Fatimah Niyas
05.07.2025

Analysis

INTRODUCTION

This final analysis aims to explore how both natural patterns and human technological advancements influence meteorite discoveries over time. By using Tableau Public to create interactive visualizations, this report highlights trends in geographic distribution, discovery rates, and average meteorite mass. Datasets used include the Meteorite Landings dataset from Data.gov and the Global Population Density dataset from OurWorldInData.org. The interactivity in each Tableau visualization allows users to explore these patterns across geography and time, drawing connections between historical innovations and discovery rates.

1. Population Density vs. Meteorite Landings Count (Side-by-Side Map)

This visualization compares the geographic distribution of meteorite discoveries with global population density. The goal was to test the hypothesis that more densely populated regions are more likely to report meteorite landings.

Process:

- Two maps were created: one showing global meteorite landings as points (dot map) filtered for fell vs found based on geographic coordinates up to the year 2013, and one showing 2013 global population density (people per square kilometer) using a choropleth style.
- These maps were placed side-by-side in a dashboard for visual comparison.
- Filters were added to allow users to highlight specific continents or zoom into regions of interest.

What the Visualization Shows:

- High discovery rates correspond to countries with large land areas and developed scientific infrastructure, such as the United States and Australia.
- Densely populated but less technologically advanced regions, such as parts of South Asia and Africa, have comparatively lower discovery counts.
- In the U.S., although population density may not be visually obvious in the map, the eastern half shows a higher concentration of "fell" meteorites, events witnessed and reported by people, while the western half, characterized by remote terrain, has more "found" meteorites, likely the result of organized searches.
- In contrast, Australia demonstrates a unique pattern: despite having one of the lowest population densities among developed nations, it shows a disproportionately high number of meteorite discoveries. The vast desert regions like the Nullarbor Plain provide ideal search environments where meteorites are well-preserved and easily visible on the barren landscape. Most of these are "found" meteorites, indicating systematic recovery efforts rather than chance observations.

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Interpretation: The side-by-side comparison suggests that both population and scientific activity (which correlates with economic development) impact meteorite detection. Remote or underdeveloped areas may experience underreporting due to limited observation or collection infrastructure. Additionally, the distinction between "found" and "fell" meteorites indicates how search conditions and visibility influence detection types: more observers tend to record "falls," while organized searches in remote deserts often yield older, weathered "finds."

2. Meteorite Count by Year with Annotated Technological Milestones

This visualization was created to investigate whether historical advancements in technology have led to an increase in recorded meteorite landings.

Process:

- A bar chart was created showing meteorite counts per year from 1850 onward.
- Annotations were added for key technological events:
  - 1858: Introduction of photography
  - 1939: Radar introduced in WWII
  - Post-1970s: Civilian access to military-grade technology
- The bar chart was made interactive, allowing users to hover over each bar to view exact counts and explore patterns more closely.

What the Visualization Shows:

- A dramatic rise in meteorite findings after the late 1800s
- Noticeable spikes following each annotated milestone, especially post-1970s

Interpretation: The timeline clearly suggests that technological advancements have enabled greater observation and recording of meteorite events. The increasing slope after each annotation indicates stronger detection capacity over time.

3. Time Series of Average Meteorite Mass by Year (with Exponential Trend Line)

This visualization was made to examine whether the average mass of discovered meteorites has changed over time, which might reflect improved detection of smaller specimens.

Process:

- A time series was created to show average meteorite mass per year.
- An exponential trend line was added using Tableau’s logarithmic regression model.
- Key statistical outputs were reviewed, including p-values, R-squared, and model coefficients.

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Model Summary:

- Formula: log(Mass) = -0.0217 * Year1 + 51.29
- R-squared: 0.407, indicating moderate explanatory power
- p-value: < 0.0001, statistically significant

What the Visualization Shows:

- A decreasing trend in average mass, with a steeper decline after 1950
- Clear visual and statistical support for the hypothesis that smaller meteorites are increasingly being discovered

Interpretation: The results support the idea that smaller meteorites, once difficult to detect, are now routinely found thanks to modern tools. The trend is significant and highlights the shifting nature of what kinds of space materials are being recorded.

Conclusion

Together, these visualizations offer compelling evidence that meteorite discovery patterns are shaped not just by natural phenomena but also by human factors such as technology, population density, and regional scientific infrastructure. Interactive Tableau dashboards make these insights accessible and explorable, enabling others to draw their own conclusions or investigate specific trends in more detail. These findings help close the knowledge gap on how societal development influences our understanding of extraterrestrial materials.