The Riemann Hypothesis Proof And The Quadrivium Theory

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"*In angello cum libello.*"

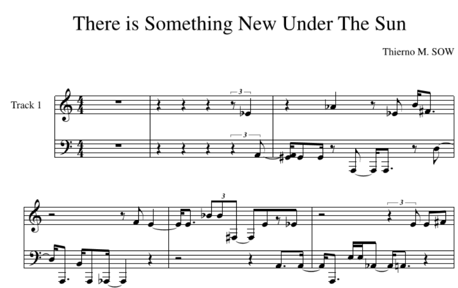
Abstract

The purpose of this article is to release an elegant proof of the Riemann Hypothesis via the Quadrivium Theory.

Mathematics Subject Classification 2010 codes: Primary 11M26; Secondary 11MXX

1 SOMETHING NEW UNDER THE SUN

The opera of the primes has been released. It's about the distribution of the prime numbers along to the Riemann zeta function. "*There is Something New Under The Sun*" is the title of this piece. Here we have a glimpse of the score.



One can watch and download the video music on youtube.

2 THE RIEMANN HYPOTHESIS

All sciences lead to Riemann and the most elegant proof of the Riemann Hypothesis can be expressed as follows: *There are infinitely many nontrivial zeros on the critical line and all these zeros have real part* $1/2$.

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Proof.

$$\frac{1}{2} + \frac{1}{p^s - 1} = \zeta(s) \tag{1}$$

where $s \in \mathbb{C}$, *and* $p \in \mathbb{P}$.

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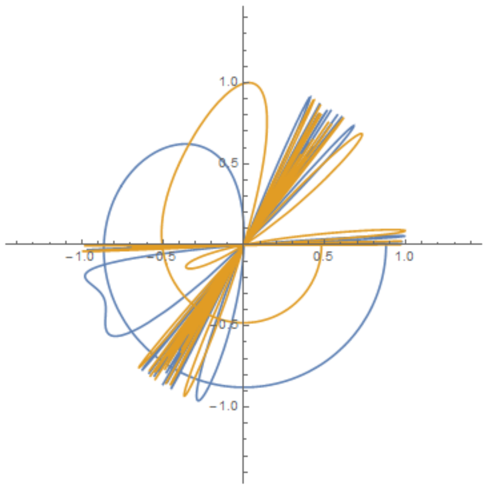
We can observe the perfect zeta function, valid on the whole complex plane, with a convergent series represented by the following polar.



Algorithm 1. Code Mathematica

```
PolarPlot[{{Cos[(tˆt + 1) / (2 tˆt - 2)]},
Sin[(tˆt + 1) / (2 tˆt - 2)]}, {t, - 2π, 2π},
PlotStyle->{Red,Directive[Dashed,Green,Orange]}, PlotRange-> All]
```

We can also define the Riemann zeta function in many different ways.
Proof.

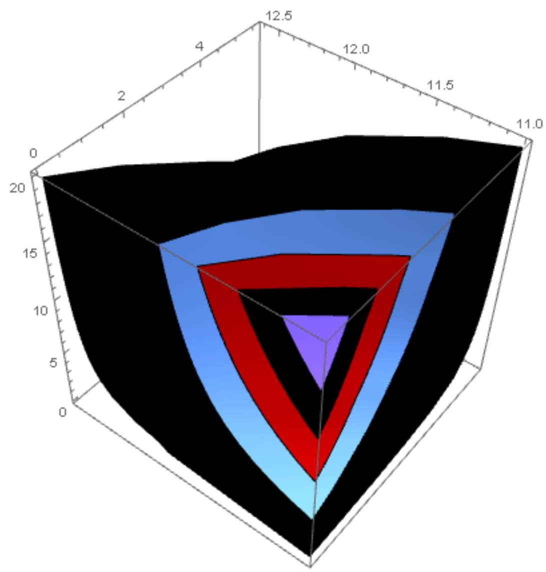
$$\prod_{k=1}^{\infty} \frac{s}{2\left(p_k - 1\right)} = \zeta(s) = \sum_{n=0}^{\infty} \frac{1}{2} p^n (-1) s \tag{2}$$

where p_k *denotes the* k *n-th* $\mathfrak{prime}$.

It is specially true for all cases for which the Riemann zeta function appear to be an infinite holographic function. Indeed, we assume, under suitable conditions

$$\prod_{p}^{\infty} \left(\frac{1}{2} + \frac{1}{p^{\left(\frac{1}{2} + \frac{1}{p^z - 1}\right)} - 1} \right) = \zeta(s) \tag{3}$$

where $s = \frac{1}{2} + \frac{1}{p^z - 1}$, $z = \frac{1}{2} + \frac{1}{p^{z_1} - 1}$ and $z_n = \frac{1}{2} + \frac{1}{p^{z_{n+1}} - 1}$.
We can illustrate the situation by the following plot :



Algorithm 2. Code Mathematica

```
ListContourPlot3D[Table[n^y + z / 2 n^y - 2 z,{n,-2,2,0.2},{y,-2,2,0.2},{z,-2,2,0.2}],
Contours->5, Mesh->None, ContourStyle->{Black,Diamond,Red}]
```

3 THE NEXT PRIME

If $p > 3$ is prime then there exists x and O integers such that

$$\underbrace{\frac{2^p - 2}{x}}_{\equiv 0 \pmod 2} = O \tag{4}$$

and p divides O.

■

4 SOWING THE SEEDS OF PRIMES

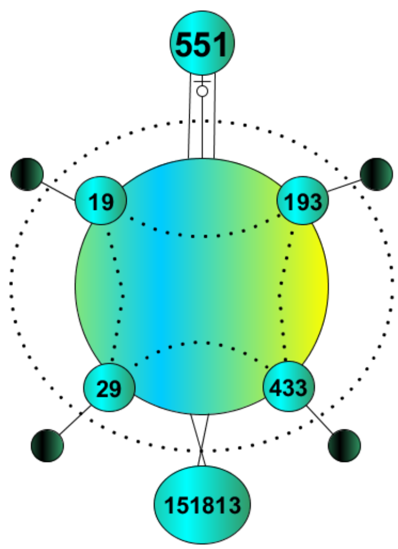
To build an infinite tree of primes we need to consider the following sequence for any given integer $n = pq$ and α as any factor of n such that

$$\frac{n^2 + (\beta\alpha)^2}{2\alpha^2} = \mathfrak{prime} \tag{5}$$

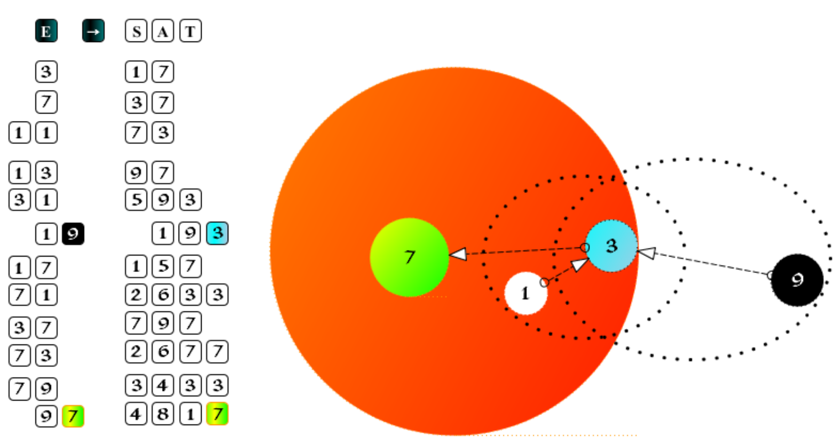
where $\beta \equiv 5 \pmod{10}$ corresponds to the gear.
We can also replace n by any prime and α by 1 such that for $p = 3$ we have

$$\frac{3^2 + 5^2}{2} = 17 \tag{6}$$

For example with $n = 551$ we have the following constellation of primes

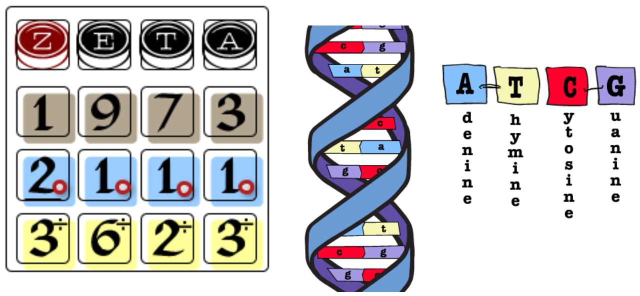


Which means that every prime number has its own satellite which is also prime. Likewise the distribution of the prime numbers depends on the last digit. We can illustrate the situation as follows:



5 THE DNA OF PRIMES

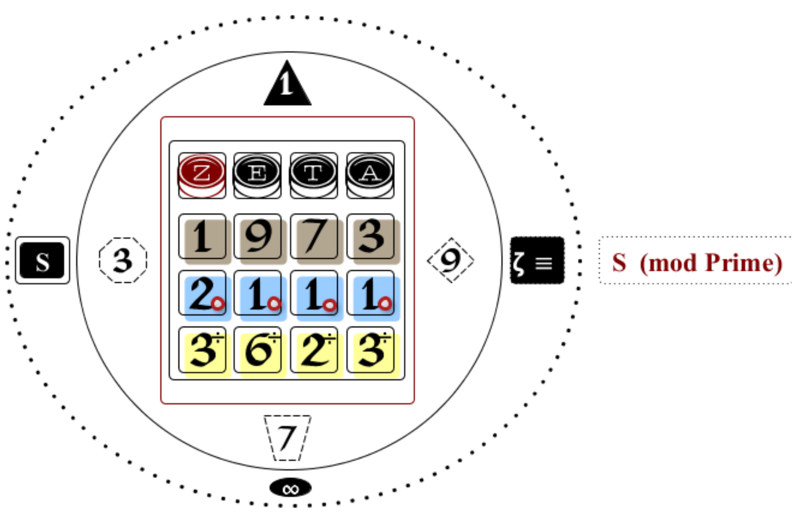
As we saw it previously, the distribution of the primes depends on the last digit. Then, there exists four classical basis as well as for the DNA. We can illustrate the situation as follows:



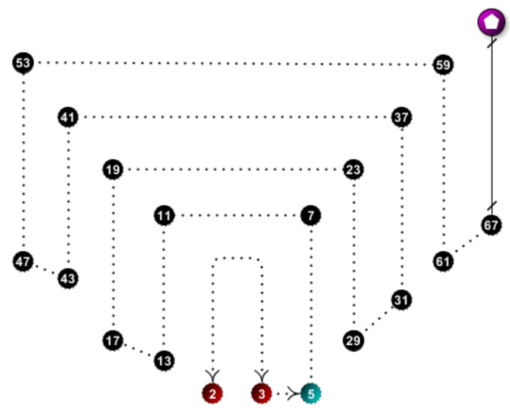
Indeed, there exists a special zeta function for which the distribution of the primes follows only some specifics values. The special zeta function is on the form:

$$sf = p + \epsilon \tag{7}$$

where $f = \dfrac{5}{6}$ corresponds to the constant of the light and p is prime. This function is an elegant proof of the Einstein's theory on the light bends. The modular distribution of the primes can be expressed as follows:

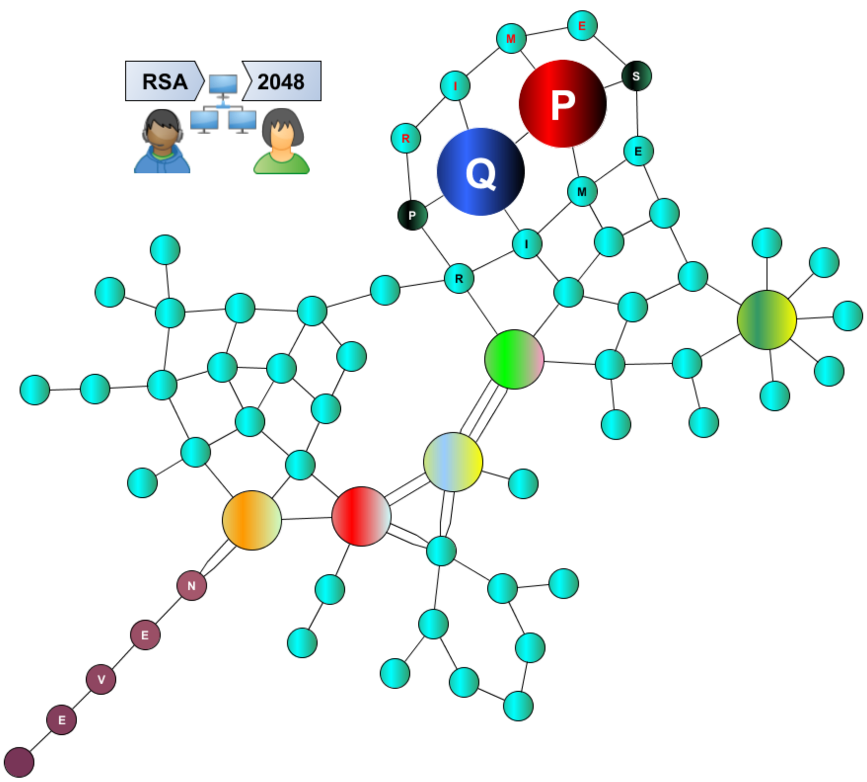


If the last digit of the prime is 1 then $\epsilon = \dfrac{2}{3}$ and so on...
The first gates of primes can be illustrate as follows:



6 FACTORING IN $O(\log(n))$

The RSA set $n = pq$ can be expressed as follows:



Searching p and q for the large numbers, it's like looking for a needle in a haystack but, for the crafty mathematicians, the situation is not all doom and gloom. In the other hand, we know that the sinews of war is about cryptography.

Exercice 1

$$n = \frac{x^2 + x - 2xy}{6} \tag{8}$$

and

$$p = \sqrt{\frac{n + p\,(y - 1)}{2^x}} \tag{9}$$

Algorithm 3. Code Mathematica

```
n=RSA-220
FindInstance[\[Sqrt]((n + (p (y - 1))) / (2^363)) == p && y > 2^728 &&
Mod[y, 2] == 0 && y < n && n == p q && p > 2^365 && p < 2^375 &&
Element[p,Primes] && Element[q,Primes], {p, q, y}, Integers, 1]
```

Exercice 2

$$\frac{\frac{n-1}{2} \pm 2^a - 2^b}{c} = p \tag{10}$$

$c < 2^\alpha$and $1 < \alpha < 11$.

Algorithm 4. Code Mathematica

```
n=RSA-220
FindInstance[(((n - 1) / 2) - (2^a - 2^b)) / c == p && c > -20 && c < 20 &&
n == p q && Element[p,Primes] && Element[q,Primes] && a >= 0 && a <=
700 && b >= 0 && b <= 700, {p, q, a, b, c}, Integers, 1]
```

Exercice 3

$$\frac{n - z}{q} = 2^x \tag{11}$$

Algorithm 5. Code Mathematica

```
n=RSA-220
FindInstance[((n - (z)) / q) == 2^98 && Mod[z, q] == 0 && n == p q &&
Element[q,Primes] && Element[p,Primes] && q > 0 && z > 0 && z < n, {p,
q, z}, Integers, 1]
```

Exercice 4

$$\frac{q\,(x-q-20)}{n}=2^3 \tag{12}$$

and

$$\sqrt{q\,(x-20)-2^3 n}=q \tag{13}$$

Algorithm 6. Code Mathematica

```
n=RSA-1024
FindInstance[((q (x - q - 20) )/ n) == 2^3 && n == p q && Element[q,Primes]
&& Element[p,Primes] && x > 0 && x < n && q > 0, {p, q, x}, Integers, 1]
```

Exercice 5

$$\frac{n}{2^x q}=\frac{9}{16}-\frac{y}{2^x} \tag{14}$$

and

$$\frac{n}{2^x p}=\frac{3}{4}-\frac{y}{2^x} \tag{15}$$

Algorithm 6. Code Mathematica

```
n=RSA-1024
FindInstance[((9 / 16) -(n / (p 2^4))) == (y/ (2^4)) && n == p q && y < 0
&& p > 0 && Element[p,Primes] && Element[q,Primes], {p, q, y}, Integers, 1]
```

7 FACTORING AND THE ZETA FUNCTION

If $n = pq$ then there exists a complex number s on the form:

$$\sqrt{\frac{n}{2^x p}+\frac{n}{2^x q}}=\sqrt{\frac{y}{2^{x-2}}}=\sqrt{s} \tag{16}$$

which means that the simplest expression of the Riemann zeta function is:
Theorem 2.

$$\prod^{\infty}\sqrt{s}=\zeta(s). \tag{17}$$

8 RIEMANN $\pi(N)$ AND THE SERIES

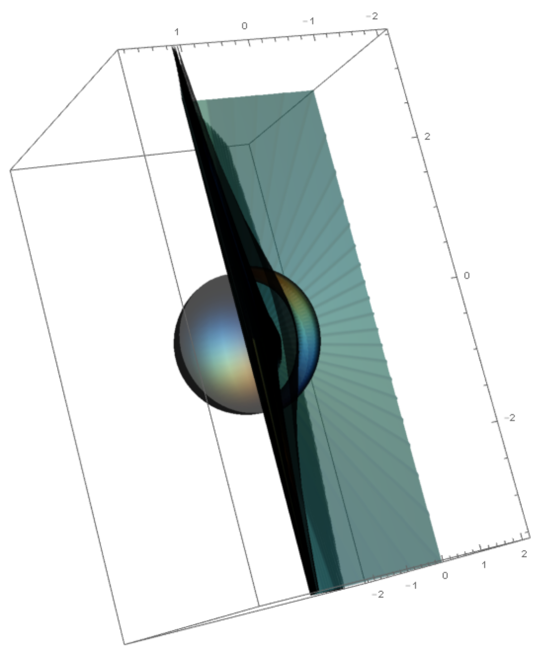
$$\lim \sum_{n=1}^{\infty} \frac{1}{(2n+2)^{\frac{n^2+1}{4}}} = \frac{3}{5} + \epsilon = 0.6120711199366587 \tag{18}$$

Algorithm 7. Code Mathematica

```
NSum[1/(2n+2)^((n^2+1)/4),{n,1,Infinity}]
```

9 RIEMANN AND THE MODERN PHYSICS

The most important contribution of the Riemann Hypothesis to the Modern Physics may be thought as the deep connections between the Riemann zeta function and the complex structure of a Black Hole. We can illustrate the situation as follows:



Algorithm 8. Code Mathematica

```
SphericalPlot3D[1+Cos[φ^φ] / (2 φ^φ - 2),{θ,0,π},{φ,0,2π}, PlotStyle-> Directive[Black,Opacity[0.7], Specularity[White,10]], Mesh->None, PlotPoints->30]
```

10 π DECODED?

There are finitely many primes a, b, c, d and e satisfying

$$\pi \approx \sqrt{a}\left(\frac{b+c}{10^d}\right) + 1.10^{-e} \tag{19}$$

For instance

$$\pi \approx \sqrt{3}\left(\frac{2+181379359069}{10^{11}}\right) + 1.10^{-5} \tag{20}$$

■

References

[1] Riemann, B. *On the Number of Primes Less Than a Given Magnitude.* Monatsberichte der Berliner Akademie, November 1859. Translated by David R. Wilkins, 1998.

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