

Re: What causes time dilation?

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"Old Man" <nomail@nomail.net> wrote in message
news:<FuGdnVs954KCCrPcRVn-pw@prairiewave.com>...
> "hunkahunkaburninluv" <some@where.come> wrote in message
> news:2p75lgFhs9v9U1@uni-berlin.de...
>> *First, I am not a physicist. I do desktop publishing as a profession, but
> am
> an avid sci-fi reader.
>>
>> Two related questions. What causes time to slow down as a ship approaches
>> the speed of light? Is there any possibility that we could create the
> effect
>> on a stationary object? Imagine a room in which time was slowed down to
> say
>> 1% normal. One year might in it might equal 100 years.
>
> Sure you can do that by modification of the space-time
> metric, that is, by increasing the curvature of space, for
> some limited region of space. For, example, see to it
> that the gravitational field is increased in that special
> room of yours.
>
> Actually, a field isn't required. All you need is a huge
> amount of gradient-free, negative gravitational potential.
> You can do that by constructing a massive spherical
> shell about yourself. Then, through peepholes in the
> shell, you can watch time fly by on the shell's outer
> surface, all in weightless comfort.*

That's a very cute idea, Old Man.

You could use that as a refrigerator: Say your peach is ripe. You just pop it in your massive spherical shell, and, a week later, when you want to eat it, you take it out, a few minutes older. Better than a refrigerator.

I wonder somewhat about the physics of watching time fly by, though. If a some light at frequency f came down your peephole, would its

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frequency on receipt be slowed by the same factor?

No, I guess that's not so: light climbing out of a gravity well is red-shifted -- i.e., *_not_* speeded up to the frequencies we would expect for its particular spectral transmission. It carries the stigmata of its slow birth. So I guess the reverse is true, and light falling in would be blue shifted to the internal observer. Which does solve a queuing problem for all the light which would otherwise be waiting around to fall in your peephole. Not to mention the even more significant precognition problem for light climbing out.

- > *However, for a large factor in time-rates between you*
- > *and those on the surface, the people on the surface*
- > *would be living (?) in a huge gravitational field. So, lets*
- > *put them out in space, almost an infinite distance away.*
- > *Then the ratio in time rates between you and them is*
- > *given by*
- >
- > $\Delta t(\text{you}) / \Delta t(\text{them}) = \sqrt{1 - 2M/Rc^2}$
- >
- > *where M and R are the mass and radius of the shell,*
- > *and G is the universal gravitational constant. Note that*
- > *your time approaches zero (their time approaches infinity)*
- > *as the mass of the shell, M, approaches that of a black-*
- > *hole of radius, R, but everyone lives in free-fall comfort.*
- >
- > *See: "Gravity: An Introduction to ..." by J.B. Hartle*
- > *ISBN 0-8053-8662-9*

Should be banned by the GR technicians, of that is an example of its teachings: it was clearly comprehensible! :-)

(P.S. He asked about kinematic time dilation, not gravitational. But yours was a lovely answer anyway ;-).