

# Fantasia in Warp Drive - Part II: Plausible Steps to Make A Workable Warp Drive Machine, Someday in the Near Future: Discussion and Remark

Victor Christianto, Florentin Smarandache

<b>Author's Affiliations:</b>	<b>Victor Christianto</b> Malang Institute of Agriculture, Indonesia, &Halton Arp Institute, affiliated to International Mariinskaya Academy, St. Petersburg. <b>Florentin Smarandache</b> Dept. Mathematics & Sciences, University of New Mexico, Gallup, USA.
<b>Corresponding author:</b>	<b>Victor Christianto</b> Malang Institute of Agriculture, Indonesia, &Halton Arp Institute, affiliated to International Mariinskaya Academy, St. Petersburg. E-mail: victorchristianto@gmail.com
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<b>ABSTRACT</b>	There is a persistence interest among physicists, to investigate on possibility of FTL (faster than light) travels, even if those fields related to FTL are most likely categorized to fringe research. Especially after Alcubierre introduces a new notion called "warp drive" solution to FTL problem. For these writers, it is interesting because (one of us :) Smarandache's hypothesis says that there is no speed barrier of anything; by generalizing implications of EPR paradox, which is known in most QM experiments. But the question remains unsolved: how to make it possible? This short article reviews several progress in such a FTL drive, while it does not necessarily mean that we agree with Alcubierre nor GTR-based approaches. We will argue in terms of possible realization of trajectory in complex plane (i.e. Argand plane.)
<b>KEYWORDS</b>	FTL travel, warp drive, Alcubierre hypothesis, warp bubble, Argand plane, Smarandache hypothesis, interstellar travel possibility

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## INTRODUCTION

This short article is intended -among other things - as an open letter to Mr. Elon Musk, founder and chief of Tesla and SpaceX, as well as other scientists and experiment investigators in FTL drive. We admire him as one of great inventors in modern era. As we often hear, Mr. Musk wants to go to Mars as quickly as possible. Although we're rather skeptical if Mars will be our next destination

for habitable planet, because it is already beyond Goldilocks zone,<sup>1</sup> nonetheless for experiment reasons...may be there are things we can learn if we get there. So we guess there

<sup>1</sup>Meaning of Goldilocks zone: "The habitable zone is the area around a star where it is not too hot and not too cold for liquid water to exist on the surface of surrounding planets." Ref. <https://exoplanets.nasa.gov/faq/15/what-is-the-habitable-zone-or-goldilocks-zone/#:~:text=The%20habitable%20zone%20is%20the,t he%20surface%20of%20surrounding%20planets.>

are reasons to consider travelling to Mars is interesting.

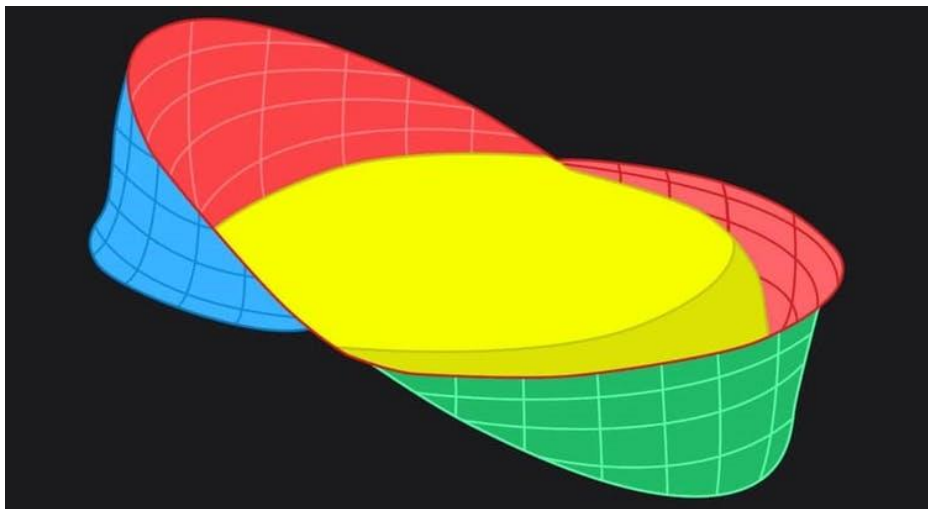
Around several months ago, one of these writers wrote to him that if he plans to use "carbon capture method" to propel a rocket to go to Mars, that is more likely to fail, because CO<sub>2</sub> only takes place around Earth atmosphere, not in outer space. And if he introduces certain nuclear engines to propel his starship, that may work, but it would take very long time to go to Mars (perhaps it would take months or may be a year or so). Therefore it leaves us to explore novel methods which so far belong to "fringe physics", something like warp drive machines.

For us, it is also interesting because one of us's hypothesis says that there is no speed barrier of anything; but the question remains unsolved: how to make it possible?

#### Other possible "real" warp drive machines in recent news

In 1994, physicist Miguel Alcubierre proposed an innovation that would permit quicker than light travel: warp drive, a theoretical method for avoiding around the universe's definitive speed limit by bowing the texture of the real world. It was an interesting thought - even NASA has been exploring it at the Eagleworks research facility - however Alcubierre's proposition contained issues that appeared to be unfavorable.[2]

He contended that the general relativity took into account "warp bubbles" - areas where matter and energy were organized so as to twist spacetime before the air pocket and grow it to the back in a manner that permitted a "level" region inside the air pocket to travel quicker than light. [2]



**Illustration 1:** Spacetime warp, as originally perceived by Alcubierre [2]

More awful, the negative energy necessities of Alcubierre's gadget are colossal. By certain appraisals, the whole energy in the realized universe would be required (however later work cuts the number down a little). Bobrick and Martire show a warp drive could be produced using positive energy (for example "ordinary" energy) or from a combination of negative and positive energy. All things considered, the energy necessities would in any case be gigantic.[4]

More recently, around December last year, Harold "Sonny" White, a NASA specialist at the Eagleworks Laboratory in Houston, Texas,

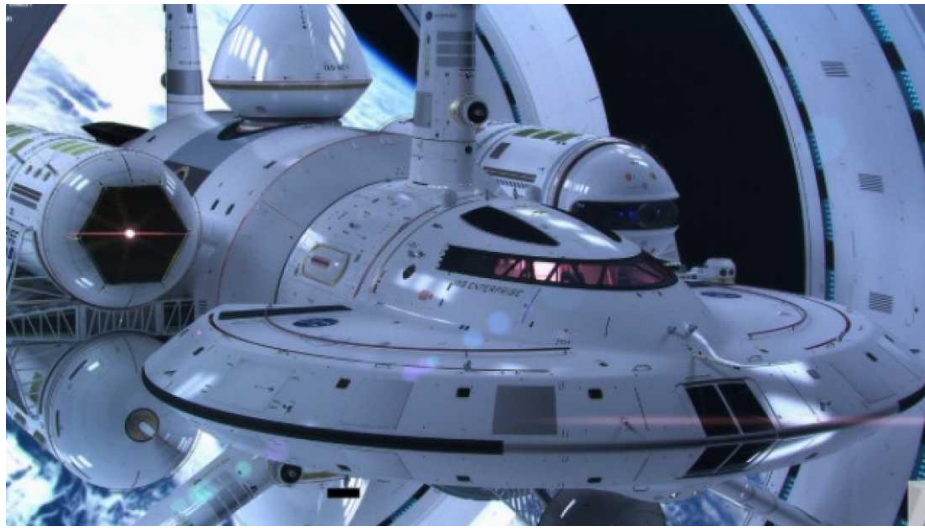
distributed an examination paper with his group in July about the "conceivable design of the energy thickness present in a Casimir hole." As indicated in their report, the Eagleworks group went over

*"a miniature/nano-scale structure ... that predicts negative energy thickness appropriation that intently matches necessities for the Alcubierre metric."*[3]

White told a science and innovation magazine: "as far as anyone is concerned, this is the main paper in the companion surveyed writing that proposes a feasible nano-structure that is

anticipated to show a genuine, yet modest, *warp bubble*." White and his group intend to direct more analyses into the chance of more modest models to more readily comprehend

the chances of a forthcoming warp drive. Maybe the Eagleworks Laboratory can take us from sci-fi to the real warp starship model.[3]



**Illustration 2:** NASA illustration [3]

A comment by a reader to that article goes as follows: "They did not 'accidentally' create a warp bubble in the lab, that's a very misleading headline. What this, and the big-think article in another comment, is stating that the math works, in a very small scale albeit, but the numbers support the theory of a warp-bubble. But that's it, the numbers look good for a theoretical idea. But, no one has built anything in a lab, and 'accidentally' created a warp bubble." [3]

#### **Beam me up, Scotty...**

Other physicist, named Dr. Erik Lentz, tried to solve the problem, inspired partially by **Star Trek**. Lentz specifically examined the assumptions leading to the negative energy requirements in Alcubierre's work. Like his colleague, Lentz began by analyzing spacetime, modeling the multidimensional substance as a stack of very thin layers. He found that Alcubierre had only considered comparatively simple "linear" relationships between the equations for shifting one layer onto the next. At this point, choosing more complex "hyperbolic" relations, which typically express rapidly changing quantities, results in a different warp bubble than the one obtained by Alcubierre.[4]

Other people, including Agnew, argues that LIGO etc. provide interesting clue on such a

realizable technology based on GTR: "The LIGO discovery a few years back was, in my opinion, a huge leap forward in science, since it proved, experimentally, that space-time can 'warp' and bend in the presence of enormous gravitational fields, and this is propagated out across the Universe in a way that we can measure. ...."[5]

As we shall see later on, this is not the case. But before we discuss our new hypothesis, let us discuss Asaro's solution. She is also a researcher, although you may find her names more related to sci-fi books, but may be there are things that we can learn.

#### **Catherine Asaro's hypothetical solution to warp Drive[1]**

Physicist and science fiction author Catherine Asaro is tracing the mathematical background of this problem and came up with a way to modify Einstein's equations in order to make them compatible with an FTL drive. Warp speed, according to her, might be achievable by using a fairly simple solution involving imaginary numbers.

Overcoming the distance between planets and stars is something that science fiction needed to do, as it would otherwise significantly restrict the plots of any film or novel. We all

know there's just no use trekking the stars when traveling from Earth to Mars takes half a year. To get around this issue at least some sort of warp drive is needed, allowing for faster-than-light travel.

Asaro explained at a panel at the Escape Velocity convention in Washington D.C. these days that most of the scientists base their FTL-research purely on Einstein's theory of relativity and **according to Einstein himself – there is no solution**. Asaro began by highlighting that:

*"The problem for light speed travel in sci-fi is you can never get to the speed of light [...] As you approach the speed of light, your mass becomes infinite..."*

So okay – FTL travel might not be scientifically plausible right away, but Asaro was pretty determined to find some kind of mathematical justification for her own sci-fi novels. Therefore, she came up with a modified version of Einstein's equations as it's definitely a good idea to not ignore them. Instead she thought of speed as an imaginary number, a complex number defined by a real number multiplied by  $i$ , or the square root of  $-1$ .

And guess what – according to Asaro, this effectively solved the problem of FTL travel in some regard. Imaginary numbers don't have or need to have a physical equivalent in the real world. She opted to apply the same to the "complex speed," as she calls it in her paper published in the *American Journal of Physics*. What she did is treating the whole issue like a thought problem. The conclusion: If there were a physical equivalent to their imaginary number, it would theoretically allow FTL travel to work in real life.

Asaro wrote an essay for PBS explaining the thought process in even more detail: "I now had a framework based on relativistic physics that I could use to let my starships break the interstellar speed laws [...] I called the process 'inversion' because if you are going faster than light, relativity predicts the constellations you see will be flipped around (ed) from their positions as seen at slower than light speeds."

...

For the time being, all of this remains the thought problem Asaro encountered, but who says we won't discover the physical analog for complex speed in real life now? Maybe we just can't fathom it yet.

On the other hand – imaginary numbers seems to suggest that that we can get back complex plane (Argand plane) without recourse to Einstein in even more ways than pure science.[2]

#### **Another hint to a workable pathway: Solve it with 3D-symmetric plane**

Let us recall one quote by one of great mathematicians of his time, J. Hadamard, something like this: *"a shortest path to a point (or to infinity) is through complex plane."*[2]

To put it in other words, we may consider that Asaro's idea may lead to something interesting...but the problem is: as we argue in a forthcoming paper, it is unlikely that the notion of *geometrodynamics* is true, and also the entire LIGO project.

To speak frankly, these authors wrote a number of papers in the past based on the notion of quaternion algebras and quaternion numbers. A senior math-physics professor once asked one of authors (VC): "Do you believe in such a universe of quaternion numbers?" At the time, he didn't think that much, because at the time it seems like the simplest approach to find 6D-version of Maxwell equations." But it does not mean that we agree with the entire geometro-dynamics theories, including Alcubierre hypothesis and also the remaining of GTR-based warp drive machine proposals so far.

As we wrote (cf. [8]):

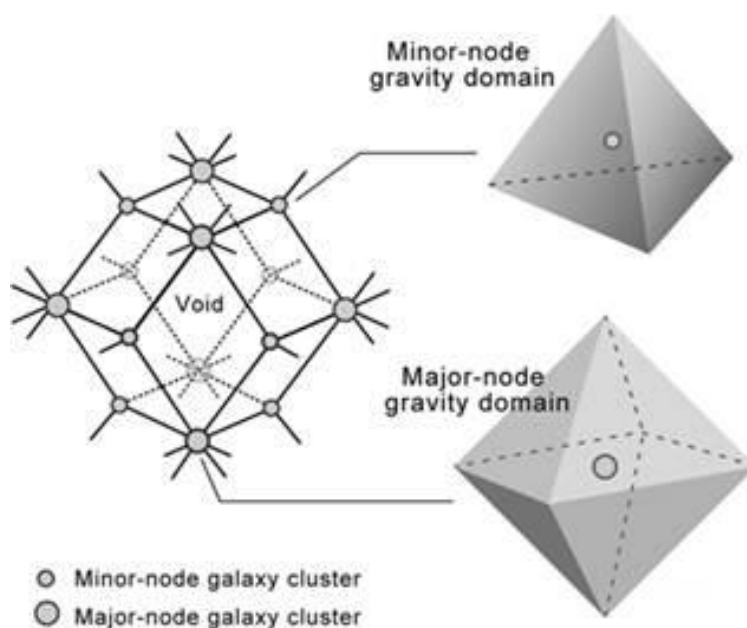
"Therefore, it is understandable that the late John Wheeler himself, who coined term geometro-dynamics, later on abandoned many features of that approach. See J. Stachel's article: The rise and fall of Geometrodynamics, and also W. Misner. We can recall too, that there is senior professor in Germany who was brought to justice a few years ago, and then he admitted that there is no way to measure "spacetime curvature." This case file can be found in internet, related to LIGO project. Actually, there are several criticisms on that observation project. ... Of course, by

mentioning all of these, it does not mean that we are right all along, but let us face the truth as it is. Physics is more related to solid experimental evidences, not just made of tower of sand. ....Nonetheless, there is also possibility that the 6D geometry, or more exactly (3D, symmetric) can be found in nature, especially in quasicrystalline structure. Therefore all we can say is that may be this is still useful, although these 6D geometry may be seen more like a mathematical artefact. Zlabys *et al.* wrote their abstract as follows: *"Here we show that time and space crystalline structures can be combined together and even six-dimensional time-space lattices can be realized. As an example, we demonstrate that such time-space crystalline structures can reveal the six-dimensional quantum Hall effect quantified by the third Chern number."*[8]

## CONCLUDING REMARK

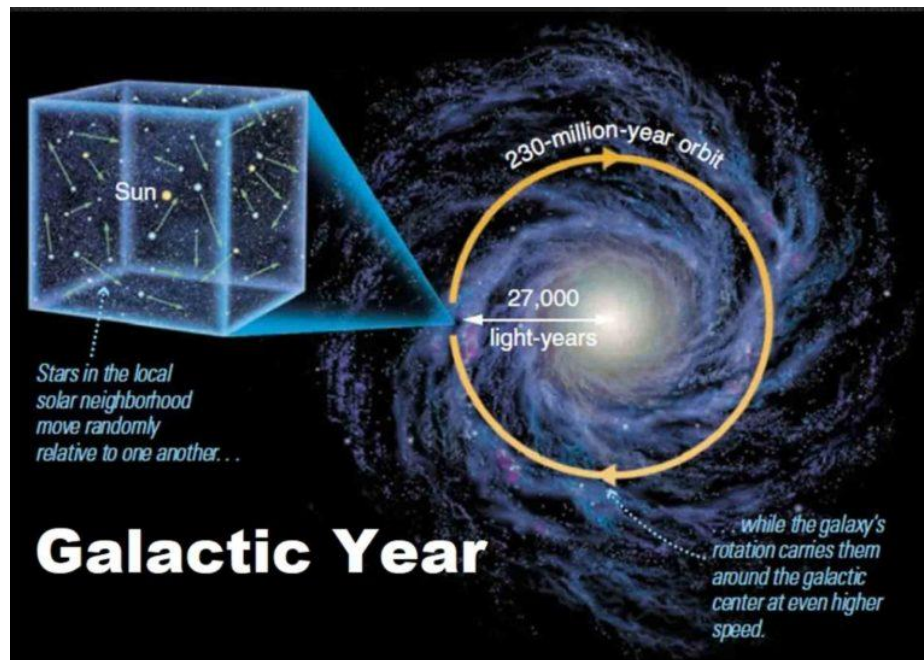
To sum up our aforementioned arguments, what can be a simpler path toward making a working warp drive machine, are as follows:

- (1) Find if it is possible at all to reconsider 6D (3D, symmetric) crystalline structure in such a way to allow "shortest path to infinity" - as J. Hadamard's famous phrase. (That is, our argument here is to do away from the geometro-dynamics approaches, such as Alcubierre's hypothesis.)
- (2) Do experiments in small-scale version. We may call such experiments: *"lab scale warp drive" experiments (LSWDE)*. This is quite similar to what Harold White, a NASA specialist at the Eagleworks Laboratory, attempts to do with their warp bubble scenario.
- (3) Computational simulation may be helpful, for instance, we shall check if the crystalline structure of the 3D space itself, can be related to Dr. Harold Aspden's space aether model.



**Illustration 3:** Harold Aspden's space aether model





**Illustration 4:** Harold Aspden's space aether model.

(4) Once we find a “realistic” *small-scale version* / simulation of LSWDE, we can begin to be sure that what is required for small-scale version of warp drive machine, can be scaled up to larger prototype of WD.

(5) Then we can start to send *photon signal* or something like that to see if it is really workable warp drive as we sought for.

At this point, some readers may ask: why do we write this article? Just to make sense of all those nonsense?

**Answer:** No. You should know that mathematicians are more or less like a coffee making machine. As a wise word says: “A mathematician,” the Hungarian mathematician Alfréd Rényi (1921-1970) used to say, “*is a machine for turning coffee into theorems.*” Rényi's colleague Paul Erdős well embodied the statement. That is part of the reason we write this short article. Hopefully you will find something to learn from this short remark.

As with a question: how to generate required energy to travel over the complex plane? - we don't get an answer for that. May be, just may be, we can generate through extracting vacuum to become negative energy or negative masses. [7][9][10]

We write this remark quite short, and it is sketchy indeed. But, what is sketchy and seems like simple steps, can actually lead to human kind's real pathway to reach the stars, and go where we belong since the ancient past...along with the Galactic Federation.

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VC & FS

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