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DR. SETI'S STARSHIP

Searching For The Ultimate DX

Light Speed

Tuning the bands in search of an interstellar CQ, we become aware that the universe is immense. When contemplating its magnitude, we need a whole new yardstick. For astronomers, that yardstick is the light year (LY), the distance light travels in one year.

However, that doesn't tell us very much, does it? I mean, how many of us can close our eyes and visualize the speed of light? I can't. I can board an airliner and know that I am traveling at, say, 78 percent the speed of sound, but even that velocity challenges my comprehension.

Just how fast does light travel, how far does it go in a year, and how can we use that knowledge to assess our place in the universe? I could tell you that a light year is a quarter of the distance to the nearest star. However, from my vantage point under this ocean of air, one star looks pretty much as remote as the next, so that doesn't clarify things at all.

Dr. SETI's spacecraft orbits the sun at about one 10-thousandth the speed of light. Its fuel economy is 200-billion gallons per light year (see text).

Still, Mach 1, the speed of sound, is a familiar concept to most of us. We know that if we see a lightning flash and then 5 seconds later we hear the thunder roar, the storm must be about a mile away. We know this because sound travels at about one fifth of a mile per second, and light (at least over such limited distances) seems to arrive instantaneously.

Well, in fact, light travels about a million times faster than sound, so we can quantify the speed of light, very approximately, as Mach 1 million. Thus, a light year is about how far we'd go in a million years, traveling at Mach 1, or how far the Concorde (which flew at Mach 2) would have gone in 500,000 years—if it didn't have to stop for gas.

Of course, we all have to stop for gas, sooner or later. My little Volkswagen Beetle gets about 30 miles to the gallon on a good day. Just how many gallons of fuel would I need to drive a light year, and how many times would I have to stop to fill up?

The textbooks tell us that one LY is about 6-trillion miles. Let's see if we can sink our teeth into that one. Well, 6 trillion is 6,000 billion, so at 30 miles per gallon, we merely need to divide 6,000 by 30 (that equals 200) and then tack a billion on the end.

Okay, 200-billion gallons of fuel. A 20-gallon gas tank means we need to fill up (let's see, 200 billion divided by 20 equals…) 10-billion times. How long do you suppose that will take us?

Each gas stop consists of pumping the petrol, paying for it, visiting the rest-room, grabbing a cup of coffee, and maybe making a phone call to home to keep the spouse apprised of our progress. Let's say 12 minutes per pit stop. That's 5 to the hour, which means we spend—let's see now, 10 billion divided by 5 equals—2-billion hours spent at interstellar service plazas. I wonder what that is in years?

Now there are 24 hours in a day and 365 days in a year. Multiplying the two together, we see that a year consists of just under 10-thousand hours. (I told you this would be approximate.) Dividing 2 billion by 10,000, we find we're spending 20,000 years just fueling up. That's for a hypothetical one light-year trip, and we haven't even begun to calculate the driving time!

Were this space ship on which we reside traveling at the speed of light, it would, of course, travel one LY in exactly one Earth year. In fact, however, Earth is a slow boat to nowhere. Is it possible that during its brief history our planet has traveled light years?

Actually, it has, if you count its curved path around our sun. Let's calculate the Earth's annual orbit in light years:

We start with the known fact that it takes 8 minutes for sunlight to reach us. (We know this because when we flip the switch to turn off the sun, it takes 8 minutes for the sky to go dark.) Well, that places the Earth 8 minutes from

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its source of power, so we'll use 8 light minutes for our orbital radius.

One trip around the sun takes us just a year. Not counting the sun's own motion around the galactic center, the distance we travel in a year is (pi times diameter equals ... two pi times radius, equals ...) 50 light minutes. Rounding up, we'll call it a light hour.

Since Earth travels about a light hour per year, and a year is almost 10,000 hours long (remember?), we can wee that we're orbiting the sun at one 10-thousandth the speed of light, or Mach 100. Did you realize that you live on a supersonic spacecraft? Furthermore, we see that in about the last 10,000 years our planet has traveled about one light year.

Ten thousand years ... let's see. That's about how long it's taken us humans to advance from primitive hunter-gatherers to ... primitive hunter-DXers.

What does all of this have to do with interstellar communications and the search for radio signals in space? Actually, more than a bit. Let's imagine our planet as a starship. We somehow manage to snap the gravitational rubber-band that binds us to our sun, and we shoot off in a straight line, toward the stars. Here we go, at one 10-thousandth the speed of light. It takes us 10,000 years to travel one LY. If we're lucky enough to be shooting off in the right direction, it takes us about 40,000 years to reach the next nearest star. And if we visit about a thousand stars, we're likely to find one being circled by a habitable planet. This means that shopping for a new home could take us 40-million years, give or take.

Is it any wonder that some of us choose to embrace electromagnetic communications, rather than merely going there?

73, Paul, N6TX