

RS2-105: Quantum π

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Background

Researcher Miles Mathis wrote a couple of interesting papers concerning the mathematical constant, π , “What is Pi?”¹ and “The Extinction of Pi,”² where he causes considerable controversy with his conclusions that π is an *acceleration* and has a value of **4.0**, not the conventional 3.14159265. This raises an interesting point in the Reciprocal System because the RS is based on *discrete units* of scalar motion, analogous to *quanta* in conventional science. As you shrink a circle in diameter, eventually you will reach the point where the discrete boundary is reached and you end up with a square, instead of a circle. A “unit square” has a diameter of one unit and a perimeter (circumference) of four units, making the value of π to be 4.0, just as Mathis indicated in his papers.

Upon further investigation into the value of π , it was found that the answer in the Reciprocal System is “all of the above,” with the caveat that the value of π is *reference system dependent*.

As mentioned in the paper on scalar motion,³ the “units of motion” are *counting numbers* with a minimum quantity of *one*. Consecutive units therefore appear as links in a chain—solid bits of metal that can only flex at their boundaries. Larson, during his discussion on *direction reversals*, states that the only time you can change scalar direction is *at* the unit boundary, where the “links of the chain” can bend. This is radically different from the *continuum* approach of conventional science, where there are no discrete units and the structure is more like a piece of rope, able to bend at any location.⁴

Pixelation: Squaring the Circle

In our conventional, Euclidean frame of reference, there are three, orthogonal axes that we divide by fixed distance intervals. In the case of the Reciprocal System, those intervals are fixed at one natural unit of of space (or time, if cosmic). To use an old computer graphics term, our Euclidean reality is *pixelated* in a fashion similar to what computers draw on a monitor—a bunch of little boxes, not a smooth structure. Pixels have gotten really small these days, but if you take a magnifying glass to your monitor, you will see that it is composed of a bunch of dots of color and that a diagonal line actually looks like a staircase—it is not smooth. The same happens with curves—they are *approximated*, because the monitor is made of tiny, illuminated squares.⁵

Pixels are treated as a *unit*, in the sense that a blue pixel will be *all* blue; you cannot start with red on

1 Mathis, Miles, “What is Pi?”, <http://milesmathis.com/pi.html>

2 Mathis, Miles, “The Extinction of Pi”, <http://milesmathis.com/pi2.html>

3 Peret, Bruce, “RS2-104: Scalar Motion”, [http://reciprocalssystem.org/PDFa/RS2-104%20Scalar%20Motion%20\(Peret,%20Bruce\).pdf](http://reciprocalssystem.org/PDFa/RS2-104%20Scalar%20Motion%20(Peret,%20Bruce).pdf)

4 String Theory is between conventional and Reciprocal System approaches, using a continuous “rope” that wiggles to form standing waves, the discrete units of the RS. The string waves end up being $1/n$, wher “n” is a counting number.

5 LED monitors tend towards squares, whereas the older CRT monitors were dots. This was a big problem in the early days of computer graphics, as designers were accustomed to the smooth lines of a drafting board and raised a big fuss over the jagged lines of the lower-resolution displays back in the 1980s. Manufacturers eventually resorted to anti-aliasing techniques to blur the “jaggies” to make it visually appear smooth.

one side and end up with blue on the other side, in the same pixel. The entire pixel will always be the same color and intensity across its surface area. This is analogous to Larson’s “discrete unit” postulate. You can only “change color” after you exit one pixel and start another. Angled lines and curves drawn with pixels therefore appear jagged.



The rectangles are what the computer actually displays, in pixels, to make the black line that is seen on the monitor. It is optical trickery.

Consider the same situation in Nature. The observable, measurable universe is also “pixelated” because of the Reciprocal System’s *discrete unit postulate* and the absolute scaled, orthogonal, Euclidean projection. It is a grid of cubes—we just call it *quantized* rather than *pixelated*.



Now consider what happens if you try to draw a circle on a computer monitor that has a radius of *one pixel*? You get a 2×2 square, with a *circumference* of 8 units,⁶ a *diameter* of 2 units, and π , the ratio of *circumference to diameter*, is actually $8/2 = 4$ — not 3.14159, due to pixelation.

Programmers that dealt with the early computer graphics worked *at* pixel level and knew that the perimeter of a pixelated circle is $4 \times$ its diameter. This had to be accounted for when a user tried to pick a location on a circle, because it was *approximated*. With a light pen, you could select the pixel approximating the circle—near where the mathematical circle should be, but seldom exactly on it.

Discrete Structure	Radius	Perimeter	Circle/Square	π (P/2r)	π (A/r ²)
	1	8	4/4	4.00	4.00
	2	16	16/16	4.00	4.00
	3	24	36/36	4.00	4.00
	4	32	60/64	4.00	3.75

Take that unit square representing a pixelated circle and increase the radius to 2 or 3. You get a series of squares, since the curvature of the “real” circle is still too steep to clip any of the corners. As the diameter increases, “clipping” occurs as indicated by the gray squares in Radius=4, resulting in a

⁶ Assuming a 1:1, height:width ratio.

decreasing ratio of circular to square area that approaches the accepted value for π , as the radius approaches infinity. The clipped pixels are those that are entirely outside the circular area. But note that the radial-to-square area changes with radius, the *perimeter* does not, even if when following the jagged path around the clipped boxes. The perimeter is always $8r$, or $2\pi r$, where $\pi=4$.

Radius (pixels)	Square Area (pixels)	Circular Area (pixels)	π
1	4	4	4.00000000
2	16	16	4.00000000
3	36	36	4.00000000
4	64	60	3.75000000
5	100	96	3.84000000
6	144	132	3.66666667
7	196	172	3.51020408
8	256	224	3.50000000
9	324	284	3.50617284
10	400	352	3.52000000
100	40000	31812	3.18120000
200	160000	126424	3.16060000
300	360000	283892	3.15435556
400	640000	504220	3.15137500
500	1000000	787344	3.14937600
600	1440000	1133308	3.14807778
700	1960000	1542092	3.14712653
800	2560000	2013768	3.14651250
900	3240000	2548164	3.14588148
1000	4000000	3145544	3.14554400

Table 1: Quantized Area to Radius

It is this knowledge of pixelated (discrete) circles that provides a Reciprocal System understanding of Mathis' " $\pi = 4$ " concept. By assuming that the smallest quantity is a single, *discrete unit* (limit=1), rather than the smallest quantity approaching nothing (limit \rightarrow 0), you are quantizing the system into square, pixelated components where there is no such thing as a *curve*—only an *approximation* of a curve, made with stair-stepped lines of a fixed, unit-sized width. That stair-stepping adds the extra distance to the perimeter to bring π up to 4.0.

So there are actually *three different concepts* for this ratio we refer to as π :

1. Analog: circumference / diameter = 3.14159... in all cases (yin aspect). This is the mathematical value, that only exists in mathematics—not in Nature.
2. Quantized: perimeter / diameter = 4.000 in all cases (yang aspect). Due to the discrete unit (smallest quantity of one), this is the value found in the 3-dimensional, spatial coordinate system of Nature.
3. Transitional: area / radius² = 4.000 \rightarrow 3.14159... as radius $\rightarrow\infty$. This is a range of values, dependent upon radius—but note that in Nature *all quantities are finite*—there are no infinities, hence, the mathematical value for π can never be reached, since the radius (or area) will always be limited.

Acceleration and Orbital Velocity

In a universe of motion, everything is based on the ratio of motion, being speed (s/t) or energy (t/s). There are no unitless constants, such as π . So what are the units of π ?

We normally represent the calculation of speed as *distance per unit of time*, $v = s/t$, where “s” is a spatial distance. This can also be expressed as an *acceleration for a quantity of time*, $v = at$, or in natural units of space and time, $s/t = s/t^2 t$.

But going around the circumference of a circle is not the same thing as moving in a straight line, which is what these equations represent. Circular motion is referred to as an *orbital velocity*, v^2 . If we treat our equation for circumference, $C = 2\pi r$ as the equation for orbital speed, expressed in natural units of space and time, we get:

$$C = 2\pi r \quad \text{or} \quad \frac{s^2}{t^2} = \frac{s}{t^2} s$$

Where the circumference is an orbital velocity, the radius is a spatial distance and the value of 2π has units of *acceleration*.

We can therefore define acceleration in two, different ways:

1. Linear velocity over time: $a = \frac{v}{t}$ or $\frac{s}{t^2} = \frac{s}{t} \frac{1}{t}$
2. Orbital velocity over space: $a = \frac{v^2}{s}$ or $\frac{s}{t^2} = \frac{s^2}{t^2} \frac{1}{s}$

Like its yin-yang counterpart, all motion in the Reciprocal System is a relation of rotation (yin, orbital velocity) to translation (yang, linear velocity). In the material sector, rotation is in time and translation is in space. Both of these equations are natural consequences of the unit of motion concept.

Consider that with $\pi=4$, the equations become simpler and we find that Larson is already using them, though never realized that he was dealing simply with a pixelated perimeter and area. For example, the circumference is $2\pi r$, or simply $8r$. Circumference is an orbital velocity and the radius is linear (a line), so this is defining the relationship between rotation and translation, which is found in all of Larson’s 8:1 ratios concerning the electron.

Further, if we look at the area, $A = \pi r^2$ or $A = 4r^2$, we find that this is exactly the same formula that Larson uses to compute the *Periodic Table of the Elements*, $4n^2$. At a conceptual level, the definition of $\pi=4$ is stating that, in a discrete unit system (quantized), the electric rotation is analogous to the *circumference* (perimeter) and the magnetic rotation is analogous to the *area*. This also explains Larson’s choice of a 1-dimensional rotation for electric motion and a 2-dimensional (planar) rotation for magnetic motion.

This quantum π relationship will be further expounded upon in following papers, demonstrating that they are the underlying structure to electron orbitals and the atomic structure, as organized by the Periodic Table.

The Reciprocal System, being based solely on natural consequences (those found in Nature), tends to use the quantum π value of 4 in many applications. So pick your “piece of π ” by the reference system in use.