



Web Relativity Calculator site

A Voyage of Knowledge

"As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality" - Albert Einstein (1879 - 1955)

Relativity Calculator is a *mathematical essay* employing common categories of thinking in philosophy, history and mathematical physics in order to better explain relativity science in as simple and straightforward manner as possible.

You are therefore about to enter a voyage of knowing and understanding your physical world. It is a voyage built upon the knowledge and understandings handed down to us by ancient Greek philosophers and thinkers, astronomers and mathematicians, right straight down thru to Einstein and other modern men and women of wisdom and insight into nature's ultimate secrets.

How, for instance, was the earth's circumference determined by simply pacing out steps on the earth's surface while at the same time thinking about this problem? Or, how was the distance to the sun and other planets determined with only their light coming into the eyes of those wise enough to understand and interpret its significance? Why, anyways, is it so significant to understand the nature of light and its distant travels? And how, by the way, do we literally count time and distances when simply standing on the earth's surface? Simply standing on either the moon or mars does not alter this basic question because their distances to the galaxies are not significantly different from that of the earth to these far off filaments in the universe.

As each of these questions - simple and not so simple - came into the minds of great thinkers past, an arduously built staircase of knowledge of experimental and mathematical lattices came to be constructed. And what questions were heretofore never even imagined by the Ancients such as whether we exist in a multi-verse system of bubbling, interacting and competing universes, are now being asked by modern cosmologists possessing newer and more powerful tools of theoretical mathematics and applied experimentation.

Finally, of what importance is all this knowledge and understanding to human existence? This is not a minor question.

In formal religions there are many competing answers given to this question. This particular branch of human inquiry is known as "Eschatology", the ultimate questions and answers to human meaning and purpose given at the very final end of human time. All of this implies of course a concept of an *unknowable* and an *unprovable* "God" whose existence is beyond any human understanding. But just as Copernicus demonstrated in 1453 that indeed the human mind can itself explore realms of the universe way beyond the tied bounds of earthly existence, so now, as then, it is entirely possible to reach way beyond our present earthly bonds in order to extend and continue human knowledge and existence throughout the universe.

What I precisely have in mind is this: our known universe is approximately $13.7 \approx 14$ billion earth - years whereas our earth has been in existence for some 4.5 billion years. Plus or

minus on all this stuff. Earth's sun has already been around for some 4.57 billion earth - years and has grown about 40% brighter since its initial beginning and in about another 1.0 billion years will be even 10% brighter than presently and earth's atmosphere and oceans will begin a long term process of boiling away. It will however in another 4 - 5 billion earth - years be fully entered into its *red giant* phase where earth's atmosphere and oceans are completely dissipated while pushing earth into a farther and more distant orbit approximating Mars's present orbit owing to a lessening of the sun's mass as it blows off the latter in order to conserve angular momentum. Hence, the sun's gravity pull upon earth considerably lessens and earth will drift into a more distant orbit from the collapsing and dying sun. During the sun's initial transition from a hydrogen - burning, main sequence star to the red giant phase, earth will be engulfed in the sun's life - destroying gases where gravitational tidal forces will attempt to totally swallow and engulf planet earth creating a surface bulge on the sun whose frictional effect upon the earth will theoretically cause earth to slow its axial spin and spiral further inwards towards the sun. Whether earth survives as a distinct entity during this transitional period is still an open theoretical question. During this apex *red giant* phase the sun will be approximately 2,700 times as luminous and 250 times as big as is our sun today. Eventually, however, the sun's internal helium will undergo a sequence of explosive ignitions, turning helium into carbon, whereupon the sun's oscillating outward expansions and inward collapses, each smaller and more dense than the last, will finally result in one last fiery explosive flash and thereafter the sun will become a cool *white dwarf* cinder as its remaining shining light will fade away as a life source for any surviving earth. Earth will literally die of intense heat and later die of intense cold, if it survives at all. Planet Earth as a spaceship for human existence is doomed.

Of course it's far, far more probable that human life on Planet Earth will have extinguished itself by its own makings of over-population and warfare well before another 1000 years, never mind the passage of these extra 4 - 5 billion years.

On the other hand, maybe human existence is not so much doomed as is Planet Earth. How so? How can this ultimate existential fate be avoided?

Well, people could travel to other planets or even to other galaxies.

However, for my part I love Planet Earth! There is hardly anything else like it in the known solar system. You really want to live on gaseous and ringed Saturn or just gaseous Jupiter with their turbulent gas storms of methane and ammonia air? Not I. I love my Earth air! You want to live on some bleak, planet outpost without blue sky, stuck out among the stars against an unknowing and uncaring blackness? Not for me either! I love my Earth mountains, oceans and sky!! So what then?

It must be admitted by scientists and mathematicians that religious dogmas are half right: namely that intelligent human life is both precious and rare. This derives from present knowledge of both our solar system and the vast remains of the universe. But it is also an *unproven faith* of scientists and cosmologists that *intelligent life is not absolutely unique* nor does human life possess some sort of teleology - ultimate meaning and purpose - in the untold boundaries of the universe. In this latter regard religious dogma is wholly incorrect.

But coming back to the first question, namely how can the ultimate fate of human existence - rare, precious, but not absolutely unique - be avoided given that Planet Earth itself disappears in 4 - 5 billion years, more or less? And, further, how can humans ever, ever travel to the farthest reaches of the cosmos when distances are so entirely vast that human lifetimes would expire before ever reaching the next nearest galaxy, Andromeda, only some 2.5 million light - years away? Not possible! Of course, because Andromeda Galaxy is speeding towards our own Milky Way Galaxy with its crashing arrival expected in some 3+ billion earth - years, then maybe we're not talking exactly about 2.5 million light - years, but only some 2.0 million light - years away? Big deal. Still not possible.

But!

Suppose that either thru contacting extraterrestrial intelligence or by means of our own intellectual discoveries, that all of human intellectual discoveries and all of Planet Earth's biota (DNAs, RNAs, etc.) (who wants to leave Planet Earth without their most precious loved ones?) could be broken down into an *informational signal code* which could then be broadcast into the cosmos at the speed of light. And suppose further that coded into this signal would be information to pick and choose where amongst the galaxies, stars and planets those most suitable to replicate Earth's former unique and hospitable conditions for advanced human life to continue onwards. Just suppose the sort of intellectual knowledge first developed on Planet Earth during its habitable period which could make all this possible! Just suppose!! [note: special allowance should be made to separate out those humans who prefer Allah's black hole to go straight into it.]

Impossible, you say? If we humans can get past the next 1,000+ years we have a good enough chance to make it to the next billion earth - years of knowledge and discovery. It's like if you personally make it healthily to, say, age 70, then you'll likely make it to 90+.

In these circumstance therefore, we humans - precious and rare, but not absolutely unique - could truly reach out and touch not the face of some unknown, mythical heavenly "God" to which supplicating prayers are made in some churches or synagogues, but rather reach out and literally touch another Friendly Earth among the stars. And not to get too flowery or teary here, we humans will truly be standing on the shoulders of the ancient Greek philosophers, mathematicians and astronomers. Hence, let us now begin as simply as possible a voyage of understanding *Relativity Cosmology*.

So what in a nutshell is [Special Relativity](#) and what does it tell us about nature's reality? Well, because light possesses finite speed all sorts of other realities become apparent. Among these other realities are that nothing in nature travels faster than the speed of light but that at speeds approaching the speed of light, time slows down appreciably; physical bodies actually contract and get smaller - truly that mass itself is a variable quantity; light itself acts like matter and therefore reacts to the gravitational forces of other bodies of mass; black holes exist and either completely trap light or bend nearby traveling light; and that huge amounts of energy are contained in bodies of all masses. In fact, energy and mass are interchangeable quantities of nature such as what The Big Bang itself demonstrates - it all depends upon the speed of light! Other little tidbits of consequence arising from [Special and General Relativity](#) are that gravity and acceleration are the same phenomenon. And because of Special and General Relativity much is understood - *and much is yet to be understood* - of the cosmos.

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