Re: The Nanometre Twin

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2007−11/msg00681.html

- *From*: stevendaryl3016@xxxxxxxxx (Daryl McCullough)

- *Date*: 7 Nov 2007 18:48:46 −0800

Peri of Pera says...

> Androcles said:
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> > c+v is essential to the derivation of the cuckoo malformations, the part where Einstein screws up is:
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> > 'we establish by definition that the "time" required by light to travel from A to B equals the "time" it requires to travel from B to A'
> >
> > If distance A to B is equal to distance B to A and the speed of light is constant is it not logical that the two paths will be traversed in equal "time"?

Androcles is a deeply confused person, and he has been obsessed with a single line from a paper by Einstein for years, perhaps decades. And he steadfastly refuses to let anyone unconfuse him. He has this in common with several other obsessive anti−relativists, including Koobee Wublee, "Sue", and Alen:

1. He completely misunderstands relativity.
2. He believes (based on his misunderstanding) that it is inconsistent.
3. If anybody else tries to explain things in a way that is clearly consistent, he accuses them of misunderstanding relativity. (If you can make sense of it, you must be doing something wrong...)

Anyway, the particular line that Androcles is obsessed about is part of Einstein's derivation of the Lorentz transformations. Suppose we have two inertial reference frames, F and F', with a relative velocity of v between them.

Suppose you have two people (called "A" and "B")
that are far apart, and they are at rest in some frame,
called F'. How would they go about synchronizing their clocks?
Well Einstein proposed what is called the "Einstein synchronization
convention". It works like this: At time t1' according to A's
clock, A sends a light signal to B. It reaches B at some time
t2' according to B's clock. B immediately sends a return signal
back to A. The return signal reaches A at time t3', according
to A's clock. We say that A's clock and B's clock are synchronized
in frame F' if the following holds:

$(t2' - t1') = (t3' - t2')$

or, solving for t2',

$t2' = (t1' + t3')/2$

This is the only choice for t2' that makes sure that
the time required to go from A to B, namely $(t2' - t1')$,
is equal to the time required to go from B to A, namely
$(t3' - t2')$.

This analysis all depends on the fact that light has
the same speed c in all directions in frame F'. But
now, let's look at this same situation from the
point of view of frame F.

As seen from frame F, A and B are not at rest, they
are moving at velocity v (with the direction of their
motion being along the line connecting A and B). If
we do the same analysis from the point of view of
frame F, we get completely different results. Let
t1 be the time, as measured in frame F, at which
A sends a light signal towards B. Let t2 be the
time, as measured in frame F, that B receives the
light signal and sends a return signal. Let t3 be
the time, as measured in frame F, that the return
signal arrives at A.

Since, as measured in frame F, A and B are moving,
it takes longer for light to travel from A to B
than it does in the other direction. Why? Well,
when the light is moving at speed c towards B,
B is moving *away* at speed v. The net effect
is that the "closing speed" between the light
signal and B is not c, but is $c-v$. On the return
trip, as the light signal is moving towards A
at speed c, A is moving towards the light signal
at speed v. The net effect is that the "closing
speed" between the light signal and A is not c,

but is c+v. So from the point of view of frame F,
the expected relationship is not

(t2 − t1) = (t3 − t2)

but

(t2 − t1) * (c−v) = (t3 − t2) * (c+v)

So, in frame F, it is *not* the case that the
time to go from A to B is the same as the
time to go from B to A. In frame F, it takes
much longer to go from A to B than vice−versa.
So t2 is not half−way from t1 to t3.

Androcles thinks that this is a contradiction.
It isn't. It just means that the Einstein synchronization
scheme only synchronizes clocks in *one* frame, namely
the frame, F', in which the clocks are at rest. It doesn't
synchronize them in another frame, F, in which the clocks
are moving. So the clocks are synchronized in one frame,
but not in the other. Androcles thinks that's a contradiction,
but it's not.

The other thing that Androcles thinks is a contradiction is
the following trio of statements:

1. Light has speed c in every inertial frame.
2. The closing speed between the light signal and B is c−v.
3. The closing speed between the return signal and A is c+v.

Androcles cannot seem to grasp that the closing speed between
the light signal and B as measured in frame F is not equal to
the speed of light as measured in frame F'. The closing speed
between the light signal and B as measured in frame F is the
following ratio:

closing speed = D/T

where D = the initial distance between the objects, as measured
in F, and T = the time required for the objects to meet, as
measured in F.

The speed of light as measured in frame F' is the ratio:

speed of light = D'/T'

where D' = the initial distance between the objects, as measured
in frame F', and T' = the time required for the objects to meet,
as measured in frame F'.

D' is not equal to D, and T' is not equal to T. So there is no
reason to believe that D'/T' should be equal to D/T.

This has been explained to Androcles many times.

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Daryl McCullough
Ithaca, NY

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