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Is "Time" Speeding up?

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Abstract

This article considers the possibility that there might be a plausible scientific explanation for the 900-year lifespans of the characters in the beginning of the biblical book of Genesis. The explanation is based upon the hypothesis that there may be two different forms of "time". The first form would be "astronomical" time, which is based upon the quasi-perpetual rotational and revolutionary motions of heavenly bodies. The rates of these processes, which ideally consume no energy, have been, to a first approximation, relatively invariant, at least within the brief temporal framework of recorded human history. The second form of time would be "thermodynamic" time, the measurement of which is based upon the movements of clocks, whose reported rates of passage of time are linked inextricably to a decrease in the free energy of the system. This second form of time is the form generally employed to measure the rates of progress of physical phenomena, such as chemical reactions. If the underlying rate of passage of thermodynamic time had changed at some point in history, both the chemical reactions and the clocks used to measure their progress, would have changed together, which change might therefore have gone unnoticed. The effects of a changing thermodynamic clock on human perception of the world, and upon the perceived speed of light, are discussed.

Subject Areas

Philosophy

Keywords

Time, Perpetual Motion, Speed of Light, Second Law of Thermodynamics, Time Crystal, Bible, Genesis, Lifespan

1. Introduction

This communication proposes a single solution to two seemingly irreconcilable discrepancies between science and faith:

1) The fact that the early personages of the Bible are said to have lived to be 900+ years old, and

2) The fact that the universe appears to be too large to have been formed a mere 6000 years ago.

In dealing with these problems, I make no presumptions whatsoever about the identity of the author of the Bible, presuming only that those who have preserved it for us through the years have done so to the best of their abilities.

Concerning the long lives of Adam and his early descendants, I am not aware of any scientifically persuasive argument to account for this longevity, other than to accept it as a manifestation of God's will.

On the other hand, concerning the problem of the apparently excessive size of the universe relative to its purported biblical age (~6000 years), there is a solution, oft-cited by scientific creationists, based on the argument that the speed of light is *decreasing*. The argument states that the speed of light, although apparently constant at any given time in history, nevertheless used to be much, much *faster* than it is now. Therefore, the light of objects at the periphery of the known universe, apparently hundreds of millions of light-years away, actually took much, much *less* time to reach our eyes than it would have taken, had light always traveled as *slowly* as it does now.

There exists a considerable body of published evidence (reviewed extensively by physicist-creationist Walter Brown [1] [2]) suggesting that the measured values obtained for the speed of light have had a statistically-significant tendency to *decrease*, progressively, since such measurements began, and that such decreases continued until about 1960, that being the point in history at which the time-measuring devices used for the determination of the speed of light were changed from mechanical to atomic clocks, which—or so the theory goes—are slowing down at the same rate as light itself.

This all suggests a single solution to the two irreconcilable discrepancies alluded to above. The proposed solution is that "time" itself is now moving "faster" than it did in the days of the Biblical book of Genesis.

I enclose the word "time" in quotation marks, because I shall propose that the meaning of the word "time" may be dependent upon the species of device one resorts to when measuring it.

2. "Astronomical" vs. "Thermodynamic" Time

The Bible states that God made the heavenly bodies for "signs, and for seasons, and for days, and years" (Gen. 1:14). Our most fundamental concepts of time arise from the rotation of the earth about its axis (which defines our "day"), and its revolution around the sun (which defines our "year"). I shall refer to the species of time defined by motions of heavenly bodies as "astronomical" time.

Let us note that these two motions of the earth, namely rotation and revolution, are not, ideally-speaking, energy-consuming activities. These are examples of circular acceleration, and, according to the laws of thermodynamics, in ideal rotating and revolving bodies there is *no net gain or loss of energy in the system*. In fact, in an ideal frictionless

system, rotating and revolving bodies are engaged in a type of perpetual motion.

Now, it is possible to suggest a second, and entirely different method of measuring time, namely a method based upon changes in various thermodynamic systems. By the term "thermodynamic systems" I mean systems in which the pertinent changes are accompanied by decreases in the *free energies* of the systems. Clocks (with the possible exception of atomic clocks) generally operate according to physical mechanisms which cause the free energy of the system to *decrease*, in accordance with the laws of thermodynamics. In a battery-driven clock, for example, the battery charge will be depleted as the clock ticks. In a spring-driven clock, the spring will unwind. And so forth.

I shall refer to this latter species of time as "thermodynamic" time.

It is commonly presumed that time is the same for circular acceleration systems (such as the rotating earth) as it is for time-keeping systems which consume energy (such as a clock). What if this is *not* so?

That is, what if the only constants in this picture were the lengths of the day and year—the astronomical lengths, that is—whereas those processes in the universe which come about because of a decrease in thermodynamic free energy occur at rates determined by an invisible and virtually imperceptible *thermodynamic clock*—a clock whose own speed may *not* necessarily be constant, but which may change over time?

If this was the case, would we notice it?

Not necessarily. If, for example, every chemical reaction and physical process in the universe suddenly speeded up by, say, 0.01%, and if all the clocks we had at our disposal to measure the change had also speeded up by the very same 0.01%, the change might go unnoticed.

But the change might be noticed by comparison with the lengths of the day and year, because, in principle at least, the rotation of the earth around its axis, and the revolution of the earth around the sun, are not accompanied by a change in the free energy of the system. In other words, employing our new terminology, there could be a disproportionation between "astronomical time" and "thermodynamic time". For the sake of the present argument, we shall assume the former to be approximately constant throughout history—a temporal "gold standard" of sorts—whereas the latter we shall assume to be possibly in a state of flux; a state of flux which, however, might be imperceptible when measured by a thermodynamic clock.

3. Practical Application of the Theory

How might living things be affected if there were two different types of time? In most familiar forms of life, energy is derived from the oxidation of glucose, which surely occurs according to the laws of thermodynamic spontaneity. For oxidation of glucose under any particular set of circumstances whatsoever, "thermodynamic time" would be the incomprehensible and hitherto undetectable power which determines the rate of oxidation (relative to our "gold standard") under that particular set of circumstances. If a modern man lives, say, 90 years, then in each revolution of the earth around the sun, he will oxidize a certain amount of glucose, corresponding to 1/90 of the total glucose

he will oxidize during his entire life. If in the past, however, "thermodynamic time" had been running at only 1/10 that "speed", then in each revolution of the earth around the sun he would only have oxidized 1/10 that amount of glucose. And, since all the chemical reactions which collectively constitute "aging" would *also* have been running at 1/10 their current rate, he would have lived 900 years!

I am nearly 70 years old. Suppose that in every *astronomical* year (*i.e.*, the time it takes the earth to revolve around the sun) I accumulate 10,000 more gray hairs (which is, unfortunately, the case!). Each of these 10,000 instances of hair-turning-gray is the result of numerous chemical reactions, each one of which is accompanied by a decrease in the free energy of the system. If, in the days of Adam, *thermodynamic* time, as defined here, was proceeding at only 1/10 the "speed" it proceeds at now, then in the same *astronomical* year, Adam would have accumulated only 1000 gray hairs—a mere 1/10 the number of gray hairs I accumulate in a modern year. In other words, if it takes 90 astronomical years for every hair on my head to turn gray, then it would take Adam 900 astronomical years to reach the same level of grayness.

Thus, the presumption that all thermodynamic events in the universe are linked to an invisible and imperceptible clock which is speeding up, can potentially explain the observation that people once lived 900 years. These were 900 years on the *astronomical* clock only; that is, these ancient people counted 900 revolutions of the earth around the sun before they died of old age. The amount of physical aging they had undergone in those "900 years", however, may have corresponded to only 90 years-worth of physical aging according to our current perception of time.

Now, let us consider our second "irreconcilable discrepancy" between science and faith, namely the size and age of the universe. This size is measured in large units such as "light years". Deductions about the age of the universe are based upon its measured size, and the calculated length of time it would take for light to reach our eyes from its periphery. According to this view, it would appear that the universe *must* be billions of years old. However, if the velocity of light used to be *greater*, then the length of time necessary for light to traverse large gulfs of space in the distant past may have been *shorter* than it is now—very much shorter according to some authors—and therefore the age of the universe might be less than we currently think.

Is this proposition, namely that the speed of light is slowing down, consistent with our hypothesis that "thermodynamic clocks" are speeding up? Broadly speaking, it is. Discounting, for the moment, a number of important questions which would have to be raised concerning the type of clock used in making the determination, it may be generally noted that the measured velocity of light over a given distance will appear to *decrease* if the rate of the clock has *increased*.

This perhaps odd-sounding suggestion—namely that "time" may have different meanings in thermodynamically-evolving systems than it does in rotating or revolving systems whose movements are not energy-dependent—is admittedly radical, to say the least. What would the world have been like 6000 years ago, if indeed clocks were far slower than they are now? Let us consider, for illustrative purposes, a single example:

agriculture.

We are informed by the Bible that agriculture was indeed practiced in the beginning. Cain made an offering to the Lord of the "fruit of the ground" (Gen. 4:3), and Noah, wise man that he was, planted a vineyard and drank the wine thereof (Gen. 9: 20-21). If all chemical and biological activities proceeded at 1/10 the rate back then, how could crops grow to maturity before the onset of winter; an onset whose timing was based upon *astronomical* time, which we are presuming to be invariant throughout history?

My answer is this. Weather itself is surely a process which proceeds according to the dictates of the laws of thermodynamics. Therefore, odd though it may seem, the weather back then might also have changed *more slowly* than it does now, as the earth followed its annual course around the sun. Let us consider the four seasons of the modern world to each be 90 days in length. What we are saying is that just as Adam, back then, would only grow 1/10 the gray hairs that I would in a 90-day period today, similarly, and for the same reasons, the weather might have changed only 1/10 as much in a 90-day period as it does now.

This means that back then, the 90 days each of winter, spring, summer and fall might have entailed no more change in the weather than we would see today if the seasons were only 9 *days in length.* Imagine a year in which the sum total of all weather changes was equivalent to that which would be seen if spring was a mere 9 days in length, followed by only 9 days of summer, then 9 days of autumn, and a pleasantly short 9-day winter! Since 9 days is not enough time for the temperature to change a great deal, the net result would be essentially constant weather year-around; an eternal spring of sorts.

So much for such speculations. In any event, since the human life span has not changed appreciably since Moses, we must presume that the rate of the proposed "thermodynamic clock" has not changed very much during the last three millennia. Alternatively, it may be changing according to some exponential function which is now in a plateau or near-plateau phase.

Ridiculous? Perhaps. But I don't suppose it's any more ridiculous than the proposition that a high-quality stainless-steel yardstick, all its rigidity notwithstanding, might actually get shorter merely because someone made it move along a little faster.

I reiterate that in stating these propositions, I make no presumptions about who wrote the Bible. Whatever one may believe about its authorship and purpose, it cannot be denied that that book—and I include here its "Old" Testament as well as its Christian and Muslim sequels—has constituted the backbone of the process of human moral, social and political development in the west (and possibly the east as well, according to an argument which is beyond the scope of this manuscript) for a very long time. The plain and readily-demonstrable fact of the matter is that those nations which have preserved it have survived—in one form or another—to the present day, whereas those nations which have rejected it have disappeared with astonishing regularity. Therefore, regardless of how silly the Bible at times appears to be, it might perhaps behoove us to refrain from casually dismissing any of its lessons prior to a deliberate and thoughtful inquiry.

4. Testing the Theory

Needless to say, it would be highly-desirable to find a way to test this theory. That, however, might be difficult or impossible, since any hypothetical disproportionation, between our proposed two types of time, would take place over periods greatly exceeding a human lifespan, much less the duration of a single laboratory experiment. The place to seek a test must therefore be sought in particle physics, where changes take place in mere nanoseconds.

Might there be examples already known, in the realm of particle physics, of systems within which forms of perpetual motion (*i.e.*, motion that is *not* accompanied by a decrease in the free energy of the system) exist? If so, these might be compared to other subatomic motions which do follow the Second Law, multitudes of examples of which are known.

Along these lines, it is interesting to note that at least one example of subatomic perpetual motion has been proposed, by F. Wilczek in 2012 [3], which he referred to as a "quantum space-time crystal". Tongcang Li *et al.* [4] have suggested a method for actually creating such space-time crystals, by confining ions in a ring-shaped trapping potential with a static magnetic field. They propose that the resultant ion crystal will rotate persistently, with no loss of energy. If so, this might form the basis for the test that we seek, comparing rates of motions between this suggested form of perpetual motion, and the more familiar forms of subatomic motion which follow the Second Law.

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