# BACK TO THE MOON AND ON TO THE STARS

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Abstract -

This is a copy of a comment I sent to ABC TV about their "Catalyst" program on 13/02/2018. That comment was limited to 1,500 words but readers get a bonus here: the comment's been expanded to 1,900 words. Professor Duffy's comment in "Catalyst" about using the Moon as a launching pad to Mars, then the stars, is a great dream for our future. But our present slow rockets aren't very convenient for travel to the stars. I can see 3 better ways - each is faster than the previous one. (1) is the controversial EmDrive which, through future application of Maxwell's and Einstein's theories as well as the Transactional Interpretation of Quantum Mechanics, may not only see huge benefits for spaceflight but also huge benefits to many areas of life for the average person who never journeys to space. (2) is the combining of a 2009 electrical-engineering experiment at America's Yale University with the ideas of Albert Einstein to produce a type of wormhole, or shortcut through space-time. (3) is mathematical – the use of the Brouwer Fixed Point Theorem in future space-time travel (there's no cause for concern if you're not trained in maths – it's explained in English).

Article -

(1) HOW EM DRIVE WORKS

The website Reddit says 'EmDrive (also known as an RF resonant cavity thruster) is a purported reactionless propulsion technology, which would - if true - revolutionize space travel and the world economy. After nearly 20 years since its "invention", there is no compelling empirical evidence that it works as described despite ample testing of a relatively simple design and all theoretical explanations for the so-called EmDrive effect are completely at odds with our most fundamental theoretical knowledge of physics.' (https://www.reddit.com/r/EmDrive/). Australian astrophysicist Prof. Alan Duffy says, "If this rocket really doesn't need fuel to create thrust then that

would be the end of physics as we know it." That's a very interesting statement - and an accurate one, too. Let's try to produce an explanation for how the EM drive might work without using fuel or thermal expansion - for "that would be the (beginning) of physics as we (don't) know it".

The beginning of the solution is with 19th-century scientist Michael Faraday's experiments with electricity and magnetism (which, later that century, James Clerk Maxwell mathematically unified into a theory of electromagnetism that includes light). The existence of both advanced waves (which travel backwards in time) and retarded waves (which travel forwards in time) as admissible solutions to Maxwell's equations was explored in the Wheeler–Feynman absorber theory of last century. Also, the transactional interpretation of quantum mechanics (TIQM) says waves are both retarded and advanced. The waves are seen as physically real, rather than a mere mathematical device.

And "Physics of the Impossible" by Michio Kaku (Penguin Books, 2009) states on p.276, "When we solve Maxwell's equations for light, we find not one but two solutions: a 'retarded' wave, which represents the standard motion of light from one point to another; but also an 'advanced' wave, where the light beam goes backward in time. Engineers have simply dismissed the advanced wave as a mathematical curiosity since the retarded waves so accurately predicted the behavior of radio, microwaves, TV, radar, and X-rays. But for physicists, the advanced wave has been a nagging problem for the past century."

Light is one form of electromagnetism – microwaves are another. So some of the microwaves are advanced, and travelling back in time. To this action, there is - agreeing with Isaac Newton's 3rd law of motion - an equal and opposing reaction ie a thrust forward in time. Since space can never be regarded separately from time, an object in space is affected and the forward thrust in time could power a spacecraft through the void.

ITS OTHER SCIENTIFIC APPLICATION

Four years after publishing General Relativity, Einstein published a paper that asked "Do gravitational fields play an essential role in the structure of elementary particles?" ["Spielen Gravitationsfelder im Aufbau der materiellen Elementarteilchen eine wesentliche Rolle?"] by Albert Einstein - Sitzungsberichte der Preussischen Akademie der Wissenschaften [Math.

Phys.] 349-356 [1919] Berlin. That paper was published in an attempt to clarify the inner workings of the atom. (See the 2012 article “How Einstein Discovered Dark Energy” by Alex Harvey (https://arxiv.org/pdf/1211.6338v1.pdf). But it might well apply to EmDrive's second app.

Albert Einstein's equations say gravitational fields carry enough information about electromagnetism to allow Maxwell's equations to be restated in terms of these gravitational fields. This was discovered by the mathematical physicist George Yuri Rainich - "Transactions of the American Mathematical Society" 27, 106 - Rainich, G. Y. (1925). Therefore, gravitational waves also have a "retarded" component and an "advanced" component. They can travel forward or backward not only in space, but in time too.

What are the consequences if gravitational fields play an essential role in the structure of elementary particles, and if gravitational waves can travel back in time? Then the equal and opposite reaction providing the forward thrust in time could not only "power a spacecraft through the void", but it could power anything with gravitational waves in their composition (in ways yet to be discovered).

(2) A 2009 electrical-engineering experiment at America's Yale University, together with the ideas of Albert Einstein, tells us how we could travel to other stars and galaxies. Electrical engineer Hong Tang and his team at Yale demonstrated that, on silicon-chip and transistor scales, light can attract and repel itself like electric charges or magnets [“Tunable bipolar optical interactions between guided lightwaves” by Mo Li, W. H. P. Pernice & H. X. Tang - Nature Photonics 3, 464 - 468 (2009)]. This is the “optical force".

For 30 years until his death in 1955, Einstein worked on his Unified Field Theory with the aim of uniting electromagnetism (light is one form of this) and gravitation. My sources for my belief that this union will be achieved include Einstein's paper "Do gravitational fields play an essential role in the structure of elementary particles?" and 2 references to the similarities between gravitation and electromagnetism: (1) "Electromagnetic and Gravitational Waves: the Third Dimension" by Gerald E. Marsh, Argonne National Laboratory (Ret) - https://arxiv.org/pdf/1101.2247 states, "The

motion of a set of test particles under the influence of a plane gravitational wave differs considerably from the electromagnetic case. Yet, there are similarities: not only do both have two independent polarization states, but when one includes the longitudinal motion, the surface associated with the motion of a charged particle responding to an elliptically polarized wave is similar to the constant phase surfaces of a set of particles driven by a plane gravitational wave; in both cases the latter surfaces derive their longitudinal motion from trigonometric double angle functions."(2) According to "Similarity Between Gravitation and Electrostatic Forces" by mathematician and physicist Ron Kurtus (5 December 2010 - http://www.school-for-champions.com/science/gravitation_electrostatic.htm#.Wkw9dcs_5Ah) - (under the heading "Gravitomagnetism"), he states on that "An analogy of gravitational and electromagnetic fields is seen by comparing the Einstein Field Equations from the General Theory of Relativity with Maxwell's Field Equations for electrical and magnetic fields." Achievement of this means the quantum components (gravitons) of gravity/spacetime-warps between spaceships and stars could mimic the Optical Effect and be attracted together, thereby partially eliminating distance (this is similar to traversing a wormhole, or shortcut, between two folds in space-time).

(3) Early last century, the Dutch mathematician and philosopher Luitzen Egbertus Jan Brouwer (1881-1966) had one of the most useful theorems in mathematics named after him - the amazing topological result known as the Brouwer Fixed Point Theorem.

"In dimension three, Brouwer's theorem says that if you take a cup of coffee, and slosh it around, then after the sloshing there must be some point in the coffee which is in the exact spot that it was before you did the sloshing (though it might have moved around in between). Moreover, if you tried to slosh that point out of its original position, you can't help but slosh another point back into its original position. More formally the theorem says that a continuous function from an N-ball into an N-ball must have a fixed point. Continuity of the function is essential (... if you slosh discontinuously, then there may not be (a) fixed point)." (Su, Francis E., et al. "Brouwer Fixed Point Theorem." Math Fun Facts. <http://www.math.hmc.edu/funfacts>. From <https://www.math.hmc.edu/funfacts/ffiles/20002.7.shtml>)

Translating this into a possible method of future spacetime travel - take the universe and "slosh it around" (this refers to gravitational waves of varying strengths constantly moving in different directions in space as well as time). Assume the point which is in the exact spot after the sloshing as it was before the sloshing is a point an orbiting spaceship might occupy near Mars - this orbital point might be encoded using the BITS (BInary digiTS of 1 and 0) of electronics. Since the point might have moved around thanks to the Brouwer Fixed Point Theorem, it could be encoded to pick up a spaceship orbiting Earth and quickly transport it to Mars orbit (greatly reducing astronaut/cosmonaut exposure to radiation, bone and muscle wasting, etc.)

Sloshing (continuously manipulating gravitational waves) so that the point which is in the exact spot after the sloshing as it was before the sloshing is part of the Andromeda galaxy would conceivably reduce travel time to a star in that galaxy by millions of years. The journeys - to Andromeda or Mars or any other spot in space or the time which can't be separated from space - wouldn't depend on slow rocket power but on fast electronics and - as has been seen - gravitational waves that can travel backwards in time, acting instantly across the universe and being entangled with any selected point in space or time.

The universal gravitational field (Einstein's Theory of General Relativity says gravity IS space-time) might possibly combine with quantum mechanics to form the unified field of quantum gravity. See references in (1) to Maxwell's / Einstein's equations, the Wheeler–Feynman absorber theory, TIQM, and Rainich. 17th century scientist Isaac Newton's idea of gravity acting instantly across the universe could be explained by gravity's ability to travel back in time, and thereby reach a point billions of light years away not in billions of years, but in negative billions-of-years. That is; the negative/advanced component of a gravitational wave would already be at its destination as soon as it left its source, and its journey is apparently instant. Instantaneous effect over large distances is known as quantum mechanics' entanglement and has been repeatedly verified experimentally.

'Physicists now believe that entanglement between particles exists everywhere, all the time, and have recently found shocking evidence that it affects the wider, "macroscopic" world that we inhabit.' ["The Weirdest Link" (New Scientist, vol. 181, issue 2440 - 27 March 2004, page 32 - online at

http://www.biophysica.com/QUANTUM.HTM]. Though the effect is measured for distances in space, the inseparability of space and time means that moments of time can become entangled too, as "Quantum Entanglement in Time" by Caslav Brukner, Samuel Taylor, Sancho Cheung, Vlatko Vedral (http://www.arxiv.org/abs/quant-ph/0402127) showed.

If the retarded (forwards) wave component travels in positive space, the advanced (backwards) component corresponds to an equal amount of negative distance. The forwards and backwards movement in time can potentially cancel to produce a quantum (and macroscopic) entanglement that eliminates the need for the Big Bang's and Cosmic Inflation's solution that the universe is roughly the same everywhere on large scales because everything was once in contact in a tiny space.