The Math+Science Journal
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With recognition of the Tucson L5 Space Society, local chapter of the
Washington DC-based National Space Society (NSS) of which
Buzz Aldrin, one of the first two men on the moon,
is on the Board of Governors.

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The mission of the Math+Science journal is to support students and others in
whatever way possible in their efforts to further their math+sci.education.

No permanent set in time
by Homer B. Tilton

Proponents of the twin paradox of the special theory of relativity claim
that a star traveler will be younger than his stay-at-home twin when he
returns to Earth because of the relativistic dilation of time with velocity.
They maintain that there would be an asymmetry in aging because of the
asymmetry in the flight profile due to the need for the traveler to stop and
restart at the turn-around point of his trip out and back; that is, that there
would be a permanent set in time.

That idea continues to have legs perhaps because it may seem to hold open
the promise of time travel. But at some point Mankind must come of age and
question the existence of Santa Claus. The time travel theme has had a good
run, making for some engaging stories, and such stories will no doubt continue
to be written - they are very entertaining - but it must be recognized that
they are only fantasy.

Mendell Sachs has pointed out that the time-dilation effect of special
relativity is only a recalibration of the traveler’s clock as seen by the twin
on Earth. “As if the clock dial had been divided into 8 hours instead of 12.”

- continued -

Word of the month
set in time - a permanent change in elapsed time analogous to the set in a
coil spring caused by its being stretched beyond its elastic limit. From
Merriam Webster’s Collegiate Dictionary: "set n 8: permanent change of form
(as of metal) due to repeated or excessive stress."

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Let the debate begin!
by Homer B. Tilton

Robert L. Forward (1932-2002) wrote, "Nothing can travel faster than the speed of light [c, 300 megameters per second]."[1] Albert Einstein (1879-1955) first held that position[2] in 1905 and it was widely accepted but he abandoned it in 1921-22,[3] finally seeing that such a conclusion does not automatically follow from the second postulate as many still believe. Louis D. Friedman, present Executive Director of The Planetary Society, recently described Robert Forward as "A leading thinker about the real physics of interstellar flight."[4]

I would like to have heard Bob's answer to this question: "It seems you're saying that a rocket cannot travel away from Earth faster than 300 Mm/s; but wouldn't that require the rocket to remember its launch point (assumed to be Earth)?" ...And what's so special about a rocket's launch point, anyway? It's true that photon speed resonates at - is "limited to" - c regardless of any reference point but a rocket is not a macrophoton (nor is a photon a particulate quantum, like a rock). Photons require no reference point when specifying their speed but airplanes and spacecraft do. When docking with the ISS, the space shuttle has a great speed relative to the ground, but at the same time its speed relative to the ISS is near or at zero. That difference cannot be ignored.

Robert Forward was a champion of light-pressure sailing ships and he had it about right for those when it came to c being a speed limit; but you cannot generalize from light-sailing ships to rocketships. Light-sailing ships "push against" the sun via the light from the sun but a rocketship does not push against anything external to its own rocket/exhaust system; rockets work as if they have traction to space itself. That's called the Woody Woodpecker principle after that cartoon character's demonstration appearing in George Pal's Oscar-winning 1950 movie, Destination Moon.

Light-sailing ships do not have traction to space. Their motor (the sun) does not travel with the ship as a rocket's motor does; a light-sailing ship is limited to 300 Mm/s relative to the sun because the energy driving it cannot reach it anymore (by Doppler and Planck); but a rocket carries its own motor so is not limited to 300 Mm/s, 600 Mm/s, or any particular speed.

As for the distortions of special relativity, those are a kinematic perspective only - an appearance - and so play no essential role. ...TM+SJ

[2] Einstein characterized his view as a conclusion. See p.43 of A. Einstein, Relativity, English translation from Crown Publishers 1931: "From this we conclude..."
[3] pp.35-6. A. Einstein, Sidelights on Relativity, 1922; Dover Publ. reprint, ISBN 0-486-24511-X; "Poincaré... is right. The idea[s] of the measuring-rod and the... clock [are not] real world." Einstein's "change of mind" (Mendel Sachs' characterization) was and still is "under the radar."
Mail Matters

Open letter to Arizona Rep. Gabrielle Giffords and Discovery Shuttle Commander Mark Kelly

Dear space pioneers:

We need your help - the Human spaceflight program needs your help - and you are responding. Thank you.

At the March '08 meeting of the Tucson L5 Space Society an idea was introduced to dedicate an area of southern Arizona as a starport corridor, the JMSASC,* whose purpose would be to focus initial efforts to send Humans on an eight-year round-trip jaunt into near interstellar space at a constant 1G acceleration and return them safely to Earth to test theories and hardware required for practical starflight.

Arizona is ripe for such an enterprise. The manufacturing and study base is already in place. The U of A is one outstanding asset now gaining practical other-planet experience with the Phoenix Mars lander. UA is also in control of Biosphere 2. Pima College is primed to participate; Chancellor Dr. Roy Flores, Vice Chancellor Dr. Raul Ramirez, East Campus President Dr. Charlotte Pugett and Dean of Instruction Dr. Mary Ann Sanchez have recently been reminded of the potential.

A chronology and proposed schedule running from 1903 to 2078 appears on pages 116 & 117 of a recent book.** Governor Napolitano has been presented with a copy of that book and the Governor has acknowledged receipt in a note that is transcribed below. As pointed out in the book, two major problems remain concerning propulsion and ecosystem.

(1) Present thinking is that a Bussard interstellar ramjet engine would provide starship motive power and would be able to maintain a steady acceleration/deceleration out and back; Carl Sagan (1934-1996) supported the Bussard ramjet idea before his untimely demise.*** (2) A closed eco-system would be developed for the ship with nearly direct application to Moon and Mars bases, and spinoffs would help us here on Earth as well to attain a greener ecology as the United States Senate was reminded by NSS Director George Whitesides on 7 May 2008.

New Mexico presently has the Nation's first civilian spaceport with Governor Richardson's support; Arizona should have the first starport. It's not too soon for its dedication. It is believed that full understanding of the plan by all could win the support of Governor Napolitano.

The work you are doing helps move things along. Thank you.

... Homer B. Tilton htilton@pima.edu

Dear Mr. Tilton, postmarked 13 May '08; received 15 May '08

Thank you for your thoughtfulness in sending your book, entitled Begin the Adventure: How to Break the Light Barrier by A.D. 2070. I am looking forward to reading your latest work as I am sure it will prove to be a very interesting read. / Thanks again for your kindness. / Sincerely, /s/ Janet Napolitano

* The John McCain Southern Arizona Starport Corridor

** Homer B. Tilton, Begin the Adventure: How to Break the Light Barrier by A.D. 2070, 2nd edition, Pima College Press, ISBN 1-59973-014-6, 2005; A slippage of 9 years in that proposed schedule presently applies.

Description of the JMSASC

by Homer B. Tilton

Based on material contained on pp. 121-22 of Begin the Adventure, 2nd ed.

Coming under the Federal Oversight of the National Ports & Harbors Authority, the John McCain Southern Arizona Starport Corridor would extend across the full width of southern Arizona with a two-mile-wide buffer zone along the border with Mexico, with entry across the border being monitored by an intruder-alarm sensor grid. The northern edge of the JMSASC would generally follow Interstate 8 from California eastward to Casa Grande, then follow Interstate 10 to New Mexico. Tucson would be its entry point. Visitors would stay over at the Janet Napolitano Guest House at Davis-Monthan AFB.

It is not too soon to begin; the "light barrier" is no longer seen as a limit. See "Let the debate begin!" on page 2. Two major problems remaining to be solved are: propulsion and a closed ecology.

The JMSASC would have no star-launch facilities of its own (those would reside in space primarily in Earth orbit in the beginning and at Jupiter Station later on) but would be home to an infrastructure for space frame propulsion/biosphere development and crew training. Those necessary things not being met by Houston, Kennedy, Vandenberg, White Sands and the rest.

The Corridor would contain Yuma Army Test Station and Yuma Marine Station at its far west end, then moving eastward, Gila Bend Army Test Range, the Barry Goldwater Air Force Test Range, the University of Arizona, Tucson International Airport, Davis-Monthan Air Force Base and Fort Huachuca. There are Kitt Peak National Observatory, the Mt. Graham Large Binocular Telescope, the Multiple-Mirror Telescope on Mt. Hopkins and Pima College where students fresh out of high school would begin learning the ropes & knots of interstellar navigation. Entry level would be - via Santa-Rita HS - at the Space Sciences Center at Pima Community College, East Campus, and the co-located University of Arizona South. And don't forget Biosphere 2 just north of there.* Kino hospital campus of UMC and the Science Center at Rita Ranch as well as other organs of the University of Arizona - telescope capital of the world and currently mission control for the Phoenix Mars lander presently on the ground at Mars near its north pole.

As during the time of the Cold War, a way would be found to support this increased national effort. It would provide good jobs and a firm technological base to help restore America to technological leadership in the world, a position she had begun to lose in the effluent of the Vietnam-War era and almost totally lost after the Berlin Wall came tumbling down. A 2005 World Economic Forum survey put America at #10 in the world, with Japan and Germany at #1 & #2 spots. A #10 spot is unacceptable.

But most of all, the effort represented by the JMSASC would immediately give an exciting purpose and inspiration to America's young. ... TM+Sp

In laboratory experiments (such as might be performed by a chemist), a distinction must be drawn between indicated "clock" time and the amount of time that has elapsed since the start of an experiment.

If I read Sachs right, he is saying that the relativistic time dilation has to do with indicated time, not elapsed time; but that elapsed time is what determines whether there will be an asymmetry in aging between the two twins as a result of a trip out and back to Earth by one twin. The thing that determines whether there will be an asymmetry in aging between the two twins is the elapsed time.

W.G.V. Rosser:* (p.411): "...it will not be possible to accelerate rockets to speeds comparable with the velocity of light, since the fuel requirements would be too heavy"; (p.413): "The clock [twin] paradox goes beyond the limitations that were previously placed on the applicability of the transformations of the theory of special relativity. ... The clock paradox will be viewed as an extension of the theory of special relativity. Whether this extension is valid or not must be settled eventually by means of experiments."

Some say that such experiments have already been performed and that they come down on the side of asymmetry in aging. They point to experiments involving π-mesons as they enter the atmosphere of Earth. But special-relativistic time dilation is only one possible explanation of the effect. Those experimental results can equally well be explained in terms of general relativity as another kind of time dilation entirely.**

No, the experiment required is to send Humans out and back on an actual star jaunt, not to draw an inference from a different and lesser experiment. The reader is referred to the relevant writings of Dingle and Sachs for more.

The recognition here and now is that there has not been shown to be an actual set in time; relativity does not require such a set in time; such a set in time would violate Occam’s razor; logic rails against the existence of a set in time, and it is concluded that there will be no such set in time and so the twin paradox is resolved on the side of sanity. ...TM+St

* A way around the fuel problem is within grasp; it is the Bussard interstellar ramjet which was supported by Carl Sagan. It is clear from Rosser’s statement that he did not recognize the existence of a fundamental impenetrable light barrier and he specifically says so on page 183. "It must be stressed that the theory of special relativity does not say that one cannot have velocities exceeding the velocity of light ..." For more, see "A Critique of the Theory of Special Relativity and the Clock Paradox," ch.11 (pp.397-436) of Rosser’s book (1964), An Introduction to the Theory of Relativity, Butterworths, 1964, a textbook.

Why Human spaceflight?

When that question is asked, space enthusiasts may give short-term answers because they think that's what the Congress wants to hear. Many are aware that Human starflight is the ultimate goal* and believe it will happen. They may not want to say so in public because they think it is too soon to expect Congress to buy it. Well maybe it depends on how the case is presented.

Remember the "space race" with the Soviets to see who would put the first man on the Moon? We nearly lost that one. Well there is a new space race forming; this time there are many players: Japan, China, India, and yes Russia too, all competing to be the first to do this or that in space and to ultimately be first to reach another star. Right this minute, the Japan space agency (JAXA) has a robot (KAGUYA-SELENE) on the ground at Shackleton crater, the site of America's declared future moonbase, and we don't. KAGUYA is getting breathtaking HDTV images from that place that can make you think you're there. Have you seen them?

America has recently been put at only $10 in technological excellence, and it seems likely we are behind in space too by about that amount and are slipping fast. For example, the shuttle will be retiring in two years, and we have nothing to replace it. It has been announced we will be buying time on the Russian shuttle to reach the ISS for perhaps five years after that.

Humans to the stars will happen sooner than many think. If America continues to fall behind and does not catch up and lead, the dominant language of the future universe could be Japanese or Chinese or Hindi or Russian; with English being only a quaint, ancient Earth dialect. RU ok w/that? ...HBT

* As evidenced by the fact that the name of the National Space Society's quarterly journal is Ad Astra (to the stars).

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Written reader comments are invited on all material. All such comments are subject to being published unless otherwise requested. They may also be subject to editing. ...Homer B. Tilton

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