Re: Why tethered electrons?

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- *From*: "Mark L. Fergerson" <mfergerson1@xxxxxxx>
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Timothy Golden BandTechnology.com wrote:

> Mark L. Fergerson wrote:
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> > Timothy Golden BandTechnology.com wrote:
> >
> > > I followed the candle trick thread a little bit and have tried it. The
> > > dimensional and geometric concerns seem completely relevant. There is
> > > no real difference between the coffee mug simply flipping over spilling
> > > the coffee on the floor and then coming back upright on the other side
> > > is there?

I should have said something about this earlier. Yes, there's a difference; you cannot continue this rotation the same way as with the candle.

> > > The 3D context is in conflict so a different model should be
> > > used. We can simply say that there is no detectable difference of an
> > > object rotating 360 or 720 or whatever whole number of rotations.

We can, but we'd be wrong WRT observation.

> > > Therefor a tether relation is relevant since it starts to model the
> > > claimed behavior (which I'm not entirely sure that I believe in) of
> > > electron spin. But the fact that it does it in a 3D environment

> may not
> be so useful as you would like it to be. Why such a tether
> should not
> actually wind and remember how many winds and provide a
> torque etc. are
> open questions.

Spin means "angular momentum" here; the memory you speak of is in the momentum. After you right the coffee cup its momentum around its rotation axis is cancelled.

> What is at the other end of the tether is also fairly
> relevant right? The trick uses a human body and an object in
> the palm
> of the hand. If the electron is the object and the arm is the
> tether
> then what is the human torso?

No, the torso+candle are a composite object and the arm is a "sub−tether". Implicit in this model is the assumption that electrons (and other things that exhibit this "spin anomaly") are composite objects no matter that they always appear to be points when looked at closely enough. This is one of those "willing suspension of disbelief" things in physics; we allow the assumption for the moment and see where it leads us; if it ends up in contradiction with experiment we go back and see where it falls apart. If it doesn't, we accept it as a working assumption and try harder to break it. If it refuses to break, it may mean we have to re−examine our earlier assumption(s) about what "point−ness" means.

> You use the word environment but that is
> too abstract. What is it? Should we admit that a solitary
> electron
> posesses this quality as well?

There is no such thing as "solitary" if it has an observer. If there's no observer there's no anomaly to be seen.

> In the SU2 thread I offered a thought−experiment suggestion that
> seems to have gotten lost.
>
> Assume you're very strong, and the candle masses exactly as much as
> you do. Now do the trick while standing on a turntable with frictionless
> bearings; as you rotate the candle one way, you rotate the other way on
> the turntable.
>
> What is seen by an external observer (one tied to whatever the
> turntable's standing on IOW the "environment")?

> Is the electron spin geometric analogy also expressible as a real line
> analogy?

Per your suggestion about extra values for each orientation, possibly.

> I'd be grateful to get you opinion since I am trying get a better
> understanding of electron spin.

Welcome to the crowd. ;>)

> I remember your turntable but in the analogy you now have four
> component objects and the third is still not clear to me.

How did you parse four objects? There's you and the candle as one composite object, and the observer (environment). The turntable represents the "channel" through which you are connected to the observer and the observer makes measurements of your state.

Are you seeing your arm as a "tether" and the turntable as another?

> So working in
> your turntable analog I would like to know what the object sitting at
> the center of the turntable is which is tethered to the electron. The
> validity of the entire analogy is questionable until this point is
> resolved.

It's the candle, and we can't see it.

> Please consider a notion of 1D rotation. This is completely unlike 2D
> rotation where handedness is maintained. in a 1D rotation an axis can
> be inverted by multiplying it by minus one. This can be performed in
> any number of dimensions once the axis is chosen. The effect on an
> object is that it changes handedness. Two such flips get you back where
> you started. So spin becomes handedness under this simplistic model.
> With a tether attached to a point particle electron should this 1D
> rotation flip the tether to the opposed position? This seems
> reasonable. In 3D we have two dimensions left to work with. This has a
> nice electromagnetic equivalence since we are getting a normal plane
> naturally. This may fit with a
> 0D 1D 2D ...

> topology.
> If the tether was winding should it be unwinding after a 1D rotation?

Why? In the thought experiment I described, in what sense can your arm be said to unwind considering the candle does not reverse its rotation WRT your shoulder? Notice the candle's axis of rotation as sen by you, and your axis of rotation as seen by the observer, are the same. Compare with your coffee−spilling example.

Remember, we're talking angular momentum. If it unwinds there's no momentum.

[I jumped in this thread (these threads?) because some time ago Edward asked a question about whether making a body rotate through some angle without interacting with the outside world was possible. I pointed out that it's easy if the body is composite. Example− sit in a swivel chair (assume frictionless bearings) with your feet off the floor and your hands in your lap. Stick one arm straight out in front of you, then swing it to your right, then put it directly back in your lap. You will have rotated to your left by an amount proportional to the mass differential of your arm and the rest of your body+chair's mass. However this does not impart angular momentum to you; you stop rotating when you put your hand back in your lap. The relevance to the candle trick leaped out at me. Notice that in the turntable experiment you and the candle have equal _and opposite_ senses of rotation, yet the observer sees you as having nonzero angular momentum.]

The word "rotation" takes on different meanings in different numbers of dimensions, and there are rotations you can peform in higher dimensions that do not have exact analogs in lower dimensions.

When you say "invert the axis" you imply rotation through a higher space regardless of how you say it mathematically; there's no other "physical" way to do it. Which way the second reversal is done (whether the tether keeps winding or unwinds) depends on whether or not there's any angular momentum afterward; are you talking coffee cup or candle trick?

> Superposition says something about this sort of possibility right?

We'll get to that.

Mark L. Fergerson

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