Below-freezing temperatures, scorching heat, and storms bigger than planet Earth are just some of the wild weather you will encounter on your trip through the solar system! Get your fun facts along with your forecast for each major planet, as well as a moon (Titan) and a dwarf planet (Pluto). Get ready for some out of this world fun with Solar System Forecast!

It’s so much more than a picture book... this book is specifically designed to be both a fun-to-read story and a launch pad for discussions and learning. Whether read at home or in a classroom, we encourage adults to do the activities with the young children in their lives. Free online resources and support at www.ArbordalePublishing.com include:

- For Creative Minds as seen in the book (in English & Spanish):
  - Solar System Compare and Contrast
  - The Sun: Heat and Light
  - Thinking it Through: Life and Basic Needs
- Teaching Activities (to do at home or school):
  - Reading Questions
  - Math
  - Language Arts
  - Science
  - Coloring Pages
- Interactive Quizzes: Reading Comprehension, For Creative Minds, and Math Word Problems
- English and Spanish Audiobooks
- Related Websites
  - Aligned to State and Core Standards
  - Accelerated Reader and Reading Counts! Quizzes
  - Lexile and Fountas & Pinnell Reading Levels
- eBooks with Auto-Flip, Auto-Read, and selectable English and Spanish text and audio are available for purchase online.

Thanks to Alice Sarkisian Wessen, Manager, Solar System/Outer Planets & Technology Education and Public Outreach at JPL; Dr. Sten Odenwald, Astrophysicist at Goddard Spaceflight Center and creator of SpaceMath at NASA; and Dr. Stephen Edberg, Astronomer at JPL for checking the accuracy of the information in this book.

Kelly Kizer Whitt loves space. She has worked at Astronomy magazine as copy editor, photo editor, and assistant editor and wrote the terrestrial planets section of The Collins Illustrated Encyclopedia of Space. She writes about space for the websites Suite101.com and AstronomyToday.com. She also has a stargazing blog for the Sierra Club online. Kelly’s hobbies include visiting the national parks, creating crossword puzzles, and reading. Kelly and her family live in Wisconsin with their cat, Perseus, named for the constellation. This is Kelly’s debut picture book. Visit her website at sites.google.com/site/kellykizerwhitt.

Laurie Allen Klein has been a freelance artist for nearly 25 years. Over the last several years, she has worked as the on-staff artist for a marine park, where she does everything from painting life-size sea animal murals, to illustrating children’s activity books. As evident by the extras included in the art, she has combined her love and fascination with outer space (and science fiction) with children’s illustration in both Solar System Forecast and Meet the Planets. Laurie also illustrated Fur and Feathers, Where Should Turtle Be?, Little Skink’s Tail, and If a Dolphin Were a Fish for Arbordale. Laurie lives in Florida. See more of her artwork at www.lauriekleinarts.com.
Good morning space explorers! This is your weatherman with today’s solar system forecast: hot, cold, windy, calm, rainy, dry, cloudy, clear, and everything in between! Let’s take a closer look at the details...
The Sun is active today, with dark sunspots scattered across the surface like polka dots. These holes in the Sun’s surface are churning storms. Gas shoots out of these dark holes and flies out on the solar wind, making exploration dangerous. We do not recommend travel.
Mercury is so close to the Sun that almost its entire atmosphere has been blown away by the solar wind. With no air, this planet has wild temperature swings. It will get up to 800°F during the day. Pack something warm for night when temperatures drop to -279°F.
Expect thick, yellow sulfuric acid clouds on Venus today . . . and every day. These clouds trap the Sun's heat with a constant greenhouse effect.
The For Creative Minds educational section may be photocopied or printed from our website by the owner of this book for educational, non-commercial uses. Cross-curricular teaching activities, interactive quizzes, and more are available online. Go to www.ArbordalePublishing.com and click on the book’s cover to explore all the links.

For Creative Minds

Solar System Compare and Contrast

Compare and contrast the different solar system objects mentioned in the book. Scientists had different understandings of what a planet was. In 2006, a group of scientists from all over the world (the International Astronomical Union) defined a planet as an object that orbits a star, has an almost round shape, with no other objects of the same or smaller size in its orbit other than its own moons (satellites).

Stars are huge balls of hot gases that give off energy including light and heat.

A dwarf planet like Pluto orbits its star (the Sun) and is almost round in shape but other objects enter its orbital area.

A planet’s atmosphere is a layer of gases held in place by gravity between the planet and space. Saturn’s moon, Titan, is the only known moon with a thick atmosphere. Which have the same or similar atmospheres? Compare and contrast the clouds. Which planets or moons have water?

<table>
<thead>
<tr>
<th>Atmosphere</th>
<th>Clouds</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Venus</td>
<td>carbon dioxide, nitrogen</td>
<td>sulfuric acid</td>
</tr>
<tr>
<td>Earth</td>
<td>nitrogen, oxygen</td>
<td>water vapor</td>
</tr>
<tr>
<td>Mars</td>
<td>carbon dioxide, nitrogen, argon</td>
<td>water vapor</td>
</tr>
<tr>
<td>Jupiter</td>
<td>hydrogen, helium</td>
<td>ammonia</td>
</tr>
<tr>
<td>Saturn</td>
<td>hydrogen, helium</td>
<td>ammonia</td>
</tr>
<tr>
<td>Titan</td>
<td>nitrogen, methane</td>
<td>methane</td>
</tr>
<tr>
<td>Uranus</td>
<td>hydrogen, helium, methane</td>
<td>methane</td>
</tr>
<tr>
<td>Neptune</td>
<td>hydrogen, helium, methane</td>
<td>methane</td>
</tr>
<tr>
<td>Pluto</td>
<td>nitrogen, carbon monoxide, methane</td>
<td>nitrogen</td>
</tr>
</tbody>
</table>

Some planets are hot and some are cold.

Wind speeds vary by planet.

<table>
<thead>
<tr>
<th>Temperatures</th>
<th>Fahrenheit</th>
<th>Celsius</th>
<th>miles/hour</th>
<th>km/hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>around 10,000</td>
<td>around 5,500</td>
<td>1,000,000</td>
<td>1,609,000</td>
</tr>
<tr>
<td>Mercury</td>
<td>-279 low to 800 high</td>
<td>-173 low to 427 high</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Venus</td>
<td>864 average</td>
<td>462 average</td>
<td>light at surface</td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td>-126 low to 136 high</td>
<td>-88 low to 58 high</td>
<td>0 to &gt;302 (tornado)</td>
<td>0 to &gt;486 (tornado)</td>
</tr>
<tr>
<td>Mars</td>
<td>-125 low to -23 high</td>
<td>-87 low to -5 high</td>
<td>0 to 100</td>
<td>0 to 160</td>
</tr>
<tr>
<td>Jupiter</td>
<td>-234 average</td>
<td>-148 average</td>
<td>&gt; 380</td>
<td>&gt; 612</td>
</tr>
<tr>
<td>Saturn</td>
<td>-288 average</td>
<td>-178 average</td>
<td>1,000</td>
<td>1,600</td>
</tr>
<tr>
<td>Uranus</td>
<td>-357 average</td>
<td>-216 average</td>
<td>90 to 360</td>
<td>145 to 580</td>
</tr>
<tr>
<td>Neptune</td>
<td>-353 average</td>
<td>-214 average</td>
<td>up to 1500</td>
<td>up to 2400</td>
</tr>
<tr>
<td>Pluto</td>
<td>-387 low to -369 high</td>
<td>-233 low to -223 high</td>
<td>unknown</td>
<td>unknown</td>
</tr>
</tbody>
</table>

Moons (satellites) orbit planets. The Earth has one moon. Mercury and Venus do not have moons. Mars has two moons. Each of the outer planets has many moons. Scientists keep discovering more moons. Some moons have their own atmospheres (Saturn’s Titan) and some even have water.

Moons don’t make light. They are like mirrors—they bounce (reflect) sunlight back.

A planet’s atmosphere is a layer of gases held in place by gravity between the planet and space. Saturn’s moon, Titan, is the only known moon with a thick atmosphere. Which have the same or similar atmospheres? Compare and contrast the clouds. Which planets or moons have water?

Mercury, Venus, Earth, and Mars all have volcanoes; as do the moons Io, Enceladus, and Titan.
Thinking it Through: Life and Basic Needs

In order to survive, living things have basic needs that have to be met in their habitat on their planet. Here on Earth, animals need food, water, oxygen to breathe, and a safe space for shelter and to give birth to their young. Plants need sunlight and heat (temperature), water, soil to grow, and a way for seeds to move (disperse). Even on Earth, life forms look very different from each other. A cactus survives in dry climates and would not survive in the rainforest. Plants and animals that live in cold climates (Arctic, Antarctic, or high elevations) won’t survive in the hot tropics. And animals absorb oxygen differently too. As mammals, humans breathe oxygen from the air using lungs. Fish absorb oxygen from the water using gills.

Scientists are looking for possible life in our solar system—whether on other planets or their moons. They don’t expect to find life that looks like humans. Many scientists think it is possible that life on other planets (called extraterrestrial life) could look like living things on Earth that are too small to be seen without a microscope (called microbes). While many microbes, like bacteria, are all around us, there are some microbes that survive in extreme environments here on Earth. For example, microbes live under ice in the Antarctic, in the hot geysers of Yellowstone, in dark underground caves, or even deep in the ocean. There are even a few bacteria that don’t need oxygen!

Some scientists are listening for signs of human-like (intelligent) life on planets in other solar systems. By using radio and optical telescopes, these scientists listen or look for radio or light signals sent from other solar systems, hoping to find intelligent life on planets in those solar systems. Scientists also use the telescopes to learn more about the stars and planets beyond our solar system.

For more activities including Size and Distance and Making a Solar Oven, go to www.ArbordalePublishing.com, click on the book’s cover and then click on Teaching Activities.
To my children, Kaden and Lucy, for always cheering me on—KKW
For BK & JK, who always keep a weather eye out for me—LAK
Thanks to Alice Sarkisian Wessen, Manager, Solar System/Outer Planets & Technology Education and Public Outreach at JPL; Dr. Sten Odenwald, Astrophysicist at Goddard Spaceflight Center and creator of SpaceMath at NASA; and Dr. Stephen Edberg, Astronomer at JPL for checking the accuracy of the information in this book.
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