



"But could there be life that's different from life on Earth? We don't know if other kinds of life are possible or where to look for them." —**Just Right: Searching for the Goldilocks Planet**

Exoplanets & Extraterrestrials Activity

In this hands-on activity, you can invite one group of readers to imagine exoplanets, and another group of readers to imagine life (that is like or unlike life on Earth). Could the imagined life and the imagined exoplanet be "just right" for each other? Is there a Goldilocks exoplanet for the life (or extraterrestrials) your readers have envisioned? Is there life that is compatible with the exoplanets your readers have envisioned?

Just Right Conditions

After a reading of **Just Right: Searching for the Goldilocks Planet** by Curtis Manley and illustrated by Jessica Lanan (Roaring Brook Press), revisit what makes Earth and life here compatible:

Habitable Zone (Depicted on Spread 5)

"Earth orbits in our solar system's "habitable zone," where a planet can have liquid water on its surface because its distance from the Sun keeps the planet's temperature just right: not too hot (so all the water doesn't evaporate) and not too cold (so all the water doesn't freeze)."

—**Just Right: Searching for the Goldilocks Planet**

Molten Core & Magnetic Field (Depicted on Spread 6)

"Earth is big enough that part of its core is still molten, swirling with so much iron that it creates a magnetic field strong enough to protect our atmosphere from the solar wind."

—**Just Right: Searching for the Goldilocks Planet**

Atmosphere (Depicted on Spread 6)

"Earth's atmosphere is thick enough that it keeps our oceans from drying up, and its oxygen lets us breathe."

—**Just Right: Searching for the Goldilocks Planet**

Revisit Jessica Lanan's depictions of Goldilocks conditions on spread 4 to discuss the various options or to reinforce the "just right"-ness of the Earth. If you have the time, consider watching the 5 minute NOVA video *The Goldilocks Zone* from PBS Learning Media.

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Other Exoplanets, Other Life

"We can only look for what we do know— life that's like the life on Earth."

—**Just Right: Searching for the Goldilocks Planet**

On Spread 7, author Curtis Manley explains that because we know no other form of life, we use life on Earth as the basis to search for the "just right" or Goldilocks exoplanets. Curtis Manley then asks the reader:

"But could there be life that's different from life on Earth? We don't know if other kinds of life are possible or where to look for them." —**Just Right: Searching for the Goldilocks Planet**

At this point, your readers' imagination and curiosity about astronomy may be equally sparked. You might reinforce that by rereading Spread 14:

"So far they've found no proof of life elsewhere. So far we still seem to be alone in the universe. But as telescopes get bigger and better, and as we watch more and more stars, the chances of finding life improve. What might that life be like?" —**Just Right: Searching for the Goldilocks Planet**

You could follow that up with the question, "and what might the exoplanet that hosts that life be like?"

Exoplanets and Extraterrestrials

Consider dividing your readers into two teams - Exoplanets and Extraterrestrials (or Life). Within those teams, consider partnering 2-3 readers into groups that will work together. Each Exoplanets group will build one planet and each Extraterrestrials group will build one life form / type of life.

Ground Rules for Life

Because you will eventually ask the Exoplanets and Extraterrestrials to make a Goldilocks match, set some ground rules for comparison. (These questions are included in an enclosed worksheet.) For example:

Exoplanets

- Is your exoplanet hot or cold? The average temperature on my planet is _____.
Note: The average temperature on Earth is 57°F (14°C).
- Do you have water on your planet? Does your magnetic field protect it from evaporating?
- Does your atmosphere have oxygen? Carbon dioxide?
- What food does your planet offer for life to eat?
- Describe your planet. You might include the presence or absence of continents, oceans, ice caps, forests, grasslands, deserts, or anything else you can imagine).

Extraterrestrials

- Do you like hot or cold? My perfect temperature is _____.
- Do you need water to survive?
- What do you breathe? Oxygen, carbon dioxide, or something else?
- What do you like to eat?
- Describe yourself and other life. You might include what you look like and why, how do you raise your young, what your perfect environment is like, or anything else you can imagine.

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Ground Rules for Life (cont.)

The answers to these or other ground rules questions will help readers create a visual representation of their exoplanet or extraterrestrial.

Building Life

Consider gathering art supplies for readers to use to turn themselves into their imagined exoplanets or extraterrestrials. Good bases for their creations might be a 12" circle of recycled cardboard or large paper plates for the exoplanets and a paper plate mask or headband base for the extraterrestrials.

Other supplies could include markers, glue sticks, pipe cleaners, collage materials, and/or objects from the recycling bin.



Finding Goldilocks

Once your readers have transformed themselves, invite your exoplanets to gather. Arrange them so they have good space around them. Here is some sample dialogue:

“May I have all the exoplanets gather over here? This is your solar system. I am your star, your sun. Please arrange yourself so you are orbiting around me.”

Once your planets are in position, invite your extraterrestrials forward.

“Extraterrestrials will be coming to our solar system looking for their Goldilocks planet. They are looking for an exoplanet that is compatible with their life or their needs for temperature, water, oxygen, and food. Please come forward, extraterrestrials seeking a home.”

Invite them to interact.

"Extraterrestrials and exoplanets, please have a conversation about temperatures, water, oxygen, and food. This conversation must happen on the move. The exoplanets orbit me and the extraterrestrials orbit the planets. Your goal is to make a match. Exoplanets, you want to be inhabited by life, you want to welcome extraterrestrials. Extraterrestrials, you need to make your home on an exoplanet. If you agree that you are a match and can co-exist, shout ‘Goldilocks!’"

The interactivity of their conversations can vary. Here are some variations:

Interview Checklist: Create and print a checklist that the extraterrestrial groups use to “interview” the exoplanet groups about what the exoplanet does and does not offer. This provides some structure, but might be less imaginative or collaborative.

Exoplanets & Extraterrestrials Activity: Page 4

Finding Goldilocks (cont.)

Just Right Tags: Make "too hot," "too cold," "too dry," "no oxygen," "no food," etc. stickers or signs that can be clipped to planets with clothespins or paper clips. As the extraterrestrials and exoplanets are attempting to match, have the extraterrestrials tag the planet designating their reasons for not matching. Once all the parties have been matched (or cannot match), compare whether a planet with stickers designating it as "unmatchable" for one extraterrestrial may still have found a match with another extraterrestrial. This could spark additional discussion about the idea of "life as we know it" and planetary needs following the completion of matching. This is higher thinking, but might engage learners beyond finding their own matches. Be aware of readers' personal space. Many readers will not want the physical contact of having something stuck to them.

Once all of your readers have a chance to make a match, reassure the unmatched that,

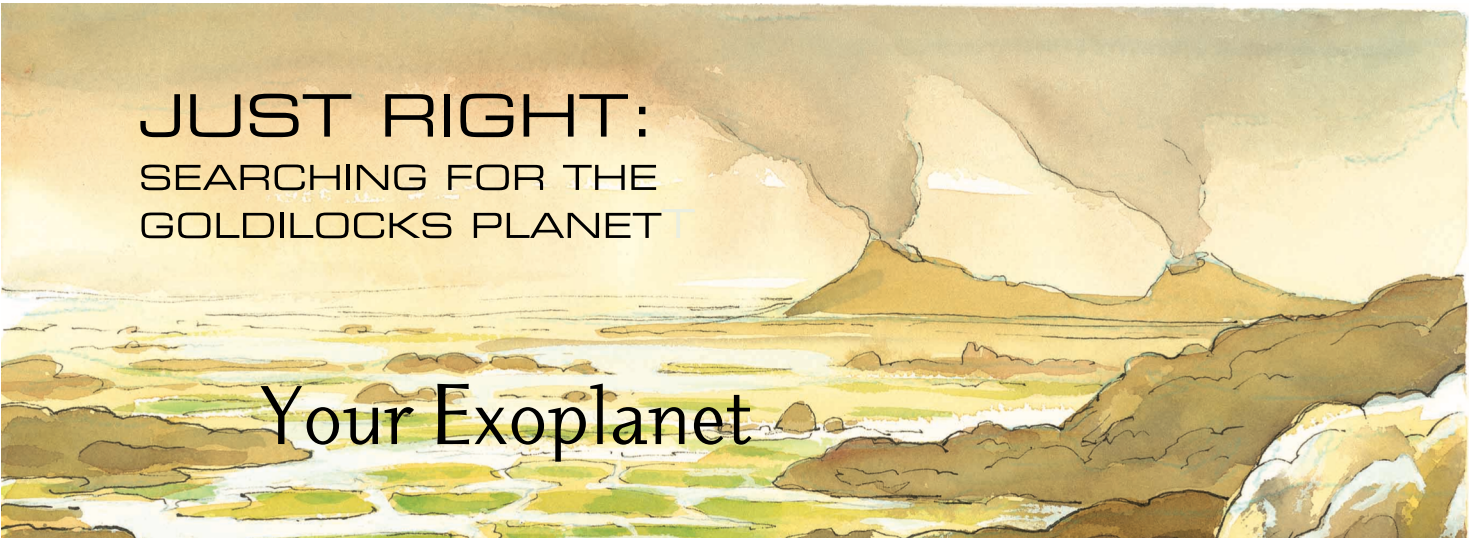
"Extraterrestrials, your Goldilocks planet may not be found today. There are trillions of stars like me in our universe. Exoplanets, you might not have found life to live on you today, but there may be life out there that we cannot even imagine."

Close with Imagination & Inquiry

Remind readers what the book **Just Right** says, "Or maybe it's like nothing we can even imagine."

Consider making this quote into laminated medallions, pins, or stickers for your readers and point them to a display of astronomy books and your copy of **Just Right: Searching for the Goldilocks Planet** to check out.





JUST RIGHT: SEARCHING FOR THE GOLDILOCKS PLANET

Your Exoplanet

“The universe is a pretty big place. If it's just us, seems like an awful waste of space.” —Carl Sagan

What are the components of your exoplanet?

Is your exoplanet hot or cold? The average temperature on my planet is

_____. Note: The average temperature on Earth is 57°F (14°C).

Do you have water on your planet? Does your magnetic field protect it from evaporating?

Does your atmosphere have oxygen? Carbon dioxide?

What food does your planet offer for life to eat?

Describe your planet. You might include the presence or absence of continents, oceans, ice caps, forests, grasslands, deserts, or anything else you can imagine.



“The universe is a pretty big place. If it's just us, seems like an awful waste of space.” —Carl Sagan

What are the elements of your extraterrestrial?

Do you like hot or cold? My perfect temperature is _____.

Note: The average temperature on Earth is 57°F (14°C).

Do you need water to survive?

What do you breathe? Oxygen, carbon dioxide, or something else?

What do you like to eat?

Describe yourself as an extraterrestrial. You might include what you look like and why, what your perfect environment is like, how do you raise your young, or anything else you can imagine.

Book Quote for Reader Medallions

Consider printing these quotes and making them into medallions, pins, or stickers for your readers.

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