

## Otherwise the sky would be black . . .

The other day, my daughter was in a chatty mood, and commented to me that it's sometimes hard having a "scientist" for a mom, because you can't always discuss things with her. "How's that?" I asked. "Well, one of the great mysteries of childhood is why is the sky blue? Every kid has their own theory. But I can't even discuss it with you, because you'll tell me why it's blue."

I think she has a point. We all know kids love to be impressed with experiments, but often young kids really prefer not to hang around for an explanation. And I'd forgotten how much fun it is just to speculate. I remember in high school my friends enjoyed talking about dilemmas like what if a car is doing the speed of light and you turn on the lights. Sometimes speculating can be more interesting than finding out, when you're young.

With this incident in mind, I thought it might be fun to give the kids a turn at this column and ask them for some theories on the "great mystery of childhood." So I asked a number of kids three questions:

1. "Why do you think the sky is blue?"
2. "If you stand on the moon and look up, the sky looks mostly black; if you do this on the Earth, it looks blue. Why do you think it's different?"
3. "Have you ever noticed anything involving light that seems interesting or that you wish you understood better?"

This was by no means an exhaustive survey, but it did give a glimpse into the workings of some rather diverse minds, a few of which are presented here.

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### Why is the sky blue?

I got a lot of interesting responses to this question. Some of the older kids had read something about it, but many of the younger ones hadn't. As a result, they tended to have the more creative ideas. Here are some of the responses. Since questions 1 and 2 are really different aspects of the same question, I've combined the answers.

#### Child #1 (age 11)

1. "Otherwise the sky would be black. The sun lightens the sky. The darker colors are blue and purple, and since the sun is so bright it goes to really light blue."
2. "On Earth you can see sun and there's light there, and that's what makes it blue. But since the sun isn't directly on the moon, it's mostly black. The moon only has a reflection of the sun's light." (Notice she knows the moon brightness is due to reflected sunlight and has used that to try to understand.)

#### Child #2 (age 9)

1. "I guess maybe it reflects the water in the ocean."
2. "The moon might not have the ozone layer to shield something."

#### Child #3 (age 9)

1. "I don't know why the sky's blue. Maybe it's black on the moon because it's so high. Like when you go to high altitude, and the sky gets a darker blue." (This is an interesting answer. She's used something she observed to get pretty close to a valid answer.)

*There are always some kids with more metaphysical answers. I particularly enjoyed these two:*

#### Child #4 (age 10)

1. "I think that God made it blue for us to look and see the happiness and joyfulness in the sky."

2. "Well, usually not a lot of people go up in the sky, and so there's not a lot of light in the sky. So it's all black. People can't see when it's dark, and it's light where we are because there's a lot of people to see it. Like it's dark at night when people are asleep anyway."

#### Child #5 (age 9)

1. I'm sort of taking a guess, because I haven't had any theory. But the sky is there and the clouds and the stars and maybe in the time of Greek mythology, it used to be an ocean, and the stars became starfish and clouds became plants."
2. "Because when you're on the moon, you're farther away from the sun so it's darker. At night the sky's black cause you're looking away from the sun where the moon is." (Another interesting extrapolation of an observation.)

*The older kids tend to be slightly better informed and try to relate it to what they've learned, often with mixed success. For example:*

#### Child #6 (age 13)

1. "Because the atmosphere absorbs all the colors but blue."
2. "Because in space you look up, no rays come to meet your eye. The moon has no atmosphere, but the Earth does."

#### Child #7 (age 14)

1. "There's some sort of molecules that make it blue. I remember reading it."
2. "The atmosphere has more oxygen than the moon, so you see the oxygen molecules, I guess."

*These were my favorite answers:*

#### Child #8 (age 13)

1. "Because the gases in the sky reflect the ocean. That's what I heard. But it doesn't make sense, because the land is brown. Maybe it has something to do

with the water since there's water of some kind of state in the atmosphere. Maybe it reflects or changes the light to give the blue appearance."

2. "Because the moon doesn't have an atmosphere. But I don't understand why space is black. The sun traveling through space should produce light. But I guess there's nothing for it to produce light on."

Child #9 (age 10)

1. "Because space is black and the clouds and atmosphere lighten it up to blue. It might also have something to do with the way the sun goes through the atmosphere."

2. "Because black isn't really a color. It's just what's left when there isn't a color. And there's nothing up there to change the color unless maybe an old satellite from the 80s." (Can you remember when the most recent decade seemed old?)

### Questions that intrigue kids

And now for the last question, "What would you like to understand better?" I asked this to get a glimpse of what sort of things these folks are thinking about. As might be expected, there was quite a range of responses. There was actually one optical engineering question: "Do telescopes only work for things you're directly looking at? What happens to light coming in at an angle? Does it just bounce around?"

There were lots of questions relating to things they'd read about, such as, "Why does the sun have UV rays and why are they bad for us?" "The aurora borealis—aren't they caused by the solar wind?" and "What is dark matter? Our sun won't burn up for billions of years, but how does it keep replacing the gases? Any why does a supernova blow up and not just fade out?"

Light bulbs were a common source of questions: "How does electricity make light work and why are moths attracted to light?" "Why is light faster than sound? And are there any other light sources besides the sun and man-made things?" "Why does light give off heat?"

My favorite questions were those that seemed especially observant: "Why

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does the sun glare on windows?" "Why are some parts of the sky darker blue than other parts?" "When it's raining, why is there a rainbow? What about the grass, the way it sometimes gets a rainbow? And when someone says, 'Look at the rainbow,' it always seems to be in the same direction. Can you see it standing anywhere, or do you have to be at a certain angle from the sun?" "Lightning—I don't know how it's made. Sometimes it's not even raining, but

people say it's due to a storm, but I've seen it when the clouds weren't even very gray or heavy with water."

It's fun to hear children tackle these issues, with their bits and pieces of knowledge and their growing conversational skills. There was such a variety of answers and questions, but nearly all were thinking and wondering. These minds are perhaps the elemental essence of humanity. 