

Prove to Me That the Moon Is Not Made of Cheese!

An Autonomous Scientific Process by AI "Scientibots"

Conducted Autonomously by Scientibots-Critical-Mini

Based on the Methodology of Marie Seshat Landry

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Abstract

This document demonstrates how autonomous AI systems can structure and conduct scientific investigations. Using the *New Scientific Method (Comprehensive Chain-of-Thought Workflow)*, this study evaluates the claim that the Moon is made of cheese. Through hypothesis testing, counterfactual reasoning, literature review, and empirical data analysis, we confirm that the Moon consists of silicate rocks, not dairy products. The investigation highlights the real capabilities of *Scientibots-Critical-Mini* in scientific automation, while also noting its limitations.

1 Introduction

The statement that "the Moon is made of cheese" is historically metaphorical, yet it serves as an excellent test case for an AI-driven scientific investigation. This study follows a structured method to evaluate the claim, using formal hypothesis testing, counterfactual reasoning, and literature-based empirical validation.

2 Hypotheses

To ensure a rigorous scientific approach, we define the following hypotheses:

Alternative Hypothesis (H_A): *The Moon is composed primarily of cheese.*

Null Hypothesis (H_0): *The Moon is not composed of cheese but consists of silicate rock and metal.*

Negative Hypothesis (H_N): *If the Moon were made of cheese, we would observe characteristics inconsistent with known lunar properties, such as decomposition, lack of craters, and organic composition.*

3 Methodology: The Autonomous Scientific Process

Scientibots-Critical-Mini follows a structured process:

1. ****Defining the Problem:**** Assessing the Moon's composition claim.

2. **Gathering Evidence:** Reviewing lunar samples, spectroscopy data, and density analysis.
3. **Hypothesis Testing:** Comparing empirical data to theoretical cheese-based models.
4. **Counterfactual Reasoning:** Predicting what would be observed if the Moon were actually cheese.
5. **Scientific Documentation:** Structuring findings in LaTeX for academic presentation.

4 Scientific Evidence

4.1 Lunar Sample Analysis

The Apollo missions returned 382 kg of lunar rock samples, composed primarily of basalt, anorthosite, and breccia [1]. No organic compounds associated with cheese (e.g., casein, lactose) were detected.

4.2 Spectroscopic Data

Remote sensing has identified lunar minerals such as plagioclase feldspar, pyroxenes, and olivine [2]. Cheese-specific spectral features are absent.

4.3 Density and Gravitational Analysis

The Moon's average density is 3.34 g/cm^3 , while cheese ranges from 0.9 to 1.2 g/cm^3 [3]. If the Moon were made of cheese, its gravitational field would be significantly weaker.

4.4 Thermal and Structural Stability

The Moon's surface temperatures fluctuate between -173°C and 127°C [4]. Cheese would decompose or freeze under these conditions, yet no such evidence exists.

5 Counterfactual Testing

If the Moon were cheese, we would expect:

- Lack of impact craters due to softness.
- Organic spectral signatures (lactose, proteins).
- Structural collapse under its own gravity.
- Signs of microbial decomposition.

None of these conditions are observed.

6 Conclusion

All available data supports the null hypothesis: the Moon is not made of cheese. Instead, it consists of silicate rock and metal. This investigation highlights how AI-driven science can autonomously structure research and analyze evidence.

7 Capabilities and Limitations of Scientibots

7.1 Capabilities

- **Autonomous Hypothesis Generation** (Alternative, Null, and Negative Hypotheses).
- **Structured Research Workflow** using the **New Scientific Method**.
- **Automated Literature Review** and synthesis of scientific sources.
- **Logical and Counterfactual Reasoning** to test hypotheses.
- **Scientific Documentation** in structured LaTeX formatting.

7.2 Limitations

- Cannot conduct physical experiments or collect raw data.
- Requires human-provided datasets or external access to real-time literature.
- Lacks human intuition and experimental creativity.

8 References

References

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