



CIRCUMFERENCE TO DIAMETER RATIO-PROPORTION: THE PARSIMONY AND DESIGN ELEGANCE OF NOMINATING 3.12 AS THE EXACT VALUE OF THE "PI" NUMERICAL CONSTANT COMMON TO ALGEBRA AND GEOMETRY OF THE PLANAR SURFACE

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ABSTRACT

The periodic table of the chemical elements was most intuitively understood and, perhaps most universally accessible to innovators when atoms were classified as triads of elements adjacent by atomic weight. Such classification depicts and reveals underlying order in the physical world: with concepts such as Design Elegance and Parsimony of Mathematical Equations having been widely spoken of by eminent physicists. To designate and nominate a numerical value of 3.12 arc radians as the exact value of the Circumference to Diameter ratio-proportion of a closed contour ("pi") could be a manifest travesty against mathematical exactitude: But only if adequate justification were not provided. The message of this written communication is that on account of hidden variables, the uncertain derivations that our best of science can infer about any cosmological constant: such "nominated" numerical value of $\pi = 3.12$ falls clearly within the bounds of reasoning and approximation. Furthermore, designating such 2-decimal value for "pi" might not compromise critical applications such as planning trajectory for navigation to planetary bodies of our solar system, and as well, to local stellar objects of our Milky Way Galaxy. The gains in computational speed from simplifying computer code to faster process 2 places of decimal compared to floating points of several hundred places of decimal would be significant. Also, the natural advantage that ensues from 3.12 is that polar geometry representation is enabled for the paper napkin: with a simple scientific calculator of year 1985 vintage. The author takes this opportunity to introduce the geography and history relevant to contextual understanding of circular and spiral geometry and measurement.

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INTRODUCTION

Closing the contour of an arc equidistant from a single point on a flat surface draws out a circle disc. Half of the surface area of the circle resembles the letter D in shape. Ratio-proportion of the curved portion of the D as numerator and the straight portion as denominator is designated as Pi for ALL scales of magnitude. But scale-invariance may not be a valid assumption from colloidal milk to the star-studded galaxy. Documented critical turning points on our friendly blue-green, white-cloud ridden planet; third rocky sphere (oblate spheroid) from

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Solaris, this Earth appear to indicate the presence of active agency beyond random chance occurrence, and numerous examples from archeology and evolutionary biology can be found, such as *Punctuated Equilibria*, Large scale stone monoliths such as the Sphinx and Stonehenge required remarkable geometric engineering experience and mathematical acumen that remains unexplained for the time era to which these constructions have been dated. Their dating as well, much necessarily be regarded as subject to revision because the Sphinx dates at least 5,000 years before the oldest pyramid of Egypt; and interpreting Stonehenge reveals an astronomical pointer; either pointing to a constellation/ stellar complex from which direction ancient alien astral travelers came from; or to where these same personages recommend for their bipedal progeny to travel toward: especially in that foreseeable event that life on Earth becomes unbearable for us. Seven Wonders of the Ancient World are not sufficient.

The handiwork represented by the Great Pyramid of Giza and the Sphinx is not the only fantastical handiwork of genius geometers from another solar system. Evidence-based speculations abound in books written by Erich von Daniken. The role of humanity in relation to itself and of humans in relation to the natural world, are still matters of speculation for most of us. Sharply contrasting metaphors might be commonly typical of any natural history geologist in comparison to any retail gemologist. Each of these is an expert undoubtedly: A master of the craft they have claimed. But do they know each other? Do they want to? Are they stuck at a battleground from 401 B.C.?

BIOLOGICAL EXAMPLE: THE MOLLUSK SNAIL

The most familiar biological example of spiraling circular "involute" geometry is the shiny cumulus shaped house carried upon the back of the slimy "snail" mollusk ecological phylum species. The snail is a relative of the octopus and the squid. The ease of computation by measurements of line segment length dimension placing a Caliper (Vernier Micrometer) upon a Shell of a Snail is wonder-striking. Such ease of computation does not translate to the scale of planets and stars. The painting by William Blake named for Isaac Newton has been shouting out to us: *You Are Superficial*, but we cut off an ear-lobe or two: and then someone used a toothpick for cleaning the ear canal.

ARTIFACTS OF HUMAN INNOVATION: 2,200 to 220 B.C.

In the Northern hemisphere, scholars of mathematical inquiry traveled from the farthest points East toward the Asia Minor regions surrounding the Red Sea, and process philosophy contemplated by Taoist monks became the gospel of Heraclitus. Dating back 2,200 years before Christ, the oldest technological artifacts after the boomerang and the arched stone/rock doorway have been unearthed by archeologists from near the region of Caucasian Anatolia (present day nation of Turkey) and are presently on exhibit in Saint Petersburg Russia at the Hermitage Museum. It is possible and likely these were used for focusing sunlight to generate fires for smelting during the Bronze Age.

Although Celtic symbols are older, invention of the very first systematized human script (written language) comprising numbers, and alphabet character comes from the region at or near the sovereign Nation-State of the country named, Syria. This script was later adapted to create the Arabic system of numerals. Inventor Fibonacci of Pisa introduced Europeans to Arabic Numerals, and he is famous for describing many natural phenomena as a sequence of discrete numbers: quantifying the marigold flower and the carnation on the very geometry and arithmetic sequence; that is evident to every color-blind boy of every racial ethnicity.

The Edicts of King Asoka inspired by the foul smell of rotting flesh at Kalinga (adjoining the Bay of Bengal: south-east from the Indus valley) remain inscribed to this day into a boulder rock-face in Kandahar, Afghanistan. King Asoka knew enough about international diplomacy to choose the Greco-Aramaic language of Palestine, instead of the Buddhist Pali script or Prakrit derivations of Sanskrit in Devanagiri script: for his edicts sculpted complete near about 220 years before Christ in Kandahar.

GEOGRAPHY OF DISSEMINATION: 3500 B.C. to A.D. 350

The civilization of Babylon and geographical regions adjoining the rivers Tigris and Euphrates are credited by historians and archeologists as chiefly responsible for precision circular geometry. Interesting that people of this Mesopotamian civilization settled between these watery shorelines and floods frequently irrigated their food and cash crops. Dissemination westward to Giza where the Great Pyramid stands (Egypt) would have occurred by way of Syria, Jordan, Israel and Palestine (Gaza Strip) near the land-bridge of Sinai at the northern Red Sea of Saudi Arabia, made famous by Moses the great patriarch of the Semitic people (Jews, Gentiles, Christians, Muslims, and others). The ethnicity of the great geographer Ptolemy is up for investigation.

Geometric circle factoring proficiency traveled from Mesopotamia/Persia/Iraq/Iran to other regions by equine horse-driven caravans accompanied by mountain goats such as the antelope relative: elk species. Travels in a direction North-East would have found scholars and traders in the Ural-Altai Turanian lowlands of Turkmenistan, Uzbekistan, and Afghanistan. Himalayan mountain range high peaks and dangerous crevasses (Karakoram) being a formidable climb and slippery descent; present day India would have been accessible only by boat South-East from the Persian Gulf. Merchant ships traded to and from ports such Karachi (S. Pakistan) and Surat (W. India) and Cannanore (S. India). World exploration expeditions led by personages such as Vasco Da Gama and Marco-Polo and Magellan, would have been well informed about such matters; and prepared, perhaps.

CONTEMPLATIONS ON THE 360 DEGREES CIRCLE

J Integral Divisibility of 360 Degrees

The Arc-enclosed contour, divided conveniently into 360 degrees subtends 2 "pi" radians at center: purportedly in 2 dimensions, our present day definition for the circle geometry of the alphabet "O" and the numerical zero "0." The choice of 360 degrees was ostensibly done because this integral whole number value can be described as the arithmetic product of units twelve (12) times thirty (30) while also being divisible by the unit numeral nine (9). The number nine is unique among numerals because ANY LARGE NUMERAL that is formed by way of multiplication of 9 with ANY CHOSEN QUANTITY of other integral unit numbers has the quality that THE SUM of those constituent multiplied integers ALSO REMAINS DIVISIBLE by 9. Connecting 9 to the decimal system requires no leap of faith: The next number ten (10) inherently requires an additional digit ending in zero.

J Four Quadrants and 3 Polar Coordinate Parameters

The three hundred and sixty degrees circle can be divided like a pie chart or pizza pie into typically eight slices. These 8 are cardinal directions for Polar Geometry graphic representation. Angle designated as 45 degrees of arc ($\pi/2$ arc radians) is a Meridian of Upper Right (North-East) directionality. Oblique orientations passing counter-clockwise became common revolution of a half diameter (radius) with circle center at the spatial origin (designated as the zero, zero (0, 0) point) in reference to which every circle is drawn by the geometer.

) **Flat-Space(x-y) vs Radial Plot (Origin-Radius-Theta)**

The unflinching assumptions of polar geometry are such that they DO NOT REQUIRE a flat 2-dimensional surface extending to infinity. Therefore, with "pi" equals 3.14, polar geometry will specify angle such as $\pi/2$ (1.57 arc-radians) equal to 90 degrees; and $\pi/3$ (1.04 arc-radians) equal to 60 degrees. Furthermore, $\pi/4$ (0.78 arc-radians) then equals 45 degrees; and $\pi/6$ (0.52 arc-radians) equals 30 degrees. Then also, $\pi/8$ (0.39 arc-radians) equates with 22.5 degrees; and $\pi/9$ (0.35 arc-radians) becomes 20 degrees; and finally: $\pi/18$ (0.17 arc-radians) is 10 degrees. Thus it is *EVOLVENT THAT* Flat-Space (x-y graphical plotting) loses miserably to the challenge presented from Radial-Plotting (Origin, Radius, Theta).

) **Circle Division into Sectors of a Disc**

Surface measurement of a 90 degree quadrant arc length with surface-area-mensuration of a circular disc is a common topic of interest for mechanical engineers and gear-manufacturing mold-makers and automobile technicians and motorcycle mechanics: with "disc-brakes" and "gear-ratio" being most typical. Sectors numbering 16 or 32 are created by radial lines from circumference to center. Surface area calculations can be approximated by sums of rectangles. The curved contour Arc length extremes at the periphery of a sector are marginally longer than the chord (linear segment). Thirty six (36) sectors provide a good approximation for calculating pi. Area is found by Diameter multiplied by Diameter (multiplied by pi) whole Divided by 4. When radius equals to 1, and pi equals to 3.14; then disc surface area in squared units equals $\pi \cdot (D)^2 / 4 = 1.57$. For a total of 36 sectors, there are 9 sectors for each 90-degree quadrant, and decimal notation might not be necessary for fairly accurate computation.

) **Our Conic Section Universe**

It must become apparent soon to most of us that we live and reside, as always, in a Conic-Section Universe. These example illustrations reveal that from the quarter circle 90 degree quadrant of the typical right angled triangle of Pythagoras (such as the x-y two-dimensioned graph) we can proceed veritably onward to the division of a circle into 18 equally segmented triangular sectors with each subtending 20 degrees of visual angle. Models of conic section such as the ambient optic array (of optical psychologist J. J. Gibson) convergent upon the nodal point of the eye can thereby be readily accomplished using no more than 2 places of decimal. Gibson's chapter on the Ambient Optic Array is a good take-off on point.

) **Days 366 Calendar Year of Quarterly transition**

The phenomenal work of day-night toiling ancient astronomers, such as Ptolemy in Alexandria of present day Egypt, resulted in humankind being directed by a calendar based on twelve constellations of the night sky. The decimal system of numbers came naturally to humans because we have five and five extensions from each of our 2 hands. Being bipedal and upright, our lower extremity has walked for two million years upon the soil of planet Earth. A twist of fortune apparently resides in our nearly 366 days to the Earthly calendar year: When dividing 366 by twelve, the resulting answer is thirty (30) with the remainder being one half ($1/2$) of twelve: the number six (6). Division of 364 calendar days by two yields 182 days, with further halving yields 91 days. It is

conceivable that someday the twelve (12) months of the Gregorian calendar year could be abandoned in favor of 4 Quarter-Years, each of 91 days duration. This would certainly make financial sense to bookkeeper accountants and taxation officers.

) **Assumed Left-Right Mirror Symmetry across Midline**

Notice that usage of the word-pair: *Upper Right* makes these following assumptions: (i) That distinguishing *Up* versus *Down* can be permissible by visual examination of internal geometry; (ii) That gravitational centripetal pulling ("force") can be sensed for bodily alignment; (iii) That the person making reference is located at or near the Origin of Zero, the Zero-Zero position of orthogonal axes at which polar coordinates are specified; and (iv) That the observer has the bodily property of handedness: right as opposing left hands, leading to Mirror Symmetry. Note that this human bodily midline has similar features on either side. The biological Midline appears as though it could be a most essential Bi-Directional Mirror of 50-50 Reflectance-Transmittance: located at the midline common to every vertebrate and mammalian phylum/species. And the coelenterate invertebrate Hydra also enables us to regard it as symmetric and beautiful.

) **Parsimony and Design-Elegance**

In the real world, and also in the world of mathematical abstraction, the best of scientists and statisticians tolerate a great deal of what is termed as "error" or "uncertainty." Mathematical logic depicted as Venn diagrams describe relationships in simple graphical form; and some of these might have existed among Buddhist scholars before Christ. The apparent complexity and diversity of natural phenomena hides underlying "design-elegance" and "parsimony." After the financial crash of 2009, the rudimentary science depicted on National TV broadcast shows has thus far been trite and condescending. At the other extreme, mathematical proofs and their symbolic algebra coefficients and constants are mind boggling to the average PhD that claims proficiency in the general sciences. Nobel awards from a committee in Northern Europe come to people with all kinds of esoteric claims to fame. Intermediary zones of understanding exist and this paper makes an attempt to find middle ground.

PHYSICS OF REVOLUTION

) **Heliocentric Parallax and Resistive Pulling**

At the SHORT cosmological scale of planetary orbits of our solar system, astronomical scale unit of one parsec represents a heliocentric parallax of one second of arc: noting that one degree equals 3600 seconds of arc; and that the circle is most conveniently described as the circumference subtending 360 degrees at the central point of reference. Another definition of the circumferential arc is that it constitutes the locus of adjacent points that are equidistant from the chosen central reference point.

) **Physical Sensation of Pulling Force**

For a solid object harnessed on a rope (such as a hunter's snare for killing a rabbit) the "Resistive Pulling" exerted by the hand that holds the rope can be termed Centripetal Force. This resistive pulling acts in a direction toward the "static" centre.

Releasing of this hand grip can be considered equivalent to termination of the force of gravitational pulling: leading to escape from planetary gravitation.

) **Star Equals Planet**

At a conceptual level because every planet has a spectral signature, so ANY *Stellar Object* of cross dimensionality larger than our nearby *Speckled Lunar Moon*: That stares at us for many hours of the night sky: night after night repeatedly; can be regarded as a Planetary Body. I am sure many will disagree; and I could not convince them: Even if I trained as an astrophysicist with a PhD from Stanford and a Post-Doc from Princeton, and got hired to be an instructor at Carnegie Mellon University.

) **Measuring Point-Images**

Is noteworthy and perplexing that despite advances in geometric algebra and silicon-computer based imaging technology: measurements of parallax from the vantage point of a telescope based on Earth are fraught with complicated interpretations for repeat correlation of point images. The difficulty comes from comparing brightness of the received telescope images as *Airy-Disc Point-Spread Functions*. Modeling the central bright spot of the Airy-Disc as a Gaussian has the problem that the Normal Distribution of statistical methods extends to infinity along the linear graphical axis from Minus-X over to Plus-X. This conundrum is not resolved by the more complex modeling of the Airy-Disc as a Bessel function of diminishing oscillation amplitude again extending outward to infinity: just like the surface water ripples generated when a curious girl swings a pebble into a lotus pond. *Expansive Emanations that appear to Reverberate Back-Inward: from the Source.*

) **Question of Scale and Inertia**

Escape velocity of a spacecraft would depend on navigating away from the natural pulling that comes along the radius of our planet Earth. To use terminology that includes the size and mean density of the object that wishes to escape gravitational pulling, terms such as "Moment of Inertia" have been used for describing dynamical systems at "Human Scale" magnitude. It may be that Mean Density is a more universal parametric entity than the term Force used since Newton. Combining Mean Density with Volume gives a semblance of Collision Force and Inertia.

) **Height of Human and Short Heat**

Average height of northern European humans might be near about 175 centimeters: equaling 70 inches or 5 feet and 10 inches; and the wavelength of heat rays from the Sun (infrared radiation or emission spectrum) is near about 1750 nanometers. Because one nanometer is one millionth of a millimeter, the ratio-proportion we speak of here is such fraction as the fraction constituted by 1750 millimeter in the numerator divided by denominator 1750 nanometer, equaling one million: in other words, six (6) zeros after the numerical one (1). On matters of spatial magnitude, the height of a bipedal hominid (1.75 meters) is merely six orders of magnitude (number 10 raised to exponent 6) separated from the heat emanated (1750 nanometers) by its biological human form.

) **Months 53 to Alpha Centauri**

Now getting back to the Astronomical Scale, the "SHORT" unit of one "Parsec," represents a heliocentric parallax of one (1.0) second of arc-length, which can be calculated as the sum of line segments (chord length) along the curved orbital transit pathways of planet Earth (and moon) as they together hobble/wobble around the Sun (Solaris). According to accepted specifications, one unit Parsec distance is equivalent to about 19 million miles times (multiplied by) one million. The time taken for visible starlight (say green of Greek symbol $\lambda = 510$ nm) to traverse one Parsec distance has been noted as distance would be traversed by light energy in duration of 3.26 years; converts to 39 lunar months of revolution around Earth. Alpha Centauri is about 4.3 light-years from Solaris. Months to A. Centauri triplet star at light-speed would be nearly 53. The photon rocket concept on a linear trajectory does NOT work for us: We need better.

VIDEO IMAGE COMPUTATION

1. Natural Snowflakes and Sub-Atomic Traces

The ubiquitous appearance of hexagonal geometry with angles 60 and 120 degrees in the natural world could be telling us something important. Hexagonal geometry of the honeycomb makes efficient space utilization for pollinator-insects such as the honeybee. Many cardinal parameters of crystals (both natural and lab-generated) have angles such as the 60 degree equilateral 3-dimensional geometry of tetrahedral diamond, and the 2-dimensional elemental shapes of graphite layers that easily slide upon adjacent layers.

The angular geometry of liquid water (H-O-H) ranges typically not far removed from the arithmetic summation of $\pi/2$ (90 degrees) with $\pi/8$ (22.5 degrees): 112.5; most nearly approximating recent measures averaging 109.4 degrees. Even despite the fact that snowflakes of any given geography have uniqueness attribute, their similarity of hexagonal appearance is striking to the scientific observer; and beautiful to the romantic artisan. Microsecond video image capture and processing of my winter bay-window snowflakes at 256 grey scales, for an achromatic array of 1024 by 1024 sensory element charge-coupled device (CCD) camera pixels, streamed on a Pentium (Intel Corp) desktop computer from year 1993 is certainly tedious, even for just 24 hours sampling duration.

2. Dependent Origination by Evolvent Pathway

Graphic referencing of the type mentioned here, without the assumption of a World run by Flat (2-Dimensional) People (Abbott/Rucker), has been used effectively used for many decades and is known to be a mainstay of high-school math classes and textbooks around the globe since the late 1980's. Summation of line segments for each seven day duration of Earth's Keplerian foray; the revolution-orbit-path is bumpy, and does not permit a singular point of reference for the Earth-moon system. Instead, a family or curved pathways (spirals) presents itself which can be simulated as locus of points along a curved arc that is derived from yet another arc from which this one originated. Each such curve is an "Involute" also called "Evolvent" and it can, as such, be termed an example of *Dependent Origination: Something New from Something Old from Yet Another.....Thing Original.*

) Jovian Rest Stop: Moons and Methane

If the exact numerical value of 3.12 would be chosen for numerical constant known to algebra and geometry as “pi” (circumference to diameter ratio-proportion) the descriptions of navigational space for escape from planet Earth onward to the moons of Jupiter, would become easy. The flatness we have assumed comes from planar 2-dimensional flat geometry of ancient Euclidean infamy. The “y” equals square of “x” formula describing the parabola conic section does not assume flatness of space. All it needs is a point: “Focus” and a linear: “Directrix.” A singular reference point combined with a singular linear segment thereby enables navigation using polar coordinates. Such navigation can be scaled according to planned distance to destination and orientation toward destination; and these plans can be updated periodically as the spacecraft traverses each successive milestone.

) Building Ships for Hyperspace

Both 60 and 90 degree angles in years prior have had many histories of use for necessary calculations concerning ship building and architectural planning for construction shelters. With pi- radians equal to 180 degrees, a designated numeric value of pi equaling 3.12 makes pi/2 (90 degrees) equal 1.56 radians, and pi/3 (60 degrees) becomes exactly 1.04 radians. At the scale of green light wavelength 510 nanometer, atomic collision data produce unprecedented Megabyte-volumes of involute-shaped *Shadow Curves: Partial Ellipsoids* that are processed by gargantuan computers at infinitesimal clock rate-intervals.

Can we process astral debris from onboard Image-Acquisition-Camera-System on our journey to escape the Tyco-Brahe 1572 Supernova, fast enough to engage our Plasma-Gun-Decimator?

CONCLUDING REMARKS

Voting the circle of 360 degrees as being comprised of 6.24 arc radians is the ultimate goal and futuristic objective of the present writing. Such election by the scientific, technical and engineering communities will ease visual presentation in polar coordinate graphs, making ease of representation of three standard variables instead of the standard two in 2-D representation of the x-y plane graphical data-plot. Applications for architects, engineers, and medical scientists can be imagined readily. *The future is immediately impending and it is upon us as a collective.*

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