In-Class Lab #1: Intro to the Nature of Science

Friday, September 7 Due at 3pm on Monday, September 10

This lab is to be completed in groups of 2-3 people, and you should hand in just one copy per group with all group members' names on it. Each group member should participate equally in the lab. All group members should complete the readings when the lab prompts them to do so. Group members who finish the readings before others should sit quietly and wait for everyone to finish. **Do not pick up the second two articles until the lab prompts you to!**

Purpose: To introduce the concept of pseudoscience and to begin to identify qualities that distinguish it from true science.

Materials: Three readings:

- (1) "Horoscope Hang-Up: Earth Rotation Changes Zodiac Signs"
- (2) "The Astrotest"
- (3) "An Astronomer Looks at Astrology"

Instructions

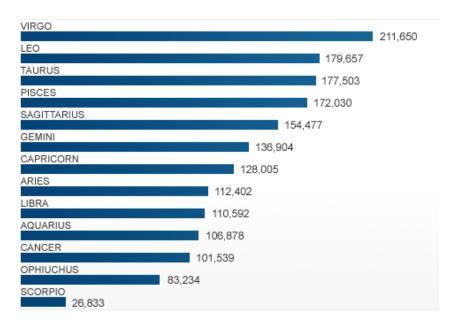
In 2011, the "New" Zodiac Signs were rolled out in the media. Read the brief article from Time magazine online entitled "Horoscope Hang-Up: Earth Rotation Changes Zodiac Signs", then answer questions 1-3 as a group.

1. The article describes a reason that astronomers defined a new set of Zodiac signs. What was their reasoning for this?

2. What is the scientific explanation for this phenomenon (the signs being off by ~one month) according to this article?

3. Write down two questions you have about the subject that are not answered by this article.

Shortly after the release of these "New" Zodiac signs, Allstate Insurance Company issued a press release that correlated drivers' Zodiac signs with their likelihood of crashing. The article listed the number of crashes in Allstate's 2010 records in which drivers of each Zodiac sign (note that they include Ophiuchus!) were involved, and the data are represented on the next page in graphical form.



4. What does the chart imply? Summarize its meaning in one sentence.

5. What is your first reaction to this data? Are you surprised? Do you have any doubts about its validity?

Examine the table of information below, which shows the same crash information, plus two additional pieces to the puzzle: the birthdates and personality characteristics that correspond to each sign.

| Sign | Birthdates | Personality | No. of Drivers |
|-------------|---------------------|--------------------------|----------------|
| | | Characteristics | Involved in |
| | | | Accidents in |
| | | | 2010 |
| Scorpio | Nov 23- Nov 28 | Passionate, resourceful | 26,833 |
| Ophiuchus | Nov 29 – Dec 17 | Wise, ambitious, lucky | 83,234 |
| Cancer | July 21 – Aug 9 | Compassion, sensitivity | 101,539 |
| Aquarius | Feb 16 - March 11 | Progressive, independent | 106,878 |
| Libra | Oct 31 – Nov 22 | Cooperative, gracious | 110,592 |
| Aries | Apr 17 – May 13 | Impatient, determined | 112,402 |
| Capricorn | Jan 18 - Feb 15 | Responsible, disciplined | 128,005 |
| Gemini | June 20 – July 20 | Short attention span, | 136,904 |
| | | nervous | |
| Sagittarius | Dec 18 - Jan 17 | Impatient, idealistic | 154,477 |
| Pisces | March 12 – April 16 | Fearful, overly trusting | 172,030 |
| | | | |
| Taurus | May 14 – June 19 | Uncompromising, | 177,503 |
| | | possessive | |
| Leo | Aug 10 – Sept 15 | Arrogant, inflexible | 179,657 |
| Virgo | Sept 16 – Oct 30 | Worried, shy | 211,650 |

6. Explain why the personality characteristics associated with each sign can't explain the car crash data **using specific examples from the table above**.

7. Do the birthdates explain the crash data? Why or why not?

8. If you were to add one column to the table that would explain why zodiac sign is correlated with car crashes, what would it be? Add it to the table on the previous page and fill in the new column.

Now, lets examine the basic premise of Astrology itself: that your personality, fate or the quality of your day might be determined by the position of the sun and planets on the date of your birth.

9. Is this idea testable? Together with your group mates, design a test that YOU could conduct to investigate whether horoscope predictions are valid and describe it.

Pick up and read the article "The Astrotest", which is about one such scientific experiment to test the validity of Astrologers' predictions, and then answer questions 10-11.

10. In one paragraph, describe the "Astrotest" experiment conducted by the author. What was his hypothesis and how did he test it? Describe the experimental design and its results

11. Together with your group mates, brainstorm two tough questions that you might ask an astrologer if you were given an opportunity to interview one and "feel them out" regarding how legit their profession is.

Pick up and read the article 'An Astronomer Looks at Astrology", which asks 10 such questions, and then answer questions 12-15.

12. In what ways were these questions similar or different from the two you came up with?

13. In what way is Mr. Fraknoi's approach to the topic scientific?

14. How do the "sidebars" included in the article (in grey) help to strengthen it's argument?

15. Together with your group mates, brainstorm 3-5 qualities of science that distinguish it from fake or "pseudo" science and list them (bullet/list form is fine). Also, make a similar list to describe the qualities of Pseudoscience.

Characteristics of Good Science

Characteristics of Pseudoscience

| Н | ach group member should answer this question separately. Ias this exercise changed your mind about the validity of Astrology at all? Be honest – I won't judge!) Why or why not? |
|---|--|
| G | roup Member 1: |
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| G | roup Member 2: |
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Group Member 3: