

OBJECTIVE: This week you will be doing more of a demonstration than an experiment. By first demonstrating the relative distances within the solar system of our own "backyard" and then moving further out into space from there, we will better appreciate the enormity of space and time, and, in contrast, the surprising and significant place we have in the heart of the One who created everything.

HYPOTHESIS: God's creativity, passion and power are both omnipresent and individually personal.

### **BACKGROUND INFORMATION:**

Because we will be demonstrating some relative distances in the universe, it might be good to have an understanding of the units of measurement we will be demonstrating.

The Mall of America is 80 miles from Living Waters. If you were to go to the Mall of America in your car, driving at average speed of around 60mph, it would take you about an hour and 20 minutes. If you were to walk to the Mall of America at an average speed of 3 miles/hour, it would take a little over a day to get there. Good thing we have cars! Now...if somehow you could ride a beam of light to the Mall of America, knowing that light travels at 186,282 miles/second....just a little faster than your car, well, you can imagine that you'd be likely be there before you would even have time to check the time. So, for the purpose of this demonstration, let's imagine that we *do* have a little vehicle that can ride on a beam of light at 186,282 miles per second. That means, in just one second, we could go around the entire earth 7 times! That's pretty fast!

So, let's take our imaginary lightbeam vehicle to the sun, shall we? The sun is far enough away that it would take us about 8 and 1/2 minutes traveling *THAT* fast to get to the sun's surface. That also means 2 other things:

The sunlight we see at any time is actually 8 1/2 minutes old. In a way, we are seeing something that happened 8 1/2 minutes ago, so, in other words, we are looking back in time 8 1/2 minutes!

If the sun were to suddenly go dark in an instant *(which would never happen!)* we would have 8 1/2 minutes before we'd know what happened. Whew!

For this demonstration, let's make that distance to the sun, which is really about 93 million miles, or about 8/1/2 minutes of travel time in our lightbeam vehicle, one unit of measure that we will call AU *(which stands for astronomical unit.)* 

The other thing to know before doing this demonstration would be the order of the planets in our solar system. Here they are in their order: *MERCURY* 

VENUS EARTH MARS JUPITER SATURN URANUS NEPTUNE



PLUTO (which is really a dwarf planet)

MATERIALS NEEDED:

9 DIMES

#### YOUR LIFE LAB JOURNAL

**TOILET PAPER ROLL(S)** 

DIRECTIONS: You should do this in the longest room in your house.

On the one end of the room, designate the wall to be *THE SUN*. Tear off one square of toilet paper which represents 1 AU *or* 93 million miles, and place it on the floor next to the wall. Place a dime about 1/3 the way from the wall on the toilet paper. That is the planet *MERCURY*. Next place a dime about 2/3 the way from the wall on the toilet paper. That is the planet *VENUS*. Now place a dime on the edge of the toilet paper farthest away from the wall. That is the Earth. We now have the first 3 planets, all "snug" together on the first sheet of toilet paper.

It's time for the next square of toilet paper! Place your next dime 1/2 way on that next sheet. This is *MARS*, a little further away from Earth than Venus.

Next tear off and place 4 squares of toilet paper. You should now have a line of 5 squares of toilet paper with one end touching the wall. Place your next dime very near the beginning of the 5th square. That is *JUPITER*, the largest planet. During the summer months, Jupiter is one of the brightest "stars" we see in the night sky.

Tear off 4 more sheets and add them to your line of squares. Place a dime in the middle of the furthest sheet. That is *SATURN.* That is the planet known for its rings, though other planets have rings as well.

Now it's time to tear off 10 sheets of toilet paper as we make our way to the next planet. You should have 19 squares of toilet paper on the floor now. Place a dime near the beginning of that 19th square. That is the planet *URANUS*.

To get to *NEPTUNE*, you need to add 12 more squares and place the dime near the beginning of that square. Ready to go to Pluto? Add 9 more squares and place your dime in the middle of the last square. There should be a total of 40 squares of toilet paper on your floor. Pluto is 3.3 billion miles away from earth. If we were riding our lightbeam vehicle, it would take us about 5 1/2 hours to get there. Feel free to figure out on your own how long it would take to walk!

So, just for fun...you probably don't have a long enough room, but, here you go!

The nearest star, *ALPHA CENTAURI*, is about 25 trillion miles away. You would need to lay down around 270,000 more squares of toilet paper *(which comes out to be about 270 rolls, or 540 rolls if you use 2-ply!)* In our lightbeam vehicle, it would take us 4 1/2 years to get to the nearest star! That means the light we see from Alpha Centauri is 4 1/2 years old! You're looking back into time 4 1/2 years!

Alpha Centauri and the sun are just two of *ONE HUNDRED THOUSAND MILLION* stars in our galaxy, *THE MILKY WAY*. The Milky Way is just one of *TWO TRILLION* galaxies in the known universe. If you were to ride your lightbeam vehicle to the farthest known galaxy, it would take you 13,200,000,000 years. The light we see leaving that galaxy started heading our way when the earth was pretty much being formed! Feel free to do the math on how much toilet paper that'd take!

# **REFLECTION:** Use the following questions to talk about with others and/or record your thoughts in your LIFE LAB JOURNAL.

- 1. If all of this was just a little mind-blowing, good! It worked. Talk about and/or write down your thoughts from having done this. When you stop to think about the enormity of the known universe *(and scientists are certain we only know a miniscule fraction of the whole universe,)* how small does that make Earth seem? This nation? Our community? Your life?
- 2. Think about the fact that the God who has the power and capacity to create this vast universe is also passionate and intent on saving you from death and offering you partnership in life. How does that make you feel?
- 3. Aristotle talked about God being the *"prime mover,"* basically an impersonal force that launched the universe into motion. The Bible, Jesus' life, death and resurrection and the personal experience of millions over the centuries would suggest a dramatically more personal God. Think about the ways you have experienced God in your life.
- 4. Psalm 17 says, "Keep close watch over me as the apple of Your eye and shelter me in the shadow of Your wings." Think about what that means to know YOU are the apple of God's eye...God's chosen...God's child? As demonstrated in that Psalm and so many others, with that honor comes the privilege of prayer and having God's ear whenever and however you need it. With the backdrop of the entire universe, what is the most important thing you would want God to know? What would you want from God in terms of help, guidance, strength, peace, etc. You have the honor of asking the Creator of our ENORMOUS universe ANYTIME! Go for it!!!
- 5. As we look into the night sky, the light we see represents so much history. And in a similar way, light just now leaving distant stars will arrive in our future. God holds past and future together, not only in space but in your life. How does Jesus' death and resurrection affect your past *and* your future?

# CONTINUE THE FUN

Here are a few additional things for you to enhance this week's theme.



Download the FREE SKYVIEW LITE APP With this app, you can head out

into your backyard on some starry night, and you'll be able to know what it is you're looking at in the night sky! Try it sometime and see if you can spot one of the planets like MARS! ... or the INTERNATIONAL SPACE STATION!

### What You'll Need:

- Shoe box
- **Scissors**
- Star chart
- Pen or pencil
- Pin
- Tape
- Flashlight
- **Books**



MAKE YOUR VERY OWN SHOEBOX **PLANETARIUM!** 

- Step 1: On one end of a shoe box, cut a hole just big enough for a flashlight to fit into.
- Step 2: Cut a rectangle out of the other end of the shoe box.
- Using a star guide, draw dots on a piece of paper to represent the stars of a constellation, and poke holes Step 3: through the dots with a pin. Do this for several different constellations.
- Put one of the sheets of paper over the rectangular hole in the box, and tape it in place. Step 4:
- Support the flashlight with a stack of books, and put it into the hole in the other end of the box. Step 5:
- Step 6: In a darkened room, turn on the flashlight, and project your constellation onto a wall. Quiz your friends family to see if they can identify the different constellations.

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