

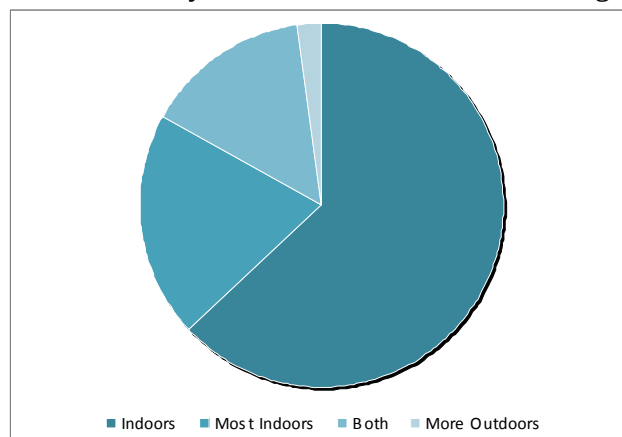
Sky Knowledge, Celestial Names, and Light Pollution
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Introduction

My cultural astronomy research on a remote island in the South Pacific was the beginning point of my exploration into light pollution, dark skies, and people's knowledge of the night sky. The Fiji Islands are one thousand miles north of New Zealand, the island nation is directly west of Tonga and east of Vanuatu. Moce Island is the easternmost island in the island nation of Fiji. My research focused on documenting the Moce Islanders' navigational practices with a special focus on their use of celestial bodies (Holbrook 2002; Holbrook Unpublished). The men that I interviewed spoke confidently of how they used the Sun, Moon, Venus, and the stars for navigation, but they did not know the Fijian names of most of the stars they used, and could only name a few Fijian asterisms altogether. They did not know the modern astronomical names of the stars and constellations, either. I considered the possibility that light pollution was leading to their lack of knowledge of the star names.

Moce Island appeared ideal for a mini light pollution study: The Island was not electrified until the mid 1980s. The electricity is on only from sunset to midnight and remains off at all other times. The only electricity on during the day and night is at the local store which has its own diesel generator that runs their freezer. While on Moce Island doing field research, it was a simple matter to include questions about changes in their familiarity with the night sky before and after the island was electrified. I was already collecting the local names of celestial bodies and was puzzled because people never knew more than about ten names. Finally, I asked if they used to know the names of more stars before the island was electrified. The answer was uniformly that there had been no change; that they did not know more names before electrification. This stimulated me to consider that light pollution was not the determining factor and I began to consider other factors including the prevalence of indoor activities in the evenings, the lack of knowledgeable individuals to teach about the sky traditions, and a lack of interest in the sky



except for those celestial bodies related to navigation. As my research progressed, I eventually considered that if

Figure 1: Where evening activities take place.

the Moce Islanders did have a detailed knowledge of the night sky then it did not correlate with knowing the names of stars.

Many years later I designed a project to assess the relationship between light pollution and sky knowledge in a more systematic way. In order to do a quantitative study of sky knowledge around the world, I developed a survey that takes between 15-30 minutes to complete: The Sky in Our Lives Survey. In regards to light pollution, I wanted to explore the possibility that, even without light pollution, appreciation and knowledge of the night sky is declining because people spend most of their time indoors. This publication marks the end of the first year of the survey and ends the preliminary field-testing phase of the survey. This is a report of my findings for 2008 that focuses on the first 100 surveys, focusing on this number makes the statistics easy to understand.

Summarizing the theories that the survey seeks to explore:

- 1) Light pollution is contributing to a decline in knowledge about the night sky, and therefore individuals who were raised in light polluted environments will score lower on the Noctcaelador Index (see definition below).
- 2) Individuals know less about the night sky because they spend the majority of their time indoors at night, conversely individuals who spend more time outdoors at night should know more about the night sky.

The Survey Data and Results

Starting with some basic demographics: Among the 100 people surveyed, 51 are United States citizens, 27 are United Kingdom citizens, one is a dual USA/UK citizen, one Brazilian, nine Europeans, one Canadian, one Australian, and the remaining didn't give their citizenship. 62 men and 36 women responded, and two people declined giving their gender. Astronomers, amateur astronomers, and students majoring in astronomy were included among the survey respondents forming obvious subgroups (see Figure 2), as well as astrologers. The highest level of education of the respondents varied but over half had education beyond the bachelors degree level: 51 people had attended some graduate school, 8 people had a master's degree or professional degree, 32 had attended college, 7 had graduated from secondary school, one had only a primary school education, and one person did not give their education information. Survey participants were given several choices as to which environment they were raised including in a city, town, suburb, in the country, desert, wilderness, or on an island. This demographic information is crucial to analyses of the trends seen in the sky knowledge responses.

Psychological Attachment to the Night Sky

The Noctcaelador Index developed by psychologist William Kelly is ten questions that measure an individual's psychological attachment to the night sky and it is included in the survey (Kelly 2004; Kelly and Rose 2005; Kelly and Daughtry 2005). Higher Noctcaelador Index scores indicate a stronger psychological

attachment to the night sky and a stronger interest in the night sky. The responses are a five point Likert scale ranging from Strongly Disagree to Strongly Agree. For the entire sample of 100 people, the mean score was 33.9 where 45 was the highest possible score.

The people surveyed were raised in a variety of physical environments (see Table 1). The environments associated with low levels of light pollution are the desert, an island, the wilderness, and in the country. The expectation was that those people raised in these environments with less light pollution would show a higher psychological attachment to the night sky. The table shows the number of respondents for each environment and the mean Noctcaelador Index score for the group. Again, the variation in these results is not statistically significant, nonetheless people raised in the suburbs scored highest. The suburbs are not known for dark skies, rather in the United States they are known for the best schools. Of those 19 respondents who were raised in the suburbs most were from the United States (12), five were from the United Kingdom, and two did not give their citizenship. Of those 19 respondents who were raised in the suburbs most indicated that they had attended graduate school (15), two had attend college, one had attended secondary school, and one did not give their education information. Also, the 19 people that were raised in the suburbs included 8 who identified themselves as astronomers, two as astrologers, and one person self-identified as an astronomy student.

Table 1: Where people were raised and their Noctcaelador Index scores.

Location	Number of Respondents	Noctcaelador
City	41	34.4
Town	19	35.4
Suburbs	19	38.2
Country	15	34.5
Island	1	35.7
Desert	4	34.8
All	1	33.9

When asked about their activities between sunset and midnight, 60% spent the time indoors and only 2% spent time mostly outdoors, see the pie chart in Figure 1. Upon analysis of the Noctcaelador score and outdoor evening activities; there was no significance difference in scores between those who spent time outdoors and those who didn't, but this result may be due to the very small sample size of the people who spent time mostly outdoors (2 people).

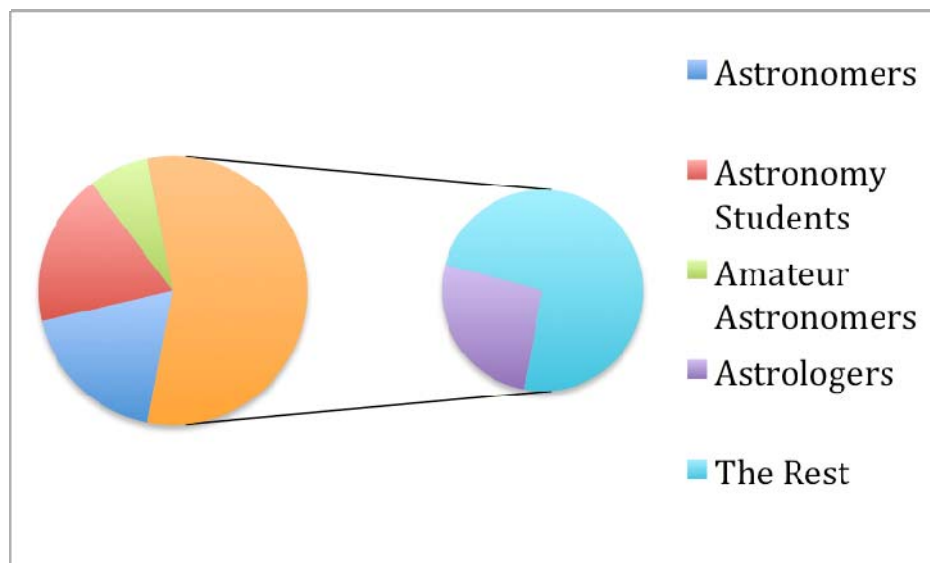


Figure 2: Respondents who have an astronomy or astrology connection.

Perhaps not surprisingly, amateur astronomers on average scored highest on the Noctcaelador Index suggesting their well-known passion for astronomy and for spending a lot of their free time stargazing. However, even their scores are not statistically significant from the rest of the respondents.

People who are navigators oftentimes use the stars for night navigation. Considering this subpopulation, the survey includes a section on personal experiences navigating by the stars. Of the 43 positive responses 34 were male, the average age was 45, most (28 of 43) had at least a master's degree, and almost half (19) were connected to astronomy. However, the mean Noctcaelador Index score for the navigation subgroup also was not statistically significant from the non-navigating population.

Disappointingly, most of the Noctcaelador Index scores for various subgroups of the people surveyed did not show any statistically significant differences. Therefore, looking at the Noctcaelador Index scores is inconclusive with respect to the two theories being explored.

Celestial Names and Constellation Drawings

The Noctcaelador Index is not the only measure used in the survey: people are asked to list the names of planets, asteroids, constellations, and stars. The hypothesis was that people who listed more names of celestial bodies had a greater knowledge of the night sky, a simple hypothesis that emerged directly from my research in Fiji. The results were that all except one person listed eight or nine planets depending upon what they thought of Pluto, and many constellations and asterisms including those of the Zodiac. Those with a connection to astronomy listed a few asteroids, the names of several stars, and the names of planets around other stars whereas the others did not. Many astrologers included the Sun and Moon in their list of planets, but often included an explanation that for astrological purposes these two are considered planets.

Table 2: Noctcaelador Index Scores for people who self-identified with astronomy

	Number of Respondents	Noctcaelador
Astronomers	21	35.6
Astronomy Students	13	33.3
Amateur Astronomers	8	40.1
Astrologers	16	38.3
The Rest	45	33.9
All	100	35

An obvious conclusion from their superior number of celestial names is that those connected with astronomy have more sky knowledge and have more experience observing the night sky. Another conclusion is that they have memorized more celestial names as part of their studies, which is definitely part of sky knowledge. However because of this, the list of names may not reflect direct experience seeing these bodies with or without a telescope, which would be the opposite of the Fiji case. Therefore, the list of celestial names seems to have little bearing on the light pollution issue. On the other hand, people connected to astronomy usually have to travel to areas with dark skies to do sky observations, thus they tend to have more experience working in non-light polluted environments. It is clear that the list number of celestial names listed is reflective of astronomy education, but it seems to not be connected to where people were raised. To determine the connection between a list of celestial names and sky watching experience, a new question asking what star and constellations have they seen directly or through a telescope would have to be posed.

Perhaps the question that people found the most fun was to draw their favorite constellation. This question was another way to assess the connection to the night sky: 1) if they had a favorite constellation, 2) could they draw their favorite constellation, and 3) how accurate was their relative placement of stars in their drawing. The constellation drawings were accurate enough for most to be easily identified by someone familiar with the night sky. By far, Orion and Ursa Major were the most popular constellations. The presence of Ursa Major shows the Northern Hemisphere bias of the survey population. For example, it was a person from the Southern Hemisphere that drew Scorpio as their favorite constellations.

Orion	24
Ursa Major	14
North Star	1
Lyra & Cepheus	1
Scorpio	1
Cassiopeia	1
Pisces	1
Crux	1

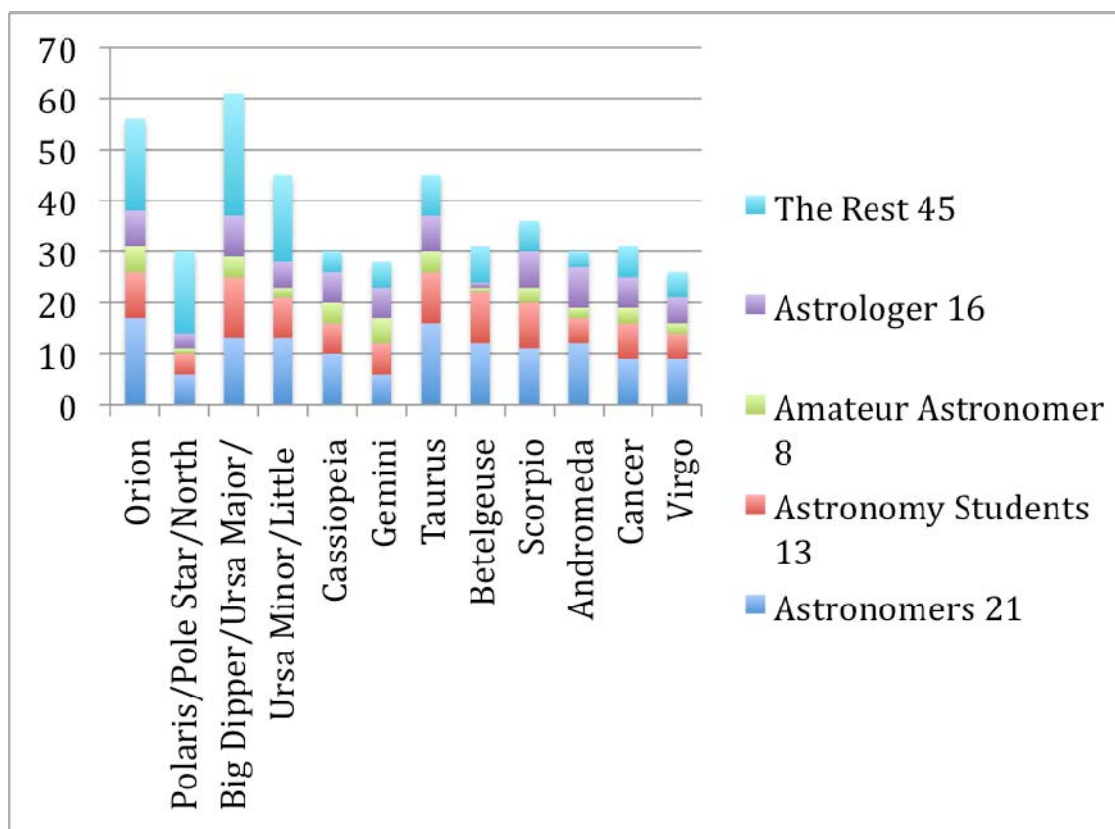


Figure 3: The most frequently mentioned celestial names for stars and constellations.

Astrology and Astrologers

In the astrology section of the survey there is a question about the Zodiac. The format of the answers indicate belief or non-belief rather than on a scale of strongly agree to strongly disagree. The Zodiac question answers indicate whether the participants believed that it was part of the night sky or not (see Figure 4). Seventy-one participants believed this, indicating that twenty-nine had some confusion.

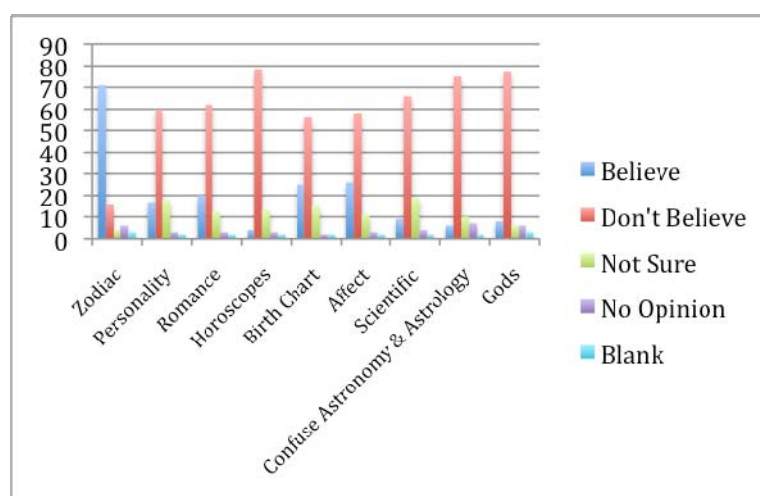
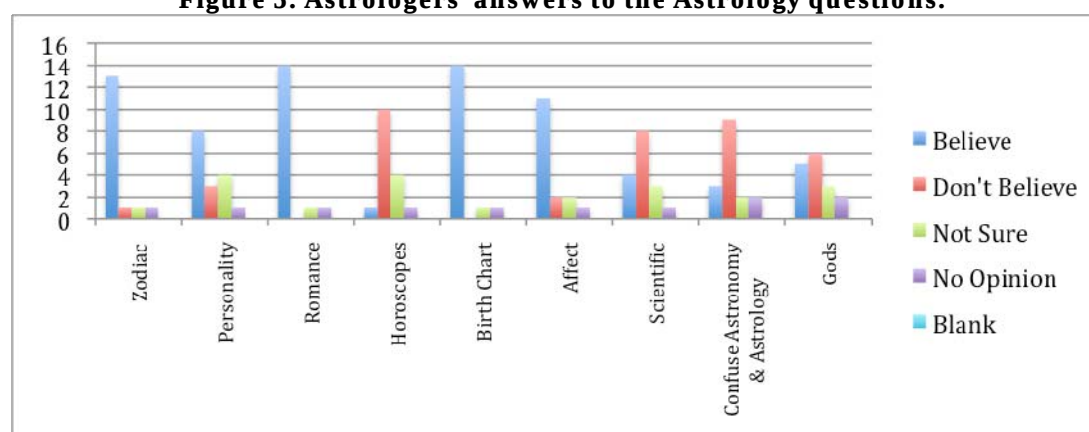


Figure 4: All responses to the Astrology section of the Survey.

Looking just at the sixteen astrologers,

Figure 5: Astrologers' answers to the Astrology questions.



The astrologers' response are complex and in many cases opposite the responses from the rest of the population. Interpreting the responses, astrologers believe that the Zodiac is part of the night sky as with the entire population. Half of the astrologers believe that personality can be determined by astrology, most astrologers believe that astrology can be successfully used for romantic and financial decisions. In contrast, the majority of the population did not believe either of these. Astrologers and the rest of the population agreed that newspaper horoscopes are not very accurate; however, most of the astrologer believed that birth charts were accurate while the others did not. The astrologers believe that the planets can affect peoples' lives, where as the rest do not. Their responses were mixed as to whether astrology has been scientifically proven, and as to whether the planets are Deities. Finally, the astrologers agreed with the rest of the population that astronomy and astrology is not the same thing.

Conclusions

The preliminary results from the first year of “The Sky in Our Lives” project suggest that most people spend their evenings indoors though on average they score high on the Noctcaelador Index showing a strong psychological attachment to the night sky. The physical environment where people were raised and their Noctcaelador score show slight variations but no statistically significance differences. The list of celestial names and the drawings of constellations appears to be connected strongly with astronomy education.

The respondents who self-identified as astrologers scored higher than astronomers on the Noctcaelador Index, and showed a more complicated pattern of responses to the Astrology questions than the rest of the population. This is the first survey to look at the question of beliefs about astrology in such a detailed manner and the first to record this information about astrologers themselves. In many instances astrologers and the rest of the population were in agreement, but overall they tended to believe more elements of astrology than the rest of the population. ‘Belief’ may be the operative word here since even the astrologers believe that astrology has not been scientifically proven.

What is not clear in these preliminary results is that the survey measures sky knowledge that reflects personal time spent outdoors looking at the night sky, which could be impacted by light pollution. A different way to get at this information is to not ask for simply a list of names of celestial bodies, but instead to ask for a list of the names of celestial bodies that people have seen in the night sky with or without optical aids and to ask respondents to include a description of the observing situation.

Finally, given these results the survey is being modified to refine the measures of sky knowledge which should make their possible connections to light pollution clearer. The next version of the Survey is several pages longer and asks more detailed questions about the role of the sky in people’s lives.

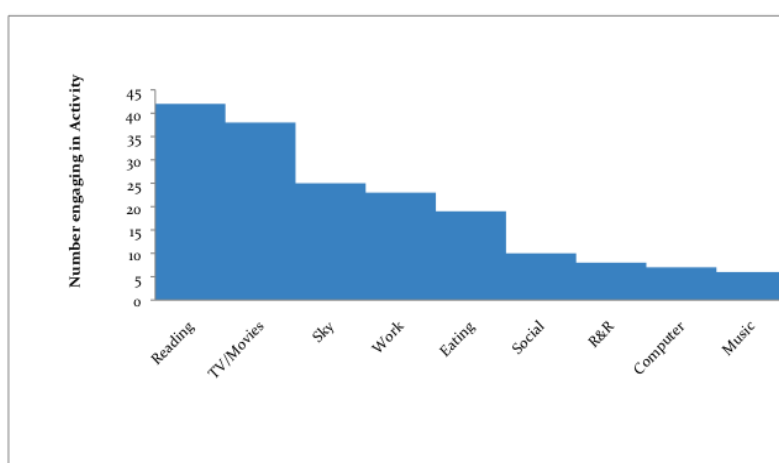


Figure 6: Evening Activities

In the Moce Island study, though they only knew about ten celestial names and had indicated that their knowledge had not changed once the island was electrified, I did additional research that could help me understand this puzzlingly low number. I asked if

they thought their grandparents knew more names of stars than they know today. The answer was uniformly “Yes”. However, studies done on nearby islands in the 1930s listed the same few names that I found in the 1990s. Thus, the Moce Islanders’ knowledge about their grandparents’ knowledge appears to be incorrect. This simply reinforces the difficulty in correlating the knowledge of names of celestial bodies alone with the effects of light pollution.

Special thanks to my partner in statistical analysis Barbara DeFilippo, Ph.D., Psychology Department, Lane Community College, and my research assistant Elizabeth Bledsoe.

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Kelly, W. (2004). "Development of an Instrument to Measure Noctcaelador: Psychological Attachment to the Night-Sky." College Student Journal **38**(1): 100-103.

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The Sky in Our Lives Survey

Location:

Background: You were selected for this survey because you live the United States and you are over 18 years old. This survey explores your Sky Knowledge. Even if you feel that you do not know anything about the sky, your answers are still important for this study. Feel free to write additional comments right on the survey.

Human Subjects Protection Disclaimers: Your participation in this survey is voluntary. There are no known risks or benefits for your participation. You will not be financially compensated for participation. Your name and identifying characteristics will not be used in any reports. Any documents linking your name to your survey will be kept under lock and key in a safe location.

If you choose to do the survey: Please return the survey to Jarita Holbrook, Box 210030, Tucson, AZ, 85721-0030, holbrook@u.arizona.edu, or to the research assistant who gave you this survey.

Part 1 Demographic Information

This is personal but ANONYMOUS information about you that will allow us to look for patterns of responses.

1. My country of citizenship: _____
2. I consider myself to be (ethnic group like African American, Armenian, etc): _____

3. I Am

Female	Male	Decline	Other _____
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4. My Age _____

5. My spiritual / religious tradition is: (Buddhist, etc):

6. I have (check all that apply):

- ☐ Attended Primary / Grammar School
- ☐ Attended Secondary / High School
- ☐ Attended College / University
- ☐ Graduated from College / University
- ☐ Attended Graduate School
- ☐ Earned a professional degree / Master's / MBA / MFA
- ☐ Earned a Ph.D./ Ed.D./ J.D./ M.D.
- ☐ No Response

7. I am (check all that apply)

- ☐ None of These ☐ Military
- ☐ An Astronomer ☐ An Amateur Astronomer ☐ An Astronomy Major
- ☐ An Astrologer ☐ An Astrology Student

8. I have learned some astronomy (Check all that apply)

- ☐ from other children
- ☐ from my mother
- ☐ from my father
- ☐ in Primary / Grammar School
- ☐ in Secondary / High School
- ☐ in an astronomy class in College / University
- ☐ in a class in graduate school
- ☐ other _____

9. I have spent most of my life living in: (Check one.)

- ☐ A city ☐ A town ☐ The suburbs ☐ The country ☐ The wilderness
- ☐ An island ☐ The desert

Part 2 The Sky in Your Life

This section explores how you use the sky in your everyday life or have used the sky in the past. These questions refer to things you have seen in the sky with your own eyes or through a telescope – not in a photograph or on TV.

1. Have you ever seen the moon up during the daytime?

Yes	No	Not Sure
-----	----	----------

2. Have you ever seen an eclipse of the sun or moon?

Yes	No	Not Sure
-----	----	----------

3. Do you like to watch the sunset?

Yes	No	Not Sure
-----	----	----------

4. Have you ever seen a shooting star?

Yes	No	Not Sure
-----	----	----------

5. Have you ever seen a comet?

Yes	No	Not Sure
-----	----	----------

6. Do you like to see movies that take place in outer space?

Yes	No	Not Sure
-----	----	----------

7. Do you like to read futuristic books that take place in outer space?

Yes	No	Not Sure
-----	----	----------

8. Have you ever visited a planetarium?

Yes	No	Not Sure
-----	----	----------

9. Have you ever used a telescope?

Yes	No	Not Sure
-----	----	----------

10. Have you ever visited an observatory?

Yes	No	Not Sure
-----	----	----------

11. Have you watched a rocket or space shuttle launch in person, on TV, or on the Internet?

Yes	No	Not Sure
-----	----	----------

Long Answers: Please write a few sentences answering each of the following questions.

12. Other than sleep, what activities do you usually do between sunset and midnight?

13. Do these activities tend to take place indoors or outside?

14. How often do you take time specifically to view the night sky?

- ☐ Once a year
- ☐ Once every few months
- ☐ Once a month
- ☐ Several times a month
- ☐ Once a week
- ☐ Several times a week
- ☐ Every night

a. What prompts you to look skyward?

b. Do you look at the night sky more casually like when you are driving or walking outside?

Yes	No	Not Sure
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c. Why do you look at the sky then?

15. Would you describe the night sky as (circle all that apply):

Romantic	Empty	Cold	Dark
Numinous	Informative	Magical	New
Changeable	Mysterious	Important	Bright
Distant	New	Beautiful	Heavenly

Other words? _____

16. Write the names of the planets that you know:

17. How did you learn the planets?

- ☐ from other children
- ☐ from my mother
- ☐ from my father
- ☐ in Primary / Grammar School
- ☐ in Secondary / High School
- ☐ in an astronomy class in College / University
- ☐ in a class in graduate school
- ☐ other _____

18. Write any asteroid names that you know:

19. How did you learn about asteroids?

- ☐ from other children
- ☐ from my mother
- ☐ from my father
- ☐ in Primary / Grammar School
- ☐ in Secondary / High School
- ☐ in an astronomy class in College / University
- ☐ in a class in graduate school
- ☐ other _____

20. List up to 20 star names:

21. List up to 20 constellation names:

22. How did you learn about stars and constellations?

- ☐ from other children
- ☐ from my mother
- ☐ from my father
- ☐ in Primary / Grammar School
- ☐ in Secondary / High School
- ☐ in an astronomy class in College / University
- ☐ in a class in graduate school
- ☐ other_____

23. Do you have a favorite constellation?

Yes	No	Not Sure
-----	----	----------

- a. Draw a picture of your favorite constellation (Please use the back of the page if you need more space).

24. Have you ever used the stars to find your way at night?

Yes	No	Not Sure
-----	----	----------

- a. If yes, draw or write the name of the stars or constellations you used? (You can use the back.)

b. Describe the situation when you used the stars to find your way at night and how often you do this (you can use the back of the page if needed):

c. How did you learn how to do this?

25. What do you wish you knew about astronomy/the night sky and why?

26. Do you participate in ceremonies or festivals on celestial days like at the full moon, Easter, Ramadan, or on the longest or shortest day of the year?

Yes	No	Not Sure
-----	----	----------

a) If yes, please describe the festival or ceremony and give what day it occurs (you can use the back)?

b) Does this festival or ceremony occur every year?

Yes	No	Not Sure
-----	----	----------

c) Do you know of other festivals or ceremonies connected to the sky?
Please write about them here and on the back of the survey pages if needed.

27. How much do your spiritual/religious beliefs shape your:

a. Attitudes About the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
b. Practices with respect to the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
c. Stories you know or were told about the sky?	Not at All	Very Little	Moderately	Very Much	Greatly
d. Knowledge about the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly

28. How much do your cultural beliefs shape your:

a. Attitudes About the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
b. Practices with respect to the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
c. Stories you know or were told about the sky?	Not at All	Very Little	Moderately	Very Much	Greatly
d. Knowledge about the	Not at All	Very Little	Moderately	Very Much	Greatly

a. Attitudes About the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
Sky?					

29. How much does astrology shape your:

a. Attitudes About the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
b. Practices with respect to the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
c. Stories you know or were told about the sky?	Not at All	Very Little	Moderately	Very Much	Greatly
d. Knowledge about the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly

30. If you know what your Zodiac sign is please write it here

-----.

31. How much does your formal education shape your:

a. Attitudes About the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
b. Practices with respect to the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly
c. Stories you know or were told about the sky?	Not at All	Very Little	Moderately	Very Much	Greatly
d. Knowledge about the Sky?	Not at All	Very Little	Moderately	Very Much	Greatly

32. Do you look at the sky to predict the weather?

Yes	No	Not Sure
-----	----	----------

- a. If yes, what are you looking for and what does it predict?

- b. If yes, how did you learn how to do this?

33. Do you or other people in your community know other things about the sky?

- a. If yes, first how would you describe your community?

Yes	No	Not Sure
-----	----	----------

- b. Can you please write down the other things that you and other people in your community know about the sky? A list is fine, but the more details the better.

- c. Was there as special situation in which you learned this, like over dinner, while camping, or in religious classes? Please give details.

34. Do you know any stories, legends, or myths about the sky that are particular to your community?

Yes	No	Not Sure
-----	----	----------

- a. If yes, how did you learn these stories?

- b. **IF YES, PLEASE TAKE THE TIME AT THE END OF THIS SURVEY TO TELL THE STORIES TO THE RESEARCHER WHO GAVE YOU THIS SURVEY.**

Part 3 This part of the survey measures your attachment to the sky.

Using the following scale, please mark the **ONE** answer which best indicates how much you **typically** disagree/agree with each statement. That is, how would you describe yourself **in general**.

SD = Strongly disagree

D = Disagree

N = Not Sure or Neutral (neither agree or disagree)

A = Agree

SA= Strongly Agree

1. I feel an emotional attachment to the night-sky	SD	D	N	A	SA
2. I become mesmerized while looking at the night-sky	SD	D	N	A	SA
3. I could spend all night just looking at the sky	SD	D	N	A	SA
4. I like to go outside and look at the sky at night often	SD	D	N	A	SA
5. Having time to look at the night-sky is important to me	SD	D	N	A	SA
6. I find more pleasure in looking at the night-sky than most people	SD	D	N	A	SA

7. Looking at the night-sky pleases me	SD	D	N	A	SA
8. I somehow feel connected to the night-sky	SD	D	N	A	SA
9. I'm very fond of the night-sky	SD	D	N	A	SA
10. I very much adore the objects in the night-sky	SD	D	N	A	SA

Part 4 Astrology Survey

The questions below test your knowledge about astrology. There are no right or wrong answers please circle ONE answer which best indicates what you think. It is important that you do not go back and change your answers.

1. The Zodiac is part of the night sky

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

2. Your personality is NOT determined by your astrological sign

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

3. Astrology can be successfully used to make financial and romantic decisions

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

4. Horoscopes in newspapers and magazines are NOT very accurate

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

5. A birth chart with explanations created by an astrologer is very accurate

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

6. Astrology or that the position of the stars and planets can affect people's lives

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

7. Astrology has NOT been scientifically proven

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

8. Astrology and Astronomy are the same.

Believe	Not sure about	Don't believe	No opinion
---------	----------------	---------------	------------

9. The Sun, Moon, and Planets are Gods and Goddesses

Believe	Not sure about	Don't believe	No opinion
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Part 5 The Astronomy Attitude Survey

The questions below are designed to identify your attitudes about astronomy. The item scale has 5 possible responses;

SD = Strongly disagree

D = Disagree

N = Not Sure or Neutral (neither agree or disagree)

A = Agree

SA = Strongly Agree

Please read each question. Please mark the ONE answer which best indicates how much you typically disagree/agree with each statement. Try not to think too deeply about each response; there are no correct or incorrect answers.

1. I have trouble understanding astronomy because of how I think.	SD	D	N	A	SA
2. Astronomy concepts are easy to understand.	SD	D	N	A	SA
3. Astronomy is irrelevant to my life.	SD	D	N	A	SA
4. Learning astronomy requires a great deal of discipline.	SD	D	N	A	SA
5. I have no idea of what's going on in astronomy.	SD	D	N	A	SA
6. I like astronomy.	SD	D	N	A	SA
7. What I learn about astronomy is not useful in my career.	SD	D	N	A	SA
8. Most people have to learn a new way of thinking to do astronomy.	SD	D	N	A	SA

9. Astronomy is highly technical but still understandable.	SD	D	N	A	SA
10. I find it difficult to understand astronomy concepts.	SD	D	N	A	SA
11. I would enjoy taking an astronomy course.	SD	D	N	A	SA
12. Astronomy involves memorizing a massive collection of facts.	SD	D	N	A	SA
13. Astronomy is a complicated subject.	SD	D	N	A	SA
14. I can learn astronomy.	SD	D	N	A	SA
15. Astronomy is worthless.	SD	D	N	A	SA
16. I am scared of astronomy.	SD	D	N	A	SA