**Suggested Discussion Questions for Planetary PostCards**

That star is hotter/colder than our Sun. How do you think that might affect its planets?

Here is where one of the planets orbits that star. What would it be like to live on this planet (or one of its moons)?

If Earth was orbiting that star, what might be different?

How big do you suppose this planet is compared to the planets in our Solar System?

Do you think we have found all the planets in this system?

Our fastest spacecraft travels 42 miles per second. It would take 5,000 years for that spacecraft to go one light year. How long would it take to reach this star which is ____ light years away?

How different do you think Earth will be in that period of time?

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**Planetary PostCards**

*Artist: Lynette Cook S5 Cancri System*

**Abbreviations and terms used on PostCards**

- **RA** = Right Ascension
- **Dec** = Declination
- **mag** = apparent visual magnitude
- **AU** = Astronomical Unit, the distance between the Earth and the Sun: 93 million miles or 150 million km
- **Light year** = The distance light travels in a year. Light travels at 186,000 miles per second or 300,000 km per second. Light from the Sun takes 8 minutes to reach Earth.
- **Jupiter mass** = $1.9 \times 10^{27}$ kg. Jupiter is about 300 times more massive than Earth (approximate difference between a large bowling ball and a small marble)
- **Temperature** of the stars is in degrees Celsius
The brightest star with a planet is a Binary star AND it’s a Red Giant! Its small “companion star” gets as close as 12 AU in a 40-year orbit.
Star: Iota Draconis

How far in light years?

150
100
50
5000
1000

How Hot?

°C

< Sun
5000
3000
1000

Same mass as the Sun but 13x the diameter!

Planet: Iota Draconis b

Star's System Compared to Our Solar System

<table>
<thead>
<tr>
<th>Planet (year discovered)</th>
<th>b (2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Distance From Star:</td>
<td>1.3 AU</td>
</tr>
<tr>
<td>(Earth from Sun = 1 AU)</td>
<td></td>
</tr>
<tr>
<td>Orbit:</td>
<td>1.5 years</td>
</tr>
<tr>
<td>Mass:</td>
<td>8.7 Jupiters(!)</td>
</tr>
</tbody>
</table>

Epsilon Eridani

How Hot?

°C

7000

6000

5000

4000

3000

2000

< Sun

1000

50

10

< 10

Planets (year discovered):

b (2000)

c (2002)

Avg Distance From Star:
(Each from Sun = 1 AU)

b: 3.3 AU

c: 40 AU

Orbit:

b: 6.8 years

c: 260 years

Mass:

b: 90% of Jupiter

c: 10% of Jupiter

Star: Epsilon Eridani

Planet: Epsilon Eridani b and c

Star’s System Compared to Our Solar System

This is the closest star to us with known planets. Our fastest spacecraft would take 50,000 years to reach this star system.
**Star: Upsilon Andromedae**

**How far in light years?**

<table>
<thead>
<tr>
<th>Light Years</th>
<th>150</th>
<th>100</th>
<th>50</th>
<th>44</th>
</tr>
</thead>
</table>

**How Hot?**

<table>
<thead>
<tr>
<th>°C</th>
<th>7000</th>
<th>5000</th>
<th>44</th>
</tr>
</thead>
</table>

This is the first star discovered with a confirmed multi-planet system. Planet b was discovered in 1996 and c & d in 1999.

**Planet: Upsilon Andromedae b, c, and d**

**Star’s System Compared to Our Solar System**

- **Upsilon Andromedae b**
  - Orbit: 4.6 Days
  - Mass: 71% Jupiter
  - Avg Distance From Star: 0.06 AU
  - Year Discovered: 1996

- **Upsilon Andromedae c**
  - Orbit: 8 Months
  - Mass: 2.1 Jupiters
  - Avg Distance From Star: 0.83 AU
  - Year Discovered: 1999

- **Upsilon Andromedae d**
  - Orbit: 3.5 Years
  - Mass: 4.6 Jupiters
  - Avg Distance From Star: 2.5 AU
  - Year Discovered: 1999

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**Tau Bootis**

View of the Jupiter-like planet with its star in the background.

**Star: Tau Bootis**

| Star's System Compared to Our Solar System |
|---|---|
| How far in light years? | How Hot? |
| 150 | < Sun |
| 100 | 5000 °C |
| 50 | 3000 °C |
| Sun | 1000 °C |

This huge planet is orbiting so close to its star and its star is so hot, this may be the hottest planet yet discovered!

**Planet: Tau Bootis b**

- Planet (year discovered): b (1996)
- Avg Distance From Star: 0.05 AU (Earth from Sun = 1 AU)
- Orbit: 3.3 days
- Mass: 3.9 Jupiters

**Star: 70 Virginis**

<table>
<thead>
<tr>
<th>How far in light years?</th>
<th>How Hot?</th>
<th>Star: 70 Virginis</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>7000</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1000</td>
<td>Sun</td>
</tr>
</tbody>
</table>

This massive planet is orbiting a star cooler than the Sun. It may have moons with liquid water. The planet is shown on the front with a ring and two moons. One moon is shown resembling Earth, having oceans and land.

**Planet: 70 Virginis b**

<table>
<thead>
<tr>
<th>Planet (year discovered):</th>
<th>b (1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Distance From Star:</td>
<td>0.4 AU</td>
</tr>
<tr>
<td>(Earth from Sun = 1 AU)</td>
<td></td>
</tr>
<tr>
<td>Orbit:</td>
<td>117 days</td>
</tr>
<tr>
<td>Mass:</td>
<td>6.6 Jupiters</td>
</tr>
</tbody>
</table>
47 Ursae Majoris

Star: 47 Ursae Majoris
Same Size as Our Sun

Planets: 47 Ursae Majoris b and c
Star's System Compared to Our Solar System

How far in light years?

<table>
<thead>
<tr>
<th>Distances</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 43</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>150</td>
</tr>
</tbody>
</table>

How Hot?

<table>
<thead>
<tr>
<th>Temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; Sun</td>
</tr>
<tr>
<td>1000</td>
</tr>
<tr>
<td>3000</td>
</tr>
<tr>
<td>5000</td>
</tr>
<tr>
<td>7000</td>
</tr>
</tbody>
</table>

Two giant planets are orbiting in nearly circular orbits far from their star. This system is somewhat like our Solar System. Might rocky planets like Earth exist closer to the star?

Planets (year discovered):

<table>
<thead>
<tr>
<th>Planet</th>
<th>(year)</th>
<th>Avg Distance From Star</th>
<th>Orbit</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>1996</td>
<td>2.1 AU</td>
<td>2 years</td>
<td>2.4 Jupiters</td>
</tr>
<tr>
<td>c</td>
<td>2001</td>
<td>3.7 AU</td>
<td>7.1 years</td>
<td>76% of Jupiter</td>
</tr>
</tbody>
</table>

**Star: Rho Coronae Borealis**

**Planet: Rho Coronae Borealis b**

Star's System Compared to Our Solar System

<table>
<thead>
<tr>
<th>Planet (year discovered):</th>
<th>b (1997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Distance From Star:</td>
<td>0.23 AU</td>
</tr>
<tr>
<td>(Earth from Sun = 1 AU)</td>
<td></td>
</tr>
<tr>
<td>Orbit:</td>
<td>39.6 days</td>
</tr>
<tr>
<td>Mass:</td>
<td>1.1 Jupiters</td>
</tr>
</tbody>
</table>

A belt of rocky/icy objects appears to orbit this star at about the same distance as the Kuiper Belt from our Sun. The occasional comet may appear in skies of this star's planet(s).

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**Star: 51 Pegasi**

**Planet: 51 Pegasi b**

Star’s System Compared to Our Solar System

- **Planets (year discovered):** b (1995)
- **Avg Distance From Star:** 0.05 AU
  - (Earth from Sun = 1 AU)
- **Orbit:** 4.2 days
- **Mass:** 50% of Jupiter

**How far in light years?**

- 150
- 100
- 50
- < 48

**How Hot?**

- °C
  - 7000 (Sun)
  - < 51 Pegasi b

This star was the FIRST sun-like star discovered to have a planet – in 1995, the first evidence that other stars like our Sun have planetary systems.
**Star: HD 38529 (Orion)**

**How far in light years?**  
- < 50  
- 50 - 100  
- 100 - 150

**How Hot?**  
- °C
  - < 1000
  - 1000 - 3000
  - 3000 - 5000
  - 5000 - 7000
  - > 7000

*This star is very dim – it is about how bright our Sun would look from the distance of this star. Compare this “small” star to Orion’s Betelgeuse – a red giant over 400 light years away or Rigel – a blue hot supergiant at over 750 light years.*

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**Planets: HD 38529 b and c**  
*Star’s System Compared to Our Solar System*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Distance From Star:</td>
<td>0.12 AU</td>
<td>3.5 AU</td>
</tr>
<tr>
<td>(Earth from Sun = 1 AU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orbit:</td>
<td>14.4 days</td>
<td>6 years</td>
</tr>
<tr>
<td>Mass:</td>
<td>77% of Jupiter</td>
<td>11.3 Jupiters</td>
</tr>
</tbody>
</table>

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View from the surface of a hypothetical icy moon of the outermost planet, which is shown with rings and two other moons.