

Case Study 01: Is Astrology Real? (And How Can You Test It?)

DUE: 27 Jan 25



Sure, it looks cool. But what do these symbols even signify?

Introduction

We all know what astronomy is, right? Astronomers observe and study the universe, using established scientific principles (like gravity, electromagnetic theory, relativity...just to name a few) to explain how the universe was formed and how it evolved over billions of years. Astronomers can explain the life cycle of the stars, and how our solar system formed. Astronomers have confirmed the discovery of literally thousands of planets orbiting other stars. Astronomy is science, and quite literally awe-inspiring.

But what about astrology? Is astrology a science? Sure, it's probably pretty fun to take a BuzzFeed quiz that predicts your zodiac sign based on your five favorite breakfast foods, but is that science? Do the locations of the sun, moon, and planets at the time of your birth determine your personality? Do the daily motions of the planets orbiting the sun give you good luck (or bad luck, depending on the day and your astrological sign)?

Let's see if we can figure out a way to determine whether astrology is scientifically sound, or

if it's an example of a pseudoscience.

Science vs Pseudoscience

What's the difference? First off, let's recall the scientific method. Without re-stating all the steps, remember that the hallmark of science is the way in which it is self-correcting. Scientific principles are routinely challenged, and when an idea is proven to be false, it must be discarded. For example, once Kepler was able to map the orbit of Mars around the sun and Galileo observed both that Jupiter had four (that he could see) moons orbiting it and that the phases of Venus were incompatible with an orbit around the Earth, it was no longer possible for credible scholars to insist that the Earth was the center of the solar system and that the sun and all the planets orbited a stationary Earth.

So, what is pseudoscience, then? In general, pseudosciences want the credibility, respect, and authority of genuine science without having to play by the rules of the scientific method. Have you ever heard of phrenology? Nowadays almost no one has, but it was pretty big for a while in the 1800s. Phrenologists claimed that they could feel your skull, and its contours would tell you all about the person. Specifically, things like intelligence and tendencies toward immoral or criminal behavior. This pseudoscience was used to "prove" the superiority of certain races, and to reinforce unfortunate racist and ethnic stereotypes.

Phrenology is an example of using science's cloak of respectability to justify what are unjustifiable (and genuinely abhorrent) opinions. It's just one example of how a pseudoscience can have real and harmful effects on people who fall prey to them.

By comparison, astrology might seem relatively innocuous. Maybe even a bit of harmless fun. But it's still valid to ask: *Is this science?*

The Principle of Falsifiability

Falsifi-a-what-ity? One of the strongest hallmarks of true science is its ability to be tested and shown to be wrong. Here's an example: Galileo hypothesized that all objects fall at the same rate, regardless of their mass. Your own experience might seem to contradict this. So, you make a counter-hypothesis: The rate at which objects fall depends on their mass. Can your claim be falsified? That is, can it be shown to be untrue? Remember, you only need *one* example of your hypothesis being incorrect to falsify it (and render it incompatible with science).

1. Think of an example within the realm of your experience where you can observe a more massive object falling at a greater rate (remember, that means acceleration) than a less massive object.

Now check out [this short video from physicist Brian Cox](#).

2. What did you just watch? By showing that Galileo was correct, does that mean that *your* observation is wrong? (Hint: Are you wrong, or are you missing some pieces of the puzzle?)
3. Now that you have seen the video, revise your hypothesis (the rate at which objects fall depends on their mass) to align with the observed evidence.

Testing the Claims of Astrology

Before we can test the claims of astrology, we need to define what they are. That's our first problem: What do astrologers claim astrology can do? Unfortunately, you can find a lot of conflicting information on the intentions and limitations of the field.

4. Is it necessarily a red flag that astrologers cannot agree on precisely what astrology can do? Why or why not?

7 Ways to Identify Pseudoscience

1. The use of psychobabble — words that sound scientific and professional but are used incorrectly, or in a misleading manner.
2. A substantial reliance on anecdotal evidence.
3. Extraordinary claims in the absence of extraordinary evidence.
4. Claims which cannot be proven false.
5. Claims that counter established scientific fact.
6. Absence of adequate peer review.
7. Claims that are repeated despite being refuted.

Source: Frontiers in Psychology, *Phrenology, homeopathy, and the Hopkinville Goblins: using pseudoscience to teach scientific thinking*, by Rodney Schults and Scott O. Lilienfeld
<http://journal.frontiersin.org/journal/10.3389/fpsyg.2014.00336/abstract>

One thing that astronomers seem to agree on is that your astrological sign strongly influences your character and personality. No doubt you've seen many memes, and you may have laughed and thought, "Oh that's so me!" to an observation directed at your specific zodiac sign. Astrologers get really specific by using a person's precise date and time of birth, using a set of complicated rules to construct a [natal chart](#).

- Does the existence of rigid or complicated rules for doing something automatically make that thing scientific? Why or why not? (Hint: Board games!)

Let's focus on the predictions, not the method of generating them. Even if we don't understand the underlying system that creates a natal chart, we can keep our attention on the predictions themselves—because predictions are, by definition, falsifiable!

- Formulate a hypothesis relevant to astrology that can be falsified. Don't worry about whether you personally can test this hypothesis, just that it *can* be tested.

Your hypothesis should be short and sweet: Don't try to do too much! It's better to think narrowly than broadly in this case.

- Describe how you can test your hypothesis. (Remember, for it to be a scientific hypothesis, it must be falsifiable. If your statement *cannot* be proven to be false, it's not a scientific hypothesis!) It does not have to be a test that you can personally perform—it just needs to be performable by *someone*.

As you think about testing your hypothesis, focus on how you could show with certainty that your hypothesis is false. You don't have to prove it true, you only need one example of it being false that can be re-tested and re-checked by other scientists.

- Based on your proposed test, explain how you would evaluate the results to show how the hypothesis either succeeds or fails. What criteria will you use to judge your results?



So what happens if a Virgo buys a basil plant or a Pisces gets a cactus?
(Image credit: Sophia Kraushaar)

Guess What? It's Been Done!

Astrology has been subjected to scientific testing for years. One of the most conclusive [scientific studies](#), published in 1985, actively included input from astrologers in the design of the experiment. This is significant, because it meant that the *astrologers were making their own predictions* about how well they would perform when tested.

You can read the entire paper (it's a little dense!), but here are the salient points:

Study participants provided information for the astrologers to construct their natal charts. From those charts, the astrologers developed a personality profile for each individual.

An individual was then given three profiles: One that the astrologers created based on the participant's birth chart, and two other two random profiles. The individuals were instructed to select the profile that best fit their own personality.

The participants also agreed to take a personality test (one that the astrologers agreed was compatible with the elements of their horoscopes). The astrologers were given a natal chart, then three personality test profiles: One that matched the chart, and two random. The astrologers were tasked with matching the chart with the correct personality profile.

What happened? Well, the astrologers agreed before the tests that their horoscopes should be accurate at least 50% of the time (so, *they got to decide for themselves* what the threshold of success would be). The participants were consistently unable to correctly select the profile created specifically for them! They chose the correct profile only $\frac{1}{3}$ of the time—completely consistent with random chance! In fact, the control group performed significantly better than

the experimental group.

The same thing happened when the astrologers were challenged with matching the natal chart with the correct profile. Literally, the same thing. The astrologers only successfully matched chart with profile $\frac{1}{3}$ of the time, the same as random chance!

- If gravity only worked as predicted $\frac{1}{3}$ of the time, would you believe in it? If you dropped a tennis ball three times, and it only fell to the ground once, would you be calling Galileo's hypothesis and Isaac Newton's Law of Gravity genius or nonsense?
- What would be an acceptable threshold? If gravity worked as predicted 50% of the time, would you accept it as a scientific principle? Would you trust airplanes or elevators designed using a gravitational principle that failed 50% of the time?

Then Why So Many Memes?

Go ahead and scroll through [some astrology memes](#). I chuckled at the very first one because I instantly recognized myself. So astrology must be true! But then I *also* recognized myself in two other astrological signs! If either of those other statements had been listed under my sign, I still would have nodded in amusement and agreement.

- Test out a few of the memes. Based on your own astrological sign, does your personality fit the meme? Can you also see yourself in the traits attributed to other signs?
- Why do you think people might choose to believe in astrology? Do you think that presenting them with the scientific experiments that disprove it would change their minds?
- Can believing in astrology be harmful? What about believing in other pseudosciences? What's an example of genuine harm being caused by believing in principles that are unscientific and have been proven to be false?

Put It Together and Hand It In!

This Case Study is due on **Monday, 27 January 2025, no later than 6:00PM.**

To prepare your case study for evaluation, create a neat, easy-to-follow document that answers each of the numbered questions completely. Creating a Google doc that can be shared within your group is a great idea for allowing everyone to have access and be able to contribute to the document. Please take a few moments before you submit to make sure that your document is neat, complete, and professional. Proofread it for spelling and grammar (then have another person do it again!). Make sure the questions are numbered, any figures or tables are labeled, and that the document is easy to read.

To submit your case, export the document as a pdf. Blackboard does not recognize a Google doc as an allowable file format for submissions. Use the [Case Study 01](#) Blackboard assignment to upload your work, and submit only one document for the entire group. Each Case Study is worth 50 points, and all *participating* group members will receive the same score.

Remember that you are permitted to self-select your groups, and if you find yourself on a team that isn't your best fit, you can choose to work with different people on the subsequent cases. You are not required to work with the same team each time, but once a team is formed, it's for the duration of the Case.

Scoring Rubric

Your Case Study will be evaluated using the following scoring rubric:

QUESTION	CRITERIA	COMMENTS	POINTS POSSIBLE	POINTS EARNED
1	Example cited is real and relevant		3	
2	Response fully addresses question		3	
3	Reasoning is well-thought out and fully explained		3	
4	Response makes sense in the context of the question		3	
5	Response is justified with a relevant example		3	
6	Proposed hypothesis is relevant to the problem and falsifiable		5	
7	Proposed test addresses the hypothesis directly and can be performed		5	
8	Criteria for success are clearly explained and justified		5	
9	Reasoning is well-thought out and fully explained		4	
10	Threshold is clearly stated and justified		4	
11	Opinion is clearly explained		4	
12	Opinion is clearly explained		4	
13	Response is fully explained and example is relevant		4	

Sources

Seven Ways to Identify Pseudoscience: <https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00336/full>

Brian Cox, The Human Universe: <https://youtu.be/E43-CfukEgs>

How Does Astrology Work?: <https://horoscopes.lovetoknow.com/about-astrology/how-does-astrology-work>

What Is An Astrology Chart?: <https://astrostyle.com/astrology-birth-chart/>

A Double-Blind Test of Astrology: <https://escholarship.org/content/qt0b40b045/qt0b40b045.pdf>

Astrology Memes: <https://www.purewow.com/wellness/astrology-memes>