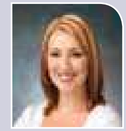
Daydreaming beyond the solar system with **warp field mechanics**



By Catherine Ragin Williams

Sure, the Red Planet or an asteroid are enticing destinations, but what if one day we wanted to go really, really far out? With the technology we have today, it's not in the realm of possibility. But it could be … and the Eagleworks Laboratories at Johnson Space Center are doing the mathematics and physics required to find the answers that defy traditional Newtonian laws.

NASA/JAMES BLAIR JSC2012E093950_ALT

Dr. Harold "Sonny" White creates a microscopic warp bubble with the White-Juday Warp Field Interferometer.

Enter: The space warp. It's the same space, and the same standard of time, but if we can theoretically manipulate it for our purposes, interstellar flight could be an option on a future technology roadmap.

"The first question you might start with is, 'How hard is interstellar flight?'" said Dr. Harold "Sonny" White, Advanced Propulsion Team lead. "The Voyager 1 spacecraft is sometimes lifted up as our first interstellar spacecraft. It's not a very big fella—it's just a little bit under a metric ton, and it's been going on now for about 33 years, headed straight out away from our solar system about as fast as it can go."

If you stuck a measuring stick out to it, it's about 119 astronomical units (AU) away from the sun. (An AU is the distance from the sun to the Earth.)

"It's one of the highest energy objects that's been launched to date," White said. "Nothing that we've launched will catch up with it or has comparable energy levels. But if you wanted to predict how long it would take to get to the nearest star system, like Alpha Centauri, it would take around 75,000 years to get there."

In terms of our galactic neighborhood, Alpha Centauri is right around the corner at 4.3 light years (271,931 AUs), so 75,000 years would not be ideal—especially for a human crew. But if you threw a bunch of power and propulsion behind it, then what?

Back in the 1970s, the British Interplanetary Society looked into what it would take to send a robotic probe to reach Barnard's Star, about 6 light years (or 380,000 AU) away, within 50 years. Oh, just a 54,000-thousand-metric-ton spacecraft—92 percent of which is fuel. And, if you're curious, that mass is well over 100 times the mass of the International Space Station.

"When somebody comes with this study result telling me it takes 54,000 metric tons to go and do something interstellar within 50 years, that just tells me we need to be looking at some other loopholes in physics to see if we can find some other ways to make it a little bit more tractable," White said.

The loopholes, amazingly, can be found in mathematical equations. Those equations are tested using an instrument called the White-Juday Warp Field Interferometer.

"We've initiated an interferometer test bed in this lab, where we're going to go through and try and generate a microscopic instance of a little warp bubble," White said. "And although this is just a microscopic instance of the phenomena, we're perturbing space time, one part in 10 million, a very tiny amount."

By harnessing the physics of cosmic inflation, future spaceships crafted to satisfy the laws of these mathematical equations may actually be able to get somewhere unthinkably fast—and without adverse effects.

"The math would allow you to go to Alpha Centauri in two weeks as measured by clocks here on Earth," White said. "So somebody's clock onboard the spacecraft has the same rate of time as somebody in mission control here in Houston might have. There are no tidal forces, no undue issues, and the proper acceleration is zero. When you turn the field on, everybody doesn't go slamming against the bulkhead, (which) would be a very short and sad trip."

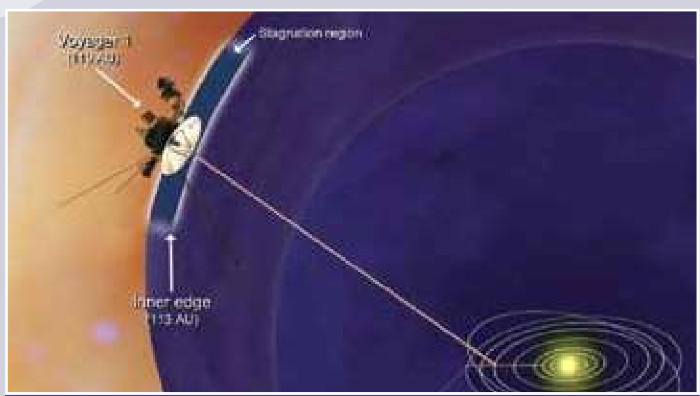
When you think space warp, imagine raisins baking in bread.

"When you put dough in a pan there's little raisins in the bread. As you cook the bread, the bread rises and those raisins move relative to one another," White said. "That's the concept of inflation in a terrestrial perspective, except in astrophysics it's just the actual physical space itself that's changing characteristics."

But for futuristic space travel, we aren't going to be a passive player.

"We're trying to do something locally so that we compress the space in front of us and expand the space behind us in such a way that allows us to go wherever we want to go really fast while observing the 11th commandment, 'Thou shall not exceed the speed of light,'" White said.

While we are trying to reach neighbors within our solar system for the time being, we cannot help it if visions of distant star systems exist in our daydreams. Perhaps a "Star Trek" experience within our lifetime is not such a remote possibility.



NASA/JPL-CALTECH

NASA's Voyager 1 spacecraft has entered a new region between our solar system and interstellar space, which scientists are calling the stagnation region. In the stagnation region, the wind of charged particles streaming out from our sun has slowed and turned inward for the first time, our solar system's magnetic field has piled up and higher-energy particles from inside our solar system appear to be leaking out into interstellar space. Voyager 1 is currently about 119 astronomical units (11 billion miles) from the sun.