‘(St)ringy’ proof the Poincaré Conjecture

Kohji Suzuki*

kohjisuzuki@yandex.com

Abstract

We prove the Poincaré Conjecture using ‘(st)ring theory’.

’. . . to prove the ”Poincaré Conjecture” —— it’s the most famous problem in low-dimensional topology, unproved for more than sixty years . . . ultra-hyper-difficult! ’
—— Doxiadis, A., “Uncle Petros & Goldbach’s Conjecture,” Bloomsbury 2010 p160.

1 Introduction

We test the idea that we might be able to prove the celebrated PC using ST, if by ‘forgetting’ the so-called SUSY , about which we have been compelled to be skeptical since around 2011, when some experimental results were released from the Large Hadron Collider , we restrict our attention to a ‘humble’ string, or a string devoid of SUSY, and try to employ, as it were, ‘elementary’ methods. Instead of SUSY, we postulate OS-derived PS and HS, which looks as if it were subplanckian stuff, can explain some known particles at least conceptually, though stuff that is literally subplanckian is almost inconceivable in terms of *physics*. Furthermore, we hypothesize that spin -$\frac{n}{4}$, where n = 1, 3, 5, 6, 7, and 8, particles exist. Since ring-like structure frequently appears in this preprint, it seems sensible for us to imagine that we are engaged in some field of ‘(st)ring theory’, from which the title of this preprint comes.

Abbreviations: CS, Closed string; HS, Hemistring; ℓ_p, Planck length ; MI, Mathematical induction ; OS, Open string; PC, Poincaré Conjecture ; PS, Photon sphere; ST, String theory ; SUSY, Supersymmetry .

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* Protein Science Society of Japan

2 Theoretical background

2.1 How OS forms a sphere -like object

Starting from an OS, we get a PS as follows:

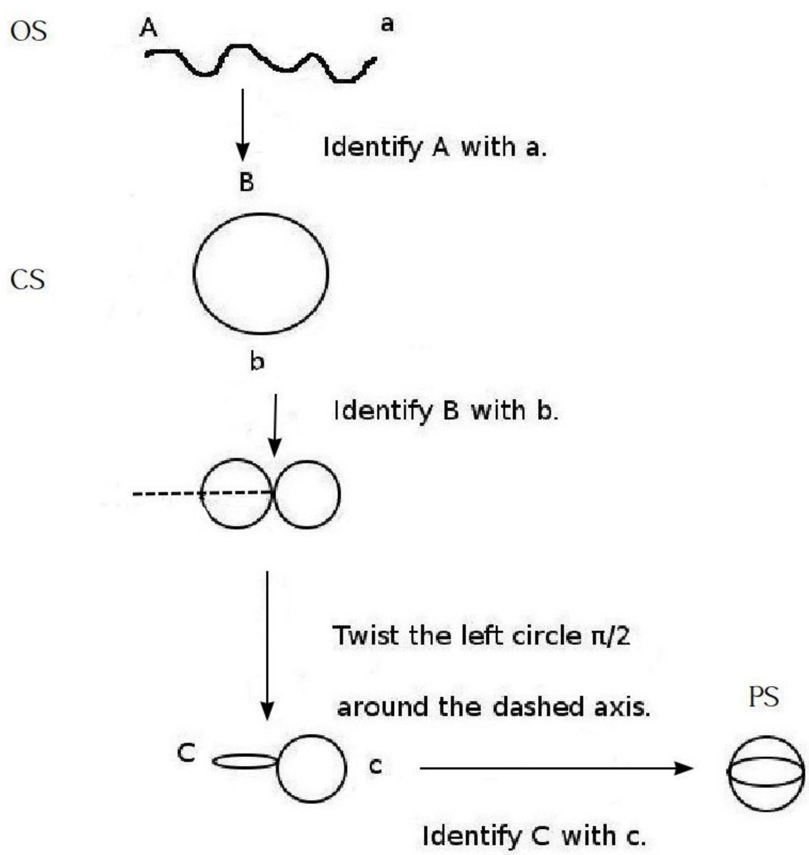

Fig. 1. From OS to PS [1]

We denote the radius of PS in Fig. 1 by r and set $r = \frac{\ell_{\mathrm{p}}}{4\pi}$, Then, r is subplanckian. Nevertheless, PS is made up of two circles whose total length is $2 \times \ 2\pi r \ = 2 \cdot 2\pi \cdot \frac{\ell_{\mathrm{p}}}{4\pi} = \ell_{\mathrm{p}}$, which can ‘reproduce’ ℓ_{p}, the minimal spatial scale of physics . Mathematically, PS is denoted $S^1 \ovee S^1$ [2] .

[1] Identifying B with b has been inspired by ‘collapsing’ a space-time diagram , which will be discussed elsewhere.

[2] The symbol $\ovee$ comes from the combination of the unit circle S^1 and $\vee$, the wedge product . *Cf.* Figure 2.4 in [1]. By the way, the exterior product $\wedge$ can be called the wedge product, though $\vee$ is clearly different from $\wedge$ [2].

2.2 How PS yields HS

We are going to 'fathom $\frac{\ell_p}{2}$'.

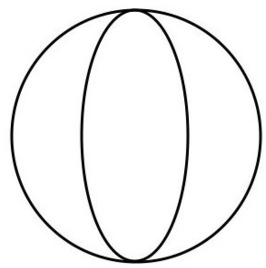

Fig. 2. PS ready to form HS

We let the two circles in Fig. 2 and their ' circumsphere ' represent the wave function and particle of photon (γ), respectively, which explains wave-particle duality . Each circle in Fig. 2 is mobile around the dashed axis in the left of Fig. 3 and can thus form the object in the right, which we call HS, since overlapping of such two circles gives a new circle whose circumference seems to be $\frac{\ell_p}{2}$.

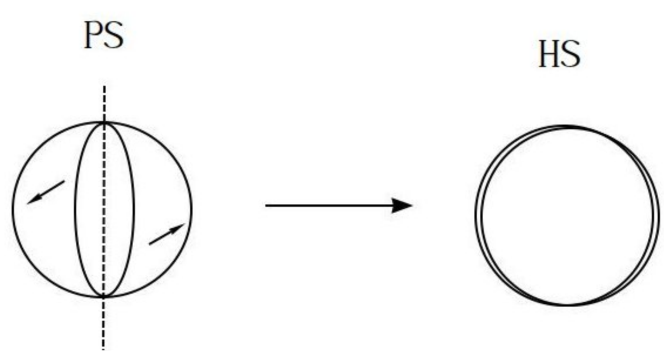

Fig. 3. PS forming HS

2.3 An assumed correspondence

We *a priori* introduce the following:

Table 1. A certain mathematico-physical correspondence

Particle	Spin	Number system	n-sphere
Higgs	0	?	?
?	$\frac{1}{4}$	$\mathbb{R}$	S^0
Lepton, quark, etc.	$\frac{1}{2}$	$\mathbb{C}$	S^1
?	$\frac{3}{4}$	?	S^2
γ, gluon (g), etc.	1	$\mathbb{H}$	S^3
?	$\frac{5}{4}$	?	S^4
?	$\frac{3}{2}$	?	S^5
?	$\frac{7}{4}$	?	S^6
Graviton	2	$\mathbb{O}$	S^7

Accompanying structure
?
$x^2 - xy + y^2 = \frac{1}{4}$
$x^2 + y^2 = 1$
$x^2 + xy + y^2 = \frac{3}{4}$
$w^2 + x^2 + y^2 + z^2 = 1$
$x^2 + xy + y^2 + yz + z^2 + zx - 2xyz = \frac{5}{4}$
$u^2 + v^2 + w^2 + x^2 + y^2 + z^2 = 1$
$x^2 + xy + y^2 + yz + z^2 + zx + 2xyz = \frac{7}{4}$
$s^2 + t^2 + u^2 + v^2 + w^2 + x^2 + y^2 + z^2 = 1$

N.B. '?' denotes something that is hypothetical, unknown, or whatever, at the time of writing.

Then, we see that

- spin-$\frac{n}{4}$ corresponds to $\mathbb{R}^n$, for $n = 1, 2, 4$, and 8 [3] ;
- spin-$\frac{n}{4}$ corresponds to $\mathbb{S}^{n-1}$, for $n = 1, \ldots, 8$;
- $x^2 - xy + y^2 = \frac{1}{4}$ suggests $(\pm\frac{1}{2})^2 - (\pm\frac{1}{2})^2 + (\pm\frac{1}{2})^2 = \frac{1}{4}$;
- $x^2 + xy + y^2 = \frac{3}{4}$ suggests $(\pm\frac{1}{2})^2 + (\pm\frac{1}{2})^2 + (\pm\frac{1}{2})^2 = \frac{3}{4}$, etc.

Moreover, because γ, g, and so forth are regarded as quaternion ic, equating spin-1 with $a + bi + cj + dk$, we assign spin-$\frac{1}{4}$ to each basis element . This enables us to write $1 = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$, which

[3] For example, $\mathbb{R}^2$ is regarded as $\mathbb{C}$.

leads us to hypothesize that spin-$\frac{1}{4}$ and -$\frac{3}{4}$ $(= \frac{1}{4} + \frac{1}{4} + \frac{1}{4})$ particles exist [4] .

2.4 Dimensional reduction (DR): Culminating in '(st)ringy' proof of PC

Now we treat the ' circumsphere ' of PS as S^2, a sphere in 3D space . Then, since γ corresponds to S^3, which is considered equivalent to the unit quaternion [5] , such a 'trick' is tantamount to the reduction of dimension like $S^3 \to S^2$ (or $\mathbb{R}^4 \to \mathbb{R}^3$), which we call DR. Applying DR to PC, we can reduce the $n = 3$ case to $n = 2$, which is trivial .

□

3 Letting PS explain other spin-1 particles than γ

We would like to extend our theory to g and Z boson (Z).

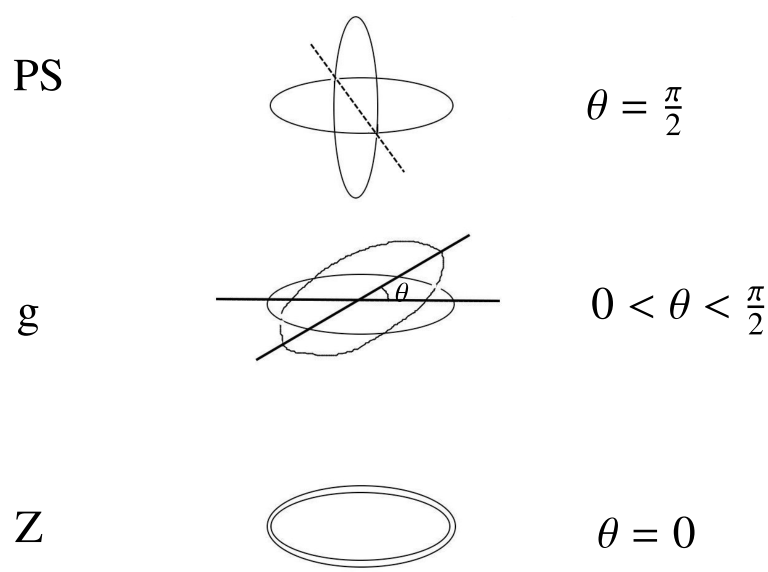

Fig. 4. PS forming g and Z

As shown in Fig. 4, we rotate a circle around the dashed line, θ being the angle defined by the two circles. PS can yield 'eight types of g's' by decreasing θ in a discrete manner like $\theta = \frac{\pi}{2} \to \frac{4\pi}{9} \to \frac{7\pi}{18} \to \cdots \to \frac{\pi}{9} \to \frac{\pi}{18}$. It can also yield Z, when θ reaches 0.

[4] We refer to the (trivial) existence of spin-$\frac{1}{2}$ particles, if we write $\frac{1}{2} = \frac{1}{4} + \frac{1}{4}$.
[5] See **Table 1**.

4 Discussion

If we wish, we can think of 'dimensional accretion' (DA), the counterpart of DR, which can be used as follows:

PC holds for $n = 2$. (a 'trivial fact')

$$\downarrow$$

It follows from DA that if PC holds for $n = k$, so does it for $n = k + 1$.

$$\downarrow$$

Therefore, PC holds for all $n \geq 2$, *i.e.,* 2, 3, 4 . . . .

As is well-known, the case $n = 3$ remained , which hampered the possibility of discussing PC exhaustively. However, once we adopt DA, all cases can be proven in a rather simple way, as if we employed MI. By the way, though perhaps proving PC is one of the easiest applications of '(st)ring theory', generalized PC is . . . .

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References

[1] Dodson, C. T. J. and Parker, P. E., "A User's Guide to Algebraic Topology," Kluwer Academic Publishers 1997 p20.

[2] Hassett, B., "Introduction to Algebraic Geometry," Cambridge University Press 2007 p191.

[3] Smolin, L., "The Life of the Cosmos," Oxford University Press 1999 p41.

5 Appendix: Dealing with fermions

Let us take the neutrino (ν), a spin-$\frac{1}{2}$ particle , for example. We now consider it to have a mass , though whether the mass of ν is > 0 was once inconclusive [3]. So we interpret losing two self-intersections of PS in Fig. 4 as endowing Z with a certain mass. Following this kind of reasoning, in Fig. 5, we present a model, in which PS loses just one self-intersection. This model is expected to explain the mass acquisition mechanism of ν.

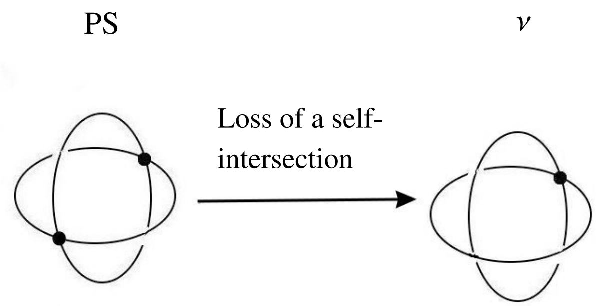

Fig. 5. Possible mass acquisition mechanism of ν

The reported morphology of electron, which *appears* spherical (italics added), might reflect one more loss of self-intersection in the right of Fig. 5 that results in the electron mass heavier than ν .