Time Dilation

Eric Hehner

According to current physics, time passes more slowly for someone in motion (relative to you) than it does for you. And time passes more slowly for someone in a stronger gravitational field than it does for someone in a weaker gravitational field. Wikipedia (viewed 2024-3-20) says "Time dilation is the difference in elapsed time as measured by two clocks, either due to a relative velocity between them (special relativity), or a difference in gravitational potential between their locations (general relativity)."; and "The faster the relative velocity, the greater the time dilation between them, with time slowing to a stop as one clock approaches the speed of light.".

Physics currently measures time by counting vibrations of cesium atoms. A second is defined as 9192631770 vibrations. I suppose that if two cesium atoms are placed side by side, and we start counting their vibrations at the same instant, then at some instant a long time later we check both counts, we find they are the same. I do not have a reference for this, but I suppose the experiment has been done with that result; otherwise this way of measuring time would be nonsense. However, if we have two cesium atoms side by side, and we start counting their vibrations at the same instant, and then we send one of them on a journey, and it later returns to its original position beside the other atom, and then we check both counts, we find they are different: the atom that went on a journey vibrated fewer times than the one that stayed home. Also, if we have two cesium atoms side by side, and we start counting their vibrations at the same instant, and then we put one of them on the top of Mount Everest, and the other on the banks of the Dead Sea, and we leave them there for a while, and then bring them back together and check the count, we find that the one from Mount Everest vibrated more times than the one from the Dead Sea. Again, I suppose these experiments (or equivalent experiments) have been done with those results, because that is what current physics says will happen.

It seems reasonable to me to conclude from these experiments that cesium atoms vibrate at different rates, depending on their circumstances. But that is not what current physics says. Current physics says that cesium atoms all vibrate at the same rate, but time goes faster or slower depending on the circumstances of the atom that measures the time. Two atoms in different circumstances experience different amounts of time.

This doesn't make sense to me. I am not disagreeing with the results of experiments. And I am not saying that the current physics explanations are wrong. I am saying that the current physics explanations are senseless: either inconsistent or meaningless.

Suppose, at some instant, time suddenly changed its rate; let's say it becomes half what it was. Does that mean that everything moves half as fast, or twice as fast? Let's say half as fast. Our neurons also switch half as fast, so we don't see the change. And our clocks (including cesium atoms) go half as fast, so we can't measure the change. There is no way to detect whether this has happened or not, and that makes it meaningless.

According to current physics, the passage of time is not absolute; it is measured differently by different observers. Physicists have calculated that an astronaut who goes to the International Space Station, then spends 6 months orbiting the Earth at a speed of about 7700 m/s, and then returns home, would have aged about 0.005 seconds less than a couch potato who stayed home on Earth. But a point on Earth is no more "at rest" than the space station. The couch potato sees

the space station move overhead. An astronaut in the space station does not see the space station moving; the astronaut sees the Earth spinning, moving the couch potato. From another point of view, both the Earth and the space station are orbiting the Sun, and all three are orbiting the galaxy. Motion is relative, and no frame of reference has special status, so the astronaut is just as entitled to calculate that the couch potato has aged 0.005 seconds less. Suppose the astronaut and couch potato each have a cesium clock, and before the astronaut is launched, they synchronize their clocks (they start a fresh count of vibrations). And then, after the astronaut returns, they check their clocks (compare vibration counts). They cannot each see that their vibration count is more than the other's. That would be inconsistent.

A black hole provides an extreme example of time dilation. According to current physics, to an outside observer watching an object fall into a black hole, the object takes forever to reach the event horizon (a specific distance from the center of the black hole), and it never gets past that horizon. But to someone who is falling into a black hole, they reach the event horizon in finite time and continue falling inward. So which is it: finite or infinite time to reach the event horizon? According to current physics, the answer depends upon your observation point. Are you watching from outside, or are you the object falling in?

An activity happens at a certain rate. For example, a cesium atom vibrates at 9192631770 vibrations per second. A car travels at 100 km/h. A heart beats at 60 beats per minute. A rate is measured as some unit per time. If time passes at some rate, what are the units? Would they be seconds per second? NASA is creating a time standard for the moon that differs from the time standard for the Earth. They say that because there is less gravity on the moon, time there moves a tad quicker, 58.7 microseconds per day, compared to Earth. “Microseconds per day” is time per time. It seems to me that cesium atoms vibrate more quickly on the moon than on Earth at sea level, not that time passes more quickly.

Physicists even talk about time reversal, time going backwards, and wonder why the “arrow of time” goes forward. Again, that's nonsense. It does make sense to talk about events occurring in the opposite order to what we observe, but that's not time going backwards; it's events happening in a different order. Why do events occur in the order that we observe? The answer is that they occur in the order of increasing entropy.

To a person, a hummingbird is fast-moving, living its life at a quicker pace than we live. To a hummingbird, a person is slow-moving, living at a slow pace. We might say that time moves faster for a hummingbird than for a human. But we don't mean that. We mean that a hummingbird's heart beats faster, and its neurons fire more quickly, and its muscles move more quickly than ours. We measure all these activity rates, theirs and ours, by the same standard of measurement, which we call time. People also say that in some circumstances, perhaps moments of danger, that time seems to pass more slowly than at other times. Or an old person might say that the days pass slowly but the years zip by. In all cases, saying that time passes quickly or slowly is just a way of saying that events seem to happen quickly or slowly. Events seem to happen quickly when my brain is acting slowly, and events seem to happen slowly when my brain is acting quickly. These psychological measures of time are not what physicists mean by time dilation.

Since the invention of movies in 1895, we can show a recorded sequence of events at the speed at which it occurred, or faster, or slower, or stopped, or even backwards. This is also not what physicists mean by time dilation. But I wonder if the previous paragraphs about psychological time, and the fact that movies can be played faster, slower, stopped, or backward, might have

affected physicists to say and accept the nonsense that time, not events but time itself, can run faster or slower or stopped or backwards.

Time has a past, a present, and a future. The present becomes the past, and the future becomes the present. These are words that apply to time. We also talk about time metaphorically as motion; we say “time flies”, or it “flows”, or it “moves”. Things that fly or flow or move have a rate of movement, measured as distance per time. But time doesn't really fly or flow, it doesn't really move, and it has no rate. This essay began with the phrase “time passes more slowly”; that phrase is meaningless. A bicycle goes fast or slow, but time does not go fast or slow.

I am satisfied to define one second as 9192631770 vibrations of a cesium atom, but since different cesium atoms in different circumstances vibrate at different rates, you have to say which cesium atom. We used to define one meter of distance by pointing to a specific piece of platinum-iridium. It is now defined as the distance light travels in vacuum in 1/299792458 seconds, so we need to have a reliable definition of a second, and for that we may need to point to a specific cesium atom. Its location defines a standard inertial frame of reference and a standard gravitational potential. We used to define one kilogram mass by pointing to another specific piece of platinum-iridium; it is now defined in terms of the Planck constant, the meter, and the second, and the meter is defined in terms of the second. So the second is the one fundamental unit, and for that we need a specific cesium atom. Or we could define one kilogram more directly as the mass of a specific number of that particular cesium atom. That precious atom would then be the holy grail of science.

Afterword

There is a kind of bullying that goes on in science. It says that if you don't accept the current scientific theories, then you must be stupid. This bullying is fueled by the fact that there are many people who do not accept science because they really are scientifically stupid. Pointing out that some bits of science are wrong, or nonsense, has the terrible side-effect of reinforcing the anti-science attitude of the ignorant science deniers. Not pointing out that some bits of science are wrong or nonsense is also bad because then science does not improve. It's a dilemma.

I have a degree in physics. I got A+ on the relativity course. But that was long ago, and I am not a physicist. I regard myself more like the child who declared that the emperor has no clothes.

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