

Deconstructing Time, 2nd Edition: Illustrated Essay-blogs About the Human Experience of Time

By Rick Doble



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This eBook is a compilation of the first two years of my blog: *Deconstructing Time*

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NOTE: This is a pdf version of the eBook with the ISBN: 978-1-312-45984-7

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Introduction

We are immersed in time. It surrounds us at every moment, at every turn. We take time as a fact of life.

Yet, although we think very little about workings of time, we are at its mercy. In a sense it is all we/you have: on your gravestone, most likely, will be your name and the date you were born and the date you died.



PICTURE CAPTION: What could we gain by obtaining a perspective on time, by standing a bit outside of time?

About 100 years ago Freud uncovered our repressed feeling about sex. His discoveries did not change our sexual urges, yet his ideas gave us insights that allowed us to be more at ease with this basic drive.

I believe, the same could be said of time. We need to not dwell on the past yet realize that it is more important and accessible than we thought. As for the future, we can begin to get a grasp of what we can and cannot know and live within its boundaries.

Although the clock will still continue to tick, our relation to time will be changed. If my exploration is successful, for example, the past will become more relevant -- the future will be less remote and frightening.

And, hopefully, we can become more relaxed in the now moment. We can learn to shed the alienation, so common in today's culture, for a more comfortable sense of time and place.

Explorations Into The Human Experience Of Time

While time exists independently of human beings, our perception and experience of time is uniquely human. I believe it is the modern human -- i.e. Homo sapiens sapiens -- sense of time that is the key difference between humans and the other animals. And further I believe that time, as we experience it, is created by our uniquely human brains and is critical to our sense of consciousness.

A friend of mine, who is an anthropologist with a PhD and who has spent a lifetime studying the effect migrating primitive humans had on the environment, made the point that whenever humans arrived at a new location, they radically changed the environment.

I believe this is because humans can see patterns, remember those patterns and then project those patterns into the future. But understanding patterns requires a sense of time. Knowing when the fish ran in the past and will run in the future, the birds migrate, the crops grow, the seasons change is fundamental to human survival. This is also why humans have been able to adapt to just about any environment or part of the world, i.e. because they could grasp new patterns when they moved to a new place.

Even the initial process of perceiving patterns required a sense of time. Humans had to see what was similar and recurring and discard what was random and inconsequential. The process of grasping a pattern meant that a culture had to relate later behavior to past behavior and understand the relationship.

While tool making has often been cited as one of the key differences between humans and animals, it was an understanding of how a tool was to be used -- which first required a memory of the past -- that determined the construction, shape and usefulness of the tool.



PICTURE CAPTION: Stone age tools. Small cropped area from the huge timeline of world history: *Adams Monumental Illustrated Panorama of History*, 1878.

Constructing a net for fishing, for example, required experience in the past of how fish moved.



PICTURE CAPTION: I found this photo at Wikimedia in the section on charts and graphics, the fishing net being a human-made pattern -- showing the close connection between tool making and patterns.

In fact our entire culture requires an ability to access the past. Learning in school, for example, would have no meaning or usefulness if years later we could not draw on the lessons and skills learned. Even understanding the words on this page requires that in the past you learned the meaning of each word -- and without that past these words would be meaningless.

Our sense of time is a unique function of our brains -- with short term, medium term and long term memories residing in our brain cells. Thus I believe it is our brains that have created this time-world we live in. The best term I know to describe this human world of time is what I call 'human meta-time'.

Yet we are so immersed in time, it is difficult to consider and separate ourselves from this immersion. We swim inside of time and time is always now. Trying to understand time is a bootstrap operation; we must lift ourselves up to a new perspective -- and for the moment put ourselves outside of time.

So in this series of essays, I will put forth ideas and concepts that examine a more complex understanding of how time operates than the one we take for granted every day.

Our Most Important Sense: A Sense of Time

Today, our sense of time is so much a part of our lives we hardly notice it's there.



A deep-sea fish has probably no means of apprehending the existence of water; it is too uniformly immersed in it...

Sir Oliver Lodge, British scientist

While the other senses such as seeing, hearing etc. are widely studied, the sense of time, while crucial, does not get much attention.

There are two reasons for this: the first is that like the deep-sea fish we are too immersed in time so we have few means of apprehending its existence; the second is that our experience with time is quite complicated, so it's hard to know where to start or what questions to ask.

"Time perception studies the sense of time, which differs from other senses since time cannot be directly perceived but must be reconstructed by the brain."

en.wikipedia.org/wiki/Specious_present

"Humans can perceive relatively short periods of time, in the order of milliseconds, and also durations that are a significant fraction of a lifetime. Human perception of duration is subjective and variable."

en.wikipedia.org/wiki/Time_perception

In order to unravel time, as we experience it, we must separate the layers. I suggest the following is a good place to start:

THE THREE ASPECTS OF TIME



Objective time: The ticking of the clock, the sun rising, the sun setting -- this will 'wait for no one' and exists independently of a culture or a person.



Cultural time: Every culture, each region, each business has its own shared concepts of time, its own conventions and expectations. A New York minute is faster than a New Orleans minute, for example.



Personal time: Each of us carries within us a 'time-map' of our lives, from earliest memories to the different schools we attended and places we lived which include milestone

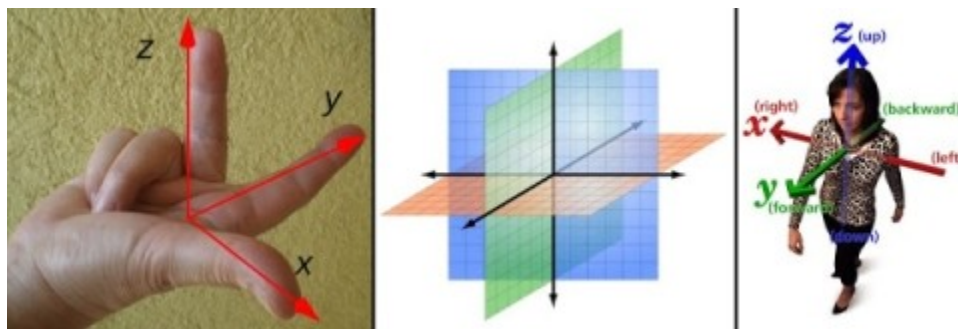
events, such as falling in love, losing a friend, starting a career and going through a family's divorce. Much of this map is divided based on these events that mark time -- rather than the mathematical divisions of the calendar or the hourly divisions of the clock. In addition when we are 'off duty' we experience time very differently than when we are 'on duty' or 'on the clock'.

The rhythm of the duration of an event is an experience of our consciousness whose beginning and end is not determined by the clock but by its duration within our consciousness, and once there, it has no other dimensions and no other limits save the limits of the experience itself.

Naum Gabo, Divers Arts, 1962 (a principle founder of the art movement, Constructivism, about 1920)

With each individual, personal time is stored in the brain. While there is much to be discovered about this process, one theory has it that each sense stores a memory of what was sensed, all of which is then somehow tied together as having happened at the same time. Yet the key point is that these memories are in the brain and can be accessed.

Each person must reconcile objective time, cultural time, and personal time to function in the society. Our sense of time is crucial as it tells us where we are on the time grid and it gives us our time bearings. Without it we would be propelled along life's journey without knowing where we are located or where we are headed.



Like the left-right, forward-back, up-down movements that define motion in the world of space (known as the x/y/z axes as described by Descartes), we keep our bearings by knowing where we are in relation to other things. And so with the dimension of time, we need to know where we are in relation to the constraints of time.

UNDERSTANDING TIME

Basic Facts About Time

Okay, lets keep it simple, really simple -- no tricks, nothing up my sleeve.



- #1. Time only exists in the moment. Period.**
- #2. The past did exist in the moment at an earlier time.**
- #3. The future will exist in the moment at a future time.**
- #4. The present is now -- you reading these words. This moment. The past is #1, #2, #3 you read earlier. The future is the rest of this blog -- if you continue reading.**

In a sense everything that happens, everything that is real is time-stamped. Nothing is real unless it has that time stamp -- even our speculations -- as those speculations, imaginations, fantasies, etc. happen in time -- even our thoughts about probabilities or our delusions happen in time.



Yet the human perception of time, which is linked to memory, which in turn is rooted in brain functions, is quite different from time stamps and clock time.



As living beings with blood going through our veins, we are always moving through time. With every breath and every heart beat, time moves forward -- and not just by seconds like a clock's second hand, but continuously in tenths of a second, or millionths of a second, or nanoseconds (billionths) or even picoseconds (trillionths). We are always in time, we can never be outside of time.

I believe much of the confusion about time is due to mistaking our artificial divisions of seconds and minutes -- which are quite useful for managing time -- with the fundamental nature of time which is indivisible; it is an unbroken stream that flows continuously.

As I quoted in an earlier blog in this series:

A deep-sea fish has probably no means of apprehending the existence of water; it is too uniformly immersed in it...

Sir Oliver Lodge, British scientist

What could a fish tell you about water? Probably not much. It lives in water, it is surrounded by water, it floats and moves in water; water is the world that it lives in -- so a fish is probably unaware of many of the properties of water. I doubt, for example, that it could understand the concept of wetness.

And so, like the fish, we live surrounded, but not by water but by time. There is no way out -- no way around it. While we work with it everyday and every moment, we are so immersed in it, we have trouble grasping its complexities.

Common phrases about time provide some hints about how we operate, phrases like, "she's been through a lot" -- implying that time is something we move through and also that there is no way around it, there is only a way through it.

But even when we try to simplify and focus only on the now moment and the present time, there are complications:

At no point is the present only now, some of it is always future and some always past -- and without this connection between past and future, the now moment and time itself could not exist.

*Time keeps on slippin',
slippin', slippin' Into the future*
Steve Miller

*Neither from nor towards;
at the still point, there the dance is,
But neither arrest nor movement.
And do not call it fixity,
Where past and future are gathered.*
T.S. Eliot, Burnt Norton, 1936, *Four Quartets*

Consider this:

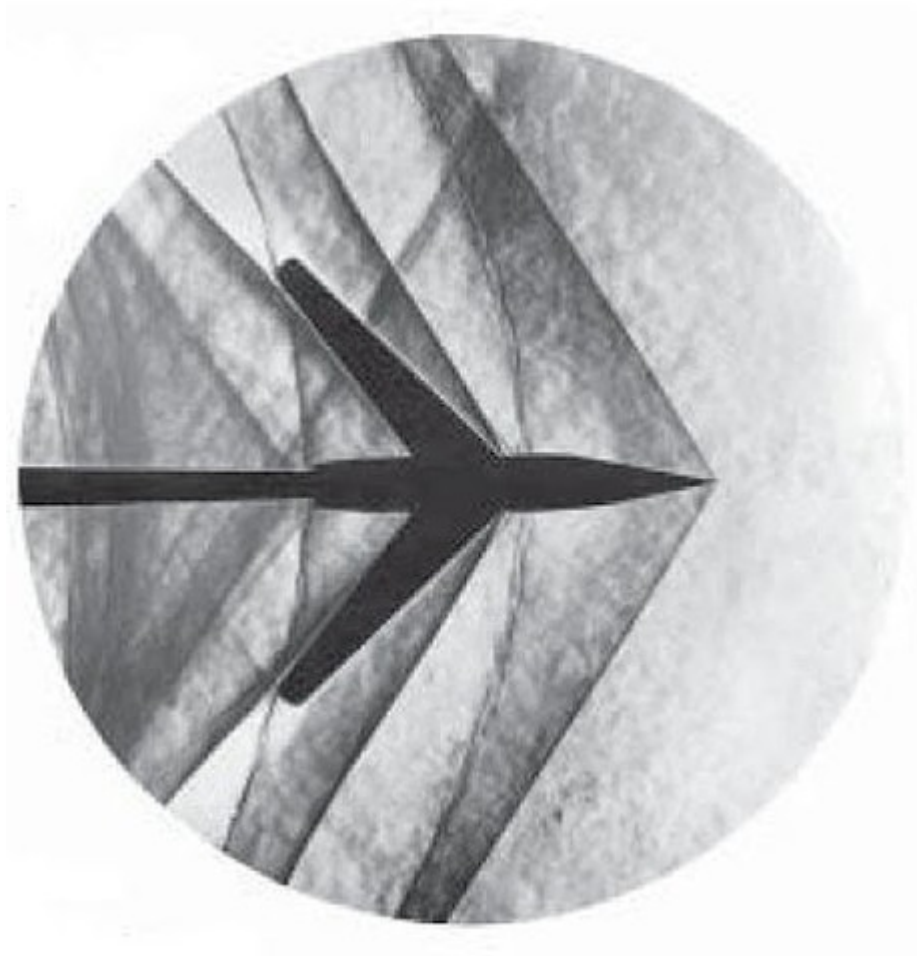
At every moment in the present

you are reaching into the future

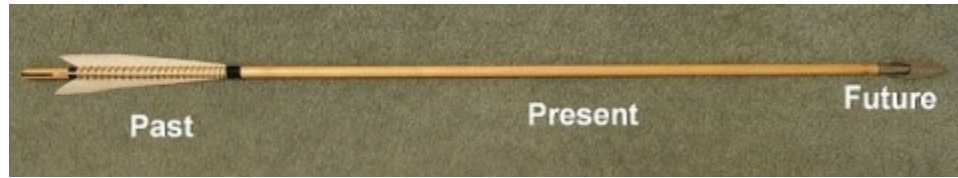
and letting go of the past



PICTURE CAPTION: From the point of view of the passengers in the boat, the wake of the boat is the boat's past, the bow and direction is its future, and the passengers are in the present.



PICTURE CAPTION: In this shock wave photo of a plane breaking the sound barrier, past, present and future are all in one shot: the nose breaking into the future, a passenger in the middle of the plane in the present and the past trailing behind.



PICTURE CAPTION: The 'arrow of time' has often been used as a metaphor to describe the relentless headlong movement of time. The now moment is like an arrow that flies always forward: the arrowhead piercing the future, the tail trailing behind and the shaft in the middle, in the present and between them. Without all of the parts: arrowhead, shaft and tail, the arrow could not fly.

My point is this:

Past/present/future are not separate from each other -- this is a misunderstanding and one which can cause a number of problems.

Further this lack of separation is not only true moment to moment but also day to day, week to week and year to year. Past/present/future are inseparable and intertwined.

The Dance of the *Now Moment*

*At the still point of the turning world.
Neither flesh nor fleshless;
Neither from nor towards;
At the still point, there the dance is,
But neither arrest nor movement.
And do not call it fixity,
Where past and future are gathered.
Neither movement from nor towards,
Neither ascent nor decline.
Except for the point, the still point,
There would be no dance,
And there is only the dance.
T.S. Eliot, *Burnt Norton*, 1936, *Four Quartets**

Except for the point, the still point,

There would be no dance,

and there is only the dance.

A gallery of dance pictures from ancient Egypt, Greece, Rome, the Renaissance, colonial times, Native Americans, to contemporary dance today, in all cultures and at all levels of society -- dance is and has always been part of human expression.































Time & The Human Sense of Duration

Perhaps the most mysterious aspect of the human experience of time is duration. Duration, by definition, is a time span.

We have to ask ourselves: how can we perceive an arc of time, operate within a span of time, when the only thing that exists is the now moment?

In other words how do we hold onto a consistent sense of ourselves -- where we have been and where we are going -- in the now moment where everything must reside to exist?

Just as time could not exist without the now moment, we could not function or survive without a sense of duration. We could not start a task and finish it without a sense of duration, for example.



PICTURE CAPTION: These popular drawings from the 19th century depicted the duration of a lifetime.

As usual the answer lies in the human brain. I believe the brain has a number of areas that hold time in suspension. Parts of our brains are "waiting for the other shoe to drop."

We all know about short term memory. A waiter must remember each person's order, bring the right food to the right person with the right drinks but then once the customers have finished and left the restaurant, forget that particular order and sequence -- virtually erasing it from memory.

Without short term memory we could not operate. We could not even drive down the road. We must remember that the speed limit has changed, the school children get out in a few minutes, that a car suddenly appeared out of nowhere and is driving just behind us in the left lane.



PICTURE CAPTION: A lifetime duration for a man -- at the bottom of the picture is Chronos, the Greek God of sequential time who rules over our lives.

There are a wide variety of durations as we experience them: from very short term to very long term. As I quoted in an earlier blog: *"Humans can perceive relatively short periods of time, in the order of milliseconds, and also durations that are a significant fraction of a lifetime. Human perception of duration is subjective and variable."*

http://en.wikipedia.org/wiki/Time_perception

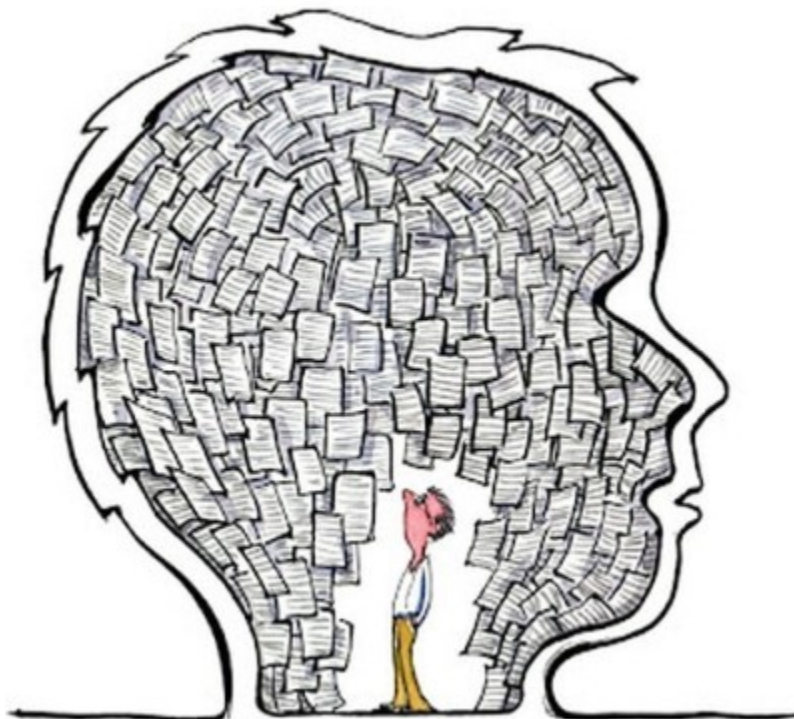
One long term duration we all know is our life story: our parents, where we are from, schools, education, jobs, relationships, marriage, children -- a story which continues as we live.

A shorter term duration might be a job you held for a year or two. In your memory you might recall the early days of the job, the later routine, the final days when you knew you were leaving.

And still shorter term is what you did earlier in the week and plan to do by the end of the week. Or what you have done today and plan to do by the end of the day. In another month if I asked you about the specifics of either of these -- that occurred a month before -- you might be hard pressed to remember. But today, you know in detail. And more, today you have a mental checklist of what is done or completed and what remains to be done.

I believe the human brain has a number of levels of memory which are related to the sense of duration.

Very short term: Minute to minute
Short term: Hours or days
Medium Term: Weeks or a month
Long term: A year
Very long term: Decades or lifelong



PICTURE CAPTION: It is our brains that stitch time together and give us a sense of duration.

Over time the shorter term memories tend to get erased, as they are in a sense working memories that must be cleaned out in order to make room for the next task at hand. Yet certain events in the short term, even events that might normally have been erased, can become part of long term memory -- due to their importance.

For example, you might not realize that when you said hello one morning to a new person at the office, that you would be married to them in a year. That moment of meeting would normally have been forgotten, but now is clearly remembered for the rest of your life.

And while I believe this article has shed some light on how we humans handle a length of time, it also raises a number of questions.

There is, for example, what might be called 'vigilant duration'.

A task, for example, requires that a kind of mental flashing red light keeps blinking until we have finished all aspects of the job. For many of us, we cannot shut off that interior red light until we have done the job to our satisfaction. Then and only then can we check off the job as completed. And only then can we begin to erase that job from our memory.



PICTURE CAPTION: A joyous leap into the air before the senior prom -- celebrating the end of a duration, high school.

So the question is this: How does this mental flashing light operate in our brains? How does it continue to flash until the job is done? And how does it shut off when we are done?

And then there is 'remembered duration' -- in which the brain stitches together a number of events over time that are related to each other and creates a coherent memory..

So like most aspects of time, there are a number of ways we sense, understand and operate when it comes to duration.

Continuity & Time

Closely related to duration, yet quite different, is the concept of continuity.

Continuity means that we expect the sun to rise every morning, we expect the road we drove down yesterday to be there tomorrow. Continuity means that things continue from the past into the present and into the future; things remain. Continuity can also incorporate a sense of change that is regular or predictable such as expecting our children to grow taller as they grow older. With continuity time in a sense stops or stops being noticed. Even though your workday was different, your house is the same when you come home and does not change, for example.

Continuity provides the framework for 'meta-time' that you will read about later in this eBook -- it is the basis for our mental maps of our office, our home, our favorite bar or coffee shop.

Without a sense of continuity it would be hard to function and do our jobs. We need to assume that roads are safe, that electricity will be available, that the phone will work.



PICTURE CAPTION: This medieval 'calendar' shows the work needed for each month, starting with January at the top. Known as the *Crescenzi Calendar*, it was a monthly calendar of tasks for successful farming. Adhering to these tasks at the appropriate time insured continuity.

The observance of annual rituals such as New Years and Halloween are ways that societies assert a sense of continuity -- with traditions that reach back thousands of years and that will also be celebrated in the future.

The daily news is often about a break in continuity. We expect planes to take off and land safely; we assume ships will have uneventful trips across the Pacific Ocean. So when a boat sinks or a plane crashes, this is reported.

When continuity suddenly changes, it can be quite traumatic. This is because it calls into question what we had assumed would continue. Expecting a loved one to be home by a certain time and then finding that they have been in an accident, for example, is a break in continuity.



PICTURE CAPTION: Accidents interrupt continuity and bring about uncertainty.

A break in continuity can also lead to artistic, creative, and conceptual leaps that see the world in a new way.

When the young Charles Darwin was on shore during his voyage on the ship, the Beagle, he experienced a severe earthquake in South America -- something he had never felt before. He wrote:

A bad earthquake at once destroys the oldest associations: the world, the very emblem of all that is solid, has moved beneath our feet like a crust over a fluid; one second of time has conveyed to the mind a strange idea of insecurity, which hours of reflection would never have created.

Charles Darwin

In this case, Darwin's assumptions about the stability of the Earth had been upset. Rather than being rock solid, the earthquake showed that the Earth had an almost fluid nature and that it could move substantially over time. And if the Earth itself was not unchangeable, what else might be brought into question?

I believe his experience of this earthquake became a metaphor for what he himself was to do years later, i.e. create a scientific and conceptual earthquake by asserting that humans were descended and had evolved from apes. This idea was a wrenching break in the prevailing continuity of thought because people believed that humans had been created by a supreme being in one stroke and came into existence fully developed.



PICTURE CAPTION: Annual rituals, such as the Chinese New Year, are an expression that continuity will continue.

Virtual Human Meta-Time

In this series of blogs I have made the point that the human perception of time is very different from clock time. Plus the human capacity for understanding time is different from all other animals on the Earth. Nowhere is this more apparent than in the way we conceptualize and use time in our conscious functioning.

I like to think of it as "human meta-time" -- 'meta' meaning time above and beyond the standard moment to moment existence of time, beyond now -- an almost different dimension of time, a kind of virtual time. This 'human meta-time' works in conjunction with a 'human meta-space' -- our mental map of the places where we live, work, drive through, visit, etc.

Within each of our minds is a conception of space and time that we have gained over the years -- a space and time that we can move around in and that is created from memories -- and a space where we can even create new areas with our imaginations. This virtual meta-space includes past, present and future -- and we can move easily within it across both time and space at warp speed.

For example, in a matter of seconds, I can walk through my childhood home that I have not seen in 30 years and that is 600 miles away and vividly remember events at the age of 8, think about what I am going to do in the next minute and then walk around an exhibit I am planning in my mind, that will be in a building an hour away and does not yet exist.



This aspect of human time is so complex, this article can only begin to scratch the surface.

Memory is the key component of meta-time and our ability to manage, shape and organize time. Because of memory we can learn skills, learn to conceptualize, recall what we have accomplished so far in a task, and build on experience.

Beyond the basic cataloging of our past, it also remembers things that happened in a unique way. It can remember occurrences as events, not measured by minutes or hours, but rather as an internal experience with its own sense of time. This aspect of memory comprehends duration -- that is time beyond the now moment -- and creates depth, dimension and perspective. It also puts together composites of places and events and allows us to walk through them at will.

We all work with meta-time and meta-space everyday yet think little of it.



In an example of meta -time and -space, each of us can visualize places where we are not now. For example a co-worker in your office an hour from you, might call you from your office and ask for the location of a book. In your mind you could move around in your office, open and close desk drawers and guide that co-worker in their search.

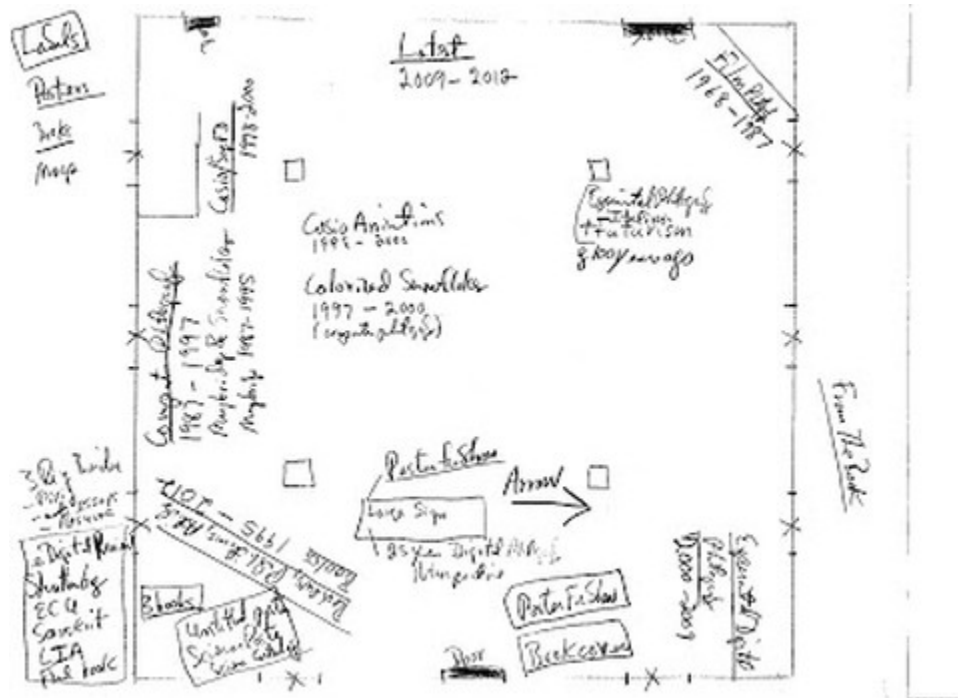
And in another example of meta -time and -space, I can go back into the past and walk through the house where I lived as a child. I can stand outside and see the door, the bushes and the windows -- then walk up the steps, open the front door and walk down the hallway, touching the walls with my hands and looking at the pictures hanging on the walls -- pictures that were there years ago and are not there now. When I taught a creative writing class, I used this idea as one of my exercises. Everyone was able to write a detailed description of a home that they had not visited in decades yet that they could conjure up in their memories.



All of us have a remarkable capacity to move through meta -time and -space effortlessly. If, for example, I asked you about a party you were at last Saturday that was held a hundred miles away, you would probably be able to walk around that party in your mind and tell me who was there, how they were dressed and what some of them said and recall in seconds things from the beginning, middle and end of the five hour party. Yet you might be hard pressed to say exactly what time -- i.e. clock time -- each thing happened, only that it occurred within the 'time frame' of the party.



This same meta capability works just as well for future events. For example, last spring I was involved in designing an exhibit of my digital photography. In my mind I ambled around the gallery space where the show was to be hung, made diagrams, looked at my work, not there yet, on the walls -- so that in my imagination I was actually able to walk through the exhibit that did not yet exist and rearrange furniture and displays.



PICTURE CAPTION: Diagram of my exhibit months before I set it up. (Rick Doble)



PICTURE CAPTION: The exhibit after I had put it together -- very much like my plan above. (Rick Doble)

To Summarize:

Human meta-time is a virtual time that we can access in our minds. In meta-time you can go forward and back in time and also into the future. The normal real world constraints do not apply in this virtual realm.

Nevertheless, your personal meta-time must mesh or work in conjunction with objective time and cultural time, as I described earlier in this eBook. So when you are driving down the road thinking of the last time you saw your girl friend a hundred miles away and imagining what it will be like when you see her again, you'd better pay attention to stop lights up ahead and apply the brakes when a car in front of you stops unexpectedly.



PICTURE CAPTION: This wonderful composite self portrait shows the artist as he is now and photos of him as a child, a young adult and also his parents -- not unlike the meta-time described in this blog.

New Terminology About Time

Time is the most used noun in the English language according to the *Concise Oxford English Dictionary*.

**Yet although there are numerous phrases involving the word *time* such as:
no time, good time, find time, out of time, and in time?
there is not much clarity or distinction in the usage.**

Therefore a major problem when discussing time is that the we do not have the necessary vocabulary to talk about it. Words are like tools and without the right tools, we can't get the job done. It's like needing a wrench when what you have is a hammer. When we consider the subject of time, we simply don't have the right wrenches and pliers in our toolbox.



PICTURE CAPTION: Don't give me a wrench when I need a hammer.



PICTURE CAPTION: Don't give me a hammer when I need a wrench.

For example, the words time or past or future or now can each have very different meanings depending on the context. Some meanings are even contradictory.

Take the word *now*:

it can mean this exact moment (such as: What is the time now?)

or a bit before this moment (I did what you asked just now.)

or a bit after this moment (Lets do this now.)

or today (I'll get this done now.)

of this year (Now the politics are getting ugly.)

or this decade (Now we do things differently than they did in the 1990s.)

or the near future (Will we be able to build a high speed rail network now?)

If we want to talk about time and understand time in a more nuanced manner, we must have more words, more phrases, more concepts.

In the arctic climate the "language of the Sami people [ED: also known as Laplanders] actually includes around 180 snow and ice related words..."

(en.wikipedia.org)

We must learn from the Sami people and construct at least as many different words and phrases for different aspects of time as they have for kinds of snow. Because for both us and them, our lives depend on it.

The six-tense language Kalaw Lagaw Ya of Australia has the remote past, the recent past, the today past, the present, the today/near future and the remote future.
(en.wikipedia.org)

A major effort of this blog will be to suggest new terms and new terminology. Naturally these are only suggestions and readers may have better ideas. I invite feedback. But to get started here is a suggestion for two new terms.

SUGGESTED NEW TERMS:

Fluid Time & Hardened Time

Time has two different almost opposite natures: one is quite flexible, the other is hard and unforgiving.

While many of us believe that "what's done is done and what's past cannot be undone," this is simply not true. For most of our waking hours, we live in what I call 'fluid time'. This means that you have flexibility to, for example, go back and fix something if it did not get fixed the first time -- to change your schedule around; to rework things that did not work properly.



PICTURE CAPTION: With fluid time, if you miss a train, you can always catch the next one.
Time can be corrected and is not irreversible.

In this case time has not 'hardened' because what you are doing can still be molded, modified, altered, changed or corrected. Most days you deal with this kind of time.

Yet like a beloved dog or cat who suddenly decides to bite, time can rear its other nature and cause no end of grief.

Perhaps the most agonizing and mysterious aspect of time is when it becomes irreversible and suddenly sets like hardened concrete; this is hardened time. Or we could call this 'irreversible time'. It can happen in minor ways and in major life events. When a cup falls off a table and breaks into a hundred pieces, it is only annoying yet irreversible.

'Irreversible time' can happen gradually. A man who can never get around to asking his girlfriend to marry him may find, without his realizing it, that she has slipped away and the moment to marry her has passed.

'Irreversible time' can happen suddenly. When out of the blue a car swerves into your lane and causes an accident in which a person is killed, it is too late to go back and change things. It is this kind of time that people are speaking about, when they say there's no use worrying about the past and there is no going back. There's no use crying over spilled milk.



PICTURE CAPTION: With hardened time, there is no going back. While you might recover from an injury, the injury is a fact and its consequences will be with you for the rest of your life.

There are points when fluid time slips into irreversible time, as when I leave home and drive to work forgetting an essential notebook. For the first few minutes, if I remember, I can go back and get it, but later in my commute, I do not have that option as it will make me late for work. The 'window of opportunity' will have closed.

So the two phrases I would suggest adding to the terminology about time are:

fluid time -- this could also be called flexible time, but that might confuse it with the work related term flextime

hardened time -- this could also be called irreversible time

NOTE: A major effort of civilization has been to gain more power to correct things that were once considered part of hardened time. As we humans obtain more knowledge, we have been able to do this. For example, I just had two hip replacements. Thirty years ago I would have been confined to a wheel chair for the rest of my life, but today I can walk around like a much younger man. So what was once considered hardened or irreversible, is now a bit more fluid -- as I still had to go through two operations and 6 months of rehab.

THE PAST

The Past Isn't Dead

Que Sera, Sera (Whatever Will Be, Will Be)

The future's not ours to see

Que Sera, Sera

From Alfred Hitchcock's *The Man Who Knew Too Much*, 1956

Don't tell me the past is dead

and the future is not ours to see:

without the past

the present cannot be understood

and has no meaning;

without the future

the present has no purpose.

Rick Doble

The past isn't dead. It isn't even past.

William Faulkner, *Requiem for a Nun*, 1951

Time present and time past

Are both perhaps present in time future,

And time future contained in time past.

T.S. Eliot, *Burnt Norton*, 1943



PICTURE CAPTION: *Allegory of Time Governed by Prudence*, Titian, c.1565, allegorical painting

The Genius of Cavemen

More than 10,000 years before the earliest beginnings of civilization in Egypt and Mesopotamia and about 5,000 years even before the start of agriculture, cavemen were creating sophisticated and accurate paintings in color of animals that they hunted and ate.

In the pitch dark of the Altamira cave in Western Spain -- two hundred meters or so from the entrance -- they must have been aided by lamp or torch light. Deep inside they could only have painted from memory. And while the skill of these artists is as good as any modern painter, what impresses me the most is the accuracy of their work.



PICTURE CAPTION: Artist's conception of how cave drawings were made.

While the particular bison they hunted, the steppe bison (*Bison priscus*), is now extinct, we can gauge the accuracy of their paintings by looking at photographs of the closely related wisent or European bison (*Bison bonasus*).

In the next pictures compare a painting of a single bison cropped from a photograph of the famous Polychrome Ceiling in the Altamira cave with a photograph of a European bison.



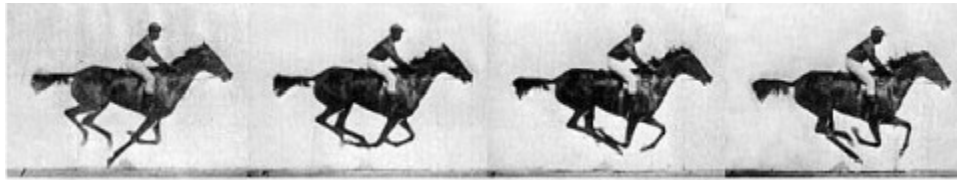
PICTURE CAPTION: Cropped bison painting from a photograph of the polychrome rock paintings at the Altamira Cave in Western Spain. About 15,000 years old, this painting was created with a sophisticated airbrush technique.



PICTURE CAPTION: European bison photograph.

To begin with it is clear that the cave painting is of a bison and no other animal. Next look at the back legs, the curve of the rump, the back bone, the angle of the head, the horns, etc.

While a painting like this might not seem that difficult, bear in mind that up until the photographs of Eadweard Muybridge in the 1870s no painter had depicted the movement of a horse's legs correctly when galloping. No one had seen that all four legs left the ground at one point in a gallop -- which was only proved by Muybridge's sequential high speed photographs. Furthermore these painters knew horses quite well and had observed them close at hand, often for decades. My point is that accurately depicting an animal is not an easy task.



PICTURE CAPTION: Photograph of a galloping horse by Eadweard Muybridge that proved what painters had not seen for centuries.

As I said in my introduction to this eBook, "I believe it is the modern human -- i.e. Homo sapiens sapiens -- sense of time that is the key difference between humans and the other animals. And further I believe that time, as we experience it, is created by our uniquely human brains..."

In the case of this Altamira bison painting, it appears that the human sense of time, i.e. memory, was exceptional. This drawing of the bison, which must have been drawn from memory, is proof that primitive humans had remarkable powers of recall as well as keen powers of observation.

It is even quite possible that the cavemen's ability to remember was much better than ours, as non-literate societies had to rely on memory rather than the written word. This has been well documented in studies of the oral tradition, before literacy, in which very long works such as Homer's *Iliad* and *Odyssey* were often committed to memory, for example.

But even more than this, memory was a key component of the cave dwellers' ability to survive. In the hunting pictures seen next, we can see a coordinated bow and arrow attack on a herd of animals. This attack required a number of memory and time related skills: a knowledge of animal habits, day to day, month to month, season to season; a plan of attack that coordinated the efforts of the hunters; and the preparation for the attack with the construction of bows, arrows and spears that were designed for the greatest effect in the hunt.



PICTURE CAPTION: "Hunting Scene" from the Cave of the Horses of Valltorta in Eastern Spain.
Such an attack required knowledge of the animal's habits plus planning, coordination and preparation.



PICTURE CAPTION: Arrowheads. These are much more sophisticated than it appears to us moderns.

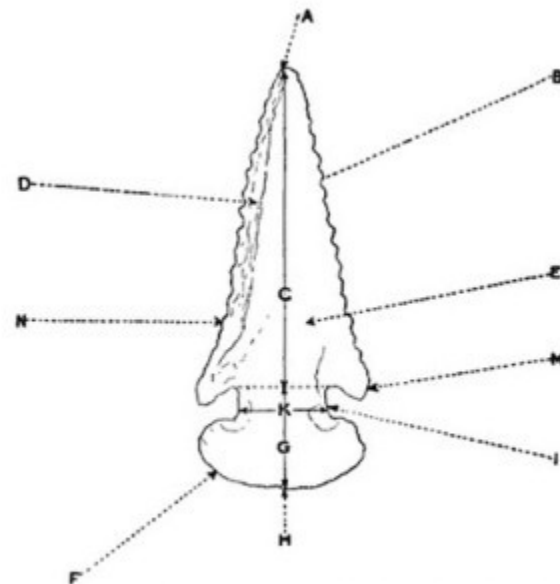


FIG. 79. (S. 1-1.) Material: white flint, Southern Ohio. A, point; B, edge; C, face; D, bevel; E, blade; F, tang; G, stem; H, base; I, notch; K, neck; M, barb or shoulder; N, serration. Phillips Academy collection.

PICTURE CAPTION: Detailed description of arrowhead construction.

The Ancient Manipulation of Time: Part 1

As I wrote in my blog *The Genius of Cavemen*, early human beings had remarkable powers of recall, powers that allowed them to accurately draw bison from memory.

It is only recently that scholars have agreed that they also were keen observers of the sun, the moon, the stars, the planets and the seasons. This, of course, required a number of skills: accurate long term observations and memory of those observations, the ability to pass along that information to others and to pass down that info from generation to generation, and the ability to extract long term patterns in the celestial movements. Comprehending these movements was essential for survival as it told people when to plant and harvest. As I have said from the beginning of this blog, humans could do this because they had a superior memory and sense of time which allowed them to understand time as no other animal had done.

Yet the implications are even more profound. By accurately observing the past and projecting that behavior into the future, humans could now, in a limited way, use time as a resource. They could manipulate time. Being able to predict meant that they not only knew when to plant, but when to start preparing months before the seeds went in the ground plus how much grain to store for the winter and how much fire wood to cut. They had, to use the modern term, a handle on time.

The following pictures from prehistoric and ancient astronomy show both the early interest in astronomy and something about the extent of knowledge, although our full understanding of what humans knew back then will always be incomplete.

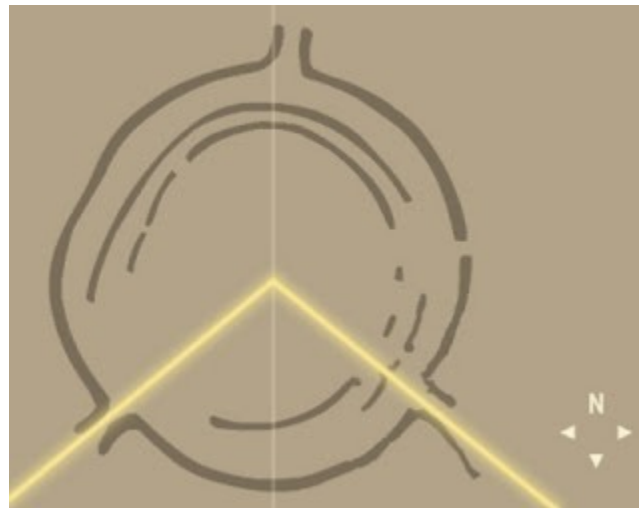
For a good listing of our current knowledge about this era, go to Archaeoastronomy: (Prehistoric Astronomers) on the *Ancient Wisdom* site in the UK.

Ironically, the advent of modern computers has made it easier to verify these astronomical calculators of the past -- because the complex movements of the planets thousands of years ago, for example, were quite difficult to simulate until now.

Yet what you will read in this article is only the beginning of ancient wisdom -- in my next blog I will show how, about 3800 years ago, discoveries were made in astronomy, astronomical science and technology which led directly to the modern day computer and our modern way of life.



PICTURE CAPTION: The Goseck Circle in Saxony-Anhalt, Germany, built around 4900 BCE, is the oldest solar observatory discovered so far. The two southern openings line up with the two solstices plus it could have been used to reconcile the monthly lunar cycle with the solar year. Built by stone age peoples and only recently discovered, it reveals a sophistication that modern archaeologists had not thought possible.



PICTURE CAPTION: Diagram showing the openings that correspond to the two solstices.



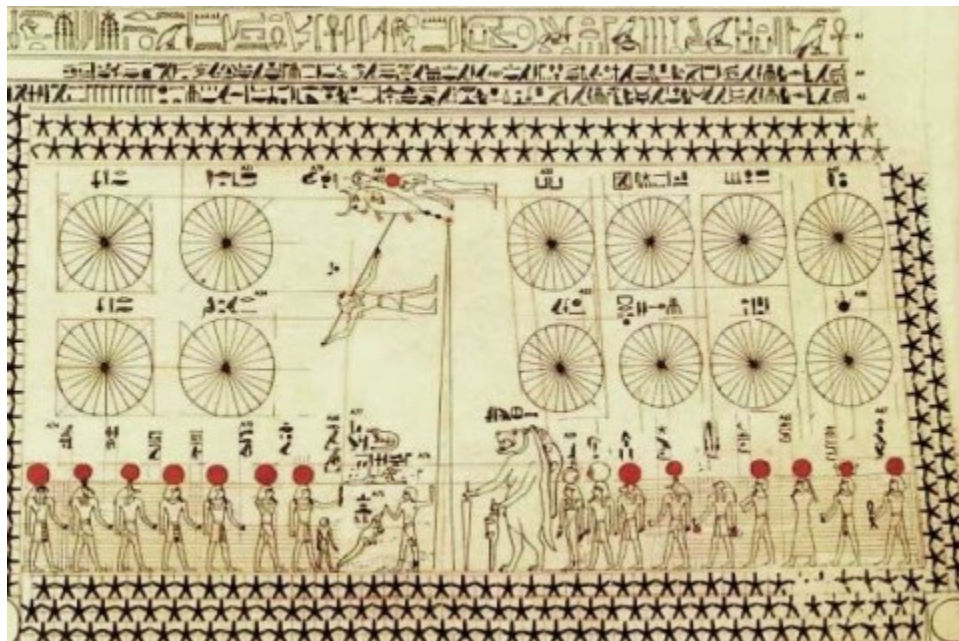
PICTURE CAPTION: It is now generally accepted that Stonehenge in England, built and reworked over a number of years between 3100 and 1600 BCE, was both a kind of clock that lined up with the sun during solstices and equinoxes and was possibly a astronomical calculator that could predict eclipses and other celestial occurrences.



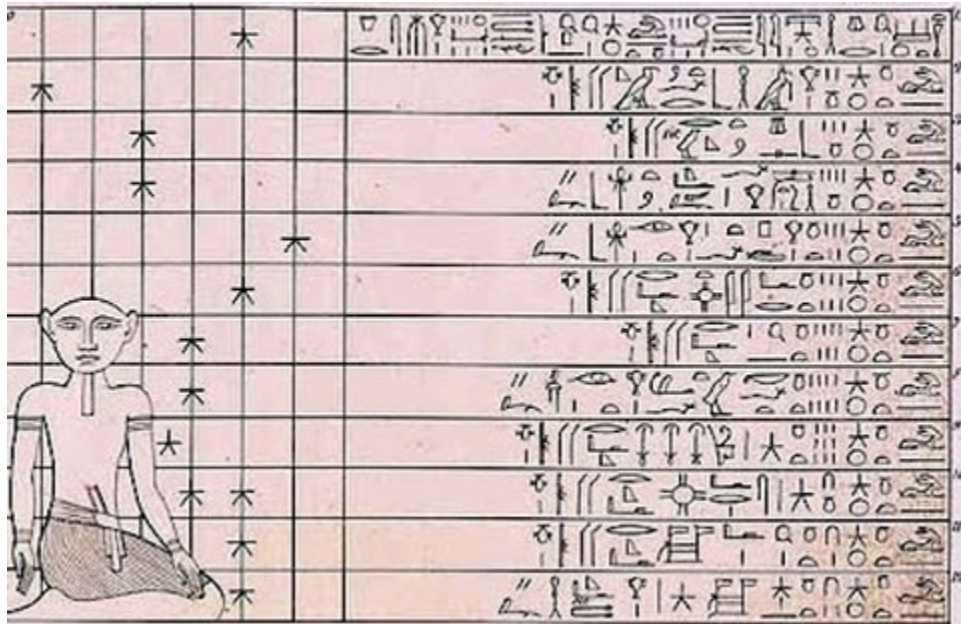
PICTURE CAPTION: Gathering of people to see the sunrise on the summer solstice at Stonehenge 2005.



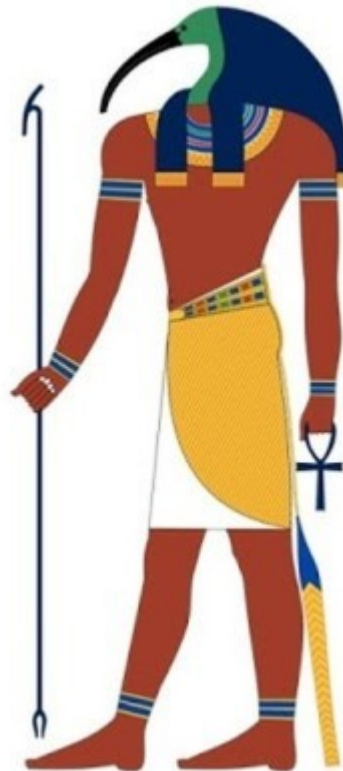
PICTURE CAPTION: The Nebraskan Sky Disk is the earliest -- ca. 1600 BCE -- accurate astronomical picture of the sky. Relatively small and portable it had the ability to reconcile the monthly lunar cycle with the solar year and could be used to predict when to plant. It was found not far from the Goseck Circle, but fabricated more than 3000 years later in the Bronze Age.



PICTURE CAPTION: Southern star panel of the earliest Egyptian star catalog, known as the Egyptian Celestial Diagram, ca. 1470 BCE. It was found in the Tomb of Senemut. This shows the intense interest Egyptians had in mapping the heavens in detail.

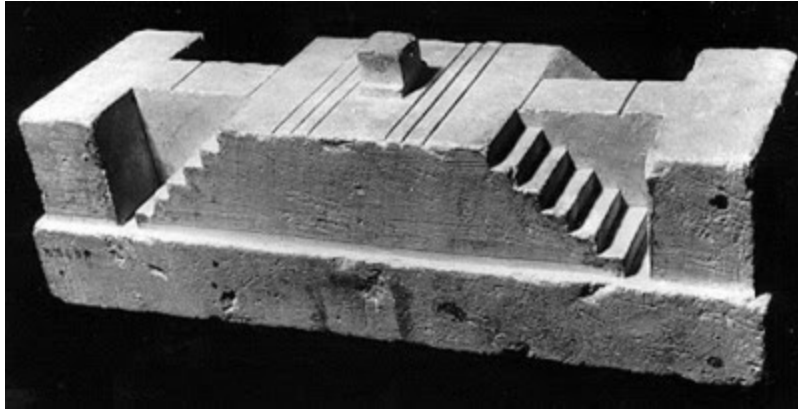


PICTURE CAPTION: Copy of a chart that served as a night clock during the Egyptian month of Thoth, ca. 1140 BCE. The name of star is on the right, the hour on the left and the position of the star is indicated in the column.



PICTURE CAPTION: The month of Thoth was associated with the God Thoth.

The God Thoth, "invented all the arts and sciences, astronomy...and most important of all - writing. ...he was the first of magicians and compiled books of magic which contained 'formulas which commanded all the forces of nature and subdued the very gods themselves'." (Quoted from www.thewhitegoddess.co.uk)



PICTURE CAPTION: Model of an Egyptian sundial or shadow clock.



PICTURE CAPTION: Plowing in Egypt ca. 1200 BCE.

Civilization was only possible because agriculture created a surplus of food. This ample supply of food was due in large part to a precise knowledge of the changing and repeating seasons that was uncovered by astronomy. The insights of astronomy were discovered because humans were able to see and grasp long term repeating patterns.

The Ancient Manipulation of Time: Part 2

The First Computer?

Today clocks are everywhere. In addition the time on your computer, your cell phone or your cable TV is usually in sync with a central atomic clock server which means that clocks now differ only seconds at most. Clocks are a particularly human invention and their ubiquitous presence means that we have accepted them as fundamental to our lives. [1] Yet the invention of clocks involved thousands of years of development -- a story that is as fascinating as any detective movie.

About 4000 years ago, the Babylonians began the ultimate leap from observations to predictability. In so doing they created the foundations for modern science and technology, which as we all know, has given humans the ability to dominate the Earth. Their work even led to what was arguably the first analog computer, a device that is still in wide use today.

The movement of the sun, moon, stars, constellations and planets were, for the ancients, the way they told the time of day, the month, the seasonal changes, the solstices and equinoxes and the new year. This was essential for knowing when to plant and when to harvest, when the fish ran, when animals migrated and when annual rains or floods would come.

Astronomical movements were to the Babylonians a celestial clock. And since time ruled the lives of people and empires, they looked to understand the complexity of time. Starting about 1800 BCE, the Babylonians kept comprehensive records of astronomical movements on clay tablets written in cuneiform. Known as the Babylonian astronomical diaries, these diaries now combined the power of human memory with the power of the written record.

For the purposes of this blog about time, it is important to note that observations deal with the past while predictability derives from these past observations and then projects into the future. This simple point is a key to understanding the human relation to time and how it has given us so much power.

It is also important to note that when human memory was recorded on clay tablets it was then not dependent on living individuals. Memory was still the key to the power that humans were unlocking, yet now it had achieved a new form, a more permanent form in writing that could be accessed by civilized humans indefinitely into the future. [2]

Careful astronomers, the Babylonians measured and recorded the positions of the sun, the moon, the stars, the constellations and the planets over hundreds of years. At some point they grasped the fact that celestial movements repeated. [3]



PICTURE CAPTION: This is a close-up of a section of a cuneiform tablet that recorded the daily movement of the planet Venus over a period of 21 years. It is the first time that the movement of a planet was understood as repeating. Although this tablet has been dated to the 7th century BCE, it is believed to be a copy of a much older record from the 17th century BCE.

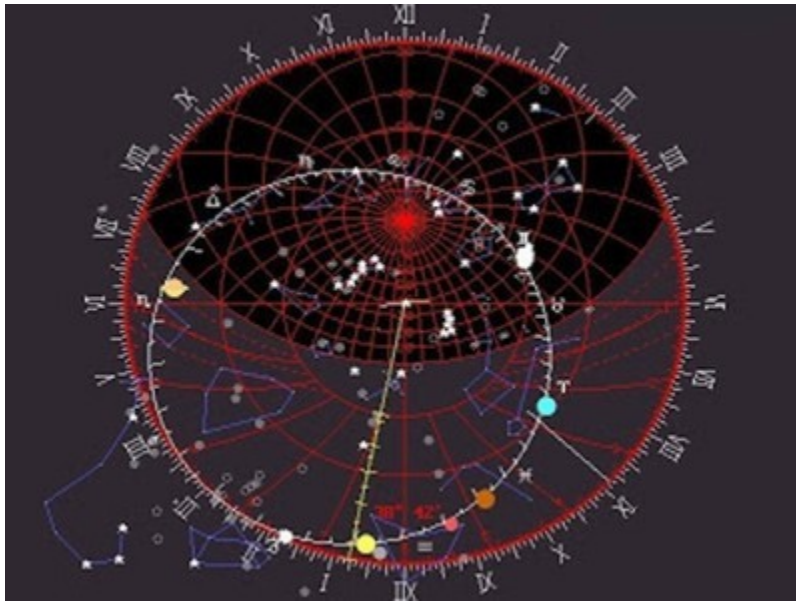
Once having understood these repeating patterns, they created mathematical formulas that correctly matched the previous paths and predicted future movements.

Historian A. Aaboe said about Babylonian astronomy that *"all subsequent varieties of scientific astronomy, in the Hellenistic world, in India, in Islam, and in the West -- if not indeed all subsequent endeavor in the exact sciences -- depend upon Babylonian astronomy in decisive and fundamental ways."*

Now let's fast forward just a bit in the ancient world to around 150 BCE. With the conquests by Alexander the Great, the science and discoveries of Babylonian astronomy became known to the Greeks. Building on the Babylonian's knowledge, the brilliant Greek astronomer Hipparchus created the first astrolabe which was perhaps the earliest computer. In later centuries, when the astrolabe became fully developed it could be used for obtaining the time, for nautical navigation, surveying, locating stars and hundreds of other uses. It is still widely used today in parts of the world.



PICTURE CAPTION: On the left is a drawing of the basic lines for an astrolabe in Chaucer's time, in the middle is an actual astrolabe during Chaucer's time, on the right is a sexton which is a specialized astrolabe for use at sea.



PICTURE CAPTION: Screen grab of a digital astrolabe. Get your own free copy at: www.astrolabes.org/pages/electric.htm

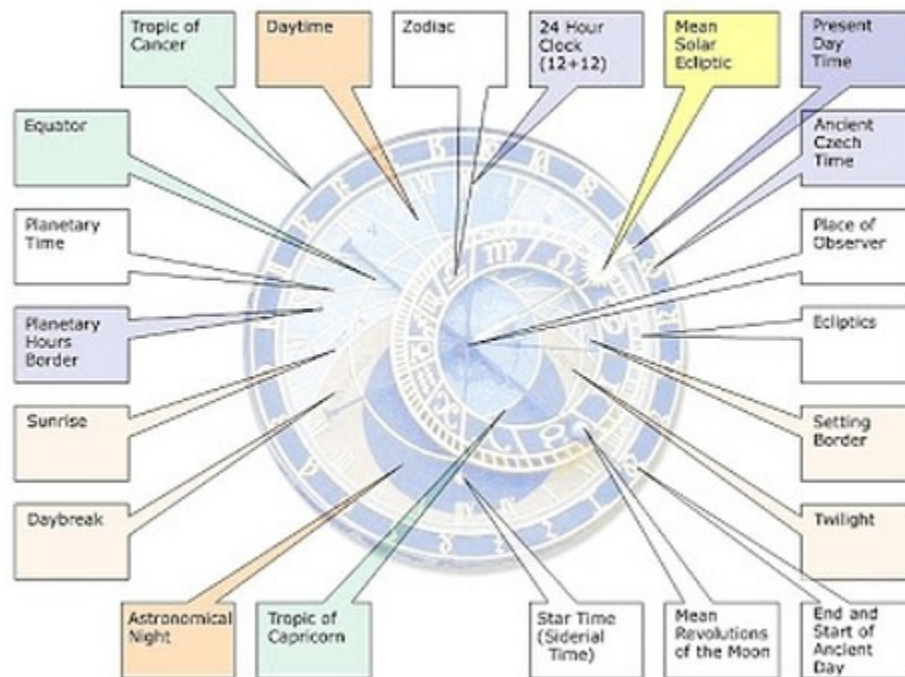
The construction and calculations of the astrolabe were based on mathematical formulas derived from the movement of astronomical bodies. Early clocks in fact were put together based on formulas carved into astrolabes.

During the Middle Ages and into the Renaissance many astronomical clocks were built -- clocks that displayed the position of the planets, the zodiac, the moon and the sun along with the current time. While the use of these clocks eventually faded in favor of today's clocks that simply give the time of day, they could not have existed without their astronomical ancestry.

Lynn White Jr., Medieval researcher, said, *"Most of the first clocks were not so much chronometers as exhibitions of the pattern of the cosmos...Clearly the origins of the mechanical clock lie in a complex realm of monumental planetaria...and geared astrolabes."*



PICTURE CAPTION: On the left is a drawing showing the moving plates of an astrolabe, in the middle is a diagram that shows how a clock based on an astrolabe can display the sun's daily and yearly movement. The last photo is of Prague Orloj, the famous astronomical clock in Prague that was built in 1410 and is still working today.



PICTURE CAPTION: This chart explains what information can be read from the Prague Astronomical Clock.

The point is this:

Time and yearly changes being critical to human survival and the fact that humans possessed remarkable memory (see my earlier blog: *The Genius of Cavemen*) led to the discovery of repeating patterns in the heavens that corresponded to seasonal changes and then to the ability to predict future patterns.

SUMMARY:

== The first time keeper was the movement of the sun, moon, stars, constellations and planets

== Humans, due to their unique memory, noticed long term patterns and began to correlate celestial movements with changes in the year

== Civilizations, such as the Babylonians, took these observations to a new level of accuracy via written records

== After hundreds of years of written data, the Babylonians were able to create formulas that predicted the movement of these celestial bodies

== These mathematical formulas were eventually built into the astrolabe device that could be used to make calculations derived from sighting objects in the sky; this led to the development of early geared clocks which were often geared astrolabes

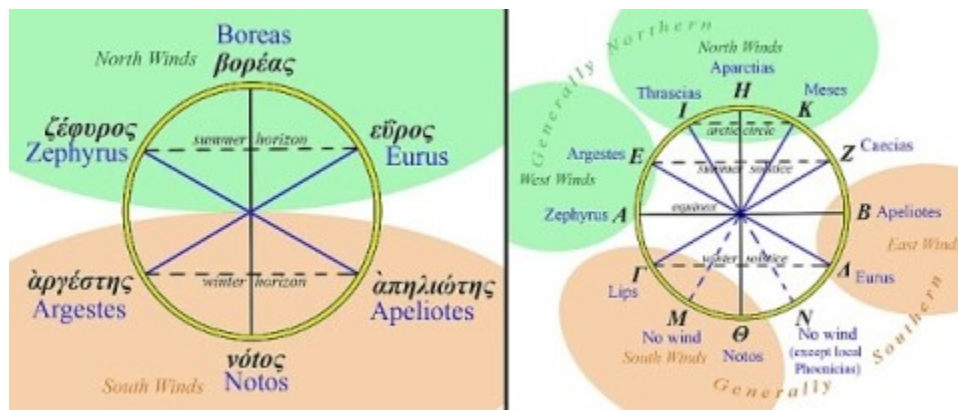
== This device eventually led in part to today's computers

Modern Note: The computer you are using to read this blog has, at its heart, a CPU (Central Processing Unit) which contains a clock -- and this clock is critical to computer processing as a CPU could not function without it. Simply put the modern world could not function without precise clocks.



PICTURE CAPTION: Virtually all microprocessors contain a clock which regulates the actions of the chip. The chip could not process information without the clock.

By accurately observing the past and projecting that behavior into the future, humans could now, in a limited way, use time as a resource; they could manipulate time. Being able to predict meant that they not only knew when to plant, but when to start preparing months before the seeds went in the ground, how much grain to store for the winter and how much fire wood to cut. My guess is that over time, the ability to predict seasonal changes in weather, flooding, temperature, prevailing wind etc. lead to a substantial increase in crop yields which in turn led to the rise of complex civilizations. Humans had begun to have, to use the modern term, *a handle on time*, which gave them a power possessed by no other animal on the planet.



PICTURE CAPTION: On the left is a chart of the seasonal winds known in Homer's time, ca. 700 BCE; on the right, from Aristotle's book *Meteorology*, is Aristotle's 'wind rose' showing a much more sophisticated understanding of wind patterns as they related to the seasons about 400 years after Homer. Aristotle coined the word meteorology and the term 'weather forecast'.

FOOTNOTES:

- [1] It is only in the last two hundred years or so that standardized and accurate clocks have become a necessity -- with the need to create time zones and schedules for the railroads, for example, and the need for factory workers to show up on time when the Industrial Revolution took hold.
- [2] Even today, astronomers are learning from these clay tablets. For example, the appearance of Halley's Comet was recorded on a Babylonian clay tablet in 164 BCE.
- [3] The Babylonians were so good at finding patterns they even discovered the Saros Cycle, which predicted solar and lunar eclipses due to repeating patterns over about 18 years.



PICTURE CAPTION: A picture of activity in the Istanbul observatory showing the intense interest in astronomy by Islamic and Middle Eastern scientists in the 15th century. Arab scientists went on to perfect the astrolabe.

THE PRESENT

How Photography Changed Time: Part 1

As a photographer for the last forty years, I only just begun to appreciate the power of photography and how it changed the world.

Time is very different now than it was before photography. Before photography there were only written records, which were often subjective, along with paintings and drawings -- plus memories that were often flawed or that faded within a few year's time.

Photography freezes time. Photography can record reality, objects and details in the real world, independent of our memories. This objective ability can allow us to view the past without the mist of emotions, the rose colored glasses that often tint our recollection of the past.

Why photography is the art of time:

A photographic exposure is a combination of the amount of light coming through the lens combined with the amount of time that light is allowed to hit light sensitive material. Time is at the core of photography. This works in two ways.

One: the moment the photo is shot freezes an instant in time.

Two: the length of the shutter speed can capture an image so that it looks normal to the human eye or capture a picture in ways that the eye cannot see.

Photographs are used routinely in court cases and other legal matters because they are believed to show an objective picture of reality. While not entirely true, the phrase, "the camera doesn't lie" echoes this idea.

Time, in a sense, can now be grabbed, taken hold of. We can look at our past in our family photo album or an old yearbook.

100 years ago when Kodak introduced the Brownie, photography became available to every level of society, from government, to companies, to the upper class and to the average citizen.

The Wikipedia article on the Brownie included this fascinating comment:
"In 1908, the Austrian architectural critic Joseph August Lux wrote a book called Künstlerische Kodakgeheimnisse (Artistic Secrets of the Kodak) in which he championed the use of the camera for its cultural potential. ...he argued that the accessibility the camera provided for the amateur meant that people could photograph and document their surroundings and thus produce a type of stability in the ebb and flow of the modern world."

Now, of course, there are many subjective aspects to photography in which a photographer can choose what to photograph or emphasize and what to leave out -- or even stage the shot. Yet at the moment the shutter is snapped, the photograph is a real world record of what was in front of the lens. (See footnote about Photoshop.)

Look at your family album with photos from ten or twenty years ago. A sharp shot will show the patterns on a dress, the hair cuts, the toys, the decorations in precise detail -- detail that could not have been preserved any other way.

**We might call the time before photography
pre-photographic
just as we call the time before written records
prehistoric**

If there is truth to the idea that "a picture is worth a thousand words" then visual/photo literacy is now just as important as the written word.

*The illiterate of the future will be the person ignorant of the use of the
camera as well as the pen.*

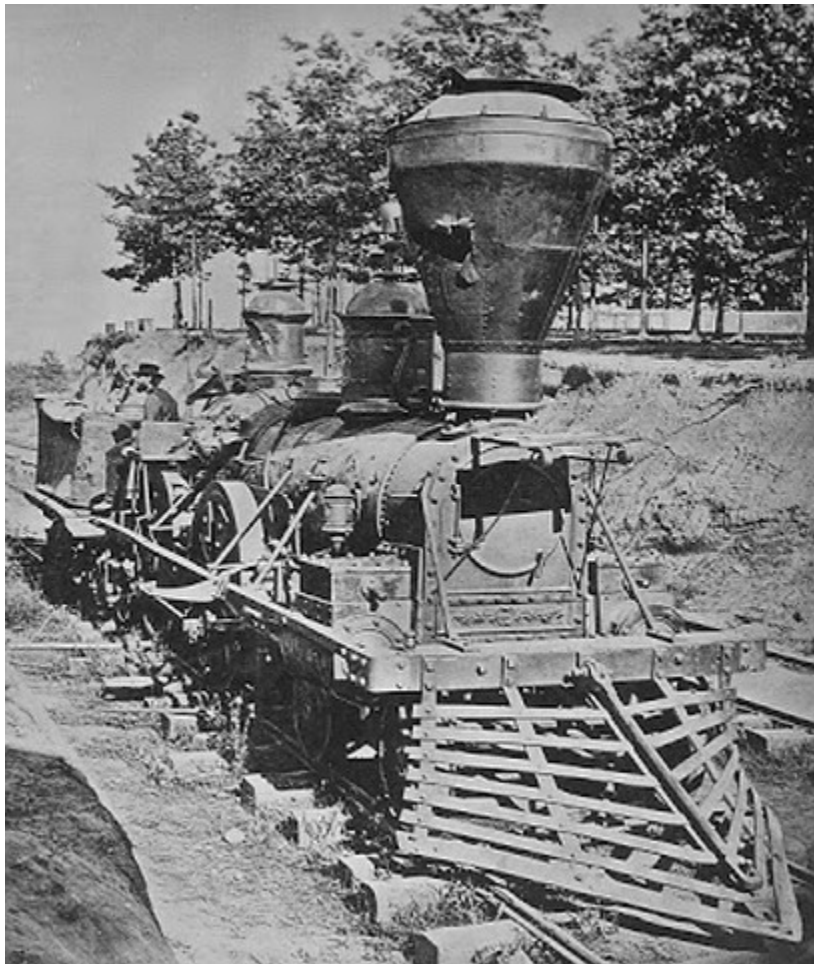
Laszlo Moholy-Nagy

If you think that I am exaggerating the importance of photography, try to imagine the world without it: no television with photography (film, video, still photos), no instant replays, no YouTube videos, movies, camera-phone snap shots, no photos sent to you on your cell phone, no baby pictures, no yearbook portraits, no photos in catalogues, online stores, newspapers, books or blogs...

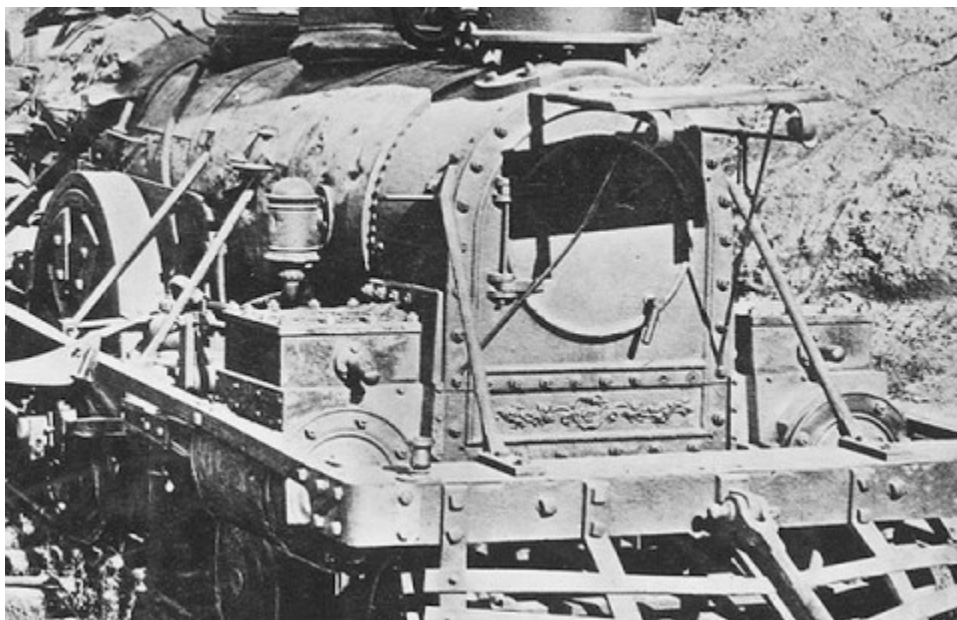
**THE FOLLOWING PHOTOGRAPHS
ARE FROM 100 YEARS OF WAR**

These pictures demonstrate the power of photography. They affect us today not only because they document war in precise detail -- detail that historians will study for centuries -- but because we know that they recorded an actual moment of real people whose lives were wrenched apart. No other art form has this feeling of reality and brings the past alive.

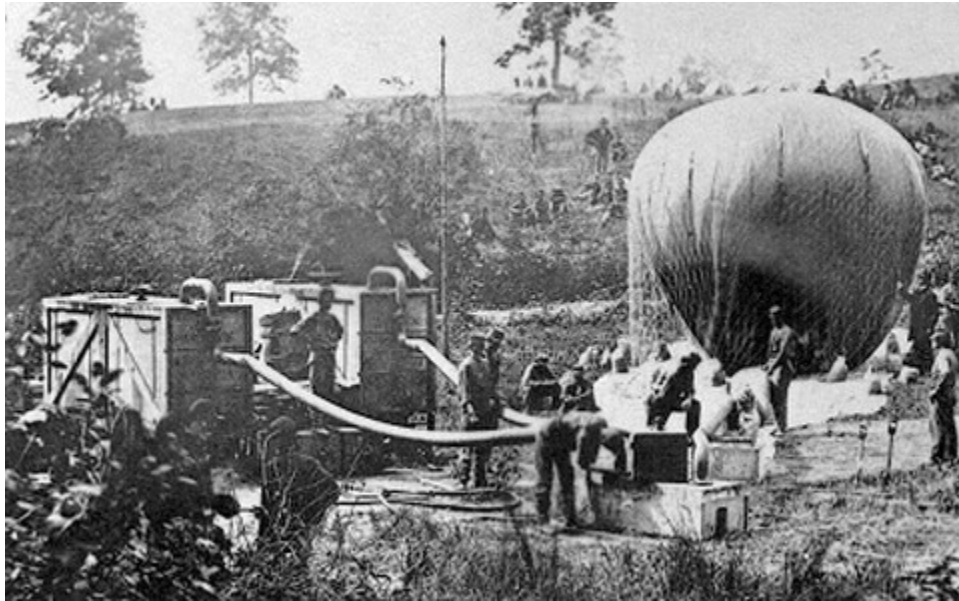
NOTE: This series of photographs shows war in all its horrible extremes from death to unbridled joy when the war was over -- and contains pictures that may be disturbing to some readers. Viewer discretion is advised.



PICTURE CAPTION: The Union locomotive "Hero" was captured by Confederates in the US Civil War during the fighting in Atlanta. (Mathew Brady)



PICTURE CAPTION: Blowup of a portion of the above photo. A railroad buff would be able to glean volumes about the construction of this engine from the sharp detail in this photograph.
(Mathew Brady)



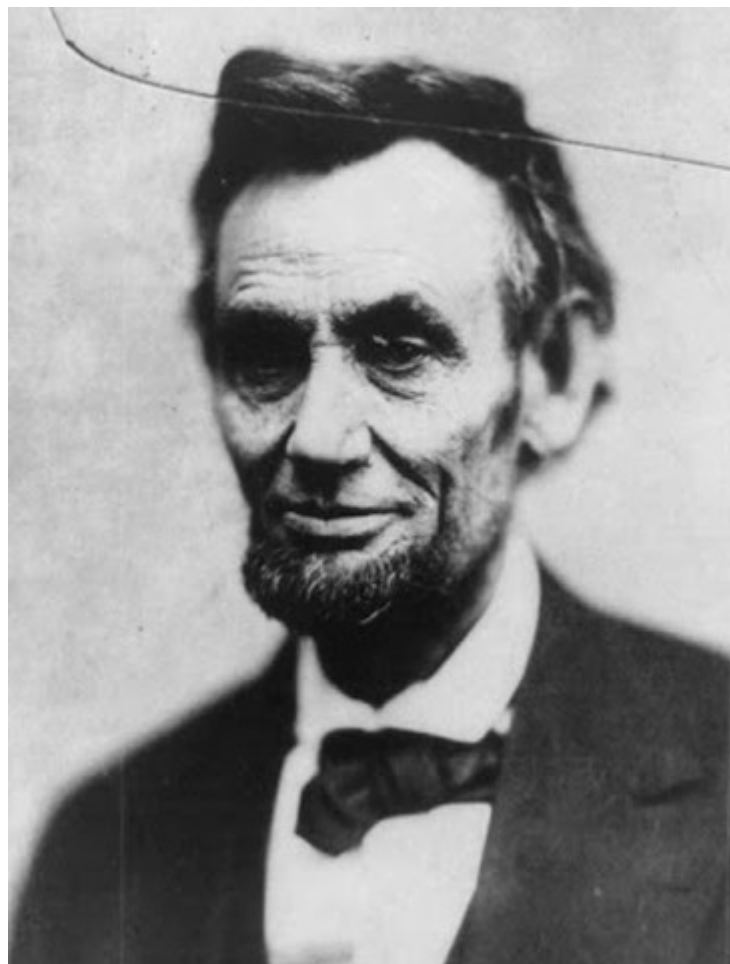
PICTURE CAPTION: Did you know that balloons were used in the US Civil War? I didn't. This photo reveals a variety of information. (Mathew Brady)



PICTURE CAPTION: Ambulance during the US Civil War. (Mathew Brady)



PICTURE CAPTION: Dead Confederate soldier at the siege of Petersburg, Virginia --US Civil War. (Mathew Brady)



PICTURE CAPTION: The last photograph of Lincoln before he was assassinated. (Mathew Brady)



PICTURE CAPTION: Damage in London by German bombers during the Blitz -- World War II.



PICTURE CAPTION: People walking by smoldering destruction in London during the Blitz in World War II.



PICTURE CAPTION: Abandoned boy in London toward the end of the war -- World War II.



PICTURE CAPTION: German Soldier during World War I.



PICTURE CAPTION: The famous Soviet T-34 tanks in night fighting in the winter during what the Russians called "the Great Patriotic War."



PICTURE CAPTION: Soviet soldiers relaxing during a lull in the fighting during the Great Patriotic War.



PICTURE CAPTION: A US officer looking at a dead German 'last stand' soldier he believed had killed a number of his men in the battle for Cherbourg, France -- World War II.



PICTURE CAPTION: Destruction in Berlin as a result of the war -- World War II.



PICTURE CAPTION: Celebration in Times Square, New York City after the surrender of the Japanese in World War II. This photo shows the many happy faces of young men who now knew they would not have to fight and die.



PICTURE CAPTION: Civilians, caught in the middle of deadly fighting during the Vietnam War, being directed by a South Vietnamese soldier.



PICTURE CAPTION: Wounded US soldier during the Tet offensive in the town of Hue during the Vietnam War.



PICTURE CAPTION: One of many confrontations, between protesters and authorities in the United States, during the Vietnam War.

Footnote: Okay -- Photoshop can change what the camera saw, but that is a different question. Plus digital manipulation is usually pretty obvious and only a tiny fraction of the billions of photos being shot now are being altered.

How Photography Changed Time: Part 2

All media are extensions of man that cause deep and lasting changes in him and transform his environment.

Marshall McLuhan

The camera has offered us amazing possibilities, which we are only just beginning to exploit...for although photography is already over a hundred years old it is only in recent years that the course of development has allowed us to see beyond the specific instance and recognize the creative consequences.

Laszlo Moholy-Nagy

Technologies can extend our reach physically and allow us to go beyond the limits of our senses. Television brings events from around the world into our living rooms, for example, and photography lets us see in the non-visible part of the light (electromagnetic) spectrum such as in the x-ray or infrared wavelengths.



PICTURE CAPTION: X-ray of a human hand (left); normal photo of a tree (bottom right), infrared shot of the same tree (top right). The camera can 'see' in ways that the human eye cannot.

But, as I said in my first article, *How Photography Changed Time: Part 1*, photography also extended our ability to perceive time. It has expanded our sense of time -- which I believe is another sense just like touch or smell or hearing but even more important.

As you will see in the following photographs, we can now take a one million second exposure to reveal 10,000 galaxies in the furthest part of space and also millisecond or nanosecond shots of subatomic particles. These long and short exposures give us a slice of time and the power to see worlds unavailable to the eye. The ability of photography to do this has allowed us to confirm that the universe was created with the Big Bang. It has also allowed us to discover the most fundamental building blocks of matter with photographs of subatomic particles released in high speed collisions.

In another blog for the Pixiq website, I wrote "starting as early as 1840, cameras were designed to take photographs with astronomical telescopes. After 1900 large telescopes were optimized for photography rather than for observation -- making them essentially telephoto cameras." Coupling photography with astronomy has led to many of the major discoveries about the universe during the last 100 years -- discoveries that were only possible with long exposure photographs.



PICTURE CAPTION: This composite photograph was included in Edwin Hubble's doctoral dissertation of 1917 and shows photographs of different types of 'spiral nebulae'. Later Hubble proved that spiral nebulae were galaxies outside our own galaxy, the Milky Way. Up until then everyone had assumed that the Milky Way was the entire universe but because of photography scientists found that the universe was much larger than anyone had imagined.

From Edwin Hubble's Ph.D. dissertation: *Photographic Investigations of Faint Nebulae* (archive.org)

Even in the normal world photography can 'see' things that the eye cannot see: events that happen much faster and also events that happen much slower -- such as a photo finish at a race, a bullet piercing a light bulb, the time lapse growth of a plant or the slow motion replay of a touchdown at a football game.

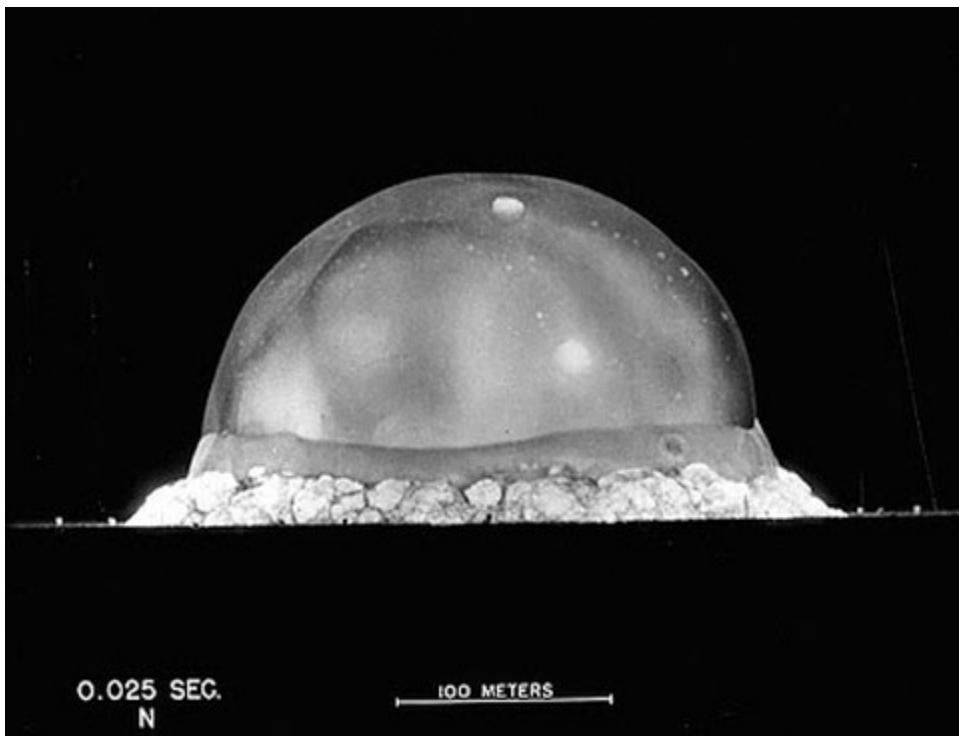
In addition artists have used photographic long exposures to capture continuous motion -- to reveal a moment in time smeared across the picture area like a painting. Or photography can capture moving light sources, such as flashlights used like paint brushes, to create light painting photographs taken over many seconds or even minutes. As a photo artist I have used both of these techniques for over 10 years now and have written a book about it: *Experimental Digital Photography*, Rick Doble, Sterling Publishing, New York/London, 2010.



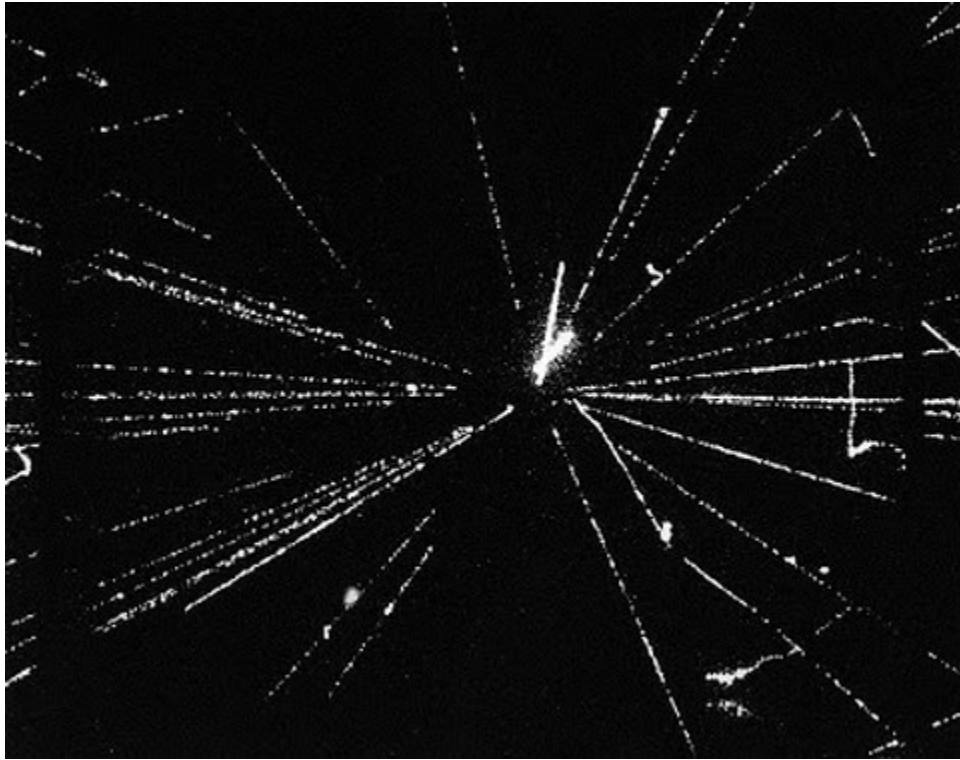
PICTURE CAPTION: Chronophotography: Named for the primal Greek god of sequential time, Chronos, chronophotography was invented by Edweard Muybridge in the 1870s and produces a number of sharp photographs of movement in sequence. Series on the right shows Muybridge's famous sequence of a horse galloping in which he proved that all four hooves left the ground at the same time (top right) -- which the human eye could not see. Photo on the left shows a modern day chronophotograph of a diver, very similar to diving photos shown recently at the Olympics.



PICTURE CAPTION: One million second exposure of deep space by the Hubble telescope; this is a cropped enlarged detail showing over a hundred galaxies. The full original photo shows about 10,000 galaxies in the deepest part of the universe. (nasa.gov)



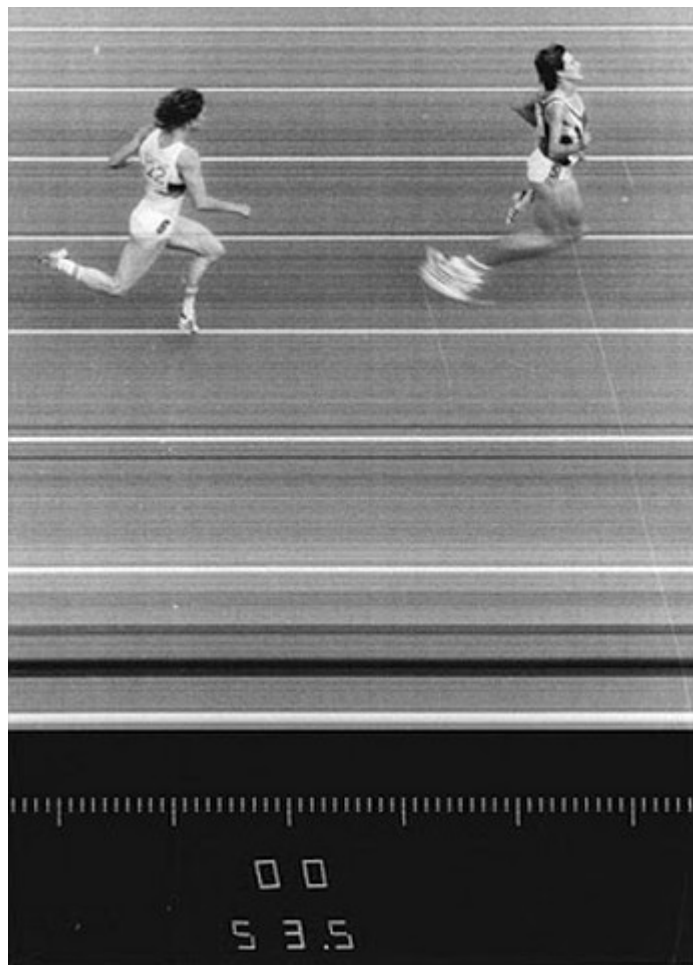
PICTURE CAPTION: Photograph of the first atomic bomb test, code named Trinity, 25 milliseconds after its detonation in New Mexico USA on July 16, 1945. Taken with a Rapatronic camera developed by Harold 'Doc' Edgerton, the high speed photography wizard, exposures of atomic blasts were frequently about 10 nanoseconds (0.00001 milliseconds).



PICTURE CAPTION: A streamer chamber photograph of subatomic particles: a proton-antiproton interaction at CERN's Super Proton Synchrotron in 1982.



PICTURE CAPTION: Very fast photo triggered at the moment a bullet pierced a light bulb.



PICTURE CAPTION: Photo finish of a race.



PICTURE CAPTION: The same water current taken at a very fast and a very slow shutter speed. The fast shutter speed photo at the top shows water in sharp frozen detail, much sharper than the eye can see; the slow shutter speed photo at the bottom shows the same water soft and foaming -- again in a way that the eye cannot see.



PICTURE CAPTION: 'Light painting' digital photograph: a self-portrait taken at eight seconds. Digital photography has expanded the ability of artists to use photography for artistic purposes. This self-portrait I took of myself was done entirely by me with a handheld flashlight in one shot.
(Rick Doble)

How Games Let Us Play With Time

Games allow us to 'play' with and improve our time skills, to exercise our brains.

We are involved with games from the moment we are born. And these games usually involve time. They allow us to "play it safe," to work with and consider time in ways that would be impossible in real life. They also utilize our uniquely human areas of the brain that deal with time -- as the following quote about short-term memory and chess points out.

This ability to hold on to a piece of information temporarily in order to complete a task is specifically human. It causes certain regions of the brain to become very active, in particular the pre-frontal lobe. This region, at the very front of the brain, is highly developed in humans. [ED: my emphasis]

Perhaps the most extreme example of short-term memory is a chess master who can explore several possible solutions mentally before choosing the one that will lead to checkmate.

'SHORT-TERM MEMORY': McGill University, Montreal, Canada

We all know the game Peekaboo that is played with very young children. Peekaboo appears to be quite old and is played worldwide in a variety of cultures.

An older person covers their face or hides behind a door only to reemerge. Some children are quite upset when the person goes away and bubble with laughter when the person comes back.



Peekaboo is thought by developmental psychologists to demonstrate an infant's inability to understand object permanence. Object permanence is an important stage of cognitive development for infants.
(Wikipedia.org)

Another way to talk about 'object permanence' is from the point of view of time. Peekaboo requires that a child remember the person when they reappear in the 'now' moment and to not be upset when they disappear as they will come back. The game trains a child to develop short-term memory.

While Peekaboo is a game, separation anxiety is the real thing -- and affects many young children. When a child must leave a parent and go to kindergarten or is left with a baby sitter, he or she may become upset. In this sense we can see Peekaboo as a safe game that allows a child to work through the idea of a parent being gone for a while.

Children's games are often about 'now you see it, now you don't'; they frequently involve hiding while retaining a sense of the permanence of things even when out of sight.

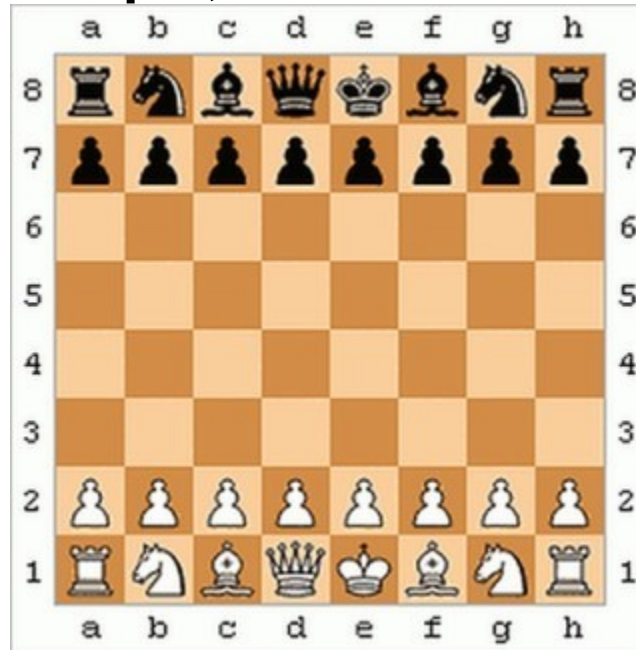
Hide-and-seek played by older children, has some of the same elements as Peekaboo but at a more sophisticated level. The children are first together, then all hide separately until they are caught; finally at the end they come back together and are reunited. This reinforces the central theme: people can go away but when they are out of sight, they still exist.

It is also interesting to note that this game is usually passed down by older children to younger children -- not taught to them by adults. This is an example of an oral tradition that still persists in our culture.



Blind Man's Bluff is an older children's game during which people in a sense disappear because the person who is 'it' is blindfolded -- but at the end everyone is back to normal. It has been played around the world by children for about 2500 years.

Games
have universal appeal
and often cut across cultural boundaries.
Chess, for example, is remarkable in this way.



Chess began about 1500 years ago and has been played continuously around the world at all levels of society, by all ages, by both men and women and in developed and less developed countries.



PICTURE CAPTION: Two knights at a chess game in 1283.

The black and white alternating squares are a grid, a classic artificial human pattern, that becomes the frame, the world during the game. Like all games it has a beginning, a middle and an end. While not necessarily limited by a specific time, the game goes through clear

phases such as the beginning characterized by the phrase "opening moves" and the final moves known as the 'endgame', a term which comes from chess.



PICTURE CAPTION: Chess Grandmaster Jennifer Shahade in competition in 2002 at the U.S. Chess Championships in Seattle, Washington.

If you have ever been around serious chess players, you know that when they are playing their concentration is total and they are not to be disturbed. For the duration of the game, they live on the chess board. Normal everyday time, in a sense, is suspended while it, nevertheless, continues relentlessly forward on the field of play -- the board.



PICTURE CAPTION: Two boys playing a game of chess in Santiago, Cuba.

Benjamin Franklin on Chess & Time:

In his essay, *On the Morals of Chess*, Franklin listed the lessons learned from the game -- starting with how it taught a player to consider the future:

Foresight: which looks a little into futurity, and considers the consequences that may attend an action; for it is continually occurring to the player, "If I move this piece, what will be the advantages or disadvantages of my new situation? What use can my adversary make of it to annoy me? What other moves can I make to support it, and to defend myself from his attacks?"

Benjamin Franklin *On the Morals of Chess* (1779)



PICTURE CAPTION: Chess players at a park in Kiev, Russia.



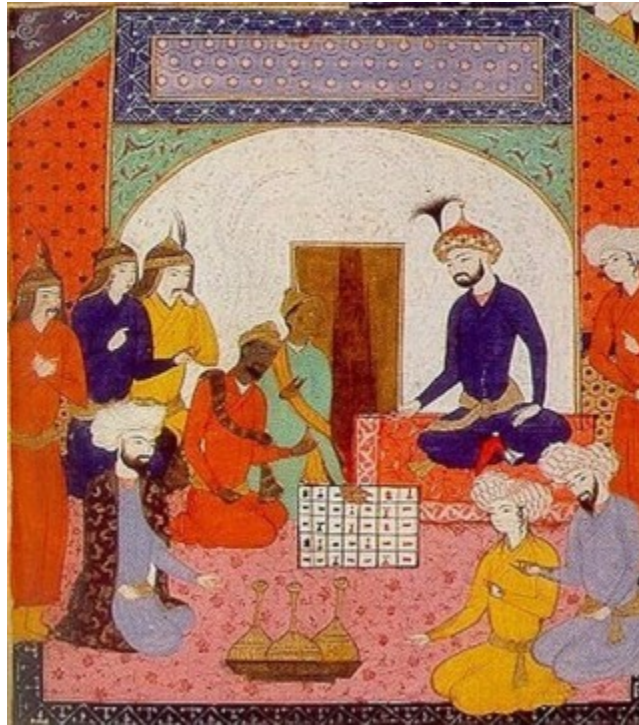
PICTURE CAPTION: Young German chess players in 1952.



PICTURE CAPTION: A game of chess in Algeria.



PICTURE CAPTION: Painting by British painter James Northcote about the game of chess, circa 1800.



PICTURE CAPTION: A page from a Persian manuscript, *A Treatise On Chess*, from the 14th century.



PICTURE CAPTION: Carved ivory mirror case depicting a couple playing chess around the year 1300.



PICTURE CAPTION: Known as the Charlemagne chess set, these pieces were made in the 11th century. This piece is a knight from this ivory set.

How Culture Plays With Time

While we must each live, work and die with the unrelenting march of irreversible time, the culture often *plays* with time in safe ways, ways that provide metaphors for life.

Games, movies, drama, music and other cultural forms are time based. But their peculiar nature allows people to consider time in a secure environment.

Who has not felt their pulse race when the home team is down a few points with only seconds to play? Or the exhilaration when the team wins? Or the crush of defeat when they lose?

We tell ourselves, it is only a game -- yet these victories and defeats are rehearsals for the real things in life -- when someone close to you dies, when you suffer a serious injury, when you achieve a major goal.



Every game has a beginning, a middle and an end, just like living: birth, life, death. Just like episodes in our lives: being born into a family, growing up, leaving.

Game: A complete episode or period of play, typically ending in a definite result: "a baseball game".

Google instant definition

While some games are open ended when it comes to a specific time span such as baseball, others are controlled by the clock such as football. Yet every type of game plays with our sense of duration, as I have written about in an earlier blog: *Time & The Human Sense of Duration*.

Baseball in the United States is particularly interesting -- especially with sayings about the game that have spilled over into life: It ain't over 'til it's over; you're down to your last out; three strikes and you're out; it's the ninth inning with bases loaded. See a full list of *English Language Idioms Derived From Baseball* at Wikipedia.org.



Baseball provides many other ways of thinking about time as well. Each action occurs within the context of a bigger event, which itself is part of something even larger. For example, each pitch is an event which in turn leads to plays which lead to hits, runs and outs which lead to the completion of innings which leads to the completion of the game. And the game is part of a season and the season part of the ball club's history.



PICTURE CAPTION: A sequence of shots showing the complete motion involved with making a pitch. This is a modern chronograph similar to the horse galloping sequence of photos by Muybridge.

Football, because it deals with time constraints, has a different dynamic. In the beginning there is often plenty of time to make up for mistakes -- because in the early periods of the game, fluid time is available and a team can make up for early errors. However, as the clock ticks down, hardened time begins to take over and every little mistake or success can have major consequences. In a close game in football, the tension builds to a fever pitch. A team down by 2 points with 2 minutes to go, could win the game, but the window of opportunity is closing fast.

And while sports operates on one level, movies operate on quite another. If you arrive late to a baseball game, let's say the 4th inning, you can easily catch up by looking at the score board and seeing the number of runs, hits and errors for each inning. Not so with movies. If you arrive twenty minutes into the movie, you may never catch onto the full meaning of the story.



Drama plays with our short term memories as you must hold in your mind the action from beginning to end to make sense of what happens. For example, some insignificant event in the beginning might have serious consequences at the close. And for you to make sense of the plot, you will need to remember this small event that occurred at the start.



Film and drama also deal with an arch of emotions. This emotional passage is like a journey. In one type of typical story the hero or heroine, for example, is faced with seemingly impossible tasks, but somehow overcomes obstacles to prevail at the end. Such a story often takes us through a slew of roller coaster emotions. At times it may look as though the hero can never survive. The emotion we feel at the end, when the hero triumphs, occurs only because we have followed his journey from start to finish, because we shared a time span with him.



PICTURE CAPTION: The audience reaction is often quite intense, even though everyone knows the action is fictional.

Tragedy, especially Greek or Shakespearean tragic drama, takes us through an arch of emotions, but with the death or destruction of the hero at the end. In this kind of story, we often know what will happen to the hero or heroine but are helpless to keep him or her from their inevitable fate -- a fate often brought on by their own blindness or pride. We see the path they have chosen swallowing them and we want to stop time, stop the relentless march that takes them to their final end. Many in the audience are deeply saddened or weep when the fictional hero dies.



PICTURE CAPTION: From the film: *D.O.A. (Dead On Arrival)*: From the moment this American Film Noir tragedy starts, we know this fictional hero, Frank Bigelow, will die. A quiet accountant, he has been poisoned and is doomed. Yet while he is alive he is driven to find out why. We follow his journey knowing the inevitable -- and are deeply moved at the end when he dies.

A Revolution In Time

A little more than a hundred years ago, a revolution occurred, a revolution that echoes today and that many people still find troubling. Darwin, Freud, and Einstein radically changed the understanding humans had of their place on Earth. In addition another revolution was taking place in manufacturing -- as Henry Ford pioneered mass production.

And while these ideas were about human evolution, human nature, physics and consumer goods respectively, they also contained new ideas about our understanding of time.

Prior to this, most people believed that the world had been created about 6000 years earlier. Instead Darwin asserted that humans had evolved for possibly millions of years. Geologists later found that the Earth itself was 4.5 billion years old and astronomers established that the universe was 13.8 billion years old. Freud made the assertion that childhood affected us for the rest of our lives and that our adult behavior could be controlled by our early upbringing. Einstein said that time was part of a space-time continuum and could not be seen as separate from space. And even more troubling, he stated that time was relative.

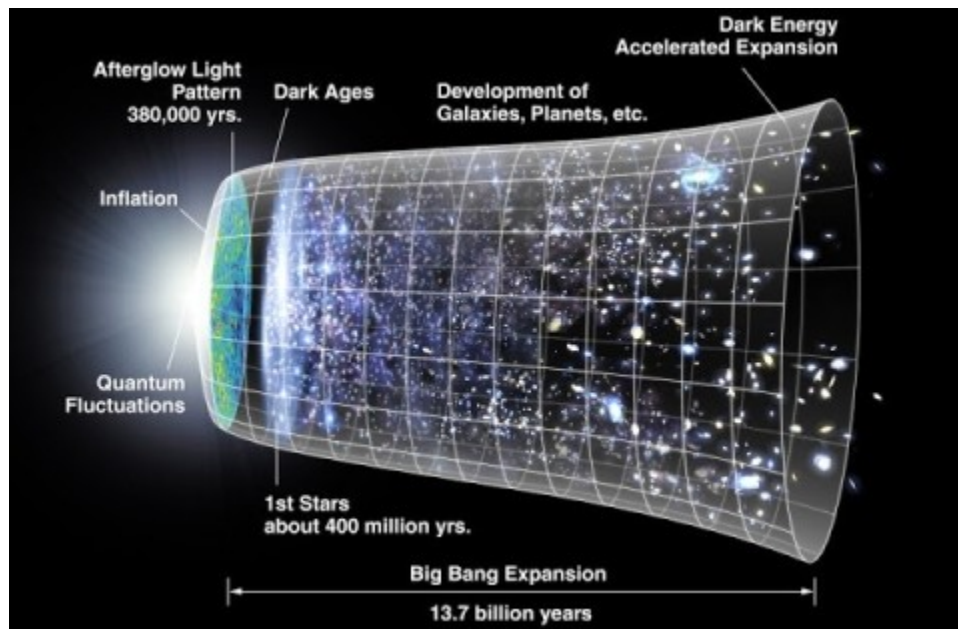


PICTURE CAPTION: Freud believed that adults were often ruled by their childhood, thus making them prisoners of their past.

Darwin's findings meant that humans were not a special species created by a supreme being but instead had evolved from animals. The related findings of geologists and

astronomers meant that humans had only been alive for a tiny portion of the time that the universe had been around and therefore were not that important. Freud's ideas meant our adult behavior was controlled by our past childhood and therefore we were not nearly as rational or in control as we thought. And finally Einstein showed that time itself was changeable and not what we had believed.

The cumulative impact of these findings was to divorce us from our previously cherished ways of understanding and relating to time.



PICTURE CAPTION: The short time that humans have been on this Earth pales in comparison to the vast age of the universe. This very modern understanding of time has only come about during about the last 100 years. The latest contemporary estimates put the age of the universe at 13.8 billion years.

Then Henry Ford developed the assembly line which sped up production by a factor of eight. With his new system, for example, a Model T took 1.5 man-hours to put together, whereas before it had taken 12.5 man-hours. Based on efficiency, time now became just another commodity which could be utilized. This method was so successful, it was copied around the world and led to millions of mass produced quality goods while shackling workers to repetitive boring work and the iron grip of the clock.



PICTURE CAPTION: Henry Ford's assembly line is now applied to a wide variety of tasks, even to making doughnuts! It is a critical component of the industrial world which treats time as a commodity.

But the revolution did not stop here. The invention of electronic communications, the adoption of standards for world time and time zones, plus the invention of incredibly accurate clocks created a world where clocks were synchronized to each other and could be found everywhere.



PICTURE CAPTION: Standard Railway Time was adopted in the United States in 1883, dividing the country into 5 time zones. Many protested. The *Indianapolis Sentinel* wrote that people would now "eat sleep work ... and marry by railroad time."

In addition, still and film photography, video and television all created a different sense of time. They recorded the world so that we could look at the past as it happened -- so that time, in a sense, could now be grabbed and taken hold of. Family photo albums, instant replays,

news reports and YouTube allowed us to freeze the past and to look at time in a totally new way.

Yet there was still another dramatic change in the human relation to time -- a shift caused by the switch from a farm culture to an industrial one. Only one hundred years ago, around 1900, most societies were agrarian and most people worked on farms. Yet with industrialization, people brought up on farms moved to the city to find work. And so farmers who had woken with the sun were now going to work by the clock.

All of these different revolutions signaled the end of long held beliefs, the end of a close relationship to the Earth and the dominance of clock time.

**I believe that much of the alienation,
felt in cities today, is due to a disconnect
between people and their world around them --
which is partly due to the dominance of clock
time**

We are governed by clock time -- be late to work and you'll be fired. Be late to class and you'll flunk. Be late to a restaurant and it may be closed. Stay in the bathroom too long and you'll miss the beginning of your favorite TV show. And at the same time be constantly on alert 24/7 for text messages, phone calls, emails and voice mails.

What is needed now is a more nuanced understanding of time -- one that realizes the human experience of time is different from clock time. The clock has allowed us to manage time and to coordinate. Our state-of-the art devices can slice, dice and synchronize time like never before. And this is very useful. Yet human nature and human needs operate differently -- so it is essential that we be in touch with that aspect as well.

The point is that there are occasions when we should divorce ourselves from clock time. We should develop another way of relating to time, while realizing that work and such will be governed by it. Clock time keeps us focused, vigilant, on the lookout -- which will cause a person to be nervous and anxious if that is their only experience of time.

**We need to have two time skills:
one by the clock
the other off the clock**

Clocks slay time... time is dead as long as it is being clicked off by little wheels; only when the clock stops does time come to life.
William Faulkner

The society already provides a few ways to escape the grip of clock time.

Films, for example, are never a specific length. When we go to a movie we simply let the story and music carry us along until the end. Music often does not have a specific duration. Go to an art gallery and lose yourself in the timelessness of the art. At bars people forget about the time. We tend to let weekends be less rigid than workdays.

A number of slang terms express this sense, such as: chill, hang out, down time, off the clock, veg out, vegging, take it easy.

Nevertheless the modern world makes it hard for us to relax, to experience the 'now moment' as it happens. Our minds are often elsewhere -- thinking about plans for tomorrow or mistakes we made today.



If you really want to turn off the clock and feel time in a different way, go watch a sunset. Get caught up in the drama of the lengthening shadows, the changing colors on the clouds, the golden light -- the magic time as filmmakers call it. But don't rush off the minute the sun sinks below the horizon, instead stay there and watch the light fade, the gradual shift from color to black and white -- okay I'm a photographer, I notice these things -- the twilight time when light passes into night. And BTW, shut off your cell phone :)

THE FUTURE

Global Warming & The Future: Part 1

When I was growing up, my parents would say that while the world had changed, "there is nothing new under the sun," quoting the ancient saying -- meaning that the truisms of life were still the same and would always be the same. For a long time I agreed with them, but now at the age of 68 I don't.



PICTURE CAPTION: An 'Earthrise' photograph taken by an Apollo astronaut, showing the Earth from the surface of the moon. For the first time, humans saw an actual photograph of the Earth from a distance, our planet floating in empty space. (NASA)

I believe technology has fundamentally changed our lives both for good and for ill. And we must come to terms with this change or suffer the consequences.

As a painter, my Dad emphasized that artists should get their inspiration from nature, a point of view held by most painters and eloquently expressed by Paul Klee in this following quote.

For the artist communication with nature remains the most essential condition. The artist is human; himself nature; part of nature...
Paul Klee, *Paths of the Study of Nature*, 1923

Yet for hundreds of years, going back to the Renaissance, the goal of humans was to conquer nature so that we were not subject to the natural forces of weather and disease, for example. And with the industrial revolution and now the hi-tech revolution, civilization has accomplished just that.

The great pivot point...of human thinking was the conquering through science...of the forces of nature. Isaac Newton['s] ... ideas on forces defined through mathematics gave the basic template for all inventors to consider the taming of natural phenomena...
(www.ucadia.com)



PICTURE CAPTION: Isaac Newton's mathematical insights unlocked the secrets of gravity, planetary and lunar orbits plus the laws of motion -- which led directly to the industrial revolution.
(NASA)

In the 21st Century it is clear that technology has altered our lives in basic ways: parents can now choose how many children to have. Travel is almost effortless. Communication via cell phone is instant and cheap. Food is plentiful. Many people live in comfortable, climate controlled homes with cable television and an Internet connection that allows them to keep in touch with others around the world.



PICTURE CAPTION: **TOP:** A wood cook stove. About 100 years ago there were no refrigerators, running water or washing machines for a majority of households. Stoves required tending with fire wood. This meant that household chores consumed most of people's free time. **BOTTOM:** A modern kitchen that today we take for granted.

Nevertheless, we still live on the Earth and our advanced technology has begun to seriously affect the Earth's environment and its cycles. Speaking from an artistic point of view, I wrote the following about 10 years ago.

The old bond between humans and nature has been permanently altered by technology. The task of the 21st century artist is to forge a new relationship between humans and the world, since our fate is inseparable from that of the Earth.

Rick Doble, 2002

We have taken many of the powers of natural forces and put them into our own hands. So it is now up to us control these powers that we hold.



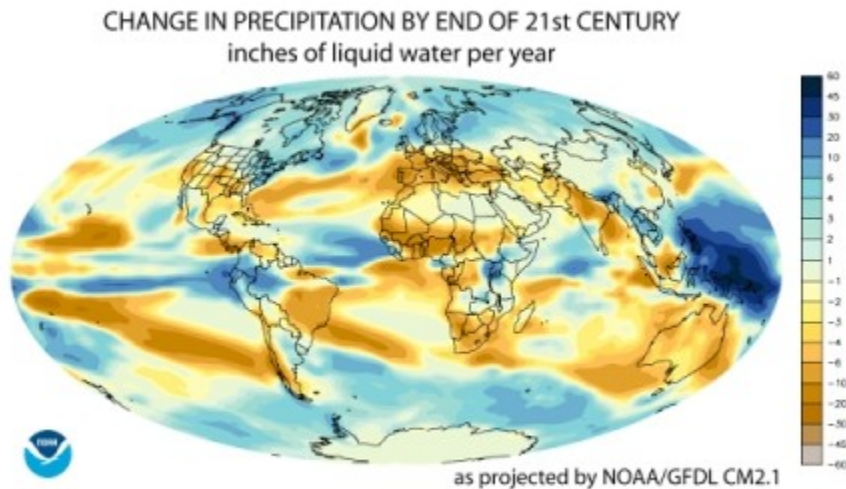
PICTURE CAPTION: This composite photograph, by a NASA satellite in 2012, recorded light at night from human activity across the surface of the Earth. (NASA)

As I pointed out in my blog, *A Revolution In Time*, time also has changed radically over that last two hundred years. And the net affect has been to disconnect us from the cycles of the sun, moon, and stars -- which means we are much less sensitive to and less in tune with the natural forces of the Earth. Yet, as we all know, Mother Nature will win in the end.



PICTURE CAPTION: **TOP:** The fire was the center of the home, before electricity, central heat and television. Before radio and music recordings, people played instruments to entertain themselves. **BOTTOM:** A modern living room, with the heat and air conditioning unseen, an electric lamp on a table and a TV at the center.

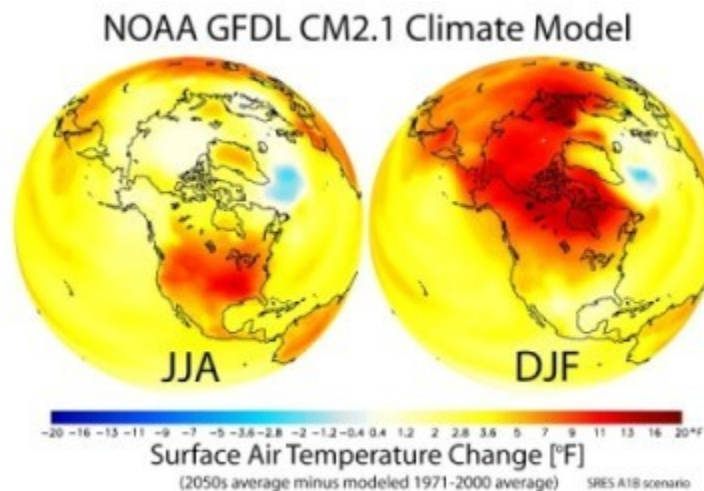
Why worry about global warming when you live and work in air conditioned buildings and travel in an air conditioned car? Technology has insulated us from the world that is our home but in the long run we cannot live independently, apart from the Earth.



PICTURE CAPTION: NOAA map from the US government, predicting the changes in precipitation about 100 years from now. (NOAA)

In the future we must come to terms with the changes that technology has created along with an understanding of how to create a technology that does not disturb the balance of the Earth.

The basic difficulty has to do with time. For example, while the rise of sea levels is a problem, most important is how quickly they will rise. A rapid rise could be catastrophic as people will not have time to adjust; a slow rise will allow gradual changes that people can accommodate. Right now conservative sea level rise estimates range from a 1/2 foot (15cm) rise in the next 100 years to a 6 foot (2 meters) rise.



PICTURE CAPTION: This US government NOAA map shows the June, July, August (JJA) predicted surface air temperature changes and the December, January, February (DJF) predicted temperature changes in about 40 years. (NOAA)

A second time related problem is that humans are not long term oriented. In a sense our average 75 year life span is out of sync with the hundreds of years it will take to deal with global warming. It might take several lifetimes before we begin to see results. It is not in our nature to spend money and effort for goals that are so far in the future.

Sea level rise is expected to continue for centuries...On the timescale of centuries to millennia, the melting of ice sheets could result in even higher sea level rise.
en.wikipedia.org/wiki/Current_sea_level_rise

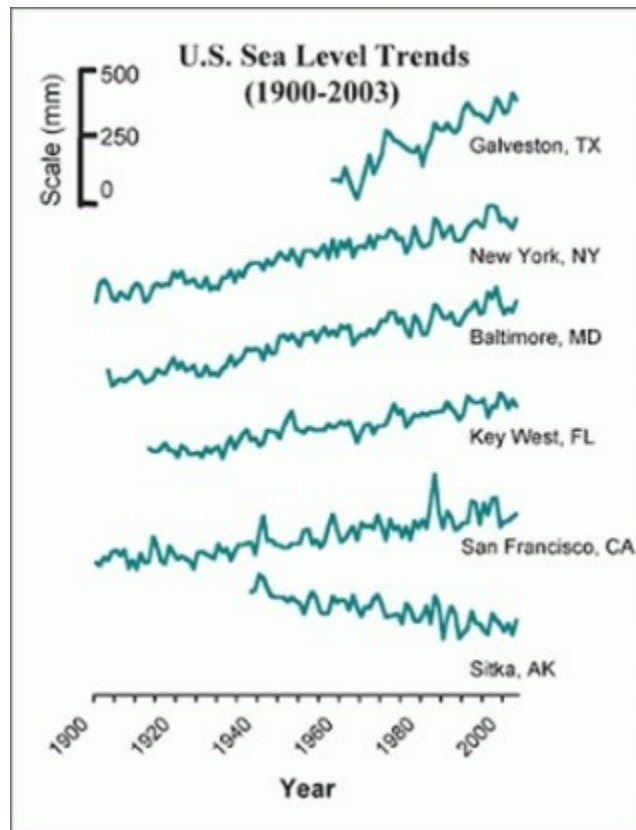


PICTURE CAPTION: If there is significant melting of the Greenland glaciers or Antarctic ice, sea levels could rise much higher than predicted.

Plus it will take visionary leadership to commit resources for an outcome hundreds of years from now. Yet this is exactly what we must do: Our survival depends on it.

So ironically having separated ourselves from Mother Nature -- having conquered nature as Isaac Newton and others intended -- we find that it is our human nature that we must come to terms with.

It is now our own nature that we must conquer and tame.



PICTURE CAPTION: A US government EPA chart showing the recorded sea level rise for a number of US cities from about 1900 to today. If there is significant melting of the Greenland glaciers or Antarctic ice sheets, sea levels could rise much higher than current projections.

NOTE: WILL PUBLIC OPINION LEAD TO ACTION ON GLOBAL WARMING?

According to polls in the *Washington Post* and the Gallop organization:

60% of people do not think global warming will affect them in their lifetime.

While 84% of scientists agree that global warming is due to human activity less than half of the public believes this.

70% of scientists believe that global warming is a serious problem, again less than half of the public thinks so.

Global Warming & The Future:

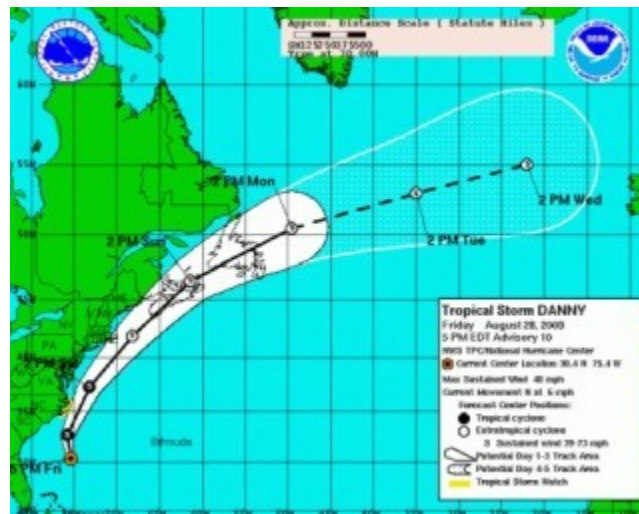
Part 2

I've got good news and bad news.

GOOD NEWS:

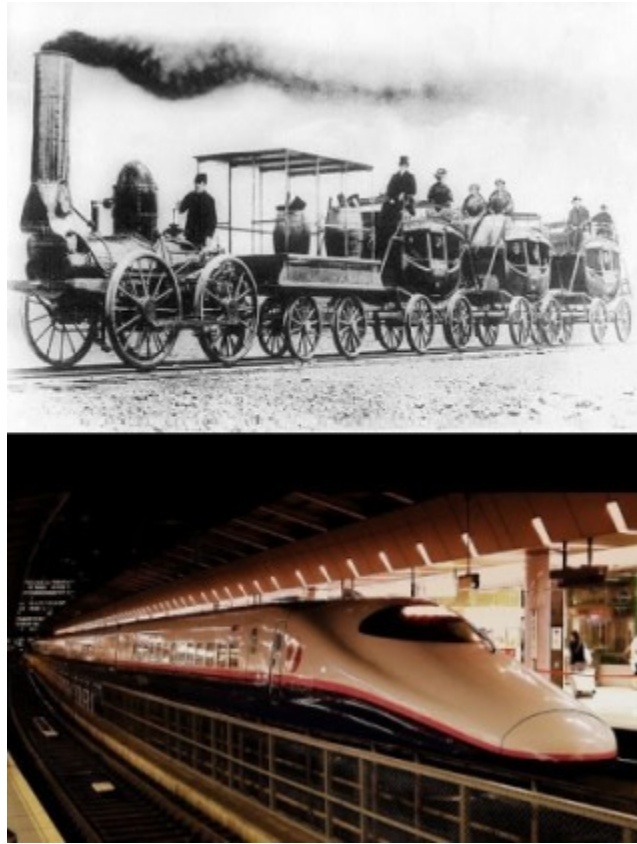
While humans used to be at the mercy of disease and weather, today's technology can cope with these threats quite well. The Black Plague that killed between 30–60% of Europe's population in the 14th Century, for example, could now be cured with antibiotics. The Irish Potato Famine around 1850, that killed over a million people, could today be prevented with chemical treatments and resistant strains of potatoes.

And while hurricanes will always do considerable harm, modern weather warning systems now give people plenty of notice and as a result have minimized the death toll and damage to property.



PICTURE CAPTION: This is a US government NOAA map showing the projected path for Tropical Storm Danny in 2009. Sophisticated satellite monitoring and aircraft reconnaissance in combination with computer programs can now predict the path, speed and strength of hurricanes. Unthinkable only a few years ago, this system provides accurate warnings and gives people time to prepare and get out of harm's way. (NOAA)

In the last 100 years according to the US CDC (Centers for Disease Control and Prevention), infant mortality rate in the US has dropped 90% and the maternal mortality rate (mothers who died in childbirth) has declined 99%. During the same time period life expectancy has doubled.



PICTURE CAPTION: **TOP:** The DeWitt Clinton, 1831, (one of the first railroads in the US) traveled at 24 miles per hour (39 km/h) on 16 miles (26 km) of track from Albany to Schenectady, New York. **BOTTOM:** The Japanese Shinkansen AKA 'Bullet Train' (photo taken in 2012) can travel at speeds of 149–199 mph (240–320 km/h) on 1,483.6 miles (2,387.7 km) of high speed track.

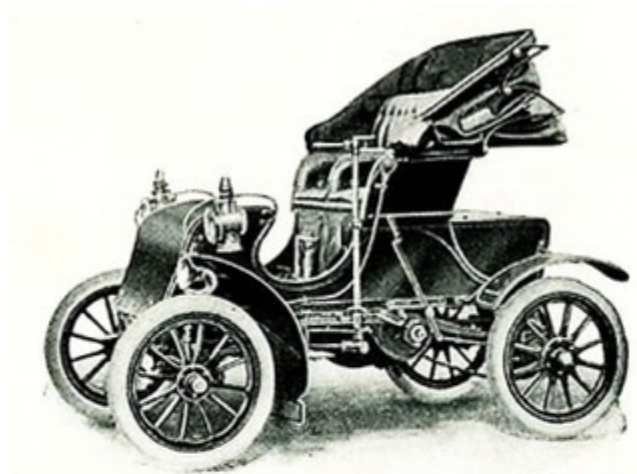
After riding the DeWitt Clinton train in 1832, a passenger wrote *"Among the astonishing inventions of man, surely that of the locomotive steam engine hath no secondary rank. By this matchless exercise of skill, we fly with a smooth and even course along once impassible barriers, the valleys are filled, the mountains laid low, and distance seems annihilated...as if by some invisible agency flown the distance of 16 miles in 40 minutes..."*

(Quotation from wikipedia.org/wiki/Albany_and_Schenectady_Railroad)

BAD NEWS:

In the last two hundred years the pace of industrial and technological development has surpassed our understanding of the effect that this development has had on the Earth's environment.

In 1900 there were about 8,000 cars in the United States. In 1950 there were 25 million cars. In 2009, according to the US Bureau of Transportation Statistics, there were over 254 million cars in the US. Today worldwide there are over one billion cars. And automobiles are just one example.



The dash of the one-cylinder eight horsepower Knox can be opened to seat two additional passengers. Its maximum speed is twenty-seven miles per hour, and its control levers are placed on the steering column. Its cost is \$1,250, the leather top being \$100 extra



PICTURE CAPTION: **TOP:** Ad for the 1905 automobile Knox. It sold for \$1350 with a leather top, equivalent to \$33,968 in today's money, the cost of the Cadillac SRX in the photo below. As you can read in the ad above, this 1905 car had a single cylinder 8 horse power engine and could go 27 miles per hour (43 km/h). **BOTTOM:** 2010 Cadillac SRX with a 6 cylinder, 308 horsepower engine with a top speed of 130 miles per hour (209 km/h). Over the last 100 years cars have become much cheaper, faster, more comfortable, safer and more reliable.



PICTURE CAPTION: **TOP:** In 1900 there were 144 miles (232 km) of paved roads in the US. Unpaved roads were often impassable in bad weather or certain times of the year as in the photo above. **BOTTOM:** Today there are 2,615,870 miles (4,209,835 km) of all weather highways in the US.

In another example, a scientist has suggested that humans now move more earth than is moved by the natural forces of the Earth.



PICTURE CAPTION: **TOP:** Famous photograph of the Wright Brothers' first flight in 1903 at Kitty Hawk, North Carolina, USA. The plane, known as the Wright Flyer, flew 120 feet (37 m) at a speed of 6.8 mph (11 km/h) carrying one person. **BOTTOM:** State-of-the-art Boeing Dreamliner today. It can hold over 200 passengers, travel at about 650 mph (about 1000 km/h), with a range of about 7,650 nautical miles (about 14,150 kilometers). In 1900 there were no such aircraft; today there are about 40,000 commercial planes and about 34 million scheduled flights per year.

Quantity has a quality all its own.

The problem is not the technology itself, but rather the rapid expansion of that technology and its environmental impact.

HOW REAL AND IMMEDIATE IS THE THREAT?

In Part 1 of this 2-part blog: *Global Warming & The Future of Civilization*, I made the case that this threat to civilization is quite real. And our future, especially the future for our grandchildren and generations to come, depends on our actions now.

For example, while oil companies have continually doubted whether humans are contributing to a warming trend on the Earth, they are also looking into using new shipping lanes through the Arctic Ocean, once this ocean melts sufficiently to allow tankers through -- probably by mid-century according to estimates. So even these skeptical companies are assuming the sea levels will rise.

Sea levels are rising -- that is just a fact. How much of this rise comes from human activity is still being debated, yet it is clear, we are affecting the Earth's natural cycles to some degree.

Sea level rise is expected to continue for centuries...On the timescale of centuries to millennia, the melting of ice sheets could result in even higher sea level rise.

en.wikipedia.org/wiki/Current_sea_level_rise

The irony is that while technology has caused these problems, technology can provide the solution by helping us design with the environment in mind. Eventually we will create accurate computer modeling systems -- for the environment, world weather and sea current patterns -- that will guide us. As I wrote in a published *Letter to the Editor* at the *Raleigh News & Observer*, Raleigh, NC about 20 years ago, the future could be the "age of design" when all aspects of a product are considered in its design -- the manufacturing, usage, disposal -- all of which could have a minimal impact on the environment.



PICTURE CAPTION: While global warming may be caused in part by our advanced technology, technology will also provide us with the tools to understand the effects of global warming and how to design for the least environmental impact. This photo shows the wide array of US government NASA satellites that monitor conditions on the planet -- something which was unthinkable about 50 years ago. (NASA)

So the good news is that unlike past history, today we do have the power to solve these problems.

With great power, comes great responsibility.
Voltaire

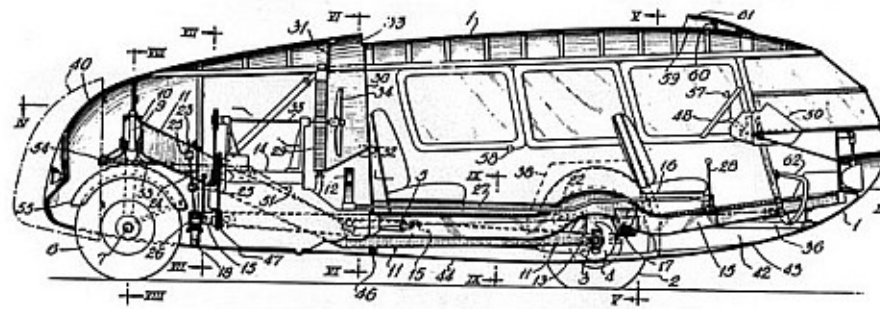
And since we do have the power, the central question now becomes one of will. Do we have the political will to insist on efficient automobiles that do not pollute, for example?

EXAMPLES OF 'FUTURE' THINKING AND DESIGNS

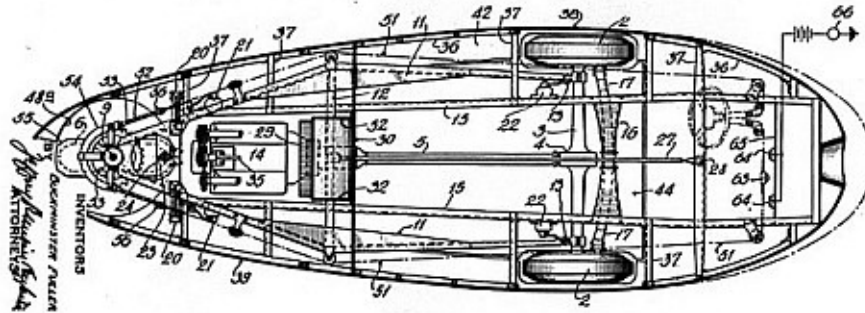
The following experimental cars, concept cars and futuristic designs show how we can design for minimum environmental impact. They also document that the quest for such designs has been ongoing for 80 years.



PICTURE CAPTION: Visionary inventor Buckminster Fuller designed and built this experimental auto, the Dymaxion car in 1933. It was one of the first aerodynamic passenger automobiles. Roomy, it could hold 11 people, get 30 mpg (very good mileage for the time) with a top speed of 90 miles per hour (140 km/h).



22. Dymaxion car. Patent drawing filed 1933.



PICTURE CAPTION: Patent drawing filed in 1933 for the Dymaxion Car by Buckminster Fuller.
(US Patent Office)



PICTURE CAPTION: Called, L'Oeuf (The Egg), this compact concept car design was built in 1942 by French designer Paul Arzens. It could go 80 km/h (50 mph) and was electric. Also called L'Oeuf Electrique (The Electric Egg) it was constructed of Plexiglas mounted on an aluminum chassis.



PICTURE CAPTION: Honda 3R-C concept car, shown at the Geneva International Motor Show in 2010. This single passenger electric vehicle allows ample storage and is designed for safety and 'zero emission commuting'.

The History of the Future: THE WORK OF THE IMAGINATION

Before we could go to the moon, we had to imagine we could go to the moon.

This 'work of the imagination' was essential to finding the will, the funds, the talent and the tenacity to accomplish this task. And while the moon mission was accomplished with state-of-the-art technology, the fundamental thrust that led to the moon launch was one of collective imagination.

In this blog-article I will use the moon mission as an example of how ideas move from fiction to reality, how the future can be shaped by human beings -- and how this might apply to ideas that we are coping with today, such as global warming.

In 1865 Jules Verne wrote the novel *From the Earth to the Moon* followed by a sequel. Using available data, Verne made a number of calculations so that his story would be as realistic as possible. Surprisingly many of his predictions were quite accurate.

In the following illustrations you will see remarkable similarities between the imaginary ideas of sci-fi visionaries and the actual space travel equipment used and space environment encountered many years later.

During the return trip to Earth on July 23, 1969 after the first landing on the moon, astronaut Neil Armstrong said, "*A hundred years ago, Jules Verne wrote a book about a voyage to the Moon. His spaceship...took off from Florida and landed in the Pacific Ocean after completing a trip to the Moon.*" Which was exactly what Armstrong's first moon mission, Apollo 11, had done and was about to do.



PICTURE CAPTION: **TOP:** Still from the Méliès 1902 sci-fi film: *A Trip to the Moon*. Based on Jules Verne's story, the space command module landed in the ocean and then was tugged to shore by a paddle wheel steam ship. **BOTTOM:** Helicopter from the ship the USS Hornet picks up the astronauts from the Apollo 12 mission. The splashdown of the astronauts was in the Pacific Ocean as Verne had predicted a 100 years earlier. (NASA)

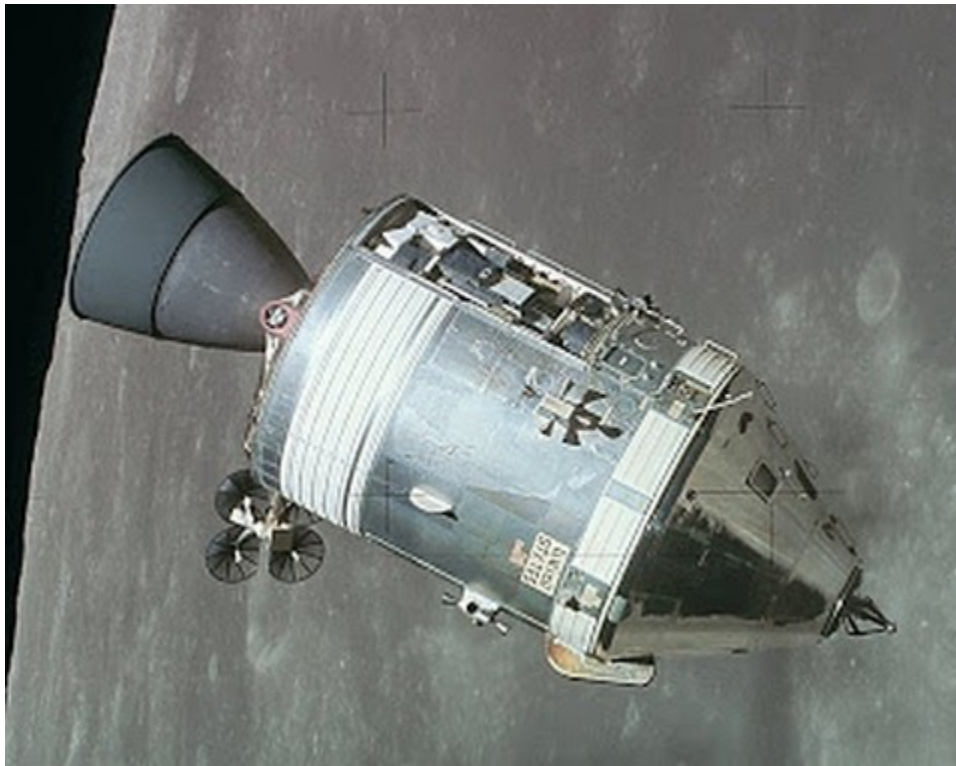
There was a bit more than 100 years between Jules Verne's novel and the actual moon landing (1865-1969). It took this long for the collective imagination to accept that such a venture was possible and then to commit to a long term program. Even then it took the cold war between the United States and the Soviet Union to force the issue, as the race to the moon became a competition between the two countries.

But I am getting ahead of the full story -- during those 100 years, there were a number of steps both forward and back. Yet in the end the public's imagination had been captured.

In 1902 Georges Méliès produced the first science fiction movie, *A Trip to the Moon*. It was based on Verne's novel and also H.G. Wells novel *The First Men in the Moon*. It employed special effects and animation -- and sent the public's imagination into outer space.



PICTURE CAPTION: **TOP:** Still from the Méliès 1902 sci-fi film: *A Trip to the Moon*. The command module that held the astronauts was inserted into a super-gun to send it to the moon. **BOTTOM:** A 1964 NASA drawing of the command module that would take astronauts to the moon. The similarity in the shape between the 1902 film fantasy and the actual NASA design is remarkable. (NASA)

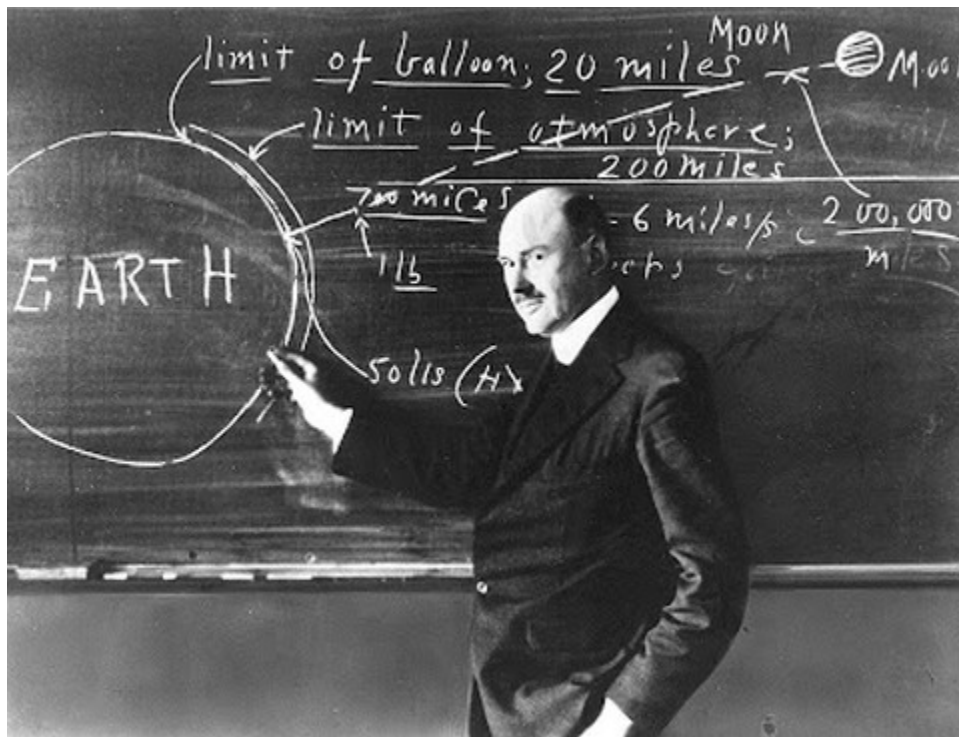


PICTURE CAPTION: Apollo 17 command module floating above the moon in 1972. Notice the similarity in shape and even the similarity in construction between the module in the Méliès 1902 sci-fi film: *A Trip to the Moon* (above) and the actual module that went to the moon. (NASA)



PICTURE CAPTION: **LEFT:** Still from the Méliès 1902 sci-fi film: *A Trip to the Moon*. The Earth people (left) who have landed on the moon watched the Earth floating up in the sky. **RIGHT:** Known as 'Earthrise' this shot by an Apollo astronaut shows the Earth floating above the moon's surface. (NASA)

In 1898, at the age of 16, Robert Goddard read H.G. Wells' *The War of the Worlds* which inspired him to think about space flight. He began to experiment with rocketry and by 1914 had registered two of the key patents for successful rocket flights -- a multi-stage rocket design and a liquid fuel method of propulsion.



PICTURE CAPTION: In 1924 Robert Goddard illustrated how a rocket could reach the moon from the Earth.

But soon he hit a brick wall known as the media. When he suggested that a rocket could go to the moon, the *New York Times* printed the following unsigned editorial, ridiculing his ideas.

That Professor Goddard, with his "chair" in Clark College and the countenancing of the Smithsonian Institution, does not know the relation of action and reaction, and of the need to have something better than a vacuum against which to react -- to say that would be absurd. Of course he only seems to lack the knowledge ladled out daily in high schools.
Unsigned editorial, *New York Times*, January 13, 1920

This condescending yet ignorant opinion from the prestigious *New York Times* dealt the idea of a moon mission a severe blow as others in the American press took the cue and also mocked his efforts. (In 1915 Goddard had tested his rockets in a vacuum and had proven that they worked.) As a result Dr. Goddard's work lost credibility in the US and was virtually ignored.

Don't you know about your own rocket pioneer? Dr. Goddard was ahead of us all.

Wernher von Braun, the key German and later US rocket scientist who designed the Apollo Saturn rockets that sent men to the moon

Nevertheless, the public's fascination only continued to grow as it began to envision a world in space. Science fiction stories about rocket and space travel continued in movies, magazines, comics, books and on radio and television from the 1920s through the 1950s -- although without much attention or respect from the authorities.

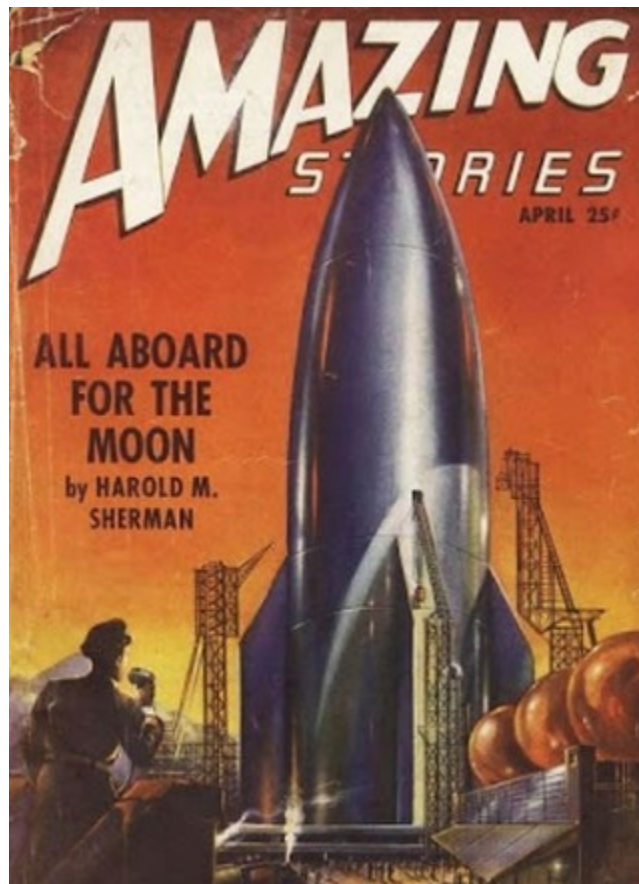
A number of movie serials (shorts shown every week before the main feature) were quite popular such as the Flash Gordon and the Buck Rogers film series. During the radio era, there were shows such as *Dimension X* and *X Minus One*, devoted to thoughtful adult science fiction plots. The popular *Twilight Zone* TV series in the early sixties often featured well crafted stories about space travel. Even the notorious tail-fins on 1950s American automobiles were based on rocket fins.

This pop phenomenon [ED: of Buck Rogers] paralleled the development of space technology in the 20th century and introduced Americans to outer space as a familiar environment...
wikipedia.org/wiki/Buck_Rogers



PICTURE CAPTION: **LEFT:** In a 1929 story, Buck Rogers in a future world watches a TV-like screen while operating controls. **RIGHT:** A NASA lead space flight officer keeps track of information coming from a space mission in 2009. (NASA)

The dream of yesterday is the hope of today and the reality of tomorrow.
Robert Goddard



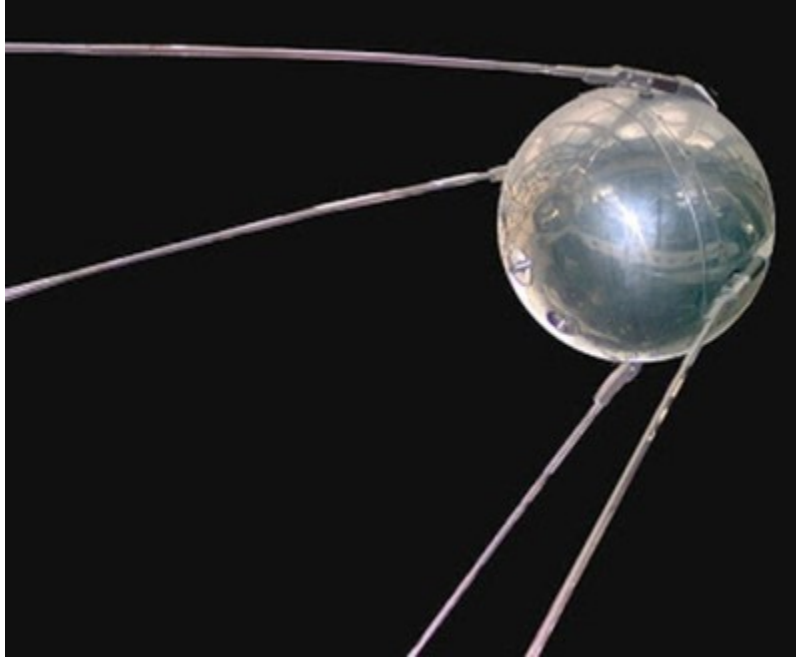
PICTURE CAPTION: Cover from *Amazing Stories* magazine in 1947.

In the early 1950s German-turned-US rocket expert Wernher von Braun wrote a series of articles for *Collier's* magazine called *Man Will Conquer Space Soon!* and collaborated with Walt Disney Studios on TV films about space exploration which drew large audiences.



PICTURE CAPTION: 1953 cast photo for the popular ABC TV sci-fi space adventure series: *Space Patrol*.

On October 4, 1957, the Soviet Union launched Sputnik, the first man made satellite. The successful launch of the rocket and then the deployment of Sputnik meant the Soviets were far ahead of the United States in rocketry.



PICTURE CAPTION: A replica of Sputnik in the National Air and Space Museum. (NASA)

This prompted President Eisenhower to create NASA (The National Aeronautics And Space Agency) in 1958. As a former general and the Supreme Allied Commander of Allied Forces in World War II, he deliberately created an agency that was independent and separate from the military and that would have a peaceful and scientific orientation. Three years later President Kennedy committed NASA to a moon landing.

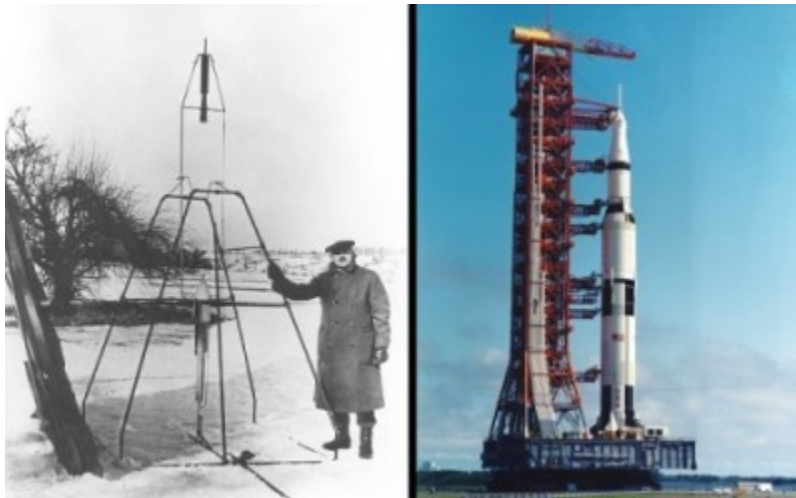
I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth. No single space project...will be more exciting, or more impressive to mankind, or more important...and none will be so difficult or expensive to accomplish...

President John F. Kennedy, 1961



PICTURE CAPTION: Kennedy announcing his plans to fund a moon mission in a speech to the US Congress in 1961.

While couched in peaceful terms, the space race was in effect an arms race between the two most powerful countries -- which was a key reason why the public supported the cost of this program.

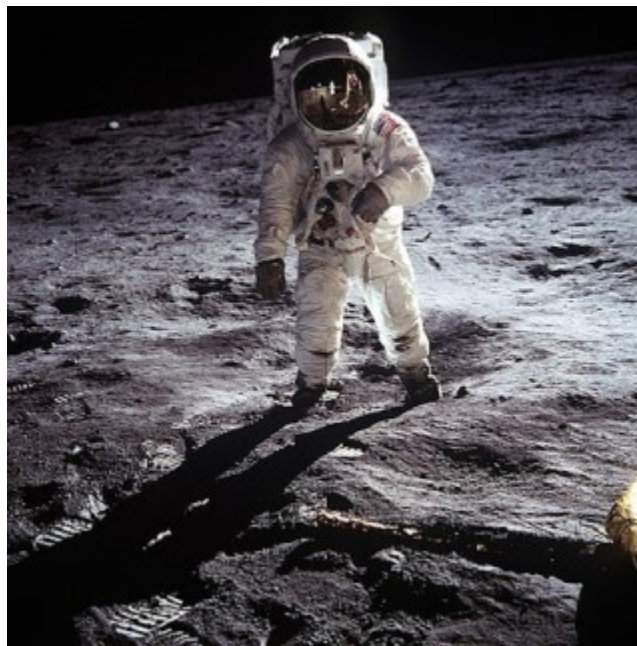


PICTURE CAPTION: **LEFT:** Robert Goddard in 1926 with an early rocket. The rocket was held in the middle of a frame until it was fired. **RIGHT:** The Apollo 11 rocket that took astronauts to the moon in 1969. (NASA)

When Neil Armstrong stepped down onto the moon's surface on live TV in 1969, it was a moment that most people will never forget. I certainly never have. And although the Apollo program ended 40 years ago, the International Space Station (ISS) is now part of everyday life. Among young people, the hunger for further exploration has only begun -- with a Mars mission in the foreseeable future along with planned landings on asteroids. Now that we know space travel is possible, the thirst to explore will only keep growing.



PICTURE CAPTION: Live TV shot of Neil Armstrong taking his first step onto the moon on July 20, 1969. (NASA)



PICTURE CAPTION: Neil Armstrong took this photograph of his fellow astronaut Buzz Aldrin during the first lunar landing. Armstrong is reflected in Aldrin's face mask. (NASA)

In hindsight, the creation and success of the moon mission was a century long effort which took imagination, technology and a cold war threat to become a reality. And once the goal of landing on the moon had been achieved, there was little public support for more expensive manned space exploration projects.

Fast forward to today and our future: While global warming poses a great risk, it does not have the same hold on our imaginations. But we have been through this before.

During the energy crisis in 1977, President Carter said that curtailing our energy imports and reducing our energy use, was the "moral equivalent of war." This phrase was borrowed from William James in 1906. "James considered one of the classic problems of politics: how to sustain political unity and civic virtue in the absence of war or a credible threat..." (Wikipedia.org) As we know, Carter was not successful in convincing people of the seriousness of the threat and as a result lost the presidency and the effort to make the US less dependent on foreign oil.

If we are to deal with global warming, we must give it the same urgency as war. As I wrote over ten years ago in my essay entitled *The World Environmental Crisis Today* (which is/was ranked in the top ten search results from Google for most of those ten years):

As Hans Blix, the United Nations weapons inspector before the second American-Iraq war, has pointed out, these environmental questions are much more dangerous than weapons of mass destruction.

Rick Doble, 2002

In hindsight, the moon mission, gave us something few of us had imagined: It showed dramatically that Earth was our home -- for all of us together. Seeing it alone in empty space evoked a sense of awe and a global perspective -- that could only have been achieved by viewing the Earth from tens of thousands of miles in outer space.



PICTURE CAPTION: This photograph of the Earth, known as Blue Marble, was taken during the last manned lunar mission in 1972 from a distance of about 20,000 miles (about 32,000 km) from Earth. (NASA)

We went to explore the Moon, and in fact discovered the Earth.
Eugene Cernan (Apollo Astronaut)

APPENDIX

**I wrote the following interviews
with a fictional character in 1989
about 25 years before
the publication of this eBook**

25 Year-Old Article About Time: Part 1

I have been writing about time on and off for decades. Yet it is only recently that many of my ideas have jelled -- which prodded me to write my blog *Deconstructing Time* and then this eBook. This essay and the next one are a 2-part essay I wrote almost 25 years ago that foreshadows many of the ideas I covered in this eBook. They are part of a decades-old wide ranging series of fictitious interviews with a mysterious character by the name of Kirk Elbod.

This interview took place on the second story of an old church in Durham, North Carolina that had been scheduled for demolition but had been saved and restored. The time of this interview was 1989.

K.E. = the person I interviewed, Kirk Elbod

K.E.: History is neither dead or gone, even though about ten years ago, Dr. David Herbert Donald, a Pulitzer Prize winning historian and Harvard history professor wrote a letter to the *New York Times*, stating that it was. And the very odd thing is that no one since then has been able to refute his argument.

What he said specifically was that history was no longer relevant to the modern world. To quote Dr. Donald, "What undergraduates want from their history teachers is an understanding of how the American past relates to the present and the future. But if I teach what I believe to be the truth, I can only share with them my sense of the irrelevance of history and of the bleakness of the new era we are entering."

There may be a speck of truth in what he said, i.e. history probably cannot solve today's problems. But he has thrown the baby out with the bath water. History is our point of reference. It is how we got to the point we are at today. It is, in fact, who we are - but I am getting ahead of myself.

Look through the windows, here, out at the city. I have taken a sixty year old map of Durham and have driven through the town as though only the old roads existed. I saw what I

thought I would see -- mostly old homes, old factories, old trees, old neighborhoods. When I followed the old map exclusively, I traveled the city as if it were old. It took a newer map to show me the newer parts. So I know that the older map, which is out of date, has meaning for me today.

And of course this is true for most towns unless there has been wholesale renovation. But even then I find it's very rare that a road, once built, is ever destroyed. A majority of the roads on the old maps still exist today. You can, for example, still follow the Blue Highways marked on the Rand McNally road map published in 1920s.

In fact if you look at maps of the Piedmont, hundreds of years old, you will see roads that roughly mark out where the four lane interstate is today. It seems that these roads had been an Indian trail before.

So I don't believe history is dead, any more than I believe that what my parents did has had no effect on me. Any more that I believe that what I teach my children will have no effect on them even after I'm dead. Each of us carries our history with us, even though we forget this in the present.

What Dr. Donald forgot is what I call the "vanishing point" of history and time.

ME: Well tell me what it is, even though I'm sure you were going to anyway without my asking.

Kirk glared slightly at me, but with a tinge of a smile and continued.

K.E.: Saul Steinberg drew a famous *New Yorker* cover depicting a New Yorker's view of the world. It showed Manhattan as huge, all of New Jersey as smaller than NYC, and the rest of the US diminishing in size and definition -- with humorous titles -- the further you went away from the city. Now this is a "vanishing point" view of the world. Meaning that the further you get from your point of reference, NYC in this case, what you envision or imagine, gets increasingly smaller and less defined.

When I visited Washington D.C. not too long ago, I noticed a rack of huge blow-ups of this *New Yorker* cover. Only to my surprise, each one was from a different perspective. A view of the world from Hawaii, from Chicago, from Miami, etc. In each case the foreground "point of departure" was huge, such as Miami, and then increasingly the world got less and less defined and smaller and smaller the further you got from the initial point. Someone had a great sense of humor to put these all together, so that you could buy your own biased view of the world.

ME: (Getting impatient.) And what does this have to with history?

K.E.: Simple. This is how we view time. Recent events in time loom very large, ones somewhat further away are less important, ones many years away of very little importance. A vanishing point in time.

And this is how it should be: recent events are usually going to have much more impact on us than events long ago.

Even historians recognize this. For example, when I took a basic Western History course in college, we spent more time on the Romans than the Egyptians. More time on the

Renaissance than the Romans. More time on the modern world than on the Renaissance. In short the closer we got to the modern day, the more detail was covered.

Now Dr. Donald of Harvard had been teaching for a number of years. When he started in the 1940s, Teddy Roosevelt and Franklin Roosevelt were very important. But during his long career he decided that this time in history was less relevant than it used to be. When he thought about it, he realized it did not matter which Roosevelt carried the big stick, so he concluded that history was not important. That you could go through life and live a perfectly useful, moral life without knowing about these things.

However during his long career other events had overtaken him, such as Korea, the cold war, Vietnam, the space program and Watergate. Now these more recent things are important to know. And it is only natural that our view of the increasingly distant past will get vaguer and vaguer as we keep up with more recent events.

ME: So are you saying that it doesn't matter whether we know about the American revolution? Is this too distant for us to bother with?

K.E.: Yes and no. I'm saying that very important distant events which still affect us today, such as the American revolution and the Civil War, need to be understood in broad detail, but not fine detail. However, we ought to concentrate our efforts on recent history, three generations into the past. This time period is the most important.

For example, I think today it is important to understand the history of the world from about 1930 to the present. This includes the causes leading to the 2nd World War, the war itself, and the post war period. Again I would want to understand the most recent events in more detail than the more distant events.

But the mistake is to think that history is dead and gone. History is alive. For example, our personal history is who we are. A family is its shared memories. I make choices based on my understanding of things my father did and maybe even my grandfathers. Further back than that my "vanishing point" view of my personal history gets dim.

But, Dr. Donald is advocating national amnesia. Imagine that each of us woke up one morning and could only remember the recent past. If you wanted to you could look up things in a book, as Dr. Donald suggested, but it was not in your memory. Where would you start? You would not know where to begin. You would have no background information to work from, no frame work.

In short people would feel dislocated, alienated, frustrated, out of place. And this is exactly what Dr. Donald is advocating.

Slaves in the south were kept in total ignorance as to their location. Even if they escaped, they did not know where to go and thus were easily captured and returned. So ignorance is a form of confinement, a limiting influence. Each of us needs to have "mental maps" of how the modern world came into being, so that we can better understand our position in this world, how we got where we are. If this map is blank then we are flying blind. We are to some extent lost. And since time is one of the four dimensions of the world, as Einstein has stated, an ignorance about history means that a person's life is not fully realized; it is three dimensional but not four dimensional.

For a moment the sun broke through a hole in the clouds. Parts of the downtown were illuminated by shafts of light, in brilliant highlights and shadows.

Let me go back to the example of amnesia. If each of us woke up one morning and could not remember any history, even how the United States came into existence, e.g. not remember anything about the American revolution or that we had immigrated from Europe, then I believe we could not function effectively as citizens. We could not make informed decisions about issues, understand our place in the world, or have an understanding of the laws that govern us. Therefore to answer Dr. Donald's implied question: under these circumstances, no, we could not be good citizens.

Further history is not just what Harvard or any one else says about it. It is an endless unbroken thread, some of which is written down in books studied in college and most of which is not. As Gerda Lerner, author of the *Creation of Patriarchy* said, we must distinguish between History, with a capital "H" and history with a small "h". History with a capital "H" represents recorded and interpreted history. And history with a small "h" involves unrecorded history and/or history which has not been focused on and interpreted. Nowadays historians are reaching back into time and revising many of our notions of how things occurred. In a manner of speaking, they are creating new histories, because they are collecting, arranging, and interpreting past events in new ways.

Historians of women, for example, are trying to discover the lost history of females. It is obvious that women have always been a part of history, but little has been included in History with a capital "H". So in a sense they are discovering the past.

And history is allusive. Imagine that I made an appointment yesterday for a meeting tomorrow. Well yesterday is history but I'd better remember to be at my appointment tomorrow or I'm in big trouble. To use the old joke, "Today is the tomorrow you worried about yesterday." This may seem like a simple example but where do you draw the line? Are things a year ago history and events since then current time? I know of a daughter who is suffering an ailment from a drug her mother took thirty years ago when her mother was pregnant with her. Is this where you draw the line? There are recurring histories of diseases and susceptibilities to diseases that run for generations through families and affect people today. So where do you draw the line?

And if this is true for individuals then how true is it for nations?

Recently the Russians and the Americans held a conference on what happened during the Cuban missile crisis. Now this event was over twenty-five years ago. Yet the conference was important and may affect us today. Because through the conference the superpowers may have learned ways to prevent such a crisis from reoccurring.

But we must come to terms with the dynamics of time and the human needs. Recent history has got to be more important than history ten years ago, which is still more important than history twenty years ago and so on. Like looking into a mist. Things up close are distinct. Things get blurrier and blurrier until we really cannot make out much of anything.

It is still history but recent events, and those preceding them need to be given more weight. Which is as it should be.

25 Year-Old Article About Time: Part 2

This is the second half of the interview with Kirk Elbod about time and history -- which we continued on another day at a lunch counter in Durham, North Carolina. The time of the interview is 1989. See the blog before this for the first part.

K.E. = the person I interviewed, Kirk Elbod

K.E.: You're probably wondering why I brought you here to this lunch counter (He said in a humorous tone of voice, recalling the old joke.). It's because of the short order cook.

ME: (Getting a bit impatient.) I don't care about the cook. I want to continue our discussion about history.

K.E.: Precisely my dear Doble (He said again with a smirk.). History is about time and our concept of time.

Watch the short order cook! The way he perfectly balances all the elements of an order so they come out all at the same time. First the burger on the grill which takes the longest to cook. Then he slices some lettuce, tomato and puts it on the side. When the burger is almost done he toasts the buns under the grill, and when the burger is completely done he toasts the cheese for just a second. Then, in one swift motion, he puts them all together on the plate, along with the mayonnaise and mustard and at last (We watched two burgers get passed to a waitress who put them in front of us.) it arrives in front of me, with everything timed right. The perfect burger and the best short order cook I've ever seen.

With this I only could wait because he was devouring his burger. Together we sat in silence as we ate our food.

ME: (Finally when we had finished.) I believe the Harvard professor may be right. That we can lead perfectly good, useful lives, have children, be involved in our community and not know much about history, except perhaps a few essential facts.

K.E.: Superficially he is right. But the US is a democracy, and as such the people vote based on the information they have. What if their understanding is just plain wrong, and they make decisions based on a misunderstanding of history.

ME: I don't think it could be that serious.

K.E.: Judge for yourself. According to a poll most Americans think today that the Russians fought on the side of the Nazi's in World War II. In fact the reverse is true - not only did the Russians fight against the Nazis, they suffered more deaths than any other single nation or ethnic group.

ME: And your point?

K.E.: That today, right now, we might be spending less money on armaments, and defense if the majority of citizens believed the truth instead of misinformation. We might have saved billions of dollars if the public knew the facts. And this is just one example.

Now, as you know I'm not suggesting that everyone know all the history there is. My notion of the "vanishing point of history" means that we mainly need to understand recent history in detail, by which I mean about ten years before World War II to the present.

But clearly a majority of people do not.

ME: Well, there will always be experts who can interpret present events in terms of history for us. Why not leave it to them?

K.E.: Another specialist! (He almost shouted.) Specialization is an entirely another subject. But leaving history to the experts means that we will feel even more alienated than we already do in modern society. If we have to go to an expert to understand our own past...(He made an exasperated expression, reaching his hands into the air.)

One of the main complaints I hear about the modern world is that people feel a lack of connection. A feeling of not engaging; alienation. But much of this is the fault of the individuals, not the big corporations and big government who usually get blamed. If you want to feel a part of your own time, and culture you need to do the work yourself; understand history yourself, for example.

But also specialists, hired by certain people, can put their own interpretation, their own "spin" on history, which is what the Nazis did. In fact they can reinterpret history and redefine history to suit whoever hires them. In the book, *1984*, George Orwell warned us against things like this. Is this what we want in a democracy?

Let me give you a 'for instance'.

Suppose that the United States had fought for 2 years on Russian soil, aiding armies whose purpose was to destroy Soviet Russia? If this were true, wouldn't it explain some of the current Soviet attitude toward the U.S., some of their military obsessions and paranoia.

ME: Yes, but of course it isn't true.

K.E.: Wrong, it is true. And very few people in the U.S. are aware that this ever happened. United States forces were in Russia -- Archangel and Siberia -- from 1918 to 1920 aiding the White Army whose purpose was to destroy the recently established Soviet government.

So this is what happens, even in a democracy, when you try to look up an incident that everyone would rather forget.

Let me attack the question from another perspective. Every time I see a news story on TV about a home being destroyed by fire, or tornado, or some such total disaster, the people invariably say "Even my photographs are gone." That's what they miss the most. Why? Because they can replace everything else, if they are insured, but not the photographs. Part of them is gone. The photos which are their personal history have been lost, and they feel as though a piece of themselves was destroyed. Which it has been.

Now those photos are history, not stuffy academic history but a personal important essential history which is badly missed when it is eliminated.

Dr. Donald's way of thinking cuts off our connection to the past. But history is our point of reference. It is where we come from. The past is where most of our concepts, our culture, and our language originated. Why else would we use a word like "horsepower" to describe a highly technical, modern engine? (He laughed.)

ME: To go back to why you brought me here: You said that history had to do with our sense of time.

K.E.: Yes, and the short order cook here.

Look at the cook again. Suppose he left the rolls in too long and they burned, or he didn't cook the hamburger long enough so it was a bit raw. Then he wouldn't be a good cook.

He is juggling, balancing each portion of the task so that even though the parts take a different amount of time, they all are ready at the same time. A juggler, if you will. A time juggler in fact. And a very good one.

ME: And what does this cook have to do with history?

K.E.: We think history is unimportant, because we believe history is in the past and does not affect us. Dr. Donald's main criticism, in fact, was that the study of history was no longer relevant to today's world. But perhaps the past does effect us, more than we realize, in the present.

So the question really is one about time. Now, I do not pretend to begin to understand all the subtleties about time, but I do know that there is more to time than meets the eye. So let me indulge in some speculation here.

ME: Why, that very humble of you Kirk.

K.E.: What is time? This is the key question. What is the past, the present, and the future? Once something is done, can it be undone? Is there any point in crying over spilled milk? We are always "another day older and deeper in debt" and the river that you put your foot into is never the same. Is time the relentless forward movement of the ticking clock?

It turns out that our sense of time, according to psychological studies, is triggered by events. When an event ends, or one begins, or something significant happens within an event, then we feel the passage of time. In a sense the clock is a series of artificial, mechanical events which makes us acutely conscious of time, perhaps too conscious, or even self conscious - but I'll save that for another discussion.

However, life is lived by the ticking of events and more by the dynamics of events. It's as though each of us is a time juggler. We juggle a number of separate events in the air as we go through our lives. Not unlike the short order cook, only the events are larger.

ME: You've lost me completely. I don't understand.

K.E.: My point is that time is subtle. And events which give us a sense of time also have dynamics all their own. There is time within an event to make changes, in a sense to go back into time until that event is over. This idea is expressed, for example, in the phrase "in time." Such as: I caught the jug of milk "in time" to prevent it from spilling; because I knew that if the jug fell and broke it would be too late; the event would be finished; and then there would be no use crying over spilled milk; instead I would be looking for the mop.

ME: Very cute Kirk (I said rather snidely.)

K.E.: (Ignoring me.) The assumption is that the past is the past, over and done with - which is why people think they don't need to understand history. But my point is that time is in reality a myriad of overlapping events. And that within an event you may be able to - in a sense - reach back into time, by being able to affect changes. Or things from the past can affect the present.

Events are like time areas or time spaces. However, these spaces in themselves, are very subtle. They are like 'windows of opportunity'. The windows can close - sometimes suddenly and sometimes gradually. When they do, we can no longer affect changes: 'the opportunity has been lost' or the 'time is gone'.

We do this everyday, but don't really think about it. Before I leave the house to go on a trip I have the opportunity to remember a notebook I've forgotten, pick it up, put it in the car. I can do this any time before I leave.

But once I've driven away it becomes harder and harder to do this. Five minutes down the road I still could, although it would be annoying. Two hours down the road I'll just have to do the best with what I've got and make do without the forgotten notebook. The time to easily pick up the notebook and put it in my car is gone. And besides I've got to get to my appointments and going back would make me late.

In an accident when things happen unexpectedly, quickly and violently we may only have split seconds to try things or to do things before the accident has run its course and whatever we do will be of no use. "What's done is done."

As an occasional photographer, I know about this. Photographers in fact, seem to develop a sixth sense about time because frequently taking a photograph requires being at the right place at the right time, whatever that may be. For example, when I take nature pictures outdoors there may be hours when I can take a number of pictures over and over until I get exactly what I want. But all the time the sun is moving, the clouds may be building. Suddenly I look up and there's a bank of clouds covering the sun and I realize that I can no longer take pictures that day. It may be a day, or a month before I can get back, according to my schedule or the weather. In the meantime the foliage may have changed or someone may have bought the land and bulldozed it which has happened more than once. When I return the place may or may not be the same as the time before.

A death bed confession is an example of a person using a last opportunity to set things straight, to do something before they die, before the window closes on them and they can no longer act. What they confess may have happened when they were very young and they may have carried it all their lives. But before they die the window is still open for them to act. In effect, they want to reach back into time and set the record straight. In a sense a person's life, from birth to death is one event.

ME: (I could sense he was through.) So what you're saying is that past, present, and future are not so clear as they appear to be and that some of history is still part of the present if we can only understand it in the proper light.

K.E.: Yes, and also that we need to try to understand the dynamics of time, because as humans, in a sense, all we really have is time.

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2nd YEAR BLOGS

I: INTRODUCTION

II: THE HUMAN SENSE OF TIME

III: THE PAST

IV: THE PRESENT

V: SCIENCE AND TIME

I: INTRODUCTION

70th Birthday Ashes and Diamonds

A Day In My Life -- The Birthday Cycle

Dealing with my own personal time, the following two blogs were written on my birthdays in 2013 and 2014. They are a summary of where I saw myself and my life at that point in time.

70th Birthday: Ashes and Diamonds (2014)

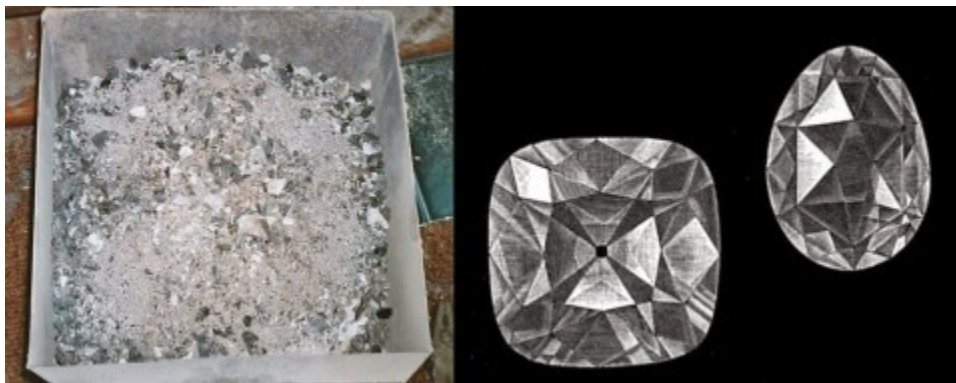
On July 24, 2014, I turned 70. It is a milestone -- a point of no return. Clearly I have fewer miles ahead than I have behind. Which, of course, sets me to thinking about what I have done with my life.

The Polish movie *Ashes and Diamonds* makes the point that we never know whether our contributions will turn to ashes or be recovered by others as shining diamonds.
[[https://en.wikipedia.org/wiki/Ashes_and_Diamonds_\(film\)](https://en.wikipedia.org/wiki/Ashes_and_Diamonds_(film))]

For most of my life I have tried to add to the human dialogue. I believe I have a number of things to say with a unique perspective. I would like to think that I have made some important points in this blog of 42 in-depth postings and also in my other publications and eBooks.

But I will never know if my work is seen as a diamond or is lost in the dust and ashes of time. Nevertheless, if there is a chance that this could add to the human pool of knowledge, the human discussion, it is well worth the trouble.

I do know this: If I do not put my ideas out, my thoughts will never have a chance of being heard. It's sort of a lottery of ideas. As a lottery player says, "I probably won't win, but I have absolutely no chance if I don't buy a ticket."



ASHES AND DIAMONDS

So often you are as a blazing torch,
With flames of burning rags
Falling about you --
Consuming all that you cherish.
You do not know if these flames

Will bring freedom or death.
Yet as your ashes fall into the abyss,
Could there be buried under the dirt
The glory of a starlit diamond?
-- A morning star --
The dawning of an everlasting triumph?

Cyprian Norwid (1821-1883)

NOTE: I did not like the translations of this poem in English, so with apologies to Cyprian Norwid -- since I write poetry myself and have translated poems in French and Spanish -- I freely improvised taking the best lines/words from four different English translations, then added my own ideas and made my own English version. Here are the links to the various English translations that I found plus the original poem in Polish.

[\[http://en.wikipedia.org/wiki/Ashes_and_Diamonds_\(film\)\]](http://en.wikipedia.org/wiki/Ashes_and_Diamonds_(film))

[\[http://www.ucis.pitt.edu/eehistory/H200Readings/Topic3-R4.html\]](http://www.ucis.pitt.edu/eehistory/H200Readings/Topic3-R4.html)

[\[http://dmorgan.web.wesleyan.edu/films/ashes.htm\]](http://dmorgan.web.wesleyan.edu/films/ashes.htm)

[\[http://www.translatorscafe.com/cafe/MegaBBS/forumthread429msg279712.htm\]](http://www.translatorscafe.com/cafe/MegaBBS/forumthread429msg279712.htm)

The original poem in Polish: [\[http://pl.wikipedia.org/wiki/Popi%C3%B3%C5%82_i_diament_\(film\)\]](http://pl.wikipedia.org/wiki/Popi%C3%B3%C5%82_i_diament_(film))



PICTURE CAPTION: Cyprian Kamil Norwid (1821-1883), Daguerreotype
[\[http://en.wikipedia.org/wiki/Cyprian_Kamil_Norwid\]](http://en.wikipedia.org/wiki/Cyprian_Kamil_Norwid) (commons.wikimedia.org)

In a positive irony, Cyprian Norwid and his work suffered the same fate as he described in his now famous poem. Ignored during his lifetime, almost forgotten for seventy years after his death, his work and this poem were rediscovered in the 20th century. This particular poem resurfaced to be the inspiration for a Polish novel and then a Polish movie made in 1958 -- when Poland was under Soviet domination. The movie, *Ashes and Diamonds*, spoke to the soul of the Polish nation and is now considered, by some, to be one of the best films ever made.

MEANING

My interpretation:

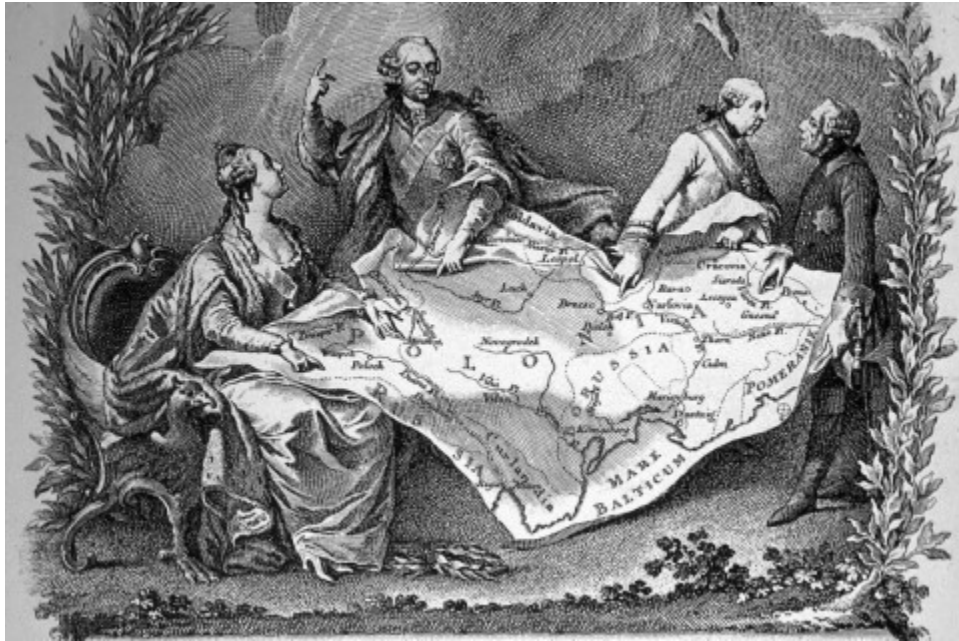
In the end the only freedom is to act and in this action to find meaning -- and by acting I include writing and ideas. No one will ever know the ripple effect of their actions far into the future. But acting with the best of intentions is the most today, in the present, that we can offer and expect.

I am a great believer in the power of art as a positive force. As we know many artists have spoken to future generations without being acknowledged during their own time. For example, JS Bach's [http://en.wikipedia.org/wiki/Johann_Sebastian_Bach] compositions were not well admired during his lifetime and after his death his music was considered old fashioned -- so much of it was lost. Yet today he is considered one of the greatest composers of all time. I think an artist does not always create for the present, often he/she creates for a future audience the artist will never know.



PICTURE CAPTION: The gravestone of the beloved actor Zbigniew Cybulski [http://en.wikipedia.org/wiki/Zbigniew_Cybulski], the Polish James Dean, who played the lead in *Ashes and Diamonds* and who died tragically in 1967 at the age of 39. (commons.wikimedia.org)

ABOUT POLAND AND ART



PICTURE CAPTION: Allegory of the First Partition of Poland in 1772. (commons.wikimedia.org)
[\[http://en.wikipedia.org/wiki/First_Partition_of_Poland\]](http://en.wikipedia.org/wiki/First_Partition_of_Poland)

Perhaps better than any nation in Europe, the Poles understand uncertainty and oppression. Starting in 1772 they were partitioned by the more powerful adjacent countries of Germany and Russia (and also Austria). In WW II Poland was conquered by Nazi Germany and then Stalinist Russia who held Poland under its control until the collapse of the Soviet Empire in 1989. Except for a brief period after WW I when Poland was free, the Poles have been fighting for their independence for almost 200 years. Nevertheless they have kept their identity and their sense of who they are intact -- which includes one of the first societies to tolerate different religious beliefs and also different ethnic groups. Now today they are free and independent -- after numerous uprisings against their oppressors that in the past had only led to defeat. However, throughout this history their faith in art and creation seemed to sustain them with artists like Chopin -- along with an 800 year-old literary tradition. The movie *Ashes and Diamonds* was filmed while under Soviet domination. Will the Poles continue to remain free or be oppressed again? Ashes or diamonds?

"Wajda [ED: director of Ashes and Diamonds] has frequently remarked upon the special role of the artist in Polish culture: the political conscience of a nation during long periods when politics could not be openly and honestly discussed. He has also noted that Polish artists have fulfilled themselves not only in their art but in their participation in history. [ED: such as Paderewski, a famous pianist, who also became prime minister]."

[\[http://www.ucis.pitt.edu/eehistory/H200Readings/Topic3-R4.html\]](http://www.ucis.pitt.edu/eehistory/H200Readings/Topic3-R4.html)



PICTURE CAPTION: Civilian killed by the Nazi Luftwaffe during the invasion of Poland in 1939.
(commons.wikimedia.org) [http://en.wikipedia.org/wiki/Invasion_of_Poland]

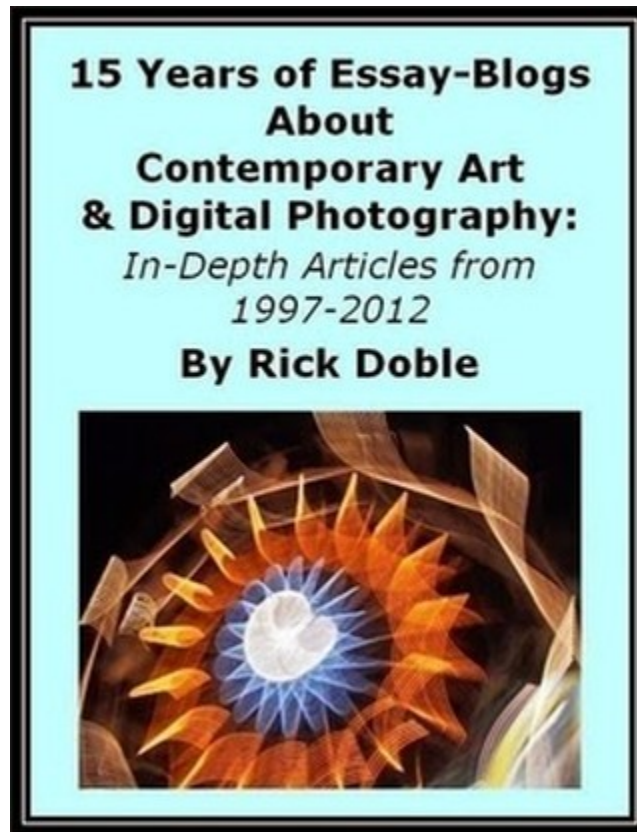
My free eBooks (no ads, no strings):

Hoping that my ideas might be around years from now, here are some of the eBooks and books I have written. And here is the general address for free eBooks and also free eReaders.

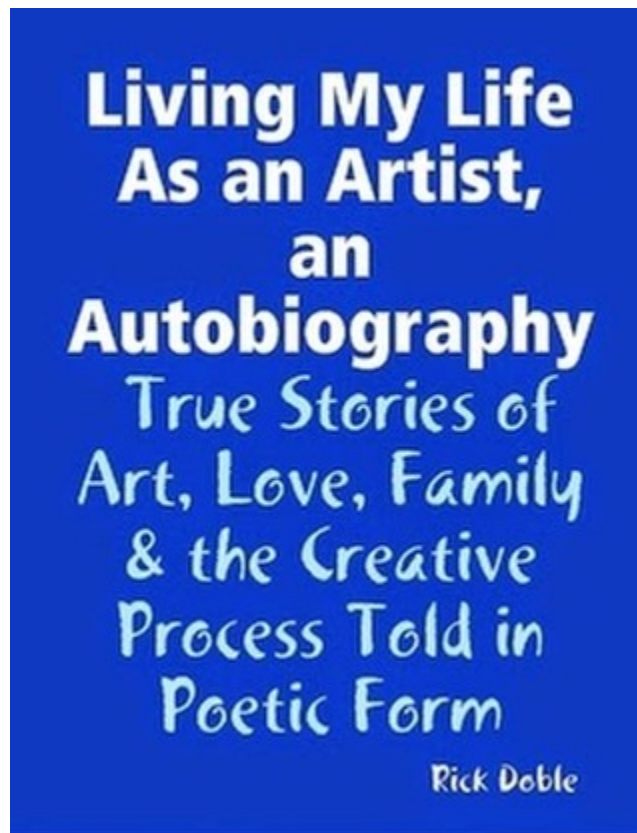
[<http://www.rickdoble.net/ebooks>]

== An eBook of essays about digital photography and the creative process

[http://rickdoble.net/ebooks/doble_rick_essay-blogs_digital_photography.epub]



== My autobiography in poetry that focuses on the creative process (eBook)
[http://rickdoble.net/ebooks/doble_rick_autobiography_poetry.epub]



I have also written:

== A print book: *Experimental Digital Photography*, Sterling Publishing, 2010, New York/London. A how-to book and picture book about digital photography that focuses on photographic effects and not software manipulation. It is the first book of its kind.
[http://www.rickdoble.net/experimental_digital_photography_book.html]

== *Cheaper*, Random House, 2009. Rated 5 stars by three reviewers, this is a complete print book about saving money, so that as artists we can concentrate on our work and live as cheaply as possible.
[<http://www.amazon.com/Cheaper-Insiders-Tips-Saving-Everything/dp/0345512081>]

== An original website about coping with abusive relationships, AbusiveLove.com.
[<http://www.abusivelove.com>]

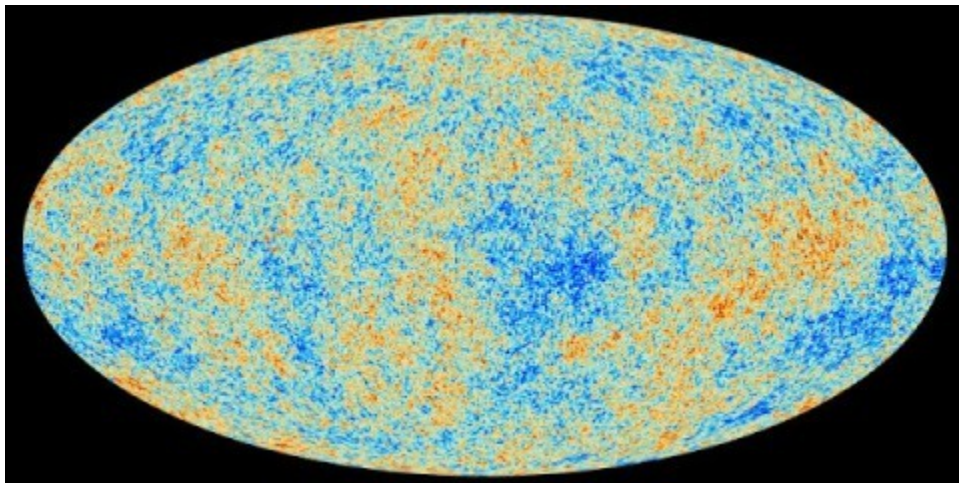
A Day in My Life -- The Birthday Cycle (2013)

Like sands through the hourglass, so are the days of our lives. :)
Quote from the opening of the long running soap opera, *Days of our Lives*

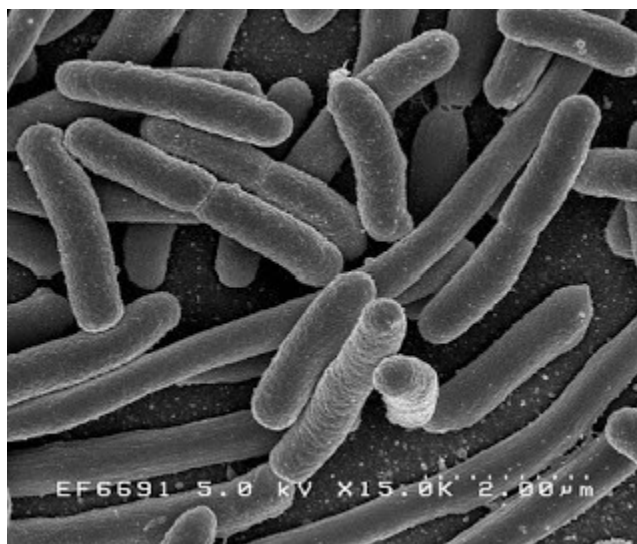
Today on my birthday, July 24, 2013, having turned 69 years old and now staring 70 in the face, I marvel at our current human understanding and our moment in time.

While it is fashionable to complain about the troubles of our day, from a historical perspective, we live in a remarkable time.

Today science has confirmed what seemed impossible just a few short years ago: that the universe began with the Big Bang -- starting from something smaller than an atom. And we have cracked the code of life with DNA, mapped the human genome and know where we as humans came from -- we evolved from tiny microorganisms. We now know that there are more than a hundred billion galaxies each with a hundred billion stars. And we have landed humans on the Moon, landed robotic instruments on Mars and explored all of the planets with our probes. Plus taking half of my lifetime, the Voyager 1 spacecraft just became the first man-made object to go beyond the edge of the solar system and into interstellar space (see photos at the bottom).

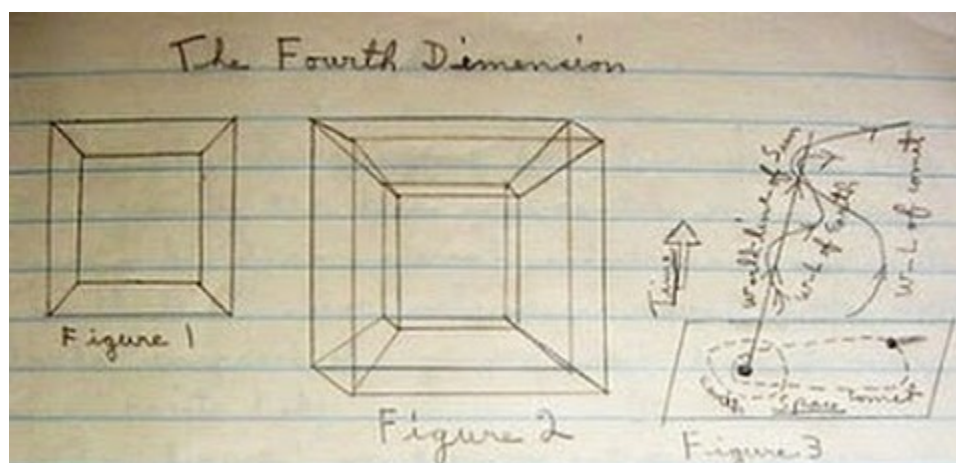


PICTURE CAPTION: Planck Satellite Image: A map of the entire universe; this is a map of the Cosmic Microwave Background Radiation (CMBR) from the Big Bang. (NASA)



PICTURE CAPTION: Electron microscope photos of microscopic organisms that led, over billions of years, to the human species. (commons.wikimedia.org)

If a person had suggested any of these ideas at the time I was born, they would have been labeled off-their-rocker. To suggest that all these things could be true would have been total madness.



PICTURE CAPTION: At age 13, I made a notebook. I essentially copied drawings from George Gamow's book *One Two Three ... Infinity* in which he explained time & space-time in diagrams and terms I could understand. (Rick Doble)

Yet this is the brave new world we find ourselves living in. In short, we can see where we came from, how we got here and where we are going -- answering all those childish questions.

When I was growing up, I did ask these questions, but there were few answers -- only doomsday forecasts about the future. Books and movies like *On the Beach* or *Dr. Strangelove* envisioned a world in which no one survived a nuclear war. Others such as

Orwell's *1984* imagined a world of 'no exit' in which the individual would be crushed. Huxley's *Brave New World* foresaw a well ordered but quite Draconian and sterile modern civilization.

Today there are regional wars and conflicts, but the World Wars are memories. Thousands of years of prejudice and intolerance also seem to be on the decline. In the 1960s I was in the Civil Rights Movement as a white guy and never thought I would see the day when a black man would be nominated for president -- yet he was elected and reelected.



PICTURE CAPTION: That's really me in the Civil Rights Movement, in Chapel Hill, NC, 1963. I am on the far right, in front, holding up the end of the banner. (NC State Government)

Just 60 or so years ago, when I was born, women were essentially second class citizens. Women did not go to college. A woman was expected to be a housewife or, if she wanted to work, be either a secretary, a nurse or a teacher -- those were the only choices. So today, this is perhaps the most important social change: the unequal treatment of women is fading.

Plus we are on the verge of creating a truly global culture that recognizes we are all citizens of the Earth. Yet at the same time we can be loyal to our own nation and traditions while respecting others whose nations and cultures are different.



PICTURE CAPTION: Electric lights at night on the Planet Earth -- showing the extent of human civilization and development. (commons.wikimedia.org)

Okay -- I get it -- the world is not perfect and never will be. The environmental problems will take all of our attention for the next several hundred years, I believe. The inequality of world living standards may take just as long. And very soon there will be more people on the Earth than the Earth can reasonably sustain, according to the United Nations.

But today, like never before, we have developing technologies that could solve many of these problems -- imagine low cost electricity from decentralized solar panels, for example.

And it is quite certain that as our technology improves we will explore our solar system and beyond -- that the human race will continue, expand and survive.

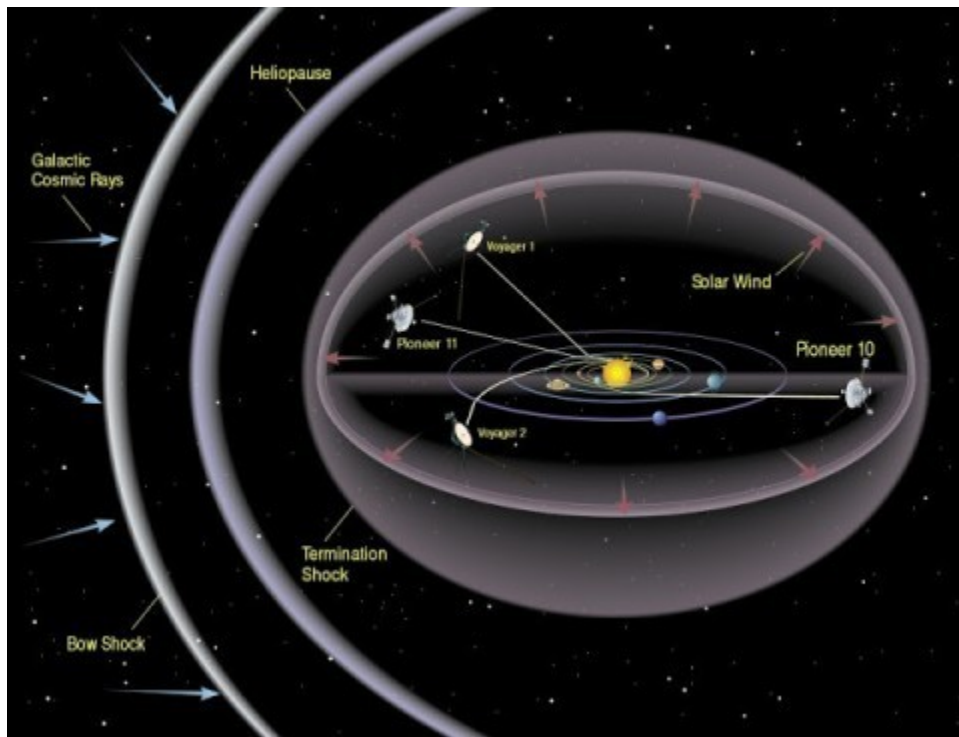
So today we stand on a mountain top where we can see where we have come from and where we are going. The view from here is really stunning. Lets take a moment and enjoy the scenery -- let the *now moment* take over and be glad we were given this gift.



PICTURE CAPTION: A Titan rocket takes off with Voyager 1 in 1977.
(commons.wikimedia.org)



PICTURE CAPTION: Color photo of Jupiter's atmosphere, sent back by Voyager 1.
(commons.wikimedia.org)



PICTURE CAPTION: Diagram that shows where Voyager 1 is now (2013) in relation to the solar system. It is the first man-made object to leave our sun's system and go out into interstellar space. (commons.wikimedia.org)

II: THE HUMAN SENSE OF TIME

Animal Senses Compared to the Human Sense of Time

Patterns & Memory

The Human Revolution: Symbolic Culture

Animal Senses Compared to the Human Sense of Time

New findings about animal senses are being announced in the scientific media on a regular basis. In only the last month, for example, it was reported in *National Geographic* that: *Elephants Have 2,000 Genes for Smell, Most Ever Found* and *Bats Set Their Internal Compass at Dusk, A First Among Mammals*. In addition, about a year ago, *National Geographic* reported that *Dung Beetles Navigate Via the Milky Way, First Known in Animal Kingdom*.

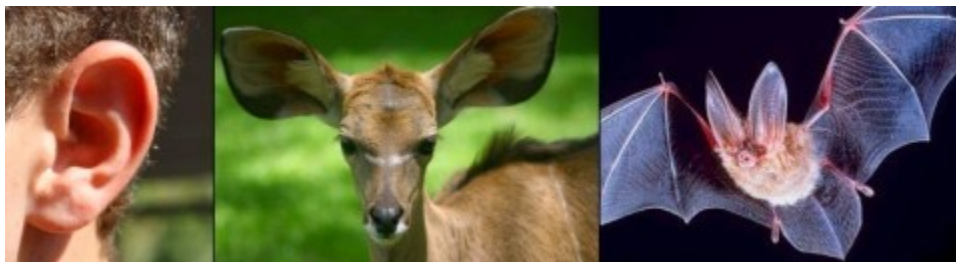
[<http://newswatch.nationalgeographic.com/2014/07/22/animals-elephants-smell-trunks-genes-africa-science/>]

[<http://newswatch.nationalgeographic.com/2014/07/22/bats-animals-science-navigation-magnetic-field-compass/>]

[<http://newswatch.nationalgeographic.com/2013/01/24/dung-beetles-navigate-via-the-milky-way-an-animal-kingdom-first/>]

In all three reports the findings were groundbreaking with phrases like "first known" and "most ever."

The range and sensitivity of senses and the different information being sensed -- in all of the animal kingdom -- is mind boggling and goes far beyond the traditional five human senses of taste, touch, smell, hearing and sight. *National Geographic*, for example, wrote, "Greater mouse-eared bats set their internal magnetic compass using the pattern of light polarization -- light that vibrates in one direction."



PICTURE CAPTION: Human ears (left) with stereo capability can hear a broad range of sound but other animals have more complex and sensitive ears and can hear a wider or different range of frequencies. This young antelope (middle) has large ears which it can move to focus sounds.

Bats (right) depend on their antennae-like ears to determine distances using echolocation, i.e. bouncing changing sounds off of objects. (commons.wikimedia.org)

But understanding animal senses does not stop with the raw data that is sensed. Often this data is processed by the animal's brain, making it much more sensitive. So while a dog has 300 million smell sensors vs. 6 million for humans (a factor of 50), it also has

proportionally 40 times more of its brain devoted to analyzing smell than human beings. This means that a dog is 10,000 times more sensitive to smell than humans according to the latest research reported by NOVA on PBS.

[<http://www.pbs.org/wgbh/nova/nature/dogs-sense-of-smell.html>]



PICTURE CAPTION: Human smell (left) is one of our weakest senses, far surpassed by dogs (middle) who are 10,000 times more sensitive and bears (right) whose ability to smell is 7 times more sensitive than dogs. (commons.wikimedia.org)

Senses are also used in combination with other abilities of an animal, such as the duck-billed platypus who can sense tiny electric impulses in its prey -- and then can zero in on the location by moving its bill in a sweeping manner.



PICTURE CAPTION: "The platypus can determine the direction of an electric source, perhaps by comparing differences in signal strength across the sheet of electroreceptors. This would explain the characteristic side-to-side motion of the animal's head while hunting."

(commons.wikimedia.org)

[<http://en.wikipedia.org/wiki/Platypus>]

But defining and describing animal senses is only part of how senses operate in a living organism, which brings us to the classic subjective/objective debate. While the stimuli that a

sense perceives is clearly outside the organism, the way that the stimuli is interpreted and acted on is determined by the animal, i.e. it is subjective.

With human eyes for example:

"Almost all higher order features of vision are influenced by expectations based on past experience. This characteristic extends to color and form perception...to face and object recognition...and to motion and spatial awareness..."

[<http://www.brainhq.com/brain-resources/brain-facts-myths/how-vision-works>]



PICTURE CAPTION: Eyesight is probably the strongest human sense (left) with full color stereoscopic vision and a remarkable ability for edge detection. But other animals such as eagles (middle) have 3.6 times the human visual acuity. Some insects (right) have a compound eye with a fisheye view (180 degrees) of the world that can see objects in focus both near and far at the same time. (commons.wikimedia.org)

In addition, many parts of the brain are often involved in processing the data that is sensed. With face recognition, for example.

Until now, scientists believed that only a couple of brain areas mediate facial recognition. However scientists have discovered that an entire network of cortical areas work together to identify faces. "This research will change the types of questions asked going forward because we are not just looking at one area of the brain," said Nestor...lead author of the study. "Now, scientists will have to account for the system as a whole..."

[<http://www.sciencedaily.com/releases/2011/05/110531121319.htm>]

This means a sound that is objectively 261.6 Hz and 70 decibels will have a different meaning for a human than for a mouse, for example. This sound is middle C or a musical note played at the normal volume on a radio. To a human being it would carry a musical meaning, perhaps reminding him or her of a sweet song, but to a mouse it might be a warning that a human was nearby.

And what is my point in this blog about the human experience of time?

I believe that humans have a unique sense, a sense of time that only we possess. And given the wide range of animal senses, it should not be surprising that we might have a sense that other animals do not have. In addition we have the largest brain relative to our body size, a brain which we now know is quite flexible (neuroplasticity).

[<http://en.wikipedia.org/wiki/Neuroplasticity>]

It is capable of storing memories, imagining future events and learning and working with concepts such as long term time both past and future. I believe that this unique sense of time is the principle reason we have become the dominant species on the planet.

SCIENTIFIC FINDINGS ABOUT THE HUMAN PERCEPTION OF TIME

Scientific findings have confirmed that there are unique parts of the human brain that deal with time.

"This ability to hold on to a piece of information temporarily in order to complete a task is specifically human. [ED: my emphasis] It causes certain regions of the brain to become very active, in particular the pre-frontal lobe. This region, at the very front of the brain, is highly developed in humans. It is the reason that we have such high, upright foreheads, compared with the receding foreheads of our cousins the apes. Hence it is no surprise that the part of the brain that seems most active during one of the most human of activities [ED: short term memory] is located precisely in this prefrontal region that is well developed only in human beings." Perhaps the most extreme example of short-term memory is a chess master who can explore several possible solutions mentally before choosing the one that will lead to checkmate."

SHORT-TERM MEMORY': McGill University, Montreal, Canada

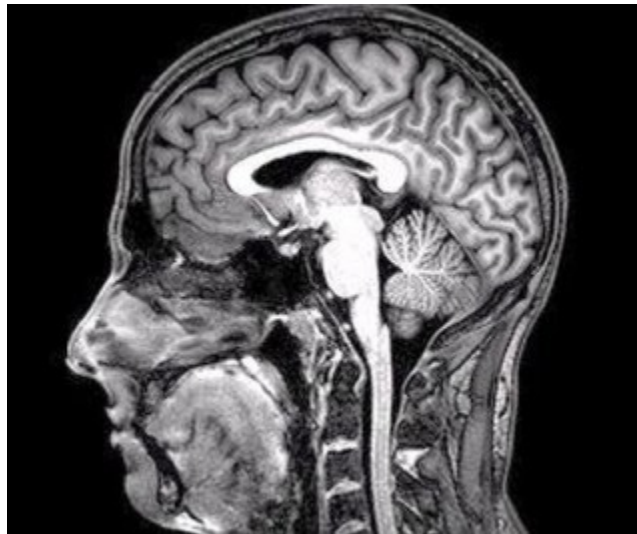
[\[http://thebrain.mcgill.ca/flash/d/d_07/d_07_cr/d_07_cr_tra/d_07_cr_tra.html\]](http://thebrain.mcgill.ca/flash/d/d_07/d_07_cr/d_07_cr_tra/d_07_cr_tra.html)



(commons.wikimedia.org)

I think it is quite possible that the human brain's unique ability to consider future actions in the short term became a model for time itself. This short term understanding of time could have been developed and expanded through language and symbolism to include time in the long term. So the skill of considering whether to go right or left in the heat of a hunt could -- over thousands of years -- be extended to considering whether to go to the river or the mountains by the next full moon.

The problem with complex, sophisticated time perception in humans is that it is not based on a specific sensory organ. Moreover, it is inextricably tied to language and symbols which have given us the tools to conceptualize time and to work with time.



PICTURE CAPTION: MRI of human brain. (commons.wikimedia.org)

QUOTE FROM WIKIPEDIA ABOUT HUMAN SENSES

[\[http://en.wikipedia.org/wiki/Human_senses#Time\]](http://en.wikipedia.org/wiki/Human_senses#Time)

Perception not based on a specific sensory organ

Time

Chronoception refers to how the passage of time is perceived and experienced. Although the sense of time is not associated with a specific sensory system, the work of psychologists and neuroscientists indicates that human brains do have a system governing the perception of time, composed of a highly distributed system involving the cerebral cortex, cerebellum and basal ganglia.

NOTE: It is quite significant that the most used noun in the English language is *time* according to the Concise Oxford English Dictionary [\[http://www.oxforddictionaries.com/us/words/the-oec-facts-about-the-language\]](http://www.oxforddictionaries.com/us/words/the-oec-facts-about-the-language), with the words year, day and life not far behind. While I can document this for English, I don't have the resources to document this in other languages -- but I assume that time is the most used noun in other languages as well.

While we cannot go back tens of thousands of years to reconstruct how a long term sense of time came about, there is perhaps another way to understand how it developed. When our children are young, they only live in the moment, but over years, especially as a result of education, they learn a long term sense of time. This process, that starts in childhood and continues until adulthood, could be observed and studied.

Childhood

Measures of performance on tests of working memory increase continuously between early childhood and adolescence; theorists have argued that the growth of working-memory capacity is a major driving force of cognitive development.

[\[http://en.wikipedia.org/wiki/Working_memory#Childhood\]](http://en.wikipedia.org/wiki/Working_memory#Childhood)

School Teaches Cultural Assumptions About Time

During the twenty year 'long childhood' of humans, young people learn their culture's expectations about time. While I will write a full blog about this, suffice it to say students in school learn about time more than any other subject. They learn to arrive on time, to not be late to each of their classes and to manage time such as doing their homework or studying for a final exam. These time demands become more stringent as a student gets older.

WHAT IS OUR UNIQUE SENSE OF TIME?

So what exactly is this different sense of time, you might ask? Well, it turns out it is quite simple. We are the only animal that understands 'when'.

But don't take my word for it, read the detailed article, *Are Animals Stuck in Time?* [[https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20\(2002\)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf](https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20(2002)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf)], that compares the animal sense of time to the human sense of time. The article concludes that in fact animals are stuck in time whereas we humans can work with and manipulate time.

Humans are not 'stuck in time' because understanding 'when' allows us to time-travel back to our past and also to an imagined future. It allows us remember our personal story and to shape ourselves and our civilization. Furthermore it allows us to take control, to plan for the future based on our knowledge of the past.



PICTURE CAPTION: The TARDIS time machine from the science fiction TV show, *Dr. Who*.
(commons.wikimedia.org)

*"People can time-travel cognitively because they can remember events having occurred at particular times in the past (episodic memory) [ED: e.g. the sense of when] and because they can anticipate new events occurring at particular times in the future. **The ability to assign points in time to events arises from human development of a sense of time** [ED: my emphasis] and its accompanying time-keeping technology."* William Roberts, *Are Animals Stuck in Time?*

[[https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20\(2002\)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf](https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20(2002)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf)]

As we go through our lives, we order and organize what we do with a sense of 'when': when in the past, when in the present and when in the future.

Take, for example, this very simple sentence that anyone of us might say -- yet which is extremely sophisticated:

"When I finish this job in about an hour, I will be done for the day."

This sentence which includes past, present, future and future perfect (a past that is in the future at the present time but will be past at a future point), is something we humans understand, but cannot be understood by any other animal.

However, I believe that we have made a critical mistake in our thinking. Most people -- in fact virtually all people I have talked to -- think of time as an objective condition that exists independently.

While time does exist objectively -- the sun will rise every morning no matter what we do -- our sense of time is particularly and perhaps peculiarly human. The way that we work with time, remember time, conceive of time is related to the way that our brains function.

Therefore while the objective nature of time can be sensed, humans deal with it in a subjective manner. For example, as I have pointed out in my blog about 'human meta-time', we humans have the unique ability to move in a virtual world of space and time at warp speed. We can travel in our minds from past and current events and past and current houses, schools and jobs to places and activities we imagine we will do soon in the present and in the future.

And although civilization has developed a highly sophisticated way of marking and telling time such as clocks and calendars, when people remember the past it is rare that they can give dates. Instead they relate the past to things that happened before and after, i.e. when something occurred in their personal history. So our personal memory is not tied to the artificial time-telling and timekeeping devices of our cultures but rather the natural human sense of memory. See William Roberts, *Are Animals Stuck in Time?*

[[https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20\(2002\)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf](https://www.msu.edu/course/psy/962/snapshot.afs/Roberts%20(2002)%20-%20Are%20animals%20stuck%20in%20time_epidodic%20memory.pdf)]

While we have all learned to live with clocks and show up on time, our personal sense of 'when' is not tied to man-made artificial timekeeping.

My point is that our inborn human sense of 'when' is separate from the man-made clocks and calendars that rule our workaday lives. Understanding when is a major part of being human. 'When' is our own personal story, knowing 'when' and how things happened in the past is how we became what we are, and thinking about 'when' in the future maps out who we hope to be.

CONCLUSION

The concept of 'when' adds a new dimension to time. Time is not just one dimensional, i.e. always in the moment or subject to an immediate need, or two dimensional, i.e. cyclical such as breakfast and dinner, night and day, and yearly migrations -- which are the way time is perceived by all the other animals. Instead 'when' adds a third dimension to time, a linear dimension of past, present and future. We are the only animal that perceives and uses this dimension of time.

Data that is sensed is often multidimensional but not every animal can detect all of the dimensions. Sharks not only have a far better sense of smell which can detect a small amount of blood in the ocean 1/3 of a mile away but also a more dimensional sense of smell than

humans have. Once having sensed the presence of blood, for example, they can locate the direction of the source of the blood with their two nares (snouts) in much the same way that our two ears are used to locate the source of a sound.

"Sharks smell through a pair of nostril-like holes, called nares...When its olfactory sensors detect the odor of a potential catch, the shark will turn into the current that is carrying the chemical. In addition, a shark's olfactory talents are so refined that it can often tell which of its nares is getting the stronger scent signal, guiding it even more precisely toward its prey."

[<http://www.pbs.org/kqed/oceanadventures/episodes/sharks/indepth-senses.html>]



(commons.wikimedia.org)

As I pointed out in my blogs about moderncentric thinking (the often superior attitude modern people have about historic cultures), we humans are also guilty of humancentric thinking. We, unknowingly, have assumed that animals possess the same basic senses we have -- only with some changes. Yet if we want to really understand how animals sense, we need to see the world from their point of view. For example, how does a dolphin perceive its world? I won't say 'see' because even though sight may be involved, the echolocation [http://en.wikipedia.org/wiki/Animal_echolocation] ability of dolphins goes far beyond anything we have experienced either as humans or in our labs and perhaps beyond anything we can yet imagine.



(commons.wikimedia.org)

"A recent discovery we made is that dolphins appear capable of directly perceiving the shapes of objects through echolocation. Prior to this finding, it had been generally assumed that dolphins learned to identify and recognize objects through echolocation by a process of associative learning -- by comparing the echoes returning from targets with the visual appearance of those targets."

[http://www.dolphin-institute.org/our_research/dolphin_research/seeingthroughsound.htm]

"The sounds they [ED: dolphins] hear create a kind of holographic image in their minds...they perceive echoes as 3-D shapes and textures...Their ultrasonic clicks penetrate flesh, giving them an X-ray view of your bones and innards."

[http://www.cracked.com/article_19952_the-6-most-mind-blowing-animal-senses_p2.html#ixzz38QE2EboO]



PICTURE CAPTION: Understanding other types of animal senses has led to major scientific breakthroughs in the past, such as the development of radar which came about in part due to the study of how bats navigated in the dark and which also led to the development of sonar and ultrasound technology. (commons.wikimedia.org)

[<http://www.usgraweb.hk/en/Pdf%20Slide%20Show/History%20of%20Ultrasound.pdf>]

[<http://www.rfcafe.com/references/articles/who-invented-radar.htm>]

And once we can see the world from the point of view of a different species, we may begin to understand our own world better. This is because the particular senses we humans possess have led us to build this world that we live in.



PICTURE CAPTION: Because humans have hands that are free along with good vision, eye-hand skills have been critical to the creation of civilization. (commons.wikimedia.org)



PICTURE CAPTION: Because of our intelligence, we have been able to enhance our ability to sense through our technology. In this photo from the 1920's, a man is listening to the radio through ear phones, listening to music that is being played hundreds of miles away. (commons.wikimedia.org)

AFTERWORD

The incredibly intuitive ancient Greeks said most of what I have written here about the human sense of time through their mythology.



PICTURE CAPTION: Detail: "The creation of man by Prometheus. Marble relief, Italy, 3rd century CE." Louvre Museum, Paris, France. (commons.wikimedia.org)

THE CREATION OF HUMANS AND THE ANIMALS

"Prometheus was said to be wise and possessed the gift of foresight and often considered what would be needed several years in the future."

[http://www.greekmythology.com/Myths/The_Myths/Creation_of_Man_by_Prometheus/creation_of_man_by_prometheus.html]

The brother of Prometheus, Epimetheus, who was rash and impulsive, was given the job of creating the animals, fishes and birds. Prometheus, a god who was wise and had the power of foresight, took his time making man out of clay. Yet when it came to giving man attributes, it turned out that this brother of Prometheus had already given most qualities away.

"Epimetheus began by giving the best traits to the animals -- swiftness, courage, cunning, stealth, and the like -- and he wound up with nothing to give to man. So Prometheus took the matter in hand and gave man an upright posture like the gods."

[\[http://www.cliffsnotes.com/literature/m/mythology/summary-and-analysis-greek-mythology/the-beginnings-8212-prometheus-and-man-and-the-five-ages-of-man-and-the-flood\]](http://www.cliffsnotes.com/literature/m/mythology/summary-and-analysis-greek-mythology/the-beginnings-8212-prometheus-and-man-and-the-five-ages-of-man-and-the-flood)

Yet since the natural qualities of fur, flight and strength etc. and had been taken, Prometheus went a step further to help mankind. He famously stole fire from the gods.

"Fire was bestowed upon mankind by Prometheus and with it came the beginning of civilization. Prometheus taught man how to craft tools from iron ore. He showed them how to plant crops and live through agriculture. Man learnt to craft weapons to defend themselves from wild animals. With fire they learnt to survive cold winters and defy the seasons. With fire man began to thrive and became superior to the animals of the wild."

[\[http://classicalwisdom.com/prometheus-the-creation-of-man/\]](http://classicalwisdom.com/prometheus-the-creation-of-man/)

In stealing fire from the gods, Prometheus also taught humans how to think ahead because starting a fire, keeping a fire going, cutting wood for the winter -- all took forethought, the skill needed to master time.

By stealing fire from the gods, teaching men crafts and agriculture, Prometheus, the god of forethought, gave man the gift of long term time, a quality more powerful than claws and sharp teeth. He taught humans about planning, about steps in a process, about the concept of 'when'. So only humans were given the ability to understand this dimension of time -- something the creatures impulsively made by his brother, Epimetheus, did not have.

Patterns & Memory

It could be a "which came first -- the chicken or the egg?" type of problem, but I'm betting on the chicken.

When I first considered writing this blog about the human experience of time, I questioned whether time was as crucial as I thought. The only other human capability that seemed equally important was our skill at grasping patterns.

The power we have as humans comes from our ability to see patterns. We see patterns everywhere. Discovering and utilizing patterns gives us the control that has allowed us to now dominate the Earth.

Finding a pattern is finding order. We are hardwired to see order, to create order, to manipulate our world based on order -- this is an essential drive in the human psyche, almost as compelling as sex.

...patterns have an underlying mathematical structure; indeed, mathematics can be seen as the search for regularities, and the output of any function is a mathematical pattern. Similarly in the sciences, theories explain and predict regularities in the world.

[<http://en.wikipedia.org/wiki/Pattern>]

A scientific law "is a theoretical principle deduced from particular facts...expressible by the statement that a particular phenomenon always occurs if certain conditions be present." (Oxford English Dictionary) Quoted in this article:

[http://en.wikipedia.org/wiki/Laws_of_physics]

Also read: *Humans Are the World's Best Pattern-Recognition Machines*

[<http://bigthink.com/endless-innovation/humans-are-the-worlds-best-pattern-recognition-machines-but-for-how-long>]

Once a scientific law is established, it gives us the ability to build, create and predict based on those laws -- as we have now, in effect, cracked the code of nature by discovering an underlying pattern.

**Why Order Is So Important:
Comprehending order gives us
comfort, predictability, control,
safety and removes uncertainty --
all of which allows us to have a better chance of survival.**

I believe that this compulsion to find patterns is separate from our experience of time and the way that our brains put memories together.

SO WHICH CAME FIRST?

I believe the human sense of time -- hundreds of thousands of years before civilization began -- gave us the edge as a species and came first. Because without an ability to recall the past, we would not have the data necessary to discern a pattern.

Before we could perceive patterns we had to have had a clear memory and a detailed understanding of what we had seen and experienced so we could connect the dots.

Yet the combination of the two: a sophisticated understanding of time combined with a sophisticated perception of patterns, gave us a tremendous advantage.

The beauty and power of patterns is that they can apply to a variety of very different phenomena. Take the spiral: this basic design in nature can be the structure of a shell, a storm or a galaxy.



PICTURE CAPTION: A spiral in a fossil shell. (commons.wikimedia.org)



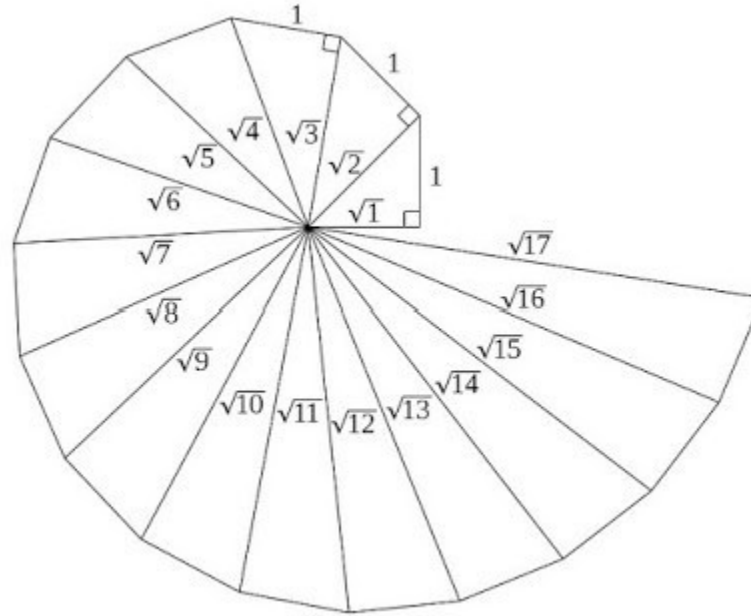
PICTURE CAPTION: A spiral in the aloe plant. (commons.wikimedia.org)



PICTURE CAPTION: A spiral in a low pressure system when seen from a satellite.
(commons.wikimedia.org)



PICTURE CAPTION: Massive spirals: colliding galaxies. (NASA)



PICTURE CAPTION: Spirals can be understood mathematically as in this example by Theodorus of Cyrene, a Greek mathematician in the 5th Century BCE. Fundamental aspects of the spiral will apply to a sea shell, a plant, a storm or a galaxy and even similar molecular structures such as the DNA helix even though they are made up of quite different materials and vary considerably in size. (commons.wikimedia.org)

And what does this have to do with time?

Finding a pattern means that we connect things we have seen in the past to things in the present which we can then project into the future.

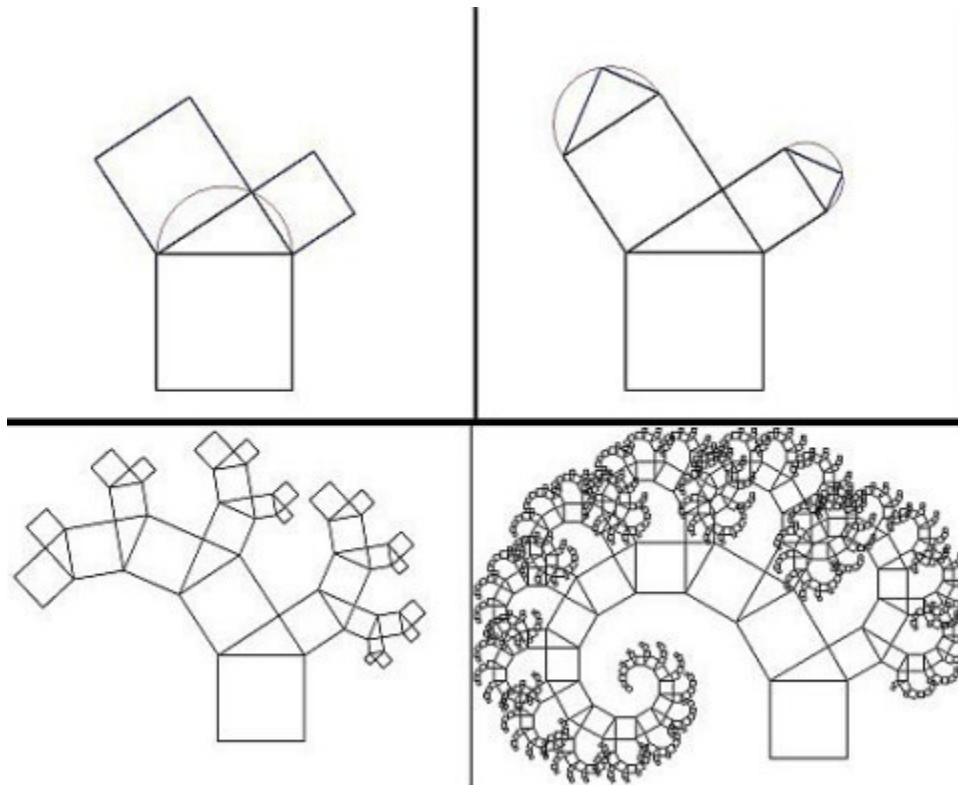
My point is that human memory came first but it was combined with a separate remarkable ability to discover patterns. This led to agriculture, astronomy, mathematics, science, technology and civilization.

As our civilizations have progressed we have become increasingly sophisticated at finding patterns and building on what we have established. The discovery and development of fractal geometry was only possible with computers, for example.

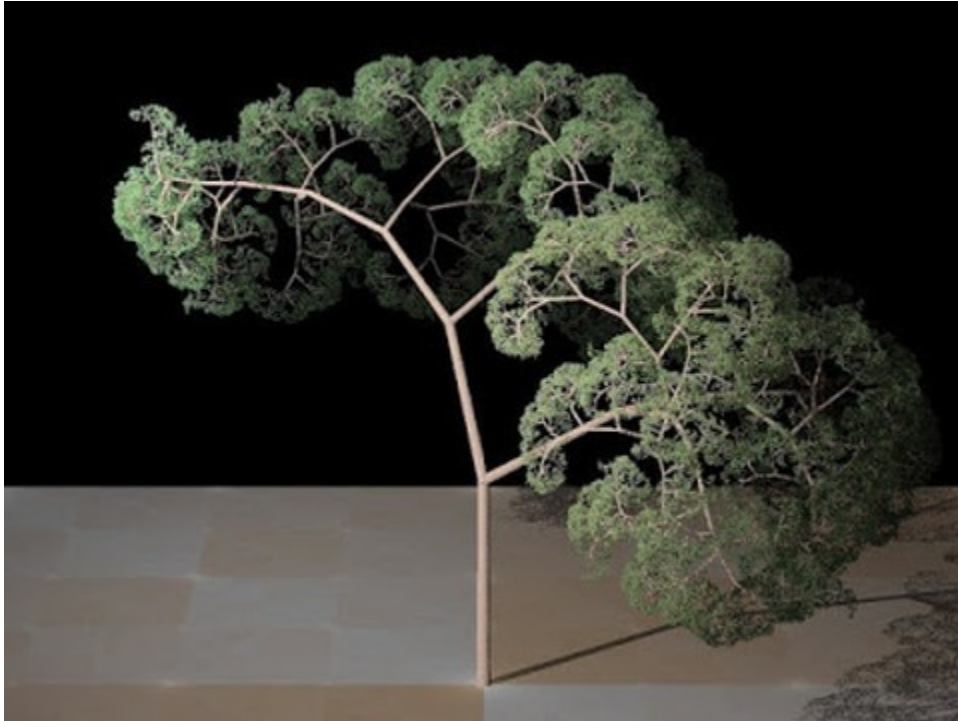


PICTURE CAPTION: A natural fractal is displayed in the veins of this plant. It was not until computers could do the complex calculations that a mathematical pattern was discovered in fractal structures. (commons.wikimedia.org)

In the following, wonderful example, the famous mathematical relationship discovered by Pythagoras 2500 years ago (in a right angled triangle the square of the hypotenuse is equal to the sum of the square of the other two sides) is used as the basis for an increasingly complex fractal design ending with a lifelike tree. This illustrates how we often build on our existing patterns to make increasingly sophisticated patterns.

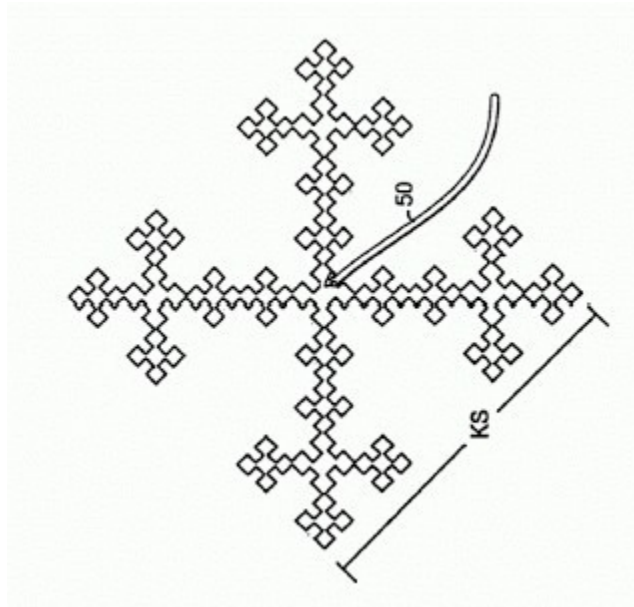


(commons.wikimedia.org)



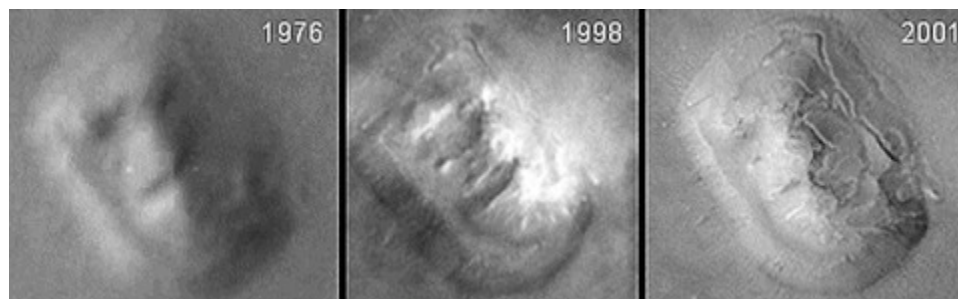
(commons.wikimedia.org)

There often is no use for a pattern when it is first discovered. This was true for fractals. Yet as time goes on, people often see how a new pattern applies to various real world problems. In one of the first practical applications, the fractal antennae is much smaller, lighter and more sensitive than previous small antennas and quite useful for cell phones. I believe we have only begun to see the ways that fractals can be used in the real world.



PICTURE CAPTION: Design for a fractal antennae. (commons.wikimedia.org)

The impulse to see patterns is so strong we often find them when there is none -- such as the face on the surface of Mars. Since a large part of our brains is devoted to face recognition, it was hard to *not* see a face when the lo-res image had facial characteristics. It turned out, of course, to be a geological feature on Mars, a mesa. Yet millions of people believed it was evidence of life on Mars while logically it was almost certain that it was simply a surface feature on the planet.



PICTURE CAPTION: The low resolution photo on the left appeared to show a face on the surface of Mars, but as the photographic resolution increased (middle photo & higher still on the right) the facial characteristics disappeared. (NASA)

When I watch the very popular detective shows on TV, shows that seem to dominate programming -- such as *Criminal Minds*, *Elementary*, *Castle*, *The Mentalist*, *Person of Interest*, *Law And Order*, *CSI*, *NCIS*, *Hawaii 5-O*, *Cold Case*, *Numb3rs*, *Bones*, *Without a Trace* plus numerous made for TV movies and documentary type shows like NBC's *DateLine* -- the bulk of the story is about finding the pattern that leads to the killer. It appears that even in our leisure moments, we are looking for patterns and enjoy the game of finding them.



PICTURE CAPTION: Karl Malden and Michael Douglas in *The Streets of San Francisco* -- a popular TV police drama. In the last 60 years there have been about 650 crime dramas on TV around the world. Many ran for a number of years. (commons.wikimedia.org)

The Human Revolution: Symbolic Culture

"Symbolic culture" is a term used by social scientists to describe the symbolic world of shared language and concepts that each one of us carries within us and is a creation of our culture.

Symbolic culture is a domain of objective facts whose existence depends, paradoxically, on collective belief. [ED: such as money or marriage]

Long before the late twentieth century invention of the Internet, evolution allowed humans to flit between two realms, reality on the one hand, virtual reality on the other. Symbolic culture is an environment of virtual entities lacking counterparts in the real world.

[\[http://en.wikipedia.org/wiki/Symbolic_culture\]](http://en.wikipedia.org/wiki/Symbolic_culture)

While all words are symbolic, there are gradations when it comes to their reality. For example, everyone has to share a belief in the value of paper money or it would be worthless -- although the paper itself would still exist.



PICTURE CAPTION: This Hungarian money became virtually worthless after World War II. It experienced the worst hyperinflation the world had ever seen. (commons.wikipedia.org)

Yet everyone does not have to share a belief in the sun -- as the sun will come up tomorrow whether they believe or not.

***What's in a name? that which we call a rose
By any other name would smell as sweet.
Shakespeare, Romeo and Juliet***



(commons.wikipedia.org)

Symbols are both virtual, subjective and shared collectively but also relate to an independent objective reality. Some independent objective realities are more independent than others -- to paraphrase Orwell from *Animal Farm*. And some symbols are more subjective than others, think of 'love' for example.

Related to the idea of symbolic culture, the "human revolution" is a term also used by social scientists who study the origins of human beings. This revolution refers to the point in human evolution when the symbolic culture emerged -- and which changed humanity forever.

"The Human Revolution is a term used by archaeologists, anthropologists and other specialists in human origins; it refers to the spectacular and relatively sudden 'apparently revolutionary' emergence of language, consciousness and culture in our species... Symbolism was not an optional extra 'life following the transition became fundamentally organized through symbols'. (A summation of the thinking of Christopher Henshilwood and Ian Watts)
[\[http://en.wikipedia.org/wiki/The_Human_Revolution_\(human_origins\)\]](http://en.wikipedia.org/wiki/The_Human_Revolution_(human_origins))

Now to relate this to the topic of deconstructing time

I believe that time is one of our shared subjective symbols. Yet it does relate to the unrelenting undeniable objective progression of time. For example, we have all agreed that 12:25 in the afternoon is a symbol we understand. But we can also correlate this clock time to a specific point in objective time.



(commons.wikipedia.org)



(commons.wikipedia.org)

WHY MODERN TIME IS SUBJECTIVE

Yet just about a hundred years ago there were no time zones in the United States, for example, but literally hundreds of local times in towns and cities each of which were synchronized to the noonday sun, which was different every couple of miles east to west.

When the transcontinental trains were built, local time became too confusing for train schedules, so time zones were implemented. While time zones made scheduling much easier for commercial reasons, the local times were more accurate as each local noon correlated exactly with the sun at the peak of its travel -- a fact which kept people more in tune with the daily rhythm of the sun.

Clocks were actually an intrusion into daily life and changed the nature of time itself around the year 1300.

It was into a world of "natural time," based on the sun's march across the sky, and varying with the seasons, that the first mechanical timepieces -- time machines -- were introduced in thirteenth century Europe. At odds with the conception of time as something that flows, with the first clocks came the idea of measuring time by splitting it into equal, discrete chunks and counting those chunks. (Before that hours were variable based on the movement of the sun during the day which varied from season to season.)

Keith Devlin from his blog: *Devlin's Angle*:

[\[http://www.maa.org/devlin/devlin_12_99.html\]](http://www.maa.org/devlin/devlin_12_99.html)

The combined effect of modern time keeping has been to disconnect us from the natural cycles of the planet. Few people today notice when the solstices or equinoxes occur, for example. Noon, that should be the highest point of the sun in the day, is no longer at the zenith for most locations since time zones mandate that noon be the same for all locations within a time zone. And even though the word 'month' comes from moon, our calendars are not synchronized with the moon and few of us know when the phases of the moon occur. Even fewer people can identify constellations which had been used for thousands of years to indicate seasonal changes.

Instead the modern world has substituted the rhythm of commerce for the natural and more precise cycles of the Earth.

Yet we can imagine that in paleolithic and neolithic societies, and older civilizations up until about 500 years ago -- or about 99% of the time humans have been alive -- people told time by the sun, the moon and the stars. I imagine that members of these cultures were expected to know exactly what phase the moon was in and which stars or constellations were rising or setting. Of course the above is conjecture, yet I believe it is quite reasonable given my research.

If you think such ideas are out of date, consider the fact that much of Asia operates today on a lunisolar calendar. These areas include some of the most advanced and rapidly growing economies. And if you think it doesn't matter see my note at the end of this blog.



PICTURE CAPTION: The phases of the moon were critical for most cultures before the industrial age. They organized time based on the moon's cycle. (commons.wikipedia.org)

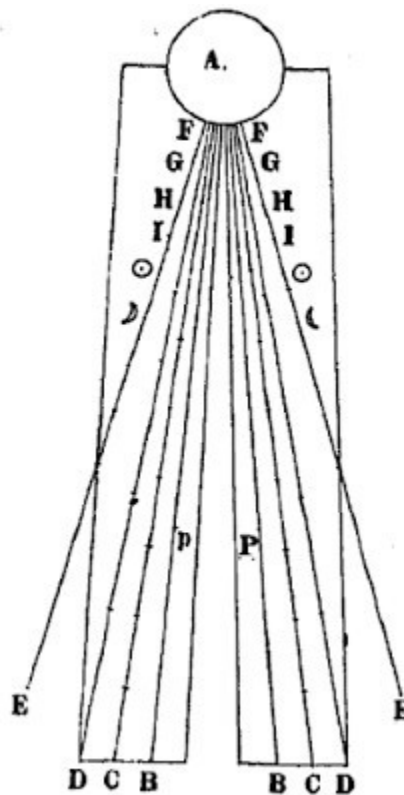


PICTURE CAPTION: Eight months from a medieval calendar known as the Book of Hours: This is from the *Tres Riches Heures du Duc de Berry*. Each month is illustrated with the appropriate activity or work for that time period and days can be read in either a solar or lunar mode. (commons.wikipedia.org)



PICTURE CAPTION: Above each month in the *Tres Riches Heures* are the positions of the important Zodiac constellations for that time period. Before the industrial age, the Zodiac was used for telling time on a monthly or seasonal basis. (commons.wikipedia.org)

Galileo, whose insights formed the basis for modern science, realized that time measurement was critical to his understanding of physics. He was the first to use pendulums to improve the accuracy of his measurements. His discoveries led to our mechanical world and changed our idea of time -- from being a continuous flow to time consisting of sliced and diced fragments.



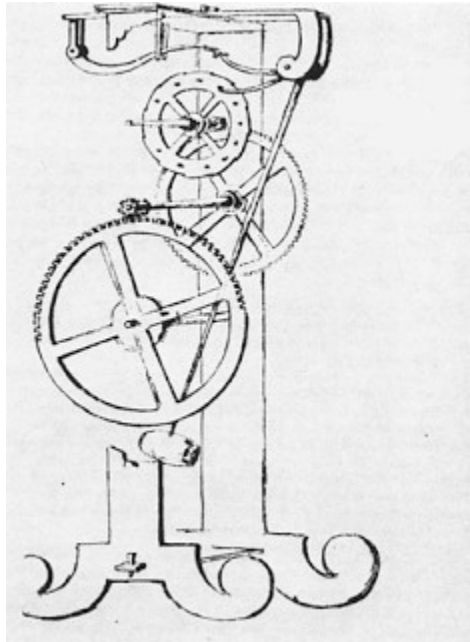
PICTURE CAPTION: Drawing from the Works of Galileo Galilei, Volume 2, illustrating the dynamics of a pendulum. (commons.wikipedia.org)

Measure what is measurable, and make measurable what is not so.
Galileo Galilei

Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.
Albert Einstein



PICTURE CAPTION: "A geometrical and military compass designed by Galileo Galilei," and built around 1604. (commons.wikipedia.org)



PICTURE CAPTION: An early pendulum clock design -- by Galileo. (commons.wikimedia.org)

Time is not a reality (hypostasis), but a concept (noema)...
Antiphon the Sophist, Greek thinker circa 5th century BCE

People like us, who believe in physics, know that the distinction between past, present, and future is only a stubbornly persistent illusion.
Albert Einstein

While this blog is a work in progress, I am certain of this: our shared notions about time create what we think of as time -- and that with different symbols, words and shared beliefs we would have a different experience of time. Our sense of time lives in our virtual internal world of symbols, our symbolic culture -- and that if we choose we could change it.

A MODERN TIME DILEMMA

A CHOICE ABOUT TIME YOU CAN MAKE TODAY

With the advent of digital readouts for time, the circular, cyclical aspect of time is no longer apparent. People accustomed to the round, repeating time clock wonder if something hasn't been lost when time is simply a number that goes forward in a linear fashion. But you can make a choice: you can decide which type of time display you prefer.



PICTURE CAPTION: A digital readout is linear -- time going forward in a straight line with no sense of the cyclical character of time. (commons.wikipedia.org)



PICTURE CAPTION: A circular clock emphasizes the repeating, cyclical nature of time.
(commons.wikipedia.org)

NOTE: Mechanical time vs. natural time -- does it matter? Time is a basic reference point that we refer to many times a day, thousands of times a year. The word 'time' is the most used noun in our languages.

For example, If we look at the moon for a time reference, we might be more in tune with nature itself -- and be less prone to adversely affecting the environment. I think our current commercial type of time affects us in major ways -- but I will save a full discussion for a later blog.

III: THE PAST

The Moderncentric Bias Against Prehistoric Cultures: Part 1

The Moderncentric Bias Against Prehistoric Cultures: Part 2

Light Pollution Is Blotting Out the Stars

The Moderncentric Bias Against Prehistoric Cultures: Part 1

We are all biased. There is no getting around it. This is not a criticism. This is simply a fact. Each of our cultures teaches us to think, act and follow rules in certain ways. We are so immersed in our own culture -- from the time we are born -- we are often unaware of our biases. Yet when we travel or come into contact with people from another culture, the mental filter of our society can make it hard to grasp what might be right in front of our eyes.

Like fish unaware of living in water, people tend to be unaware of being totally enveloped by their culture.
(Kalyanpur & Harry, 1997; 1999)

When we look at those who are different from ourselves, we are often in the position of a deaf man who sees a bunch of people with fiddles and drums, jumping around every which way, and thinks they are crazy. He cannot hear the music, so he doesn't see that they are dancing
(Myerhoff 1978) (Nanda & Warms 2007)

This idea of cultural bias originated in anthropology -- especially when it came to the study of 'primitive' societies by people from 'advanced developed' nations. But this idea also works equally well when considering and excavating prehistoric cultures -- such as the Neolithic.

Anthropologists have called cultural bias:

ethnocentrism

I call a sense of modern superiority:

moderncentrism

By moderncentrism and moderncentric I mean the belief that modern people are more advanced, more intelligent, more developed than the 'barbarian, primitive, superstitious, stone age people of the past.' And, I might add, this attitude is also often directed at contemporary indigenous societies and 'third world' or 'developing' countries.

Yet for the last 200,000 years humans have had the same brain and the same intelligence. No culture is more advanced than another. Each culture adapted to its particular conditions.
[\[http://genealogyreligion.net/classifying-cultures-grade-v-clade\]](http://genealogyreligion.net/classifying-cultures-grade-v-clade)

Although, of course, some societies are more powerful than others or more dominant or have more sophisticated technology -- but that is another question entirely.

WHAT DIFFERENCE WILL CHANGING OUR BIASES MAKE?

If we assume prehistoric people were intelligent, we can then make connections that we would not make otherwise. Using a term from psychology, we can give ourselves *permission* to look for signs of intelligence. Take the example of the discovery of sophisticated cave paintings in the Cave of Altamira about 100 years ago.
[\[http://en.wikipedia.org/wiki/Cave_of_Altamira\]](http://en.wikipedia.org/wiki/Cave_of_Altamira)



PICTURE CAPTION: Polychrome rock paintings of bison in the Cave of Altamira, Spain.
(commons.wikimedia.org)

Altamira, "was the first cave in which prehistoric cave paintings were discovered. When the discovery was first made public in 1880, it led to a bitter public controversy between experts which continued into the early 20th century, as many of them did not believe prehistoric man had the intellectual capacity to produce any kind of artistic expression. The acknowledgement of the authenticity of the paintings, which finally came in 1902, changed forever the perception of prehistoric human beings."
[\[http://en.wikipedia.org/wiki/Cave_of_Altamira\]](http://en.wikipedia.org/wiki/Cave_of_Altamira)

Unfortunately for the man who discovered the cave, Marcelino Sanz de Sautuola [\[http://en.wikipedia.org/wiki/Marcelino_Sanz_de_Sautuola\]](http://en.wikipedia.org/wiki/Marcelino_Sanz_de_Sautuola), the controversy was more than an argument between experts. Sautuola's finding was ridiculed at the Prehistorical Congress in Lisbon in 1880 by prehistoric art expert Émile Cartailhac whose arguments were so convincing members of the Congress did not feel the need to visit Altamira to see for themselves. But then it got worse. "Sautuola was even accused of forgery. A fellow countryman maintained that the paintings had been produced by a contemporary artist, on Sautuola's orders. (Wikipedia.org)" Before the controversy was settled, Sautuola died at an early age. Some believe he died young because of these accusations.



PICTURE CAPTION: Marcelino Sanz de Sautuola (commons.wikimedia.org)

Finally in 1902 after other caves had been discovered with similar art, Sautuola's harshest critic, Cartailhac, did agree that the paintings were authentic and apologized to Sautuola's daughter (who had actually found the cave) and then to the world in a famous article, *Mea culpa d'un sceptique*. He flatly admitted he was wrong and that he had done damage to the name of a good man and to the discipline of prehistoric art -- and further that he had dismissed the authenticity of the cave paintings without investigating.



PICTURE CAPTION: Sautuola's daughter (commons.wikimedia.org)

After Altamira was discovered over 10 more major caves with extensive artwork were found across Europe, caves which had been there for at least 10,000 years, but which no one had looked for. And as of this writing, "Nearly 340 caves have now been discovered in France and Spain that contain art from prehistoric times. (Wikipedia.org)"

It seemed that once people realized prehistoric cave paintings did exist, they could then go out and find new caves -- caves that had been there all along.



PICTURE CAPTION: Picasso was so impressed by the skill and impact of the cave paintings at Altamira and Lascaux he was reported to have said, "We have learned nothing." Others quoted him as saying, "We have invented nothing." (commons.wikimedia.org)

SO WHAT HAVE WE LEARNED?

In a detailed article about prehistoric art, author Paul Bouissac makes the point that 100 years after the discovery of Altamira, many professionals today still carry a moderncentric bias:

Moreover, prehistoric "art" has variously been characterized as "primitive", "childish", "magic", "hallucinatory", etc., in other words as lacking "sophistication", "maturity", "rationality", and "normality"... The specialized literature still abounds [ED: this was written around the year 2000] in theories whose authors purport to demonstrate that the prehistoric agencies [ED: e.g., cavemen] who produced these signs of pictorial activities lacked full (that is, modern) cognitive competence, or had reached only an early stage of mental development...
[\[http://www.semioticon.com/frontline/probing_prehistoric_cultures.htm\]](http://www.semioticon.com/frontline/probing_prehistoric_cultures.htm)

AND HOW DOES THIS APPLY TO NEOLITHIC CULTURE?

There has been a long running controversy about the ability of Neolithic people, in particular, to make structures or devices that were astronomically sophisticated.

This idea that ancient people, long before Greece, Rome or Babylon, were skilled astronomers has been around for over 100 years. Joseph Norman Lockyer
[\[http://en.wikipedia.org/wiki/Norman_Lockyer\]](http://en.wikipedia.org/wiki/Norman_Lockyer), a well respected scientist who discovered the

element helium and founded and edited the journal *Nature*, suggested in his book, *Stonehenge and Other British Stone Monuments Astronomically Considered* (1906) [<http://www.sacred-texts.com/neu/eng/sac/index.htm>], that Stonehenge and other British monuments contained astronomical alignments. He was also concerned that many of these structures were going to disappear -- and that their secrets might be lost.

One reason for doing so [ED: Writing his book about British stone monuments] was that in consequence of the supineness of successive Governments, and the neglect and wanton destruction by individuals, the British monuments are rapidly disappearing.
Norman Lockyer, *Stonehenge and Other British Stone Monuments Astronomically Considered*, 1906

Yet Lockyer's ideas were not well received. As with Altamira the opinion during his time was that ancient Britons could not have achieved a high level of astronomical sophistication. So it took about another 60 years before scientists began to seriously consider the possibility of alignments in the large number of prehistoric monuments in Britain and also Ireland.

The following quote from the US space agency NASA -- *the* authority on precise alignments (think of the Moon and Mars missions) -- is about the Neolithic passage tomb known as Newgrange in Ireland that was built about 5200 years ago.
[<http://en.wikipedia.org/wiki/Newgrange>]

Once a year, at the winter solstice the sun shines directly along the long passage into the chamber for about 17 minutes and illuminates the chamber floor. This alignment is too precise to be widely considered to be formed by chance. Professor M. J. O'Kelly was the first person in modern times to observe this event on December 21, 1967.
[<http://spacemath.gsfc.nasa.gov/SED11/P8Newgrange.pdf>]

Confirming the alignment of an ancient stone monument is controversial -- as it should be since many apparent alignments can happen by chance. Yet I feel the possibility of significant alignments should always be considered and tested.

But the task might be more complicated than finding familiar alignments. Some alignments, which are not important to us moderns, apparently were quite important to the ancients -- such as the 18.6 year lunar standstill cycle -- as this alignment has been found in a number of monuments.

Why do I care? My reason for wondering about astronomical alignments is simple. The sky, the heavens, the moon, the sun and the stars were the clock for the ancients. This is how they told time. And if we can understand what they measured and calculated, we might gain a better understanding of their sense of time and how that understanding developed.

WHY BOTHER?

Why should we care about Neolithic peoples and culture? Quite simply -- because they are us!

And that is not just a metaphor. They are our ancestors, our great-great-great-etc-grandparents. Without their knowledge and skills they would not have survived which means we would not be alive today -- and we would not have the civilization we have today.

Plus in a very real sense we will be reclaiming our past, our heritage -- where we actually came from.

The arrival of the new stone age, the Neolithic, was the single most momentous shift in all of our history. It was the moment we stopped being hunter-gatherers roaming from place to place and became farmers tied to the land and to the seasons. Everything we consider part of the modern world...all of that has its roots in the Neolithic.

Neil Oliver, Archaeologist, *A History of Ancient Britain*, BBC Two

From the point of view of civilization, time -- as we understand it today -- began with the Neolithic change from nomadic hunter-gatherers to people living sedentary lives in houses, growing crops and keeping animals. The human sense of time -- about the past, the present and the future -- would never be the same once the Neolithic Revolution was in place. It set the stage for all other civilizations -- the ones we are more familiar with, the ones who have gotten better press coverage -- such as Egypt, Greece and Rome. The Neolithic was the foundation for these empires and more importantly for today's modern world.

The Moderncentric Bias Against Prehistoric Cultures: Part 2

The Moderncentric Bias Against Old Stone Age Societies

In Part 1 of this two part blog, I offered the term **moderncentrism**. By moderncentric I mean the modern sense of superiority that sees prehistoric societies as inferior.

And what does this have to do with this blog, *Deconstructing Time*? There are a number of theories that Upper Paleolithic people, about 15,000 years ago, had a sophisticated understanding of astronomy -- which to me means they may have had a sophisticated understanding of time, since the stars, moon and the heavens were their clock. And if they did, I want to understand it -- because their sense of time might shed light on our contemporary understanding of time.

Unfortunately there is also a more powerful contrary opinion which holds that these people were not capable of such complex thought.

I believe that much, but not all, of the rejection of these theories comes from a moderncentric point of view. So in this blog I want to discuss the biases against old stone age, Paleolithic, people in particular -- you know, the cavemen everyone makes fun of.

BIAS #1: OLD STONE AGE PEOPLE WERE BARBARIC SAVAGES

Think this attitude is long gone? Think again. Here is a current quote from the online *Encyclopedia Britannica* of April 2014:

*The Neolithic Revolution: Toward the end of the last ice age, some 15,000 to 20,000 years ago, a few of the communities that were most favored by geography and climate began to make the transition from the long period of Paleolithic, or Old Stone Age, **savagery** [ED. my emphasis] to a more settled way of life depending on animal husbandry and agriculture.*

[<http://www.britannica.com/EBchecked/topic/1350805/history-of-technology/10392/The-Neolithic-Revolution>]

From the Google dictionary
DEFINITION OF 'SAVAGE'

Noun:

1. *(chiefly in historical or literary contexts) a member of a people regarded as primitive and uncivilized.*

synonyms: barbarian, wild man, wild woman, primitive

2. *a brutal or vicious person.*

synonyms: brute, beast, monster, barbarian, sadist, animal

Adjective:

1. *(of an animal or force of nature) fierce, violent, and uncontrolled.*

2. *cruel and vicious; aggressively hostile.*

synonyms: vicious, brutal, cruel, sadistic, ferocious, fierce, violent, bloody, murderous, homicidal, bloodthirsty



PICTURE CAPTION: Stereotypical view of an old stone age man with the obligatory club in hand. (commons.wikimedia.org)



PICTURE CAPTION: These are drawings of wild men or savages by Durer in the 15th century.
(commons.wikimedia.org)

The characterization of any prehistoric people as barbaric savages has been around since the Romans. For example, when the invading Roman General Suetonius was about to go into battle against tribes of Britons in England, he said to his troops: "Despise the savage uproar, the yells and shouts of undisciplined Barbarians," according to the Roman author Tacitus. [<http://www.athenapub.com/britsite/tacitus1.htm>]

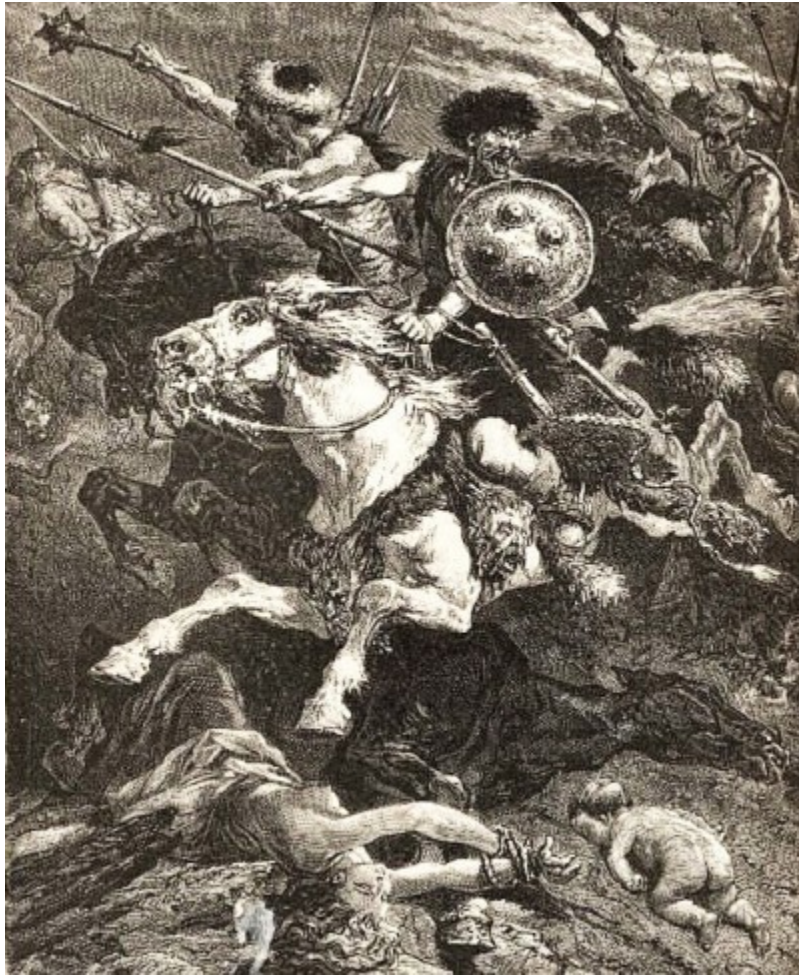
From the Google dictionary
DEFINITION OF 'BARBARIAN'

Noun:

(in ancient times) a member of a community or tribe not belonging to one of the great civilizations (Greek, Roman, Christian).

an uncultured or brutish person.

synonyms: savage, heathen, brute, beast, wild man/woman



PICTURE CAPTION: Uncivilized barbarians destroying everything in their path as they attacked the Romans in 451 CE. Notice the helpless bound woman and naked child being trampled by horses at the bottom of this 19th century drawing. (commons.wikimedia.org)

While the tribes of Briton were not stone age people, they were seen by the classical world as wild beasts who were less than human -- as savage and uncivilized. Therefore they could be conquered and dominated. And this word 'savage' was later used to justify the domination of other 'savage' people by a number of colonial powers throughout history. For example, the Indians of North and South America were seen as savages by the English, Spanish and Portuguese. Read a detailed exploration of these concepts from the contemporary *Berkshire Encyclopedia of World History*.

[\[http://pzacad.pitzer.edu/~dsegal/1492/Other%20Pages/Civilization%20and%20for%20Encyclopedia%20of%20World%20History.pdf\]](http://pzacad.pitzer.edu/~dsegal/1492/Other%20Pages/Civilization%20and%20for%20Encyclopedia%20of%20World%20History.pdf)

I believe the loaded words 'savage' and 'barbaric' are a kind of name calling with little substance. As I will show later in this blog, stone age people had a sophisticated knowledge of their world. They studied and understood in depth a number of things that we modern people are ignorant about.

"Savages we call them because their manners differ from ours."
Benjamin Franklin

However, a characterization of savagery, that has been around for thousands of years and continues to this day, will be hard to discard. To get rid of this notion, we must become aware of our prejudices.

Here is a current blog on the Internet that shows how easily the words caveman, barbarian and savage are accepted in contemporary thought:
Curing the Caveman Mentality : "I'm sure that the 'finger pointing' blame-game approach for determining responsibility dates back well into prehistoric times. Battles between Harry B. Barbarian and Charlie Q. Savage were likely fought..."
[<http://blog.k2sg.com/2011/03/17/curing-the-caveman-mentality/>]

About a 100 years ago, Sir James George Frazer, author of *The Golden Bough*, was perhaps the first writer to attempt a modern understanding of 'primitive' people. Yet even he could not avoid the bias of his age. He used the word 'savage' 229 times in the book and variations of 'barbaric' 47 times. He wrote, "Contempt and ridicule or abhorrence and denunciation are too often the only recognition vouchsafed to the savage and his ways."

Oddly this tone, which continues throughout the book, has drawn little attention. But it is typical of the attitude of people living in 'advanced' civilizations -- note that even the word advanced has the same tinge of superiority.

A savage hardly conceives the distinction commonly drawn by more advanced peoples between the natural and the supernatural...Along with the view of the world as pervaded by spiritual forces, savage man has a different, and probably still older, conception in which we may detect a germ of the modern notion of natural law or the view of nature as a series of events occurring in an invariable order without the intervention of personal agency.
Sir James George Frazer, *The Golden Bough*

BIAS #2: MODERN PEOPLE ARE MORE INTELLIGENT THAN STONE AGE PEOPLE

Quite simply this is not true. According to anthropologists, about 200,000 years ago Homo sapiens sapiens evolved and they were anatomically modern humans with the same brain that we have today.

"One of the traps we have to avoid, I think, is that we shouldn't think people back in those times were dumber, not so bright, not so intelligent. So far as we know, they had brains exactly like ours. And if they survived in the conditions in which they lived, they were probably a lot smarter on their feet than most of us are today."

Prehistorian Prof. Trevor Watkins

[\[http://www.youtube.com/watch?v=eWLbQjbqGfs\]](http://www.youtube.com/watch?v=eWLbQjbqGfs)

'Nuf said.

BIAS #3:

STONE AGE PEOPLE DID NOT HAVE THE SOPHISTICATION TO UNDERSTAND COMPLEX PHENOMENA IN ANY DEPTH

NOTE: Since the focus of this blog is about time, I will go into some detail about stone age cultures and astronomy -- because the moon, sun and stars were the clock for Paleolithic people.

In an article, *Prehistoric Astronomers? Ancient Knowledge Created By Modern Myth*, Dr. Emilia Pasztor glibly dismissed theories and possible evidence of complex Upper Paleolithic astronomy, yet acknowledged in a rather condescending tone that "members of prehistoric societies would have acquired a certain level of knowledge and understanding of the celestial landscape."

[\[http://journalofcosmology.com/Consciousness159.html\]](http://journalofcosmology.com/Consciousness159.html)

Dr. Emilia Pasztor's statement plays to our stereotypes about 'cavemen' as illiterate savages. Yet if you were suddenly transported back to Paleolithic times, I believe that you would be the one who was illiterate and they instead would be the sophisticated ones who could read the night sky effortlessly and in detail.

Rather than a limited knowledge of the celestial landscape, it is more likely that Upper Paleolithic people had a complex understanding of the night sky, one they had been taught and studied since birth -- a knowledge that had been handed down for thousands of years. It is quite possible they were able to read the stars, moon, and planets like a book. And not just any book, but rather a sacred book they had grown up with and memorized cover to cover, with perhaps constellations as chapters and stars as verses.

Most modern people today are lucky if they can find one or two constellations.

Plus as we all know, when you learn something from a very early age, it becomes second nature and part of your world. In addition it is also quite likely that from time to time over thousands of years, a particularly brilliant star gazer would have been born who would have added to the existing knowledge, just as Isaac Newton single-handedly added to scientific knowledge in the west.

But am I overreaching in my assumptions or is there evidence? It turns out that there is a wealth of evidence from a living stone age people, the Aborigines who live in Australia today

and who have been there for about 40,000 years -- years before the stone age paintings, for example, were made at the Lascaux Cave in France.



PICTURE CAPTION: This confusing carpet of stars was familiar to Paleolithic people -- it was possibly like a book that they knew how to read from hour to hour, day to day, month to month and year to year. (commons.wikimedia.org)

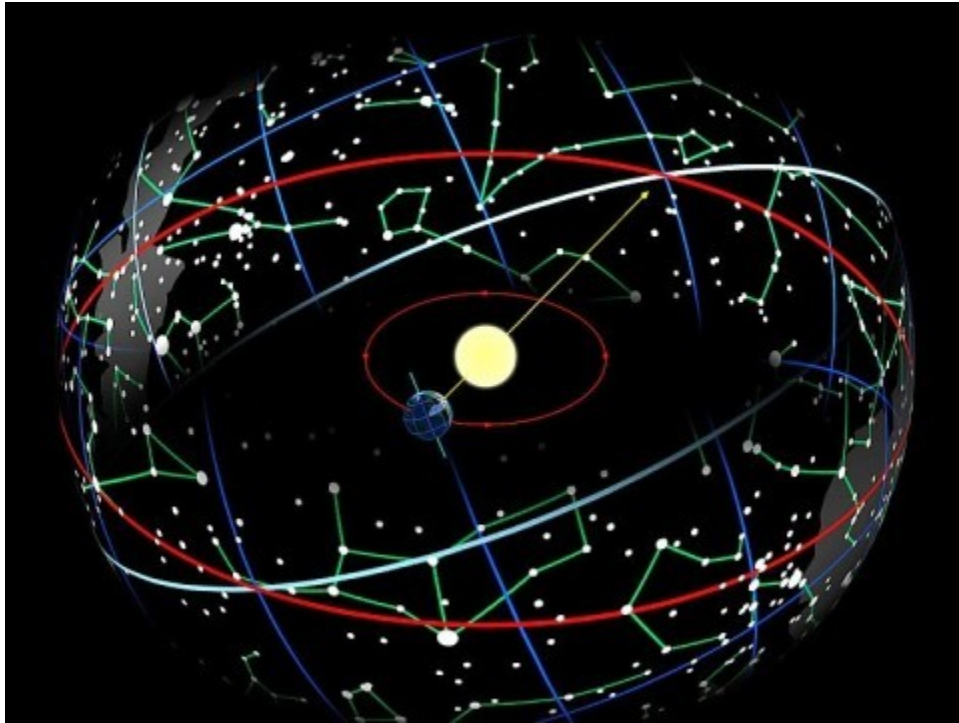
"Of such importance is a knowledge of the stars to the Aborigines in their night journeys and of their positions denoting particular seasons of the year, that astronomy is considered one of the principal branches of education." (Dawson 1881)

"The Aborigines of the desert are aware of every star in their firmament, down to the fourth magnitude, and most, if not all, of these stars would have myths associated with them." (Mountford 1976)

Each member of an Aboriginal desert tribe was expected to know about 500 stars plus the constellations and myths associated with them. And more than 300 of those stars were quite dim (4th magnitude). They were even aware of the color of a number of stars. In addition this information was passed down orally for perhaps a thousand generations.

[<http://cosmoquest.org/forum/archive/index.php/t-148331.html>]

Nevertheless, none of the above proves that Upper Paleolithic people understood complex astronomical phenomena such as the yearly cycle of the zodiac -- it just means that it was possible.



PICTURE CAPTION: Graphic of the ecliptic path, the path that the sun, moon and planets follow during the year. While stone age people probably saw and named different constellations in what became later known as the zodiac in the west (this particular word from the Greek meaning "circle of animals"), the paths of the sun, planets, and moon would still have passed through these same groupings of stars no matter what the culture. It is quite likely that the phases of the moon were used as a monthly calendar, but that the rotating zodiac was used to keep track of time in relation to the yearly cycle and the changing seasons -- which was essential as time-keeping based only on the moon goes out of sync with the seasons. (commons.wikimedia.org)

But astronomy was probably only part of the complex expertise of Paleolithic peoples.

During the day, these people probably knew their landscape in detail. Based on evidence from contemporary hunter-gatherer societies, stone age people knew about wild plants, for example: what was edible, how to prepare them, where they were located and when they should be harvested. And they knew which ones were poisonous. Modern people would not have a clue. In short Paleolithic people could read the sky, plants and the environment with a sophisticated knowledge.

Indeed, foraging peoples are legendary for their vast stores of local zoological and botanical knowledge. Lee, for example, writes that !Kung "tools and techniques of gathering are relatively simple" but the "knowledge of plant identification, growth, ripeness, and location . . . is extremely complex, and the !Kung women are highly skilled at distinguishing useful from nonuseful or dangerous plants and at finding and bringing home sufficient quantities of the best food species available." (Dobe !Kung 37)

Michelle Scalise Sugiyama and Lawrence S. Sugiyama, *Use Of Oral Tradition To Buffer Foraging Risk*
[<http://pages.uoregon.edu/sugiyama/docs/HungryforMore97%5B1%5D.pdf>]

BIAS #4: STONE AGE PEOPLE WERE ILLITERATE

Okay, stone age people probably did not have a written language -- but that was for a very simple reason. They did not need it. As we know "necessity is the mother of invention" and in their case there was no necessity.

Writing was only developed when human settlements became large and complicated. We now know that writing was originally invented for accounting -- for example, for keeping track of grain and supplies in the big cities of the Middle East.

Yet many people feel that literacy is an essential part of culture.

"All the known world, excepting only savage nations, is governed by books." Voltaire

And while they did not have a written language, they had a spoken language -- which, according to the current thinking in linguistics [http://en.wikipedia.org/wiki/Language_complexity], was not primitive but capable of complex thought and concepts.

What the hunter-gatherers had was an oral tradition which often used memory in a sophisticated manner -- and I suspect they were much better at remembering things than we are today for precisely the reasons that Socrates stated next. No less than the giant intellect of Socrates distrusted the written word and felt that a good memory was far superior. In Plato's *Phaedrus* Socrates recounts a story about the Egyptian god, Theuth, the inventor of writing, who explains his great invention to the god/king Thamus.
[http://en.wikipedia.org/wiki/Oral_tradition]

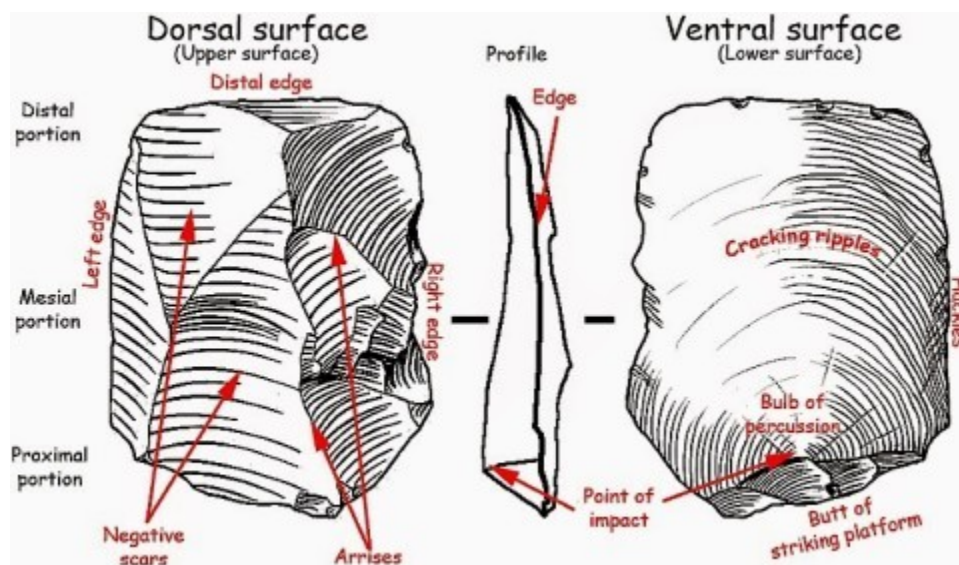
"This invention, O king," said Theuth, "will make the Egyptians wiser and will improve their memories; for it is an elixir of memory and wisdom that I have discovered." But Thamus replied, "Most ingenious Theuth...you, who are the father of letters, have been led by your affection to ascribe to them a power the opposite of that which they really possess. For this invention will produce forgetfulness in the minds of those who learn to use it, because they will not practice their memory. Their trust in writing...will discourage the use of their own memory within them. You have invented an elixir not of memory, but of reminding; and you offer your pupils the appearance of wisdom, not true wisdom..."
[<http://www.english.illinois.edu/people/faculty/debaron/482/482readings/phaedrus.html>]

NOTE: Even the word 'prehistoric' -- which originally was an unbiased word meaning that part of history before written

records -- now has a negative connotation.

BIAS #5: PALEOLITHIC PEOPLE USED PRIMITIVE TECHNOLOGY, THAT OF STONE

While the term 'stone age' carries with it the most negative connotations, the reality is that stone was their material, their medium. These people were masters of stone. They knew a variety of stones, their properties, where to find them, how to mine them, how to shape them, etc. They also knew how to attach wooden handles to stone implements or arrow heads to a shaft. The beautiful paintings on cave walls that have survived as long as 30,000 years were made from powdered stone paint that was applied to stone walls.



PICTURE CAPTION: Lithic flake. (commons.wikimedia.org)



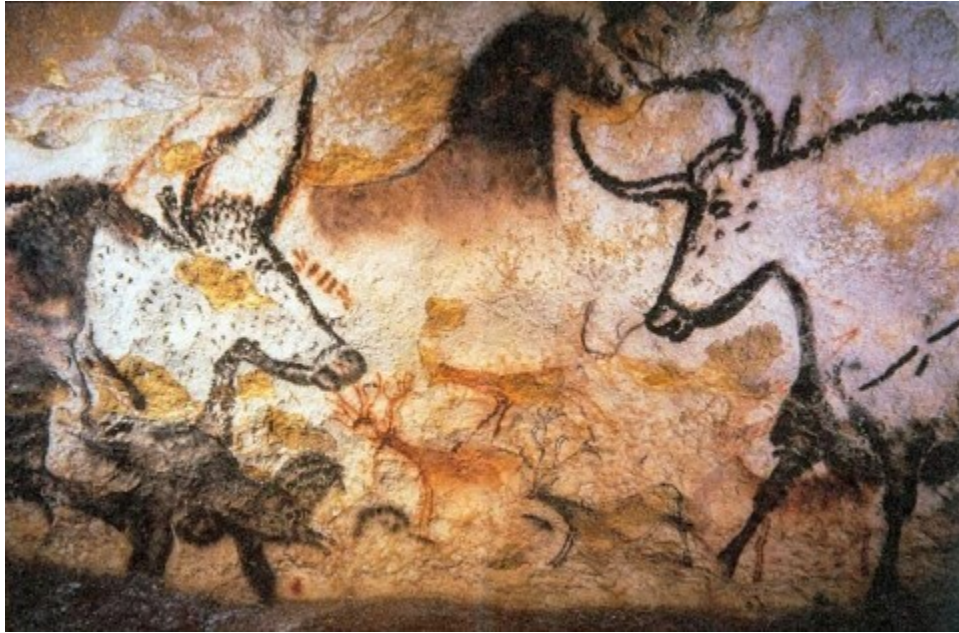
PICTURE CAPTION: Lithic core -- the piece that gets shaped by the removal of lithic flakes. (commons.wikimedia.org)



PICTURE CAPTION: Finished flint knife - shaped so that a handle could be attached to it.
(commons.wikimedia.org)



PICTURE CAPTION: Stone sculpture of horse head from the same period as Lascaux.
(commons.wikimedia.org)



PICTURE CAPTION: 'Primitive' polychrome cave paintings were made with red, yellow, black, brown, and violet paints. The paints were produced from powdered stone mixed with binders using a type of spray painting technique. The stone pigments were then applied to the stone walls of the cave. This particular group of paintings, illustrated here from the cave at Lascaux, has lasted about 17,000 years, 12,000 years longer than the Egyptian pyramids. But, of course, we should not forget that these are unsophisticated works by savages incapable of complex thought. (commons.wikimedia.org)

During the Stone Age, humans fashioned tools from a variety of rocks, including flint, chert, basalt and sandstone. These materials were initially collected as loose rocks and, as demand grew, openpit and underground mining methods were developed. At some point...early humans discovered that certain minerals can be used to make paint. From natural pigments, such as manganese oxide, hematite and goethite, early artists created life-like images of bison, deer, mammoth and other Paleolithic animals. What compelled these artists to dig minerals out of the ground, grind them to fine powders, mix them with various binders (animal fat, saliva, water, blood) and apply them to cave walls hidden from view is unknown.

A look at the history of mining, Mining Engineering Online

[http://www.mineralseducationcoalition.org/sites/default/files/uploads/july_2013pres_entire_article_mining_history.pdf]

In the painted caves of western Europe, namely in France and Spain, we witness the earliest unequivocal evidence of the human capacity to interpret and give meaning to our surroundings. Through these early achievements in representation and abstraction, we see a newfound mastery of the environment and a revolutionary accomplishment in the intellectual development of humankind.

The Metropolitan Museum of Art, New York

[http://www.metmuseum.org/toah/hd/lasc/hd_lasc.htm]



PICTURE CAPTION: The Lamp of Lascaux, carbon dated to about 17,000 BP. Discovered in the floor of the Lascaux cave, this lamp shows the remarkable skill of Upper Paleolithic people. It is constructed of sandstone with a precise geometry. (commons.wikimedia.org)

The (exterior) oval bowl of the lamp of Lascaux is an almost perfect geometrical figure, of which the carving, according to craftsmen, has been done directly into the mass of sandstone...Some colleagues, like M. Delporte, believe that the eye of the Palaeolithic artist was better than the eye of a modern technician, and that for the sake of beauty of form, he obtained an astonishing precision.

Beaune, S., White R., *Ice Age Lamps*, Scientific American, March 1993.

[<http://donsmaps.com/lascauxlamp.html>]

CONCLUSION: DISCARDING OUR MODERNCENTRIC POINT OF VIEW

When it comes to astronomy, we moderns do not spend much time looking up at the stars as they are not important to us. When we do, we rarely take the half hour or more required to let our eyes adjust to full night vision. We have not spent the hundreds of hours it would take

to learn to see the sky as groupings rather than a confusing carpet of lights. We do not know the constellations; we do not know how the constellations and stars relate to the seasons and the time of night. We are not familiar with the movements of the planets, the constellations of the zodiac and we even are often unaware of such basic events as the spring and fall equinox and the winter and summer solstice -- events which were crucial to early humans. As a result I think it is very hard for us to understand how vital astronomy was to Paleolithic people.

And it is also important for us modern people to remember that until Galileo -- a mere 400 years ago -- the stars were quite mysterious. People did not know what they were -- but few thought of them as distant suns, like our Sun. In fact Giordano Bruno was burned at the stake, in part, for suggesting this only 410 years ago.

"We have not the reverent feeling for the rainbow that a savage has, because we know how it is made. We have lost as much as we gained by prying into that matter."
Mark Twain

Since Dr. Emilia Pasztor felt he had the right and knowledge to assume that "members of prehistoric societies would have acquired a certain level of knowledge and understanding of the celestial landscape," I will take the liberty to make my own assumptions based on evidence from hunter-gatherers.

Bronislaw Malinowski, the important early anthropologist stated that the "goal of the anthropologist, or ethnographer, is 'to grasp the native's point of view, his relation to life, to realize his vision of his world'."
[\[http://en.wikipedia.org/wiki/Bronis%C5%82aw_Malinowski\]](http://en.wikipedia.org/wiki/Bronis%C5%82aw_Malinowski)

If we try "to grasp the native's point of view," I think it is reasonable to postulate the following about the Upper Paleolithic view of the stars.

*** The landscape of the stars -- the celestial landscape as Dr. Emilia Pasztor called it -- was as familiar to Upper Paleolithic people as the landscape of the ground. Living in the open much of the time meant there was ample time at night, lying on the ground looking up, to observe the sky.**

*** Children would be exposed to the night sky from birth and would probably be given instructions about the stars from an early age.**

*** These people were in a sense comfortable with the night sky, it was a place where they spent a lot of time and that they used for a guide. While the terrestrial landscape did change with storms, floods, volcanos, lightning, earthquakes and snow, the night sky remained about the same year after year. It was something they could depend on to be constant.**

*** Based on a wealth of data from hunter-gatherer societies and texts from ancient civilizations such as Sumer, Babylon and Greece, it is quite likely that groups of stars**

were seen as constellations of mythical figures. Constellations had stories associated with them which helped people remember them.

* Paleolithic people were able to recognize the stars and constellations in all kinds of weather and lunar phases. So, for example, the stars looked quite different on a hazy night under a full moon or at dawn or dusk than they did when the moon was new and the sky was clear. These people also were able to identify constellations at varying angles and recognize parts of constellations when they set and rose.

* The unpolluted skies of Paleolithic times offered a better view of the sky than today.

* They were not only masters of stone but also of fire. They knew how to build fires in combination with stone to store or reflect heat over many hours.

* The color temperature [\[http://en.wikipedia.org/wiki/Color_temperature\]](http://en.wikipedia.org/wiki/Color_temperature) of an ember fire would have been perfect for staying warm while not interfering with the eye's ability to adjust to the dark sky and to continue to see the night sky once eyes had adjusted. Read more about this in an article about star gazing [\[http://www.skyandtelescope.com/howto/basics/3304001.html?page=3&c=y\]](http://www.skyandtelescope.com/howto/basics/3304001.html?page=3&c=y).



PICTURE CAPTION: Fire with embers. (commons.wikimedia.org)

Based on evidence from contemporary indigenous people and these reasonable assumptions, I believe it is likely that old stone age hunter-gatherers did know the stars quite well and, after tens of thousands of years, began to see patterns and cycles. It is also likely that they felt the need to depict on the walls of caves some of the mythological figures they saw in the stars. However, long held beliefs about 'primitive cultures', in archaeology and other fields, dismiss such theories.

"Evidence that contradicts the ruling belief system is held to extraordinary standards, while evidence that entrenches it is uncritically accepted."

Carl Sagan

Writing about a similar attitude in the United Kingdom Dr. Lionel Sims said that there is,

"a deep assumption within archaeology that such is the complexity of the moon's horizon properties compared to those of the sun, that farming cultures just emerging out of foraging [ED. meaning old stone age] lack the sophistication to design monuments with lunar alignments. This view is contradicted by that of anthropology, which sees hunter-gatherers as fully human, as 'sophisticated' as agriculturalists, and who use lunar cycles to time their ritual life (Knight 1991, Sims 2006)."

He further added:

"Science should not be limited to the socio-political pressures of institutional acceptance."

A new model instead "both explains the findings of archaeoastronomy and at the same time integrates those findings that remain from archaeology and anthropology."

Lionel Sims, Ph.D.

[\[http://journalofcosmology.com/AncientAstronomy107.html\]](http://journalofcosmology.com/AncientAstronomy107.html)

WHY DOES A MODERNCENTRIC ATTITUDE MATTER?

A moderncentric attitude, that sees stone age people as inferior, damages our understanding of the past and our understanding of how we as humans developed. "Deep assumptions" as Dr. Lionel Sims calls them stand in the way of truth.

In addition, criticisms that play to our prejudices need to be discredited. Dr. Emilia Pasztor, for example, while dismissing possible astronomical evidence, never explained his statement that nevertheless "members of prehistoric societies would have acquired a certain level of knowledge and understanding of the celestial landscape." This statement is vague and unscientific and plays to our assumptions that "a certain knowledge" by stone age people means that their understanding would not be very complex. But I could just as easily say: A person today with a college degree would have acquired a certain level of knowledge and understanding of written material. And in this case we would assume, because they were college educated, that they would be quite proficient.

If archaeologists and others in the field want to hold onto their assumptions, they need to put them to the test. These assumptions need to be out in the open and subject to scientific scrutiny. Then let the chips fall where they may. But assumptions, almost by definition, are a bit hidden -- like unwritten rules.

About 100 years ago Sir James George Frazer, author of *The Golden Bough*, did set the proper tone for investigating people of the past and stone age cultures in general.

For when all is said and done our resemblances to the savage are still far more numerous than our differences from him; and what we have in common with him, and deliberately retain as true and useful, we owe to our savage forefathers who slowly acquired by experience and transmitted to us by inheritance those seemingly fundamental ideas which we are apt to regard as original and intuitive. We are like heirs to a fortune which has been handed down for so many ages that the memory of those who built it up is lost, and its possessors for the time being [ED. meaning us] regard it as having been an original and unalterable possession...

Sir James George Frazer, *The Golden Bough*, Chapter 23, *Our Debt to the Savage*

Light Pollution Is Blotting Out the Stars

As I have written, our moderncentric point of view makes it hard to understand some simple basic facts about the history of human development.

For example, until several hundred years ago virtually all towns and cities, large and small, were dark at night -- quite dark. Nevertheless, even with the introduction of street lighting in Paris and London about 300 years ago, the candle lamps were dim and only on main roads. And although cities became better lit by the 19th century, these lights did not wash out the sky until recently -- about 50 years ago.

While doing research for my blogs, I realized that our ever present electric lighting has blinded us to the fact that for most of human history, we humans had a clear view of the stars at night -- no matter where we lived. Interest in the stars and constellations goes back tens of thousands of years -- possibly hundreds of thousands of years. This means that until the rise of the modern well lit world, the stars were familiar and important to the average person -- whether a cave dweller in Paleolithic times, a Roman in the Roman Empire or a Victorian in London.

Even using conservative estimates, our modern lighted environment has been part of the human lifestyle for about 1/10 of 1% of the life of our species -- i.e., only 300 years of the last 200,000 years since we (*homo sapiens sapiens*) evolved.

As I have written I believe Paleolithic people would have been able to read the stars like a sacred book, a book they had seen since birth. However, modern scholars often dismiss this idea -- in part because they are unfamiliar with the night sky, blinded as they are by the bright lights of today.

This is important because it is my belief that the original clock and calendar were based on the stars, the moon, the planets and the constellations. Yet many assume that once the great cities of Rome and Greece had risen, the streets were somewhat well lit and consequently people paid less attention to the night sky. But this is totally false.

No less an authority than the British Museum had this to say about ancient Greek culture in their "Summary of the Greeks' relation to the stars:"

"The stars were used as gigantic clocks to measure the changes in the seasons."

[<http://www.ancientgreece.co.uk/staff/resources/background/bg9/worksheet.html>]

My Point Is This

For most of history people had a clear view of the stars which were a point of reference -- a nightly clock and a monthly, seasonal and yearly calendar. Also because cities were not lighted, people's eyes were often well adjusted to seeing in the dark -- and so the night sky was an ever-present background.

NOTE: This fact is critical because eyes that have adjusted to darkness can see many more stars.

Yet, our picture of ancient times is often quite different.

THE HOLLYWOOD/ART VIEW OF LAMP AND CANDLE LIGHT

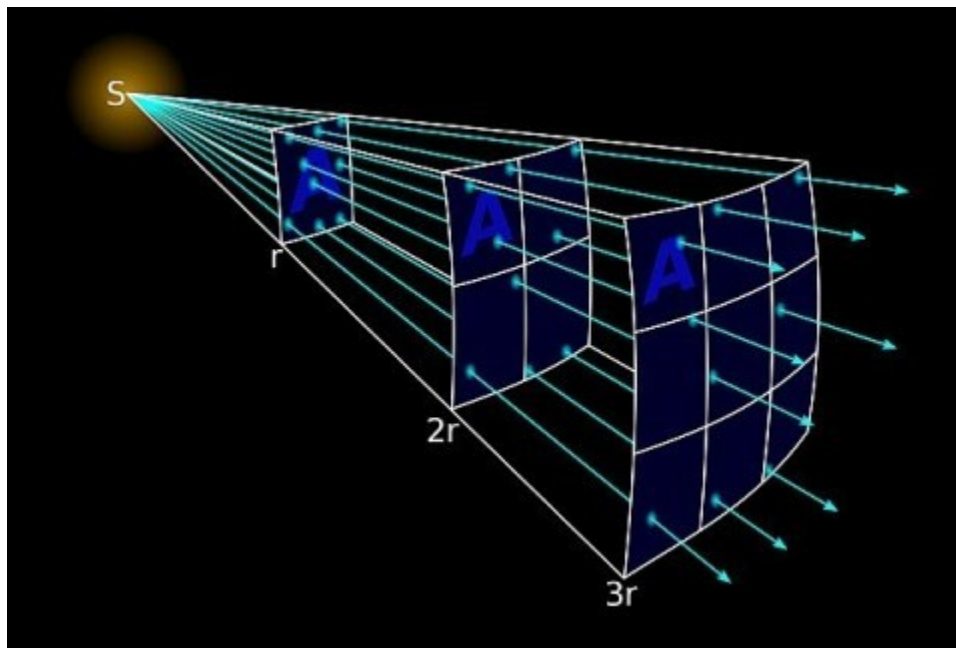
Our moderncentric view has been shaped in part by paintings and Hollywood movies. We think historic cities were not dark because the movies have shown us well lit nighttime scenes. Yet the night images we saw in such movies as *Ben Hur* and *Gladiator* and the paintings beginning with the 16th century were not realistic.



PICTURE CAPTION: In the fictional historic worlds created by Hollywood, light seemed to be everywhere. So in this screenshot from the trailer for the 1951 film *Quo Vadis* (left) Deborah Kerr was seen in light that illuminated the background and delicately highlighted her face -- all from Roman lamps! In reality the light was probably more like the picture on the right, where the background was dark and her face was lit in a much starker manner. (commons.wikimedia.org)

NOTE: The picture on the right is my own reworking of the original trailer screenshot and my best guess about the actual lighting in ancient Rome.

Depictions of historic time periods often show bright lamps and candles that illuminate wide areas. Yet this is not accurate. While this may seem like a minor point, it is not. As a photographer, I know how light operates. Light diminishes according to the square of distance, which means that light falloff is quite rapid.



PICTURE CAPTION: Quote from Wikipedia: [http://en.wikipedia.org/wiki/Inverse-square_law]: "The intensity (or illuminance or irradiance) of light or other linear waves radiating from a point source (energy per unit of area perpendicular to the source) is inversely proportional to the square of the distance from the source; so an object (of the same size) twice as far away, receives only one-quarter the energy (in the same time period)." (commons.wikimedia.org)



PICTURE CAPTION: This is a completely unrealistic painting in terms of lighting. In this painting one candle is brightly shining on the man in the bed and the two women several more feet away. The intensity of the light does not change with the distance from the candle. It is images like these that have given us a false picture of how light operates. (commons.wikimedia.org)



PICTURE CAPTION: This is a much more realistic picture of how light works. The torch on the left illuminates the person it is closest to and then the light falls off rapidly as the distance increases. (commons.wikimedia.org)

If we want a realistic understanding of people in the past, we need to know that they spent much of their time in near darkness -- a darkness they were accustomed to and that they understood.

So just how dark were the cities? Let's take ancient Rome as one example.

This is in fact one of the characteristics which most markedly distinguishes Imperial Rome from contemporary cities: when there was no moon, its streets were plunged in impenetrable darkness. No oil lamps lighted them, no candles were affixed to the walls; no lanterns were hung over the lintel of the doors, save on festive occasions...
 Jerome Carcopino, *Daily Life In Ancient Rome: The People And The City At The Height The Empire*



PICTURE CAPTION: Roman bronze oil lamp. Oil was poured into the filler hole in the middle and the wick came out of the nozzle. (commons.wikimedia.org)

But in addition, the illumination that did exist was from a variety of oils (olive, fish, sesame, whale and nut oils, for example) used in lamps, then later from candles and even later from kerosene. All of these created light in the red end of the spectrum. Candle light, for example, is 1,850 K, putting it in the far red end.

As I mentioned in an earlier blog faint red light does little harm to night vision -- meaning that people would have been able to see the stars clearly on a nightly basis, with little or no adjustment needed. As a result the night sky was not just background or unimportant, but something people paid attention to. Like today's celebrity stars, I suspect Romans discussed the movement and changes in the heavenly stars and planets just about every day and educated citizens commented on anything unusual -- not unlike our news stories now.

And how about the cities of Europe after ancient times?

Around 1590 probably in London, Shakespeare wrote the following, showing that he had a clear view of the night sky -- one that his theater audience would be familiar with:

*The poet's eye, in a frenzy rolling,
Doth glance from heaven to earth, from earth to heaven;
And as imagination bodies forth
The forms of things unknown, the poet's pen
Turns them into shapes, and gives to airy nothing
A local habitation and a name.
William Shakespeare,
A Midsummer Night's Dream, circa 1590*

Candles became widely available in Europe around the 13th century. In the 17th century cities began to install candle street lights.

"In 1667, Paris became the first city in the world to light its streets, using wax candles in glass lamps...by the end of the century, more than 50 of Europe's major towns and cities were lit at night."

Quoted from the following URL.

[<http://www.bbc.com/news/magazine-16964783>]

While street lighting began in Paris in 1667, it was only from November to March and only on main streets. Yet by 1700 it had been extended to nine months of the year. The idea of street lighting with candles spread to other cities, yet many only lit their lamps on moonless nights. And although candles helped, the general lighting was still quite dim.

Information paraphrased from:

Joan DeJean, *How Paris Became Paris: The Invention of the Modern City*



PICTURE CAPTION: A painting of Frederick the Great of Prussia playing the flute. While the best quality approx. 50 candles -- pictured here in the mid-18th century -- were a lavish expense, the total light output was about as much as one 100 watt incandescent bulb of today. (commons.wikimedia.org)



PICTURE CAPTION: Although there were street lamps in major cities, they were quite faint. London was so dim in the early Victorian era that boys called link-boys (bottom left) made a living by carrying a candle or torch at night to guide people to their destination. The picture above is of a woman arriving home in her 'sedan chair' -- with a street lamp behind her, a footman with a candle and a link-boy with a torch. Picture of contemporary London life from Dicken's *Pickwick Club*, 1837. (commons.wikimedia.org)



PICTURE CAPTION: Another unrealistic painting. The bright light for this well lit coffee house comes from only a couple of candles. (commons.wikimedia.org)



PICTURE CAPTION: Gas lighting in Paris in 1889. Gas lighting became common by the end of the 19th century. Yet although brighter than candles, it was relatively dim compared to today's electric lights and also burned in the red end of the spectrum. So the stars and the night sky were still visible in the 19th century and were an integral part of people's lives up until a few years ago. Countrywide electric lighting did not take over until after World War II. (commons.wikimedia.org)

TODAY: BRIGHT LIGHTS, BIG CITY

Today in just about any city of any size, electric lights blot out the sky. Even in the country area-lights have begun to take over. Light pollution is everywhere. As a result the stars of the night sky are lost to us.

Google translation from the French Wikipedia entry about light pollution:
"With the emergence and rapid spread of the light bulb and the electric network, public lighting became widespread in the world, producing in the 1940s an early bright halo, reported by astronomers as being a hindrance to their work. The concept of "light pollution" was born (under that name) in the late 1980s."
[\[http://fr.wikipedia.org/wiki/Pollution_lumineuse\]](http://fr.wikipedia.org/wiki/Pollution_lumineuse)

Today few people know the constellations or keep track of the phases of the moon or are aware of the summer or winter solstice or the spring or fall equinox -- things that were essential to our ancestors for hundreds of thousands of years. The stars and moon were the original clock -- one that we have exchanged for an artificial man-made system of

timekeeping that is virtually removed from the natural cycles of the Earth.

Here is a quote from a discussion group about why astronomy is not important:

Science & Mathematics > Astronomy & Space

I think that most people are focused on a few things that are critical to their own existence. For some, that means family; for others, a career. In those specific areas, they are generally articulate and knowledgeable...What this means is that astronomy is a backwater in the knowledge pool for most folks. They could understand it if it was a priority, but it's not.

If we wonder why so many urban people today feel alienated, one reason could be that they are no longer in touch with the cycles of the Earth and the Sun and the natural sense of time told to us by the stars.



PICTURE CAPTION: Coney Island's Luna Park, an amusement park in New York City at the beginning of the 20th century (1903), when electric light was still a novelty.
(commons.wikimedia.org)



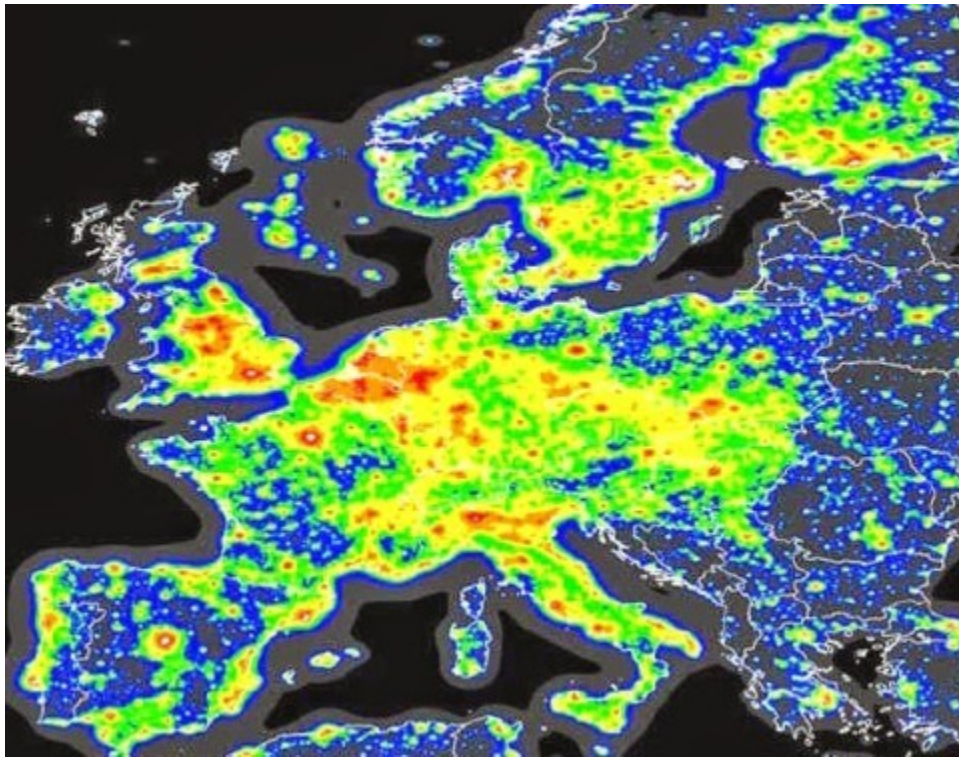
PICTURE CAPTION: NYC around 1935 from the top of a construction site.
(commons.wikimedia.org)



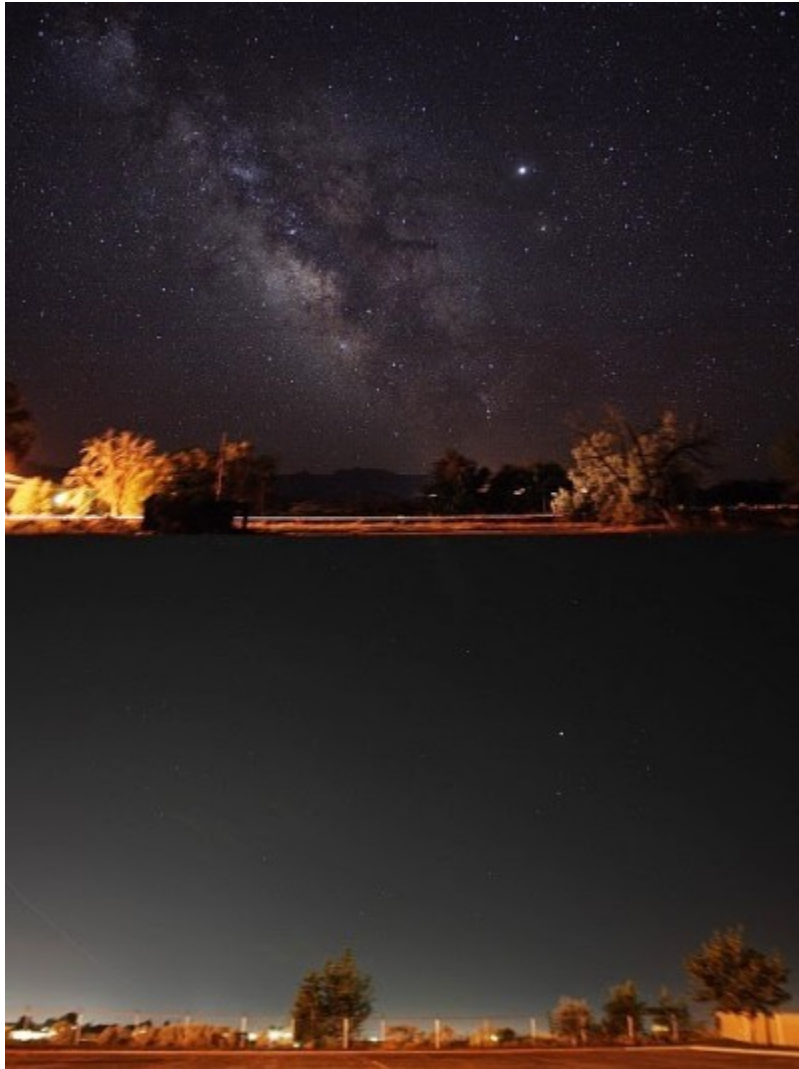
PICTURE CAPTION: Times Square today in NYC. (commons.wikimedia.org)



PICTURE CAPTION: Satellite composite of lights at night on the Earth.
(commons.wikimedia.org)



PICTURE CAPTION: Map showing light pollution in Europe: red is the most, yellow next.
(commons.wikimedia.org)



PICTURE CAPTION: The same region of sky near a town of about 200 people (top) and near a city of about 400,000 people (bottom) in Utah, USA. The light pollution near any urban area now blots out much of the sky. (commons.wikimedia.org)

IV: THE PRESENT

Modern Time: Time as a Commodity

The Protective Bubble of Civilization

Climate Change & Our Age of Denial

Modern Time: Time as a Commodity

Spend a little of your time with me and I will explain how our industrialized and commercial civilization has changed the nature of time for us as human beings.

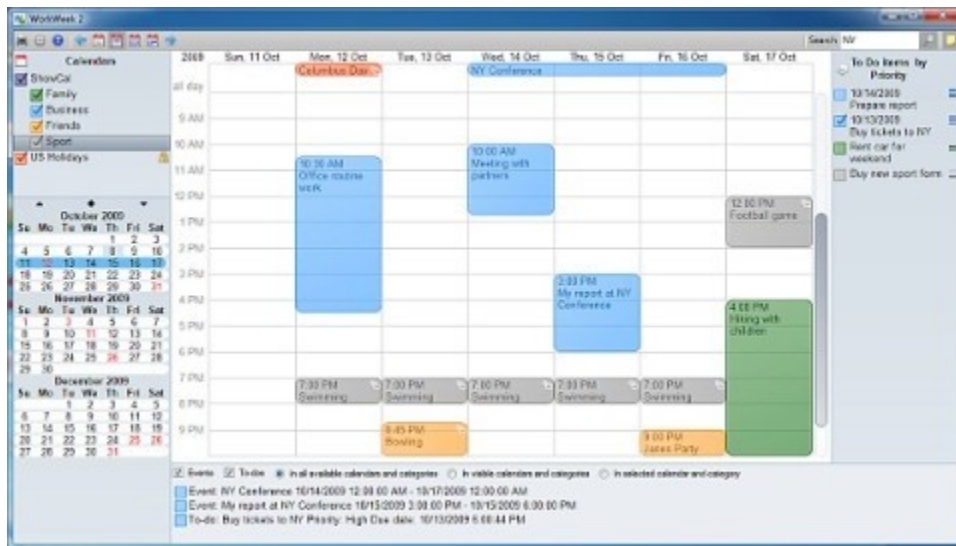
We have all dealt with children who live entirely in the now moment. Part of our job as adults is to teach them our shared beliefs about time. This is so critical that it often becomes a major sticking point and causes serious arguments.

This is what we teach them: In our consumer society we often think of time as a commodity with expressions such as 'time is money' or 'wasting time' or 'lost time' or 'time to spare'. When our children 'have time' they can 'spend time' with or 'give time' to a friend. And if they are about to 'run out of time', they might be able to 'buy some time' if they are clever.



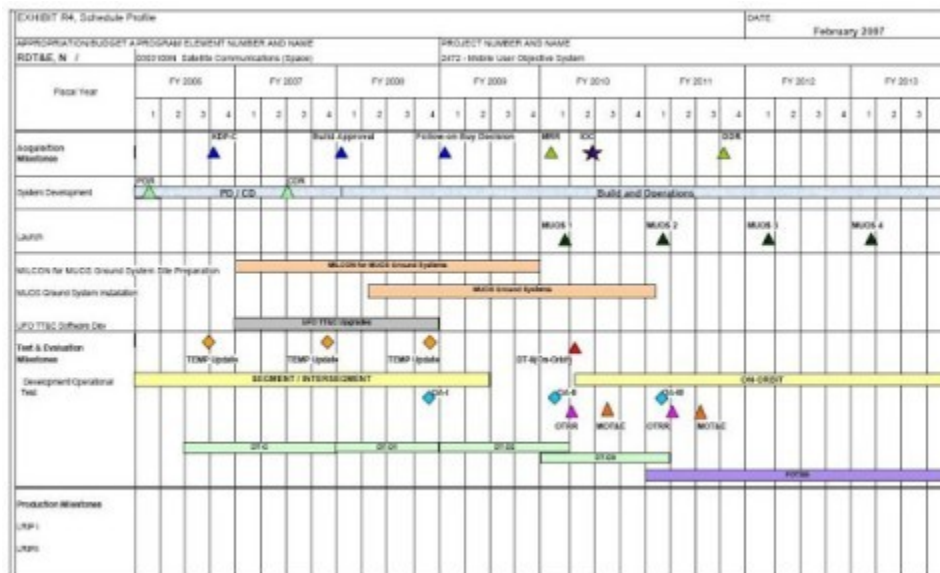
PICTURE CAPTION: Becoming widespread around 1300 BCE, the hourglass was accurate and also provided a way to visualize time. The future was the sand at the top, the tiny hole where sand fell was the present and the sand at the bottom was the past. Time became a commodity. Because the hourglass was so visual, it became an universal symbol for time.
(commons.wikimedia.org)

To 'manage time' we teach our children to think of time spatially, with the past behind and the future forward. We teach them to make sure they always have the 'right time' and then to 'make room' for the things they want to do and have to do. They want to avoid a 'crowded schedule', do some things 'ahead of time' and to not be 'pressed for time' and to not get 'behind schedule' or 'run late'. As they grow older this sense of time expands and they learn to get to the school bus 'on time' and go to bed with 'time to spare'.



PICTURE CAPTION: A typical modern planner, where time is envisioned as chunks & blocks of space. A person's daily, weekly and monthly future is laid out on a spacial grid.
(commons.wikimedia.org)

In the process we are teaching our children that actions have consequences and that what they did in the past matters. We tell them that they need to remember what they did, so they can build on the past to accomplish things in the future. And we encourage them to imagine the future -- all within the framework of western culture.



PICTURE CAPTION: A long term project planner page for the MUOS satellite system (Mobile User Objective System) from 2006-2013. This page describes the schedule for the build, launch and operation of 4 geosynchronous satellites. (commons.wikimedia.org)

All of these time expressions are concepts and the values we share are based on mechanical, clock time.

Most of us think of the time produced by our clocks as time itself. Yet the only thing natural about the time produced by clocks is that it is originally based on a complete revolution of the earth (or more precisely, the average of such revolutions). The division of that period into 24 equal hours -- generally treated as two successive periods of 12 hours each (AM and PM), the division of each hour into 60 minutes, and the further division of each minute into seconds are all conventions -- human inventions.

Keith Devlin from his blog: *Devlin's Angle*
[\[http://www.maa.org/devlin/devlin_12_99.html\]](http://www.maa.org/devlin/devlin_12_99.html)

The idea of time as a commodity has been around for hundreds of years in the US:

Time is money.
Benjamin Franklin, *Advice to Young Tradesmen* (1748)

And 150 years later:

Observe a method in the distribution of your time. Every hour will then know its proper employment, and no time will be lost.
Bishop George Horne



PICTURE CAPTION: A BMW production line, where every aspect has been scrutinized using time-motion studies to provide the most efficient methods for assembling cars. (commons.wikimedia.org)

Although work time is treated as a commodity, as humans we also need to experience time as a flow, not as chunks. This is why young people flock to rock concerts which erase fragmented and divided time. And other people drink, since alcohol can dissolve the division between each tick of the clock.

Time is different depending on how we treat it and value it. We all know the concept of 'quality time', which is not the same as distracted or rushed time. We all know that ten minutes of intense and satisfying love making is qualitatively different from eight hours on the job. Many of us have had an 'ah-ha' moment of feeling wonderfully alive and joyful -- which may have only lasted for a brief time, but which we will carry with us for the rest of our lives.

So my points are these:

*** Time is real, objective and exists independently -- just like the sun . We know this because the sun sets every night and rises every morning and the seasons change and our children grow older.**



PICTURE CAPTION: Winter Solstice at Stonehenge in modern times (1980s). The same sun that rose 5000 years ago at Stonehenge rises today -- it is only our way of telling time that has changed. (commons.wikimedia.org)

*** Our understanding of time is cultural -- how we experience time and deal with time determined by our culture**



PICTURE CAPTION: A free program, that I downloaded and installed on my computer, tells time worldwide within a second, as it synchronizes itself to an atomic clock over the Internet.

*** Time is subjective: when we are off duty, we experience time differently than when we are on-the-clock. For example, you need to arrive at 2 pm sharp for a meeting at work, but it's okay to arrive 15 minutes late for a 2 pm party on the weekend.**



PICTURE CAPTION: Hope you're not watching the clock when this is happening to you.
(commons.wikimedia.org)

*** Different from all the other animals, the human brain has given us an expanded and sophisticated sense of time, another sense just like touch or smell. This sense, which is related to memory (past) and imagination (future), is the reason we can grasp time and not just live in the moment. And also this is why we have survived and are the dominant species on the planet.**

MY LAST POINT IS THIS:

You as an individual can learn to live both on the clock and off the clock, to experience time in a number of ways. These are skills just like any other skills.

There are times when you need to be able to feel the moment intensely as it is happening or you need to let time flow effortlessly when being creative.

Yet when you are at work, you must operate quite differently -- you need to be vigilant, constantly alert and on top of things.

There are other times when you need to turn off your cell phone and give your full attention to your spouse or child or best friend. And there are other times when you need to withdraw and follow an interesting idea within your thoughts without being interrupted.

These choices about time are up to you and they greatly affect the quality of your life, your personal comfort zones and how you feel about yourself.



PICTURE CAPTION: Does Bluebell, the cat, care what time it is or whether there is a message on the cellphone? (commons.wikimedia.org)

The Protective Bubble of Civilization

We live inside a bubble. All of us in the developed world live inside this protective bubble we call civilization.

No matter what the season or the weather, we leave our safe dry insured heated or cooled homes to travel down all weather roads inside comfortable cars to temperature perfect offices or stores. We eat sanitized food made from plants and animals that humans have learned to domesticate. We make sure we have shots or medicine to ward off disease. Often man-made music is everywhere we go. And while we can chose to step outside the bubble briefly to go for a walk -- usually in a well maintained park or down a city sidewalk -- most of our lives are spent inside the protection of this bubble.

Outside this bubble there is the natural world -- which the bubble of civilization depends on. Unfortunately we who live inside the bubble often forget that our lives and the lives of our children rely on the natural world such as the world's oceans and the world's climate.

One of the dangers of being inside the bubble is that we can forget civilization depends on the much more powerful environment of the Earth.

And while the obvious parts of the bubble are buildings and transportation, there are other parts as well. We humans have learned to domesticate plants and animals, but those we use for food and other purposes are a very small part of the natural plant and animal world. Mass cultivation of these specialized plants is beginning to affect the world's ecosystems and also cause the extinction of many plants and animals that are not useful to civilization. In another example, we are protected from some diseases by modern antibiotics. But the overuse of antibiotics has resulted in resistant bacteria. And the vast majority of climate scientists agree that our highly developed technology is contributing to global warming.

The civilization bubble has worked so well and helped us live longer, more comfortable, healthier lives that we are no longer connected to the larger environment of the Earth. Yet the bubble of civilization has gotten so big -- leading to over seven billion people on the Earth -- it is starting to affect the world outside the bubble.

Because of the protection of the bubble, we are insulated and increasingly out of touch with the natural world and the effect that civilization has on the natural world.

What does this have to do with time, the subject of this blog? Time is a critical part of civilization and the bubble we live in. Yet because of the 'advance' of civilization we have distanced ourselves from the natural time cycles of the Earth and instead now, for example, depend entirely on an artificial time which is man-made. This means we are not in tune with the rhythms of the natural world.

NOTE: While civilization took perhaps ten thousand years to develop, it is only in the last hundred years or so that the industrial-technological revolution has taken civilization to the tipping point -- where it has both provided a comprehensive protective bubble for its citizens and also begun to affect the larger environment of the Earth.

A BRIEF HISTORY OF MAN-MADE TIME

Our modern artificial time of minutes and hours and clocks and time zones took thousands of years to develop. It developed in a number of stages.

Upper Paleolithic: The awareness of repeating yearly cosmological events

Humans began to notice specific recurring events in the sky such as the position of the sun at the summer and winter solstices and the seasonal occurrence of certain stars and constellations.



PICTURE CAPTION: Cave painting from the Lascaux caves. While not yet proven, two different experts concluded that some paintings by old stone age people in the cave at Lascaux have a number of astronomical aspects. The evidence is so strong the cave has been declared a UNESCO heritage site for astronomy [<http://www2.astronomicalheritage.net/index.php/show-entity?identity=5&idsubentity=1>]. (commons.wikimedia.org)

Neolithic: The creation of sophisticated astronomical structures

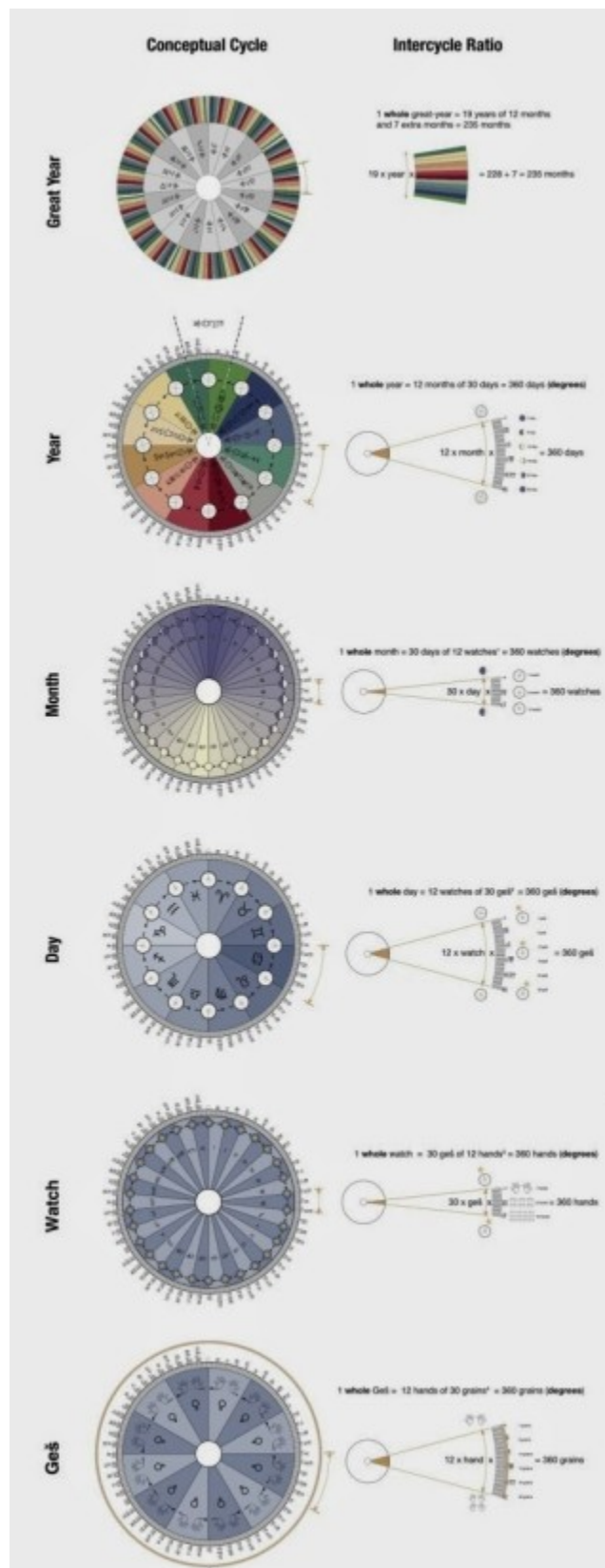
Buildings and structures were created that aligned exactly with key moments in the sun's travel such as the winter solstice -- showing a precise understanding of annual time and the seasons.



PICTURE CAPTION: The Newgrange passage tomb in Ireland, built about 5200 years ago. "Once a year, at the winter solstice the sun shines directly along the long passage into the chamber for about 17 minutes and illuminates the chamber floor." Document of the US space agency NASA. [<http://spacemath.gsfc.nasa.gov/SED11/P8Newgrange.pdf>] (commons.wikimedia.org)

Ancient Civilizations, Sumer and Babylon: The mathematical creation of hours and minutes

For administrative reasons, the ancient cities and civilizations of Sumer and Babylon invented a way to treat time as a commodity, just like grain or bronze. Daily time was divided into hours, minutes and seconds and reasonably accurate clocks, such as water clocks, were constructed.



PICTURE CAPTION: Sumerians divided time mathematically from seconds to minutes to hours to days to months to years to great years (19 years or the Metonic cycle). Today we still use much of what they invented. (commons.wikimedia.org)



PICTURE CAPTION: Water clock calculations on a Sumerian clay tablet. (commons.wikimedia.org)

Classical Civilization, Rome: The Julian Calendar

Julius Caesar came up with today's calendar which accurately kept track of the days in the year (even though it was tweaked a bit later by Pope Gregory) -- but ignored the cycles of the moon. This calendar created a way of keeping track of time with a time-keeping chart. It was a way of accounting for time -- rather than referring to or looking directly at the sun or the moon or the stars -- thus distancing people from the astronomical cycles.

May 2006	June 2006	July 2006
S M T W T F S	S M T W T F S	S M T W T F S
30 1 2 3 4 5 6	28 29 30 31 1 2 3	25 26 27 28 29 30 1
7 8 9 10 11 12 13	4 5 6 7 8 9 10	2 3 4 5 6 7 8
14 15 16 17 18 19 20	11 12 13 14 15 16 17	9 10 11 12 13 14 15
21 22 23 24 25 26 27	18 19 20 21 22 23 24	16 17 18 19 20 21 22
28 29 30 31 1 2 3	25 26 27 28 29 30 1	23 24 25 26 27 28 29
4 5 6 7 8 9 10	2 3 4 5 6 7 8	30 31 1 2 3 4 5
August 2006	September 2006	October 2006
S M T W T F S	S M T W T F S	S M T W T F S
30 31 1 2 3 4 5	27 28 29 30 31 1 2	24 25 26 27 28 29 30
6 7 8 9 10 11 12	3 4 5 6 7 8 9	1 2 3 4 5 6 7
13 14 15 16 17 18 19	10 11 12 13 14 15 16	8 9 10 11 12 13 14
20 21 22 23 24 25 26	17 18 19 20 21 22 23	15 16 17 18 19 20 21
27 28 29 30 31 1 2	24 25 26 27 28 29 30	22 23 24 25 26 27 28
3 4 5 6 7 8 9	1 2 3 4 5 6 7	29 30 31 1 2 3 4

PICTURE CAPTION: This Julian calendar we use today keeps accurate yearly time, but ignores lunar cycles and downplays seasonal events such as the summer and winter solstices.
(commons.wikimedia.org)

Medieval Civilization: The invention of mechanical clocks

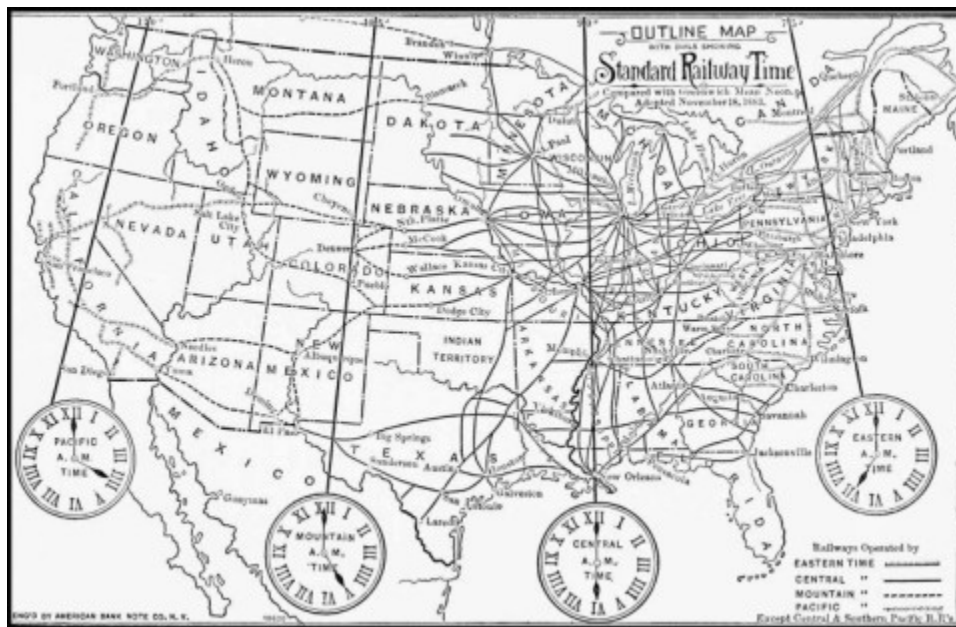
Most early mechanical clocks indicated not only the time of day but the position of the sun, moon, stars and the zodiac. Later clocks got rid of their references to the heavenly bodies and only indicated the time in mechanical hours and minutes -- thus removing time from its relationship to the cosmos.



PICTURE CAPTION: Built in 1410 the Prague astronomical clock displays a wealth of astronomical information. Lynn White Jr., Medieval researcher, said, "Most of the first clocks were not so much chronometers as exhibitions of the pattern of the cosmos...Clearly the origins of the mechanical clock lie in a complex realm of monumental planetaria...and geared astrolabes." (commons.wikimedia.org)

The Culture of Science, 19th century: Time is divided across the world into time zones

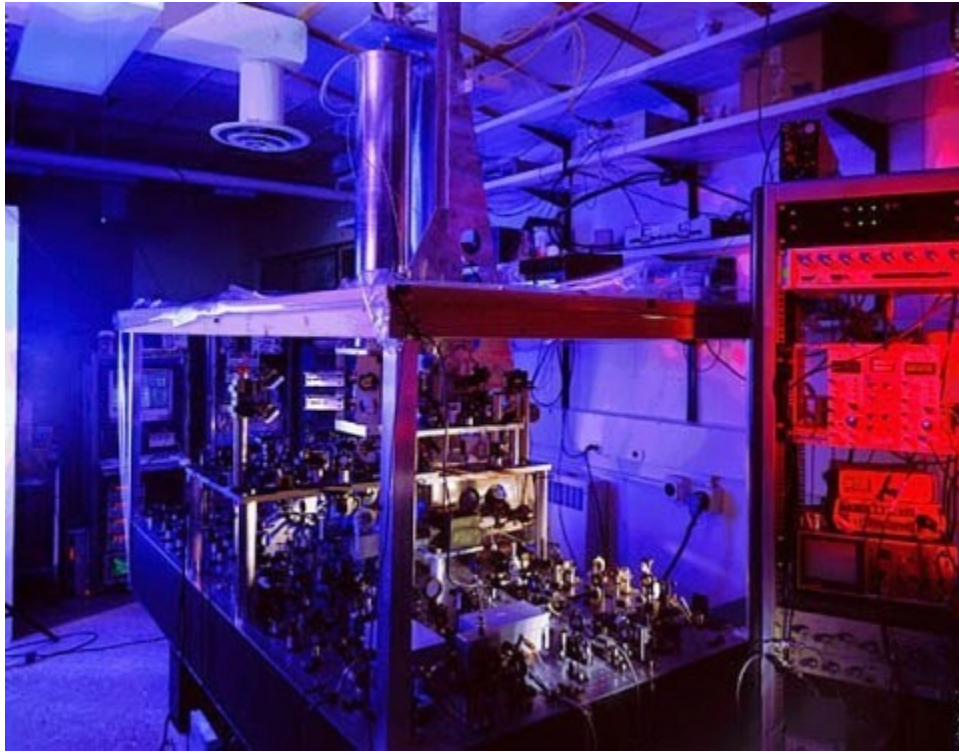
Prior to time zones each town and city set its clocks to high noon when the sun was at its zenith. The creation of time zones severed the connection between noon and the sun at its highest point at a local location. And this in turn distanced people from the relationship between the time of day and the position of the sun.



PICTURE CAPTION: Standard Railway Time was adopted in the United States in 1883, dividing the country into 5 time zones. Many protested. *The Indianapolis Sentinel* wrote that people would now "eat sleep work ... and marry by railroad time." (commons.wikimedia.org)

The Culture of Science, 20th century: The clock is no longer tied to the Earth's natural cycles

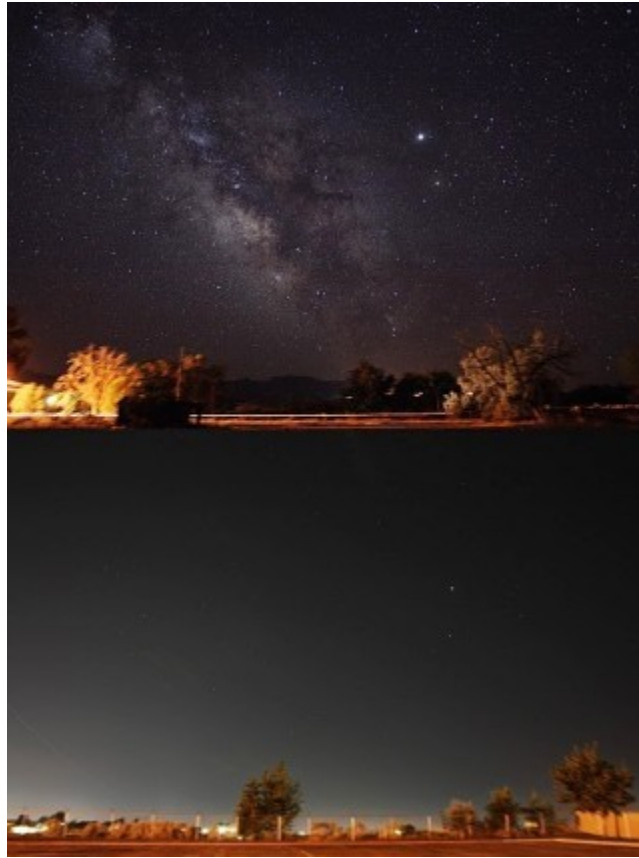
In the 20th century the clock itself was removed from its connection to the natural cycle of the Earth's rotation. In 1967 an atomic clock became the standard for a second, creating a very accurate way of telling time -- but removing the clock from nature.



PICTURE CAPTION: "NIST-F1 Cesium fountain atomic clock, serving as the US time and frequency standard, with an uncertainty of $5.10 \cdot 10^{-16}$ (as of 2005)." Picture and quote from commons.wikimedia.org.

The Culture of Science, late 20th century: Artificial electric lights blot out the night sky

In a related development the ever-present light of modern civilization -- known as light pollution -- has washed out the night sky so most people are no longer able to keep in touch with the constellations and the seasonal astronomical cycles.



PICTURE CAPTION: The same region of sky near a town of about 200 people (top) and near a city of about 400,000 people (bottom) in Utah, USA. The light pollution near any urban area now blots out much of the sky. (commons.wikimedia.org)

Climate Change & Our Age of Denial

Years from now our age will not be seen as a high point in technological achievement. Instead it will be seen a major failure. While we had the information and the technology to keep our planet from being harmed, instead humans buried their heads in the sand.

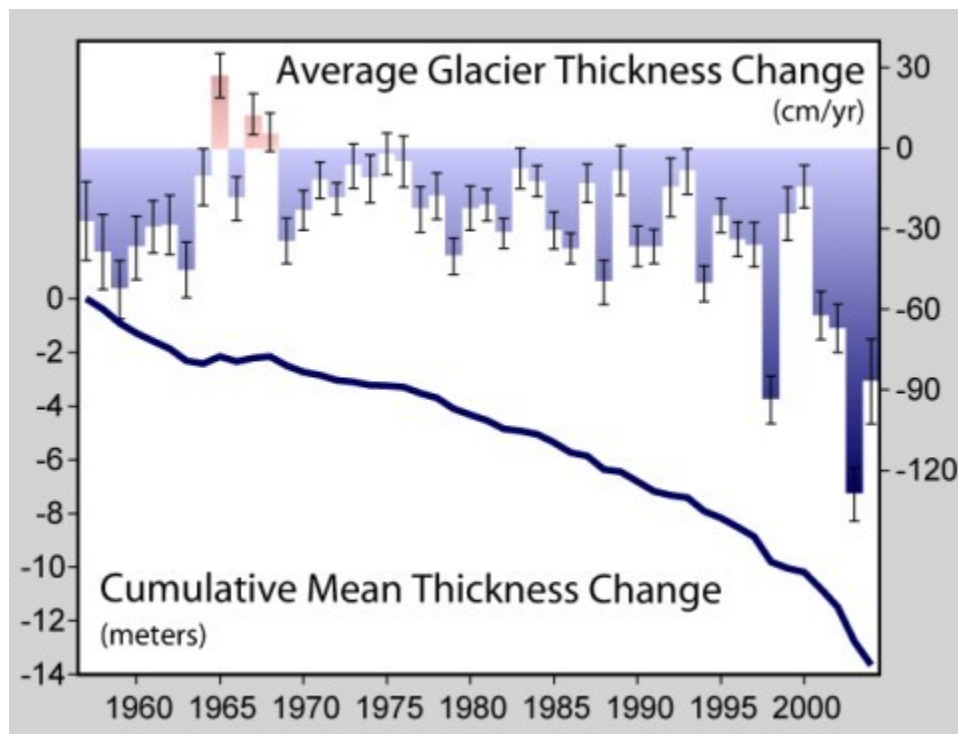
this age will be seen as The Age of Denial

A hundred years from now, this hi-tech age we live in will be seen as a watershed moment when we failed to grasp the seriousness of the situation. The obsession with consumer goods and instant gratification has put civilization at risk. In our expanding consumer societies, people are more interested in comfort than the resulting damage to the environment. The warnings about climate change and global warming that began about 1980 have been ignored. And today it is obvious that we are going to pay the price -- and a very steep price at that.

JOKE: Why worry about global warming? Just turn the air conditioner temperature lower.

Read Carl Sagan's 1980 original essay , about the dangers of climate change, that he wrote over 30 years ago.

[\[http://io9.com/heres-carl-sagans-original-essay-on-the-dangers-of-cl-1481304135\]](http://io9.com/heres-carl-sagans-original-essay-on-the-dangers-of-cl-1481304135)



(commons.wikimedia.org)

Now with the recently reported (May 12, 2014) irreversible collapse of Antarctic glaciers, a domino effect has been set in motion that will cause sea levels to rise and lead to a number of other related effects.

Read the following current report:

Irreversible collapse of Antarctic glaciers has begun, studies say

[<http://www.latimes.com/science/environment/la-sci-0513-antarctic-ice-sheet-20140513-story.html>]

But first things first.

The collapse of the glaciers means that sea levels will rise about 4 feet or 1.2 meters in the future due to this one factor. This is now a virtual certainty. But other forces are also at play. To put it simply, the hotter things get, the hotter they will get. Removing the reflective ability of the ice means that the oceans will absorb the sun's heat and heat up more. The additional heat around the globe will cause other glaciers to melt such as in Greenland. The addition of large amounts of fresh water into the salt water of the oceans may affect ocean currents -- see the next graphic. This in turn will cause extensive climate change across the globe. So a 4 ft./1.2m rise in sea levels is just the beginning as other parts of the domino effect will add to that.

Ocean Currents



(commons.wikimedia.org)

"Ocean Circulation Conveyor Belt. The ocean plays a major role in the distribution of the planet's heat through deep sea circulation. This simplified illustration shows this 'conveyor belt' circulation which is driven by the difference in heat and salinity. Records of past climate suggest that there is some chance that this circulation could be altered by the changes projected in many climate models."

[http://en.wikipedia.org/wiki/File:Ocean_circulation_conveyor_belt.jpg]

While the naysayers continue to doubt, the scientific community is in almost total agreement. "Just over 97% of climate researchers say humans are causing global warming." [http://en.wikipedia.org/wiki/Global_warming_controversy]

The irony is that we have the technology and the knowledge to design energy systems such as solar or wind that are sustainable and workable. And what do we have to lose by switching from a fossil based energy source to a sustainable, non-polluting energy source? Not very much in the long run.

But all is not lost -- perhaps. If we can slow the inevitable warming by cutting back greenhouse gases now, the rise in sea levels can take much longer which will give us time to build and adjust.

Time, the subject of this blog, is the critical factor. We need to make changes now for benefits that none of us will live to see, benefits that are a hundred years or more in the future. These benefits will be felt by our great-great-grandchildren -- perhaps. We cannot know for sure.

This is hard for humans, who live a relatively short time, to plan for -- but if the survival of the human race is important, we have no choice.

NOTE: 25 years ago I wrote a series of essays warning about the dangers of global warming. More than 10 years ago I wrote the following essay which has been ranked in the top ten search results in Google for most of those years.

THE WORLD ENVIRONMENTAL CRISIS TODAY

Rick Doble (2003)

Dr. Michio Kaku has written that we live in an especially dangerous time. By time he does not mean the last couple of years or even the next fifty, but rather the hundreds of years it may take for us to progress from a planet of special interests to a planetary culture.

Right now we are in the infancy of technological development with crude energy sources and chemical processes that have the potential to destroy the environment either as by-products of our civilization or with their deliberate destructive use in another world war.

Energy systems could be created that would cause virtually no pollution. Furthermore world wide economic development can proceed without harming the environment. Decentralized systems such as solar panels can bring electricity and non-polluting development to many corners of the world.

Yet the destructive technology that we continue to use will have consequences for many years to come. In fact, we will feel the effects long after we have stopped using this technology and switched to a more environmentally friendly one.

Global warming will affect just about everyone, even though it is primarily a small number of nations that are responsible for greenhouse gas emissions. The same holds true for radiation pollution, as we saw in the Chernobyl disaster. Radiation crossed national borders and ended up all across the world.

Even over-population will affect us all, because a severe strain on the ecosystem in one part of the globe will create stress on other parts.

This crisis is very real. If the global temperature increases and the sea level rises, there will be massive changes in the weather which will cause migrations across the world as well as wide spread flooding. In this kind of environment, new and rapidly spreading diseases could wipe out large numbers of people and the food supply could be threatened. These kinds of disruptions could also lead to wars.

The problem is that any solution is a long term solution. As Hans Blix, the United Nations weapons inspector before the second American-Iraq war, has pointed out, these environmental questions are much more dangerous than weapons of mass destruction. Yet since politicians do not often think beyond their four or eight year terms, they feel no urgency to risk their political future to forge a fifty or hundred year policy that may be required.

V: SCIENCE AND TIME

The Limits of Our Scientific Knowledge

Science vs. Faith, Religion and Belief: Part 1

Science vs. Faith, Religion and Belief: Part 2

Pure Speculation About the Physics of Time

The Limits of Our Scientific Knowledge

True wisdom is knowing what you don't know.
Confucius

As I pointed out in my birthday blog, we have come a long way baby in the last 50 years. Our understanding of the Universe today is far ahead of our mid-20th century ideas.

However, there are limits. And, moreover, there will always be limits. The idea of limitations is hard to accept. But oddly, once we accept these limits we may be able to see much farther.

Let me explain:

Some ideas about limits are already part of science such as Heisenberg's "Uncertainty Principle" that asserts we can know the position of a particle or its momentum, but not both at the same time.

...the uncertainty principle is any of a variety of mathematical inequalities asserting a fundamental limit to the precision with which certain pairs of physical properties of a particle...can be known simultaneously.
Wikipedia.org

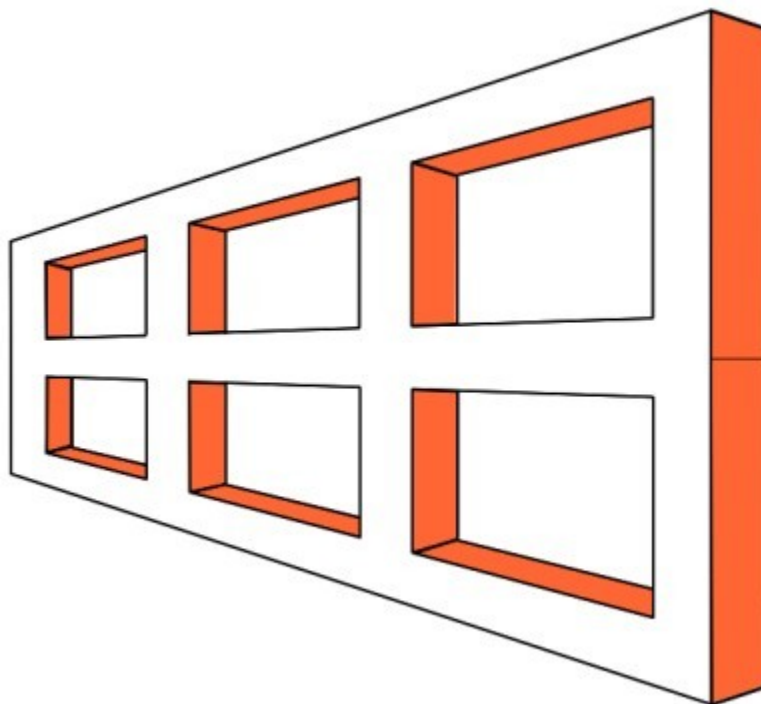
And this just scratches the surface. Today with our advanced understanding of the Universe -- the Big Bang and all that -- we now realize how little we know. Our current understanding is based on astronomy in the visible light spectrum -- i.e., ordinary matter, meaning things like us, the Earth, the Solar System and the galaxies -- which makes up only 4% of the Universe. Most of the Universe, that is 96%, is not visible or easily measurable and quite mysterious, such as dark matter and dark energy. Today astronomers have no idea what these are. [<http://www.space.com/11642-dark-matter-dark-energy-4-percent-universe-panek.html>]

So limits are a part of science. But there is still more.

Science does not rest upon solid bedrock. The bold structure of its theories rises, as it were, above a swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and when we cease our attempts to drive our piles into a deeper layer, it is not because we have reached firm ground. We simply stop when we are satisfied that they are firm enough to carry the structure, at least for the time being.
Karl Raimund Popper, *The Logic of Scientific Discovery*

I believe that all our ideas, mathematical formulas and even our perceptions are limited and limited by our humanity. Everything we understand and all our knowledge is based on concepts thought up by humans. For example, humans invented the notions of gravity, acceleration and space-time. And while these ideas are useful, they may only be scratching the surface of *REALITY*.

Could Even Our Perceptions Be Limited?



(commons.wikimedia.org)

In a famous example, the Ames trapezoid [http://en.wikipedia.org/wiki/Ames_trapezoid] when rotated continuously in a circle is seen as a rectangle that oscillates back and forth by Westerners, but not by those in other cultures. It appears that Westerners are so used to seeing a trapezoid as a perspective drawing of a rectangle, they cannot see a real trapezoid when it is presented to them. I challenge you to see the following YouTube video as a rotating trapezoid. [<https://www.youtube.com/watch?v=nW7BZmYyAKY>]

It is as though our human understanding is and will always be surrounded by a thin film. Or to use another metaphor, human investigators will always be wearing gloves. We can grasp many objects with these gloves and see many marvelous things through this film. but we will never be able to hold these things in our bare hands or see them directly without the film being in the way.

Gravity is a good example: We know how gravity operates, but we do not know what it is -- yet it holds the entire Universe together and without it there would be no Earth or Solar System or Universe. Newton was able to describe this force precisely so that we can now predict the tides and send rockets to the moon. Einstein was able to add significantly to these

ideas with the concept of space-time. Yet we still do not know the fundamental nature of gravity. See the USA NASA article about gravity. [<http://spaceplace.nasa.gov/what-is-gravity/>]

How does all of this relate to time, which is the subject of this blog? As I have said, we are surrounded by time, submerged in time -- there is nothing that exists independent or apart from time.

When Newton had his great revelation about gravity -- when he watched an apple fall and then looked at the moon orbiting the Earth -- he was able to move his imaginary perspective out into space and see that these two seemingly different forces were the same -- both were a result of gravity.

Yet when considering time, we cannot move our point of view out beyond time -- time is always there.

Anthropologists know that each person's culture will always be part of their point of view. There is no getting around this -- even trained scientists may not realize their own cultural bias. Yet this awareness -- that when a culture is studied the observations by an outside anthropologist may be biased -- results in better data and better ideas.

While Einstein was able to see further than any other scientist of his time, he was also keenly aware of his limitations.

Once we accept our limits, we go beyond them.
Albert Einstein

If we want to understand time, then we must realize we are bounded by time from the moment we are born to the moment we die. Many if not most of our human ideas about time come from our human experience.

Science vs. Faith, Religion and Belief: Part 1

Scientists often scoff at what they call 'primitive belief systems' such as those with medicine men and shamans. Yet the roots of science come from the same fundamental human impulses that formed these beliefs.

All religions, arts and sciences are branches of the same tree.
Albert Einstein

For example, history of science professors James E. McClellan and Harold Dorn wrote, "In the case of Neolithic astronomy, we are dealing not with the prehistory of science, but with science in prehistory."

And going back even further to animistic beliefs, the roots of science are still visible.

"Animism" is said to describe the most common, foundational thread of indigenous peoples' "spiritual" or "supernatural" perspectives. Animism encompasses the belief that there is no separation between the spiritual and physical (or material) world, and souls or spirits exist, not only in humans, but also in some other animals, plants, rocks, geographic features such as mountains or rivers, or other entities of the natural environment, including thunder, wind, and shadows.
Wikipedia



PICTURE CAPTION: The return of the Pleiades every year was a major event in many cultures as it often marked the beginning of the rainy season and for some was the beginning of the new year. Since there was a distinct seasonal change when it appeared, it was also given godlike powers and treated with reverence in many religions. According to Wikipedia, the Pleiades was known to "the Maori, Aboriginal Australians, the Persians, the Chinese, the Japanese, the Maya, the Aztec, and the Sioux and Cherokee." as well at the Greeks. When the Pleiades first appeared in the night sky -- which lasted only a few minutes at the beginning of its annual reappearance -- indigenous tribes often greeted it with wild celebrations. Yet their ability to mark time was sophisticated enough that they knew exactly when to look for the Pleiades -- even though it appeared over the horizon very briefly at first. (commons.wikimedia.org)



(commons.wikimedia.org)

The time of the rains was announced to the Hottentots by the rising Pleiades, whose reappearance was hailed at the annual festival. The first missionary to the Khoi-Khoi, George Schmidt, (1737), relates that, 'At the return of the Pleiades these natives celebrate an anniversary; as soon as these stars appear above the eastern horizon, mothers will lift their little ones on their arms, and running up to elevated spots will show to them those friendly stars, and teach them to stretch their little hands towards them. The people of a kraal will assemble to dance and sing according to the old customs of their ancestors. The chorus always sings, "O Tiqua! our father above our heads, give rain to us, that the fruits (bulbs, etc.), may ripen, and that we may have plenty of food and a good year."

[<http://www.masseiana.org/ngbk12.htm>]



PICTURE CAPTION: It is now believed that the 1600 BCE Bronze Age Nebra Sky disk, with pictures of the sun, moon and Pleiades was used astronomically to determine the fall and spring solstices and also had religious importance. (commons.wikimedia.org)

An essential part of many animistic religions was the role of the shaman.

Shamanism among Eskimo peoples refers to those aspects of the Eskimo cultures that are related to the shamans' role as a mediator between people and spirits, souls, and mythological beings. Most Eskimo groups had such a mediator function, and the person fulfilling the role was believed to be able to command helping spirits, ask mythological beings to ... enable the success of the hunt, or heal sick people by bringing back their "stolen" souls.

Wikipedia

The above definition of the role of the shaman is not unlike the Greek hero:

In Greek mythology heroes are regarded as mediators between gods and mortals...

[\[http://www.presentationsistersunion.org/whereweare/view_article.cfm?id=1514&loadref=181\]](http://www.presentationsistersunion.org/whereweare/view_article.cfm?id=1514&loadref=181)

Tylor, the anthropologist who coined the term animistic, was quite condescending:

Tylor believed that animistic beliefs were "childish" and typical of "cognitive underdevelopment", and that it was therefore common in "primitive" peoples such as those living in hunter gatherer societies.

Wikipedia

And what does all this have to do with science? Well, it's really quite simple, but hard to see from our modern technological and scientific perspective:

**In the beliefs of all cultures
-- from the most 'primitive' to the most modern --
across the globe, there was/is
an underlying uniquely human logic:
There are forces outside of human beings
which can be known
and once known can be influenced.**

This idea is so much a part of us and our cultures that we take it for granted. And more than that, we are still driven to better understand these outside forces and to learn how these forces can be tamed or used to our benefit.

This idea is at the heart of science. Rather getting the help of a shaman or making offerings to gods and goddesses, with science we now look for laws of nature which once understood can often be controlled or harnessed.

And BTW just how far removed is science from previous ideas about gods and goddesses?

Commenting on the Western fascination with technology and science, Dr. Eugen Weber in his conclusion of the entire history of the West (52 1/2 hour lectures) pointed out the importance of Greek mythological ideas which led to today's obsession with modern technology. Weber believed that modern science is, in a sense, stealing fire from the gods and putting this power into our own hands.

Really when you think about it, our patron saint is Prometheus who stole fire from the gods.

Eugen Weber

Professor of History, UCLA

Public Television Series, *The Western Tradition*

However, science was designed to answer some questions but not others.

Science, natural philosophy, proceeds on the information given by the senses. This line of its attack is thus limited and we cannot hope that anything but limited objectives can be reached. Science does not profess to solve ultimate problems. On the other hand it does seek to solve its limited problems with a known degree of accuracy and a known margin of error.

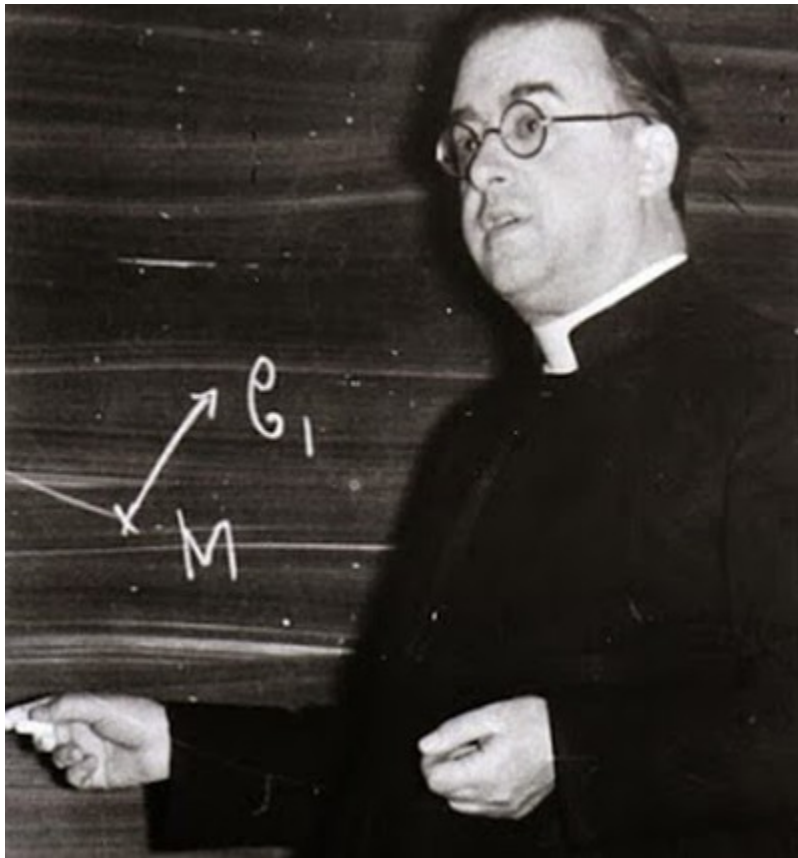
Charles Singer, *A History of Scientific Ideas*

There are many things beyond our understanding -- and that always will be beyond our understanding -- which is the realm of religion. And yet there are things that we now do understand -- such as earthquakes, storms and disease -- that used to be part of religion. Nevertheless science will always be limited and religion will always speak to that part of our soul that craves a connection to a huge universe that fills the sky with hundreds of billions of galaxies that contain hundreds of billions of stars.

It is also important to note that the father of the Big Bang theory was a Catholic Priest, Georges Lemaitre -- so a religious view point led directly to our modern understanding of the creation of the Universe.

Lemaitre explored the logical consequences of an expanding universe and boldly proposed that it must have originated at a finite point in time. If the universe is expanding, he reasoned, it was smaller in the past, and extrapolation back in time should lead to an epoch when all the matter in the universe was packed together in an extremely dense state. ...Lemaitre argued that the physical universe was initially a single particle -- the "primeval atom" as he called it -- which disintegrated in an explosion, giving rise to space and time and the expansion of the universe that continues to this day.

www.amnh.org



PICTURE CAPTION: In 1931 Georges Lemaitre, a Catholic Priest, was the first to propose that the Universe began with the Big Bang. (commons.wikimedia.org)

In a recent article in the *New York Times*, a scientist, Adam Frank, bemoaned the fact that the truths of science such as evolution theory were not more widely accepted: "This is not a world the scientists I trained with would recognize. Many of them served on the Manhattan Project. Afterward, they helped create the technologies that drove America's postwar prosperity."

[http://www.nytimes.com/2013/08/22/opinion/welcome-to-the-age-of-denial.html?smid=fb-share&_r=0]

Yet as we know, the Manhattan project brought us the ever-present threat of nuclear war as well as nuclear reactor accidents -- so perhaps a blind faith in science is not always a good idea.

Science and the institutions of science should not become a kind of unquestionable priesthood that is as inflexible as the Catholic church of the 1600s that tried and imprisoned Galileo.

Charles Singer, *A History of Scientific Ideas*

Knowledge for knowledge sake has created an imbalance in our worldview. Human knowledge should progress evenly on all fronts. When our understanding of the physical universe far surpasses our understanding of ourselves a great disequilibrium occurs. It isn't as though we don't need to know all this stuff. It is simply that there are other things we need to know in order to make sense out of all this physical knowledge we have gathered.

Dr. John M. Artz



(commons.wikimedia.org)

As you look through the veil of stars in our Milky Way Galaxy to our companion galaxy, Andromeda -- with its billions of stars aligned in a majestic order -- it is hard to not believe in something much greater than ourselves. If you ever get a chance, look at it through a telescope. It will take your breath away.

A religion old or new, that stressed the magnificence of the universe as revealed by modern science, might be able to draw forth reserves of reverence and awe hardly tapped by the conventional faiths. Sooner or later, such a religion will emerge.

Carl Sagan

Science vs. Faith, Religion and Belief:

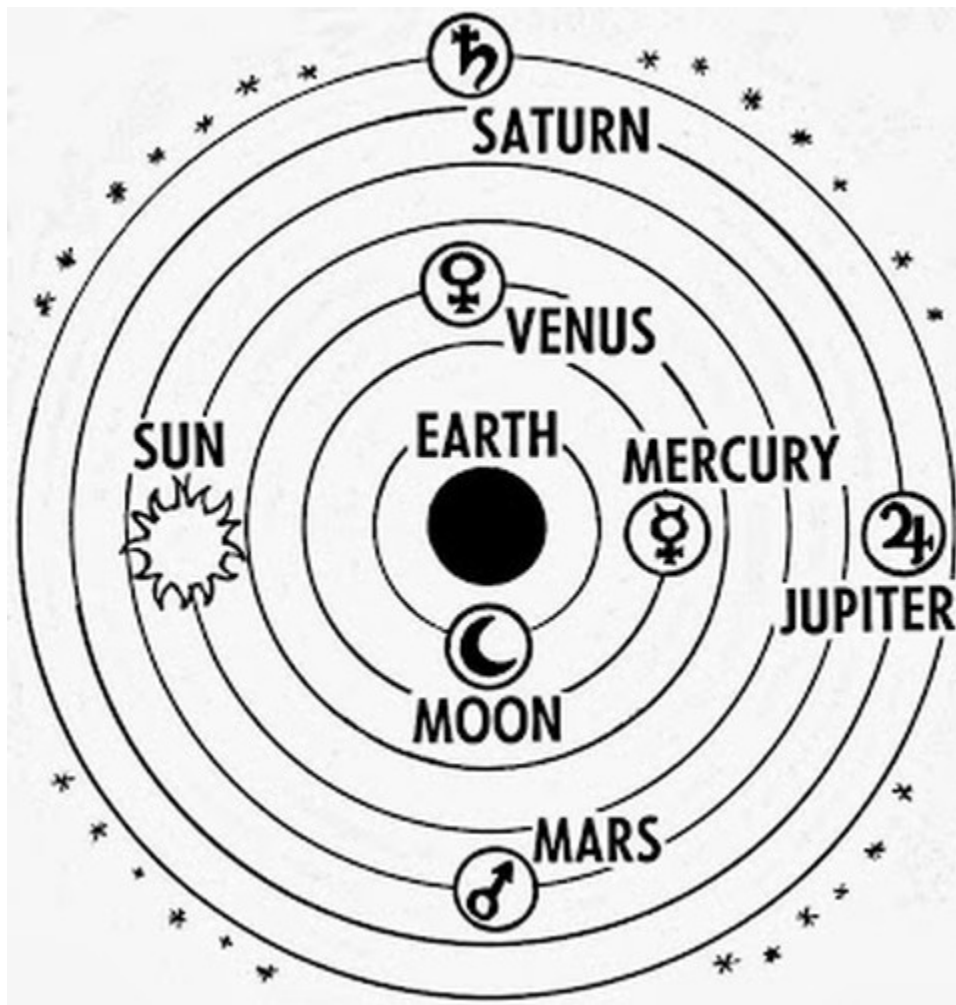
Part 2

What do this and my previous blog have to do with time? Quite simply time is often at the center of disputes between religion and science. The scientific discovery that the Earth was billions of years old and humans millions of years old upset the accepted religious understanding as interpreted from the Bible, for example. At the same time religion often spoke/speaks of a supreme being who lived in a world independent of time or spoke about immortal gods or spiritual realms outside of time -- concepts which scientists often dismissed.

Religion and science go together. As I've said before, science without religion is lame and religion without science is blind. They are interdependent and have a common goal -- the search for truth. Hence it is absurd for religion to proscribe Galileo or Darwin or other scientists. And it is equally absurd when scientists say that there is no God. The real scientist has faith, which does not mean that he must subscribe to a creed. Without religion there is no charity.

Albert Einstein

It is also important to remember that the classic battle between science and religion, i.e., the arrest and imprisonment of Galileo by the Catholic Church was not religion vs. science but rather a battle between two different scientific theories. Yet this battle seemed to set the stage for today's conflicts between religion and science, such as those involving human evolution and the Big Bang Theory.



PICTURE CAPTION: The Earth centered, geocentric, system held that the Earth was at the center of the Universe. Refined by Ptolemy it was quite accurate. (commons.wikimedia.org)

Galileo promoted the new idea that the Earth revolved around the Sun while the Catholic Church held with the earlier scientific theory that the Earth was at the center of the solar system, known as geocentric. The older theory had been in place for about two thousand years; in addition, over the centuries, this Earth centered system had been refined to be quite precise with the Ptolemaic model. It was not nonsense (as some modern commentators have stated) but good science in that it explained the movement of the sun, moon and planets very well up to a point. And while not widely known, the geocentric system is still useful and used today under various circumstances:

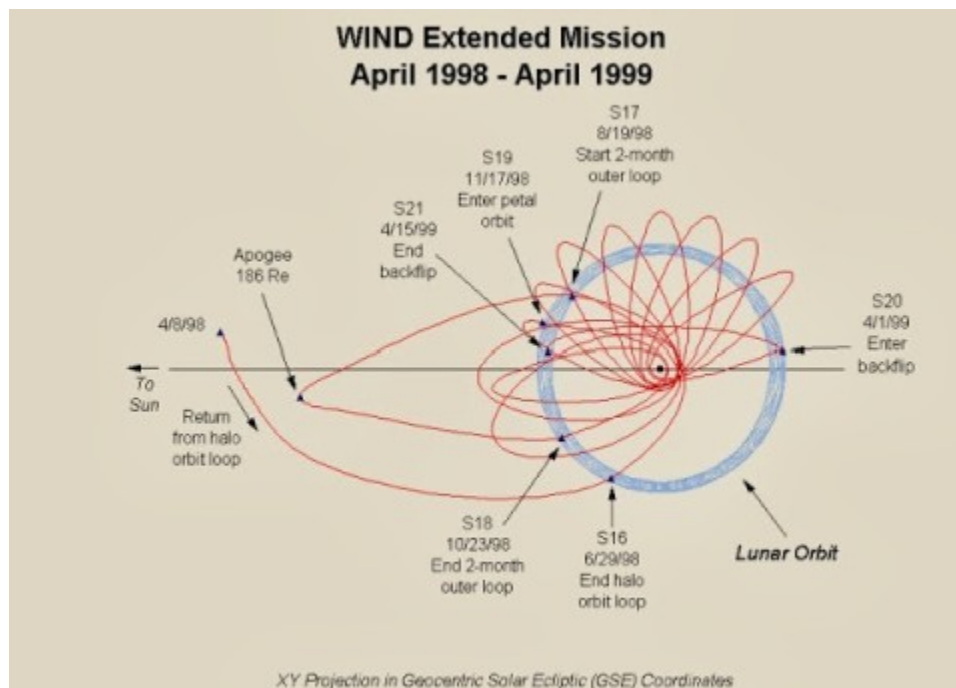
The geocentric (Ptolemaic) model of the solar system is still of interest to planetarium makers, as, for technical reasons, a Ptolemaic-type motion for the planet light apparatus has some advantages over a Copernican-type motion.

[http://en.wikipedia.org/wiki/Geocentric_model]



PICTURE CAPTION: Zeiss Planetarium Projector in Montreal. (commons.wikimedia.org)

It is also used by NASA when it makes some calculations easier.



PICTURE CAPTION: NASA uses the Geocentric Solar Ecliptic (GSE) system for some applications. The GSE is now the preferred system for depicting vector quantities in some space physics situations. (commons.wikimedia.org)

The conflict between science and religion is often one of older ideas or an old science vs. new concepts. Ideas once held by religion such as lightning bolts being thrown by an angry god have been replaced by a scientific understanding of electricity in the atmosphere. Few people would argue with this today. As a result some ideas in religion need to give way to well established scientific understandings.

It can scarcely be denied that the supreme goal of all theory is to make the irreducible basic elements as simple and as few as possible without having to surrender the adequate representation of a single datum of experience.

Albert Einstein

Science, on the other hand, needs to acknowledge that it cannot know everything. There is a limit -- as I have suggested in my earlier blog. Science, for example, relies on its ability to measure. Measurement is at the heart of the scientific method. Yet there are things, critical things, that cannot be measured.

Measure what is measurable, and make measurable what is not so.

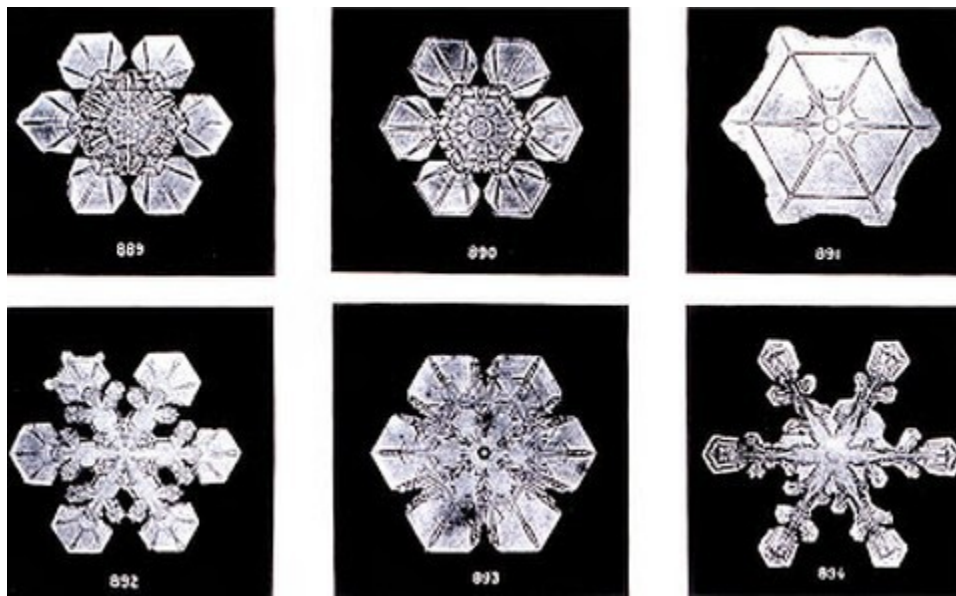
Galileo Galilei

Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted.

Albert Einstein

I do not believe that science can explain, for example, why there is such wide ranging diversity in the Universe if the Universe is solely governed by predictable laws.

Every snowflake, every person, every galaxy is unique. If this were simply a scientific world of laws of cause and effect, then it would also be a cookie cutter world of duplicate people and galaxies -- a Universe of clones. Yet it is our uniqueness that science cannot explain, which is essential to life and a fundamental mystery.



PICTURE CAPTION: Snow crystals photographed by William Bentley (commons.wikimedia.org). While subatomic particles, the building blocks of nature, are exactly alike, and water molecules are, for the most part, exactly alike, every snow crystal is different. "The water molecules in an ice crystal form a hexagonal lattice..." "it is indeed extremely unlikely that two complex snowflakes will look exactly alike" [\[http://www.its.caltech.edu/~atomic/snowcrystals\]](http://www.its.caltech.edu/~atomic/snowcrystals)

And there is more. The diversity in the Universe is a delicate balance. Too much diversity would cause galaxies to shred apart and many people would be born with three eyes. It appears that the Universe has just the right mix of predictable laws along with a sprinkle of diversity that seems to defy those laws.

We know with nature, in particular, that diversity is a survival strategy. Diversity gives a species the advantage of responding differently to changing environmental conditions, for example.

Evolutionary processes give rise to diversity at every level of biological organisation, including species, individual organisms and molecules such as DNA and proteins.
[\[http://en.wikipedia.org/wiki/Evolution\]](http://en.wikipedia.org/wiki/Evolution)

This principle of change or movement prevents nature from ever really repeating herself...
 Charles Singer, *The History of Scientific Ideas*



PICTURE CAPTION: Even something as simple as green seaweed seen through the natural mosaic of endlessly diverse water surface ripples shows the infinite variations created by nature.
(commons.wikimedia.org)

The soul given to each of us is moved by the same living spirit that moves the universe.
Albert Einstein

This idea was also expressed by the poet/painter/photographer who went by the name of Wols. In 1944 when looking out at the Mediterranean at Cassis, France, he wrote:

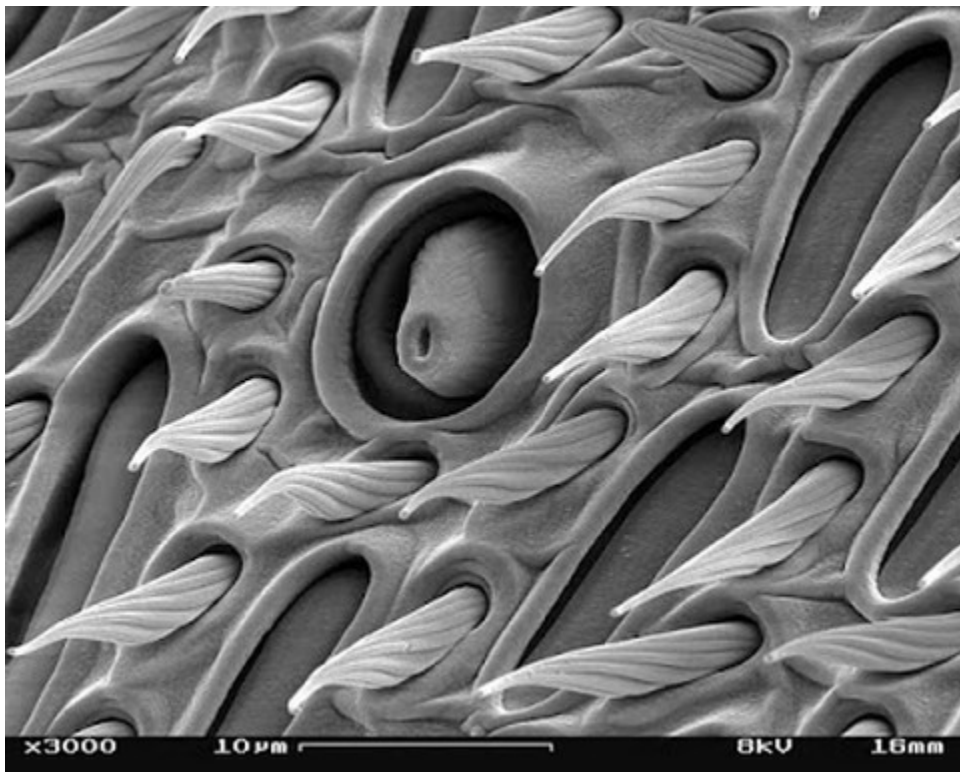
*... eternity
in the little waves of the harbor
which are always the same without being the same...
All loves lead to one love, and
beyond all personal loves,
there is the nameless love,
the great mystery,
the Absolute,
X
Tao
God
the cosmos ...*

Wols (Alfred Otto Wolfgang Schulze)

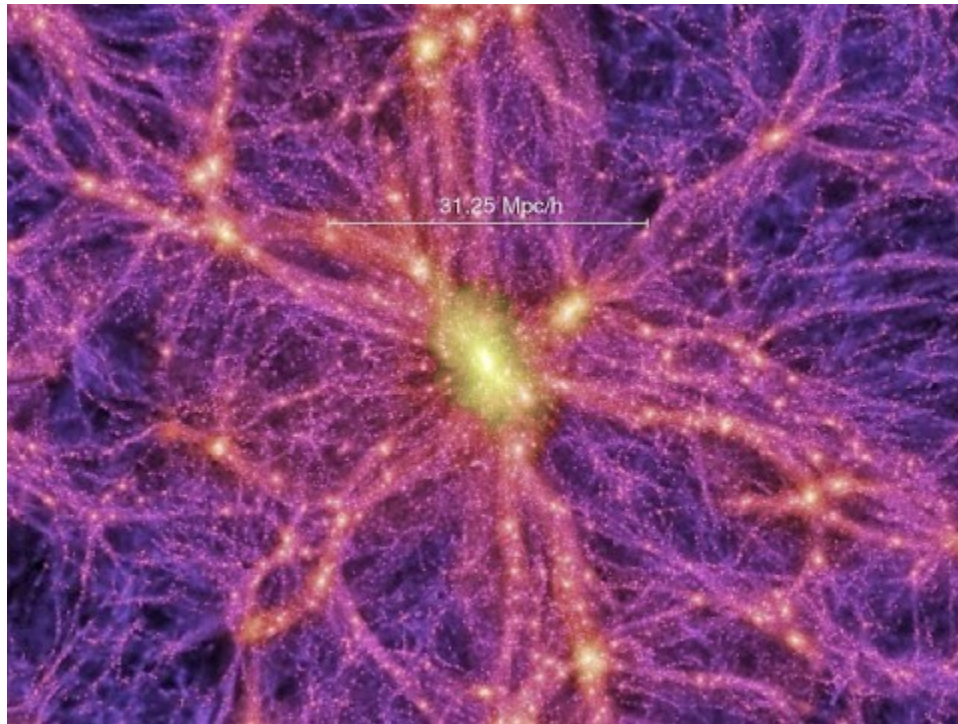


(commons.wikimedia.org)

**To see a World in a Grain of Sand
And a Heaven in a Wild Flower,
Hold Infinity in the palm of your hand
And Eternity in an hour.
William Blake**



PICTURE CAPTION: Electron microscope photograph of an "antenna of common wasp, *Vespula vulgaris*" magnified 3000 times. Scale is about 30 micrometers or about 1/1000 of an inch. (commons.wikimedia.org)



PICTURE CAPTION: The Millennium Simulation, an extremely sophisticated computer simulation of the large structure of the cosmos -- showing the filaments that the Universe is made of -- is a "model... of the Universe in a cube over 2 billion light years on a side, holding 20 million galaxies." George Greenstein, *Understanding the Universe*. (commons.wikimedia.org)

See a full video of the structure of the Universe, the largest detailed structure ever visualized by humans based on scientific data put together by the Max-Planck-Institute for Astrophysics. [http://www.mpa-garching.mpg.de/galform/data_vis/]

Pure Speculation

About the Physics of Time

While the focus of this blog is the human experience of time, I could not help wondering about quantum mechanics and Einstein's ideas.

While I admit to being a rank amateur when it comes to modern physics, I have taken 6 semesters of physics and also 6 semesters of higher math, i.e., algebra, trigonometry and calculus.

So at the risk of getting way over my head, the following idea occurred to me as I worked on this blog.

#1. Everything is in motion

Atoms vibrate, your heart beats, your blood flows, the Earth turns on its axis, the Earth circles the Sun, the Sun's hydrogen atoms become helium atoms in a fusion reaction, the Solar System orbits around the center of our Milky Way Galaxy, our galaxy is moving toward the Andromeda Galaxy, and the Universe itself is expanding. Nuff said.

#2. Motion by definition requires time

The *Merriam-Webster Dictionary* defines motion as "an act, process, or instance of changing place" and changing place can only happen over time. Since motion means that something went from one point to another, movement can only happen during a period of time.

#3. Time is part of matter, not separate from it

Since time is a requirement of movement and everything moves -- from atoms to the Universe -- it is quite likely that time itself is an integral part of matter, not just something that exists separately from matter. In other words time is not something that matter moves through, time is an essential element of matter.

#4. A concept of matter-time might bring new insights

While most of us have gotten accustomed to the Einsteinian term 'space-time', we might want to consider a new term, 'matter-time'. And if time were factored into the equations of modern physics as part of matter, the results might be quite interesting.