**WOK & ROLL Peter Kwong**

**Twinkle, twinkle: The mind-boggling math of stars and space**

Since moving to the Northwoods, my wife and I have enjoyed our new lifestyle immensely. It is just so peaceful and quiet, and folks are so open, warm and friendly.

I love the mornings — sipping my tea in the back porch, listening to the rustling leaves and watching the birds gliding over my head. And sunsets are simply spectacular. It is a different show every evening. I never knew that there are so many different colors, and just how beautiful it can be when they are all blended together. Then, as soon as the sunset curtain closes, another show begins.

Living in the cities, I have never seen so many stars before, ever. It is mind-boggling — just how many stars are twinkling out there? And how many of them are looking back at us with a smile?

Just then, while I was wondering these things, I received an email from an old friend. The title is "[Earth in True Perspective](http://www.ba-bamail.com/content.aspx?emailid=12288)." And it answers all my questions.

Our solar system consists of Earth, Mars, Mercury, Venus, Uranus, Jupiter, Neptune and Saturn; all orbiting around the sun. Comparing to the sun, Earth is the size of a sesame seed. But then, there are other stars which are even bigger and larger than the sun. Can you imagine that?

There are Sirius, Pollux, Arcturus, Rigil, Aldebaran, Betelgeuse, Eta Carinae, and plenty of others, each one much bigger and brighter than our own sun. And scientists keep discovering new stars or planets which are millions and millions of light years away.

Hmm, I thought to myself, 1 million is a pretty large number. But then, how far is the distance of a light year? I did a little research, and find out that a light year is how far the light can travel in a year. Well, there are 60 seconds in a minute, 60 minutes in an hour, 24 hours in a day, and 365 days in a year. So, in a sense, there are 60 X 60 X 24 X 365 seconds, or 31 million seconds in a year. Well, 31,536,000 seconds to be exact. And just how far does light travel in a second?

To go around the equator is 24,901 miles. And, in one second, the speed of light can travel around the earth about 7½ times. That’s over 186,757 miles that light can travel in just one second. Unbelievable to comprehend, isn't it? One blink of an eye, and the light can travel all that distance.

Well, there are 31,546,000 seconds in a year. Multiply that by 186,757 miles and you get the distance that light can travel in one year. That’s nearly 5,900,000,000,000 miles that light can travel in one year. And just how many times we can go around the earth?

Now, with these newfound planets 30 million light years away, just how far away is that? Well, 5,900,000,000 X 30,000,000, or 177,000,000,000,000,000. It is just a bunch of zeros. Like when we hear the government tell us that we are running $250 trillion deficit, it is just bunch of zeros.

OK, are you ready for more exciting news? On March 9, 2003, the Hubble Space Telescope noticed a bright little star which is 1/10 the size of the moon. So, for four months, the telescope just zeroed in on the same spot and took pictures. And the result was overwhelming!

That little spot actually was a picture consisting of more than 1,000,000,000 (1 trillion) stars; and each star has more than 10,000 galaxies. And that’s only off one single dot in the sky! So, how many stars/planets/galaxies are there in the sky? An old quote from our famous astrologer Carl Sagan, there are “Billions and billions” out there.

Some of the stars are so old that they already exploded billions of years ago and no longer exist. But it is not until now that the light actually reaches our naked eye. It is mind-boggling knowing that the past, the present, and the future can stand still at the same moment.

So, million, billion, and trillion, what’s the difference? I did some more research and found out that:

* 1 million seconds = 13 days
* 1 billion  seconds = 31 years
* 1 trillion seconds = 31,688 years

To be politically correct, when I sing the nighttime lullaby to my granddaughter, I guess I have to change the lyrics:

“Twinkle twinkle giant stars  
I’ll never know how many there are  
Up above so far and high  
Many galaxies in the sky  
Twinkle twinkle giant stars  
I’ll never know how many there are.”

I’ll never complain how far I have to drive ever again. What is 500 miles comparing to 5,900,000,000,000 miles?

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