Were the U.S. Moon Landing Real or Fake? The Conspiracy Theories Surrounding the Apollo Program's Moon Landings

Introduction: The Moon Hoax

Conspiracy theories about NASA faking the Moon landings firstly emerged in the 1970s, soon after the first landing in July of 1969 (Eversberg, 2019). Trust in the American government was low after lies about the Vietnam War were leaked in Pentagon Papers, leading to an increase in conspiracy thinking at that time (Knight, 2019). Bill Kaysing's book *We Never Went to the Moon: America's Thirty Billion Dollar Swindle*, published in 1976, further influenced allegations against the Moon landings. Conspiracy theories developed for multiple reasons such as mistrust of the authorities and skeptics gaining attention in the public sphere. The "Apollo astronauts failing to show the stars", "inconsistency in shadows on the moon", "perspective and backgrounds in pictures taken on the moon", and that "the radiation from the Van Allen Belt and in space would've killed the astronauts" are all theories created to prove that the Apollo moon landings were fake and filmed in a Hollywood studio (Rudolf, 2003, pp. 75-81).

In 'Science and Pseudo-Science' by Hansson (2008), pseudoscience is defined by Oxford English Dictionary as "a pretend or spurious science; a collection of related beliefs about the world mistakenly regarded as being based on scientific method or as having the status that scientific truths now have" (Hansson, 2008) and related terms to pseudoscience are "scepticism", "resistance to facts", "conspiracy theories", "bullshit", and "epistemic relativism" (Hansson, 2008). Hence, according to this definition, the Moon Hoax is considered as a pseudoscience as it's a collection of theories about the Apollo Program that are based off of false scientific evidence created by skeptics.

Despite the large amount of evidence proving the reality of the moon landings provided by NASA, around 30% of Americans don't believe American astronauts landed on the moon (Kaysing & Reid, 1997, p. 3). This exploration will determine whether the largely believed conspiracy theories are proven to be a pseudoscience, using falsification and confirmation, or whether these theories are considered scientific.

This essay will place multiple conspiracy theories against the falsification and confirmation theory to test whether the conspiracy theories are scientific theories or not. It is relevant to test whether these conspiracy theories are determined as pseudoscience according to philosophers who contributed their work to the 'demarcation problem' and to test whether these conspiracy theories truly are pseudoscience.

True or False: They Landed on the Moon!

According to Karl Popper, falsification demarcates a science from non-science: a theory is scientific if it falsifiable and is non-science if there is no potential for falsification (Mcleod, 2023). Falsification works in favor for supporting theories on the faking of the moon landing. Germar Rudolf's 2003 article, *The Moon Landing: Fact or Fiction*, analyzes and falsified several theories surrounding the faking of the moon landing.

One of the most popular theories against the moon landing was "all photos taken by the Apollo astronauts fail to show the stars, even though the universe is totally black due to lack of a lunar atmosphere. This would prove that the background is not the universe but a studio forgery" (Rudolf, 2003, p. 77). This theory was easily falsified by the fact that the cameras used to take pictures on the moon were adjusted so that "objects photographed would not be totally overexposed […] there was

not enough time for the dim light of the stars to leave a trace on the film" (Rudolf, 2003, p. 77). Therefore, using Popper's theory of falsification, this theory is scientific since it can be falsified.

Another theory that was easily falsified is "If the sun was the only light source, all shadows ought to have been parallel to each other. However, one can clearly see that not all of them are, which indicates falsification" (Rudolf, 2003, p. 78) through the falsification "Shadows of objects will only appear parallel if the areas upon which the shadows are thrown are themselves even […]" (Rudolf, 2003, p. 78), which states that the distorted shadows is caused by the uneven area of the surface of the moon. This theory was also falsified through that if there had been other light sources, like the theory suggests, multiple other shadows would've been casted.

A final theory that was falsified was "[…] that radiation from the Van Allen Belt and beyond in space would have killed the astronauts within a few minutes" (Rudolf, 2003, p. 80), hence stating that the moon landing was faked. Although it is true that long periods of exposure to radiation from the Van Allen Belt, which is a region with a magnetic field that routes electrically charged particles from solar wind, would kill an unprotected human, the Apollo rockets passed the area in an hour and were protected by radioactive particles by the rockets' metal (Rudolf, 2003, p. 80). It was also falsified by the fact that any sensitive electronic equipment on the rocket would've been destroyed if the radioactive particles penetrated the rocket's metal (Rudolf, 2003, p. 81). Therefore, the conspiracy theory is considered scientific because it can be falsified by two pieces of observable evidence: the rocket protected the astronauts in the short amount of time they passed through the region, and no sensitive electronic equipment was damaged.

Therefore, since the theories can be falsified by multiple cases of evidence, these theories are scientific according to the theory of falsification and are therefore not a pseudoscience. Despite falsification proving these theories to be scientific and Karl Popper stating that only falsifiable theories are informative, these theories are still rejected. Even though they are hence considered science, that does not mean that the theories are true and the multiple cases of evidence prove them to be wrong. In short, the conspiracy theories are scientific but not necessarily true.

Confirm This: Did They Really Land on the Moon?

In James Hawthorne's *Confirmation Theory* (2011), the confirmation theory is defined by "the study of the logic by which scientific hypotheses may be confirmed or disconfirmed (or supported or refuted) by evidence" (Hawthorne, 2011, p. 1). The confirmation theory, by Rudolf Carnap, can be used to vaguely differentiate between a science and a pseudoscience as empirical evidence is key in science and often lacking in pseudoscience. Thomas Eversberg's book *The Moon Hoax? Conspiracy Theories on Trial* provides multiple conspiracy theories that will either be confirmed or disconfirmed according to evidence provided.

One theory that can be disconfirmed is "The lunar soil is made of dust as fine as flour, and sharp footprints can only be made if the dust is wet. Since there isn't any water on the Moon, the footprints must not have been formed on the Moon" (Eversberg, 2019, p. 82) by the evidence that dust particles can be formed into "stable shapes" under pressure and since these particles do not oxidize, the shape is left smooth over time with weathering (Eversberg, 2019, pp. 82-83). This can be empirically tested multiple times in chambers that mimic the atmosphere of the Moon that lacks oxygen to receive the same results: solid shapes can be formed in lunar soil. Hence, this theory is not scientific due to disconfirmation.

The conspiracy theories surrounding the moon landings can be disconfirmed by the evidence brought back from the Apollo moon landing missions. The moon landings can be confirmed by the 400 kilograms of moon rocks brought back by earth. New minerals such as “Pyroxferroite” and “Tranquilityite” as well as the natural isotopes Neptunimun-237 and Uranium-236, both which don’t exist on Earth, were found on the Moon and serve as evidence of the moon landings (Eversberg, 2019, p. 107). Another piece of evidence is the discovery of heavy hydrogen, found in lunar soil samples, which can also be found in comets. Lastly, the moon rock samples brought back to Earth are covered in small craters that can only be formed by impact from particles in space and these impact craters cannot be found on Earth (Eversberg, 2019, pp. 107-108).

The amount of empirical evidence that confirms that the Apollo moon landings did not happen is almost non-existent, evidence provided by NASA for the Apollo moon landings confirm that they did indeed happen. Hence, according to Carnap’s theory of confirmation, the conspiracy theories can be classified as pseudoscience since it can be confirmed with observations and evidence brought back to Earth that the moon landings happened.

To Conclude, is it Science or Pseudoscience?

In conclusion, according to Karl Popper’s theory of falsification the Moon Hoax theories are scientific theories. On the other hand, Rudolf Carnap’s confirmation theory classifies the Moon Hoax theories as pseudoscience. Despite the two being contradictory, both theories explain the Moon Hoax conspiracy theories as false theories, and simply because the theories can be falsified does not mean the theories hold any truth. Since the theories can be understood as both scientific and non-scientific according to two different demarcation theories, it could be understood how some populations do not believe in the Apollo moon landings. Despite the two demarcation theories being contradictory, the moon landing conspiracy theories are indeed a pseudoscience, and the moon landings did happen.

There are multiple consequences of the moon landing conspiracy theories being scientific: politically, it could lead to more distrust in the American government by the population. Socially, communities of moon landing skeptics can form to create more conspiracy theories, and vice versa. This exploration can further contribute to understanding flaws within the demarcation theories provided to ‘solve’ the demarcation problem as certain pseudo-sciences, such as the Moon Hoax conspiracy theories, can be regarded as both scientific and non-scientific. Falsification has proven to not be a strong criterion for demarcating between science and non-science, however confirmation is also not a strong criterion as confirmation can be found anywhere and even pseudoscience can be confirmable. Therefore, the demarcation problem is still present, and a stronger criterion should be found.

Bibliography

Eversberg, T. (2019). *The Moon Hoax? Conspiracy Theories on Trial.* (M. J. Geiss, & J. B. Holquist, Trans.) Bonn, Germany: Springer. Retrieved October 2, 2023

Hansson, S. O. (2008, September 3). *Science and Pseudoscience*, Fall 2021. Retrieved October 4, 2023 from Stanford Encyclopedia of Philosophy: https://plato.stanford.edu/archives/fall2021/entries/pseudo-science/

Hawthorne, J. (2011). Confirmation Theory: Philosophy of Statistics. *Handbook of the Philosophy of Science, 7*, 333-389. doi:10.1016/B978-0-444-51862-0.50010-1

Kaysing, B., & Reid, R. (1997). *We Never Went to the Moon* (Preview Version ed.). Health Research Books. Retrieved October 4, 2023 from https://books.google.nl/books?id=N1Gcfdj81T4C&printsec=frontcover#v=onepage&q&f=false

Knight, P. (2019, July 10). *How moon landing conspiracy theories began and why they persist today*. Retrieved October 2, 2023 from The Conversation: https://theconversation.com/how-moon-landing-conspiracy-theories-began-and-why-they-persist-today-118643

Mcleod, S. (2023, July 31). *Karl Popper: Theory of Falsification*. Retrieved November 1, 2023 from SimplyPsychology: https://www.simplypsychology.org/karl-popper.html#:~:text=The%20Falsification%20Principle%2C%20proposed%20by,by%20observing%20a%20black%20swan.

Rudolf, G. (2003). The Moon Landing: Fact or Fiction - Analyzing the Mounting Controversy. In *The Revisionist: Journal for Critical Historical Inquiry* (Vol. Volume 1, pp. 75-81). Castle Hill Publishers. Retrieved October 4, 2023 from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=bd22fe8ca789c4b9b37d7aabd1494266166dd8e5#page=83