since it is not possible to accurately prove whether or not the organization exists based on a lack of evidence.

Bandwagon Fallacy

Since a large number of people believe that the Illuminati exists as a modern-day society, it supposedly lends more credibility to its existence. When there is a significant amount of attention placed on the existence of such an idea, people may have a hard time understanding how so many have been misled.

Causal Fallacy

During a basketball game, fans and the media noticed American singer Beyoncé behaving somewhat roboticly. They mentioned that she had zoned out and had moved her head back and forth for approximately 30 minutes. This supposedly confirmed the suspicion of Beyonce's involvement with the Illuminati and the idea that they replace celebrities with robots that sometimes "glitch" (Krishnan, 2019).

7.1.2 SEE-I MODEL

State

Belief in the Illuminati seems to come as a result of paranoia and general suspicion regarding the government and society.

Elaborate

Over the years, the Illuminati has become a fascinating concept to many and often causes people to question their personal connections and authority figures. While the existence of the fabled super-society has disappeared into history, it still holds an impressive sway in modern minds. The idea that "everyone is out to get you" can result in a lonely life, isolating against and fearing society. As is characteristic of conspiracies, those who believe in the Illuminati can develop "tunnel vision" and only seek information that fits their specific cause. It may seem irrational from the surface, but this well-known concept deserves an objective evaluation.

Exemplify

- **Historical Lens:** The purpose of the original Illuminati

was to create an isolated society in order to eliminate all other possible sources of power. For example, W. Mcllhany (2009) from Gale In Context states, "Voltaire bore an implacable hatred of all religions, of all monarchs, and of all morality derived from religious belief." With the purpose of creating an alienated society, increased levels of paranoia and skepticism formed. To maintain secrecy and prevent information leaks, Adam Weishaupt—one of the Illuminati's founders—created a way to ensure security from these liabilities. W. Mcllhany states, "He set up an elaborate spy network so that all members would constantly be checking on the loyalty of each other." The Illuminati also contained internal police who would brutally silence anyone who tried to expose the society to proper authorities and the public. Not only did the original members of the society intend to be isolated from the world, but serious crimes and harsh punishments were carried out to prevent intrusion or outflow of information.

- **Psychological Lens:** It has been shown that beliefs and paranoia regarding these types of views are prone to cause a feedback loop (Leonard and Philippe, 2021). Someone will begin with feelings of mistrust in the

government and the structure of society, becoming more likely to turn towards conspiratorial views to feel a sense of control over their situation. Naturally, once an individual is cemented in this kind of thinking, other outlandish ideas seem more plausible and easily acceptable. Therefore, one may experience an expansion of superstition and fear regarding those concepts and related ideas.

- **Sociological Lens:** Belief in the Illuminati is strongly encouraged by anti-semitic views. Krishnan (2019) states "The Illuminati conspiracy is inherently anti-semitic because a large part of the population of believers think that Jews control the world." Krishnan continues by saying that that those within the Illuminati have severe distrust and skepticism towards other individuals and the government.

Illustrate

Belief in the Illuminati can be compared to believing one's house is haunted. A person may start to hear strange noises or wonder why doors are open that were supposedly left closed. They start to compile a list of events that have happened recently. All may have reasonable explanations, but in the light

of the collective seem to point to supernatural influence. The occasional creaking is perhaps the house settling into the foundation, the unexplained moving of items is likely due to the user forgetting small changes that they have made. Coincidentally, the more they feed into the idea of their home being haunted, the more 'evidence' they find. They begin having nightmares due to the increased stress and fear, attributing it to this supernatural entity. They become increasingly paranoid and startle at common occurrences such as the doorbell ringing or floorboards creaking. In this way, a few initial assumptions create a feedback loop of increasingly suspenseful consequences. This is often the case with conspiracies like the Illuminati. Only a few misplaced assumptions are needed to launch an already suspicious person into the throes of paranoia and hatred. Their 'supernatural entity' is a powerful secret organization, and their 'haunted house' is the whole world.

7.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: There are government conspiracy theories that were believed to be ridiculous but were then proven to be true (Saltarelli, 2015).

Rebuttal: Government secrets have been uncovered before, and it is important to recognize these discoveries. This proves that the government is not all-powerful in hiding its motives or actions. Notably, the uncovered conspiracies are also on a much smaller scale in comparison to the existence of an omnipresent world power, which would be much harder to disguise for so long.

Argument: The Illuminati never existed.

Rebuttal: There is evidence to prove the Illuminati's existence in history. It could potentially still exist today, but not in the way that it is perceived by society. It was originally a secret organization founded in the 1770s to combat the influence of religion on society and abuses of power by the state. This result was sought after by fostering a safe space for critique, debate, and free speech (Vickery, 2017).

Argument: There is behavioral evidence that proves that some celebrities are Illuminati members.

Rebuttal: Behavioral evidence is not reliable; it is exaggerated and assumed. These assumed behaviors seem unusual, yet are just normal functions such as posing hands in certain ways for pictures, zoning off at certain times, and looking confused (Krishnan, 2019). When people see these ambiguous sources of information, they will often find a way to construe the evidence in a way that supports their belief. In reality, human beings aren't perfect at being socially present constantly.

7.1.4 RESEARCH PAPER

Introduction

Dating back to Western Europe in the 1600s, the Illuminati began as a small, secret organization seeking to change the influence of religion and government. Today, the perception of the Illuminati is larger-than-life and entirely fictitious. Rather than living through a few members as it did in the past, this society now persists in the minds of conspiracy theorists and is buffered through pop culture. Due to this, the disciplinary lens of history is invaluable to discover why the belief in the Illuminati has evolved in such an unusual way. It has become increasingly clear that belief in the Illuminati—like all conspiracy theories—must be psychologically influencing rather than physically changing. With long-lasting effects of mistrust in the government, isolation, and alienation from the greater portion of society, the disciplinary lens of psychology is the next to be considered. The last disciplinary lens is sociology to delve into why the Illuminati theory has such deep ties with anti-semitism and religious prejudice.

For being a currently fictional concept, the Illuminati has covered a lot of ground. So how did the organization even begin in the first place?

History

The Illuminati is a name given to many groups, both fictitious and real. On May 1, 1776, the Order of the Illuminati was founded by Adam Weishaupt in Bavaria, Germany. Weishaupt, known as Spartacus by members of the group, was a former Jesuit and law professor at the University of Ingolstadt (The Editors of Encyclopaedia Britannica, 2020). The original organization "aimed to overthrow civil and religious institutions with the claim that ends justify the means," while also keeping a charitable and philanthropic image in the public eye (O'Brien, 2003, p. 598). Nearly ten years following the formation of the Illuminati, the group had expanded from five members to almost three thousand (Waterman, 2005, p. 17).

By the late 1870's, the Bavarian government seized papers belonging to the Illuminati. This was an attempt to eliminate the Order and secret societies as a whole (Waterman, 2005, p. 17). This strong action against secret societies put an end to the Order's plans completely. Yet, the remaining idea of the group's secretive existence has "fueled conservative theories from the 1780s to the present" (Waterman, 2005, p.17). The Illuminati was therefore forced to operate in secret since names of the members had been revealed and were accused of various anti-religious acts.

In the 1790s, an anti-Illuminati crusade formed in response to the French Revolution. French Jesuit, Abbe Barruel,

published an exposé accusing the Illuminati of being directly responsible for the French Revolution. Following Barruel's exposé, American professor John Robison wrote a publication expressing similar views. Both authors implied that the Illuminati were still operating secretively and supported the conservative view that mid-century philosophers, such as Voltaire, Montesquieu, and Rousseau, conspired to provoke the popular uprising. According to Barruel and Robison, the mid-century philosophers were "not only responsible for the overthrow of religion and government in France, but also for conspiring to infiltrate and seize control of all the governments in the world" (Waterman, 2005, p.17). This included the emerging United States government. Thus, fear of the Illuminati was quickly instilled in the minds of the American people.

While the Illuminati existed in the past, there is no evidence that it exists today. Recently, the Illuminati has begun to reappear online. It has gained traction throughout popular culture and is featured in television shows, movies, and YouTube videos. In addition to the presence of the Illuminati in entertainment media, there are also many recent scammers and websites acting as the Illuminati. These misleading groups promise people money, housing, celebrity interviews, and more (Bitdefender, 2023). The name "Illuminati" has become another well-known title used to fulfill the purposes of whomever may want to use it. Numerous fraternal organizations claim to be a descendant of the original Bavarian

Illuminati, while also openly using the name "Illuminati" as a part of their organization's title. However, there is no evidence to prove that any of these organizations have ties to the historic Order. All in all, this interesting and relatively isolated circumstance in history seems to have no further proof of its continuation today.

Psychology

If there is no logical reason to believe in the Illuminati, why does it currently have such a presence in our society? What compels people to hold onto their belief so fervently? Conspiracies often share a similar origin. Belief in the Illuminati (or any conspiracy) provides an explanation for some idea or event that is "confusing or threatening to self-esteem," reports S. Galer in *The accidental invention of the Illuminati conspiracy* (Galer, 2020). This explanation involves some evil power—usually the government—being responsible for some sort of large-scale coverup. Angelo Fasce explains conspiracy ideation, an idea that promotes a "threatening, non-random, and immoral worldview," and is a key aspect of all conspiracies (Fasce, 2019, pg.8). Naturally, conspiracy ideation often gives rise to a very strong political stance. Conspirators often become unwavering in their beliefs, considering themselves to be an enlightened minority. The irony here the unlikeliness to acknowledge any other point of view. There are psychological reasons behind the belief in events or ideas that reject the standard explanation behind

them. Social exclusion creates a feeling of meaninglessness within, and the search for meaning can often lead people to find patterns in randomness. Isolation leads to individual distrust in society, believing that the world is out to get them and fear that shuts out the world. There are many cognitive contributions behind believing in conspiracies, and more specifically believing in secret societies like the Illuminati.

The recent quarantine throughout the COVID-19 pandemic has had an extreme effect on the mental health of those who lived through it. This was a time of increased social isolation for many, and "societies have also witnessed the spread of other viral phenomena like misinformation, conspiracy theories, and general mass suspicions about what is really going on" (De Coninck et al., 2021, p. 1). Conspiracy theories and their associated beliefs act as comforting and coping mechanisms to satisfy deprived social needs. Nevertheless, these kinds of subsistence are not expected to truly satisfy the basic needs; they can only temporarily compensate for them. A study published in *Frontiers in Psychology* shows how empirical data suggests that conspiracy theories may "cultivate the thwarting of the basic needs, creating a feedback loop in which the person is further reinforced to support and expand their beliefs in conspiracy theories" (Leonard & Philippe, 2021). It was also mentioned how the exposure to conspiracy theories decreases the feelings of control and autonomy by increasing one's perception of powerlessness. The concept of herd mentality applies when a

good portion of society begins to tout the same ideas. When one has an irrational belief and finds others that support their belief, it helps to satisfy the psychological craving of loneliness and reinforces the idea that they are correct. However, conspiracies cannot completely relieve the psychological distress of loneliness as increasing practice in such wild fantasies will generally increase the amount of distrust in society as a whole. Social isolation is both a cause and effect of believing in conspiracy theories and secret societies like the Illuminati.

Much of the supposed proof that is behind the current existence of the Illuminati is popular culture– videos, photos, reported news, celebrity behavior, etc. When people see these obscure sources of information, they will often find a way to render the "evidence" to support their beliefs, which is a form of confirmation bias.

Conspiracy theories in general are associated with a range of negative consequences, mostly stemming from violence. An article written by Karen Douglas from Cambridge University Press evaluated several different studies and concluded that people who were predisposed to conspiracy theories were more likely than others to agree that "violence is sometimes an acceptable way to express disagreement with the government" (Douglas, 2021, p. 2). Conspiracy theories change people's attitudes. When initially learning about information from a conspiratorial source rather than a reliable and tested one, it is more than likely that the conspiratorial information will

still hold emotional significance against the real information. There are also negative consequences involving political engagement and political behavior. It has been found that people who were asked to read anti-government conspiracy theories were less inclined to vote in the next election (Douglas, 2021). Conspiracists have a more relaxed attitude towards gun ownership and are more likely to commit routine crimes. They also tend to indicate that their trust in politics has diminished. Apart from this political apathy, conspiracy theories may also be associated with radicalization and extremism. They have been linked to non-normative political actions such as protests and illegal actions such as occupying buildings. Online extremist groups, both right-wing and left-wing, frequently engage in conspiracy theories. Conspiracy theories may therefore be a "radicalizing multiplier" (Bartlett & Miller, 2010) that serves to reinforce ideologies and psychological processes within extremist groups. These relationships tend to be stronger for individuals who have low self-control and are socially isolated. Ironically, such distrust in the government may seem to have the opposite effect desired by the individual. Quoting social psychology professor Viren Swami in Sophia Galer's article (2020), after mentioning how several governments in Asia have used conspiracies to control their people:

> In the West, it's typically been the opposite; (conspiracies) have been the subject of people who lack agency, who lack power, and it's their lacking of power that gives rise to

> conspiracy theories to challenge the government. ... The big change now is that politicians... are starting to use conspiracies to mobilize support.

Sociology

Anti-semitism is considered a form of racism. This is an act of open discrimination and prejudice against individuals of Jewish descent. Wilhem Marr, a German Publicist, first introduced the term in the late 19th century. "Marr's intention was to find a term that would explain more persuasively the need to exclude Jews from European secular society than the older religiously based anti-semitism still popular at the time" (Krondorfer, 2015, p. 294). This idea indicated the exclusion of the Jewish community on racial stances. Krondorfer says that the term cannot refer only to the Jewish culture, religion, politics, or racial characteristics, but rather a hatred that encompasses it all.

Several decades after anti-semitism was coined, *The Protocols of the Elders of Zion* was published, which is a falsified Jewish text. The book details the fraudulent plan for Jewish world domination and describes the conspiracy to take control of the banking system, political institutions, and the media. This idea of Jewish domination is the epitome of anti-semitism. *The Protocols of the Elders of Zion* was used by Adolph Hitler to justify the Holocaust and it is also presently used to condemn individuals of Jewish descent. Though the origin of the book is unknown, it is believed that it had been "created by a governing

body of the Jews" (Dice, 2009, p. 25). Despite the lack of evidence that backs up the validity of *The Protocols of the Elders of Zion*, it became one of the most notable anti-semitic publications.

An example found in *The Protocols of the Elders of Zion* is the plan to control the banking system. The Rothschild family is a famous household from the 1800's. Mayer Rothschild and his five sons created a "multinational enterprise" and their wealth allowed them to be quite influential. With the Rothschild family being of Jewish descent, they quickly became a target to conspiracy theorists as a "prime example of Jews allegedly using their money to control global financial institutions" (Hudson, 2020). The original five brothers became barons of the Austrian Empire, the first Jewish member of Parliament was a Rothschild, they were bankers of the French Revolution and Napoleonic Wars, and other members of the family were also able to garner noble status (Hudson, 2020). Due to their success across countries, the Rothschilds fell perfectly into the standard set forward by anti-semitic theories. To many, this seems to equate with the notion that the Rothschilds were a part of the Illuminati's plan to control the world. In reality, their dedication, diligence and determination is what sparked their success.

Niche internet groups and opinions provide people with a way to hide behind their harmful beliefs. To keep themselves relevant, one of the primary functions social media platforms use are algorithms that function as "filter bubbles" for the

purpose of creating personalized "ecosystems of information" (Fasce, 2019, pg. 9). These filters, referred to as a cycle of "expression-response-satisfaction" and "expression-response-dissatisfaction" create digital boundaries that essentially restrict what people can see and learn about the world through these platforms based on what sort of content they have shown to prefer or not prefer in the past. From an entertainment aspect, this is perfectly logical, but when social media only provides certain types of controversial content consistently, it becomes easy to forget there are other points of view not being accurately represented. This is especially true since social media is notorious for amplifying extreme views, fake news, and emotionally appealing content more efficiently than moderate, factual information. When it comes to conspiracies—especially the Illuminati—people often only see their conspiratorial points of view online and interact with many more people who think alike. This leads them to have stronger conspiratorial beliefs. As the old saying goes, where there is smoke there is fire. According to a study done by the American Jewish Committee (2023), "69% of Jews surveyed reported they have experienced antisemitism online, either as a target or by seeing antisemitic content."

The connection between the Illuminati and anti-semitic views is detrimental to the function of a unified society. When two parties—such as the Illuminati and Jewish people—are linked together negatively, it encourages hate and distrust between those involved. The Illuminati and its connection to

Jewish people are both examples of pseudo-theory promotion. When individuals are advocating that a religion has been corrupted with the intention for world domination, they are presenting an idea that relies on anecdotal evidence. For something to be relied upon and trusted, it requires substantial evidence, which is certainly not present in relation to Jewish ties with the Illuminati.

Conclusion

Although the Illuminati is a long-gone relic of history, there still exists much consternation and conjecture about the nature of the society's influence. One may say that the current members of the Illuminati are not powerful government officials or planted celebrities, but rather the people who still cling to the idea and live in fear of such imaginary forces. The Illuminati conspiracy has severely depleted many sociological, psychological, and trusting mannerisms and traits of its current members. This skepticism and imaginary persecution can easily lead to a feeling of isolation, which is often the natural response to suspecting that the world 'has it out' for like-minded people. Times have changed and society has transformed along with the views of the Illuminati. Transforming into a pop-culture and governmental-focused perspective has adapted the view of the Illuminati with the current world. In some ways, it almost seems as though the Illuminati is merely a cover story for the anti-semitism, suspicion, and governmental fear that falls within its bounds.

The name and meaning of this influential group started with an underground organization, and now continues buffered only by terror and hatred.

References

American Jewish Committee. (2023, February 21). *American Jewish Committee urges social media firms to confront antisemitism on platforms*. https://www.ajc.org/news/american-jewish-committee-urges-social-media-firms-to-confront-antisemitism-on-platforms

Bartlett, J., & Miller, C. (2010). *The power of unreason: Conspiracy theories, extremism and counter-terrorism*. Demos. https://demos.co.uk/wp-content/uploads/2010/08/Conspiracy_theories_paper.pdf

Bebergal, P. (2014, December 16). *Decoding those lingering Jay-Z Illuminati rumors*. Vulture. https://www.vulture.com/2014/12/jay-z-illuminati-satan.html

Bitdefender. (2023, June 1). *The Anatomy of Illuminati Scams: We spoke to the grand masters so you don't have to*. Hot for Security. https://www.bitdefender.com/blog/hotforsecurity/the-anatomy-of-illuminati-scams-we-spoke-to-the-grand-masters-so-you-dont-have-to/

Bouvier, J. (2023, November 3). *Rothschild family*. Encyclopædia Britannica. https://www.britannica.com/topic/Rothschild-family

Conway O'Brien, J. (2003). The good society: The

Illuminated, Karl Marx and Adam Smith. *International Journal of Social Economics*, *30*(5), 598–612. https://doi.org/10.1108/03068290310471862

De Coninck, D., Frissen, T., Matthijs, K., d'Haenens, L., Lits, G., Champagne-Poirier, O., Carignan, M.-E., David, M. D., Pignard-Cheynel, N., Salerno, S., & Généreux, M. (2021). Beliefs in conspiracy theories and misinformation about COVID-19: Comparative perspectives on the role of anxiety, depression and exposure to and trust in information sources. *Frontiers in Psychology, 12,* 1–13. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.646394/full

Dice, M. (2009). *The Illuminati: Facts & fiction*. The Resistance. https://books.google.com/books/about/The_Illuminati.html?id=GeXBzJBJe1wC

Douglas, K. M. (2021). Are conspiracy theories harmless? *The Spanish Journal of Psychology, 24,* e13, 1–7. Cambridge Core. https://www.cambridge.org/core/journals/spanish-journal-of-psychology/article/are-conspiracy-theories-harmless/FA0A9D612CC82B02F91AAC2439B4A2FB

Fasce, A. (2020, June 30). *The upsurge of irrationality: Post-truth politics for a polarised world*. Semantic Scholar. https://www.semanticscholar.org/paper/The-upsurge-of-irrationality%3A-post-truth-politics-a-Fasce/14014b1a3658288be452ff1dd69a5f0f8c33e82d

Galer, S. (2022, February 24). *How the Illuminati was invented*. BBC News. https://www.bbc.com/future/article/

20170809-the-accidental-invention-of-the-illuminati-conspiracy

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A, 63*(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

Hudson, M. (2020, September 3). *Where do anti-semitic conspiracy theories about the Rothschild family come from?* Encyclopædia Britannica. https://www.britannica.com/story/where-do-anti-semitic-conspiracy-theories-about-the-rothschild-family-come-from

Krishnan, N. (2019, February 11). *The Illuminati conspiracy theory*. The Psychology of Extraordinary Beliefs. https://u.osu.edu/vanzandt/2019/02/11/the-illuminati-conspiracy-theory-2/

Krondorfer, B. (2015). Anti-semitism and islamophobia: Twins or category mistake? *CrossCurrents, 65*(3), 292–296. https://www.jstor.org/stable/26605697

Leonard, M. J., & Philippe, F. L. (2021, June 28). *Conspiracy theories: A public health concern and how to address it*. Frontiers. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.682931/full

McIlhany, W. (2009, June 12). *A primer on the Illuminati*. The New American. https://thenewamerican.com/us/culture/history/a-primer-on-the-illuminati/

Saltarelli, K. (2015, June 8). *11 unbelievable conspiracy theories that were actually true*. HowStuffWorks.

https://history.howstuffworks.com/history-vs-myth/11-unbelievable-conspiracy-theories-that-were-actually-true.htm

The Editors of Encyclopedia Britannica. (2020, October 30). *Illuminati*. Britannica. https://www.britannica.com/topic/illuminati-group-designation

Van Cleave, M. (2016). *Introduction to logic and critical thinking*. Open Textbook Library.

Waterman, B. (2005). The Bavarian Illuminati, the early American novel, and histories of the public sphere. *The William and Mary Quarterly, 62*(9), 9–30. https://www.jstor.org/stable/pdf/3491620.pdf

UNIT 7 CRITICAL THINKING EXERCISES

1. Are there any conspiracy theories that you typically engage with or have engaged with in the past?

1. Do you recognize that they are conspiracy theories?
2. Do you truly believe them? Why?
3. What fallacies had been put in place for this belief to flourish?

2. If you could create a secret society, what would its purpose be?

3. If given the option to join a secret society, would you?

4. Knowing the Illuminati conspiracy cannot be absolutely proved or disproved, how would you go about trying to discern for yourself whether elitist societies are real or not?

1. Do you think critical thinking would lead you to discover there are general principles that apply to all secret society conspiracies, or would it lead you to believe it's a case-by-case situation?

PART VIII
UNIT 8: EXTRASENSORY PERCEPTION

8.1: CAN THE RISE IN BELIEVERS OF EXTRASENSORY PERCEPTION (ESP) BE ATTRIBUTED TO THE DEPICTION OF EXTRASENSORY PERCEPTION IN THE MEDIA?

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8.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

Can the rise in believers of extrasensory perception (ESP) be attributed to the depiction of extrasensory perception in the media?

Information and Evidence:

- Clinical trials and studies that disprove the effect and existence of extrasensory perception
- Research analysis on how extrasensory perception affects the mind
- Personal mental accounts
- Student conducted research
- The history of ESP and its relevance today
- The relationship between popular movies and extrasensory perception

Assumptions:

- There are certain humans that claim to possess telekinetic or clairvoyant abilities. Examples include psychics, fortune tellers, or mediums.
- Religion has a very big influence in the amount of extrasensory perception believers.
- Previous research has disproved the existence of ESP.
- Belief in extrasensory perception across the population is common.
- People can experience examples of extrasensory perception in a mental crisis

Concepts:

- Religious involvement
- Human superstition
- Media prevalence
- Locus of control and easing anxieties

Context:

- Psychological
- Theological
- Historical
- Entertainment

Point of View:

- Neurologist
- Psychologist
- Theologist
- Individuals claiming to possess supernatural abilities
- Director/filmmaker
- Media consumer

Purpose:

- To differentiate between personal intuition and supernatural abilities
- To demonstrate the media's influence in the spread of extrasensory perception
- To uncover the origins of extrasensory perception and how they influence its current validity
- To question the use of mediums, psychics, tarot card readers, etc.

Implications and Consequences:

- If there is a correlation between media and belief in ESP, it would indicate that the media can affect public belief through repetition, even in the supernatural.
- If the media has no influence on increased belief in ESP, it would indicate that the cause of this rising belief must boil down to what many other pseudosciences do: superstition and a need for control.

Conclusions and Interpretations:

While most people do not give extrasensory perception credibility based on fictional films, its consistent presence in media has made it highly desirable and contributed to its popularity. Desirability can contribute to belief when coupled with theological and psychological similarities.

Disciplinary Lenses

Psychology

Question at issue:

What psychological factors can lead to the experience or believing extrasensory perception?

Information and Evidence:

- Clinical studies
- Medical records
- Neurological imaging

Assumptions:

- Psychology can explain why people believe that they experience telepathy or clairvoyance.
- The medicinally-related belief of ESP is better explained

through psychology rather than neurology as no physical evidence has been discovered.

Concepts:

- Mental health
- Abuse and trauma
- Drug abuse/hallucinations
- Easing anxieties

Context:

- Medical
- Emotional

Point of View:

- Psychologist
- Patients
- Psychiatrist
- Neurologist

Purpose:

- To understand how extrasensory perception can be traced back to traumatic experiences, forms of abuse or mental illnesses
- To explain that there is no physical evidence of telepathy,

firsthand hallucinations are caused by delusions or psychosis
- Believing in the unknown can ease anxieties about the unknown
- Prove the parapsychologists are mentally harming and confusing others rather than conducting actual work.

Implications and Consequences:

- Belief in ESP can be a result of mental issues stemming from a need for control or an overactive imagination.
- Visual and auditory hallucinations can promote belief in the paranormal
- Individuals may have underlying beliefs in religion or the supernatural that correlate with belief in ESP.

Conclusions and Interpretations:

There are varying levels of belief in extrasensory perception. Some experiences contain traumatic roots or mental delusions, whereas others may have origins in religious beliefs.

Theology

Question at Issue:

How does extrasensory perception influence the formation and continuation of religion?

Information and Evidence:

- Religious texts
- Religious practices
- History of religious formation

Assumptions:

- Religious believers engage in the supernatural when communicating with deities, performing miracles, etc.
- Religion can often have fundamental aspects that involve ESP, but it has also been shown to have social and mental benefits.
- Religious texts contain inspiring stories to positively influence the audience, these stories contain elements of extrasensory perception

Concepts:

- Religion
- Occultism

Context:

- Historical
- Spiritual

Point of View:

- Theologists

- Practicing religious believers
- Non-religious individuals

Purpose:

- To understand how and why ESP is an integral part of many religions
- To discern the correlation between belief in ESP and orthodox religious participation

Implications and Consequences:

- The term extrasensory perception is relatively new, but the general ideas involving such beliefs have been integral to the formation of almost every religion known.
- While dogmas vary greatly, there are many who continue to support their convictions in the modern day through spiritual experiences or practices such as prayer and miracle-working.
- Turning a blind eye to critical thinking and logical fallacies

Conclusions and Interpretations:

Faith, community and support are driving parts of a religion that remain as important in society and culture. Belief in ESP has greatly contributed to the formation of many religions. Humans are prone to look for comfort and safety through a

higher power or supernatural influence. This does not discern the presence of pseudoscience within these religions, promoting a metaphorical stance to many stories.

Film Studies

Question at Issue:

How has extrasensory perception in filmmaking affected the popularity of genres and movies?

Evidence and Information:

- Data analysis
- Student conducted surveys
- Highest-grossing movies and TV shows

Assumptions:

- Many people are first introduced to ESP through film or media aside from religion.
- The portrayal of ESP is usually positive, may lead to it being seen as desirable.

Concepts:

- Filmmaking
- Screenplay
- Plot structure

Context:

- Cultural
- Film history

Point of View:

- Producers
- Audience members
- Directors
- Screenwriters

Purpose:

- To understand why ESP has become so prevalent in film genres.
- To try and determine if there is a link between increased extrasensory perception interest and prevalence.

Implications and Consequences:

- Advancements in technology and special effects have made themes of ESP more interesting and visually appealing. This contributes to the popularity of genres with fictional depictions of ESP.
- People often want new and original forms of entertainment, which are developed when considering the realm of the supernatural.

Conclusions and Interpretations:

Many of the most popular film franchises contain depictions of ESP, which suggests that its influence on film has been significant. Though it is unlikely that fictional stories are leading people to a blind acceptance of superpowers, it seems plausible that there is a correlation between increased media presence and belief in ESP.

Empirical Claims

Inductive Reasoning:

True Premise 1: Many of the highest-grossing films have some form of extra-sensory perception for the purpose of plotlines or character-building.

True Premise 2: As the quality of films has increased, movie franchises have drawn a larger audience.

Weak Inductive Reasoning: With the quality increase of films, people believe ESP is attainable because of how realistic it looks on the big screen. (Argument uses Post Hoc Ergo Propter Hoc fallacy)

Logical Conclusion: People are drawn to films containing high-quality visuals of ESP because it is interesting and unique.

Deductive Reasoning:

True Premise 1: The belief in ESP has been around for a long time.

True Premise 2: The use of ESP features prominently in many religions, both modern and ancient.

Weak Deductive Reasoning: The historical and religious use of ESP proves that it must bear some credibility in the modern day. (Argument uses the bandwagon and genetic fallacies)

Logical Conclusion: The historical use of ESP only goes to show that, much like religion, people turn to the supernatural for comfort and a sense of control.

Abductive:

Observation: Various fictional movies have either predicted future technologies or featured real-world cutting-edge science as a basis for their science fiction.

Weak Explanation: Many movies must feature ESP because it exists somewhere in the real world. (Post Hoc Ergo Propter Hoc)

Logical Explanation: ESP is featured in popular movies simply because it is entertaining and can serve various purposes in forming a plot.

Logical Fallacies

The Bandwagon Appeal

The media has presented countless examples, uses, and ideations of extrasensory perception through movies, books, and TV shows. Examples include the Harry Potter, Marvel and Star Wars franchises. The popularity of ESP seems to give it some credibility because there are so many who enjoy indulging in it.

Post Hoc Ergo Propter Hoc

The prevalence of ESP in popular culture does not mean that the nature of its commerciality in any way proves or supports the existence of ESP. (Lavin 2020, p. 110)

Ad Hominem

When individuals are unable to experience or 'attain' extrasensory perception, parapsychologists and other believers can easily write off others as "not having the gift". This makes it impossible to prove or disprove experiences of ESP, indicating that anyone not experiencing ESP wasn't lucky enough to be born with it (Lavin 2020, p. 86).

Wishful Thinking

Science has disproved the existence of extrasensory perception through studies, experiments, and examinations. Though these studies are credible and have been retested, psychics, mediums, and parapsychologists still encourage the idea of ESP onto others to keep the belief alive (Merced, 2018).

Magical Thinking

According to magical thinking, anything can be manifested in reality simply by believing it is true. ESP believers try to manifest their beliefs to be true, even when there is no

credibility for them. Relates to quantum mysticism. By looking for ESP in every part of their life, believers inevitably find coincidences and say that it must be spiritual power (Merced, 2018).

Genetic Fallacy

Some may say, "People have been practicing ESP for centuries", "there are stories that include it all throughout history" and "It is the basis of my religion, therefore it must exist". This is a genetic fallacy because an idea's origins have no effect on its credibility. Just because an idea of something has existed for a long time does not necessarily prove that the idea is real. (Lavin 2020, p. 89)

Cherry Picking

Many of the cases that would prove the inexistent of extrasensory perception are often cast aside as it does not fit the agenda of believers. Examples include mediums, psychics and certain theologist practices. This is a common example of cherry-picking across many pseudosciences. (Lavin 2020, p. 107)

8.1.2 SEE-I MODEL

State

A correlation can be drawn between the common presentation of extrasensory perception in the media and the increase in individuals who perceive this practice as a real or attainable power when it is a pseudoscience. Medias can include movies, television shows, video games, certain religious sermons, exorcisms, faulty accounts and documentaries and more.

Elaborate:

The top-grossing box office movie genre in the United States and Canada is Adventure (Navarro, 2022). Highly popular movie series and TV shows such as Marvel, Star Wars, Harry Potter, Game of Thrones, and Stranger Things all share one large portion of their plot structure: extrasensory perception. Many of these adventurous medias contain elements of magic, supernatural powers, and extrasensory perception that are portrayed with such high-quality animation that it almost seems realistic. These supernatural visuals created by production companies could be part of the reason that so many viewers today are more inclined to believe in things like

telekinesis, talking to spirits, telepathy, etc. Even when an audience knows it is fiction, ESP's repeated appearance in movies across time and genres may contribute to people viewing it as a desirable phenomenon. Along with this, certain extreme religious sermons can influence the public easily, bordering on quantum mysticism. Exorcisms and faulty accounts coupled with fraudulent documentaries can also sway the public to believe in the supernatural. Parapsychologists devote their lives to study the supernatural without physical proof, relating back to quantum mysticism as well. Though these examples are more realistic in the world outside of movies, the medias that promote them are condemning the tangible truth.

Exemplify:

- **Psychological Lens:** Psychologists at Harvard University developed a clinical trial in 2008 involving scanning the brain in an attempt to prove if a person can truly have extrasensory perception. Participants were presented with ESP and non-ESP stimuli, with the only difference being that the ESP stimuli was presented telepathically, clairvoyantly, and pre-cognitively. Non-ESP stimuli were presented only visually. The results showed no difference in the brain when presented with the two different stimuli, giving evidence that ESP does not exist in a way that can be proven by science (Lavoie,

2008). Though psychologically and medicinally extrasensory perception cannot be proven, attention has been brought to the harmful psychological effects believing in the nonexistent can have, and what that can stem from. Belief in the supernatural has been linked to increased anxiousness and paranoia which can stem from a variety of mental health disorders including anxiety, schizophrenia, post-traumatic stress disorder and more.

- **Theological Lens:** Using the data that was gathered in an Orenstein (2002) article, it was claimed that "paranormal beliefs are profoundly religious in nature". The difference between paranormal beliefs and most forms of religion is insignificant. There were no findings that those who practiced a religion were less likely to believe in ESP. The study also mentioned the prevalence of paranormal beliefs, such as ESP, being used as a substitute for mainstream religion (Orenstein, 2002). This indicates an increase in the popularity of this pseudoscience.

- **Film Studies Lens:**Statista created a list of the top 20

most successful movies of all time as of June 2022. Within this list, 13/20 (65%) of these movies contained elements of extrasensory perception in their plots. Three out of the thirteen movies were marketed towards children. Movies containing extrasensory perception generate more revenue than movies that do not. For example, this can be seen in films like Harry Potter and Star Wars with the common plot structure of a "hero's journey." Plot structure influences the way a movie plays out, giving a backbone for directors or authors to create a story. This "hero journey" structure consists of elements including "supernatural aid", "abyss", "call to adventure" and "atonement". These common thematic aspects of the plot structure lend themselves to the use and addition of ESP.

Illustrate:

After a full day of going to church, watching a new movie in the theaters, and going home listening to a paranormal podcast; extrasensory perceptive attributes have present the whole day. Impressionable children may begin to 'practice' what they are consuming until they are convinced they have this special gift. On a day soon after, the child is thinking about calling one of their friends when the phone rings at the same time. Had they actually somehow predicted the future? They begin trying to predict other small, daily occurrences.

The phone ringing, the mailman, the exact moment the light turned green at a stoplight. Every time they would predict something incorrectly, they thought "Ah well. I got it wrong that time but maybe I just need to practice harder." When they predict something correctly they become exhilarated with the idea that they might actually possess the telekinetic powers!

Truthfully, if the child kept track of how often they were correct in their 'predictions' they would see that it mostly stemmed from coincidence. This is a fictional example, but one that many people have likely experienced to some degree. It is common for humans to fall prey to confirmation bias in even the smallest areas of life, and in this case, visual media can sometimes contribute to such beliefs.

8.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: What if someone is able to accurately predict the future?

Rebuttal: While there may be some instances throughout history where it has seemed that one is able to predict the future, further investigation finds that it is always due to chance or falsification.

Argument: How do you explain intuition?

Rebuttal: Intuition is an instinctive feeling based on surroundings; an evolutionary trait from our animalistic ancestors. Scientists have yet to prove that this is a psychic ability. Intuition helps maintain order and can be swayed when approached with repeated instances or frequently doing the same task.

Argument: What about mediums? How do they talk to the dead?

Rebuttal: It has been proven that mediums and others who claim ESP to talk to the dead or predict the future have no real supernatural abilities. The perceived ability to talk to the dead or hear supernatural voices can stem from traumatic

experiences, control issues, mental illness, or hallucinations (Powell and Moseley, 2021).

Rebuttal: The one million dollar paranormal challenge was conducted in which a sum of 1 million dollars was offered to anyone who could prove their paranormal ability. In thousands of applicants, no one was able to prove it in a way that was scientifically sound (Taylor, 2022).

8.1.4 RESEARCH PAPER

Introduction

Extrasensory perception is the supernatural ability to manipulate the environment without physical contact. There are six main categories of extrasensory perception: Telepathy, Clairvoyance, Precognition, Retrocognition, Mediumship, and Psychometry. To the average person, these terms have likely been heard or referenced in various forms of media. Through the recent popularity of extrasensory perception, there has been a rise in those who believe in these faux properties, and some who claim they possess such abilities. The modern preceptors of this ability are those who engage in practices such as fortune telling, tarot card readings, parapsychology and exorcisms while claiming the titles of a medium, psychic or trained professional. The purchase of psychic readings in the United States hit a new high in 2020, with 2.2 billion dollars spent on such services. The COVID-19 pandemic has caused a notable surge in the use of these pseudoscientific treatments (Macdonald, 2021). Yet this is far from the origin of extrasensory indulgences.

From the beginning, 'Scrying' is the practice of dropping ink into water and making assumptions about the future based on the shapes made. This was practiced by ancient Egyptians

and is one of the oldest known forms of future telling. Across the globe, different groups also practiced things like palmistry or the reading of tea leaves (Alexandra, 2018). It seems that superstition and belief in the supernatural have been around nearly as long as humans have. The belief in ancient gods and religion had a significant role in the formation of these psychic ideas. These extrasensory practices and belief in various all-powerful Gods and deities have aided in the development of cultures around the world. This should come as no surprise; people want to know more about the world around them, filling in the blanks themselves with the use of imagination and creativity. Humans want to figure out the truth, to be able to control whatever they can for themselves safety and security.

The discussion of extrasensory perception seems to have reached a high with the rise of modern society. Various media outlets have spread these beliefs around and given it new life as modern science grows to disprove what humans once believed. Movies, television shows, books, and apps have all served to reinforce the idea that telekinesis and psychic abilities are attractive and desirable. The media has reinforced this extrasensory thought process and made it seem as though extrasensory perception is prevalent in the real world. The popularization of movies and television shows that contain ESP draws in the most views and have the highest budgets of most genres. This is likely due to new technological advancements and capabilities such as realistic special effects and high-quality animation.

To fully acknowledge the means of extrasensory perception through different media, the situation must be looked at through a psychological lens, theological lens, and film studies lens.

Psychology

It is important to consider extrasensory perception through a psychological lens, as the power is a phenomenon of the mind. To date, there is no physical evidence that people can possess abilities that involve telekinetic abilities, clairvoyance, superpowers or the ability to talk to the dead. An article written by Amy Lavoie in *Harvard Gazette* addresses an attempt to find evidence of the phenomenon. Researchers used neurological imaging to try and find reactions to stimuli that could only be accessed if one were using this neurological extrasensory ability. This study concluded with no physical, neurological or medical evidence of extrasensory perception (Lavoie, 2008). While neurological imaging may be able to help disprove the phenomenon, psychology can address the factors that may contribute to the belief in or experience of ESP.

Various mental illnesses can make people believe they are vastly different from others in society. Symptoms can lead into delusions or psychosis that could easily be classified as supernatural by the individual affected. Hallucinations are a major auditory and visual symptom consistent with a variety of mental illnesses. Psychologists are understanding to their

patients and believe what they are experiencing is real to them. Even though it may not be physically happening, mentally these occurrences are real and are symptoms of something greater. Doctors ask questions to discover if these experiences could be a result of trauma, psychosis, or underlying mental illness or neurological disease. It is common for these hallucinations to both be triggered by major life events or triggered by nothing at all. One study exploring the connection between trauma and the supernatural found that "[...] paranormal experiences occur especially frequently after stressful or negative life events" (Rabeyron and Watt, 2010, p. 487). Thus, stress and anxiety can be safely attributed as the cause of many hallucinations and paranormal experiences.

Figures 8.1, 8.2, and 8.3

Mythical Depictions of Extrasensory Perception

Note. (From left to right) Image Credit: (8.1) Artifact courtesy of the Louvre, France. Greek, possibly from Armento, Eumenides Painter, 380–370 BC. Accession number: Cp 710.

Photo taken by Bibi Saint-Pol. (8.2) The Yūrei from the Hyakki Zukan by Sawaki Suushi, 1737, Public Domain. (8.3) Hammersmith Ghosts from Kirby's Wonderful and Scientific Museum, Volume II, Engraving, 1804, London, Public Domain, Wikimedia Commons

Aside from hallucinations or intense disorders, the belief in extrasensory perception is common for those suffering from everyday anxieties or compulsivities. This does not make the believer unintelligent, just looking for control or understanding of their life and the way the world works. A joint study by Marija Branković (2019) questioned the reason behind the believers' adamancy. It was theorized that "ESP is motivated by a desire to better control one's environment and reduce some basic anxieties." For example; the external locus of control describes an individual's belief that their life and decisions are primarily affected by external forces. According to M. Branković (2019), the relation between death anxiety and one's locus of control is also seen as a strong motivator for the belief in extrasensory perception.

So what differentiates those who believe in ESP and those who don't? A study by Gray and Gallo (2016) sought to compare the cognitive differences between believers and skeptics of ESP, determining why such a large portion of the population finds credibility in the idea. The researchers found evidence to "[...] suggest that differences in analytical thinking and conceptual knowledge might contribute to the development of psychic beliefs" (p. 42). Those with a belief

in the extrasensory were found to think less analytically. Yet, the study also discovered that there seems to be a correlation between the belief in psychic abilities and "greater life satisfaction." Thus, it may be the case that belief in ESP provides mental and social benefits, as most conspiracy theories often do. Historically, there has been a great deal of organized belief in extrasensory perception which, in the psychological sense, is now known to be a socially valuable phenomenon.

Theology

With many religions having extrasensory perception in their origin stories, it is important to look at this pseudoscience through the lens of a theologist. Most religions start as collections of fables, observations, or metaphorical tales passed around through groups of people. Faith joins these topics together, all riding on the back of a bigger purpose. Since these observations have little to no scientific evidence of their existence, a system of belief and devotion is required for a religion to become more than just stories.

Religions have logical, psychological, and cultural reasoning for the formation of a belief system, even one created using stories of the pseudosciences we know today. United under the faithful guise of moral beliefs, no one could question the power this holds. Community is the driving factor of religion, and the stories told from religious texts preach whimsical events of magic, heroism, and self sacrifice. These stories often

have metaphorical meanings that are meant to be the key takeaway, not that regular humans are the facilitators of superpowers.

The mainstream religions have been around for a long time and have become a staple of normalcy for most. This could be due to cultural influence in the environment, community worships and social time or even just the way society functions. This follows the guidelines of the genetic fallacy, which claims that something must be true due to how long it has persisted in culture or society (Lavin 2020, p. 89). Century-old practices or beliefs couldn't be wrong, could they? This is a logical fallacy because a concept's origins have do not have a direct impact on its current state. This can apply to religions, cultural traditions, and pseudosciences. A study regarding the connection between religion and extrasensory perception stated that "belief in ESP is profoundly religious in nature" (Orenstein, 2002, p. 309). This study was a collection of data from surveys that asked college students about their beliefs in religion and their beliefs in paranormal concepts such as ESP, psychics, deja vu, astrology and necromancy. The data concluded that greater religious beliefs correlate highly to greater belief in the paranormal. Those who do not attend religious services have been found to have a decreased belief in the paranormal, highlighting the importance in religious participation and the supernatural. The author was led to the conclusion that paranormal beliefs have become a sort of

'substitute' for mainstream religion, as orthodox religious practices have begun to fade out of the societal norms.

Film Studies

The film studies lens is the visual preceptor of the magical thinking that has become so common. Without the visual media influence, extrasensory perception would likely not have the sturdy grip on the imaginations of the public that it currently holds. It is estimated that 75% of Americans have some belief relating to the paranormal – higher than the typical amount worldwide (Merced, 2018). This is a significant portion of people and the nature of the topic can lead to what is known as the bandwagon fallacy. People assume that since the belief is so common, there must be some truth to the idea since it seems unreasonable that so many people could be wrong. Unfortunately, no amount of belief can make a false thing true. It is also possible that the prevalence of ESP in visual media has contributed to the continuation of the fallacy – it seems so common that it's viewed as less of a taboo than many other pseudosciences.

Books, television shows, movies, apps, and other common forums for entertainment include fictitious plots and stories. Though it isn't known to the public, there are established structures for successful films. "A good script is only as good as the plot – or the story at the center of it all. Screenwriters and filmmakers agree that it's this central story that develops, informs, and controls how you write your script, shoot your shots, and make those final edits" (Aldredge, 2020). The

entertainment industry puts pressure on the plot of the story. This is the most important piece of the work, and it is the vision the consumers will see come to life. But what makes a good plot? The plot diagram is the most commonly used medium to track events in a movie. This contains exposition, conflict, rising action, climax, falling action, and resolution. Though this is the most widely recognized medium, several other models are also common in the making of movies. Filmmakers regard 'The Hero's Journey' as a way of "taking these building blocks and creating unique and powerful stories" (Aldredge, 2020). The contents of the hero's journey involve three main aspects: the departure, the initiation, and the return. The circle begins at the departure and then flows through eras such as 'call to adventure' 'supernatural aid' 'abyss' and 'atonement'. These are a few of the steps that, with attention to detail, can be perceived in movies such as Harry Potter and Star Wars.

Regarding blockbuster hits, extrasensory perception has been a staple in the filmmaking industry. In fact, 65% of movies on the highest-grossing movies list contain ESP, with 15% being children's movies (Statista, 2022). The currency of extrasensory perception in the media is no coincidence.

Films containing ESP became popular in the early 2000s. Before this, movies containing magic and paranormal activity were not as common. This is partially due to the intense popularity generated by movie franchises such as Harry Potter, Star Wars, Avatar, and superhero media. After the great success

of these film franchises, filmmakers and directors took notes and the entertainment industry has followed suit. In 2022, ⅗ of the most popular movie genres are the ones with the highest percentages of ESP. This includes action, adventure, and suspense/thriller (Statista, 2022). Yet, with the production of superior equipment, genres such as sci-fi have had a rise as well. Special effects, new technology, and better editing have aided creators in generating realistic graphics to correlate with their fantastical stories.

Entertainment that is consumed by the public always leaves the audience with a takeaway. Maybe they watch a horror movie and become uneasy, sleeping with the light on or the closet door shut. Maybe they see an inspiring health journey on social media and become influenced to go to the gym or make a healthy dinner. Maybe they see a television show about family and feel inclined to call or reach out to someone they hold dear. Would it be so preposterous to assume that the most consumed genre and the highest-grossing movies in the world don't leave audiences with a takeaway of their own? These adventure-driven, extrasensory-holding movies leave an impact on audiences both subliminally and outwardly, especially children and impressionable, naive individuals. Through the film studies lens, it starts to become apparent why belief in ESP is common nowadays. In recent years, ESP has become more and more prevalent in films as societal demand for the magical and supernatural increases. It seems to be no coincidence that there has been a notable growth of belief in the supernatural.

The prevalence of believing in extrasensory perception has been enforced through psychology and theology but cemented with the daily media consumed by the masses.

Conclusion

It has been proven by medical professionals, psychologists, and scientists that ESP is a pseudoscience. While there is more than one type of pseudoscience, ESP would be classified as a pseudo-theory promotion. The theory of extrasensory perception is more focused on promoting an idea that has no scientific evidence rather than denying science in general (Hansson, 2017). The student-led survey conducted throughout this project showed that 90% of participants knew of ESP. Of this 90%, 63% heard about it from media such as movies, TV shows, or books. While only a small sample of 40 individuals, the data adds some empirical evidence to the research regarding the connection between ESP and media.

The argument for ESP is fairly one-sided. There is no evidence supporting the existence of ESP, so there is only personal or religious experience to pull from, lacking physical evidence. This concept crosses the line into the logical fallacy of cherry-picking, where certain information is used to support a claim while other information is completely ignored (Lavin 2020, p. 107). Fallacies like ad ignorantiam often occur when people assume that a lack of evidence disproving ESP means that it is real. It can be compared to when a child seeks loopholes in the household rules. The child may say, "Well I

wasn't told not to light firecrackers in the garage, so it must be alright." However, as both the child and the ESP supporter should realize, a lack of evidence or instructions to the contrary does not make the argument or action correct. While still indefinite, it is reasonable to say that there is a correlation between the presence of ESP in the media and the large percentage of people who believe it to be real. The media cannot blindly convince viewers that ESP is real on its own, but rather creates repetitive exposure to the concept that makes people more inclined to believe in it. It seems a monumental task to try and disprove something that has had such a strong influence on religion and social norms. However, the purpose of this text is to look at the past and the present with a critical eye. Perhaps a few educated guesses about the future of ESP can be made, but one does not need precognition for that!

References

Aldredge, J. (2020, October 29). *Understanding and implementing plot structure for films and screenplays*. The Beat: A Blog by PremiumBeat. https://www.premiumbeat.com/blog/plot-structure-for-films-and-screenplays/

Alexandra, R. (2018, May 3). *A history of TV psychics (and why we love them so much) – KQED POP.* KQED. https://www.kqed.org/pop/103358/a-history-of-tv-psychics-and-why-we-love-them-so-much

Branković, M. (2019). Who believes in ESP: Cognitive and motivational determinants of the belief in extra-sensory perception. *Europe's Journal of Psychology, 15*(1), 120–139. https://doi.org/10.5964/ejop.v15i1.1689

Černín, D. (2019, November 24). Historical methodology and critical thinking as synergised concepts. *Disputatio, 9*(13), 00–00. https://disputatio.usal.es/vols/vol-9-no-13/cernin-concepts/

Gray, S. J., & Gallo, D. A. (2015). Paranormal psychic believers and skeptics: A large-scale test of the cognitive differences hypothesis. *Memory & Cognition*, *44*(2), 242–261. https://doi.org/10.3758/s13421-015-0563-x

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science Part A, 63*(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

Lavoie, A. (2008, January 3). *Neuroimaging fails to demonstrate ESP is real.* Harvard Gazette. https://news.harvard.edu/gazette/story/2008/01/neuroimaging-fails-to-demonstrate-esp-is-real/

Macdonald, F. (2021, January 15). *What, if anything, can psychics tell us about all of this?*The New York Times. https://www.nytimes.com/2021/01/15/style/did-you-predict-this.html

Merced, M. (2018). The uncanny: A biopsychosocial perspective. *American Journal of Psychotherapy*, *71*(1), 39–49. https://doi.org/10.1176/appi.psychotherapy.20180004

Navarro, J. G. (2022, June 27). *Worldwide highest-grossing films of all time as of 2022.* Statista. https://www.statista.com/statistics/262926/box-office-revenue-of-the-most-successful-movies-of-all-time/

Nosich, G. M. (2012). *Learning to think things through: A guide to critical thinking across the curriculum* (4th ed.) [eBook edition]. Pearson.

Orenstein, A. (2002). Religion and paranormal belief. *Journal for the Scientific Study of Religion, 41*(2), 301–311. https://doi.org/10.1111/1468-5906.00118

Powell, A. J., & Moseley, P. (2020). When spirits speak: Absorption, attribution, and identity among spiritualists who report "Clairaudient" voice experiences. *Mental Health, Religion & Culture*, *23*(10), 841–856. https://doi.org/10.1080/13674676.2020.1793310

Rabeyron, T., & Watt, C. (2010). Paranormal experiences, mental health and mental boundaries, and psi. *Personality and Individual Differences*, *48*(4), 487–492. https://doi.org/10.1016/j.paid.2009.11.029

Taylor, G. (2015). 'The One Million Dollar Paranormal Challenge'. *Psi Encyclopedia*. London: The Society for Psychical Research. Retrieved December 9, 2023, from https://psi-encyclopedia.spr.ac.uk/articles/one-million-dollar-paranormal-challenge

UNIT 8 CRITICAL THINKING EXERCISES

1. Choose a partner

    - Individually, write down a list of movies, TV shows, books, or news articles that contain ESP elements.
    - Compare with your partner. See how many each of you came up with and if you share any similarities.
    - Discuss why you think these forms of media decided to use ESP. How does it contribute to the overall story? Do you or your partner believe the elements of ESP that are presented? Why? If not, what makes it intriguing to watch if you do not believe in it? Is it the storyline, the animation, or something else?

2. Choose one ESP feature you find the most interesting. This could be psychics, necromancers, the reading of tea leaves, telekinesis, etc. Research more about that feature. For example; recent studies, news articles, common sightings or occurrences, etc. Write

down your research and be prepared to discuss it with a group or partner.

3. Throughout the day, try to incorporate the topics into your daily life. Have you ever seen a psychic? Do you have any intuitive experiences? Write it down in your journal.

PART IX
UNIT 9: QUANTUM MYSTICISM

9.1: HOW MUCH TRUTH IS THERE TO QUANTUM MYSTICISM?

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2.

9.1.1 REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at Issue:

Does physics, specifically quantum and particle physics, explain any of the trendy spiritual phenomena that has gained attention over the past few years?

Information and Evidence:

- Peer-reviewed studies on quantum mechanical models
- Mathematical theories exploring the many-world theory and the law of attraction
- Studies about vibrational frequency
- Studies about energy and thermodynamic laws detailing what energy is and how it flows in the universe

Purpose:

To evaluate whether or not quantum physics explains the recent trends of spiritual phenomena such as astral projections, the law of attraction and the phenomenon of raising frequencies

Assumptions:

- A phenomenon must be successfully supported by quantum physics.
- Mathematical models must be in place detailing its functionality.
    - It is crucial for these models to be widely accepted in the physics world.

Point of View:

- Physicists
- Spiritually-inclined individuals
- Wiccan practitioners
- TikTok users
- Medical professionals

Concepts:

- Physics
- Quantum mechanics
- Vibrational frequency
- Energy

- Law of attraction
- Quantum entanglement

Implications and Consequences:

If there exists a highly spiritual world and it is supported by mathematical models, then it is being kept hidden from the general population. The consequences of using physics to support spiritual theories can be drastic. Not only do these models poorly represent physics and spread misinformation, but the people who are partaking in these trends also rarely understand quantum mechanics. These individuals use it simply because it is not explained well, nor understood by the masses. They are using a little known physics concept to support their theories.

Context:

Spiritual phenomena should be considered within the context of physics, social media impact, human psychology, and cognition.

Conclusions and Interpretations:

There is absolutely no evidence suggesting that the spiritual phenomena mentioned is based on a true quantum mechanics model, nor can it be supported by physics (Newtonian or not).

Disciplinary Lenses

Physics (Thermodynamics)

Question at Issue:

How do the laws of thermodynamics affect humans and matter such as crystals?

Evidence and Information:

- Thermodynamic textbooks
- Anecdotal research published in the form of articles
- Peer-reviewed research
- Crystal marketing schemes

Concepts:

- Vibrational energy
- Crystals
- Energy interactions
- Entropy

Assumptions:

- Materials (including crystals) have energy and release radiation, however, this radiational energy is either hardly impacting us or is detrimental to humans and their well-being.

Purpose:

To determine if there exists any thermodynamic data that points towards crystal healing and law of attraction among other spirituality or spiritual healing practices

Context:

- Thermodynamics
- Energy
- Spiritual healing

Point of View:

- Physicists
- Spiritual leaders
- General public

Implications and Consequences:

- Understanding the role that physics plays in everyday life
- Understanding the basis of how people use thermodynamics and the flow of energy to support topics such as crystal healing, law of attraction, and more
- Understand if the energy of materials influences humans

Conclusions and Interpretations:

Thermodynamics has the potential to show whether there

are any physical and mathematical models supporting the mentioned spiritual topics.

Physics (Quantum Mechanics)

Question at Issue:

Does quantum mechanics relate spirituality, consciousness and subconsciousness to physical and mathematical models?

Evidence and Information:

- Peer-reviewed research
- Understanding quantum mysticism
- Spiritual leaders publishing about quantum mechanics and its relation to spirituality

Concepts:

- Quantum mechanics
- Quantum mysticism
- Consciousness
- Astral projection
- The many-worlds theory
- The Copenhagen interpretation

Assumptions:

- When observed, the wave function collapses and not all possibilities are realized.
    - This renders any "many-reality" theories—such as shifting realities—impossible.

Purpose:

- To understand why quantum mechanics does not support these theories and what quantum mysticism is as a subject

Context:

- Consciousness
- Subconsciousness
- Quantum realm
- The mind-body relationship

Point of View:

- Physicists
- Spiritual leaders
- TikTok users
- Supporters of the many-worlds theory
- Supporters of the Copenhagen interpretation

Implications and Consequences:

- There is a need to understand what quantum mysticism is and how it impacts the interpretation of physics in less informed people.
    - The misuse of quantum mechanics has severe mental consequences:
        - *Ageless Body, Timeless Mind*.

Conclusions and Interpretations:

Physicists have completely rejected the application of quantum mechanics to other topics and are constantly fighting against theories of this kind.

Psychology (Need for Uniqueness)

Question at Issue:

How does the need for uniqueness (NFU) cause people to look for the "special" or "supernatural" within them and around them?

Evidence and Information:

Psychological Studies

- Clinical trials on uniqueness
- The rise in TikTok users in recent years and the negative impacts of social media

Assumptions:

- Most spiritual occurrences and beliefs come from a need to feel unique or regain control.

Concepts:

- Psychology
- Sociology
- COVID-19
- Yearning for something "more"
- Helplessness

Purpose:

- To determine the correlation between the NFU and recent spirituality trends that have gained a following in recent years

Context:

- Spirituality, as it's seen in a psychological context, and the attempt to support claims with science

Point of View:

- Psychologists
- Sociologists

- Spiritually-inclined individuals
- Eastern healers that do not work under Western assumptions and practices

Implications and Consequences:

- Spirituality and spiritual practices gained traction during the isolation that occurred during the 2020 pandemic.
- People not only craved a feeling of uniqueness but also yearned for a fresh perspective of the world.
- These beliefs can be harmless and fun when practiced in moderation, however, there is the threat of capitalization on the vulnerability of younger audiences at play.
    - This threat is particularly prevalent amongst online users, like those on TikTok, who do not source their information from reliable sources.

Conclusions and Interpretations:

The NFU, in addition to the need that humans expressed during the pandemic when they sought to "take back control" in situations of helplessness, could be reasons why spirituality is gaining a following.

Empirical Claims

Inductive Reasoning #1

True Premise 1: After owning crystals, my anxiety/depression/illness/etc seemed to get better.

True Premise 2: Through quantum physics, one can achieve the capability to raise their body's vibration and promote healing through the power of positive thinking.

Weak Inductive Reasoning: Crystals have healing powers because they can capture the positive energy within them.

Logical Conclusion: Due to the placebo effect, one may see positive benefits by truly believing in the crystal's power. In reality, the two are not connected, nor does the crystal affect the ailment.

Inductive Reasoning #2

True Premise 1: There are anecdotal claims that if one wants to raise their vibrations, a positive mindset is crucial.

True Premise 2: After shifting one's mindset, their life quality improves.

Weak Inductive Reasoning: Due to the vibrational rise in their thoughts, they are now attracting the life they desire.

Logical Conclusion: Changing one's attitude toward life may lead to better quality of work and an increase in positive lifestyle choices. Vibrations are not included.

Abductive Reasoning #1

True Premise 1: The concept that remaining positive and having an optimistic outlook on life produces a happier and healthier life is used by quantum healers as proof that thoughts hold intense power over the outcome of humans lives.

Weak Abductive Reasoning: One can make dramatic life changes and even prevent aging through their thoughts.

Logical Conclusion: Having a positive outlook on life has shown an overall improvement in people's lives—not because of their thoughts and what healing they are performing—but because they are more likely to find enjoyment and accomplishment in their daily tasks.

Abductive Reasoning #2

True Premise 1: Most people want to have control over their destiny, and there is anecdotal evidence that crystals help change one's life. Energy is all around, and crystals possess energy.

Weak Abductive Reasoning: Since crystals affect energy, they affect one's life energy and make it positive.

Logical Conclusion: Experiencing happy emotions or

experiencing something good while carrying a crystal doesn't make the crystal the source of happy energy. It is likely a coincidence or the placebo effect.

Deductive Reasoning #1

True Premise 1: Quantum mechanics math models support the many-worlds theory, which claims that there is a reality formed for every possible choice.

Weak Deductive Reasoning: One must only think positively because there is a reality created for every thought/choice that is made, and satisfactory realities are desirable (science misinterpretation, appealing to false authority).

Logical Conclusion: The physics of quantum mechanics exceedingly supports the Copenhagen interpretation. The many-worlds theory exists mainly because the math requires less constants. Therefore, one can conclude no other realities are created for the choices you do not make.

Deductive Reasoning #2

True Premise 1: Energy is all around us.

True Premise 2: People are capable of manipulating energy

and converting it between different forms (electrical to thermal, kinetic to potential, etc.).

Weak Deductive Reasoning: People can use crystals to channel positive energy, so energy crystals must be supported by physics.

Logical Conclusion: People are indeed able to use energy to influence their lives, but there is no physics-based energy referred to as positive energy, nor is there a way to channel it into an object using the power of thought.

Logical Fallacies

Vagueness

Quantum mechanics is not well understood, especially by the masses. This causes it to be used often to back up metaphysical concepts. "You must raise your thoughts' vibrational frequency." What is one's thoughts' vibrational frequency? How is it raised?

Appeal to Ignorance

Due to the fact that there can be no research done on quantum mysticism theories, there will always be individuals claiming that the theory cannot be disproved. "Since it cannot be absolutely, dismissed then it is true."

Wishful Thinking

Quantum mysticism relies on wishful thinking. A lot of the ideas incorporated into quantum mysticism are built upon the idea that if one truly believes something, then it will happen. This is the definition of wishful thinking. "If I take on a more positive mindset, my life will be better. I will get my job because I have manifested it."

Hasty Generalization

Quantum mysticism is mostly supported by anecdotal evidence that shapes bold conclusions. "Two of the people who bought crystals in my shop had a new job within the week, it must be the crystals."

The Slothful Induction (Appeal to Coincidence)

Many people are unable to improve their lives despite how hard they try to think positively or how many crystals they buy. Instead of claiming that these methods do not work, a guru could claim they are not in the right vibrational frequency or the stars are not properly aligned.

Coincidence

A lot of people who use crystals and other forms of metaphysical practices attribute their successes to their metaphysical practices instead of acknowledging that a lot of it is a coincidence.

Correlation-Causation

This fallacy is similar to the coincidence fallacy in which

individuals disregard other relevant factors (mood, viewpoint, attitude) and claim that their lives are improving due to the practice of metaphysical ideas. For example, one may say, "My anxiety is gone ever since I started wearing my amethyst necklace." In reality, the crystal necklace one is wearing has nothing to do with the improved anxiety of the wearer.

Science Misinterpretation

Quantum mysticism applies the fallacy of misinterpretation by portraying science incorrectly. "Quantum mechanics shows that vibrational frequencies can change, which supports the idea that of changing vibrational frequencies."

Appeal to False Authority

Individuals involved in quantum mysticism are often fake experts. D. Chopra lacks accreditation in the field of physics, yet he speaks about quantum theories in his published books. D. Chopra uses his publishing accolades, such as his status of being a New York Times bestselling author, to appeal to authority when he has no formal background in the scientific fields he claims to have knowledge in.

Standards of Critical Thinking

Clarity: The point is clear and the evidence supporting it is well-defined.

Accuracy: Most of the articles supporting scientific facts are legitimate articles from reputable journals and books. Anecdotal experiences have been attached to support and explain how theories of quantum mysticism are insufficient, working in favor of the pseudoscience claim.

Importance/Relevance: The information covered is highly relevant due to the rise in quantum mysticism today. It is also greatly important to educate people before they are preyed on.

Sufficiency: There are a number of articles used, but more should be included to strengthen the backbone of the paper.

Depth: The article provides good depth for a primary introduction to the topic, but it requires a further delve into the physics realm.

Breadth: The article has three lenses, two of which are physics-related. While this is extremely applicable, a different point of view could be brought in. Maybe a business/marketing lens?

Precision: The article has good precision because the conclusion is widely supported by physicists.

3.

9.1.2 SEE-I MODEL

State

There is no physics-based evidence supporting many of the spiritual phenomenons that have gained traction in the last few years.

Elaborate

The physics-based evidence used to support spiritual awakening movements is often attributed to quantum mysticism and viewed by most physicists as fake, reaching or grasping for straws.

Exemplify

- **Quantum positivity:** Information presented by quantum healers (D. Chopra) mainly regards having an exaggerated positive attitude under the guise of improving people's lives while the 'gurus' benefit financially. Another example is information presented in

the movie *What the Bleep Do We Know!?* This is a film depicting quantum mysticism and aims to provide a message about how thinking a certain way can influence the world around you.

- **Crystals:** There is no evidence showing that the healing done by crystals is legitimate, all evidence is anecdotal stories lacking in scientific basis likely due to placebo effects.
- **Quantum mysticism:** All the work that aims to relate quantum physics to spirituality is labeled as quantum mysticism and is debunked and looked down upon by physicists worldwide.

Illustrate

An adequate number of individuals wear a certain piece of jewelry or clothing to provide good luck when undergoing an important life event because they believe that it will help them achieve successes like they have in the past. While not necessarily true, it provides a sense of comfort and increases the likelihood of success which can enforce their belief in the superstition.

4.

9.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: Reputable psychics, healers and oracles have been around for centuries. Crystals and quantum mystics help people the same as they did. How can we dismiss that as fake?

Rebuttal: Manipulation and false accounts, as well as coincidence and the placebo effect have been around for centuries. Humans fall for alternative medicine as a comfort psychologically or to have something to rely on. In todays time, quantum physics is not well understood to most people, allowing for room for interpretation and manipulation. Such practices go back to the times of oracles and psychics. This is why the false healers tend to stretch it and back up incorrect theories. The implications could make vulnerable people—especially in times of hardship—fall prey to crystals/ quantum healers to seek comfort instead of seeking professional health.

Argument: Believing in quantum mysticism makes someone unintelligent.

Rebuttal: Humans are not unintelligent for needing

support and finding things that make them excited and happy. A crystal may not affect the present and make events occur, but neither do lucky numbers or any object deemed 'lucky'. It is just comforting object, helping someone feel secure in their tasks. Those who fall victim to crystals or quantum mysticism tend to be people looking to create positive change in their lives. Changing their mindset brings positive change, attributed to the placebo effect.

Argument: We can manipulate energy and do it every day with engines/refrigerators, directing your energy into crystal amplifiers is just a form of that.

Rebuttal: There isn't any evidence that supports the existence of positive energy flowing into crystals or the human vibrations increasing. While powerful refrigerators and engines have the ability to manipulate energy, crystals are not known to have the same power.

5.

9.1.4 RESEARCH PAPER

Quantum Mysticism and Its Grasp on Today's World

Physics is one of the many important sciences that shed light on the arrangement of the universe. By describing phenomena with strong mathematic theories, physicists help make sense of the world. Humans have always craved a sense of understanding and knowledge. Starting from the early Egyptians, Greeks, and Romans; humans have always tried to explain the oddities of the world. With the progression of science and technology, the list of said oddities becomes narrower and narrower. However, there are many occurrences that science has yet to mechanistically explain. Such phenomena lie below the surface, including thoughts and feelings. In addition to the desire to explain and understand, humans have an innate need to feel different while fitting in. This explains why some individuals express their individuality any chance they receive in a consuming world. Quantum mysticism can be thought of as originating in the desire to explain odd phenomena while also differentiating themselves from the masses.

Identified as a pseudoscience, more specifically pseudo-theory promotion, quantum mysticism fits the whole criteria stated in "Science Denial as a Form of Pseudoscience" (Hansson, 2017, p. 40). Quantum mysticism fulfills the criterion of falling within the scientific domain given that it pertains to an issue in a broad and applied science—such as physics. Additionally, it also satisfies the criterion of unreliability. Most of the data supporting quantum mysticism is anecdotal evidence or vague descriptions. Finally, it fulfills the criterion of a deviant doctrine where it is claimed that quantum mechanics and physics support the claims of quantum mysticism. Although it mostly fits the definition of pseudo-theory promotion, quantum mysticism also has some features of science denialism. A prominent characteristic is the conspiratorial idea that the government—or some sort of "they"—is monitoring available sources. "They" work to ensure that humans are unable to find out "the truth" about raising vibrations and reaching some sort of enlightenment. Young or naive individuals often become susceptible to these claims found on social media such as TikTok.

Another harmful characteristic of quantum mysticism is its misappropriation of physics terminology. As described by L. Green (2018), semantic creep is a natural part of any language's development; it drives the change in the meanings of words over time. Because of semantic creep, words with very defined and applied meanings in physics, such as energy and

vibrational frequency, have had their meanings expanded and changed beyond their original usage. This means that practitioners of quantum mysticism are using physics terminology in ways that are not the same as the way physicists use them. This is harmful because the misappropriation of physics terminology gives quantum mysticism an air of scientific authority that it does not actually have. Despite the many tries to use quantum mysticism to understand the underlying phenomena of thoughts and make sense of human origins and the universe, there is no physics-based evidence supporting many of the spiritual acts that have gained traction in the last few years.

Quantum Mechanics Lens

Quantum mechanics (also quantum physics) is a relatively new subfield of physics developed in the first half of the 20th century. The father of quantum physics is Max Planck, a German theoretical physicist who introduced Planck's constant. Planck's constant is widely used today in a multitude of different disciplines aside from physics including chemistry, biology, and organic chemistry. Neil Bohr also made groundbreaking discoveries in the structure of atoms and quantum theory in the field of quantum mechanics (Squires, 2021).

The study of quantum mechanics has led to the discoveries of fundamental applications in many disciplines. From the MRI

in medicine to the spectroscopy of molecular biochemistry, quantum mechanics has made a large impact on the functionality of society. Despite the continuous strides of progress in the understanding of quantum mechanics, there are still many unknown elements in the world. The complexity surrounding quantum mechanics has allowed for incorrect interpretations. The media has taken bits and pieces about this vastly unknown topic and has applied it to theories that are often untrue. This has given rise to a pseudo-theory of quantum mechanics, the Hyde to its Jekyll—quantum mysticism.

Quantum mysticism encompasses all attempts at society using quantum mechanics to describe vague metaphysical theories. D. Chopra is a guru and writer of the very famous books *Quantum Healing* and *Agless Body, Timeless Mind*. Chopra talks about training the mind to not stress because it is the beacon of aging. He and many other new-age self-help gurus throw around the word "quantum vibrations" and tell audience members to raise their vibrations without describing what vibrations are or how to do so. Vibrations are mechanical movements of particles in oscillating periodic intervals. They are a response of a system when it is disrupted from the equilibrium (Editors of Encyclopaedia Britannica, 2020). Vibrational energy corresponds to the infrared region of the electromagnetic spectrum. When a molecule interacts with a photon with a wavelength that is in the infrared region, the

molecules change their vibrational level from a ground state to an excited state. Eventually, the molecule emits that photon and falls back to its ground state (Atkins et al., 2017). This simple explanation of vibrational energies shows their volatile nature. Humans are constantly exposed to radiation as their vibrational frequency is not in a single wavelength, but a range of such wavelengths. So, is it ridiculous to make claims of using thought to raise vibrations, when vibrations are constantly shifting?

Chopra and other gurus misuse science to back up personal beliefs. Many have written and identified Chopra's teachings as pure pseudoscience since they are not based on quantum physics but instead an idealized version of quantum mysticism (Weldon, 2009). Many physicists, such as V. Stenger, have commented on quantum mysticism and stated that nothing in quantum physics requires the addition of supernatural qualities (Prometheus Books, 2003).

Thermodynamics Lens

In addition to misinterpreting quantum physics, there has been a new age of embracing ideas from ancient cultures including the Egyptians and Greeks (Scialla, n.d.). With the evolution of science and humanity's increased understanding of the world, these ideas began to fade as they were disproven. Now, they are resurfacing significantly, especially on social media. Malleable generations of people frequent these social

apps and embrace these old practices. An example includes society using crystals to improve the quality of one's personal life, which is found all over the internet. Sadie Kadlec, reported getting a raise at work and credits wearing crystals, drawing social attention (Viebrock, n.d.). While some might attribute this success to hard work and persistence, Kadlec vouches that her crystals gave her that raise. Having achieved this crystal success, Kadlec meditates daily to strengthen her crystals and teaches classes on how to use them to manifest a better life. Despite this, legitimate studies such as the one done by psychologist C. French have shown that crystals' effects are more than likely placebo effects:

> He gave 80 volunteers booklets explaining the sensations they might have while holding crystals, including tingling limbs, increased concentration, and heightened energy. Then he gave half of the participants genuine gemstones and the other half fakes made of cheap plastic. Those holding a fake were just as likely to respond physically as those holding the real thing. French's conclusion: The power of suggestion—not flowing energy—was to credit. (Viebrock, n.d.).

Even though crystals are not truly healing, research shows that the placebo effect can release endorphins and help with day-to-day struggles, similar to having a 'lucky' number or object (Kaptchuk & Miller, 2015). So even though these alternative methods have been disproven, are they really that bad?

In addition to the scientific evidence stating that crystals do not cause a desired change in someone's life, there is also physics-based evidence that remains unsupporting of these theories. When asking a question whether crystals contain energy, the answer is yes. Every resting body holds energy, as demonstrated by the $e=mc^2$ equation. But that energy does not interact with us. There is no scientific evidence that it is possible to channel positive energy into crystals. There is a lot of potential energy stored in atomic and molecular bonds, but that energy remains there until those bonds come undone (Kapustinskii, 1956).

Psychology Lens

There are many psychological reasons one might turn their back on science and seek out relief in pseudosciences such as quantum mysticism, crystals, and other metaphysical phenomena. One of them is the need for uniqueness, a psychological phenomenon that describes a normal desire among humans to be different and outstanding from peers. It emphasizes a sense of individuality, rebellion, anti-conformity, and the craving to "swim against the current" (Snyder & Fromkin, 1977, p. 8). The need for uniqueness is an inherently positive trait, leading to increased self-esteem, and a higher drive for inventions. However, it can also lead down a dark path. People can fall into rabbit holes as they go above and beyond to look for their individuality—not realizing that being themselves is unique enough.

Other psychological phenomena have also given traction to a lot of today's metaphysical trends: helplessness, a feeling of losing control, and isolation. The COVID-19 pandemic deeply influenced the minds of society in different ways, proving how easy it is for the structure of life to collapse. Humans are social creatures craving interaction. When trapped in four wall cages, animals look for ways to cope. Feelings of helplessness and loss of control dominated society everywhere during the pandemic, and people sought ways to regain that control.

S. Vyse (2000) claims that using crystals to take control over your destiny can brighten moods, uplift mindsets, and bring hope or happiness into someone's life. Though these positive effects are surely placebos, the act of regaining control can change a person's mood and how they view their life.

Conclusion

There is no real or peer-reviewed scientific evidence that supports the stated metaphysical theories that have gained traction during the pandemic. Most of the evidence obtained is anecdotal or produced by those who capitalize on vulnerabilities. A lot of these practices gained traction during COVID-19 due to feelings of depression, loss of control, and the desire to express individuality in different ways. There is no physics-based evidence supporting any of these practices, yet they can provide comfort due to the placebo effect.

The rise in metaphysical practices can be compared to a lucky shirt, socks or heirlooms. Humans can have one article of clothing worn during a big test day or a lucky seat to always take. Whether it helps or not is not the point, it is done to ease discomfort, making or breaking performance and confidence. This is why these practices are not necessarily harmful if treated with care. They become detrimental when people capitalize on other's struggles, or when science is completely ignored and misinterpreted to give legitimacy to incorrect claims.

References

Atkins, P., De Paula, J., & Keeler, J. (2017). *Atkins' physical chemistry* (11th ed.). Oxford University Press.

Editors of Encyclopaedia Britannica. (2020, April 6). *Vibration | Physics*. Brittanica. Retrieved April 25, 2022, from https://www.britannica.com/science/vibration

Green, L. (2018, December 6). *Who decides what words mean.* Aeon. Retrieved August 12, 2024, from https://aeon.co/essays/why-language-might-be-the-optimal-self-regulating-system

Kaptchuk, T. K., & Miller, F. G. (2015). Placebo effects in medicine. *The New England Journal of Medicine, 373*(1), 8–9. https://www.nejm.org/doi/full/10.1056/NEJMp1504023

Kapustinskii, A. F. (1956). Lattice Energy of Ionic Crystals. *Quarterly Reviews, Chemical Society 10*(3), 283–294. https://doi.org/10.1039/QR9561000283

Moriarty, P. (2018, June 12). *The wow and the woo.* Physics World. Retrieved April 25, 2022, from https://physicsworld.com/a/the-wow-and-the-woo/ (April 25, 2022).

Prometheus Books. (2003, April). *Has science found God? The latest results in the search for purpose in the universe: Publisher's blurb.* University of Colorado Boulder. Retrieved April 25, 2022, from https://web.archive.org/web/20141019071755/http://www.colorado.edu/philosophy/vstenger/Found.html

Scialla, J. (n.d.). *History of crystals and healing.* Crystal Age. Retrieved April 25, 2022, from https://www.crystalage.com/crystal_information/crystal_history/

Snyder, C. R., & Fromkin, H. L. (1977). Abnormality as a positive characteristic: Development and validation of a scale measuring need for uniqueness. *Journal of Abnormal Psychology, 86*(5), 518–527. doi: 10.1037/0021-843X.86.5.518

Squires, G. L. (2021, June 21). *Quantum mechanics.* Brittanica. Retrieved April 25, 2022, from https://www.britannica.com/science/quantum-mechanics-physics

Viebrock, S. (n.d.). *Can crystals heal? Fact vs. fantasy.* Telluride Inside... and Out. Retrieved April 25, 2022, from https://tellurideinside.com/2018/03/can-crystals-heal-fact-v-fantasy.html

Vyse, S. A. (2000). *Believing in magic: The psychology of superstition*. Oxford University Press.

Weldon, J. (2009, May 15). *Book review: Ageless body, timeless mind by Deepak Chopra*. Summit Ministries. Retrieved April 25, 2022, from https://www.summit.org/resources/articles/book-review-ageless-body-timeless-mind/

UNIT 9 CRITICAL THINKING EXERCISES

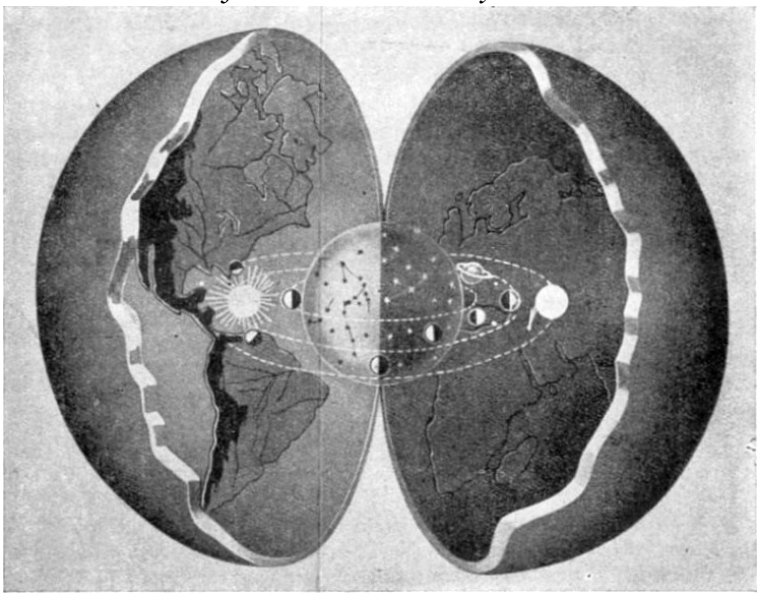
1. Do you have a small superstition, act you perform or object you tend to before an important life event?
    1. Do you truly believe in it? Is it really lucky?
    2. Will you sacrifice not doing it?
2. Have you ever fallen into the rabbit hole of metaphysical practices (crystals, manifestations or quantum mysticism)? What was it and how did you deal with it?
    1. Identify fallacies that were involved in said practice.

PART X
UNIT 10: HOLLOW EARTH

CHAPTER 10.1: WHAT MADE THE HOLLOW EARTH THEORY CONVINCING?

Figure 10.1

Illustrated visual of Hollow Earth Theory



Note. Image Credits: "Hohlwelt"; Quelle: Kongress Astrologischer Pioniere, by Erfurt 1932, S. 68, 2014, CC BY-SA 3.0.

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6.

10.1.1: REASONED ANALYSIS AND EMPIRICAL CLAIMS

Reasoned Analysis

Question at issue:

What made the Hollow Earth Theory convincing?

Evidence and Information:

- Eye witness testimonies of Hollow Earth inhabitants
- Scientific theories of what the Hollow Earth looks like
- Psychological data on what makes people believe certain things
- Hollow Earth in relation to the findings of Earth sciences

Assumptions:

- The Hollow Earth Theory is a pseudoscience.
- Reports of extraterrestrial beings living inside Earth are false and exaggerated.
- Geological sciences can be trusted.
- People choose to believe things because of media influence, political alignment, pressures from peers and family, desires for certain outcomes, etc.

Concepts:

- Mythology
- Oral history
- Pseudoscience
- Gravity & physics
- Inner Earth beings
- Core, mantle, crust
- Epistemology
- Media
- Aryan race

Context:

- Historical
- Political
- Cultural
- Scientific

Point of View:

- Writer
- Politician
- Hollow Earth Theory believer
- Geologist
- Psychologist

Purpose:

- To find out why people choose to believe pseudosciences over actual sciences
- To uncover the political motives surrounding the theory
- To discover the role that media played in people's belief in this theory

Implications and Consequences:

- People are susceptible to false beliefs because of outside influences such as the media, political alignments, and family.
- The Hollow Earth Theory contradicts established geological science.
- The Hollow Earth Theory provides misleading and false information, which can lead to misinterpretation of facts and support of beliefs without logical evidence.

Conclusions and Interpretations:

While people have believed in the Hollow Earth Theory due to the pressures of the media, influential political leaders, and relationships, there is no scientific evidence that supports this theory. The believers must defy proven sciences such as geology, biology, and physics in order to believe in the theory. Thus, the Hollow Earth Theory can be categorized as a pseudoscience.

Alternatives

Instead of a completely hollow Earth, there could be some regions within Earth's layers that have their own ecosystems and way of life separate from human society.

Disciplinary Lenses

Geological Lens

Question at issue

How can geology be used to dispel the Hollow Earth Theory?

Evidence and Information

- Vertical deflection experiments

- Seismic wave analysis

Assumptions

- Amount of time it takes for seismic waves to travel
- Seismic wave analysis works
- Gravity has effects on the formation of Earth.

Concepts:

- Earth's layers (crust, mantle, core)
- What the core consists of (iron & nickel)
- Seismic waves

Context:

- History and science of geology
- Political & scientific environments

Point of View:

- Geologist
- Seismologist
- Physicist/geophysicist (Pierre Bouguer)

Purpose:

- To use the study of geology to prove the Earth is not

hollow
- To better understand what geological information Hollow Earth believers use to promote their theory
- To find out what Earth consists of
- To find out how it is known what Earth consists of

Implications and Consequences :

- If the Earth were proven to be hollow, then it would completely discredit all science that has supported Earth not being hollow. This could send people down a rabbit hole and lead them to wonder if they could trust science.

Conclusions and Interpretations:

- Geological practices that prove the Earth is not hollow have been tested and repeated many times, leading to a fair assumption that the Earth is not hollow because of the scientific evidence.
- People choose what they do and do not want to believe.

Alternatives:

- Early 19th century: John Cleves Symmes (Symmes Holes) = 4,000 miles wide holes at the poles
- 1906: William Reed's book *The Phantom of the Poles* argued that Symmes' Holes were so large as to make the

poles nonexistent.

- 1913: Marshall B Gardner's *Journey to the Earth's Interior* suggested the holes were only 1,000 ft wide & that the sun, 600 miles in diameter, existed within the Earth to provide heat & light to Hollow Earth inhabitants.

Psychological Lens

Question at issue

How can using the psychological lens help understand why people believe in the Hollow Earth Theory?

Evidence and Information

- Psychological studies
- Human behavioral studies
- An article titled "Why Facts Don't Change Our Minds" by E. Kolbert shares findings related to why people tend to believe information that is presented to them by an authority figure.
- 19th-century respected physician Cyrus Teed shared pamphlets that outlined his view of a hollow Earth. These pamphlets inspired many, as Teed was respected in science.

Assumptions

People must have a good reason to deny an abundance of refuting information.

Concepts

- Humanistic behavior
- Cognition
- Biological characteristics

Context

- Hollow Earth started gaining traction around the same time psychology became a respected science.
- Political landscapes of the early 20th century

Point of View

- Psychologist
- Behavioral scientist

Purpose

To find out why people believe in the Hollow Earth Theory when presented with refuting information

Implications and Consequences

- Entire populations, such as Nazi Germany, have been convinced that the Earth is hollow.
- "A mouse led to believe there are no cats around would soon be dinner" (Kolbert, 2017).
- Someone who believes in the Hollow Earth Theory has abandoned their critical thinking skills and is therefore easily swept into conspiracy theories and pseudosciences.

Conclusions and Interpretations

Science is a way to correct people's natural inclinations; therefore, when it is denied, the truth doesn't always surface.

Folklore Lens

Question at issue

How can studying myths help us understand why people believed in the Hollow Earth Theory?

Evidence and Information

- Richard Shaver testimonies
- Novels and magazines by Richard Shaver, Raymond Palmer, and Cyrus Teed
- Journalistic accounts
- News reports
- Ethnographic accounts (studies of groups of people)

Assumptions:

- Studying myths can tell us about why people believe certain things.
- Folklore can spread via media and powerful authority figures.

Concepts:

- Advanced cultures & scientific abilities
- Good vs. evil
- Extraterrestrial race
- Aryan race
- Teros, Deros, Titans

Context:

- *The Coming Race* (1871): This novel by Bulwer-Lytton describes a technologically and culturally advanced subterranean race that thrived in the Earth. This theoretical subterranean race plotted to one day ascend from the world below & destroy the surface population to win control of the planet.
- Cyrus Teed (late 1800s–early 1900s): physician turned pseudoscientist who founded the beliefs of Koreshanity. This belief system was used in Nazi Germany by Adolf Hitler.

- Shaver (1940s): claimed to have ventured into Hollow Earth & met its inhabitants.
- "Shaver's Mystery" (1947): A story published by Raymond A. Palmer that further developed Shaver's theory of a technologically advanced world with mystical creatures.

Point of View:

- Folklorist
- Anthropologist
- Literature studies

Purpose:

- To show how theories of a hollow Earth contributed to folklore
- To show how folklore contributed to the Hollow Earth Theory

Implications & Consequences:

- These myths significantly influenced popular culture and scientific theories and impacted the perceptions of the unknown.
- The myth of an advanced race could perpetuate narratives of racial superiority within a particular

cultural or ethnic group.

Conclusions & Interpretations:
Studying myths helps provide an understanding of the societal, cultural, and psychological factors that influence belief systems. Shaver's and Hitler's interpretation of the advanced civilization residing under the Earth's surface influenced people to partake in beliefs of the supernatural and the related superiority complexes designed to divide society members into social rankings.

Alternatives:

The inhabitants of Hollow Earth could be a remnant or representation of an ancient, advanced civilization that thrived in the past.

Empirical Claims

Inductive Reasoning:

Premise 1: Halley's 1692 book, *The Philosophical Transactions of the Royal Society of London*, was published.

Premise 2: This book compares the mass of the Moon to the mass of the Earth to draw a comparison.

Conclusion: This book attempts to prove that the Earth is hollow.

Deductive Reasoning:

Premise 1: There is the idea that "caverns and caves" provide direct access to a "strange inverted world below Earth's surface."

Premise 2: These caverns & caves lead to a Hollow Earth that consists of exotic, extraterrestrial creatures.

Conclusion: The Hollow Earth can be accessed through caverns & caves with exotic, extraterrestrial creatures.

Abductive Reasoning:

Premise 1: "Unusual geofacts," such as fossils, exist within the Earth's interior.

Premise 2: These "unusual geofacts" suggest the concept of an "inner world."

Conclusion: The Hollow Earth can be proven true through the findings of "unusual geofacts," or fossils, within the Earth's surface.

Logical Fallacies

Appeal to ignorance:

Symmes claims that there are "openings" or "access points" in the North and South poles that lead to the "interior world." This argument suggests that because there's no evidence disproving the existence of these openings, they must exist. `

Red herring:

Some Hollow Earth believers argue that the US government is hiding a secret relating to extraterrestrial creatures or a superior race within the Earth.

Ambiguity:

Halley argues that the existence of earthquakes, volcanoes, karst swallow holes & sinkholes, springs, and wells proves that not all of the Earth is "solid underfoot." His logic relies on ambiguous diction and equivocation between different geological phenomena. While these natural occurrences suggest variability in Earth's makeup, the term "solid

underfoot" can be left to interpretation and possibly combines various geological processes that do not exactly suggest a hollow interior.

Appeal to authority:

Hitler's authoritative position as a dictator contributed to the appeal of the Hollow Earth Theory. His authoritative position in politics did not directly qualify him as an expert in the science field, specifically geology. So, he relied on his power to persuade people into his Hollow Earth beliefs despite its lack of data or validity.

Neglect of refuting information:

Scientists in geology, seismology, and other disciplines that investigate the inside of the Earth have proven that the core of the Earth is highly pressurized and solid, not hollow. Nonetheless, believers of the Hollow Earth Theory neglect this information.

7.

10.1.2 SEE-I MODEL

State

Despite the geological evidence that invalidates the Hollow Earth Theory, its appeal and persuasive abilities were heightened by cultural and political influences, a fascination with mystery and the supernatural, and a lack of scientific understanding.

Elaborate

The Hollow Earth Theory is the idea of an interior world within the planet's core that can be accessed through the North and South poles. In Hollow Earth, "exotic creatures" live within an exotic, subterranean paradise.

The Hollow Earth Theory consists of dozens of theories regarding an "interior world" suspected to exist within the planet. Throughout the last few centuries, this theory has been interpreted and altered in political, mythological, and geopolitical settings. Two very prominent interpretations of

the Hollow Earth Theory have been implemented in decades past: Hitler's theory about a superior, Aryan race living in Hollow Earth, and the theory that there are aliens living inside the planet.

Exemplify

- **Geological Lens:** When asking if the Hollow Earth Theory has any validity, answers can easily be found through geology. Hundreds of years ago, in 1735, French scientists Pierre Bouguer and Charles Marie de La Condamine traveled to Chimbozaro, a volcano in Ecuador, to prove that the planet was, in fact, not hollow. The two performed a vertical deflection experiment to test how local mass anomalies affected gravitational pull. Bouguer remarked that their findings were enough to falsify the Hollow Earth Theory. This experiment was repeated by Charles Mason in 1772 and produced far greater evidence to debunk the Hollow Earth Theory. Seismic waves are yet another way to prove that Earth is not hollow. The amount of time it takes for the waves to pass through and around Earth contradicts a fully hollow sphere. Through research, it is known that the planet is made up of four layers: the crust, mantle, inner core, and outer core. Therefore, the conclusion can be drawn that there is no geological evidence in support of the Hollow Earth Theory.

- **Psychological Lens**: Because of the lack of supporting scientific evidence for the Hollow Earth Theory, one should question the psychological reasoning for somebody to believe in this outlandish theory. When someone hears a figure of authority in their lives tell them Earth is hollow, the person is very likely to carry that perception throughout the rest of their lives and treat it as fact. Even after evidence that entirely refutes a theory, people refuse to change their opinion. This makes it almost impossible to convince someone who believes in Hollow Earth Theory that the planet is not actually hollow.

- **Folklore Lens:** In Shaver's narrative about venturing into the Earth, Hollow Earth is depicted as a realm inhabited by distinct mythical beings, each with its own characteristics and roles. This interpretation places Shaver's account within the realm of mythology, illustrating how the Hollow Earth Theory can be viewed through a lens incorporating legendary elements and narratives. Another element of folklore reveals untold parts of history. While society knows much of Adolf Hitler's beliefs and actions, they may not know that he was a believer in the Hollow Earth Theory. In fact, he suggested that a species of superior beings, otherwise known as the Aryan race, lived inside of the planet.

Illustrate

Hollow Earth is imagined in various ways, with an overall consensus that there is a shell that all humans live on. Within this shell, there is space with another Earth-like sphere. On this sphere live different beings, with which beings depending on the hypothesis being considered. Generally, there are theorized superior beings living inside of Hollow Earth. To visualize this, consider having a plastic Easter egg. Inside this egg, there is another egg. Between the two eggs are jelly beans representing the magical beings who live on the surface of the inner egg representing the inner Earth.

10.1.3 WEAK POINTS AND COUNTERARGUMENTS

Argument: The magnetic poles and center of gravity are in the middle of Earth's crust, not its geometrical center.

Rebuttal: The center of gravity is in the core of Earth. The Earth has been proven to be generally spherical, and mass is pulled equally from every direction to the center of the Earth due to gravity. Historically, scientists tried to prove hollow Earth by arguing that compassses did not work while approaching poles because the poles were actually gaping holes that led to the entrance of Hollow Earth. However, gravity and magnetism are completely different phenomena and cannot be used to prove or disprove one another.

Argument: There are living beings inside of hollow Earth.

Rebuttal: The Hollow Earth theory does not address the extreme temperatures and pressures observed and proved by scientists. Natural events, such as volcanoes, prove that there is extreme heat and pressure within the Earth that is completely

inhabitable by any being. The temperatures and pressure also work to prove the solidity of the Earth.

Argument: There is a superior race living inside of hollow Earth.

Rebuttal: Besides the fact that the inside of the Earth is solid and inhabitable, there is no superior race. Biologically speaking, all humans share 99.6% of their DNA, with no room to be more advanced than one another. There has yet to be proof that any being is "more advanced" than homeo sapiens; additionally, they could not be living within our Earth.

10.1.4 RESEARCH PAPER

Introduction

Beginning in the 17th century, belief in the Hollow Earth Theory became widespread. The theory describes openings to a subterranean utopia that can be accessed through caves and caverns or giant holes at the north and south poles, as well as advocating for ideas of extraterrestrial creatures or a technically advanced race. These ideas fly in the face of scientific evidence to the contrary. The mantle and outer and inner cores are basic concepts regarding the earth's interior. This understanding of the interior has been proven true through the discovery of seismic waves & data, although individuals continue to believe that this is not the case. What is it that makes the Hollow Earth Theory so convincing?

Geological Lens

When asking if the Hollow Earth Theory has any validity, one can easily find answers through geology. In 1735, French scientists Pierre Bouguer and Charles Marie de La Condamine traveled to Chimbozaro, a volcano in Ecuador, to prove that Earth is, in fact, not hollow. The two performed a vertical deflection experiment to test how local mass anomalies

affected gravitational pull. Bouguer remarked that their findings were enough to falsify the Hollow Earth Theory. This experiment was repeated by Charles Mason in 1772 and produced far greater evidence to debunk the Hollow Earth Theory. Seismic waves are yet another way to prove the Earth is not hollow. The amount of time it takes for the waves to pass through and around Earth does not suggest a fully hollow sphere. Research shows that the Earth is made up of four layers: the crust, mantle, inner core, and outer core. With this undeniable evidence, it can be deduced that there is no evidence, geologically, that the Earth is hollow.

Centuries ago, many, if not most, people believed that the Earth was hollow due to religious beliefs, what they were told growing up, or what scientists believed was true at the time. Now that science has evolved, scientists are able to do more elaborate experiments than the ones that Pierre Bouguer, Charles Marie de la Condamine, and Charles Mason conducted in the 1700s. Seismic waves, which are produced through activities such as earthquakes, volcanic eruptions, and magma movement, can be analyzed with modern technology that was not available many centuries ago. A machine such as a seismogram allows geologists to see the waves and how long it takes them to get from point A to B. Seismic waves slow down when faced with resistance. If the planet were hollow, the waves would pass from one side to another very quickly. Because they have to travel through the Earth's solid and liquid

layers, seismic waves travel more slowly than would be expected if the planet were hollow, which proves that the Earth is not, in fact, hollow. Through modern technology, geologists have been able to disprove the Hollow Earth Theory.

Psychological Lens

Because of the overall lack of supporting scientific evidence for the Hollow Earth Theory, one should question the psychological reasoning driving belief in this outlandish theory. By examining documents regarding the roots of the Hollow Earth Theory, one can see that a psychological lens is key to understanding the foundation of the theory. In the early 1940s, Richard Shaver became an influential figure in the world of science fiction after a paper called "Shaver Mystery" was included in a popular publication. As stated by Mckee (2020),

> the paper argues that, for Shaver, the dero provided a psychological framework for processing tragic and traumatic events, externalizing tormenting forces into monsters. His fiction then became a force for combating those torments within a narrative context. Like other conspiracy theories, the Shaver Mystery seeks to impose order on a chaotic world. (p. 1).

Before Shaver wrote his science fiction material, he had spent several years in mental institutions. Shaver's descriptions of Teros and Deros could reflect his own psychological

projections or personal beliefs about the nature of humanity. They might symbolize his perception of the inherent goodness and darkness within individuals, projected onto external entities.

According to Kolbert (2017), the human brain is wired to believe in what it is told before applying any skepticism. In a Stanford study, students given two different descriptions of the same person—even after being told both sources were false—described the person with the information that was initially given instead of forming their own opinion. Even after evidence is given that entirely refutes a theory, people refuse to change their opinion. Something similar happens with people who believe in the Hollow Earth Theory. When someone hears a figure of authority in their lives tell them the Earth is hollow, the person is very likely to carry that perception throughout the rest of their lives and treat it as fact. This makes it very difficult, without using a purely psychological approach, to convince someone who believes in the Hollow Earth Theory that the Earth is not hollow. No matter how much evidence is provided refuting the theory, people will still believe in their minds that the Earth is indeed hollow.

Belief perseverance is maintaining a belief after being given evidence that directly contradicts it (Guenther & Smith, 2020). This is caused by multiple factors including the cultural and social dynamics influencing someone's personal life. By thinking casually rather than critically, one can easily fall into

belief perseverance. Cognitive consistency is also a factor that could lead people to start believing in multiple layers of a pseudoscientific theory such as the Hollow Earth Theory. Cognitive consistency is when someone attempts to dismiss all inconsistencies in related beliefs surrounding a topic by fabricating information that goes along with their theory (Russo & Chaxel, 2017). Cognitive consistency can be seen when examining the Hollow Earth Theory. Believers of the theory will fabricate a story regarding what they believe lives under the Earth's crust in order to make different parts of their theory and related beliefs be in agreement with one another. Understanding the Hollow Earth Theory using psychology shows how complex the issue really is. Because of factors such as belief perseverance and cognitive consistency, simply presenting scientific information proving the Earth to have a solid core is not enough to convince a believer to change their mind. Once someone has fallen into the mental trap of believing in the Hollow Earth Theory, little can be done to convince them otherwise.

"Conspiracy ideation promotes a threatening, non-random, and immoral worldview" (Fasce, 2019, p. 8). Hollow Earth Theory believers engage in conspiracy ideation and therefore, this theory should be considered a pseudoscience. A psychological lens is crucial to understanding why the Hollow Earth Theory has been so convincing.

Folklore Lens

Teros, Deros, Titans

The Hollow Earth Theory cannot be thoroughly studied without analyzing the set of beliefs it consists of. There are various theories about advanced civilizations within the earth. 19th-century writer Richard S. Shaver developed the most popular myth, describing the inner earth as a vast world of caverns constructed by godlike aliens. Author Raymond A. Palmer further developed and published Shaver's theory in his story, "Shaver Mystery." Supposedly, 12,000 years ago, these aliens, known as the Nortans, Titans, and Atlans, or the "Elder Race," built the caverns under the earth's surface to shield themselves from the emanating poisons of the sun. They soon left after the radiation became too much, leaving behind technologically advanced creatures. Deros ("detrimental robots") were the sexually perverse, evil beings who tormented inhabitants on earth's surface. On the other hand, Teros ("integrative robots") were heroic beings working to destroy the Deros. According to Shaver, these beings could manipulate events on the surface through ray devices. For example, they used "stim rays that [could] cause pleasant sensations; needle rays that cause pain; ben rays that heal and… resurrect the dead, telaugs that transmit voices into other beings' minds, [and] epilepto rays that cause seizures" (McKee, 2020, p. 3). Deros used this technology to bring harm and chaos to the world while the Teros actively fought to stop it.

These writings contributed to Shaver's controversial claims

about subterranean civilizations and their influence on human affairs. Shaver's interpretations of the Hollow Earth's inhabitants could be seen as an attempt to explain the reasons for events in the world. To elaborate, the concept of Deros as malevolent beings may be an attempt to rationalize adversity, tragedies, or inexplicable negative events in the world. On the other hand, Teros are the valorous beings in charge of maintaining stability and order in the world. The two creatures coincide as a portrayal of the struggle between good and evil, serving to explain conflicts, moral dilemmas, and the complexities of human existence (Mckee, 2020).

Advanced Aryan race (Hitler)

By comparison, Hitler used the ideas of Hollow Earth to defend his racist and antisemitic views. It is commonly known that Hitler significantly manipulated the public eye. Smith (1977) mentions in his book *This Hollow Earth* that "Hitler preyed on the fears and frustrations of the people" (p. 74). He took advantage of society's weakness and filled the minds of the population with the Hollow Earth Theory. His radical ideas appealed directly to the public (Hansson, 2017). The theory that Hitler composed suggested there was a species of superior beings living inside of the Earth, also known as the Aryan race. These beings were described to be very beautiful and god-like. Their blood was said to be purer than homeo sapiens. A majority of the beings were described as being male, and the female's only use was to reproduce with homeo sapiens

to produce more Aryans or superior beings. Hitler gained political support by believing in the Hollow Earth Theory. Because he was a person with high political power, many citizens also began to believe in Hollow Earth due to his authority (Lavin, 2020). Hitler used the Hollow Earth Theory for his benefit as a dictatorial leader.

These clashing viewpoints about Hollow Earth inhabitants are considered to be fabricated controversies, or pseudoscience. Because of its lack of physical and scientific evidence, this theory falls under the areas of myths and conspiracy theories (Hansson, 2017). However, despite the lack of evidence, these theories were presented as reliable theories. At the time, Shaver, Palmer, and Hitler were viewed as credible sources, thus persuading people to believe in their theories. Now, it is clear that these figures lacked the competence and expertise to synthesize reasonable information, allowing society to debunk such theories and claims (Hansson, 2017).

Conclusion

The Hollow Earth has been imagined in various ways, with an overall consensus that there is a shell on which all humans live. Within this shell, there is space with another Earth-like sphere. On this sphere live different beings, depending on the hypothesis being considered. Generally, there are theorized superior beings living inside of the Hollow Earth. To visualize this, consider having a plastic Easter egg. Inside this egg, there

is another egg. Between the two eggs are jelly beans representing the magical beings who live on the surface of the inner egg representing the inner Earth.

Hollow Earth can also be illustrated as a jawbreaker candy. There are several different layers within a jawbreaker, much like the Hollow Earth. The first several layers are comparable to the outer layers of the earth's surface, the surface humans currently are living upon. The further one gets into the jawbreaker candy, the more layers that are revealed. This is much like the Hollow Earth, where further into the Earth—whether through caverns or caves— lies an exotic, mysterious, paradise-like center. This illustration of the Hollow Earth Theory demonstrates how implausible the concept is. The Hollow Earth Theory has a scarce amount of evidence supporting it, if any at all. With the support of authoritative figures, the theory continued to grow in popularity within the 18th, 19th, & even 20th centuries. However, due to the altogether lack of credible evidence, the Hollow Earth Theory can be determined to be a pseudoscience.

Not only does the idea of a hollow Earth lack well-founded evidence, but it also promotes science denialism. The authority figures that promote the theory, such as Hitler, use Hollow Earth and supernatural beings to justify their beliefs in a superior race in order to control those who are deemed inferior. There is no scientific evidence that supports the idea

of a hollow Earth or an advanced race; thus, believers must defy proven sciences such as geology, biology, and physics to strengthen their claims. Much like other pseudoscientific claims, such as climate change denialism, there is a great deal of science denialism present. Climate change denialists blatantly choose to ignore scientific evidence that the planet is warming due to fossil fuels, which is comparable to Hollow Earth theorists denying scientific evidence proving the existence of the Earth's inner and outer cores and mantle.

References

Cluff, R. M. (n.d.). *Welcome!* World top secret: Our Earth is hollow! https://www.ourhollowearth.com/

Fasce, A. (2019). The upsurge of irrationality. Post-truth politics for a polarised world. *Disputatio,* 9(13), 00–00. https://disputatio.usal.es/vols/vol-9-no-13/

Guenther, C. L., & Smith, A. M. (2020, February 26). *Belief Perserverance.* Oxford Bibliographies. https://www.oxfordbibliographies.com/display/document/obo-9780199828340/obo-9780199828340-0258.xml

Hansson, S. O. (2017). Science denial as a form of pseudoscience. *Studies in History and Philosophy of Science*

Part A,63(June 2017), 39–47. https://doi.org/10.1016/j.shpsa.2017.05.002.

Kachka, B. (2013, November 15). The Nazis came from Middle Earth (and possibly still live there). *New York Magazine*. https://nymag.com/news/features/conspiracy-theories/nazi-vril-society/

Kolbert, E. (2017, February 20). Why facts don't change our minds. *The New Yorker*. https://www.newyorker.com/magazine/2017/02/27/why-facts-dont-change-our-minds

Lavin, A. (2020). *Thinking well: A creative commons logic and critical thinking textbook* (3rd edition). Course Hero. https://www.coursehero.com/file/68307737/Thinking-Well-Lavin-Edition-3pdf/.

Mckee, G. (2020). "Reality – Is it a horror?": Richard Shaver's subterranean world and the displaced self. *Journal of Gods and Monsters, 1*(Summer 2020), 1–17. https://journals.tdl.org/godsandmonsters/index.php/godsandmonsters/article/download/1/8/

Netzley, P. D. (2006). *hollow-Earth theory*. Gale in Context. https://go.gale.com/ps/i.do?p=OVIC&u=coastcui_kimbel&id=GALE|CX3205300169&v=2.1&it=r&sid=bookmark-OVIC&asid=1bb346d7

Nosich, G. M. (2012). *Learning to think things through: A*

guide to critical thinking across the curriculum (4th ed.) [eBook edition]. Pearson.

Russo, J. E., & Chaxel, A. S. (2017, July 26). *Cognitive Consistency Theories.* Oxford Bibliographies. https://www.oxfordbibliographies.com/display/document/obo-9780199828340/obo-9780199828340-0195.xml

Smith, W. (1977) *This Hollow Earth*. Sphere. https://www.ourhollowearth.com/This%20Hollow%20Earth%20-%20Warren%20Smith.pdf

UNIT 10 CRITICAL THINKING EXERCISES

1. Create your own illustration of the Hollow Earth
2. What effective strategies or methods grounded in scientific principles could be used to persuasively engage with a Hollow Earth believer in hopes of shifting their perspective away from this belief?
3. If you could create your own civilization within the earth, what would it look like? What purpose would the individuals serve?
4. Why do you think the Hollow Earth theory was so convincing at the time? What additional factors might have contributed to the widespread acceptance of this belief? Considering these factors, would you have believed in the Hollow Earth theory in the past?

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