**Peggy Ashbrook:** What is your title or a description of your position and work within the NASM?

**Ann Caspari:** Ann Caspari, Early Childhood Education Specialist at the National Air and Space Museum.

For a little over ten years I have been charged with developing programs for toddlers, preschoolers and early elementary aged children and their caregivers that come to the National Air and Space Museum, whether with their families, friends, or schools. The National Air and Space Museum is both a history and science museum and we offer programs that engage people with the objects in our huge collection.

**Peggy Ashbrook:** Is it important for children in preschool to grade 2 to have education about the solar system?

**Ann Caspari:** This is a tricky question. The solar system is a very abstract idea, even for adults. We cannot touch or interact with planets and it is very difficult for us to really imagine the immense size and scope of the solar system and the universe. I believe that it is not that important for young children to learn about the solar system and that it is better to focus on things that are more easily observable. And yet, as with many other concepts that are difficult to fully understand, young children will no doubt encounter information about the planets and the solar system in their lives. If we do not provide some background information about the solar system through stories, songs, and play activities, they will still develop understandings that are naïve, incomplete, or incorrect. It is better that these understandings do not crystallize too fully before they encounter formal education about the solar system in upper elementary or middle school. Also, planets, space travel, and rockets are topics that fire the imagination of young children and get them very excited. The National Air and Space Museum created a story time video called *Family of the Sun* that provides a fun narrative way to consider that each planet in the solar system has its own character and is different from the others. <https://www.youtube.com/watch?v=HuOJNeYG6jk&list=PL6RlkQnoCx_URXpH-7jY2aNO7g7OdWtas&index=3>

**Peggy Ashbrook:** The NGSS Appendix E: Progressions within the NGSS lists this for K-2. ESS1.A The universe and its stars. Patterns of movement of the sun, moon, and stars as seen from Earth can be observed, described, and predicted. How should preK educators begin teaching space science? [https://www.nextgenscience.org/sites/default/files/resource/files/AppendixE-ProgressionswithinNGSS-061617.pdf](https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.nextgenscience.org%2Fsites%2Fdefault%2Ffiles%2Fresource%2Ffiles%2FAppendixE-ProgressionswithinNGSS-061617.pdf&data=02%7C01%7CCaspariAK%40si.edu%7C0f5a723b891b4b8f07af08d84f6dfb28%7C989b5e2a14e44efe93b78cdd5fc5d11c%7C0%7C1%7C637346681078443722&sdata=YxyNbKn1RC4MeMaQGsVFg3EUK5rpWmpSplcrI3CPFL8%3D&reserved=0)

**Ann Caspari:** When young children begin to notice the sunrise or sunset, the Moon in the sky or the stars appearing in the evening sky, this is a good time to look up in awe and wonder together and enjoy the beauty of our Earth. I still make my children look for the Moon at night and they are now in their twenties. The practice of stopping to enjoy the wonder of the amazing place we live in the Universe from a very young age helps to develop an appreciation for scientific phenomena that lasts a life time. As you observe together you may notice how the Moon seems to change shape or how the colors of the sunset are different. You may start to see that the positions of the Sun changes over time or that some stars seem much brighter or different colors. Making these observations together, perhaps drawing a picture or singing a song about them is the best way to begin to teach about space science. Keeping a science journal where children are encouraged to draw and document observations is perfect. It is most important to provide young children lots of opportunities to observe, notice, and document for themselves what they see. It is very helpful to have conversations where you compare what they observe to what they thought they know. For instance, many people think the Moon comes out at night. But young children see the Moon in the daytime. It is easier to see the Moon at night when it is dark, but you can sometimes observe it in the day. Then you can find simple non-fiction books to help deepen understanding.

**Peggy Ashbrook:** What prior knowledge or ideas do young children commonly have about space by age 5?

**Ann Caspari:** These three questions are related. Young children are naturally curious about the sky and the world around them. They are often enchanted by the Moon, the Sun, and Stars both in seeing and experiencing them as phenomena and also through stories and songs. Toddlers will often notice the Moon in the daytime sky or point out the Moon as it seems to follow them when they are riding in a car. They may make very astute observations about these large objects that we can observe in our sky. By five children know that the Sun and Moon and stars are in space, but they may not have an idea of the size or distance of these. They also know that the Earth is in space, but it is difficult to think about the Earth that we are experiencing and the image of the Earth in space as being the same thing. Five year olds know that astronauts go to space in rocket ships and they believe that they may visit the Moon.

**Peggy Ashbrook:** When young children talk about “space,” what are they thinking?

**Ann Caspari:** I think children develop ideas about space from stories, animated shows, and movies. They think about space as being a cool place you can visit in a rocket ship. They know that the sky is dark in space and that there is no air to breathe. There might be aliens.

**Peggy Ashbrook:** Do imaginative play experiences about the solar system and space travel help children build understanding about natural phenomena and science concepts related to Earth and Space science?

**Ann Caspari:** Narrative stories and imaginative play experiences can help young children build excitement and interest in space and can lead to understandings of Earth and Space science. <https://www.youtube.com/playlist?list=PL6RlkQnoCx_URXpH-7jY2aNO7g7OdWtas>

The National Air and Space Museum has created a collection of stories about the planets that we hope will fire young imaginations about space and the history of aircraft. When children use space travel as the setting of their imaginative play, locations in space become more concrete and real to them. If we can provide non-fiction books and realistic stories to fuel their imagination, then the play becomes more productive and fun! It is fun the imagine visiting Mars, but even more fun if you know Mars has mountains, canyons and polar ice caps that you could explore. In our Flights of Fancy story Mission to Mars, three friends imagine what it might be like to travel to Mars and they build props to take a pretend trip there. After watching the story time video, children might like to build their own rocket, space suit and Mars habitat and then pretend to explore Mars. <https://www.youtube.com/watch?v=bNfrt_SumRY&list=PL6RlkQnoCx_URXpH-7jY2aNO7g7OdWtas&index=2&t=2s>

Also, ideas like rotating and revolving can be made into fun games, and kids do love to spin and go around! The Flights of Fancy story *The Day the Earth Stopped Spinning* gives children a narrative way to explore these concepts.

<https://www.youtube.com/watch?v=ABY6SD0FMMg&list=PL6RlkQnoCx_URXpH-7jY2aNO7g7OdWtas&index=15>

**Peggy Ashbrook:** What “on Earth” experiences can children have that they can relate to their media engagement and/or imaginative play about the solar system and space travel?

**Ann Caspari:** I like to talk about how the astronauts who went to the Moon collected rocks to study what the Moon was like. We can collect Earth rocks to study our planet. We can become planetary explorers on Earth and collect samples. Wouldn’t it be fun to create a collection of air samples from different places that we visited? We could collect playground air, classroom air, air from the woods, air from the seashore. I wonder if we would observe anything about the different air? I think it is important that children understand that science is a process and science is precise, but also science is fun! Every scientist that I know began “doing science” because they enjoyed it.

**Peggy Ashbrook:** How can early childhood educators incorporate experiences with natural phenomena and science concepts in children’s imaginative play experiences?

What practices can families participate in to strengthen their (including young children’s) understanding about Earth and Space science?

**Ann Caspari:** Go outside together and observe the sky. Always be careful not to look directly at the Sun! Become a family that takes an interest in space. Watch a rocket launch together online. Take note of when a solar or lunar eclipse is happening and see if you can observe it together. Let the children stay up late or get up extra early to see the shooting stars or the sunrise. Look at the sky together when you are driving in your car or on public transportation. Driving time is a great time for children to observe the sky. Keep a science journal and drawing supplies with you so the children can record their observations. Read stories like Owl Moon by Jane Yolen or Grandfather Twilight by Barbara Hellen Berger that help develop reverence and awe for nature. <end>

**A few additional children’s books about space and space travel.**  **See many additional books read in space by working astronauts at:** [**https://storytimefromspace.com**](https://storytimefromspace.com)

(Note that human exploration of space has changed since 1961 when Russian cosmonaut Yuri Gagarin became the first human in space by traveling 108-minutes in a flight orbiting the Earth in the Soviet Vostok 1 spacecraft. Spacecraft design continues to evolve.)

**Fiction**

*Astronaut Annie* by Suzanne Slade, illustrated by Nicole Tadgell. 2018. (Read by an astronaut while in space: <https://storytimefromspace.com/astronaut-annie-2/> )

*BLAST OFF! A space counting book* by Norma Cole. 1994.

*The Boy Who Touched the Stars/El Niño que Alcanzó las Estrellas* by José M. Hernández and Steven Petruccio. 2019.

*I Want to Be an Astronaut* by Byron Barton. 1992.

*If You Decide to Go to the Moon* by Faith McNulty, illustrated by Steven Kellogg. 2005.

*Kitten’s First Full Moon* by Kevin Henkes. 2004.

*Kitten's First Full Moon - Picture Book Read Aloud with Kevin Henkes*.  <https://www.youtube.com/watch?v=PacweS54au0>

*My Rainy Day Rocket Ship* by Markette Sheppard and Charly Palmer. 2020.

*The Moon Over Star* by Dianna Hutts Aston and Jerry Pinkney. 2008.

*Papa, Please Get the Moon for Me* by Eric Carle. 1991.
*Ritchie’s Rocket* by Joan Anderson. 2001.

*Roaring Rockets* by Tony Mitton and Ant Parker. 2000.
*Space Boy* by Leo Landry. 2007.

*Wait Till the Moon Is Full* by Margaret Wise Brown, illustrated by Garth Williams. 1989.

**Non-fiction:**

*Astronaut Handbook* by Meghan McCarthy. 2017.

*Astronauts (First Explorers)* board book. 2018.

*Boy, Were We Wrong About the Solar System!* by Kathleen V, Kudlinski and John Rocco. 2008.

*Cutaway Space Vehicles* by Jon Richards. 1998.

*Faces of the Moon*. by Bob Crelin and Leslie Evans. 2009.

*Home Address: ISS: International Space Station (Smithsonian)* by James Buckley Jr. 2015.

*I Want to Be an Astronaut* by Stephanie Maze. 1999.

*The Moon Book* by Gail Gibbons. 2019.
*Space!* DK Smithsonian Knowledge Encyclopedia. 2015.

*Space Exploration* by Carole Stott. 2009.

*The Space Shuttle* by Jaqueline Langille and Bobbie Kalman. 1998.

*Space Vehicles* by Anne Rockwell and David Brion. 1994.

*Walk When the Moon is Full* by Frances Hamerstrom. 2013.