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Revised and updated!

TIME DILATION EXPLAINED

FOR

DUMMIES®

2nd Edition

Sorry,
no CD-ROM
included

A Reference
for the
Rest of Us!®

By
Steven Vincent Johnson

Best selling Author of
**Where Have All
the UAP Gone?**

TIME DILATION EXPLAINED for DUMMIES

It is a fallacy to assume Einstein's mysterious Time-Space Time-Dilation theory is too complicated for the average person to comprehend. A well-known right triangle whose three sides possess convenient integer lengths of 3-4-5 can demonstrate Time Dilation in a simple forthright way. Consider the X,Y coordinate plane below. Each square represents the distance light travels per second (light seconds)—as perceived by a stationary person observing the triangle from a distance. A fast rocket travelling from left to right at 80% the speed of light has recently entered the graph. It is currently positioned over the "Y" axis 3 light seconds above the (0,0) origin point of ("A"). A light source is currently positioned on the ("X,Y") coordinate (origin). It pulses on for a brief microsecond. This light source travels parallel with the rocket, and is perceived as being stationary insofar as travelers on the rocket are concerned. Another light source is positioned at the bottom end of line ("x"). It remains stationary, from our frame of reference. It also pulses on for a brief microsecond, and at the same time as the moving light source.

$$\text{TimeDilation} = 0$$
$$\text{StationaryTime} = 0$$

StationaryTime = 0

Rocket

C

Right Triangle

5

Y

x 3

Moving light bulb

Z

4

B

Stationary light bulb

Two Light bulbs briefly flash on. The right sided light bulb remains stationary whereas the left sided light bulb travels parallel to the speeding rocket. It is also traveling at the same 80% speed-of light as the rocket. Travelers on the rocket will perceive the moving light bulb as being stationary from their Space-TIme reference point.
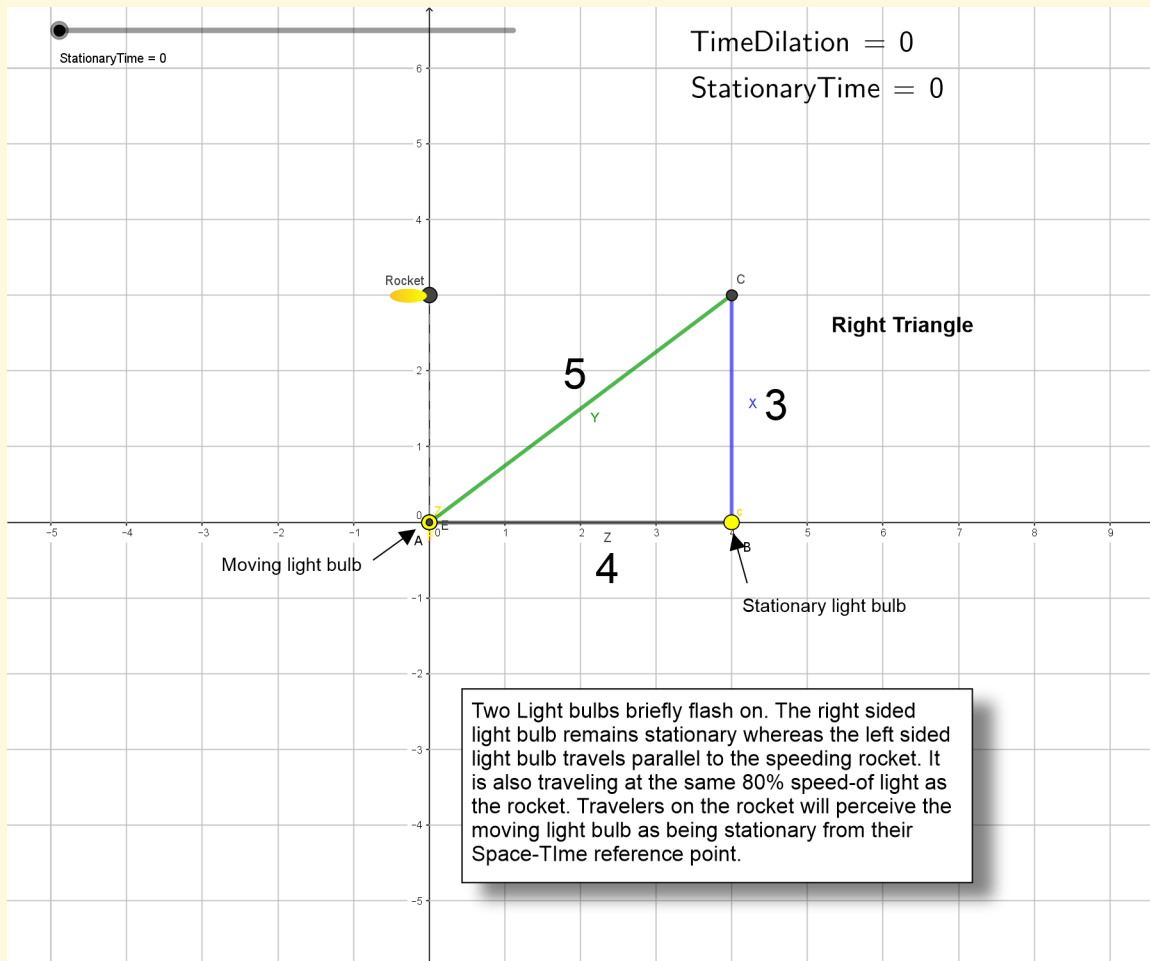
FIG 1

TIME DILATION EXPLAINED for DUMMIES

Both light pulses have now traveled a length of 1 light second. Keep in mind that light waves, *regardless of whatever velocity the light source might have been traveling at when the light was emitted*, must travel at the speed of light, as perceived from all Space-Time perspectives. This means that from our stationary perspective both light sources produce an expanding circular bubble of pulsed light that currently possesses a radius length of 1 light second. Notice that even though the moving light source has moved 0.6 light seconds to the right of the expanding bubble of light, the pulse behaves as if the light source was stationed at the (0,0) origin point of the graph, which actually was where the light source came from. Travelers on the rocket experience 0.6 seconds in the passage of time whereas we experience 1 full second. Why time *MUST* slow down for the rocket travelers will become more clear as we progress through this graphic presentation.

TimeDilation = 0.6

StationaryTime = 1

StationaryTime = 1

Rocket

0.6 Seconds, Time Dilated

Moving light bulb

Stationary light bulb

The expanding light "circle" behaves as if the burst of light originated from the original position of the light bulb. However, from our perspective, the light bulb has moved in tandem to the velocity of the rocket, at 80% the speed of light.
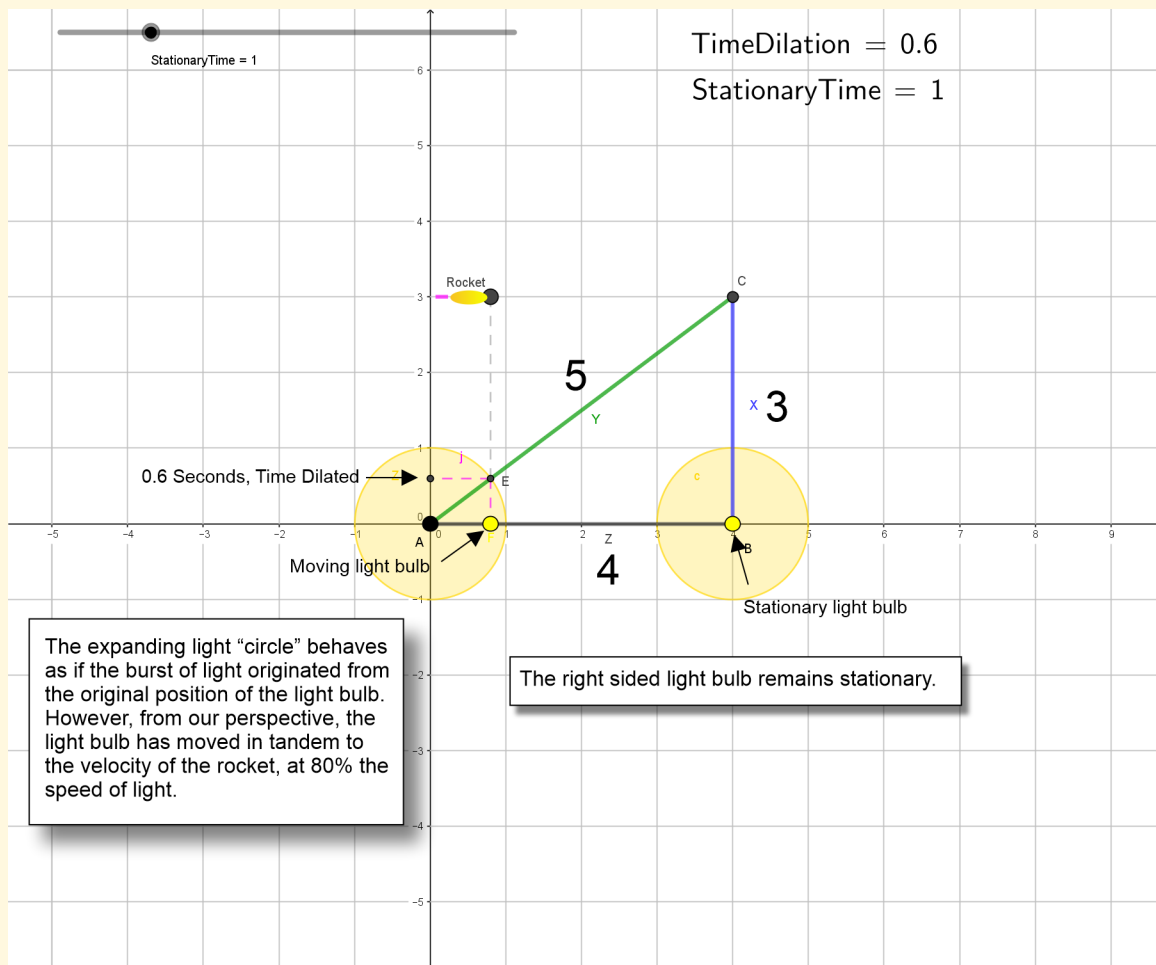
The right sided light bulb remains stationary.

FIG 2

TIME DILATION EXPLAINED for DUMMIES

2 seconds have now transpired from our stationary Space-Time frame of reference. Meanwhile, the rocket travelers have experienced 1.2 seconds of dilated time. The light wave pulse originating from the stationary right handed light source has travelled 2 light seconds, or 2/3 of the distance to point "c", whereas only 1.2 light seconds of distance and dilated time would be experienced by the rocket travelers.

I repeat, from our stationary reference point we would perceive the moving light pulse as having traveled 2 light seconds, whereas from the rocket travelers perspective only 1.2 light seconds have traspired. (See point "E")

StationaryTime = 2

$$TimeDilation = 1.2$$
$$StationaryTime = 2$$

Rocket

5

3

1.2 Seconds, Time Dilated

Moving light bulb

4

Stationary light bulb

Notice the expanding light "circle" continues to behave as if the burst of light originated from the original position of the light bulb.
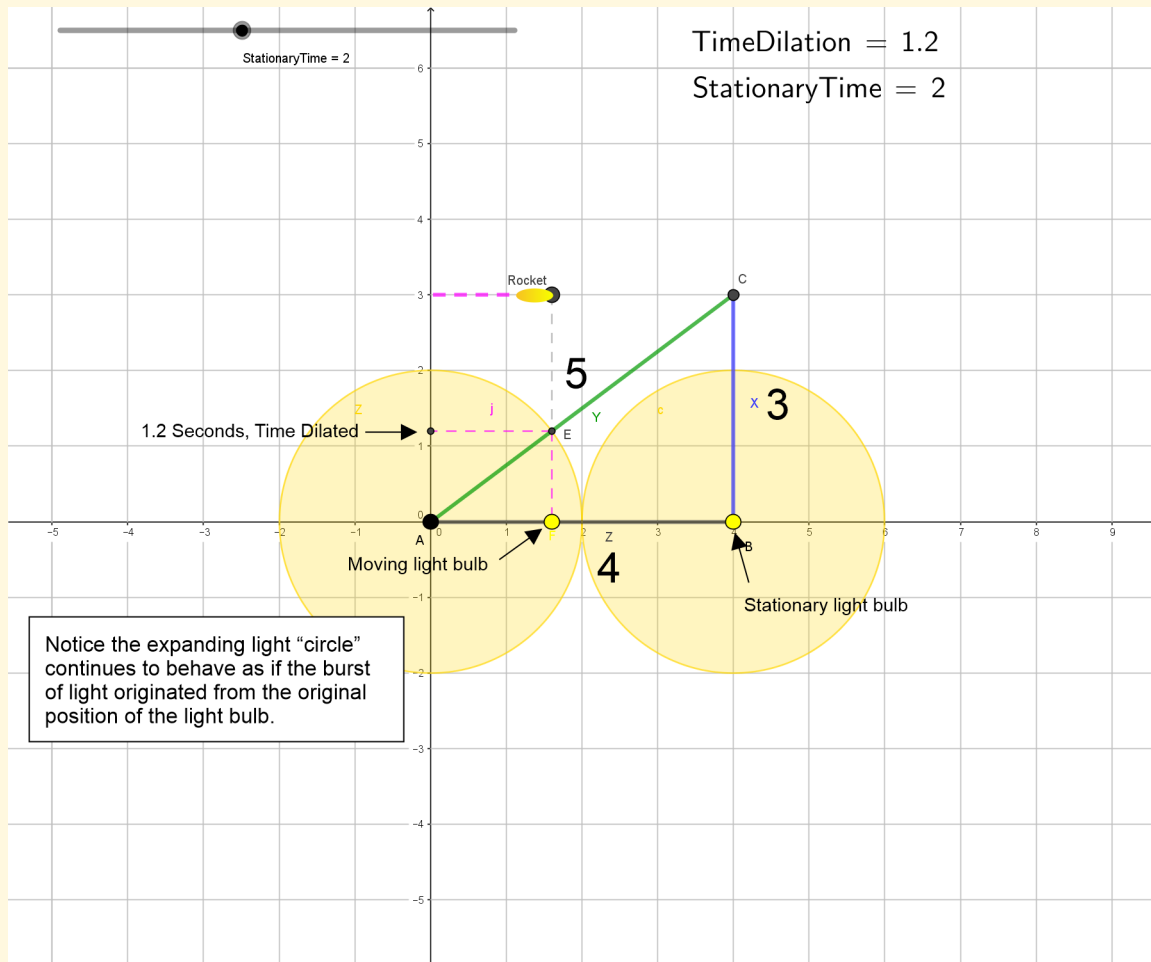
FIG 3

TIME DILATION EXPLAINED for DUMMIES

This is were things get interesting—and a bit contradictory! Three seconds, as experienced from our stationary frame of reference, have transpired. The light wave pulse propagating from our stationary right sided light bulb has met up with point "c". It took 3 light seconds. But wait! Look at the dashed vertical red line, position just above the number "4". It's vertical length is only 1.8 light seconds. It intersects with line "Y" at point "E". According to Time Dilation, 1.8 seconds have only been experienced by travelers on the speeding rocket ship. But from our stationary frame of reference the circular energy pulse of light which had originated from the left sided light source (Point "A") has traveled the same distance as we, a radius of 3 light seconds, seemingly contradicting the fact that only 1.8 seconds of dilated time have been experienced by our rocket travelers. According to Einstein, the pulsed light has not reached yet reached the rocket. It only got as far as point "E".

$$TimeDilation = 1.8$$
$$StationaryTime = 3$$

3.0 Seconds have gone by, from our stationary Space-Time reference. We see that the burst of light originating from our stationary light bulb has reached pont "C", and it took 3 seconds.

1.8 light seconds have gone by from the rocket's Space-Time reference point. Even though the light appears to have traveled a total of 3 light seconds, as perceived from our Space-Time perspective, from the rocket perspective the light appears to have traveled only 1.8 light seconds.

Moving light bulb

Stationary light bulb

FIG 4

4 seconds, have been experienced from our stationary frame of reference. The pulsed light has now passed point "c" by 1 light second, for a total of 4 light seconds. Meanwhile, the dashed vertical red line, which meets up with the green line ("Y"), now has a length of 2.4 light seconds. According to Time Dilation, 2.4 seconds have been experienced by the rocket travelers.

$$TimeDilation = 2.4$$
$$StationaryTime = 4$$

StationaryTime = 4

2.4 Seconds, Time Dilated ⟶

5

Y

x 3

From the rocket's Space-Time perspective 2.4 light seconds have transpired, whereas from our stationary Space-Time perspective the same light took 4 light seconds.

Rocket

C

E

A

4

Z

B

Moving light bulb

Stationary light bulb

The original burst of light from the left light bulb has reached the position of the Stationary light bulb, at point "B". It took 4 light seconds to reach "B".

FIG 5

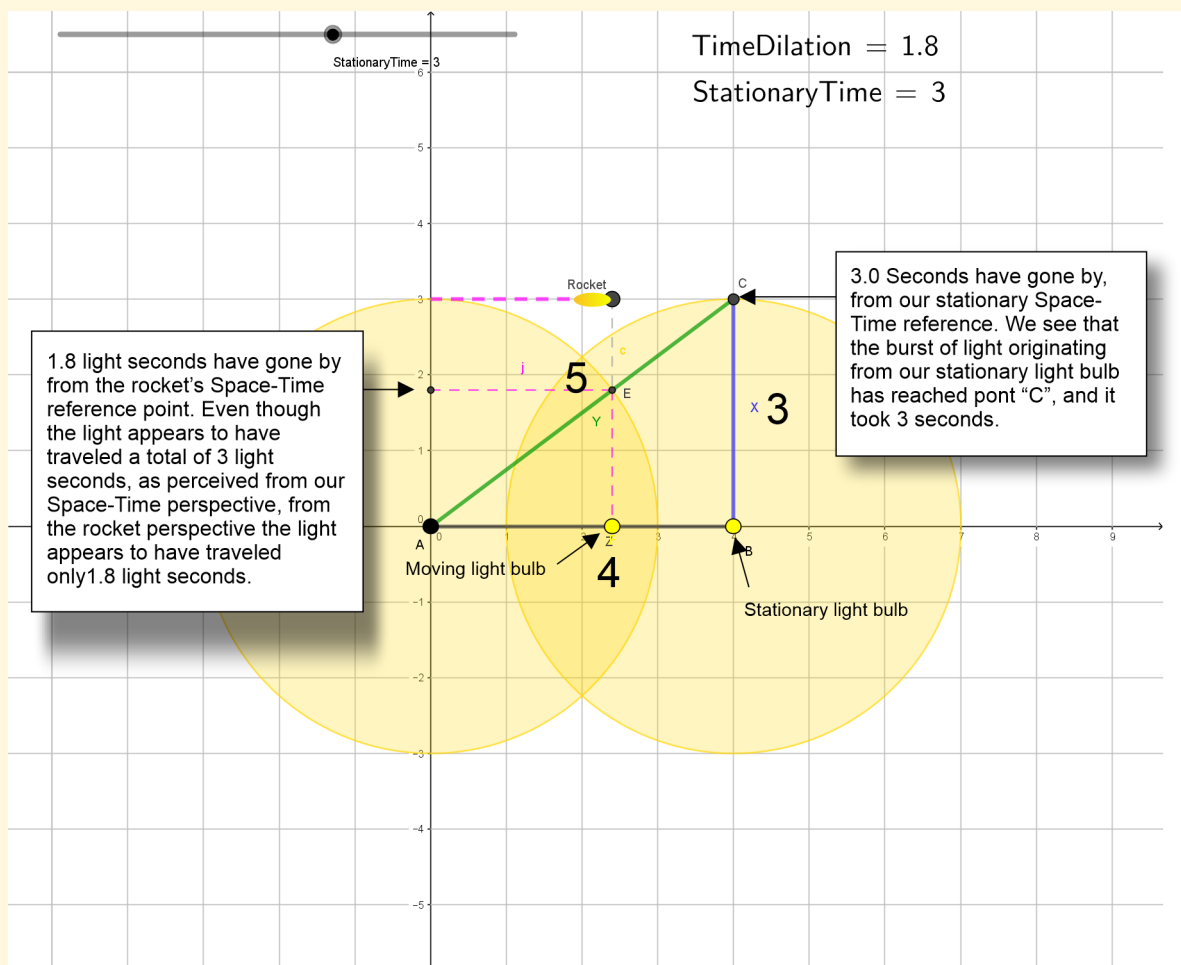## TIME DILATION EXPLAINED for DUMMIES

Finally, 5 seconds, of experienced time (as perceived from our stationary frame of reference) have transpired. The light pulse ("E") propagating from the left sided light bulb finally meets up with point ("C"). We perceive the distance the light pulse travelled as a passage of 5 light seconds. But from the rocket travelers dilated Space Time reference point, 3.0 seconds of time have passed . It *HAS* to be 3 seconds because the light pulse, as originally emitted at the point ("A"), was positioned a distance of 3 light seconds below the rocket, at the origin point ("0,0"). It truth, it never mattered where the moving light source might have positioned itself after emitting the light pulse.

The moral of this relativity/geometry lesson comes down to the fact that 3-4-5 right triangles can come in handy—at times. It also took six meticulously assembled illustrations, a mock cover, and a full work-week to exploit the pun.
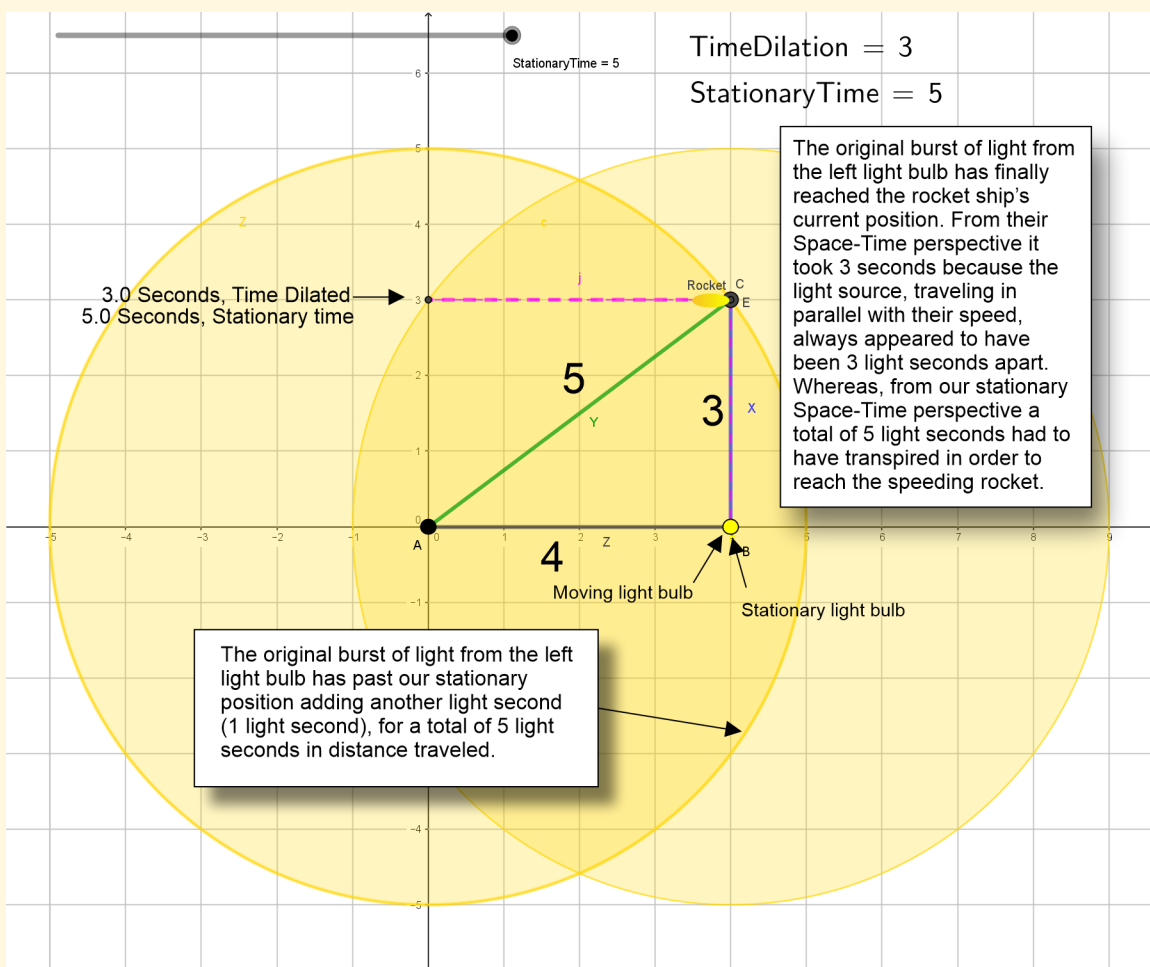

TimeDilation = 3

StationaryTime = 5

StationaryTime = 5

The original burst of light from the left light bulb has finally reached the rocket ship's current position. From their Space-Time perspective it took 3 seconds because the light source, traveling in parallel with their speed, always appeared to have been 3 light seconds apart. Whereas, from our stationary Space-Time perspective a total of 5 light seconds had to have transpired in order to reach the speeding rocket.

3.0 Seconds, Time Dilated
5.0 Seconds, Stationary time

Rocket C

E

5

Y

3

X

A

4

Z

B

Moving light bulb

Stationary light bulb

The original burst of light from the left light bulb has past our stationary position adding another light second (1 light second), for a total of 5 light seconds in distance traveled.

FIG 6

Tag Along

By Darlene P. Coltrain

On the night of the September full moon I didn't really expect Charm to come in because it was so lovely out. I wanted to stay out and play! She did come in though, and brought her apatite with her!

Then, the next day a dear friend posted about seeing the moon where she is far away out west…

This happened:

> Distance:
>
> We were looking at the same moon last night.
> Then I was watching Charm's moon shadow
> Walk across the street with her
> Coming home for kitty supper
> Sometimes just whistling for her is not enough
> Sometimes she comes to the locater signal
> Sometimes it takes persuasion
> Sometimes nothing works
> And she stays out
> Dancing to the magnificent full moon
> All night long.
> Last night she came in safe.
> I'm glad that you did too.
> You are not alone.
> Just geographically far away.
> We have the same moon as the cat
> And that makes me happy.

Thank you all who commented on the #422 cover! It is especially nice that our work has an 'afterlife' here and Steve can exercise his graphic design muscles even when he's not actually contributing the art. This is good for us while we are not showing at conventions…

Comments from Darlene

Elizabeth! Here there is no bar to set higher. All covers are good by definition because we are TURBO…heh… besides that, It's all art to me. I love the koi frenzy photograph too!

Andy! Interesting covers are GOOD! gimmme a break… Are we not FANS? It's all good!

Carrie! Yes, the scarves are truly one of a kind paintings on silk. What can I say, I am terribly easily bored with my own art… Fortunately Steve has pestered me into preserving images for greeting cards and some prints, and… ta-da, the occasional TURBO cover… I hope to have another koi cover for April but the silk shop has fallen to wrack and ruin since Covid started canceling my best conventions. I'm not sure that new work will be finished in time…

A brief haiku from Steve

CArroT PAWS (rare)

> Stretch out a Cat paw
> Lick a tiny little claw
> That's not meat I smell