THEORIES OF TIME

CHANGE

CAUSALITY

PHYSICAL TIME

SUBJECTIVE TIME

TIME

THEORIES OF TIME
- CHANGE
- LINEAR AND CYCLICAL TIME
  - Chronos and Kairos
- DIRECTION OF TIME
  - Second Law of Thermodynamics
  - Causalism and Finalism
- DETERMINISM SPECTRUM
  - Determinism, Fibonaccian, Markovian, Existentialism
  - Hopi views
- PHYSICAL TIME
  - Matrices
  - Space-time
- SUBJECTIVE TIME
  - Dental Seconds
  - Civil Time, Client Time, Prussian Time
  - Jet lag

MEASUREMENT OF TIME
- LINEAR TIME
  - Cosmic Ages
    - Hubble Time
    - Geologic Time
    - Evolution
  - Cultural Ages
    - Astrological Ages (Pisces, Aquarius, etc)
    - Axial Periods
    - Mayan Suns
    - Astronomical
      - Julian Days
- CYCLICAL TIME
  - Astronomical Cycles
    - Precession, Elongation, Apsides
    - Year, Month, Day, Analemma
  - Clocks
  - Calendars
    - Western, Liturgical Years
    - Celtic
    - Chinese
    - Hindu
    - Mayan
  - ~~Keplerian Cycles~~

PHYSICAL QUANTITIES

all values are $\log_{10}$ cgs units

Fundamental Constants:

$c = 10.476821$ [L/T]; $G = -7.175705$ [L^3/MT^2]; $\hbar = -26{,}976924$ [ML^2/T]

$c^2 = 20.953642$; $c^3 = 31.430463$; $c^4 = 41.907284$; $c^5 = 52.384105$, $c^6 = 62.860926$

$c^2/G = 28.129347$ [M/L]; $c^3/G = 38.606168$ [M/T];

$c^4/G = 49.082989$ [ML/T^2] (Force); $c^5/G = 59.559810$ [ML^2/T^3] (Power);

$\hbar c = -16.500103$ [ML^3/T^2]; $\hbar/c = -37.453745$ [ML] $\hbar/c^2 = -47.930388$ [MT];

$\hbar\alpha c = -18.636938 = e^2$ [ML^3/T^2]; $\hbar/\alpha^2 c = -33.180075$ [ML]; $\hbar/\alpha^2 c^2 = -43.656896$ [MT]

$\hbar G/c^4 = -76.059913$ [LT]; $\hbar^2/G = -46.778143$ [M^3L]; $a_o = -8.276399$ [L]

Dimensionless Constants:

$\alpha^{1/2} = -1.068418$; $\alpha = -2.136835$; $\alpha^{3/2} = -3.205253$; $\alpha^2 = -4.273670$; $\alpha^3 = -6.410505$

$\alpha^{1/8} = -0.267104$; $\alpha^{2/3} = -1.424556$

$\mu^{1/2} = 1.631955$; $\mu = 3.263909$; $\mu^{3/2} = 4.895864$; $\mu^2 = 6.527818$; $\mu^3 = 9.791727$

$(\alpha\mu)^{1/2} = 0.563537$; $\alpha\mu = 1.127074$; $(\alpha\mu)^{3/2} = 1.690611$; $(\alpha\mu)^2 = 2.254148$

$(\alpha\mu)^{2/3} = 0.751383$; $(\alpha\mu)^{3/4} = 0.845306$; [$\log_{10}7 = 0.845098$]

$S^{1/2} = 19.677940$; $S = 39.355880$; $S^{3/2} = 59.033820$; $S^2 = 78.711760$; $S^3 = 118.067643$

The Planck Particle

$m_o = \sqrt{(\hbar c/G)} = -4.662199$[M]; $l_o = \sqrt{(\hbar G/c^3)} = -32.791545$ [L]

$t_o = l_o/c = -43.268366 = \sqrt{(\hbar G/c^5)}$ [T]; $\tau_o = \sqrt{(l_o^3/Gm_o)} = -43.268366 = \sqrt{(\hbar G/c^5)}$ [T]

$E_o = m_o c^2 = 16.291442 = \sqrt{(\hbar c^5/G)}$ [ML^2/T^2]; $\epsilon_o = Gm_o^2/l_o = 16.291442 = \sqrt{(\hbar c^5/G)}$ [ML^2/T^2]

$\varrho_o = c^5/\hbar G^2 = 93.712439$ [M/L^3]; $G\varrho_o\tau_o^2 = 1$; $E_o t_o = \epsilon_o\tau_o = \hbar$; $\hbar\nu_o = 16.291442$

The Baryon:

$m_p = -23.776602$ [M]; $m_n = -23.776004$[M]

$r_e = -12.550068$ [L]; $r_e^3 = -37{,}650204$ [L^3]

$t_b = -23.026889 = r_e/c$ [T]; $\tau_b = -3.348949 = \sqrt{(r_e^3/Gm_p)}$ [T]

$\varrho_b = 13.873602 = m_p/r_e^3$ [M/L^3]; Lifetime of neutron = 2.947924 = 887 sec

The Electron:

$m_e = -27.040511$ [M]

$t_e = -23.026889 = r_e/c$ [T]; $\tau_e = -1.716994 = (G\varrho_e)^{-1/2}$ [T]

$e = -9.318469$ (charge); $e^2 = -18.636938 = \hbar\alpha c$ [ML^3/T^2]; $e^2/\alpha = -16.500103$ [ML^3/T^2]

$\varrho_e = 10.609693$ [M/L^3]; $e/\sqrt{G} = -5.730617$ [M] $\hbar/[(\alpha c)^2 t_o] = -0.388530$ [M]

Mathematical Quantities:

$\pi = 0.497150$; $2\pi = 0.798180$; $4\pi^2 = 1.596360$; $4\pi/3 = 0.622089$; $8\pi/3 = 0.923119$

$e = 0.434294$; $\Phi = 0.208988$;

Miscellaneous Quantities:

Earth: Mass = 27.776243 [M]; $\rho = 0.74153$ [M/L^3]; $g = 2.991521$ [L^2/T];

Rotation Period (fixed stars) = 4.935236; Rotation Period (sun) = 4.936514; $\delta = 236$ sec

Schuster period = 3.704137 [T];. Schuman frequency = 0.874433 [1/T]; Sec in year: = 7.499112

Mean radius: Earth = 8.804208 [L]; Moon = 8.2401 [L]; Sun = 10.842302 [L];

Mass (Earth+Moon) = 27.781552 [M]; Moon = 25.866465 [M]; Sun = 33.298645 [M]

A.U. = 13.174927 [L]; L.Y. = 17.975932 [L]; MPC = 24.489352 [L]

Heliopause = 14.95 to 15.175 [L]; Cosmic time 17.456065 sec [T]

BASIC TIMES AND FREQUENCIES

[UPDATE BASEFREQ.WPD, 2002-11-27, # 62]

ITEM	FORMULA	LOG_{10} Seconds	D-H-M-S	HERTZ
electron Schuster	$2\pi\sqrt{(r_e^3/Gm_e)}$	-0.918814	0.120555 s	8.294954
baryon Schuster	$2\pi\sqrt{(r_e^3/Gm_p)}$	-2.550769	0.002813 s	355.442210
hydrogen Schuster	$2\pi\sqrt{(a_o^3/Gm_p)}$	+3.859735	2h 0m 39.94 s	0.0001381
earth Schuster	$2\pi\sqrt{(R_e^3/GM_e)}$	+3.704223	84m 20.84 s	0.0001976
earth Schumann	$2\pi R_e/c$	-0.874433	0.133526 s	7.489158
earth Schwarzschild	GM_e/c^3	-10.829925	1.479364×10^{-11} s	6.759662×10^{10}
earth Schwarz2	$2GM_e/c^3$	-10.528896	2.958721×10^{-11} s	3.379839×10^{10}
orbit Schumann	2π(A.U.)/c	+3.496286	52m 35.35 s	0.0003189
earth rotation ⊙		+4.9365137	86400 s	1.157407×10^{-5}
earth rotation ☆		+4.9353263	23h 56m 4.09 s	1.160576×10^{-5}
earth geosync*	$2\pi R_g/c$	-0.052906	0.885307 s	1.12955
neutron star	$\alpha\mu S\ t_p$	-2.785412	0.001639 s	610.1154
sun Schuster	$2\pi\sqrt{(R_s^3/GM_s)}$	+4.000163	2h 46m 43.75 s	0.00009996
sun Schumann	$2\pi R_s/c$	+1.163661	14.576760 s	0.068602
Sun Schwarzschild	GM_s/c^3	-5.307523	0.000004928026	203012.6031
Sun Schwarz2	$2GM_e/c^3$	-5.006494	0.000009851583	101506.5343
Univ Schuster	$\sqrt{(R_u^3/GM_u)}$	+17.456065	9.056346 gyr	
Univ Schumann	R_u/c	+17.456065	"	
Univ Schwarzschild	GM_u/c^3	+17.456065	"	
½ Univ			4.428173 gyr	
3/2 Univ			13.584519 gyr	

* This is the Schumann period at the distance R_g, = 42241 km (26,247 miles) for synchronous satellites in equatorial orbits.

Notes:

(earth Schuster)^4 = (earth rotation ⊙)^3, 14.817 = 14.810 Δ = 0.007

(earth Schuster)/(hydrogen) = 0.699017 or 7/10 Δ = 0.001

(log day) = (log hydrogen) x (log 19) 4.9365 = 4.9357 Δ = 0.0008

(log hydrogen) = (log earth Schuster) x (log 11) 3.860 = 3.858 Δ = 0.002

$4 \cdot \log(\oplus\ \S) = 3 \cdot \log(\odot\ \text{ROT})$

$\log(\odot\ \text{rot})^{3/4} = \log(\oplus\ \S)$

Schw $\circ$ (Schu)^2 = (Shum)^3

$\pi\left[\frac{2GM}{c^3} \cdot \frac{4\pi^2 R^3}{GM}\right] = \left(\frac{2\pi R}{c}\right)^3$

OK for ⊙ and ⊕

7 day = 120 · 84 = 10080 min

7 rot = 120 schusks

log # = 0.4971499

Rot of ⊙ = ?

TIME

02/04/10

linear

T - time = $\frac{R}{v}$

many other kinds of time

Two kinds of Time

Two kinds of Energy

What is the relation between T and τ?

Time as age → ?

cycle → freq^{-1}

Kepler = τ

cyclical

τ time = $\frac{1}{\sqrt{G\rho}}$

$R = vT$ $\quad Gm\tau^2 = R^3$

$R^3 = v^3T^3$

$\boxed{Gm\tau^2 = v^3T^3}$

equating R^3's

Age $T = \sqrt[3]{\frac{Gm\tau^2}{v^3}}$

$\tau = \sqrt{\frac{v^3T^3}{Gm}}$ counter help

There may be two R's size localism

INDETERMINANCY'S IMPLICATIONS

$\mathcal{E}$ $h\nu$ energy

E mc^2 energy

$E \cdot T > t$	$\frac{mc^2R}{v} > t$	$\frac{mR}{v} > \frac{t}{c^2}$	$mT > \frac{t}{c^2}$	
$E \cdot \tau > t$	$\frac{mc^2}{\sqrt{G\rho}} > t$	$\frac{m}{\sqrt{\rho}} > \frac{\sqrt{G}t}{c^2}$	$mR^3 > \frac{Gt^2}{c^4}$	if m↓ R non local
$\mathcal{E} \cdot T > t$				
$\mathcal{E} \cdot \tau > t$	$\frac{h\nu R}{v} > t$	$\frac{\nu R}{v} > t$	if R↓, ν↑ → X-Rays ∴ black hole	
	$\frac{h\nu}{\sqrt{G\rho}} > t$	$\frac{\nu}{\sqrt{\rho}} > \sqrt{G}$	$\frac{\nu R^{3/2}}{m^{1/2}} > G^{1/2}$	

Forcing

alternative to freq = $\frac{1}{\text{time}}$?

If m↑, then either R↑ Doppler and or ν↑ ARP

If R↓ then either m↓ or ARP ν↑

Gravity R↓ if m constant ν↑ pro ARP

$\frac{R}{\tau} > v$ if τ↑, R↑

if τ represents age, the universe must expand

Imagination is more important than knowledge. –EINSTEIN

When you have an issue, problem, or challenge, you cannot solve it at the same level of consciousness by which you created it. –EINSTEIN

Knowledge is the image of existence. FRANCIS BACON

To "save" the world it will take still greater freedom of thought then we are capable of. –FRITZ ZWICKY

You cannot reach heaven with a tower of Babel. –KURT GÖDEL

To absorb this century's new perceptions of time and space into our conscious minds, we need the new images that only the creative artist can find, Scientists and philosophers often say (and painters as often deny) that the abstractions of twentieth-century science have passed beyond our powers of visualization.

Nature is not restricted by the imaginations of scientists. –JOE WAMPLER

Science must be protected from ideologies; and societies, especially democratic societies, must be protected from science. –PAUL FEYERABEND

Science should be taught as one view among many and not as the one and only road to truth and reality. –PAUL FEYERABEND

Anarchism must now replace rationalism in the theory of knowledge. –PAUL FEYERABEND

Nothing dulls the mind as thoroughly as hearing familiar words and slogans. –FEYERABEND

There is no idea, however ancient or absurd, that is not capable of improving our knowledge. The whole history of thought is absorbed into science and is used for improving every single theory. –PAUL FEYERABEND

External interference may be needed to overcome the chauvinism of science that resists alternatives to the status quo. –PAUL FEYERABEND

Anarchism, while perhaps not the most attractive political philosopy, is certainly excellent medicine for epistemology. –PAUL FEYERABEND

There must be a separation of state and science [and technology] just as there is a separation between state and religious institutions. –PAUL FEYERABEND

Science today is failing to self-correct. –HALTON ARP

SCANNED FROM TIME7.P51 DISK:JOURNYOYEAR 1973

The hands of the clock display but a small part of what our consciousness experiences as the phenomenon of time. Not only can human consciousness expand a minute of clock time to what seems hours or contract an hour to what seems only minutes but our subjective experience impresses upon us the reality that time possesses much more than mere duration. Time is also rich in quality. All of us continually experience the moods of time: The cycle of the day with its changing hours of expectancy, vibrancy, stillness and gloom; the cycle of the year with its seasons of awakening, activity, fruition and sleep; even the cycle of lunation with its more subtle phases of expansiveness, heaviness, closedness and emptiness. These cycles, through all of the nuances created by their superposition, lead us to feelings that the time may be propitious or out of sorts, focused on diffused. These basic cycles together with other still more subtle cycles provide us with the fact that, in quality two instants of time are never exactly alike, and that the common physical conception of time as linear and uniform, possessing only sequence and duration, is far too naive a viewpoint for an adequate description of the richness of the human experience of time.

The quality of time impressed itself on human awareness long before there existed adequate psychological techniques for independently measuring the states of the psyche that reflect the quality of time. Ancient peoples overcame these lacks through their adaptation of the movements and patterns in the sky for the measure of rhythms and the symbolization of psychological essences. The markings in the sky were more permanent and more accurate than any available written language. They were an indelible and universal display whose observation permitted the ready retrieval of the phases of the multitudinous cycles basic to the cosmos and to life.

AGES1.WPD

AGES OF AGES

Human schemes of reckoning time are usually arranged through counts of cycles that have occurred since some event that is considered exceptional or unique. Time from the Big Bang, which is usually considered to be a unique event, is measured in terms of billions of earth year cycles. Geologic time is usually measured from the formation of the earth, estimated to be some 4.5 billion years ago, and, depending on temporal resolving power, is sub-divided into eons, eras, periods and epochs. Historic time is usually measured from the rule of some great king who made important changes and is commonly divided into dynasties. Today's scheme is to reckon time from the supposed birth date of a great teacher, Jesus of Nazareth. We might say that the last 2000 years have belonged to the "Christian Dynasty".

The origin of a period, epoch or dynasty, and the time considered to be the beginning of a cycle, such as January first taken to be the beginning of the yearly cycle, are much the same except that epochs and dynasties may have quite different durations whereas years are all of closely the same length. How are these origin dates or beginning times selected? As mentioned they are usually associated with some great change or unique event. In recent years geologists have found that the beginnings of various periods or epochs are frequently associated with great "extinctions" and their ensuing "radiants", such as the cretacious-tertiary extinction of the dinosaurs and subsequent radiant of mammalian life, that occurred some sixty five million years ago. Certainly, whatever the cause, a mass extinction of species and a radiant is a major event, and is a quite proper marker for sub-divisions of time.

What about historical time? The Bible and the Mythic accounts of many peoples point to an extinction that occurred a few millennia ago caused by a great flood. Little of the accumulated knowledge and wisdom of the cultures that preceded that time has come down to us. (To assume that little came down because there was little in the first place is a bit of temporal chauvinism, which in our times is required to support our dogma of progress.) While the flood and pre-flood precede dated historical records, we do know of a cultural radiant that occurred in recorded times. This was the great radiant that occurred about 600 B.C.E. We are not well informed, however, concerning the extinction that preceded it.

Occultists have used the position of the vernal equinox in a zodiacal zone to delineate an age. Precision aside, there is some convenience in this practice. We are now living in their so-called Piscean Age, and we may for purposes of identification associate the beginning of the Piscean Age with the great cultural radiant of 600 B.C.E. This is an age apparently now ending. Although when in the midst of an event it is difficult to place it in proper perspective, we do seem at the present time to be living during another great cultural extinction and radiant. Following the precession of the vernal equinox, the age now beginning has been appropriately labeled, the Aquarian Age.

The beginning of the Piscean age was marked with two kinds of activity: 1) A radiant of new ideas, practices, viewpoints and 2) a summarization of the learning and wisdom of what had gone before. Under the first activity, we have the teachings of Lao Tze and Kung Fu Tzu in China, the insights of Sakyamuni Buddha and Maha Vira in India, the real beginnings of mathematics and science with Pythagoras and Thales in Greece, and other important innovations in Persia, Egypt, and Mexico. Under the second activity, we have the writing of the Upanishads and the Bahgavad Gita in India, the first inscription of the Old Testament by Jews in exile in Babylon, and the recording of the mythic traditions of Egypt and Greece.

.....

Notes:

A certain parallelism is occurring in our time. There is a radiant of innovation and **we are now called to summarize the learning and wisdom of the past age.**

We are not clear on the nature of the extinction that took place in the sixth century B.C.E., but we can see some of the extinctions taking place today.

World War I, end of kings, coming of democracy, end of faith, coming of science, end of church, coming of ?, end of plenitude, coming of squeeze, end of frontier, coming of space, end of resources, coming of pollution, end of boundaries, coming of the internet. etc.

~~The role of thought~~ TIME in sentient systems:

Numerous examples have been given in the literature of the effects of positive or negative thoughts on the functioning and the structure of sentient systems. The spectrum of the effects of thought on living matter range from hypochondria through placebos to Christian Science. It is thus reasonable to surmise that those findings of physics and chemistry which have been found applicable to all physical systems, in the special case of sentient systems, must be supplemented with the effects on their functions played by the action of thought. In those sciences which focus on being 'objective' these subjective effects have naturally been either overlooked or ignored.

Model: All physical systems exist in three spatial dimensions. All physical systems also exist in the dimension of sequential time. Living systems, particularly those systems that experience subjective time, also exist in a second temporal dimension in which the 'velocity of the now' moves at variable speeds. Which is to say that if a system experiences a varying velocity of the 'now'(or the present), then that system also exists within a second temporal dimension, which can in distinction be called subjective time. Hence inanimate systems are one dimensional in time, and living, or at least sentient systems, exist in two temporal dimensions.

In the worldview of this model it becomes essential to consider sentient systems as not operating under the laws of ordinary 'objective' physics and chemistry, but under the laws of 'thought-modified' chemistry and physics. These laws are at present not formalized nor well understood. However, their differences from the laws of objective chemistry and physics are explicit in countless anecdotes and in the inferences of many experiments with bio-systems.

The linear time used in objective chemistry and physics ignores the interior of the cycles of which time is composed. It generally restricts itself merely to the counting of the number of cycles involved in phenomena. But if the interior details of the changes in temporal quality within a cycle play a role, as with circadian rhythms, for example, the bio-system must have access to these fluctuations of quality. This is achieved by altering the temporal resolving power, 'zooming' in or out, in effect slowing or speeding the rate of the flow of time with respect to the system. The total count of integral cycles, however, remains the same over a period of linear time as for objective systems.

Whether it is proper to call the power to expand and contract time a second dimension of time is not the question. What is significant is that the ability to expand and contract time infers the existence of a second temporal dimension, just as the ability to introduce curvature between two fixed points on a line infers the existence of more than one spatial dimension. While expansion and contraction of time can be considered analogous to and mappable onto curvature, we may further take the view that expansion/contraction forces displacement into higher temporal dimensions in which are located the attributes which manifest themselves as the quality of time.

cf also Roger Penrose: "Shadows of the Mind"
3 worlds: Physical World, World of conscious Perceptions,
World of Mathematical Forms & Pythagoras

THE REAL TRINITY

- Physical World
- Perseptive or Psychical World
- Mathematic Forms

PLATO
PYTHAGORAS

Not illusions, rather 3 interrelated worlds

nothingness = openness

nothing ≡ everything eg. yellow highlighting

Develop a calculus of Nothing ≡ Everything

$0 \equiv \infty$

and $1 \neq$

See 1994 - #3 The interaction of Cycles

when the representation of a cycle by a circle

⇒ all portions identical

but cycles within cycles are not representable by circles i.e. whenever ∃ more than 1 cycle ∃ "quality" of time.

(cf. curvature change with position ~ quality change with time.)

COSMOS

JOURNYOYEAR/TIME

See also #91, #101

1-10-91

CLOKTIME.P51 DISK: ~~AGWSCRAPS~~

EXAMPLES OF THE THESIS THAT DISEASE, DYSFUNCTION, AGEING,... RESULT FROM CLOCK-TIME TENSIONS:

INTER-SPECIES OF TIME - CACOPHANIES

1) JET LAG: STANDARD TIME ORIGIN - STANDARD TIME DESTINATION

2) SAD: MEAN SOLAR TIME - APPARENT SOLAR TIME [JOURNEY OF THE YEAR] Seasonal Affective Disorder

3) PREMENSTRUAL SYNDROME:

4) "URBAN STRESS": SCHEDULES - NATURAL TIME

5) AGEING: EARTH TIME - ATOMIC TIME [CHON]

THREE PHYSICAL PRINCIPLES: $\frac{v}{c} \propto \frac{GM}{c^3}$

I. Every system must have a slow or inertial/mass rate and a fast or electric/information rate. Coherence and coordination of material systems depend on the communication of information at the fast rate. This is the embodyment in the material world of the deeper principle of the necessity for "Primordial - Kairos - Chronos" (THE TEMPORAL TRINITY)

II. Systems possess inate or natural rates and respond to external or imposed rates. The results are beat frequencies beteen the two rates. [Stress may be the result of the beat frequencies]

III. The general theory of relativity demonstrates that the existence of matter effects and affects the existence of space-time. Hence associated with every particle of matter is both a ruler and a clock. The ruler determines the scale and curvature of local space, the clock provides a local zeitgeber for coherence of any systems present and sets a temporal scale.

~~F~~ β or motion time (special relativity)
or density time ~ general relativity

Maybe the forces are functions of frequency
high-fast electric charge
low-slow gravity mass

Coulomb differs from gravity in some sort of frequency

MOREWEEK.WPD APRIL 10, 2000

see also 1991 #88; 1994 #7, #13, #15

MORE ABOUT THE WEEK

It has been noted that in looking for a natural cycle related to the week, that it is the earth itself, not the moon or some other planet, that provides the cycle. Indeed, it is the relation between the day and the earth's Schuster period that gives us a cyclical basis for the week. The Schuster period is related to the mass and size of the earth and is the time period in which a satellite would circle the earth at its surface were there no atmosphere or other obstructions. It is the limiting value of time that Kepler's third law would assume for a minimum orbital radius. In this case the minimum orbital radius being the mean radius of the earth itself. The Schuster time T is given by,

$$T = 2\pi\sqrt{\frac{R^3}{GM}}$$

where R is the earth's mean radius, G is Newton's constant, and M is the mass of the earth.

		Value in seconds	$\log_{10}$ value in seconds
T	The earth's Schuster Period	5042.51897	3.7026475
S	The earth's sidereal day	86164.09054	4.9353264
D	The mean solar day	86400.	4.9365137

First note the ratios:

$\frac{\log T}{\log S} = 0.7502326$ $\frac{\log T}{\log D} = 0.7500531$

Indicating that to within about 5 parts in 10^5 the ratio of the logarithms of the Schuster period to the day is 3 to 4. An example that many of the astronomical period or frequency ratios are between log values, unlike ratios of frequencies in music.

Next note the following values:

The first solution to the diaphantine equation M x T = N x D gives M = 120 and N = 7.

D/T = 17.134294, 120/7 = 17.142857, with $\delta = 0.009$ or 9 parts in 10^3

Seven days is equal to 604,800 seconds, 120 Schuster periods is equal to 605,102.27 seconds, the difference being 302 seconds or just over five minutes.

302/604,800 = 0.0004993 or 5 parts in 10^4

It is accordingly suggested, without a mythic explanation regarding the origin of the week, that somehow humans tuned in on this basic relation between these two fundamental natural cycles.

TIME LANGUAGE

3 - JOURNOYEAR / TIME

LANGTIME.P51 DISK:JOYTIME 1-11-91

LANGUAGE AND TIME

- SLAVIC LANGUAGES: PERFECTIVE AND IMPERFECTIVE ASPECTS
- INDO-EUROPEAN LANGUAGES: VERB TENSES
- HOPI: MANIFEST AND UNMANIFEST

. . . . . .

On Slavic Languages from The Software Toolworks Illustrated Encyclopedia (TM) (c) 1990 Grolier Electronic Publishing, Inc.

Slavic languages

In the 18th century, Slavic scholars realized that their languages possessed a grammatical category not shared to any appreciable extent by other Indo-European languages: verbal aspect. Every verb is classified today as belonging either to the perfective aspect or to imperfective aspect. A perfective verb focuses attention on a certain phase or aspect of the verbal action--the onset of action, for example, or its completion, or the action taken as a whole. An imperfective verb simply describes the verbal action with no particular [temporal] focal point.

Of the six Indo-European tenses--present, future, imperfect, aorist, perfect, and pluperfect--Common Slavic preserved the present and the aorist. The old imperfect and perfect were replaced by a new imperfect, and the Indo-European future was replaced by the present tense form of the perfective verb. The new perfective form singles out some aspect of the verbal action that did not take place prior to the moment of speech and that is therefore intended by the speaker to take place afterward, usually sometime in the future. A periphrastic future found in the East and West Slavic languages expresses a future action without focal point. In the South Slavic languages, the future can only be formed through the help of Slavic languages expresses a future action without focal point. In the South Slavic languages, the future can only be formed through the help of an auxiliary verb or particle.

Old Church Slavonic possessed an elaborate set of verb forms--up to 236 for an imperfective verb. All but Eastern Serbo-Croatian, Macedonian, and Bulgarian have lost the aorist and imperfect tenses. In these languages the old perfect has come to signify a past action not witnessed by the speaker; the perfect form is used in the other Slavic languages to signify a nonpresent tense, most commonly the past, but it is also used in conjunction with an auxiliary form to denote the conditional (as in Russian or Czech) or even the future (as in Slovenian).

. . . . . .

The term aorist is from the Greek aoristos meaning unlimited or indefinite. The aorist tense signifies action took place in unspecified past time with no implication of continuity, repetition or completion.

J@YPRLG1.P51 DISK:~~JOURNYEAR02~~ TIME May 2, 1991

THE FENG SHUI OF SPACE AND TIME

If we ask a physicist, does space have quality? He or she would probably not know what we meant, but would say that space has size and dimensions, attributes that we can measure, but space having quality? Does that mean anything?

If we ask an architect, does space have quality? He or she would probably say, that's how I make my living, shaping the quality of space. It is my job to make space as useful, beautiful, and interesting as possible.

Similarly with regard to time.

Ask a physicist, does time have quality? Again the reply would probably be, what do you mean by that? Time has duration and we can measure that, but quality?

Ask a musician, does time have quality? He or she would say that's how I make my living--organizing the qualities of time into pleasing, arousing, or ~~quieting~~ calming patterns.

The space and time of the physicist has only those attributes that can be measured by meter sticks and clocks. The space of the architect and the time of the musician also can be measured by meter sticks and clocks, but possess other qualities which can be experienced, felt, and described, but not always measured.

Whitehead said that nothing can be experienced which does not recur and nothing can be measured which does not recur regularly. Since more recurs than recurs regularly, it follows that we can experience more than we can measure and that the world of the physicist is a restricted one. This dichotomy: Measurable vs unmeasurable, is more fundamental than the physical vs spiritual dichotomy

. . . . . .

With the architect and the musician we experience quality in space and in time. The quality of space varies from place to place, and the quality of time varies from day to day. Each moment is not the same as every other moment, (except possibly to a ball rolling down an inclined plane). So what determines the quality of space and the quality of time? What are the tools the architect uses to shape the quality of space and the musician uses to shape the quality of time?

But prior to the architect shaping space, the earth has already shaped it, and prior to the musician shaping time, the seasons ~~earth and sky~~ have already shaped it. The tools of the earth for shaping space are the distribution of matter and energy, the tools of the earth and sky for shaping time are light and rhythm, the beat of various drummers. These effect the basic feng shui of space and of time.

SYMBOLS1.P51 DISK:THEO July 18, 1991

ON SYMBOLS AND MYSTERIES

Sir Fred Hoyle once remarked in reply to the question, 'for what purpose was Stone Henge built?', "We cannot know what purpose the builders of Stone Henge had in mind when they built it, but we do know what we can do with it. We can use it to predict eclipses."

So it is with many monuments, artifacts, devices, and, indeed with the world itself. We are not sure what their creators had in mind, but we have discovered what we can do with them.

at least in part

I take two examples from my own experience. I do not understand the properties that the purveyors of the eneagram claim for it, but I do know one very important attribute contained in the structure of the eneagram. This is that there exist two causal paths, the outer, visible or peri-path and the inner, hidden, or dia-path. The outer sequence of the arcs may represent the causality of the physical world as it appears to us, while the inner sequence of the chords may represent a deeper cosmic causality connecting the same events. Ordinary time revolves around the circumference, but some other kind of time, one which violates all notions of past, present, and future operates cutting across the interior to connect the same events.

A second example for me lies in the Sephirothic Tree of the Qabbalah. This tree is one of the great symbols of Jewish mysticism and it provides the infrastructure for many Talmudic concepts. Again, I possess no knowledge of what the designers of the Sephirothic Tree had in mind, nor how they used it symbolically, but I can use it as an infrastructure to display symbolically the relations in the three great events of Christian teaching: the Crucifixion, the Transfiguration, and the Resurrection.

Many monuments, artifacts, and devices are thus seen to be *mysteries*, which is to say they are receptacles capable of containing many constructs and projections. Thus a mystery is a special kind of symbol which is capable of containing many meanings, each of which may be but a facet of some great meaning which is in some way the quintessence of symbol. In the same manner many of the equations of mathematics are capable of representing widely diverse phenomena. They too may be said to be mysteries.

See also #5 #101

TIMETYPS.P51 DISK:JOY03, TIME August 15, 1991
08/04/91

PERI-TIME AND DIA-TIME

In order to understand the Journey of the Year it is necessary to note two types of time. We may call these two times peri-time and dia-time. Peri-time is what we ordinarily consider to be time: the time measured by clocks and calendars, the time of physics, the time of history, the time possessing past, present, and future. Dia-time, on the other hand, is time outside of ordinary time. It is what Eliade called primordial time. It is the abode of archetypes, the domain of eternity.

Events are ordered in both peri-time and dia-time, but their sequence in peri-time may be entirely different than their sequence in dia-time. This may be illustrated by considering a set of events ordered numerically around the circumference of a circle. [Figure I] Say that peri-time moves from event to event in the order 1,2,3,4,... clockwise around the perimeter of the circle. While in dia-time the ordering of the same events follows that given by the directed chords, 1,4,2,8,5,7,..

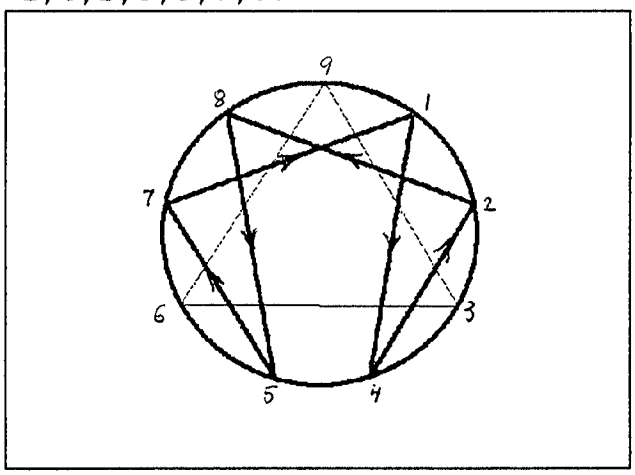


Figure I.

If a particular order in peri-time is always followed, such as the order 1,2,3,4,... then we would say that these events form a causal sequence. That is, we would assert that if event 2 always follows event 1, then event 1 causes event 2. However, this assertion may be based on an illusion. The archetype that governs the sequence in dia-time may be the real cause of the ordering as it appears in peri-time. But if, as is customary, we call the peri-time sequence a causal sequence, then we might properly call the dia-time sequence a meaning sequence. Those events that occur on points common to both sequences, such as the numbered points in Figure I. leaving out 3,6, and 9, give rise to the phenomenon C.G. Jung called 'synchronicity'. This is a name for events connected by meaning, rather than causality. For example, in peri-time, the event 2 occurs, then 3, then 4. But in the dia-sequence, 4 supplies the meaning for the occurrence of 2 even though 4 follows 2 in peri-time.

We must have temporal continuity (peri or chronological time)
in order to have reality
That which is discontinuous is taken as unreal

Examples of Peri and Dia
Enneagram
Names of Days of Week and Sidereal Periods of Planets
Scales and Circle of Fifths
The I Ching arrangements of FU HI and KING WEN

Math and EP1

TRNSFRM1.P51 October 13, 1991

TRANSFORMS

In the development of analysis several operations known as **transforms** were introduced. These operations had the property of altering the perspective on the objects being described. For example, a transform known as the Laplace transform

$$f(\alpha)=\int_{x=0}^{\infty} e^{-\alpha x}F(x)dx$$

has the property of converting derivatives and integrals into products and quotients or in general converting differential and integral equations into algebraic equations. Another operation known as the Fourier transform

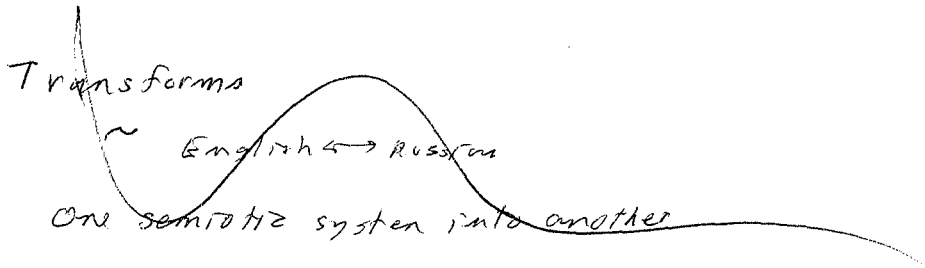
$$f_s(n)=\int_{x=0}^{\pi} F(x)\sin(nx)dx$$

has the property of changing from a time perspective to a frequency perspective. Another way of looking at the Fourier transform is that it can analyze a continuous wave from and transform it into a spectrum of its harmonic contents.

An interesting example of this is the cochlea, the spiral shaped organ in the inner ear. The cochlea creates a spectrum of the sound wave received by the ear and sends the spectrum data on to the brain. The brain then establishes a fundamental frequency and separates its harmonics thus creating the sensation of pitch and timbre or tone color. In the outer world there is sound which is energy and information in wave form, while inside the brain there is a spectral analysis of the sonic information providing a fundamental and a set of harmonics each with an assigned relative intensity. The cochlea and brain have performed a fourier transform on the incoming energy-time information producing intensity-frequency information.

It is not clear whether the spiral shape of the cochlea is for any purpose other than economy of space. A straight tube of diminishing diameter with nerve sensors located linearly in the same way as they are in the cochlea would seem to perform the same function, all else being the same. However, spirals possess other important properties that may play a role in effecting the transform.

Another interesting example of the human transformation of information from the time-energy patterns of nature into an alternate information form is in the Weber-Fechner Law which states that inner information is proportional to the logarithm of the sensation received. This is true for optical information (cf the astronomers logarithmic scale of stellar magnitudes) and aural information (the logarithmic decibel scale for intensity of sound). Humans interact with the world by creating a transformed inner world which samples from the cosmos that which its sensors and processors can extract.


Transforms
English ↔ Russian
one semiotic system into another

ZEITGEBR.WPW DISK:COSNUMBERS May 16, 1993

THE ZEITGEBERS

THE FERMIONIC CLOCKS

The general theory of relativity postulates the equivalence of space-time geometry and the dynamic or mechanical properties of matter. The equivalence of geometry and dynamics allows alternate descriptions of the world; the properties of space and time may be formulated in terms of the properties of energy and matter and vice versa. An example of this is the equivalence of mass densities and temporal periods. We have dimensionally,

$$[T^2] = \left[\frac{R^3}{GM}\right] \tag{1}$$

More specifically, if **T** represents the fundamental temporal period associated with a spherical object of radius **R** and mass **M**, then

$$T^2 = 4\pi^2 \frac{R^3}{GM} \tag{2}$$

where **G** is the Newtonian gravitational constant. Equation (2) is recognized as the Schuster period of a gravitating body, i.e. as the limiting case of Kepler's third law when the orbiting radius is equal to the object radius. Equation (2) may be rewritten in the form

$$T = \sqrt{\frac{3\pi}{G\varrho}} \tag{3}$$

where ϱ is the mass density. It follows that the frequency associated with a mass is proportional to the square root of the mass density.

Three specific examples of equation (2) give us the fundamental periods of three universal clocks. The first of these is the *atom clock* based on the proton mass m_p and the Bohr radius a_o .

$$\tau^2 = 4\pi^2 \frac{a_o^3}{Gm_p} \tag{4}$$

The second is the *baryon clock* based on the ~~electron~~ nuclear radius r_e and the proton mass m_p.

$$T^2 = 4\pi^2 \frac{r_e^3}{Gm_p} \tag{5}$$

The third is the *lepton clock* based on the electron radius r_e and the electron mass m_e.

(6) $$t^2 = 4\pi^2 \frac{r_e^3}{Gm_e}$$

Using the values [1]

$a_o = 5.291772 \times 10^{-9}$ cm, $m_p = 1.672623 \times 10^{-24}$ gm
$r_e = 2.817941 \times 10^{-13}$ cm, $m_e = 9.109390 \times 10^{-28}$ gm

The following values for periods and frequencies are obtained:

CLOCK	PERIOD	FREQUENCY
ATOM	τ = 7239.94 sec (7237.93 using m_H)	0.000138 hz
BARYON	T = 0.0028134 sec	355.44 hz*
LEPTON	t = 0.120537 sec	8.296 hz

* The frequency 355.44 hz lies between F (349.23) and F# (369.99) above middle C.

These values are approximately 2 hours and 40 seconds for the *atom clock*, 2.8 milliseconds for the *baryon clock*, and one eighth second for the *lepton clock*.

The ratios of the periods are given by:

$$\frac{T}{\tau} = \alpha^3, \quad \frac{t}{T} = \sqrt{\mu}, \quad \frac{t}{\tau} = \alpha^3\sqrt{\mu}$$

where α is the fine structure constant and μ is the ratio of the proton to the electron mass.
($\alpha = 7.297\ 353\ 08 \times 10^{-3}$ and $\mu = 1.836\ 152\ 701 \times 10^3$) [1]

THE BOSONIC CLOCKS

[1] Cohen, E.R. and B.N.Taylor The fundamental physical constants Physics Today, August 1992 p9ff

2TIMES2.W52 DISK: January 28, 1994

THE TWO-FOLD NATURE OF TIME

I am repeatedly bothered by questions such as the one posed by the nature of "density" time. It is well known that the period in many systems varies inversely with the square root of the density.

$$(1) \qquad \tau = k/\sqrt{\varrho}$$

In such systems as a pulsating star whose density varies with the period τ, what is the value of ϱ that determines the period? Another example is given by Kepler's Second Law. In an elliptical orbit, the mean density of a binary system varies with the separation of the two objects. If the period depends on the density, and the density on the separation, which density and which separation? For purposes of Kepler's Third Law, of which equation (1) is a special form, we can calibrate the periods against a specific separation or density. In the case of binaries, the semi-major axis is usually chosen. While we can answer the question of what density to choose by calibration, we have not resolved the paradox implied by equation (1) that since ϱ is different at each instant of time, τ must also be different at each instant, yet we end up with a single value for τ. Are we talking about two kinds or levels of time when we refer to $\tau(t)$, the period being a function of time? Should not equation (1) be written

$$(2) \quad \tau(t) = k/\sqrt{\varrho(t)}$$

and just what is the physical and cognitive difference between τ and t? Are we talking about the same kind of time in Kepler's Second and Third Laws?

But this is not the only instance in which we encounter a dyadic nature in time. Every physical system, in order to maintain coherence, must have a fast component and a slow component. We recognize this in artificial systems. In the 19th century, railroad operation came to depend on the telegraph, the slow trains and fast wire signals. In the 20th century we see the far more complex airline systems as totally dependent on radio communication, the slow airplanes and the fast wireless signals. And in organic systems, the nervous system operates at high speed relative to the muscular system. Throughout the universe information must move more rapidly than matter. There are fast clocks (zeitgebers) and slow clocks and both are required to tell us "what time it is".

In the 30's and 40's

The Mount Wilson astronomer, Gus Stromberg, used to ~~like~~ to point out a paradox that everybody chose to ignore. The beam interferometer mounted on the front of the 100 inch telescope allowed the diameters of near by stars to be measured. The process depended on light originating at the left limb of the star forming an interference pattern with light originating at the right limb. But Stromberg pointed out that for such an interference pattern to be possible, the atoms at the left end and those at the right end must radiate in coherence. That is, they must stay in phase, operate under the baton of the same orchestra director. But the diameter of the star was too great for the velocity of light to serve as director. So how did the atoms know what time it was? What was the fast information system that made interference patterns possible? Some second level kind of time involved? non-locality?

We have long recognized that time derives from change. Aristotle, and Western scientists ever since, have centered on the particular kind of change we call motion.

time = distance/velocity

But in equation (1) we are encountering time that does not involve motion or even change. Time is a attribute of matter, in particular of the density of matter. But this is exactly what the general theory of relativity tells us. Both space and time are attributes of matter. With no matter present, there would be neither space nor time. Since frequency is the inverse of period, equation (1) tells us that frequency is proportional to the square root of density. If the density is zero, the frequency becomes zero (the period, infinite), and if the density is high the frequency becomes high (is there an upper bound?). Planck time? 10^{43} hertz?

The two ways of looking at time, as period or as frequency, constitute another dyadic aspect of time. Here music comes to mind. Music consists of a series of events, call them notes, each with a period or duration and each with a pitch or frequency. Music is usually represented by a two dimensional device called a staff, on which the horizontal axis represents rhythm and the vertical axis represents pitch. The interesting question is where is the interface between time rates we term rhythm and those we term pitch? Pitch usually is the realm of the ear, going as low as say 30 hertz. Rhythm is the realm of feeling, going as fast as say 8 hertz. So somewhere in the neighborhood of a tenth of a second, we make a switch between period and frequency, between rhythm and pitch. It is interesting that the lepton zeitgeber (see The Zeitgebers, Scraps 93 #38) has a period of 0.120537 seconds corresponding to a frequency of 8.296 hertz. Perhaps this is the interface. Durations longer than 1/8 second we respond to as duration and

measure in seconds, minutes, ... years. Durations shorter that 1/8 of a second we invert and respond to as frequency and measure in hertz, kiloherz, megahertz, ... This seems to be the human time-frequency interface. It would be wrong to assume that other creatures and systems possess the same one.

If we take the positive axis of real numbers as a metaphor, then in the interval 1 to ∞ we express a number as n, its period or duration; in the interval 0 to 1 we express a number as 1/n, its frequency. In the metaphor the number 1 is the time-frequency interface.

We are left with the question, should we write A or B? where

check and re-do this

$$A) \quad \tau \stackrel{?}{=} \frac{k}{\sqrt{\rho(t)}} \quad ; \quad B) \quad \tau(t) \stackrel{?}{=} \frac{k}{\sqrt{\rho(t)}}$$

Writing A infers that τ, though constant in length, is in some way a function of t, that it varies from instant to instant. Since it is not the length of the cycle that varies, it is something else. Perhaps it could be a "quality" of time, a large ρ indicating one quality, a small ρ another, but with the mean value of ρ determining the length of τ.
We might then write

$$q(t) = \frac{k}{\sqrt{\rho(t)}}$$

where q(t) is a quality.

91-#6 85

Ref: 91-#5, 91-#18, 93-#6, 93-#38, 93-#42, 94-#5, 94-#6, 94-#7, 94-#10, 94-#11, 94-#12, 97-#8 on music

a typo is here with regard to ρ and $\bar{\rho}$

A) $\tau = \frac{k}{\sqrt{\rho(t)}}$

2times3.w52 disk January 29, 1994

MORE ON THE DYADIC NATURE OF TIME

In considering the elliptical orbit of a binary system in terms of system density, the mass is given by the sum of the masses of the two bodies and the R used to determine the volume is the semi-major axis, which is

$$(R_{min} + R_{max})/2$$

The density so calculated gives the correct answer for the values of the period when used in Kepler's third law. Although the density in an elliptical orbit is a function of time, it is continuously varying, so the period is determined by the mean value of the density. So the correct interpretation of the equation would be

$$\tau = \frac{\kappa}{\sqrt{\bar{\varrho}}}$$

where $\bar{\varrho}$ is the mean density.

In the case of a system of three bodies, how would the mean density be calculated? This question leads to the heart of the difficulties involved in solving the general three body problem. There is no such thing as a mean density in this case and the system is aperiodic. In the restricted problem of three bodies, such as the sun, earth, moon configuration, calculation of a mean value of R should be possible and the system is periodic.

One speculative way of calculating the density would be to pass a circle through the three bodies and take the radius of the circle as the value of R. Here the smallest R would be a value close to the astronomical unit, while the largest R would be almost infinite when the three bodies were near alignment, as in the case of an eclipse. Returning to the earlier interpretation of the equation, that τ is a function of t, continuously varying, then the period would become exceedingly long as the density drops toward zero at the time of an eclipse. Perhaps this $\tau \to \infty$ during an eclipse participates in giving an eclipse its awesomeness.

The feeling of eternity

Use a sphere for 4 bodies

for $n > 4$, what?

Best to use bounding spheres

One method of calculation for $\tau = \frac{\kappa}{\sqrt{\bar{\rho}}}$

another for $\tau(t) = \frac{\kappa}{\sqrt{\rho(t)}}$

2times4.w52 disk:TIME February 15, 1994

Motion Time and Density Time

Given a velocity and a distance, a travel time is derived by

travel time = distance/velocity

If a universal rate is postulated, such as the velocity of light, c, then a general concept of time is derived as

light time = distance/c

These travel or motion times support a "linear" concept of time. [Some motion times: light travel from sun = 499.012 seconds; light travel time of the earth's orbit = 3135.383sec = 52 minutes]

check: $\omega t = 2\pi$

A second concept of time derives from the dimensional analysis of a function of density

time = k/ √density

This kind of time supports a "cyclical" concept of time. For the earth, for example, density time is approximately 84 minutes, while motion time, $2\pi R/c$ is 0.137 seconds (~ frequency of 7.3 hertz).

These two times become numerically equal for bodies on the Schwarzschild Limit.

$GM/c^2R = 1$

For bodies with $GM/c^2R < 1$, which includes everything but black holes, density time exceeds motion time.

The formulae relating motion and density time derived from physical theory are as follows:
From the definition of density time

(1) $$\tau = \sqrt{\frac{4\pi^2 R^3}{GM}}$$

And the definition of motion time

(2) $$t = \frac{2\pi R}{c}$$

We derive

(3) $$\tau = \sqrt{\frac{c^2 R}{GM}}\, t \quad ; \quad \tau = \frac{c}{R}\sqrt{\frac{3}{4\pi G\rho}}\, t$$

As stated above, when $GM = c^2R$, the body is on the Schwarzschild Limit and $\tau = t$. Or possibly the Schwarzschild Limit is the result of a resonance condition resulting from $\tau = t$. If the Schwarzschild Limit is the fundamental, we question how or whether higher harmonics are manifested.

Another basic question is, how is density time properly interpreted? It is not age, it is not related to motion or travel time. It is cyclical, it manifests itself physically in satellite orbital times and dynamical rotational limits. Is it a synchronization signal? A temporal pulse that preserves coherence of the body or system? Is it possibly a universal zeitgeber?

Is it the minimum time for global "synchronization"?

UPDATE

4times1.W52 DISK:TIME February 16, 1994

DIMENSIONAL TIMES

On the basis of dimensional considerations there are four species of time: Motion + Gravitational

t Motion or Radar time

METRIC TIME

$$t = 2\pi\frac{R}{c} \qquad t = f(R) \qquad t = \frac{\hbar}{E}$$

τ Density or Kepler time

Time and Energy are complementary ? ∃ {his}?

$$\tau = \frac{2\pi R^{\frac{3}{2}}}{\sqrt{GM}} = \sqrt{\frac{3\pi}{G\rho}} \qquad \tau = f(\rho)$$

T Energy time

$$T = \frac{h}{Mc^2} \qquad T = f(M)$$

calculate each for ℓ

𝒥 K Gravitational time

also $\frac{GM}{c^3} = \frac{R}{c^2}$

$$\mathcal{J} = \frac{hR}{GM^2} \qquad \mathcal{J} = f\left(\frac{R}{M^2}\right) = f(R,M)$$

Complementary to each of these four times are four energies given by (action/time) in each case. (h has the dimensions $[ML^2/T]$ of action)

Motion energy

Is there an RM time?

$$E_m = \frac{hc}{2\pi R} \qquad \sim \hbar\omega$$

Density energy

$$E_\rho = \frac{h\sqrt{GM}}{2\pi R^{\frac{3}{2}}} = \sqrt{\frac{h^2 G\rho}{3\pi}}$$

Normalize with ℓ energy

Total energy

$$E_t = Mc^2$$

Gravitational energy

$$E_g = \frac{GM^2}{R}$$

additional times $\mathcal{T}_e = \frac{\hbar^3}{m_e e^4} = [T]$

An electric time

Electrical times?

$$\Upsilon = \sqrt{\frac{MR^3}{e^2}}$$

$$\Upsilon = \sqrt{\frac{hc}{e^2}}\,T = \frac{T}{\sqrt{\alpha}}; \qquad \Upsilon = \sqrt{\frac{M^2G\ell^2}{e^2}} = \frac{M}{e}\sqrt{G}\,\ell$$

$\times 4\pi^2$?

$$\Upsilon = \frac{M}{\sqrt{\rho}}e$$

TEMPDYAD.W52 DISK:TIME February 17, 1994

TEMPORAL DICHOTOMIES

PHYSICAL TIMES

MOTION	DENSITY
ARISTOTELEAN	KEPLERIAN 2nd $T \propto R^2$ 3rd $T^2 \propto R^3$
LIGHT TIME	GRAVITATIONAL TIME
FAST	SLOW
INFORMATION	MATTER/ENERGY
COMMUNICATION	TRANSPORTATION
SPECTRAL LINES	G-ATOMIC
LEPTON TIME	BARYON TIME

BIOLOGICAL TIMES

NEURON TIMES	MUSCULAR TIMES
CIRCADIAN RHYTHMS	MONTHLY RHYTHMS
SUBJECTIVE TIME	OBJECTIVE TIME

CULTURAL TIMES

CHRONOS	KAIROS
SECULAR	LITURGICAL
SOLAR	LUNAR
IMPERFECTIVE	PERFECTIVE

CONCEPTUAL TIMES

LINEAR	CYCLICAL
EVOLUTIONARY	REPETITIVE
INOVATIVE Sp?	ITERATIVE
HISTORICAL	ARCHETYPAL
TEMPORAL	PRIMORDEAL
FREQUENCY	PERIOD
CONTINUOUS	DISCRETE
OPEN	CLOSED
SEQUENTIAL	ETERNITY
PITCH	METER

Creativity must have two frames of reference.--Craik

Information must have a faster rate than matter.

Is Kairos associated with density time? Both are cyclical.
Is Chronos associated with motion time? Both are linear.

KEPTIME.WP6 DISK: July 7, 1994

More on the Kepler Time Paradox

In the case of one dimension, there is the law of conservation of momentum:

$$mv=k, \qquad t/r \propto m, \qquad t \propto rm \tag{1}$$

In the case of two dimensions, there is the law of conservation of angular momentum:

$$mvr=k, \qquad t/r^2 \propto m, \qquad t \propto r^2 m \tag{2}$$

This result is seen to be the same as Kepler's Second Law, the law of areas.

However in three dimensions, an inversion occurs. Kepler's Third Law tells us that:

$$mt^2/r^3 = k \qquad r^3/t^2 \propto m \qquad t \propto r^{3/2} m^{-1} \tag{3}$$

A table compares the results of equations 1), 2), and 3):

DIMENSION	EXPONENT OF r	EXPONENT OF m
n = 1	1	1
n = 2	2/1	1
n = 3	3/2	-1
n = 4	4/3 ?	?
n = n	n/(n-1) ?	?

Multiplying 1) x 2) ✗ 3) gives $m^3 = k$, while 1) x 2) ÷ 3) gives $t^4/r^6 \propto m \rightarrow t \propto r^{3/2} m^{1/4}$

(conservation of mass)

We seem to have two kinds of time: Momentum time and Density time.
Kepler's Third Law introduces two dimensional time.

TIMEGRAV.WP6 October 6, 1994

MORE ON GRAVITATIONAL TIME

also 1995 #54

Since Aristotle our physical notions of time have been derived primarily from motion. This is true of Newton's contributions to the subject and also of Einstein's (up through special relativity). However, Newton's modification of Kepler's Third Law including the role of mass, introduced a notion of time based on the density of matter rather than derived from motion. Specifically,

$$\tau = \frac{2\pi R^{3/2}}{\sqrt{GM}} \quad or \quad \tau = \sqrt{\frac{3\pi}{G\rho}}$$

where τ is the time period associated with a domain of radius R and of mass M, (here assumed to be spherical), and ρ is the mean density within the domain, G being the gravitational constant. In these two equations motion is not explicitly present. The period of the "beat of the clock" is determined by the density of the system. This is a gravitational clock, time being manifested as a result of the presence (density) of matter rather than the motion of matter.

The current Big Bang Theory of the origin of the universe, tells us that the universe came into being with a high density concentration of energy which immediately began to expand. Very quickly, through the appearance of particles, the universe acquired mass. While the size of the universe continues to increase, whether mass is bounded or still increasing is uncertain. In either event, the mean density seems to be decreasing. But before we can effectively discuss changes in size, mass, density, clock rate, etc. we have to be clear on the meaning of our units. The problem is like the problem of comparing purchasing power over the years in inflationary economics. One has to convert earlier dollars to today's dollars, today's wages, etc. in order to obtain meaningful comparisons.

If we assume that the fundamental physical constants, G, c, and h, are really constant, (G=Newton's gravitational constant, c=the velocity of light, h=Planck's constant), then we are provided with "absolute" units of extension, mass, and duration. Explicitly,

$$R_p = \sqrt{\frac{Gh}{c^3}}, \qquad M_p = \sqrt{\frac{hc}{G}}, \qquad T_p = \sqrt{\frac{Gh}{c^5}}$$

R_P, the unit of length has a cgs value of 4.051×10^{-33} cm
M_P, the unit of mass has a cgs value of 5.456×10^{-5} g
T_P, the unit of time has a cgs value of 1.351×10^{-43} sec

From these we can derive a unit of density, $\rho_P = \frac{c^5}{G^2 h}$ with a cgs value of 5.157×10^{93} g/cm^3.

The general theory of relativity predicts that the rate at which a clock runs varies as the strength of the gravitational field at the location of the clock. The stronger the field, the slower the clock rate. An atom in a strong gravitational field, for example, will radiate at a lower frequency than the same atom in a weak field. This is manifested as the gravitational red shift. If we designate the period of time that increases with gravitational field strength by T, and the field M/R by Φ, then $T = T(\Phi)$ such that if Φ increases T will increase.

On the other hand the time that we designate by τ which is proportional to $\rho^{-1/2}$, varies as $R/\sqrt{\Phi}$, decreasing as Φ increases. If T is the basic period operating in a gravitational field of strength Φ, how is τ to be interpreted? What sort of time does τ measure? If atoms march to T, what marches to τ? T may be a "bridge time" between photons and hadrons, while τ governs the time table for larger material bodies. *

The properties of both T and τ have been observationally confirmed. T through comparisons of clock rates at different terrestrial field strengths and τ through planetary and binary star motions. And from the above with one time increasing with field strength and the other decreasing, we must conclude that there are at least two independent kinds of time.

Recent observational determinations of Hubble's parameter have led to an age of the universe that is less than the age of oldest stars. This paradox possibly has its resolution in the existence of different times. In the region of star formation the density is large and therefore τ is small. If star formation marches to a local τ rather than to a global T, then as viewed locally, there would be ample time for the evolution of the stars, even though the observer's clock suggests a paradox. The entire matter hinges on the proper interpretation of the time τ.

$\Phi = \frac{M}{R}$ as $\Phi \uparrow$ T dilates

$\rho = \frac{M}{R^3}$ as $\rho \uparrow$ τ shortens

In absolute units

$\tau \equiv T_P$! Times converge at P

diverge from P

$T =$

Resonance ?

Is the decrease of the Kepler (Schuster Density) time τ solely attributable to the dilation of the unit of time, T as $\Phi \uparrow$ & $\rho \uparrow$? Or are both effects independent ? Or what is their functional relation?

* How is the transition from quantum ontology to meso ontology involved?

AGERATE.WP6 September 8, 1995

HOW TO BE OLDER THAN YOUR MOTHER

You cannot be older than your mother, common sense apodictically asserts. But we are finding stars that are older than mother universe herself. Recent more refined measurements of the rate of expansion of the universe lead to an age of from nine to twelve billion years, while old stars in certain globular clusters require something like 16 billion years to explain their life span. The difference between the genealogical case and the cosmogonic case is that ages of mother and offspring are measured by the same clock while the ages of stars and the universe are measured by different clocks. The star-universe paradox may be easily dissolved if we can show the clocks run at different rates.

Games with time, clocks, and clock rates have been popular since Einstein brought out his special theory of relativity in 1905. There is, for example, the famous twin paradox of one twin staying on earth, the other twin taking a high speed space voyage of a few years duration and returning to earth to find his twin had died of old age decades ago. Relative clock rates in special relativity depend on relative velocities. So herein might lie a contribution to the star-universe paradox. But there are other clock games. For example, there are these fascinating objects called **black holes**. According to Einstein's general theory of relativity clocks behave differently in the presence of matter than in empty space. And in the presence of highly condensed matter such as occurs in a black hole the clock rate almost drops to zero. Herein might lie another contribution to the star-universe age paradox.

Relativity theory tells us it is wrong to assume that the clock governing the rates of physical phenomena runs everywhere at the same rate. Furthermore the rate may be changing, as for example with a change of local or global density. Considering the variations in matter density throughout space and the change of density occurring in the general expansion itself, it is indeed probable that our present numbers assigned to ages of objects ranging from stars to the observable universe may require some adjustments. The problem of age shifts from determinations based on the hypothesis of a universal "metaclock" governing the entire universe and its contents to reconciling the rates of a set of diverse clocks operating at local rates throughout the universe.

Density time: $\tau \propto \rho^{-1/2}$ i.e. $\tau \uparrow$ as $\rho \downarrow$

General Relativity $t \uparrow$ as $\rho \uparrow$

These operate oppositely

∃? a Dirac like relation between t and τ?

τ can be thought of as life time, age, or metronome rate

$$\frac{R_S R_K^2}{R_M^3} = \text{constant}$$

R_S = Schwarzschild radius = $\frac{GM}{c^2}$

R_M = Metric size

R_K = radius of space curvature

MOON ILVS. WPG

Moon Illusion
Oct 14, 1995

Subjective TIME

1995 776

apparent size of an object is determined by its angular relation to the information cone, not the optical cone. There is a rod-cone illumination factor affecting the size of the optical cone, but this is apparently a much smaller effect than the angular changes taking place in information processing.

More formally, we postulate a bound to the number of bits of information that can be processed per scanning time unit. If σ = the information density measured in bits/(arcsec)^2, and if Ω = the angular field size of the information cone, the total number of bits is = $\sigma\Omega$. The value of Ω will adjust so that the bound, $\sigma\Omega/t \leq B$, is satisfied, where B is the maximum amount of information that can be processed in time t. For t fixed, (the static case), a large value of σ forces Ω to be smaller, which in turn makes a centrally viewed object occupy a larger percentage of Ω. Conversely, a small value of σ allows Ω to be larger and a central object appears smaller. In summary, the moon illusion is the result of the existence of a limit to our visual information processing capacity.

[Will a printed page look smaller than a blank page?]

II. THE DYNAMIC CASE

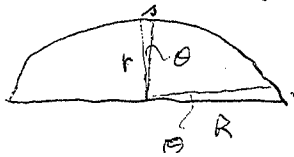
At the Los Angeles airport airplanes arrive only minutes apart. One day I was parked about a half mile from the airport on a street making a right angle to the landing runway. I began to watch the planes come in viewing their approach at right angles. I noticed that the apparent landing speed of the planes seemed to vary inversely with their size. While the larger planes actually had faster landing speeds their apparent angular speed was the least, in some cases so small it seemed they would stall. ~~landing planes Watching~~

II Peter 3:8 One day is with the Lord as a thousand years and a thousand years as one day.

This is not about the movement in time, past → present → future
It is about the scale of time, the resolving power, the size of "now".
It is zooming in and out.

As with the cones of information and optics, we have with time the "spread of now" as a function of the information content of the "now". This may also effect the subjective speed of time, velocity of the now.

Another item: The distance to the zenith < the distance to the horizon (Hamburger Bun)



$R > r$

$S \quad S = R\theta > r\theta = s$

$\therefore S > s$

But why is $R > r$?

TIMEAGIN.WP6 November 18, 1996

SOME BASIC FACETS of TIME

It is clear that the word *time* is used to cover many experiences and many phenomena.

1) Time assymmetry Past/Future
   - The arrow of time
   - Differences between past and future
   - Causality and Finality
   - Memory, recollection, vs. Vision, imagination
   - Role of Belief
   - Verb tenses

2) Time Present and not-Present, Now/Then
   - The present, "width" of now, temporal resolving power
   - Present, determinator, decker
   - Determinism and open endedness
   - Verb modes

3) Time and Eternity
   - Outside of time, Archimedes' point of view
   - The phenomenon of "recognition" (as opposed to recollection)
   - Beginnings, endings, and no-beginnings, no-endings
   - Everywhen and Nowhen

4) Time and Energy
   - Time: quantity and quality, duration and "windows"
   - Chronos: time; Kairos: timing Linear & Cyclical time
   - Heisenberg's time x energy = h
   - Energy transferred in the present, information transferred in future
   - Power of Belief, power of imagination
   - Objective (clock) time and Subjective (mind) time

5) Time and Template
   - Time as the third element of energy and information
   - Time as the source of dynamic
   - Aristotle's or change time, Kepler's or density time
   - Other dimensional times

CHON the ubiquitous cosmic clocks

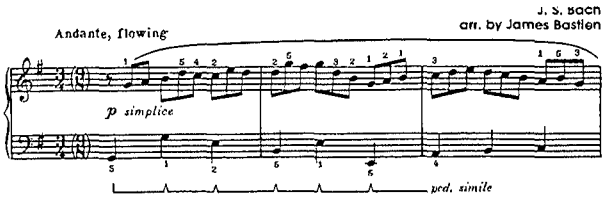
In the evolution of the universe a sequence of clocks took charge. First, Planck's clock @ 10^{-42} sec, Baryon clock @ 10^{-3} sec, atomic clock 10^{3} sec

MUSICTF.WP6 January 6, 1997

See 1994 #5
1997 #32

OF TIME AND FREQUENCY

Whenever I look at a piece of sheet music, I am intrigued by how the symbolism of music shows us ~~that~~ where we invariably discriminate and separate time from frequency (or pitch as musicians prefer to call it).



In written music, time moves from left to right horizontally, while pitch goes vertically from bottom to top as frequency increases. We understand that pitch or frequency is the reciprocal of time, f = 1/t. So pitch and duration are just two different ways of looking at time. Why do we view time in these two distinct ways and how do we decide where to stop viewing time as duration and changeover to view time as pitch? Is there more involved than just inverting the 1/t equation? The equation tells us that there are as many frequencies between zero and one as there is time from one, or now, to infinity. But what is **one,** what does **one** stand for?

Depending on the loudness, the average human ear can hear sounds from about 20 hertz (cycles/second) to 16,000 hertz. Depending on the tempo there can be up to about M.M.240, that is at extreme prestissimo, about 240 quarter notes per minute. This value is equivalent to a quarter note having a duration of one quarter of a second, an eighth note one eighth of a second, a sixteenth note one sixteenth of a second, etc. Here the time durations of notes are approaching the same values as the frequencies we hear at the lowest levels of pitch. So it appears that somewhere in the range say 8 to 16 hertz we make the switch of preference between time and frequency.

The second is the shortest time unit that humans find useful to measure sensory experience, (nanoseconds and femtoseconds are for computers). We express time periods longer than a second in numbers of seconds, (or in units of multiple seconds, such as minutes, days, years). But we express time periods shorter than a second in frequency units or hertz. (There is, however, an ambiguous region between about 1 second and 1/20th second (or 20 hertz) where both systems are used. Also note here that the number of motion picture frames per second needed to create for us the illusion of continuous motion is from 8 to 16). Evidently then, there is something fundamental in the internal human clock that switches in this zone.

One hypothesis is that humans use the Schuster Electron Time[1] [SET] of 0.121 second as a zeitgeber. Since this value is very close to 1/8 second, we might say that [SET] is the metronome that governs our time sense. We switch to frequency representations at times shorter than [SET] and to duration representations at times longer than [SET]. It is probably not fortuitous that the duration value of the second is near this period, but it does seem fortuitous that this value is related to the rotation period of the earth.

Another matter of interest in the musical utilization of time and sound is that in both the duration and pitch zones there are intervals of silence. In the horizontal zone, there is a brief silence between the sounding of each note. (One classical composer held that the whole purpose of music was to give quality to these intervals of silence). In the vertical zone there are non-pitch intervals between the values of pitch that are set by scales or modes. All of this is present in our music, but somehow musical notation obscures it from us. But then there are no symbols that carry all the reality of that which they symbolize.

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1) The Schuster Electron Time [SET] is a period associated with an electron based on the electron's mass rather than on its charge. The frequencies we usually associate with atomic phenomena derive from coulomb forces and are of the order of 10^{16} hertz. The [SET] derives from mechanical forces and has a value close to perception times of ordinary experience. The value of [SET] is given by

$$t = 2\pi\sqrt{\frac{r_e^3}{Gm_e}} = 0.121\text{sec}$$

where r_e is the radius of the electron, m_e is its mass and G is the gravitational constant.

See the RAINBOW BOOK p 111ff

p 113 adopted pitches

A above middle C 432 hertz — Pythagoras

1834 German 440 hertz for A

1859 French 435 = International low pitch

450 = Concert or high pitch

Choices from natural units baryon 355.44 Ihertz } see 1995 #73

electron 8.276 Ihertz }

×54 = 446.904

($3^3 \times 2$)

Karl Popper has described the development of polyphonic multivoiced music as "possibly the most unprecedented, original, indeed miraculous achievement of Western civilization, not excluding science".

– Digital Mantras p22

monodic → polyphonic

TIME AND LOGIC

Aristotle's law of the excluded middle [see Scraps 1999#54, 2000#69] in effect has instituted a way of thinking that precludes our seeing the world as it really is. His logic derives from basic human experience of the world portrayed to us by our senses, but not reflecting the many other facets that the world possesses. For example, in our sensory experience of the world two objects cannot occupy the same place at the same time, nor can a single object be two different places at the same time. These indisputable "facts" are at the root of Aristotle's logic, and are the basics underlying true-false polarization and the law of the excluded middle. For over two thousand years this two valued logic has not been questioned, but now...

But now comes Schrödinger's Cat, who defies polarization, and confounds our thinking about him in Aristotelean terms. The cat is not governed by the polarization canon of the excluded middle which says he must be either dead or alive. It is absolutely non-Aristotelean to have a cat who is *both* dead and alive or possibly *neither* dead nor alive. Quantum mechanics forces us to admit that the world as we have always thought it to be is but a special case of a larger cosmic reality, and our way of thinking is but an adaptation to [or creation of] that special case.

Let us introduce another cat. This cat belongs to the Chinese sage, Li Kiang. Li's cat is one of those who, if inside, wants out; if outside, wants in. And except for the minor periods of transit, at any one time the cat is either inside or outside. No confusion about that. But Li nevertheless sometimes becomes confused, for Li is one of those sages who is able to speed or slow the rate at which his sensory clock tics, that is, the rate at which subjective time flows. One of the meditations that Li practices enables him to halt the movement of the secondhand of a clock. [If the clock had a microsecond hand Li could also halt its movement, a nanosecond hand? Perhaps]. When in such a meditative state, Li does not have to worry about the cat. It is permanently either inside or outside, as motionless in its position as the everlasting hills. Thus, when Li uses this meditation, the apparent glacial rate-of-flow of external time transfers him to a Parmenidean world.

But Li is also able by slowing his subjective clock to speed the apparent rate-of-flow of external time, and this is where his confusion begins. [But not only is Li confused, but those who know and watch Li are confused. He can remain absolutely motionless for days at a time.] What Li observes during his slowed time meditations is that everything about him moves very rapidly. For Li, the cat is simultaneously *both* inside and outside, because an "instant" of time for Li spans many transitions by the cat. But when Li goes to the extreme and stops his subjective clock, then everything moves so rapidly that it vanishes from his perception, and Li's cat, like its cousin the Cheshire Cat, disappears. The cat is then *neither* inside nor outside.

We conclude: There is a different logic proper to different ratios of subjective rate of time flow to external rate of time flow. Logics employing the law of the excluded middle are proper with "normal" rate ratios, but lead to erroneous conclusions when observing a world with a widely different ratio, such as the micro world of quantum mechanics or the universe itself.

TIMENER1.WP6 January 14, 1997

TIME AND ENERGY

One of the forms that the Heisenberg uncertainty inequality may take is:

$$\Delta T \times \Delta E \geq h$$

where T is time, E is energy and h is Planck's constant. The conventional interpretation of this result is if the time interval is known precisely, the amount of energy is uncertain or if the energy is precisely known, the time is uncertain. But as with all mathematical results many interpretations are possible. In fact that is the power of mathematics--the same equation can be applied to many things. Here we look at two additional interpretations.

This inequality is in all its interpretations a description of a tradeoff. Heisenberg's initial interpretation was about a tradeoff in certainty. Another interpretation is a tradeoff in efficiency. Time efficiency is inversely related to energy efficiency. If we want something done in a short time, its costs in energy go up. If we want to be economical with energy, then we must be prepared to be patient. A jet across the continent is quick but energy expensive; a bus with the same load, longer time, less energy. In all of our efforts to save energy we must realize that we are first going to have to give up our demand for instant results. But we have become the 'now' generation and we have yet to realize the cost in energy. Hence:

If you want to save energy, you are going to have to slow down.

A second tradeoff implicit in the equation has to do with the future. Let us call it a tradeoff in influence. A small effort by an individual or group can in the long run effect tremendous change. Or as Margaret Meade said: *"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever does".* This point has been emphasized in chaos theory. In fact the so-called butterfly effect, *"The manner a butterfly flaps its wings in Kyoto today will alter the weather in London thirty days hence",* is an essential part of chaos theory. There are many historical examples of the time-energy tradeoff in influence, such as that of a handful of Palestinian fisherman, or a man in the English country side observing an apple fall. The closer to the present you want your influence, the greater the energy required. We need only point to such as Genghis Khan and Hitler who wanted the results in their own life time. Ideas with low energy cost of diffusion, such as word of mouth, require longer times to spread, while rapid diffusion demands expensive media costs. Hence:

If you want to influence, act now in moderation but ignore the time table.

Energy ⇔ Thought re influence ← the future

see William James in Schlesinger's essay on leadership

This phenomenon has a familiar political example in the New Hampshire primaries. Its time lead offsets the smallness of New Hampshire's number of voters.

But New Hampshire's clout comes from being first and ahead of the others. If future time is (−) time and past time is (+) time, then (−) time contains clout.

PARTIME1.WP6 May 23, 1997

see 1994#5
1997#3

PARTICLES:TIME :: WAVES:FREQUENCY

Another venture into the jungle of juxtaposition. This time with frequency/time as wave/particle. Mathematicians have settled that frequency = 1/time, but could there not be more? In going from frequency to time may we not also be going from a wave to a particle manifestation. This seems to be the case in music. The horizontal time axis has a particulate nature consisting of entities distributed in time called notes. The vertical pitch axis references the frequency or wave nature of the notes. The human musician or 'observer' gets into the act by deciding where the time-to-frequency interchange should be located. For human music this seems to be somewhere in the interval eight to twenty hertz. That is for duration times less than about 1/20 sec we prefer to sense the frequency aspects.

Let us generalize from this music metaphor. By analogy, every entity from atoms to the cosmos, like every note, has associated with it both a duration in time and a wave pattern. While this time-frequency parameter may be singular for every entity, the t<-->f interchange is set by the t<-->f of the observer. In the abstract world in which mathematicians exist, they always set t<-->f at one. For humans the time side of the divide is usually called the lifetime of the entity, the wave side the frequency range of the entity. In general, the larger the entity, the greater its age, the smaller the entity the higher its frequency. The Planck particle has f = 10^{42} hertz.

conjecture:
Surmise: For every entity: $_{\text{e.g.}}\ h\nu + (mc^2 \times d) = a$ constant, where h is Planck's constant, ν the frequency, m the mass, c the velocity of light, and d the life time.

(some function of ν, m, and d)

An alternate approach holds that, instead of the time-frequency parameter being singular, there is either TDMA or FDMA (or both) multiplexing going on. In the TDMA version, every entity oscillates back and forth between its wave manifestation and its particle manifestation at some unknown frequency. In the FDMA version, every entity exists at two or more frequency levels. In this view a singular frequency spectrum could not even exist.

cf. Pythagoras and Nagarjuna

Another TDMA multiplexing model would have an information vs. energy oscillation occurring at some unknown frequency. Somehow every material form must be continually refreshed by being supplied both energy and information. This view holds that information-energy, time-frequency, and wave-particle are each two sides of a coin. [of how many coins?, one, two, or three?]

$$\frac{\text{particles}}{\text{waves}} = \frac{\text{curvature}}{\text{frequency}}$$

6times1.WP6 October 23, 1997

SIX TYPES OF TIME

On the basis of purely dimensional considerations six species of time may be derived:

t Motion or Radar time

$$t = \frac{R}{c}$$

τ Density or Keplerian time

$$\tau = \sqrt{\frac{R^3}{GM}} = \frac{1}{\sqrt{G\rho}}$$

T Total Energy time

$$T = \frac{\hbar}{Mc^2}$$

Z Gravitational Energy time

$$Z = \frac{\hbar R}{GM^2}$$

ζ Gravitational time

$$\zeta = \frac{GM}{c^3}$$

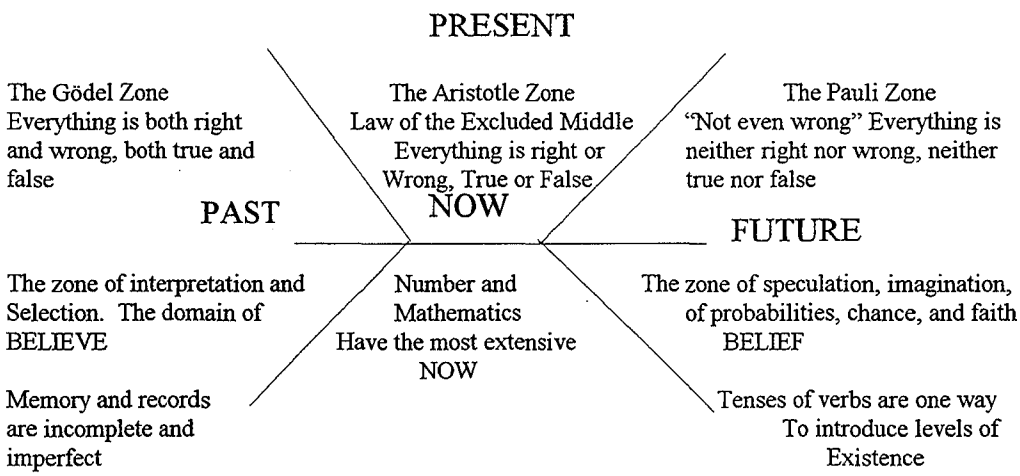
ϵ Electric time

$$\epsilon = \sqrt{\frac{MR^3}{e^2}}$$

Note that in the case of t, T, and ζ only one parameter, either M or R is involved. In the case of τ, Z, and ϵ both M and R are involved. [Are there two more times? Symmetry would say there should be one involving 1/R, and one involving RM^2, bringing the total to eight.]

TIMELINE.WPD SEPTEMBER 11, 1999

THREE ZONES OF TIME, LOGIC, AND EXISTENCE



HUBBLE03.WPD SEPTEMBER 19, 1999

THE HUBBLE PARAMETER AND FUNDAMENTAL CONSTANTS OF PHYSICS

REVISED

Number is the infrastructure of everything. –Pythagoras

As above, so below. –Hermes Trimegistius

From the Heisenberg and Schwarzschild inequalities it can be shown that,

$$\frac{V}{T} \geq \frac{G\hbar}{c^2} = cl_o^2 = \frac{l_o^3}{t_o}$$

where V has the dimensionality [L^3], T has dimensionality [T], G, ħ, and c are respectively the gravitational constant, Planck's constant, and the velocity of light; l_o is the planck length and t_o the planck time. Hence,

$$\frac{T}{t_o} \leq \frac{L^3}{l_o^3}$$

In particular, if L is taken equal to r_e, the electron radius,

$$T \leq \frac{r_e^3}{l_o^3} t_o = (\alpha\mu S)^{\frac{3}{2}} t_o$$

where α is the fine structure constant, μ the proton to electron mass ratio, and S the coulomb to gravitational force ratio.

The $\log_{10}$ value of T becomes 17.345065 seconds, or $\log_{10}$ 9.956955 years, which is equal to 9.056387 billion years. The interesting thing about this maximum value of T is that it is close to modern approximations of the time since the big bang, or "age of the universe". Indeed, if we take recent values derived from observations of 800 cepheids in 18 galaxies out to 25 megaparsecs[1] , the age of the universe comes out to be 9.18 billion years, (with a Hubble time of 13.77 billion years). This value is derived from a Hubble parameter = 71±7 km/sec/mpc.[1] When the above value of 9.056387 billion years is converted to a Hubble parameter, it turns out to be 71.977 km/sec/mpc. If this is not just a numerical coincidence, and the present value of the Hubble parameter is indeed 71.977 km/sec/mpc, then there are some disturbing implications.

Pursuing this line of investigation, we find that the above value of T arises also from other levels of the inequality.

$$T \leq \frac{r_e^3}{l_o^3} t_o; \quad T \leq \frac{l_a^{\frac{3}{2}}}{l_o^{\frac{3}{2}}} t_o; \quad T \leq \frac{l_U}{l_o} t_o$$

where l_a is a stellar radius, and l_U is the radius of the Hubble universe. In each case the value of T is 9.056387 billion years.

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[1]Key Project, Wendy Freedman et al. Physics Today Aug 1999, p 19

8TIMES.WPD February 19, 2000

FUNDAMENTAL TIMES

Dimensional considerations lead to the discrimination of ten basic times or frequencies. These are:

1) $t = R/c$
This time is based on motion and change. It involves a linear dimension, R, or distance. It is also radar time. It is the basis of Aristotle's concept of time, so **Aristotle** time.

2) $\tau = \sqrt{(R^3/GM)} = (G\rho)^{-1/2}$
This time is based on density. It involves both a mass, M, and a volume, R^3. This equation is Kepler's third law, so we term it **Kepler** time.

3) $T = GM/c^3 = Mc^2/(c^5/G)$
This time involves only mass, M.. It is equivalent to energy/power. The Energy is Einstein's energy, Mc^2, appropriately, let us call this **Einstein** time.

4) $Z = \hbar/Mc^2$
This time derives from Heisenberg's relation, energy x time = action or $\hbar$ The energy used is Mc^2. We might term this **Heisenberg** time.

5) $\zeta = \hbar R/GM^2$
This time also derives from the Heisenberg relation with the energy being gravitational. In honor of the father of gravity, this might appropriately be called **Newton** time.

6) $\Phi = \sqrt{(MR^3\alpha/e^2)} = \sqrt{(MR^3/\hbar c)}$
This time involves electric charge, as well as mass and volume. Perhaps it could be called **Coulomb** time.

7) $\phi = MR^2/\hbar$
This time also derives from the quantum relations. So to leave no one out, call this **Schrodinger** time.

8) $K = G^2M^2/Rc^5 = GM/c^2R \times T$
This time is also energy/power, gravitational energy this time. Since GM/c^2R defines the Schwarzschild limit, let's call this **Schwarzschild** time

9) $k = G\hbar/Rc^4$
This time derives from the fundamental constants, let's call it **Bohr** time.

10) $t_o = (G\hbar/c^5)$
This is the time associated with the Planck particle. It is the **Planck** time.

When the Planck mass and the Planck time are substituted in the above equations, their value in each case is the same = the planck time = −43.268366 sec

$T\tau^2 = t^3$
$Tz = t_o^2$
$T\zeta = t^2$
$\Phi = \varphi = t$
$K = \frac{T^2}{t}$
$k = \frac{t_o^2}{t}$

4 fundamental times:
t, τ, T, t_o
all times are $f(t, \tau, T, t_o)$

LARGNUMB.WPD JUNE 11, 2000

KALPAS AS UNITS OF TIME

While we know that the ancients developed systems for expressing large numbers, we are ignorant of any practical applications for which they needed large numbers. Particularly, we recognize the creativity of Archimedes in his "Sand Reckoner" and of unknown Hindu mathematicians in their development of the system of yugas and kalpas. Today we have many uses for large numbers to express social, economic, and scientific quantities and have developed a convenient representation by expressing them as powers of ten. For example, one billion = 1,000,000,000 = 10^9. In our culture, astronomy has long been the cradle of large numbers, for distances, numbers of stars and other objects, and for their ages. With recent focus on the cosmological importance of the age of the universe, (derived from its rate of expansion), it is of interest to see what modern age numbers might look like when expressed in terms of ancient units like yugas and kalpas, which were used to represent great lengths of time.

THE HINDU TIME SYSTEM

Brahma, the creator of the universe, is supposed to have a lifetime of 100 Brahma Years, each of 360 Brahma Days. The length of one Brahma Day is called a kalpa and is 4.32×10^9 earth years. This would make Brahma's lifetime equal to about 156×10^{12} earth years. It is held that at the end of such a period the world disappears to be replaced by a new world with a new Brahma. But there are subdivisions to the kalpa or Day of Brahma. One kalpa is equal to 1000 mahayugas, each of which would be of length 4.32×10^6 earth years or of 12,000 so-called Divine Years. This works out to one Divine Year = 360 earth years, [$360 \times 12{,}000 = 4.32 \times 10^6$] Each mahayuga consists of four yugas, each successive yuga is of decreasing length, containing increasing strife and conflict. The first yuga is the Krta Yuga whose length is 4000 Divine Years, [1,440,000 earth years]; the second is the Treta Yuga of 3000 Divine Years, [1,080,000 years]; the third is the Dvapara Yuga of 2000 Divine Years, [720,000 years]; and the last is the Kali Yuga of 1000 Divine Years, [360,000 years]. These add up not to 12,000 Divine Years, but to only 10,000 Divine years. The discrepancy is explained in terms of "yuga dawns and twilights".

THE 20TH CENTURY COSMOLOGICAL SYSTEM

For most of the 20th century, cosmologists have been using a model based on a "critical density"; critical in the sense that if exceeded, the universe will oscillate between a series of big bangs and big crunches, and if deficient, will expand forever. The jury is still out, but at the beginning of the 21st century, the smart money is on insufficient matter and eternal expansion. In this model we are concerned with three quantities:

1) An observable: the Hubble parameter, H_o measured in kilometers/second/megaparsec.
2) An interval of time called the Hubble Age, A, the time from the present back to an origin assuming constant rate of expansion at the present rate, measured in billions of years.
3) The so-called age of the universe, T, the time from the present back to the big bang, measured in billions of years.

These quantities are related as follows:

(H_o in km/sec/mpc) x (A in billions of years) = 978; and $T = 2/3\ A$

And Now

Kalpa $= 4.32 \times 10^9$ years

Planck Age $= {}^{43}_{10}: 268366$ seconds

3.12×10^9 gypes in the human genome or 0.72 kalpas

It is Intriguing to guess that kalpa should have been defined as 4.3268366×10^9 year = modified kalpa

$\sum = 9.636171$ years

$= 17.135282$ sec 1 modified kalpa

17.456067 sec = ~~Planck Age~~ T_U

$\delta = {}^{10}_{} 0.320785 \sim 2.093$

$17.485626 \sim 2$ kalpas

$17.135282 \sim 1$ modified kalpa

$0.300344 \sim 2$

$.30103$

2 modified kalpas = 17.436812

17.456067 T_U

$\delta = 0.019755 \sim 1.0465$

i.e. 2 modified kalpas $\doteq T_U$

$2\ mk \times 1.0465 = T_U$

Working backwards:

if $2k \equiv T_U$

$1k = 17.155037$ sec

$= {}^{9}_{10} 9.655925$ yr $\sim 4.528194 \times 10^9$ yr

4.32×10^9 yr old kalpa

0.208194×10^9 yr

off by 208 m.y.

1 galactic rotation

i.e. If kalpa were $= \frac{1}{2} T_U =$ new kalpa

then the difference between old kalpa and new kalpa would be the time of one ~~revolution~~ rotation of the galaxy

Great stuff for the current astronaut crowd fun!

Page 2

KALPAS AS UNITS OF TIME

The table shows the relations between the Hubble parameter, H_o; the Hubble time or age, A; the time since the big bang, the so-called age of the universe, T; with $\log_{10}$ values.

H_o km/sec/mpc	A Gyr	T Gyr	log T years	log T seconds
1) 550	1.8	1.2	9.079	16.578
2) 71.99	13.58	9.056	9.956955	17.456067
3) 75.46	12.96	8.64	9.936514	17.435626
4) 150.93	6.48	4.32	9.635484	17.134596
5) 4.1924×10^{-3}	233,280	155,520	14.191786	21.690898

1) Hubble's first value [Realm of the Nebulae p168, 1936]
2) Current value based on Cepheids [Friedman et al, 1999] This value = $(\alpha\mu S)^{3/2}\, t_o$
3) Value corresponding to 2 kalpas
4) Value corresponding to 1 kalpa
5) Value corresponding to "Lifetime of Brahma"
[log number of seconds in year = 7.499112]

10^5 billion years

Notes: The age of the earth is estimated to be about 4.5 Gyr which is close to one kalpa, which means the earth was born toward the end of the first Day. The sun is estimated to be about 4.7 Gyr, though a second generation star, it was still born in the first Day. The age of the universe 2) is "slightly" over two kalpas. Meaning we have been in the third Day of Brahma for 0.42/4.32 = 0.097 Day, that is for about 420 million years. This means the third Day of Brahma began 420 million years ago in the Silurian period, the age of first appearance of vertebrates, the fishes, and the first seedless land plants and ferns. Since the beginning of the third Day, there have been 97 mahayugas (out of 1000 per Day). The 98th mahayuga of the third day began 960,000 years ago in the Pleistocene epoch. This was the time of homo erectus well before homo neanderthalensis and homo sapiens. But since 960,000 years is less than 1,440,000 years of a Krta Yuga, we are still in a Krta Yuga, with 680,000 years to go. That should be good news for all of us.

If we define the Planck Age, P_A, as +43.268366 seconds, and take the total number of Brahmas, past, present, and future, B_N, as having the same numerical value as the lifetime of Brahma, B_L, in seconds = 21.690898, then $B_N \times B_L = +43.381796, \sim P_A$. [$\log_{10}$ values]

(The difference must lie in the Yuga dawns and twilights)

While the use of kalpas has no advantage over our powers of ten notation, it does help to put relative lengths of time into perspective by reducing billions and millions of years to days and hours. Since the big bang we are now only two hours and 20 minutes into the third Day of Brahma.

$B_L^2 = 43.381796$

$P_{t_o} = 43.268366$

Gyr = giga years or 10^9 years

There seem to be numbers of the order of 10^9 that occur in nature

# of genes	3.12×10^9 [#]	$S^{1/4} = 2.36 \times 10^9$ [#]
age of earth	4.5×10^9 [y]	$(\alpha_{MS})^{1/4} = 16.12 \times 10^9$ [#]
Kalpa	4.32×10^9 [y]	

$S \doteq 7\,(\text{kalpa})^4$ $\quad 1.074S = 7K^4$

Sand Reckoner

Is there a large number of importance ~ 0, 1 ?

say, .3. $\frac{1}{\#} = \frac{\#}{\infty}$?

$0.\bar{0} = 1$

$\# = \infty \cdot \sqrt{0}$

Orders of nothingness $(0)^n$ or $(0)^{\frac{1}{n}}$

0^0

Archimedes' Sand Reckoner → 10^{63} grains = A

but his largest number

$= 10^{8 \times 10^{16}}$ See The Kingdom of Infinite Number p172

$\sqrt[7]{10^{63}} = 10^9$ $\qquad 10^{63} = 10^{9 \times 7}$

$(1 \text{ billion})^7$

Kalpa = 9.6354837

$(K)^{6.54} = A$

10^{96}

K: The Meta-Universe or "FOAM" has $T_K = (\alpha_{MS})^2 t_0 = 37.697542$ sec

B_L = Life Time of Brahma this is $144.4 \times T_U$ $\qquad \frac{T_K}{T_U} = 2.159567$ antilog = 144.39993

$\frac{T_K}{B_L} = \frac{37.697542}{21.690898} = 1.737943 \simeq \frac{7}{4}$ $\quad$ antilog = 54.694416

$\frac{B_L}{T_U} = \frac{21.690898}{17.456065} = 1.242600 \simeq \frac{5}{4}$ $\quad$ antilog = 17.482338

$\frac{T_K T_0}{B_L^2} = 1.398634 \doteq 1.4$ $\quad$ i.e. $T_K \cdot T_0$ in B_L units = $1.4 = \frac{7}{5}$ pure numbers

TIME TABLE I MAXIMUM VALUES

$\Delta M = (\alpha\mu S)^{1/2}$; $\Delta R = (\alpha\mu S)^{1/2}$

	$t = R/c$	$\Delta_{(t,T)}$	$T = GM/c^3$	$\Delta(T,\tau)$	$\tau = (G\rho)^{-1/2}$	$\Delta\tau,t)$
PLANCK	-43.268366	0	-43.268366	0	-43.268366	0
Δ(PL,B)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(\alpha\mu)^{1/2}$ S	
BARYON	–23.026889	S	–62.382770	$S^{3/2}$	–3.348949	$S^{1/2}$
Δ(B,D)	0		S		$S^{1/2}$	
DARK	–23.026889	0	–23.026893	0	–23.026887	0
Δ(D,*)	$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$	
STAR	–2.785412	0	–2.785412	0	–2.785412	0
Δ(*,U)	$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$	
UNIVERSE	+17.456065	0	+17.456065	0	+17.456065	0
Δ(U,K)	$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$		$(\alpha\mu S)^{1/2}$	
KOSMOS	+37.697542	0	+37.697542	0	+37.697542	0

$19.114404 = (S/\alpha\mu)^{1/2}$ $19.677940 = S^{1/2}$ $20.241477 = (\alpha\mu S)^{1/2}$

$39.355881 = S$ $39.919417 = (\alpha\mu)^{1/2} S$ $59.033821 = S^{3/2}$

TIME TABLE II MEAN VALUES
$\Delta M = S^{1/2}$; $\Delta R = S^{1/2}$

	t = R/c	$\Delta_{(t,T)}$	$T = GM/c^3$	$\Delta(T,\tau)$	$\tau = (G\rho)^{-1/2}$	$\Delta\tau,t)$
PLANCK	-43.268366	0	-43.268366	0	-43.268366	0
Δ(PL,B)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(\alpha\mu)^{1/2}$ S	
BARYON	–23.026889	S	–62.382770	$S^{3/2}$	–3.348949	$S^{1/2}$
Δ(B,D)	$(\alpha\mu)^{1/2}$		$S/(\alpha\mu)^{1/2}$		$(\alpha\mu S)^{1/2}$	
DARK	–23.590427	0	–23.590427	0	–23.590427	0
Δ(D,*)	$S^{1/2}$		$S^{1/2}$		$S^{1/2}$	
STAR	–3.912486	0	–3.912486	0	–3.912486	0
Δ(*,U)	$S^{1/2}$		$S^{1/2}$		$S^{1/2}$	
UNIVERSE	+15.765454	0	+15.765454	0	+15.765454	0
Δ(U,K)	$S^{1/2}$		$S^{1/2}$		$S^{1/2}$	
KOSMOS	+35.443394	0	+35.443394	0	+35.443394	0

$19.114404 = (S/\alpha\mu)^{1/2}$ $19.677940 = S^{1/2}$ $20.241477 = (\alpha\mu S)^{1/2}$

$39.355881 = S$ $39.919417 = (\alpha\mu)^{1/2} S$ $59.033821 = S^{3/2}$

$0.563537 = (\alpha\mu)^{1/2}$ $38.792043 = S / (\alpha\mu)^{1/2}$

TIME TABLE III MINIMUM VALUES

$\Delta M = (S/\alpha\mu)^{1/2}$; $\Delta R = (S/\alpha\mu)^{1/2}$

	t = R/c	$\Delta(t,T)$	T = GM/c^3	$\Delta(T,\tau)$	$\tau = (G\rho)^{-1/2}$	$\Delta\tau,t)$
PLANCK	-43.268366	0	-43.268366	0	-43.268366	0
Δ(PL,B)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(\alpha\mu)^{1/2}$ S	
BARYON	–23.026889	S	–62.382770	$S^{3/2}$	–3.348949	$S^{1/2}$
Δ(B,D)	$\alpha\mu$		S / ($\alpha\mu$)		$\alpha\mu\ S^{1/2}$	
DARK	–24.153963	0	–24.153963	0	–24.153963	0
Δ(D,*)	$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$	
STAR	–5.039560	0	–5.039560	0	–5.039560	0
Δ(*,U)	$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$	
UNIVERSE	+14.074843	0	+14.074843	0	+14.074843	0
Δ(U,K)	$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(S/\alpha\mu)^{1/2}$	
KOSMOS	+33.189246	0	+33.189246	0	+33.189246	0

19.114404 = $(S/\alpha\mu)^{1/2}$ 19.677940 = $S^{1/2}$ 20.241477 = $(\alpha\mu S)^{1/2}$

39.355881 = S 39.919417 = $(\alpha\mu)^{1/2}$ S 59.033821 = $S^{3/2}$

1.127074 = $\alpha\mu$ 38.228807 = S / ($\alpha\mu$) 20.805014 = $\alpha\mu\ S^{1/2}$

TIME TABLE IV MIXED VALUES

$\Delta M = (S/\alpha\mu)^{1/2}$; $\Delta R = (\alpha\mu S)^{1/2}$

	$t = R/c$	$\Delta(t,T)$	$T = GM/c^3$	$\Delta(T,\tau)$	$\tau = (G\rho)^{-1/2}$	$\Delta\tau,t)$
PLANCK	-43.268366	0	-43.268366	0	-43.268366	0
Δ(PL,B)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$(\alpha\mu)^{1/2}$ S	
BARYON	–23.026889	S	–62.382770	$S^{3/2}$	–3.348949	$S^{1/2}$
Δ(B,D)	0		S / ($\alpha\mu$)		$(S/\alpha\mu)^{1/2}$	
DARK	–23.026889	$\alpha\mu$	–24.153963	$(\alpha\mu)^{3/2}$	–22.463352	$(\alpha\mu)^{1/2}$
Δ(D,*)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$\alpha\mu\ S^{1/2}$	
STAR	–2.785412	$(\alpha\mu)^2$	–5.039560	$(\alpha\mu)^3$	–1.658338	$\alpha\mu$
Δ(*,U)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$\alpha\mu\ S^{1/2}$	
UNIVERSE	+17.456065	$(\alpha\mu)^3$	+14.074843	$(\alpha\mu)^{9/2}$	+19.146677	$(\alpha\mu)^{3/2}$
Δ(U,K)	$(\alpha\mu S)^{1/2}$		$(S/\alpha\mu)^{1/2}$		$\alpha\mu\ S^{1/2}$	
KOSMOS	+37.697542	$(\alpha\mu)^4$	+33.189246	$(\alpha\mu)^6$	+39.951691	$(\alpha\mu)^2$

19.114404 = $(S/\alpha\mu)^{1/2}$ 19.677940 = $S^{1/2}$ 20.241477 = $(\alpha\mu S)^{1/2}$

39.355881 = S 39.919417 = $(\alpha\mu)^{1/2}$ S 59.033821 = $S^{3/2}$

1.127074 = $\alpha\mu$ 38.228807 = S / ($\alpha\mu$) 20.805014 = $\alpha\mu\ S^{1/2}$

TIME

THEORIES OF TIME

- CHANGE
- LINEAR AND CYCLICAL TIME
  - Chronos and Kairos
- DIRECTION OF TIME
  - Second Law of Thermodynamics
  - Causalism and Finalism Consequences as Causes
- DETERMINISM SPECTRUM
  - Determinism, Fibonaccian, Markovian, Existentialism
  - Hopi views
- PHYSICAL TIME
  - Matrices
  - Space-time
- SUBJECTIVE TIME
  - Dental Seconds
  - Civil Time, Client Time, Prussian Time
  - Jet lag

MEASUREMENT OF TIME

- LINEAR TIME
  - Cosmic Ages
    - Hubble Time
    - Geologic Time
    - Evolution
  - Cultural Ages
    - Astrological Ages (Pisces, Aquarius, etc)
    - Axial Periods
    - Mayan Suns
    - Astronomical Julian Days
- CYCLICAL TIME
  - Astronomical Cycles
    - Precession, Elongation, Apsides
    - Year, Month, Day, Analemma
  - Clocks
  - Calendars
    - Western, Liturgical Years
    - Celtic
    - Chinese
    - Hindu
    - Mayan
  - Keplerian Cycles
    - The Week, CHON

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TURBULENCE IN THE STREAM OF TIME

First it is necessary to distinguish between the ***present*** and the ***now***.
The Direction of Time:

The ***present*** is an instant of time that moves along the line of time in a direction past to future. This direction or "arrow of time" has been defined in terms of the second law of thermodynamics as the direction in which entropy increases. Associated with this direction of time is the concept of causality. The conventional assumption is: that which is subsequent can only be caused by that which precedes, or consequences do not play a causal role.
It is also recognized that living systems are able locally and temporally to violate the second law of thermodynamics. This property would infer that living systems can also effect conditions in which consequences can play a causal role. Indeed, this disposition in living organisms has been given a name, "purpose". [This purpose is not to be confused with a philosophical purpose of life, but is simply an agenda the organism has chosen to influence.]

The ***now*** is a zone within the stream of time in which the second law of thermodynamics has been violated. Within this zone antecedent-subsequent are no longer locked to cause-effect. Causality is free to move both from prior to later and from later to prior. Consequences may play a causal role. And living organisms seem to be able to create such "now zones". Whenever such a zone occurs in the stream of time it is in many respects analogous to turbulence in a fluid stream where the flow is in several directions at once. The ***now*** may be thought of as a turbulent eddy in the stream of time..

Two quotes are of interest in this connection:
Who controls the past controls the future; who controls the present controls the past.

—George Orwell 1984

History is what I write it to be.

—Joseph Stalin

An implication of these quotes is that people in a position of power more readily recognize this human capacity to locally and temporarily violate the second law of thermodynamics. But this power to overrule some aspects of the determinism or necessity present in the natural order is possessed to some extent by all life forms.

Notes:
The **present** is the period in which energy may be transferred. The **now** is the time zone in which information may be transferred. [or created]

The Hopi view of a determinator in the future may be considered the leading front of a now zone The lagging front, liberation from the past, is more difficult to ascertain.
Questions:
Is there an holographic analogy in time where the part, a portion of time, may contain the whole?

Are there different topologies for time as there are for space?

CAUSALITY AND THE DIRECTION OF TIME

Who controls the past controls the future; who controls the present controls the past.
—George Orwell 1984

The Direction of Time:

Does time always move from past to future? The direction or "arrow of time" has been defined in terms of the second law of thermodynamics as the direction in which entropy increases. And locked into this direction of time is the concept of causality. We conventionally assume that causality must operate in the same direction as the flow of time, meaning that consequences never play a causal role. But in the case of living systems, it is recognized that they are able, locally and temporally, to violate the second law of thermodynamics. This capability of living systems infers that they may also, locally and temporally, be able to alter the direction of time. This carries the additional implication that living systems can create situations in which consequences do play a causal role. Indeed, this concept of the power of living organisms to reverse the direction of time and causality has been given a name, "purpose". Living systems do direct sequences of events toward selected goals which conflicts with the idea that the future is solely determined by past causes. A power to overrule some aspects of the determinism or necessity present in the natural order seems to be possessed to some extent by all life forms.

The Present and the Now:

We distinguish between the **present** and the **now**. We may define the **present** as an instant that moves along the line of time in a direction past to future, but at possibly different rates. We define the **now** as a zone in the stream of time in which the second law of thermodynamics has been locally violated. Within this zone antecedent-subsequent are no longer locked to cause-effect. Causality is free to move both from prior to later and from later to prior, and consequences may play a causal role. Living organisms seem to be able to create such "now zones". Whenever such a zone occurs in the stream of time it is in many respects analogous to turbulence in a fluid stream where the flow may be in several directions at once. Such an intentionally controlled zone or interval of time may be thought of as a turbulent eddy in the stream of time..

Notes:

- The **present** is the only period in which energy may be transferred. The **now zone** is the time interval in which information may be transferred. [and/or created]
- The Hopi view of a determinator in the future may be considered the leading front of a now zone

Questions:

Is there an holographic analogy in time where the part, a portion of time, may contain the whole?
Are there different topologies for time as there are for space?

EVOSTEP.WPD January 5, 2004

THE DISCRETENESS OF CHANGE

While change may not be discreet, it appears to be discrete. Moments of change are interspersed between periods of stasis. For example, we age in spurts. Just when we become used to our current restrictions, we get a new set. The same culturally, just when we stabilize our comings and goings, some innovation pulls the rug from under us. This also happens in both science and in religion. When scientists begin to have it figured out, close to a theory of everything, along comes a new paradigm, and it's back to the drawing boards. Over millennia the same happens to religions. Every entrenched orthodoxy knows that new prophets with new theophanies are a repeating occurrence (and menace).[1] Why does this oscillatory process of pause and change occur? Should there not be a Parmenidian changelessness or a Heracleitian ever flowing river? Is it to give new situations time for testing? Or is it that we feel secure in the old and fear the new?

The authors of myth understood this process very well usually framing it in anthropocentric terms. In Greek myth, for example, Hesiod tells us that the original gods, Chaos and Gaea and their family, including Erebus and Uranus, were the creators and first rulers. Then came their offspring, the Titans, who included Chronus and Rhea. Subsequently Chronus overcame Uranus and established the dominion of the Titans. But in turn Chronus and Rhea's children, including Zeus, Hera, and Hades, overthrew the Titans and established the dynasty of the Olympians. So the gods, whether representative of concepts, weltanschauung, or paradigms, were periodically replaced by new gods. And it is the offspring, the descendants of the gods (or consequences of the paradigms), that forced the replacements.

Not only the Greeks, but other cultures refer mythically or otherwise to paradigmatic changes. Judaism teaches there will be a new future brought by a messiah who is yet to come. Christians believe in a second coming of Christ. Buddhism tells us of Maitreya, the Buddha yet to come. And Hinduism goes even further with the concept of gods having many avatars. In the Bagavad Gita, Krishna tells Arjuna, "Whenever there is the need, I make for myself a body and return to earth." Native Americans believed in successive "Suns", or epochs that involved major transformations in the nature of being.[2] In each view there are successive transformations resulting from a new revelation, a new theophany, or a new paradigm.

While the river ever flows, it is also periodically halted. Perhaps in order to self-reference itself. Or possibly dammed temporarily by those with investments in the ephemeral, but who are invariably swept away. Whatever the side effects on the banks, mortality and extinction or transformation and emergence, the river continues to flow.

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[1] It seems fair to say that a paradigm is to science what a theophany is to religion.

[2] The next or sixth sun will occur at Baktun 13.0.0.0.0 which is Gregorian 2012-12-12

DISCRETENESS ≈ NON CONTIGUITY
NON CONTINUITY

TIMEMEAS.WPS August 18, 2005

MEASURING TIME

The operational definition of time:
"Time is what is measured by a clock" –P. W. Bridgman

Humans have been measuring time for millennia, but still are not sure just what it is they are measuring. And if Professor Bridgman's definition of time is correct, then we might ask, if we measure time by an hour glass, by a water clock, or by monastery bells, are we measuring the same thing that a mechanical clock measures? It may be that while all devices measure the same essence, each different device measures some different aspect, attribute, or component of time. Whether this is so, different measuring devices do emphasize and project different "feelings" about the nature of time.

The oldest measuring device of time was the sky, the cyclical positions of the sun, giving us the day and the year; the positions and phases of the moon, giving us the month. Wherever we went, the same sun was there, regularly repeating its voyage through the sky. This emphasized the feeling that time must be the same everywhere, time was universal and absolute. And these ancient inferences from the sky of a single fundamental and universal time still dominate our present day view of time. But also implicit in the sky clock was the cyclical nature of time. Time was made of ever repeating cycles.

In time the ancients developed devices with finer temporal resolving power than those afforded by the motions of the sun and moon. Water clocks and sand clocks (hour glasses) were devised that could measure a fixed interval of time depending on the amount of water or sand transferred from an upper container to a lower container. While these measuring devices could be rendered cyclical, as by regularly refilling the water chamber or inverting the hour glass, this required the intervention of an outside agent. But without the intervention of some outside agent, the period came to an end. This had inferences that were projected into ancient religious thought: Time comes to an end. There will be an end to the present order and then some deity will come to renew the world. There will be a new Brahma, and a new life time of Brahma, A messiah will come, A savior will return and there will be a day of judgement.

In the middle ages arrived another measuring device for time: the monastery bells telling us when to rise, when to pray, to eat, to work, to return, to pray and to sleep. The bells told us that different times were appropriate for different tasks. This has evolved to our present day structuring of time with schedules, our nine to five and 7/24.

In the 14th century, mechanical clocks began to appear on towers in different cities. These clocks not only changed civil life, they changed the world view. The cyclical movement of the hands of the clock reprojected the importance of cyclicity onto life. Science, the study of the repetitive and regularly repetitive was born. The concepts of frequencies, electromagnetic waves, atomic spectra, bio-rhythms all followed. Philosophers explained the cosmos as basically being a clock. God became a clock maker.

And with century 21 arrives the digital clock. A number changeless for a brief period, then an instant of change, another number changeless for a moment, then a change, number, change, number, change,... What will this digital clock do to our view of time and to our world views? Will it make us aware that time may speed and slow, that the "now" may sometimes be short, sometimes long. And though ultimately cyclical, the parts of a cycle may not all be continuous, but mix before with after. Histeron proteron.

BMATRIX1.WPD

2003 #7

THE BARYON MATRIX

This matrix is derived from the TIME MATRIX, [T] = 1, by substituting the value of the proton mass, m_p = -23.776602 for M, and the value of the electron radius, r_e = -12.550068, for R. The table gives the values in Planck units. All entries are dimensionless quantities. To convert to time in seconds multiply entries by the Planck time, t_o = –43.268366. S is the ratio of coulomb force to gravitation at the baryon level, = 39.355880. α is the fine structure constant = –2.136835. μ is the ratio of proton mass to electron mass = 3.263909 All quantities are given as $\log_{10}$ values.

	-0.5	0	0.5	1	1.5	2	2.5	3
3		$(\alpha\mu/S)^{3/2}$		$(\alpha\mu)^2 / S$		$(\alpha\mu)^{5/2} / S^{1/2}$		$(\alpha\mu)^3$
2.5	$\alpha\mu / S^{3/2}$		$(\alpha\mu)^{3/2} / S$		$(\alpha\mu)^2 / S^{1/2}$		$(\alpha\mu)^{5/2}$	
2		$\alpha\mu/S$		$(\alpha\mu)^{3/2} / S^{1/2}$		$(\alpha\mu)^2$		$S^{1/2} (\alpha\mu)^{5/2}$
1.5	$(\alpha\mu)^{3/2} / S$		$\alpha\mu / S^{1/2}$		$(\alpha\mu)^{3/2}$		$S^{1/2} (\alpha\mu)^2$	
1		$(\alpha\mu/S)^{1/2}$		$\alpha\mu$		$S^{1/2} (\alpha\mu)^{3/2}$		$S (\alpha\mu)^2$
0.5	$1/S^{1/2}$		$(\alpha\mu)^{1/2}$		$S^{1/2} \alpha\mu$		$S (\alpha\mu)^{3/2}$	
0		1		$(S \alpha\mu)^{1/2}$		$S \alpha\mu$		$(S \alpha\mu)^{3/2}$
-0.5	$1/(\alpha\mu)^{1/2}$		$S^{1/2}$		$S (\alpha\mu)^{1/2}$		$S^{3/2} \alpha\mu$	
-1		$(S/\alpha\mu)^{1/2}$		S		$S^{3/2} (\alpha\mu)^{1/2}$		$S^2 \alpha\mu$
-1/5	$S^{1/2} / \alpha\mu$		$S / (\alpha\mu)^{1/2}$		$S^{3/2}$		$S^2 (\alpha\mu)^{1/2}$	
-2		$S / \alpha\mu$		$S^{3/2} / (\alpha\mu)^{1/2}$		S^2		$S^{5/2} (\alpha\mu)^{1/2}$
-2.5	$S / (\alpha\mu)^{3/2}$		$S^{3/2} / \alpha\mu$		$S^2 / (\alpha\mu)^{1/2}$		$S^{5/2}$	
-3		$(S/\alpha\mu)^{3/2}$		$S^2 / \alpha\mu$		$S^{5/2} / (\alpha\mu)^{1/2}$		S^3

BMATRIX2.WPD

2003-48

THE BARYON MATRIX

This matrix is derived from the TIME MATRIX, [T] = 1, by substituting the value of the proton mass, m_p = -23.776602 for M, and the value of the electron radius, r_e = -12.550068, for R. The table gives the values in Planck units. All entries are dimensionless quantities. To convert to time in seconds multiply entries by the Planck time, t_o = –43.268366. S is the ratio of coulomb force to gravitation at the baryon level, = 39.355880. α is the fine structure constant = –2.136835. μ is the ratio of proton mass to electron mass = 3.263909 All quantities are given as $\log_{10}$ values.

	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5
3	$1/ S^3$		$(\alpha\mu)^{1/2}/ S^{5/2}$		$\alpha\mu / S^2$		$(\alpha\mu/S)^{3/2}$	
2.5		$1/ S^{5/2}$		$(\alpha\mu)^{1/2}/ S^2$		$\alpha\mu / S^{3/2}$		$(\alpha\mu)^{3/2} / S$
2	$1/(S^5 \alpha\mu)^{1/2}$		$1/ S^2$		$(\alpha\mu)^{1/2} / S^{3/2}$		$\alpha\mu / S$	
1.5		$1/(S^4 \alpha\mu)^{1/2}$		$1/ S^{3/2}$		$(\alpha\mu)^{1/2} / S$		$\alpha\mu / S^{1/2}$
1	$1/ (S^2 \alpha\mu)$		$1/ (S^3 \alpha\mu)^{1/2}$		$1/ S$		$(\alpha\mu / S)^{1/2}$	
0.5		$1/ (S^{3/2} \alpha\mu)$		$1/ (S^2 \alpha\mu)^{1/2}$		$1/ S^{1/2}$		$(\alpha\mu)^{1/2}$
0	$1/ (S \alpha\mu)^{3/2}$		$1/ (S \alpha\mu)$		$1/ (S \alpha\mu)^{1/2}$		1	
-0.5		$1/[S(\alpha\mu)^{3/2}]$		$1/ (S^{1/2} \alpha\mu)$		$1/ (\alpha\mu)^{1/2}$		$S^{1/2}$
-1	$1/ [S(\alpha\mu)^2]$		$1/[S(\alpha\mu)^3]^{1/2}$		$1/ \alpha\mu$		$(S / \alpha\mu)^{1/2}$	
-1/5		$1/ [S^{1/2}(\alpha\mu)^2]$		$1/ (\alpha\mu)^{3/2}$		$S^{1/2} / \alpha\mu$		$S / (\alpha\mu)^{1/2}$
-2	$1/[S(\alpha\mu)^5]^{1/2}$		$1/ (\alpha\mu)^2$		$S^{1/2} / (\alpha\mu)^{3/2}$		$S / \alpha\mu$	
-2.5		$1/ (\alpha\mu)^{5/2}$		$S^{1/2} /(\alpha\mu)^2$		$S / (\alpha\mu)^{3/2}$		$S^{3/2} / \alpha\mu$
-3	$1/ (\alpha\mu)^3$		$S^{1/2} / (\alpha\mu)^{5/2}$		$S / (\alpha\mu)^2$		$(S / \alpha\mu)^{3/2}$	

I. TABLE OF t-TIME RATIOS Column/Row

	α^2U	SwU	$\alpha^2\bigstar$	Sw$\bigstar$	H	b	Pl	Ω
α^2U	1	α^2	$kS^{-1/2}$	$\alpha^2kS^{-1/2}$	S^{-1}	α^2S^{-1}	$\alpha^2kS^{-3/2}$	α^2S^{-3}
SwU	α^{-2}	1	$\alpha^{-2}kS^{-1/2}$	$kS^{-1/2}$	$\alpha^{-2}S^{-1}$	S^{-1}	$kS^{-3/2}$	S^{-3}
$\alpha^2\bigstar$	$k^{-1}S^{1/2}$	$\alpha^2k^{-1}S^{1/2}$	1	α^2	$k^{-1}S^{-1/2}$	$\alpha^2k^{-1}S^{-1/2}$	α^2S^{-1}	$\alpha^2k^{-1}S^{-5/2}$
Sw$\bigstar$	$\alpha^{-2}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	α^{-2}	1	$\alpha^{-2}k^{-1}S^{-1/2}$	$k^{-1}S^{-1/2}$	S^{-1}	$k^{-1}S^{-5/2}$
H	S	α^2S	$kS^{1/2}$	$\alpha^2kS^{1/2}$	1	μ^{-1}	$\alpha^2kS^{-1/2}$	α^2S^{-2}
b	$\alpha^{-2}S$	S	$\alpha^{-2}kS^{1/2}$	$kS^{1/2}$	μ	1	$kS^{-1/2}$	S^{-2}
Pl	$\alpha^{-2}k^{-1}S^{3/2}$	$k^{-1}S^{3/2}$	$\alpha^{-2}S$	S	$\alpha^{-2}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	1	$k^{-1}S^{-3/2}$
Ω	$\alpha^{-2}s^3$	s^3	$\alpha^{-2}kS^{5/2}$	$kS^{5/2}$	$\alpha^{-2}S^2$	S^2	$kS^{3/2}$	1

Note: SwU/Pl = $k^{-1}S^{3/2}$ and Pl/Ω = $kS^{3/2}$, i.e. Pl is the mean between U and Ω.

II. TABLE OF τ-TIME RATIOS Column/Row

	α^2U	SwU	$\alpha^2\bigstar$	Sw$\bigstar$	H	b	Pl	Ω
α^2U	1	α^3	$kS^{-1/2}$	$\alpha^3kS^{-1/2}$	$S^{-1/2}$	$\alpha^3S^{-1/2}$	$\alpha^3kS^{-3/2}$	$\alpha^3S^{-7/2}$
SwU	α^{-3}	1	$\alpha^{-3}kS^{-1/2}$	$kS^{-1/2}$	$\alpha^{-3}k^{-1}S^{-1/2}$	$S^{-1/2}$	$kS^{-3/2}$	$S^{-7/2}$
$\alpha^2\bigstar$	$k^{-1}S^{1/2}$	$\alpha^3k^{-1}S^{1/2}$	1	α^3	k^{-1}	α^3k^{-1}	α^3S^{-1}	$\alpha^3k^{-1}S^{-3}$
Sw$\bigstar$	$\alpha^{-3}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	α^{-3}	1	$\alpha^{-3}k^{-1}$	k^{-1}	S^{-1}	$k^{-1}S^{-3}$
H	$S^{1/2}$	$\alpha^3kS^{1/2}$	k	α^3k	1	α^3	α^3kS^{-1}	α^3S^{-3}
b	$\alpha^{-3}S^{1/2}$	$S^{1/2}$	$\alpha^{-3}k$	k	α^{-3}	1	kS^{-1}	S^{-3}
Pl	$\alpha^{-3}k^{-1}S^{3/2}$	$k^{-1}S^{3/2}$	$\alpha^{-3}S$	S	$\alpha^{-3}k^{-1}S$	$k^{-1}S$	1	$k^{-1}S^{-2}$
Ω	$\alpha^{-3}s^{7/2}$	$s^{7/2}$	$\alpha^{-3}kS^3$	kS^3	$\alpha^{-3}S^3$	S^3	kS^2	1

Note: $\alpha^2\bigstar/H = k = \sqrt{(2\pi/\alpha\mu)}$

BMATRIX1.WPD

2003 #7

THE BARYON MATRIX

This matrix is derived from the TIME MATRIX, [T] = 1, by substituting the value of the proton mass, m_p = -23.776602 for M, and the value of the electron radius, r_e = -12.550068, for R. The table gives the values in Planck units. All entries are dimensionless quantities. To convert to time in seconds multiply entries by the Planck time, t_o = –43.268366. S is the ratio of coulomb force to gravitation at the baryon level, = 39.355880. α is the fine structure constant = –2.136835. μ is the ratio of proton mass to electron mass = 3.263909 All quantities are given as $\log_{10}$ values.

	-0.5	0	0.5	1	1.5	2	2.5	3
3		$(\alpha\mu/S)^{3/2}$		$(\alpha\mu)^2 / S$		$(\alpha\mu)^{5/2} / S^{1/2}$		$(\alpha\mu)^3$
2.5	$\alpha\mu / S^{3/2}$		$(\alpha\mu)^{3/2} / S$		$(\alpha\mu)^2 / S^{1/2}$		$(\alpha\mu)^{5/2}$	
2		$\alpha\mu/S$		$(\alpha\mu)^{3/2} / S^{1/2}$		$(\alpha\mu)^2$		$S^{1/2} (\alpha\mu)^{5/2}$
1.5	$(\alpha\mu)^{3/2} / S$		$\alpha\mu / S^{1/2}$		$(\alpha\mu)^{3/2}$		$S^{1/2} (\alpha\mu)^2$	
1		$(\alpha\mu/S)^{1/2}$		$\alpha\mu$		$S^{1/2} (\alpha\mu)^{3/2}$		$S (\alpha\mu)^2$
0.5	$1/S^{1/2}$		$(\alpha\mu)^{1/2}$		$S^{1/2} \alpha\mu$		$S (\alpha\mu)^{3/2}$	
0		1		$(S \alpha\mu)^{1/2}$		$S \alpha\mu$		$(S \alpha\mu)^{3/2}$
-0.5	$1/(\alpha\mu)^{1/2}$		$S^{1/2}$		$S (\alpha\mu)^{1/2}$		$S^{3/2} \alpha\mu$	
-1		$(S/\alpha\mu)^{1/2}$		S		$S^{3/2} (\alpha\mu)^{1/2}$		$S^2 \alpha\mu$
-1/5	$S^{1/2} / \alpha\mu$		$S / (\alpha\mu)^{1/2}$		$S^{3/2}$		$S^2 (\alpha\mu)^{1/2}$	
-2		$S / \alpha\mu$		$S^{3/2} / (\alpha\mu)^{1/2}$		S^2		$S^{5/2} (\alpha\mu)^{1/2}$
-2.5	$S / (\alpha\mu)^{3/2}$		$S^{3/2} / \alpha\mu$		$S^2 / (\alpha\mu)^{1/2}$		$S^{5/2}$	
-3		$(S/\alpha\mu)^{3/2}$		$S^2 / \alpha\mu$		$S^{5/2} / (\alpha\mu)^{1/2}$		S^3

BMATRIX2.WPD

2003-48

THE BARYON MATRIX

This matrix is derived from the TIME MATRIX, [T] = 1, by substituting the value of the proton mass, m_p = -23.776602 for M, and the value of the electron radius, r_e = -12.550068, for R. The table gives the values in Planck units. All entries are dimensionless quantities. To convert to time in seconds multiply entries by the Planck time, t_o = –43.268366. S is the ratio of coulomb force to gravitation at the baryon level, = 39.355880. α is the fine structure constant = –2.136835. μ is the ratio of proton mass to electron mass = 3.263909 All quantities are given as $\log_{10}$ values.

	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5
3	$1/ S^3$		$(\alpha\mu)^{1/2}/ S^{5/2}$		$\alpha\mu / S^2$		$(\alpha\mu/S)^{3/2}$	
2.5		$1/ S^{5/2}$		$(\alpha\mu)^{1/2}/ S^2$		$\alpha\mu / S^{3/2}$		$(\alpha\mu)^{3/2} / S$
2	$1/(S^5 \alpha\mu)^{1/2}$		$1/ S^2$		$(\alpha\mu)^{1/2} / S^{3/2}$		$\alpha\mu / S$	
1.5		$1/(S^4 \alpha\mu)^{1/2}$		$1/ S^{3/2}$		$(\alpha\mu)^{1/2} / S$		$\alpha\mu / S^{1/2}$
1	$1/ (S^2 \alpha\mu)$		$1/ (S^3 \alpha\mu)^{1/2}$		$1/ S$		$(\alpha\mu / S)^{1/2}$	
0.5		$1/ (S^{3/2} \alpha\mu)$		$1/ (S^2 \alpha\mu)^{1/2}$		$1/ S^{1/2}$		$(\alpha\mu)^{1/2}$
0	$1/ (S \alpha\mu)^{3/2}$		$1/ (S \alpha\mu)$		$1/ (S \alpha\mu)^{1/2}$		1	
-0.5		$1/[S(\alpha\mu)^{3/2}]$		$1/ (S^{1/2} \alpha\mu)$		$1/ (\alpha\mu)^{1/2}$		$S^{1/2}$
-1	$1/ [S(\alpha\mu)^2]$		$1/[S(\alpha\mu)^3]^{1/2}$		$1/ \alpha\mu$		$(S / \alpha\mu)^{1/2}$	
-1/5		$1/ [S^{1/2}(\alpha\mu)^2]$		$1/ (\alpha\mu)^{3/2}$		$S^{1/2} / \alpha\mu$		$S / (\alpha\mu)^{1/2}$
-2	$1/[S(\alpha\mu)^5]^{1/2}$		$1/ (\alpha\mu)^2$		$S^{1/2} / (\alpha\mu)^{3/2}$		$S / \alpha\mu$	
-2.5		$1/ (\alpha\mu)^{5/2}$		$S^{1/2} /(\alpha\mu)^2$		$S / (\alpha\mu)^{3/2}$		$S^{3/2} / \alpha\mu$
-3	$1/ (\alpha\mu)^3$		$S^{1/2} / (\alpha\mu)^{5/2}$		$S / (\alpha\mu)^2$		$(S / \alpha\mu)^{3/2}$	

I. TABLE OF t-TIME RATIOS Column/Row

	α^2U	SwU	$\alpha^2\bigstar$	Sw$\bigstar$	H	b	Pl	Ω
α^2U	1	α^2	$kS^{-1/2}$	$\alpha^2kS^{-1/2}$	S^{-1}	α^2S^{-1}	$\alpha^2kS^{-3/2}$	α^2S^{-3}
SwU	α^{-2}	1	$\alpha^{-2}kS^{-1/2}$	$kS^{-1/2}$	$\alpha^{-2}S^{-1}$	S^{-1}	$kS^{-3/2}$	S^{-3}
$\alpha^2\bigstar$	$k^{-1}S^{1/2}$	$\alpha^2k^{-1}S^{1/2}$	1	α^2	$k^{-1}S^{-1/2}$	$\alpha^2k^{-1}S^{-1/2}$	α^2S^{-1}	$\alpha^2k^{-1}S^{-5/2}$
Sw$\bigstar$	$\alpha^{-2}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	α^{-2}	1	$\alpha^{-2}k^{-1}S^{-1/2}$	$k^{-1}S^{-1/2}$	S^{-1}	$k^{-1}S^{-5/2}$
H	S	α^2S	$kS^{1/2}$	$\alpha^2kS^{1/2}$	1	μ^{-1}	$\alpha^2kS^{-1/2}$	α^2S^{-2}
b	$\alpha^{-2}S$	S	$\alpha^{-2}kS^{1/2}$	$kS^{1/2}$	μ	1	$kS^{-1/2}$	S^{-2}
Pl	$\alpha^{-2}k^{-1}S^{3/2}$	$k^{-1}S^{3/2}$	$\alpha^{-2}S$	S	$\alpha^{-2}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	1	$k^{-1}S^{-3/2}$
Ω	$\alpha^{-2}s^3$	s^3	$\alpha^{-2}kS^{5/2}$	$kS^{5/2}$	$\alpha^{-2}S^2$	S^2	$kS^{3/2}$	1

Note: SwU/Pl = $k^{-1}S^{3/2}$ and Pl/Ω = $kS^{3/2}$, i.e. Pl is the mean between U and Ω.

II. TABLE OF τ-TIME RATIOS Column/Row

	α^2U	SwU	$\alpha^2\bigstar$	Sw$\bigstar$	H	b	Pl	Ω
α^2U	1	α^3	$kS^{-1/2}$	$\alpha^3kS^{-1/2}$	$S^{-1/2}$	$\alpha^3S^{-1/2}$	$\alpha^3kS^{-3/2}$	$\alpha^3S^{-7/2}$
SwU	α^{-3}	1	$\alpha^{-3}kS^{-1/2}$	$kS^{-1/2}$	$\alpha^{-3}k^{-1}S^{-1/2}$	$S^{-1/2}$	$kS^{-3/2}$	$S^{-7/2}$
$\alpha^2\bigstar$	$k^{-1}S^{1/2}$	$\alpha^3k^{-1}S^{1/2}$	1	α^3	k^{-1}	α^3k^{-1}	α^3S^{-1}	$\alpha^3k^{-1}S^{-3}$
Sw$\bigstar$	$\alpha^{-3}k^{-1}S^{1/2}$	$k^{-1}S^{1/2}$	α^{-3}	1	$\alpha^{-3}k^{-1}$	k^{-1}	S^{-1}	$k^{-1}S^{-3}$
H	$S^{1/2}$	$\alpha^3kS^{1/2}$	k	α^3k	1	α^3	α^3kS^{-1}	α^3S^{-3}
b	$\alpha^{-3}S^{1/2}$	$S^{1/2}$	$\alpha^{-3}k$	k	α^{-3}	1	kS^{-1}	S^{-3}
Pl	$\alpha^{-3}k^{-1}S^{3/2}$	$k^{-1}S^{3/2}$	$\alpha^{-3}S$	S	$\alpha^{-3}k^{-1}S$	$k^{-1}S$	1	$k^{-1}S^{-2}$
Ω	$\alpha^{-3}s^{7/2}$	$s^{7/2}$	$\alpha^{-3}kS^3$	kS^3	$\alpha^{-3}S^3$	S^3	kS^2	1

Note: $\alpha^2\bigstar/H = k = \sqrt{(2\pi/\alpha\mu)}$

TIME TABLE: T=T(G,M,R,ħ,c)

[T] = 1

↓M →R	0	0.5	+1	1.5	+2	+2.5	+3
+3	G^2M^3/hc^4		$\sqrt{G^3M^6R^2/h^3c^5}$		GM^3R^2/h^2c		$\sqrt{GM^6R^6c/h^5}$
+2.5		$\sqrt{G^3M^5R/h^2c^6}$		$\sqrt{G^2M^5R^3/h^3c^3}$		$\sqrt{GM^5R^5/h^4}$	
+2	$\sqrt{G^3M^4/hc^7}$		GM^2R/hc^2		$\sqrt{GM^4R^4/h^3c}$		M^2R^3c/h^2
+1.5		$\sqrt{G^2M^3R/hc^5}$		$\sqrt{GM^3R^3/h^2c^2}$		$\sqrt{M^3R^5c/h^3}$	
+1	GM/c^3		$\sqrt{GM^2R^2/hc^3}$		MR^2/h		$\sqrt{M^2R^6c^3/Gh^3}$
+1/2		$\sqrt{GMR/c^4}$		$\sqrt{MR^3/hc}$		$\sqrt{MR^5c^2/Gh^2}$	
0	$\sqrt{Gh/c^5}$		R/c		$\sqrt{R^4c/Gh}$		R^3c^2/Gh
-1/2		$\sqrt{Rh/Mc^3}$		$\sqrt{R^3/GM}$		$\sqrt{R^5c^3/G^2Mh}$	
-1	h/Mc^2		$\sqrt{R^2h/GM^2c}$		R^2c/GM		$\sqrt{R^6c^5/G^3M^2h}$
-3/2		$\sqrt{Rh^2/GM^3c^2}$		$\sqrt{R^3hc/G^2M^3}$		$\sqrt{R^5c^4/G^3M^3}$	
-2	$\sqrt{h^3/GM^4c^3}$		Rh/GM^2		$\sqrt{R^4hc^3/G^3M^4}$		R^3c^3/G^2M^2
-5/2		$\sqrt{Rh^3/G^2M^5c}$		$\sqrt{R^3h^2c^2/G^3M^5}$		$\sqrt{R^5hc^5/G^4M^5}$	
-3	h^2/GM^3c		$\sqrt{R^2h^3c/G^3M^6}$		R^2hc^2/G^2M^3		$\sqrt{R^6hc^7/G^5M^6}$

Notation: In the above table h is used for ħ, the Planck constant / 2π .

TIME TABLE: T=T(G,M,R,ħ,c)

[T] = 1

↓M →R	0	0.5	+1	1.5	+2	+2.5	+3
+3	G^2M^3/hc^4		$\sqrt{G^3M^6R^2/h^3c^5}$		GM^3R^2/h^2c		$\sqrt{GM^6R^6c/h^5}$
+2.5		$\sqrt{G^3M^5R/h^2c^6}$		$\sqrt{G^2M^5R^3/h^3c^3}$		$\sqrt{GM^5R^5/h^4}$	
+2	$\sqrt{G^3M^4/hc^7}$		GM^2R/hc^2		$\sqrt{GM^4R^4/h^3c}$		M^2R^3c/h^2
+1.5		$\sqrt{G^2M^3R/hc^5}$		$\sqrt{GM^3R^3/h^2c^2}$		$\sqrt{M^3R^5c/h^3}$	
+1	GM/c^3		$\sqrt{GM^2R^2/hc^3}$		MR^2/h		$\sqrt{M^2R^6c^3/Gh^3}$
+1/2		$\sqrt{GMR/c^4}$		$\sqrt{MR^3/hc}$		$\sqrt{MR^5c^2/Gh^2}$	
0	$\sqrt{Gh/c^5}$		R/c		$\sqrt{R^4c/Gh}$		R^3c^2/Gh
-1/2		$\sqrt{Rh/Mc^3}$		$\sqrt{R^3/GM}$		$\sqrt{R^5c^3/G^2Mh}$	
-1	h/Mc^2		$\sqrt{R^2h/GM^2c}$		R^2c/GM		$\sqrt{R^6c^5/G^3M^2h}$
-3/2		$\sqrt{Rh^2/GM^3c^2}$		$\sqrt{R^3hc/G^2M^3}$		$\sqrt{R^5c^4/G^3M^3}$	
-2	$\sqrt{h^3/GM^4c^3}$		Rh/GM^2		$\sqrt{R^4hc^3/G^3M^4}$		R^3c^3/G^2M^2
-5/2		$\sqrt{Rh^3/G^2M^5c}$		$\sqrt{R^3h^2c^2/G^3M^5}$		$\sqrt{R^5hc^5/G^4M^5}$	
-3	h^2/GM^3c		$\sqrt{R^2h^3c/G^3M^6}$		R^2hc^2/G^2M^3		$\sqrt{R^6hc^7/G^5M^6}$

Notation: In the above table h is used for ħ, the Planck constant / 2π .

TIME TABLE: T=T(G,M,R,ħ,c)

[T] = 1

↓M R→	-3	-2.5	-2	-1.5	-1	-0.5	0
+3	$\sqrt{G^7M^6h/R^6c^{17}}$		G^3M^3/R^2c^7		$\sqrt{G^5M^6/R^2hc^{11}}$		G^2M^3/hc^4
+2.5		$\sqrt{G^6M^5h/R^5c^{15}}$		$\sqrt{G^5M^5/R^3c^{12}}$		$\sqrt{G^4M^5/Rhc^9}$	
+2	G^3M^2h/R^3c^8		$\sqrt{G^5M^4h/R^4c^{13}}$		G^2M^2/Rc^5		$\sqrt{G^3M^4/hc^7}$
+1.5		$\sqrt{G^5M^3h^2/R^5c^{14}}$		$\sqrt{G^4M^3h/R^3c^{11}}$		$\sqrt{G^3M^3/Rc^8}$	
+1	$\sqrt{G^5M^2h^3/R^6c^{15}}$		G^2Mh/R^2c^6		$\sqrt{G^3M^2h/R^2c^9}$		GM/c^3
+1/2		$\sqrt{G^4Mh^3/R^5c^{13}}$		$\sqrt{G^3Mh^2/R^3c^{10}}$		$\sqrt{G^2Mh/Rc^7}$	
0	G^2h^2/R^3c^7		$\sqrt{G^3h^3/R^4c^{11}}$		Gh/Rc^4		$\sqrt{Gh/c^5}$
-1/2		$\sqrt{G^3h^4/MR^5c^{12}}$		$\sqrt{G^2h^3/MR^3c^9}$		$\sqrt{Gh^2/MRc^6}$	
-1	$\sqrt{G^3h^5/M^2R^6c^{13}}$		Gh^2/MR^2c^5		$\sqrt{Gh^3/M^2R^2c^7}$		h/Mc^2
-3/2		$\sqrt{G^2h^5/M^3R^5c^{11}}$		$\sqrt{Gh^4/M^3R^3c^8}$		$\sqrt{h^3/M^3Rc^5}$	
-2	$Gh^3/M^2R^3c^6$		$\sqrt{Gh^5/M^4R^4c^9}$		h^2/M^2Rc^3		$\sqrt{h^3/GM^4c^3}$
-5/2		$\sqrt{Gh^6/M^5R^5c^{10}}$		$\sqrt{h^5/M^5R^3c^7}$		$\sqrt{h^4/GM^5Rc^4}$	
-3	$\sqrt{Gh^7/M^6R^6c^{11}}$		$h^3/M^3R^2c^4$		$\sqrt{h^5/GM^6R^2c^5}$		h^2/GM^3c

Notation: In the above table h is used for ħ, the Planck constant / 2π .

KRONOS AND KAIROS

27.5
also see
CHRNKROS.PSI
91-101

KAIROS1b.W52 April 12, 1994

Chronos and Kairos

There are two distinct aspects of time. A description of the first is given by Omar Khayyam in the Rubiayat:

The moving finger writes
and having writ moves on,
nor all your piety nor wit
can lure it back to cancel half a line.

A description of the second is given in the Bible, Ecclesiastes 3:1-8:

For everything there is a season,
a time to every purpose under the heaven:
A time to be born, and a time to die;
a time to plant and a time to pluck what is planted.

TIME & TIMING

The Greeks had a word for each type of time. CHRONOS (ΧΡΟΝΟΣ), meaning a period, a space of time, a duration of time. This is linear time, the time measured by the clock, ever flowing forward, ticking away. Chronos stands for the quantity of time. And KAIROS (ΚΑΙΡΟΣ), meaning the right time for an action, the critical moment, the opportune season. This is cyclical time, the time that presents or denies opportunity. Kairos stands for the quality of time.

Chronos is the time of physics. The aspect of time that can be measured. It is like the metronome of the musician, or like the odometer in our car, telling us how far we have gone. Kairos is the time of being, it has never been measured. It is the rhythm, melody and harmony of the musician, or the country side through which we travel. That there is kairos, a proper time to do certain things, means that time is not an isolated or independent entity, but is related to the events that occur in it. The same is true of space. Space is not an isolated or independent container, but is related to the objects which occupy it.

While kairos was of great importance to ancient Hebrews and Greeks, its experience today is obscured by technology, urbanization, and particularly by our modern worldview. In the age of science we are imprisoned by the idea that only that which is measurable is of significance. Since the only measurable aspect of time is duration, in our worldview time has come to be regarded as having only quantity, and to assert that there is also quality to time, i.e. kairos, is regarded as unscientific.

FROM BIRDS3.WPD 2003 #19
Paul Tillich, a theologian and a deeply soulful man, described this process as Kairos: An outstanding moment in the temporal process, a moment in which the eternal breaks into the temporal — shaking, transforming it, creating a crisis at the depth of human existence.

FROM CHRISMED. 1993 # 54

II The Pagan Celebration: Relating the season to nature

- **Winter** The celebration of winter, the season of introversion and transformation. The stilled world listening to the silence of the winter stars. The scars of the earth covered with a white purifying blanket, the beauty of the earth enhanced by the fanciful masks of frost, ice, and snow. The paradox between the intimacy and otherness we feel with the crystalline world of ice and snow. And the paradox between the constraints and the empowerments it provides us. The exhilaration of the gliding world of sleighs, skis, and skates releasing us from the rotating repetitious world of wheels.

- **The Solstice** The season of darkness moves to its climax. And as in a theater when the lights grow dim, feelings of anticipation rise. Although the darkness depresses our spirits (SAD, Seasonal Affective Disorder), anticipations accompanying the turning offset it. The yule log is set ablaze and the warmth and light of the hearth sustain us through the tropos.

- **The 25th of December** Dies Natales Invicti: The Darkness is overcome, and the good news spreads that light will prevail. It is the birthday of the renewed sun. And in consequence the beginning of a new year. The victory is celebrated with trees of light, menorahs. But even so, this day is the most special day of the year. The sun reaches its maximum velocity to the east, opening the day to its greatest span. The time of maximum receptivity. Nature's time and man's time are in phase, chronos and kairos become one.

When these seasonal archetypes are merged with the aseasonal archetypes, adorned with the stories of the stable, the shepherds, and the star, a mystery of profound beauty is created., and the whole becomes far greater than the sum of the parts.

FROM TEMPDYAD 1994#12

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Creativity must have two frames of reference.--Craik
Information must have a faster rate than matter.
Is Kairos associated with density time?  Both are cyclical.
Is Chronos associated with motion time?  Both are linear.
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1993 #55

II The Pagan Celebration: Relating the season to nature

ADVENT

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YULE

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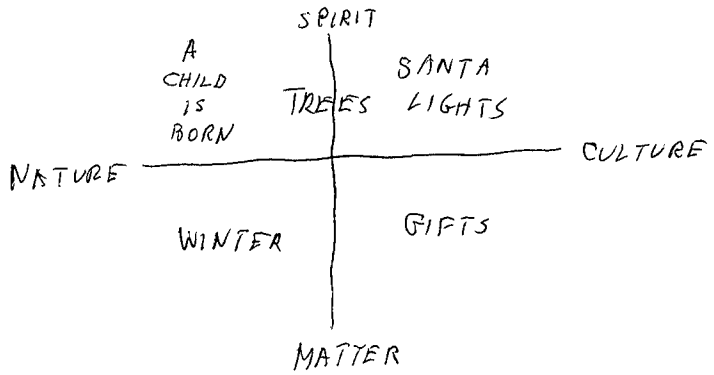
Helios Mithras Sol Invictus

When these seasonal archetypes are merged with the aseasonal archetypes, adorned with the stories of the stable, the shepherds, and the star, a mystery of profound beauty is created., and the whole becomes far greater than the sum of the parts.

cf The Empty Quadrant



ACSNOTES.WP6 December 15, 1995

NOTES FROM AGNES CRAWFORD SCHULDT'S PAPER,
THE VOICES OF TIME IN MUSIC
from The American Scholar Autumn 1976

Humans are not born with an awareness of time but acquire it slowly in childhood.

In the early Middle Ages, time moved with the sun from day to night, from planting to harvest, from birth to death.
Time was too fluid for demarcation into small units.
Recorded time was brief. By Biblical reckoning the earth was less that 5000 years old.
Eternity will follow time. Time moved toward timelessness.

Later the pace of life quickened. Time was marked by the striking of monastery bells. The day was divided into intervals. The weight driven clock was introduced toward the end of the 13th century. The 24 hours were marked.

In music at the time of Gregorian chants, the notes were shaped by the Latin text. With the coming of the clock came measures. The text was then shaped by the beats.
{[Language developed free of time, it later became subject to time. Kairos --> Chronos]}

{[When the earth was seen to move (Galileo) it followed that both time and space must be enlarged. Time extended deeper into the past and future, space became infinite.
And with the enlargement of the world, came a new sense of energy and power. The urge to explore was born.

The world is reducible to matter in motion-- Hobbes

"Give me extension and motion and I will construct the universe" --Descartes.

The use of the pendulum --> divisions into seconds.
As clocks and watches became common the pace of life accelerated.
Time was irreversible and irresistible in its steady march.
But this was only movement not development.

{[The next step was for change to go beyond Aristotle's motion only and become multi dimensional change--evolution]}
But we still measure all change by reducing it to motion based

time.

{[In the 20th century we expand and contract the interval of "NOW". The focus has narrowed to the present, to instant satisfactions, but this has had to be compensated by dilating and contracting the present.]}

The plunge into the nanosecond, had to be offset by meditative stopping of the clock.

"To absorb this century's new perceptions of time and space into our conscious minds, we need the new images that only the creative artist can find, Scientist and philosophers often say (and painters as often deny) that the abstractions of twentieth-century science have passed beyond our powers of visualization. " cf Schopenhouer and Wittengenstein

The universe is not to be narrowed down to the limits of understanding-- Bacon

Music is always there, we do not create it, we discover it"--Webern

from above
Pre Hubble:
The clock is ticking faster
and
Space is larger - expanding.

∴ redshift ~ clock rate

∴ redshift ~ Dopple

download – date - source?

Lostim~.wpd

More than three weeks have passed since the great Waterford disco ball dropped over Times Square, and most of us are taking 2007 in stride. The time is flying by, just as it does when we're having fun, approaching a deadline or taking a standardized test on which our entire future depends, though not, oddly enough, when we ourselves are flying, especially not when we are seated in the last row, near the bathrooms.

1.
But before we stuff the changing of the annum into the seat pocket in front of us and hope that nobody notices, it's worth considering some of the main astral and terrestrial events that make delightful concepts like "new year" and "another Gary Larson calendar" possible in the first place. Let's think about the nature of so-called ordinary time, the seconds, days, seasons and years by which we humans calibrate our clocks and merrily spend down our lives. As Robert L. Jaffe, a theoretical physicist at

1. **M.I.T.**, explained in an interview and recent articles in Natural History magazine, our earthly cycles and pacemakers are freakish in their moderation, very different from the other major chronometers that abound around us, but of which we remain largely unaware.

The long and short of the universe is just that, almost exclusively long and short, with the hyperclipped quantum clickings of the atom on one end and the chasmic lollygags and foot drags of the greater cosmos on the other. We terrestrial, tweener-timed life forms are the real outliers here, the kinky boots at the party.

1. So what are the public and private rhythms by which we humans abide? Our prima donna of a planet twirls on its axis once every 24 hours and so gives us our days, and as it rotates it circumnavigates the sun to sketch out our 365-day years; and because the angle of **Earth**'s spin relative to the big, flat platter of its orbit isn't straight up and down, but instead is tipped by 23 degrees, we have our seasons, our cashmere and cotton, the heartbreak of clothing moths.

These cycles have been in place at more or less their current configurations since the birth of Earth more than four billion years ago, and they have set the dials and counters of virtually all life. Every cell of the human body pulses to a circadian beat, sucking in glucose, squirting out

1. **hormones**, building up fresh proteins and breaking down stale ones, all in predictable swells and troughs throughout the day, a rhythmicity that may help explain why we love music but still does not explain the lingering popularity of Bachman-Turner Overdrive.

Elsewhere in the solar system are other worlds, taking care of their business, working their quirky times. Saturn, for example, spins as snappily as it accessorizes, completing a day in 10½ hours; but being almost 10 times farther from the Sun than we are, it needs 30 of our years to finish one of its own. Mercury, by contrast, orbits the Sun in just 88 days, but rotates a miserly one and a half times during the entire mercurial "year," which means that the side facing the sun has a chance to bake to 700 degrees Fahrenheit, while the half staring out into space turns as cold and miserable as that poor little demotee from the planetary pantheon, Pluto.

Author 2

These various blends of diurnal and annual cycles are all perfectly comprehensible, if medically ill-advised. But just as the light that we humans deem "visible" represents a tiny part of the vast electromagnetic spectrum, so the collected clocks of the solar system are a meager sampling of the universal stock of tockers. Far more action is going on below the surface, in the subatomic community. There we find events occurring in increments far briefer than classic quickies like "in a heartbeat" (i.e., about a second) or "in the blink of an eye" (a tenth of a second), and down into the realms of scientific notation blessedly leavened with Marx Brothers nicknames — intervals like the attosecond (a millionth of a trillionth of a second, or 10^{-18} second), the zeptosecond (a billionth of a trillionth or 10^{-21} second) and, my personal favorite, the yoctosecond (a trillionth of a trillionth, or 10^{-24} second). No matter the nomenclature; the duck soup is ever astir. The time it takes a quark particle to circle around inside the proton of an atomic nucleus? Midway between zepto and yocto, or roughly 10^{-22} second. For an electron to orbit the proton to which it is madly, electromagnetically attracted? A not-quite-atto-sized 10^{-16} second.

1. Fleeting does not mean flaky or unstable, however. To the contrary: the fundamental quivers of the atom "are exceedingly regular," Dr. Jaffe said, adding, "They mark the heartbeat of the universe." Atomic events are so reliable, so like clockwork in their behavior, that we have started tuning our macroscopic timepieces to their standards, and our beloved second, once defined as a fraction of a solar day, is now officially linked to oscillations in a cesium atom.

Or look to the expanding firmaments, the unspeakably protracted pace of the space race. Cosmic time is as difficult to grasp as the twitchings of the atom, but it, too, is rule bound and reliable. Galaxies and clusters of galaxies are moving away from one another in defined intervals as the space between them expands like the rubber skin of an inflating balloon. They have been sailing outward from one another for nearly 14 billion years, since the staggering, soundless kaboom of the Big Bang set this and all clocks ticking, and they will continue their dispersal for tens of billions, hundreds of billions of years more.

We are poised between the extremities and homogeneities of nature, between delirium and ad infinitum, and our andante tempo may be the best, possibly the only pace open to us, or even to life generally. If we assume that whatever other intelligent beings that may be out there, in whatever alpha, beta or zepto barrio of the galaxy they may call home, arose through the gradual tragicomic tinkerings of natural selection, then they may well live lives proportioned much like ours, not too long and not too short. They're dressed in a good pair of walking boots and taking it a day at a time. And if you listen closely you can hear them singing gibberish that sounds like Auld Lang Syne.