Some Thoughts on Time

Once upon a time…

In considering the nature of time, what appears to first be needed here is a consideration of our perception of the nature of time...

"What is time? What a ridiculous question! Why, everybody knows it's what a clock measures - the hours in a day!"

Well, that's what most people, at least if heralding from anywhere touched by a Westernized culture, consider time to be.

The origin of this concept of time resides in a human subjective perception within the context of Earth. In human perception, it is the recognition of repeating patterns that establishes an understanding of something substantive existing "out there". This perception of repetition is the basis for what we call "real". This perception does not provide much information about any "true nature" of what it is that is generating a visceral sensation of repetition of sameness, but that repetition for us as infants is what establishes the "isness" of the world we come to know - the basis of our concept of reality.

Approximately 13,000 years ago, the nature of that reality for formerly hunter-gatherer cultures around the world underwent some fundamental change. Nearly everywhere there were changes going on in what then existed of human cultures. This shift roughly coincides with climatic changes known as the Younger Dryas (a cool, wet period), the extinction of large animals such as mastodons that had been being hunted and possible additional challenges; there is some indication of a major extraterrestrial object impact along the eastern coast of North America at this time.[1] In any event, it was time for a change. While hunting didn't die out, it had become more challenging while the prevailing cool, wet climate made for abundant, diverse plant material suitable for food. There was a shift toward a vegetarian diet. Plants as food sources were plentiful, diverse and required little to no preparation. The shift was highly pragmatic. Within another 3,000 years (only about 10,000 years ago), grain cultivation, most notably wheat in the Middle East, possibly rice this early in China, and an indication of cultivation of some fruit trees begin to appear in the historical records. Within another 3,000 years (only about 7,000 years ago), there was around the world a dramatic shift from wandering to an in situ larger group effort structure. Again, this is apparently in response to changing climatic conditions. A significant warming and drying, known as the "Altithermal", forced people to congregate around what remained of diminishing water supplies. Nomadic gathering gave way to lingering around localized water resources. The wandering groups of 30 to 50 individuals came together in much larger groups at these resources. Plant domestication appears around the world at this time, largely as a result of a series of progressively more intense environmental challenges. In many areas of the world, the "Garden of Eden" was gone for good. The Altithermal period lasted some 4,000 years.[2]

Along with this transition in human strategies gradually a new significance to the rising of the sun, length of days and the changing of the seasons arose. This becomes much more important in intentional agriculture than it ever was in hunting or gathering. Successfully growing crops takes planning, long term planning compared to that required for hunting. Timing is much more important. This sense of timing also became more abstract. Gathering depended on timing to some extent, but the timing was much more visceral; all one had to do was go and check if the looked for commodity was ripe. Farming further cemented our dependence on a specific location; it required staying put in one place at or very near the required resources. Hydroponic backpacks hadn't been invented yet.

This all lead to many many developments. Writing apparently first arose from a need to keep track of quantities of grain. Instead of moving ourselves to the food energy sources, the food required transport to us. A concept of geographical boundaries and ownership arose from the increased importance of location. Religions, governments and law grew in complexity as organizational structures for our gathering together in much larger groups. There was nobody around at the time taking notes on psychological processes involved, but it seems safe to assume that the changing conditions gave rise to shifts in what our attention was focused on which initially gave rise to new response. These responses would necessarily give rise to further changes in perception and, for the first time we became primary agents of our own evolution. While we may have changed little in physical structure, behaviorally, the changes have been so radical that it might be said that we are an emerging new species, less than 7,000 years old.

Agriculture ultimately proved a much more successful survival strategy, at least for the time being, capable of supporting much larger populations. For agriculture, especially for growing grains as developed in Europe, a much more complex exploration of natural cycles as they occur on Earth was very desirable. Although agriculture was far from the only motivation, a much more complex concept of time, typically based on solar, lunar and seasonal cycles, developed. A series of calendars were invented and developed and served a multitude of purposes. The development of calendars was terribly complicated. The Gregorian calendar, typically used by those who might actually read this, took several centuries to develop and it's still being "tweaked". Study of natural cycles, starting with little more than a post in the ground and observing shadows cast by the sun, also eventually lead to the development of the clock, which measures intervals in a day. The clock is explicitly tied to the length of the Earth day in the Solar System. It's gotten a little abstract. Hours are actually just an average. The length of the solar day actually varies constantly and the hour is only an average, matching up with actual solar time as you would find on a sun dial only for a brief moment twice a year - on the vernal and autumnal equinox. If you're involved with astronomy, you may be familiar with another clock, measuring intervals of the sidereal day, which is derived not from the Earth's position relative to the sun, but from its position relative to the stars. A sidereal day is slightly shorter than a solar day.

Just about everywhere where there was permanent settlements and large scale intentional planting of crops you will find some form of record keeping and some form of keeping track of days, seasons and years. Though accuracy varied greatly due to the complexity involved, the time keeping was almost invariably tied to naturally occurring environmental cycles.

It may seem as if I'm stating the obvious here, but this has been a sketch of the history of our oldest formal conception of time. It has been a slow evolution as far as concepts go, but is very recent in our history as a species and is still evolving and far from having achieved a universal consensus. There are some forty different calendar systems in use today around the world. There is a much wider variety of ways to measure shorter intervals, from the length of a stick of incense to the velocity of a photon. Clocks have been in the news recently as I write this: the unveiling of the fantastical Cambridge Time Eating Clock which intentionally runs irregularly and the NYC National Debt Clock which ran out of digits.

And this is where our general popular concept of time came from. It wasn't planned, it would be a bit of a stretch to say it was discovered, it sort of just happened, co-evolving in what might be called an organic process along with the other changes we humans were experiencing, and is primarily based on and harmoniously in synch with cycles inherent in our little local corner of the universe.

Things could be much different. If Earth did not rotate as it goes around the sun, as it's popularly described as doing, and if it didn't have a bit of a wobble to it over the course of a year, our conception of time and seasons would be very different. A sense of time for a jelly fish, if it were capable of contemplating such things, in the depths of the ocean where no sunlight reaches, no significant cyclical changes occur and physical directional orientation is much more diffuse, would be very different. Time under these circumstances would likely have little more than a somewhat Zen-like vague sense of abiding associated with it rather than the grand scale of dynamic transformations which mark the passing of time for many of us.

The common concept of time is a practical concept that was more or less invented as a description of the progression of days and seasons here on Earth. In that the seasons are fairly long-term relatively constant cycles, the concept acquired a sense of immutability, of changelessness to the process itself - a quality of constancy. Time in these pragmatic terms could indeed be called constant. This time is what is kept close track of at an astronomical observatory in Greenwich England, which serves as the international benchmark for all clocks.

Along the way, we have come up with at least four conceptions of time.

There is the clock time between compared intervals. This gives rise to the impression that there is some sort of ground or base on which this occurs.

That there was something before and after clock time, something before the before and after the after gives rise to the concept of infinite time: eternity. We can't prove eternity. It's a long walk from the infinite past to the infinite future, but it seems implied and is hard to argue against. With little change in the basic cyclical daily and yearly elements of time within the history of the human race, it certainly appears to stretch on forever, backward and forward.

Then there's this moment where everything that happens occurs. Other things may occur in the past, future and distant elsewhere, but not here, now. This 'moment', in order to be experienced, is actually quite a few moments smoothly blended together and is not exactly identical in character with a geometric one dimensional point. We'll come back to "this moment" again here in the not too distant future, but only referentially, not literally.

Then there's subjectively experienced time, where time can seem to 'flow' at very different rates under different subjective perspectives, such as the subjective time slowing impact of awaiting with great anticipation and eagerness some future event.

There may be said to be an additional regional cultural concept of time, such as a "New York minute" or how time runs “on the Res".

There are a number of additional subjective perceptions of time, including a sense of time as disappearing as a factor while intensely engaged in physical activities such as some sports or some fine arts involvements and some forms of meditation.

Time could be measured in very different ways. It might be said that, regardless of minutes or years, we all live exactly the same length of time: one lifetime. But this is not the collective consensus conception of time.

Why consider the cultural development history of time in considering time in terms of the physical sciences? Physical science cannot be separated from the historical and cultural contextual perspective from which it arose. The past 7,000 years have been rough, full of profound changes for us as a species. This is in marked contrast to the experience of, say, the dinosaurs of the Jurassic Period, in which conditions apparently changed much less dramatically over a period of some 64,000,000 years. This highly accelerated and seemingly still accelerating rate of change has subtly colored our perception of the nature of many aspects of the dynamics of the world around us, including that of time. If it weren't for the perceptual contrasts afforded by some relatively abrupt and recent planetary surface changes here on Earth, much of any concept of time may never have arisen. Furthermore, we can see from the above that concepts have arisen not entirely spontaneously out of nothing, but out of a changing context. Concepts are colored by the cultural context from which they arise. Copernicus would likely never have come up with the radical idea of moving the earth from the center of the solar system to somewhere around the sun and dared to think, let alone suggest his one truly original idea that the earth was perhaps (cough) a planet, had it not been for the Protestant revolution. The French Revolution was the cultural conceptual ground for the 2nd Law (suggestion, really) of Thermodynamics. It doesn't take much effort to note the similarities there.

From the above, we can see that the nature of time historically cannot adequately be considered in isolation as a discrete entity, but only in context of dynamic systems, of which our consciousness happens to be a part. We see also that the concept of time is primarily derived, not from some absolute, but from comparison of relative cyclical intervals.

In every contemporary flavor of physics that I'm aware of, the function of *"t"* remains, as in the long-standing nearly universal cultural tradition, that of a relative interval of motion. This concept may reflect more of the subjective human context from which it arose than an objective reality.

Perception and time

Regardless of what physical phenomena are being described, perception plays a central role. Even so called "objective" measurement is a perceptual activity, subject to interpretation. A little about perception, it is primarily a matter of pattern recognition. In order for any patterns to perceptually emerge requires contrast. There is no perception if there is no contrast. This page could not be perceived as having any content, regardless of any subjective valuation of alleged content, if it were presented black text on a black background. Perception requires comparison and for this to occur requires contrast of some sort.

Time, as described above, is popularly defined as the interval between two events. It only takes a brief glance to notice here that the primary characteristic involved in this perception of time is compared motion. Take, for example, two rocks sitting in a field. You can notice one rock. The rock is sitting there, not going anywhere, not doing anything in place other than remaining very similar to what it looked like moments ago, with the exception of subtle changes in sunlight falling on it creating areas of light and dark contrast which informs you that it is what we usually call a rock and is what might be described as actually being in the world. You walk over to the other rock and find it is similarly engaged in just sitting there and that the environment around it may well be changing more than the rock itself. There is no motion relative to its surroundings discernible in either rock. We would not speak of one rock occurring before the other or being a time interval apart. Distance separating the rocks would be measured differently. We might note how long it takes to move ourselves from one vantage point to another to observe the two separate rocks, but that would be thought of as us moving, not the rocks. If time comes into our perception of the rock, it is as a function of this changeless lack of motion that is in contrast to the environment around it and elicits impressions of 'long time' - a sense of simply abiding in contrast to our own motion. The expression, "like a rock", suggests this same changeless, abiding timelessness.

However, rains have come and made some modifications in the rocky environment and one of them begins to roll down a hill, having had the material supporting it washed away (why the rock should roll down hill rather than simply stay where it was, while this has been amply described, remains a great mystery well beyond the scope of the present discussion). The rock is now in motion. It is first noticed at one point, seen to roll and is subsequently seen at another point. Something changed. The rock 'moved' relative to its environment and to our perspective point. This stands out in our perception; it's not typical rock behavior to move relative to its environment in human perception scale. Now we have an event occurring in what we have come to call time.

Time only becomes relevant in terms of motion. If there is no motion, there can be no perception of time as we know it as living, perceiving organisms. So, the concept of time does not arise merely from the repetition of cycles, but also has as a function of its basis residing in perceptual capabilities and limitations inherent in the observer.

Note that our perception of the change in the location of the rock doesn't offer much information about the true nature of 'rock' or 'roll' or dappled sunlight in a leafy glade. It is only the patterns we perceive and the subjective significance we ascribe to them. We can look very very closely, but still all we can see are the patterns. Because these patterns do not actually provide much information about from whence they arise, there will always be a certain ambiguity to the world we live in, a quality of mystery to it. Because of this, science is much more apt to run out of funding long before it runs out of things to study.

Time is only one of a myriad of such ascribed significances to observed patterns - a pragmatic tool for informing self and communicating with others about a certain perceived quality of the surrounding environment. There is no data in the perception beyond the pattern recognition.

That is the world we live in. Much more than any 'true nature' of the world, the world's absolute reality is primarily a function of consensus based on perceptual pattern recognition. Period. Er, periodicity... of sensory impressions. These perceptions have been known to change from time to time.

It's the recognition of this pattern in ourselves that gets us wondering if there is an 'absolute reality' beneath our perceptions and asking silly questions about the 'true nature' of 'time'. It's not terribly surprising that physicists today should be finding such things as E-8 constructs so fascinating; but it is still only patterns. Such things as E-8 may predict more patterns (I'm predicting it will), but still says nothing of what it is that gives rise to the patterns. Any understanding of a true nature of the canvas on which reality as we perceive it is painted won't likely get answered without coming to grips with a physics of the canvas on which our perceptions are painted, consciousness itself, the only place we are actually aware of anything, quite possibly a unique pattern in the universe, the systematic study of which has hardly been begun yet. But in the meantime, we can still look at the lovely patterns.

Optical illusions

"For us believing physicists the distinction between past, present, and future is only an illusion, even if a stubborn one."

–Albert Einstein, March 21, 1955

This is quite a remarkable statement coming from someone who set light as the only constant in the Universe and set everything else as relative to one's point of view. I can't say that I've ever seen a light come on before activating the switch. It appears to move only from the present into the future. I know nobody who has yet seen next summer's blockbuster movie.

However, that is light from a human scale perspective and it's behavior in time and not time. Einstein has relegated to light many of the properties we conventionally ascribe to time, apparently rightly so. There are instances where time does not have the same directional arrow we are commonly familiar with. There is a subatomic particle known as a positron. It is described as being the same as an electron, only with a positive charge instead of a negative charge. The physicist, Dr. Richard Feynman once described a positron as merely being an electron moving backward in time. And this is exactly what is seen in results from particle accelerators. A positron will appear at a distance from the target and move toward the target to intersect with the target precisely as the accelerated particle meets the target, generating the positron which appeared to have just reached the same location but was actually hurled backward in time away from the target at the time of impact. There are similar counterpart subatomic particles for all such known “objects”, including photons. They are all theoretically capable of traveling “backward” in time. It is when you get larger bundles of systems of particles that it gets particularly challenging to move them in different temporal directions, especially simultaneously. I’m noticing that this either goes “forward” or “backward” in “time”; I’ve heard of no in-between particles exhibiting lateral temporal displacement – appearing synchronously with but distant from an originating event. But it’s a good thing that most particles tend to move in the same relative temporal direction, or we wouldn’t be here.

What we measure when we measure time are not actually any absolute time elements, but relative pattern intervals in time. Time would appear to be the ground upon which these intervals occur and doesn’t appear to have any particular direction of its own. We notice the intervals because of motion. We even inject motion into time measuring devices. Clocks 'run'. There is no perception without contrast. The contrast here is motion relative to a lack of motion or a differing rate of motion or different direction of motion. This would suggest that any "absolute time" would be devoid of motion. Time could not be measured without motion to provide contrast. This suggests that what we have historically been calling time is not actually time, but its distortion - a distortion induced by motion, enabling perception.

This has some implications for space as well. You can't have motion without some room for it to occur in. What we have been measuring as space may also not be space, but the distortion of space induced by motion. What we call 'space' has a remarkably long list of characteristic properties for 'nothing'. Space as “something” is a subtle concept; the contrast isn’t very strong. In comparison to a rock, space appears to be nothing. It took Einstein over 36 years to recognize that space is not exactly nothing.[3]

We would not know space or matter without both together presenting some contrast. We would not know time if it were not for matter moving through space. We would not know movement if it weren’t for energy doing something to what we call matter in space and time. Rather than a space/time continuum, it seems actually more like a space/time/matter/energy continuum.

Continuing with the “pattern” theme, to theorize an absolute space/time is consistent with quite a few system patterns, such as “0” in math or an “absolute 0” degrees Kelvin or an at rest state relative to motion of physical objects or black or clear relative to colors or silence relative to sound, and so on. There does appear to be a pattern of relative consistency to patterns found in the universe. This observation may simply be a result of our perceptual requirement of contrasts. However, in that our perception is a product of the universe, its nature may be instructive of the nature of the universe.

Absolute time/space would be devoid of relative motion and 'measurement' would become meaningless. It is only movement in time/space that permits of measurement.

With a negative curvature to distorted space, an absolute time/space would be quite large enough to hold the entire universe, and then some, while having no discernable size if viewed from some hypothetical vantage point 'outside' time/space. Sort of like in the British sci-fi TV series, Dr. Who, in which there is a time traveling machine, the Tardis, which is much larger inside than outside.

That there is motion, and not entirely absolute time/space quietude suggests that an absolute time/space might be intrinsically unstable. The alternative would be an energetic injection from a source external to time/space. Such a scenario would be beyond our capacity to infer in science terms. We have no definition of anything existing outside time/space and no way of stepping out of time/space to have a look see. It would be the same problem we run into with the "big bang" theory of an origin of the universe – if the universe is running down, something must have initially wound it up and there has been no apparent intrinsic dynamic emerge for that to have happened on its own. It's in violation of the 2nd Law of the French Revolution (see above).

Returning to "this moment", the concept of "now" is primarily a function of light. Einstein's Relativity gave rise to a description of a "light cone". It is typically depicted as an X but is thought of as two cones tip to tip, hourglass fashion. The point where the two lines intersect represents here/now. The bottom part of the X is said to be "absolute past", where light from now cannot reach and light from there cannot reach now. We can look into the past sort of, if that past is very far away in distance and it takes a long time for the light to reach us. If the past is physically very close, this won't work. We can't see yesterday here. The light's gone already. The top of the light cone is said to be the absolute future. Light from there cannot reach here and now, but light from here/now proceeds into the absolute future elsewhere. To either side of the X is absolute elsewhere, where things exist synchronous to here/now but are beyond where light can reach us in the local here/now. With this model, we can't know anything directly of the absolute past, absolute future or absolute elsewhere in the here and now. Light is the fastest known thing. It is also a primary source of data regarding patterns. The Light Cone sounds a lot like our concept of time, including a direction of movement. [4]

Apparently, time is not as is generally thought and that what we have been thinking of as time in day-to-day practical terms is more a function of the movement of light.

"When the bird and the book disagree, always believe the bird."

–James Audubon

Do we have any perceptual information to suggest that time differs from the function of light?

Quietly over more than a hundred years of research, a massive amount of data has been accumulated clearly indicating that we do on occasion experience what are called anomalous perceptions of events distant in time and space beyond the limits of the "Light Cone". A class of perception commonly referred to as psychic or psi. . It is no longer a question of "if", but "how". It appears to be entirely an event in consciousness and entirely independent of any known means of transmitting information

This body of data presents some challenges for physics. Relativity says it can't happen, that there can be no data transfer at speeds greater than the speed of light. Yet psychic perception appears to not be bounded by temporal/spatial constraints imposed by light. Consciousness appears to be capable of exceeding light speed or bound by the same directional arrow. This has given rise to a description of consciousness as being 'non-local'. Extensive experiments in shielding have shown that psychic function is clearly not a matter of any form of electromagnetic transmission.

Psychic function cannot be accounted for by quantum entanglement. There is no data transfer in quantum entanglement and there is clearly anomalous data acquisition going on in psychic perception.

It is not where data fits the working model, but where pieces don't quite fit that is interesting.

The data from psi experiments strongly suggests that a significant revision to some physical models, at least certainly that of Relativity, is called for. There has been some work done in this regard with a consideration of a complex space-time metric in which everywhere and everywhen would, in effect, become "local", but consideration of this is beyond the scope of the present work.

Consideration of psi phenomenon has some profound implications for our concept of time and the nature of the ordering of events in time. But that also is a whole 'nother paper.

As mentioned earlier, the undertaking of a systematic study of the physics of consciousness would appear to be called for.

Seek your answers within. It's the only place we can actually be aware of anything.

At the front door here, I had seen a request for, "interesting".

It is my hope that at least that request has been satisfied here.

Thank you for the stimulus to contemplate the question of time (if nothing else, it has proved personally useful in keeping my thoughts off politics and economics at this time) and for this opportunity to share some thoughts on the subject it has evoked.

It's late.

No time to recapitulate.

Thank you again and good night.

Matthew Kolasinski

October 8, 2008

Middletown, CA

Notes

[1] Evidence for an extraterrestrial impact 12,900 years ago that contributed to the megafaunal extinctions and the Younger Dryas cooling
R. B. Firestone, et al.
Communicated by Steven M. Stanley, University of Hawaii at Manoa, Honolulu, HI, July 26, 2007 (received for review March 13, 2007)

[2] Parker, John
1994 Dots on a Map: Using Cultural Resource Management Data to Reconstruct Prehistoric Settlement Patterns in the Clear Lake Basin, California, Doctoral Dissertation, UCLA, Published by University Microfilm International.

2007 Prehistory of the Clear Lake Basin, Presentation given to the Lake County Sierra Club, Kelseyville, Ca.

Additional clarification was also obtained from private communications with Dr. Parker, 2008.

See also:
HISTORY OF CULTIVATION OF PLANTS
http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ab56

[3] Relativity – The Special and the General Theory
A popular exposition by Albert Einstein
Translation by R. W. Lawson
5th Edition, 1952
Appendix A: Space.

[4] For a particularly lucid treatment of the light cone and its implications for time, see:
The Nature of the Physical World
Sir Arthur Eddington