

The structure of the string in mathematical principle of nature philosophy

Foreword

If string theory unifies quantum mechanics and general relativity, the applicable objects of string theory should include microscopic particles and the macrocosm. The greater time span of the universe phenomenon, the more probability that phenomenon contains geometrical symbol that can show the string structure.

Theoretical physicist S. Hsu and A. Zee discussed in a paper [arXiv:physics/0510102](https://arxiv.org/abs/physics/0510102) *"We argue that the cosmic microwave background (CMB) provides a stupendous opportunity for the Creator of universe our (assuming one exists) to have sent a message to its occupants, using known physics"*.

The cosmic microwave background radiation is such a cosmic phenomenon that has barely changed over time. If we can find evidence from known cosmic microwave background radiation, string theory can be scientifically proven.

It should be arisen the theoretical solution to observe the universe before compare experiment result.

In order to "observe" the real universe theoretically, the following five effects must be eliminated.

- 1) The limits of the universe itself (how big is the universe outside?),
- 2) Deviation of quantum level (what's the quantum size in observation),
- 3) Dimensional deviations (how much dimensional does the universe has? Is the universe represented differently in different dimensions?),
- 4) The spatial deviation of the object itself (how big the universe itself is)
- 5) The space motion deviation of Observation itself (does observation behavior cause deviation?)

We can find the solution to observer the strings, if we can eliminate the last five effects above.

By certain geometrical change rules of the space in nature philosophical theory, the article arise the solution to observe the string. In the article it build the structure mold in 2-D expression by projected high dimensions (three and above dimension). Compare the mold there is an obvious structure of B-mold polarization transfer and rotation in Cosmos Microwave Background radiation. It proofed the existence reality of the string in space geometry.

Contents

Chapter 1, the main logic built by ten propositions.

The first seven propositions eliminate the last five effects:

1. The limits of the universe itself (how big is the universe outside?),
2. Quantum level deviation (what's the quantum size),
3. Dimensional deviations (how much dimensional does the universe has? Is the universe represented differently in different dimensions?),
4. The spatial deviation of the object itself (how big the universe itself is),
5. The space motion deviation of Observation itself (does observation behavior cause deviation?)

And the last three propositions propose the solve method in theory.

Chapter 2, the expand process of the theoretical solve method on the last three propositions in chapter 1.

Based on a unified system background, project the 3-D expression of the geometrical space-change onto 2-D expressions, and it get the potential space-change geometry on a relative stable 2-D expression, it is a 2-D expression that is overlapped other higher dimension expressions.

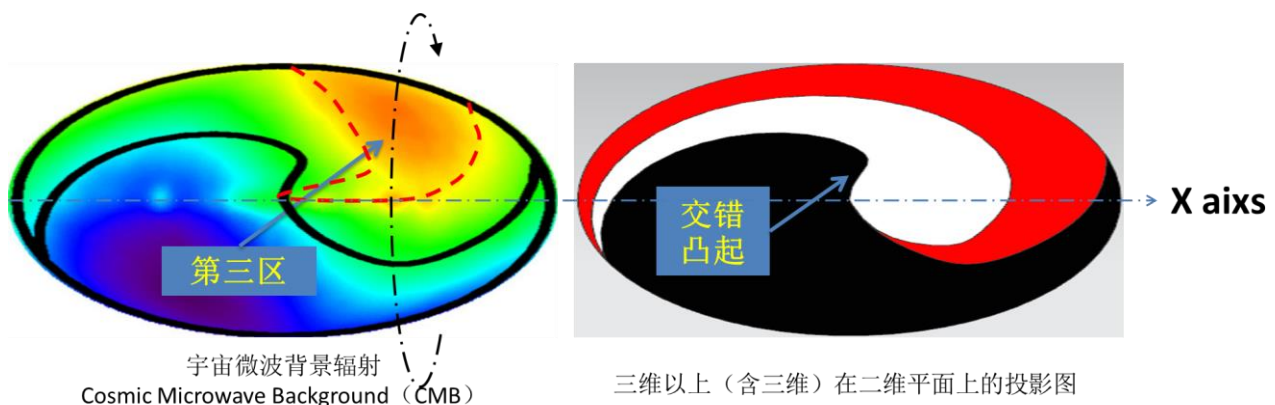
Chapter 3, why the cosmos microwave background radiation contains the symbol of the string

The strings theory unites the quantum mechanics and general relativity. What exactly suitable object of the string theory are **Microscopic particles and Macro Universe**. It can't catch the tiny particle sign phenomenon of the string theory by the modern experiment equipment. Therefore it should change the thinking mind to understand the string theory by macro universe of general relativity. And the string theory is suit for every moment of the universe, **so the bigger time span of the universe phenomenon it is, the more opportunity to show the sign phenomenon of the strings theory in the stable phenomenon of the universe itself**. The Cosmos Microwave Background radiation doesn't change since it been until it gone away. **If the universe contains the sign phenomenon of the string theory, it should be hidden in the Cosmos Microwave Background radiation.**

Chapter 4, B-mode polarization rotate around axis X in CMB, it's the falsifiability of string.

Through the relativity between the original gravitational wave and the electromagnetically polarization, it confirm the rotation hidden in Cosmos Microwave Background radiation by left-hand rule and right-hand rule. Compare the relative changeless 2-D expression projected from higher dimension expressions; the structure of the cosmos microwave background radiation (which is published by NASA) has the rotate difference surround axis X on the third area.(because the last two area represents L1 and L2, and L1+L2 represent the changeless background L0, so the last two area doesn't rotate).

It is the evidence of B-mode polarization in the cosmos microwave background radiation. Also it is the evidence of the string's existence in realization.



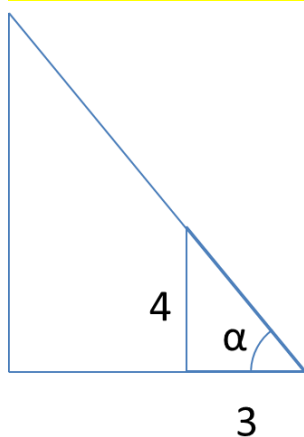
Chapter 5, what's the definition of the string. And what's the author's understanding of four philosophy reasoning rules of <mathematical principle of nature philosophy>

Chapter 1, Ten Propositions of logic framework

(Proposition 1) the expression of space structure, it not only avoid the limit issue, but also the quantum size issue.

A triangle with edge length 3 and edge length 4, there is the expression $\tan \alpha = 4/3$. In mathematics the number $4/3$ it is an infinite loop expression, it can't be an absolutely precision. But in space structure, it is an exactly clear expression. So it avoids the limit issue. Any similar triangles could be represent the expression $\tan \alpha = 4/3$, and it ignore the exact size of the similar triangle in real. So it avoids the quantum size issue.

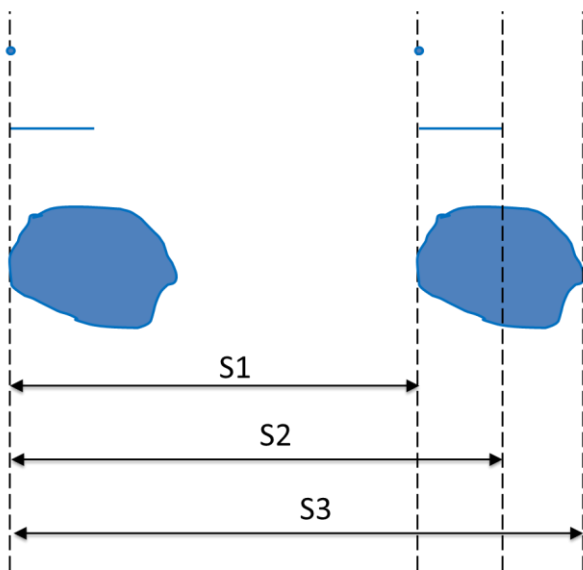
By proposition 1, it can scale the universe into **any certain** size we defined, meanwhile **keep the space structure of inner universe**. It avoid the up-limit of the question "how big the universe it is?"



(Proposition 2) By the expression of space's change, it eliminates the space deviation of object itself, also it eliminate the space deviation in different dimensions.

As figure, a point (represented by 0-D), a line segment (represented by 1-D), a body (represented by 3-D), these three objects moved space S_1 . Because the space of themselves are different each other, the expression of the whole space range are different as $S_1 \neq S_2 \neq S_3$. Obviously the space of object itself, it affects the space expression range. But the space-change of these three objects all are S_1 , they are completely same. Obviously **whatever space size of object itself, it doesn't affect the space-change of object**. In further mean whatever the dimensions expression it is in (such as 0-D point, 1-D line segment, 3-D body and so on), the change of space are same.

By proposition 2, it avoids the exact dimension and size of the quantum and universe. Whatever the size of quantum or universe it is, the change of space can be represented by a point. **One core of the theory in article: the final geometrical structure, it is the expression of the space-change.**



(Proposition 3) On each position of a point, there are infinite possible directions of potential changing.

The space is continuous, while the quantum not. The direction of space changing, it is not same with the motion's direction of quantum.

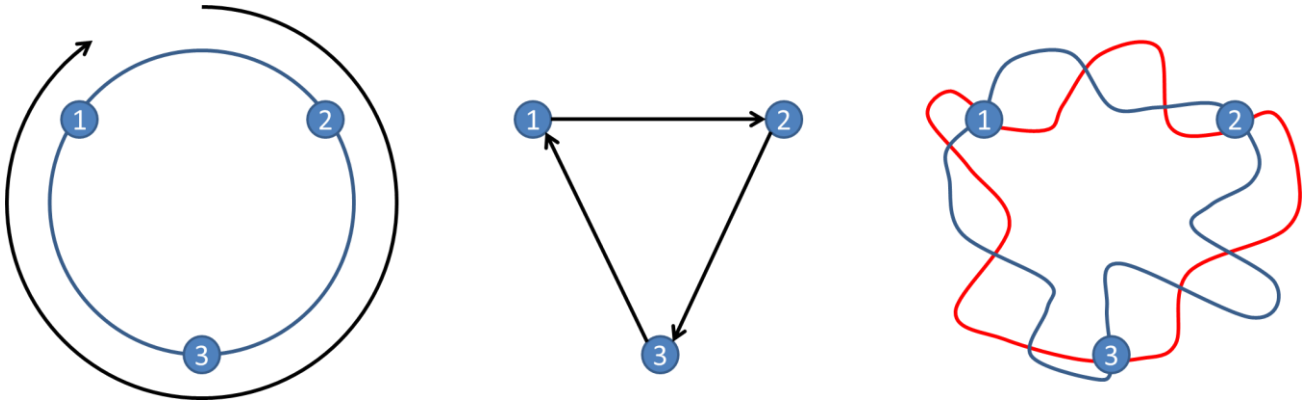
For example there is a point runs in a circle. The point goes through three non-continuous positions in the circle. The direction of the point's motion in continuously is tangent to the circle.

For the three positions as mid figure, the space change direction is the line between each two positions. From left figure to the mid figure, based on a certain circle track, it contains exact directions between three non-continuous positions (position to position).

But from the mid figure to the right figure, based on three non-continuous positions, there are infinite possible motion tracks between these three positions. As right figure, motion track it might be red curve or blue curve or other curves. (For these three positions on the red curve and blue curve, the direction of space change all are the line between each two positions)

Only the movie play speed is higher than certain fps, the movie will get continuously. So is the observation in real. There is a limit "frequency" in observation. The observe result like the mid figure, while the real is more like the right figure

The certain status, it contains infinite possible situations. It is the basis to input the following quantization onto space expression.

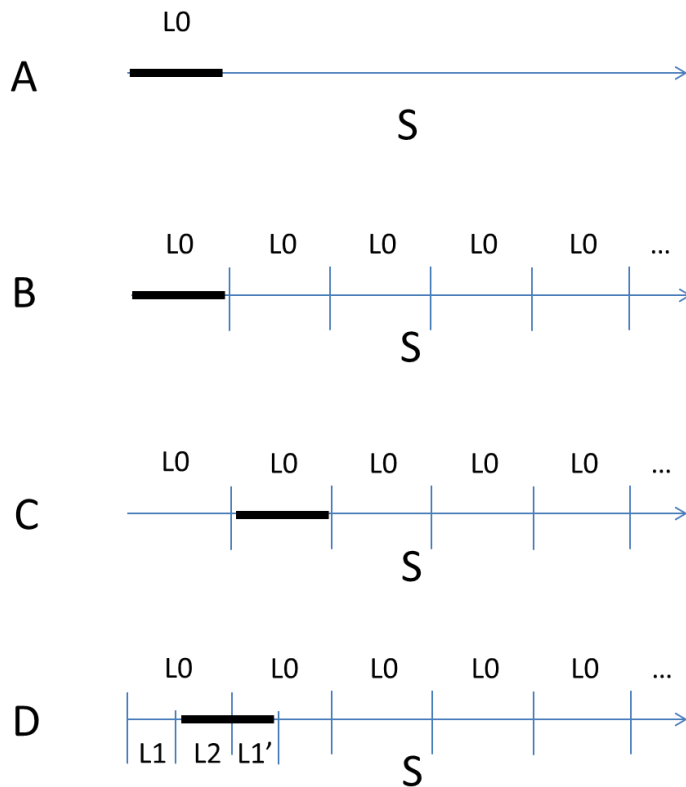


(Proposition 4) the existence of space-change that is smaller than the fundamental unit (the space of quantum itself), even it is invisible but it is exist.

As distance S_1 in proposition 2, the space-change is represented in space expression. It inputs quantization into the space S which is representing the space-change. From figure A to figure B, the space S is divided into a series parts by fundamental unit L_0 . From figure B to figure C, the change of space units are in non-continuously change.

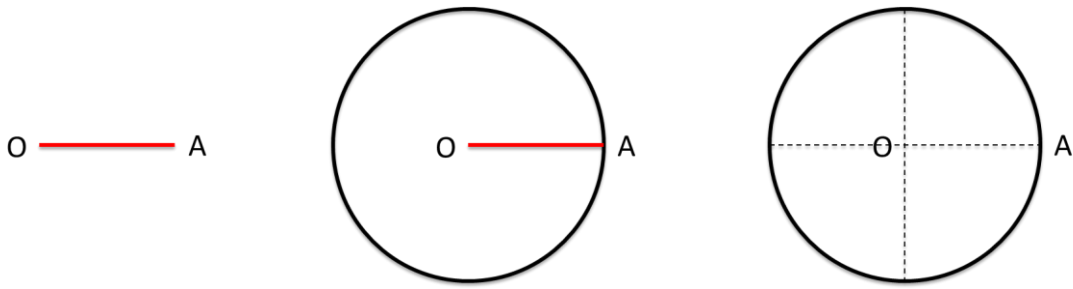
Quantum is non-continuous, while space not. In figure D, when the space-change is smaller than fundamental unit L_0 , the change of space still is going on. In the expression $L_0=L_1+L_2$ as figure D, segment L_1 is representing changed space in quantization, and segment L_2 is representing un-changed space in quantization. Because of natural integer, space-change that is smaller than fundamental unit L_0 , it is invisible in quantized change expression. when $L_1>0$ and $L_2>0$, **because $L_0=L_1+L_2$, so $L_1<L_0$, $L_2<L_0$. And so L_1 and L_2 are invisible in quantized change expression.**

After input quantization, the observability of space-change is changed. All of changed part and un-changed part are invisible, except the boundary position of the units.

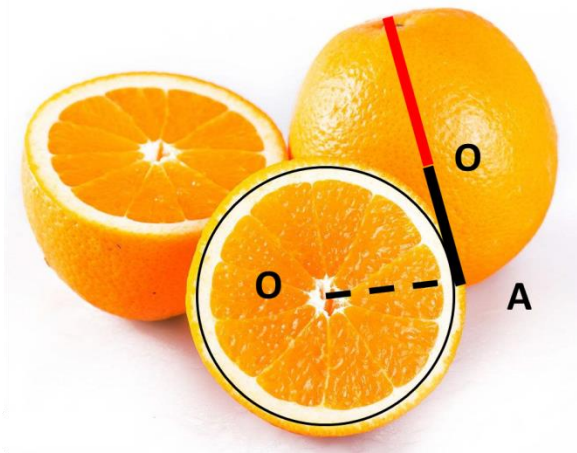


(Proposition 5) the distance of the space-change, it is a property of boundary, and it doesn't relate with quantum unit. For example it doesn't change the property of distance whatever by meter unit or light-years unit.

As proposition 4 showing, the expression after quantization, it directly only shows the representation of the boundary. The property of boundary it is a space expression. Per proposition 3, the change of a position can avoid the deviation of dimensions, **and all of dimensions expression can be represented on a same position.** So a same segment it can presents all of dimensions' space-change. As proposition 2, the change direction between two positions in quantum expression, it could be any one of infinite synchronous directions. **Proposition 5 it is a potential track of a point after moved among a line segment distance with infinite synchronous directions.** Based on the space distance (radius OA), the boundary of the point motion track in 2-D expression is the circle OA. **The boundary effect from a line segment to a circle, it is one core of theory in the article.** The center is the position before space-change, and the circumference is potential range of the position after space-change.



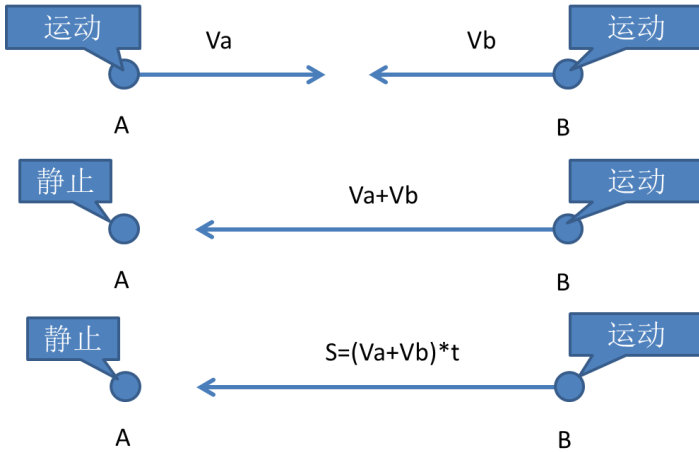
Proposition 3 represent the boundary effect. And proposition 5 represent the relationship on 2-D expression which is between a line segment (1-D) and other forms (all dimensions above 1-D). It explains AdS/CFT in space-change. The spherical surface is conformal with the diameter in 1-D space, the projection form of spherical surface in 2-D, it is the circle OA in proposition 5.



(Proposition 6) The transfer of space-change between objects.

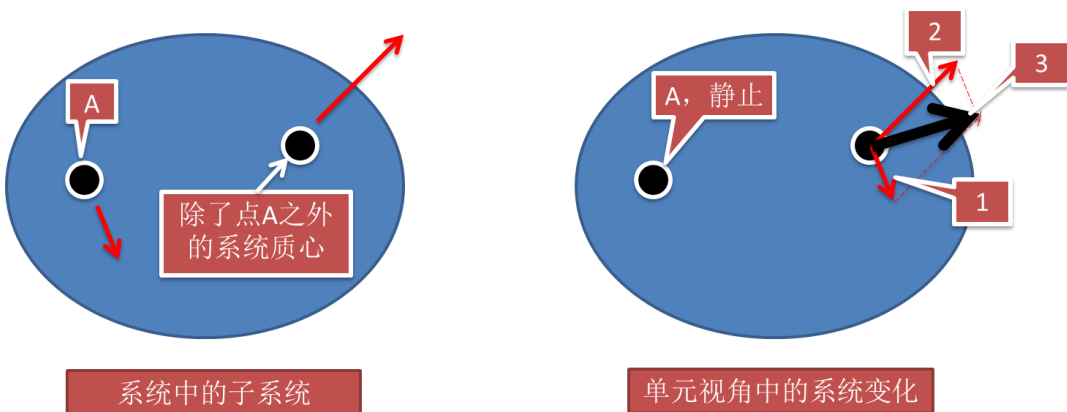
As figure a point move from position A to position B in speed V_a , while a point B move from position B to position A in speed V_b . When the observation is based on point A, the point B is moving to position A in speed V_a+V_b .

Per proposition 6 when set observer on position A, and it eliminates the deviation of observer's motion



When the point A is anyone position of universe system, and the point B is the centroid of whole universe system except position A. If observation is based on point A, the motion of point A will transfer onto the point B, so point A is static. **When the change space of point A is too much smaller than the systems', the space-change of point B is equal with the systems'.**

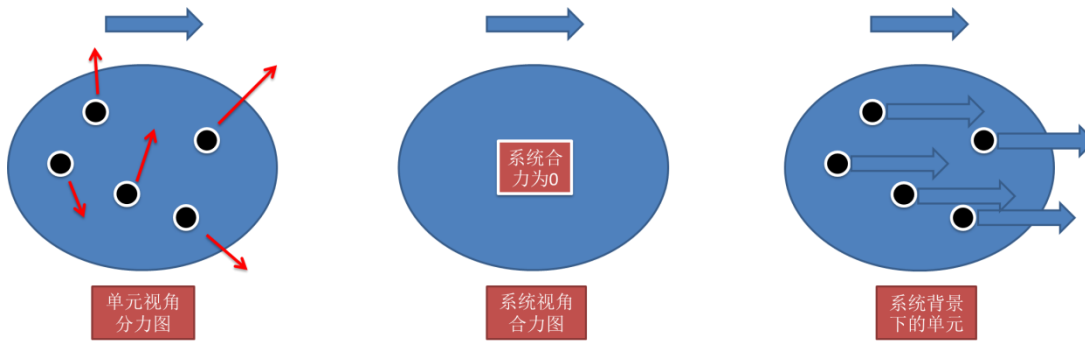
By transfer the space-change, it eliminated the deviation of observation completely.



(Proposition 7) the inner universality of the system

According the rule 3 of reasoning in philosophy in <mathematic discipline of nature philosophy>: the property of system should be suit for all of units in the system. So everything of the universe, it has certain consistency with the holistic universe.

If we throw an iron ball ten meters away. And no matter how inner particles of the iron ball moved, particles moved ten meters with the ball system.



(命题 8) 单元和系统之间，变化空间上的等效性，与不同空间位置上的差异性共存

由命题 4 可知，由于 L_2 的存在，观察行为本身可能存在空间变化偏差。基于命题 6 且以宇宙系统作为观察背景时，如果宇宙系统守恒整体变化为 0 时（即命题 6 中 $V_b=0$ ）。由命题 7 可知宇宙系统内被观察目标的空间变化，存在和宇宙系统内的其它任意单元的空间变化是相等的表示。

如图黑色箭头表示，从点位 A 观察到点位 B 上有一个质点。如图红色箭头表示，实际上这个被观察到的质点（在点位 B 上），在观察行为刚刚开始的时候，该质点是从点位 C 同步于观察本身的变化到达点位 B。如图红色圆周 b，实际上点位 C 可能是由点位 B 为圆心、以空间距离线段 AB 的圆周 b 上的任意一个点位。把系统空间变化和观察结果关联，直接从观察结果中去分析整体宇宙系统内部单元的空间变化。

(Proposition 8) The equivalence between changes in units and systems, and the coexistence of differences in different spatial locations

As proposition 4, because the existence of L_2 and $L_2 < L_0$, there is some space deviation of the observation itself. So it set observation background by the holistic universe as proposition 6, when the universe system is conserved (the $V_b=0$). And then according proposition 7 there is a consistent expression of observed object's space-change, it is equates with the any unit in the universe system.

As the black arrow, the observation start from position A, and a point is observed on position B. As the red arrow, the point start move from position C at the beginning moment of observed. And it is caught on position B. Because proposition 4, actually the motion from position C to position B is invisible, so when the point is caught on position B, it potentially start from anyone position on circumference (the circle in radius AB, and the center is on position B).

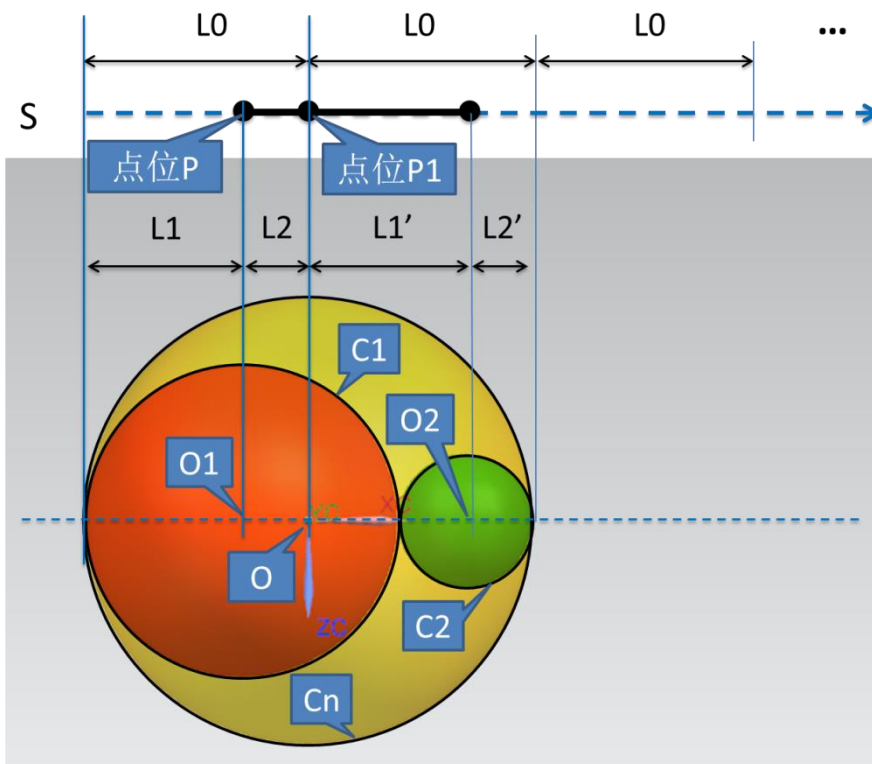
By relating observation space-change with the systems', it gives an intuitive way to analysis the inner space-change of the holistic universe system.

(Proposition 9) The space-change structure of any one position in quantization by fundamental unit L_0

The position D'' could be anyone position on the segment AB . And position D'' it splitted the segment AB into segment BD'' and $D''A$. Because these two segments BD'' and $D''A$ are smaller than segment AB , when it sets segment $BD'' \setminus D''A \setminus AB$ as $L_1 \setminus L_2 \setminus L_0$ on quantization expression. **When they are invisible on quantization expression, the only thing can be sure is the range of potential position of space-change. As the following figure, it is the structure of the space-change that is reacting on one position of unit L_0 .**

- 1) Because L_1 relatively joint with L_2 , so $L_1 + L_2 = L_0$. And because the universality of the system, $L_1 = L_0$, and $L_2 = L_0$. And according the boundary effect, the boundary circle of L_1 and L_2 , **they are tangent with L_0 in same time. (because $L_1 \leq L_0$ and $L_2 \leq L_0$, so they are tangent not intersect.)**
- 2) Because the observation is visible only it is on the position P_1 in quantization expression L_0 as figure. So $L_1 = L_0 - L_2$, that means **the position of center O_1 of circle C_1 , it is transferred distance L_2 start from center O of circle C_n .**
- 3) Because L_1 and L_2 are lay on the same unit L_0 , so the center O_2 of circle C_2 it is on the line OO_1 . And $L_1 = L_0 - L_2$ is duality with $L_2 = L_0 - L_1$, so **the position of center O_2 of circle C_2 , it transferred distance L_1 start from center O of circle C_n .**

Based on space-change, O_1 is relative with $L_1 = L_0 - L_2$, and O_2 is relative with $L_2 = L_0 - L_1$.



(Proposition 10) based on the first nine propositions it arises a geometry structure of space-change in all dimensions. And the structure is based on a quantum unit set by the space of observation itself.

The proposition 8 represents the potential position range of space-change in quantization. It is the basis in 2-D expression. The proposition 9 represents the structure of any one position in quantization by unit L0. It is the overlapping in 2-D expression which projected from 3-D expression in boundary affected of space-change. And then **put proposition 9 into proposition 8**, it get the structure of space-change in 2-D which overlap 3-D projection expression. It is potential structure of space-change based on the space of the observation unit itself.

Propositions before proposition 10, they eliminated deviations of universe limit; quantum size; dimension form; observation form. And then based on the potential integrity of space-change, **proposition 10 it arises a geometry structure of space-change in all dimensions. And the structure is based on a quantum unit set by the space of observation itself.**

- Proposition 1. It eliminated limit deviation and quantum size deviation by spatial structure
- Proposition 2. It eliminated spatial deviation of object itself and it avoid deviations on different dimensions
- Proposition 3. The certain status, it contains infinite possible situations
- Proposition 4. It assure the integrity of space-change whatever visible or not
- Proposition 5. It input duality to explain boundary effect of space-change
- Proposition 6. It eliminate the spatial deviation of observation itself
- Proposition 7. It set up the inner universality of system
- Proposition 8. the potential position range of space-change in quantization
- Proposition 9. the structure of any one position in quantization by unit L0
- Proposition 10. the structure of space-change in 2-D which overlap 3-D projection expression

The final spatial structure is only related with the existence of the observation.

Chapter 2, the structure of dimensional space-change in 2-D which is projected from 3-D (including higher dimensions above 3-D)

The changed object is sensible in realization, and the not changed object is insensible. Per proposition 4, L1 represents changed space, and L2 represents not changed space. The invisible L2 is expressed by the transfer of L0 and L1. Because proposition 6 eliminates the deviation of observation's space itself, and all "L1" are changed into L0, so L1 is always relatively changeless.

The whole of chapter 2, it is describing the observed potential L_2 when it is in relative condition $L_1=0$. Because $L_0=L_1+L_2$, so $L_2=L_0-L_1$. So it is the spatial structure of expression L_0-L_1 . And because $L_0=L_1+L_2$ again, so what chapter 2 explain is the spatial structure of expression $L_2=L_0-L_1=(L_1+L_2)-L_1$

Finally the chapter 2 is about the space structure of $(L_1+L_2)-L_1$ which is observed on condition $L_1=0$.

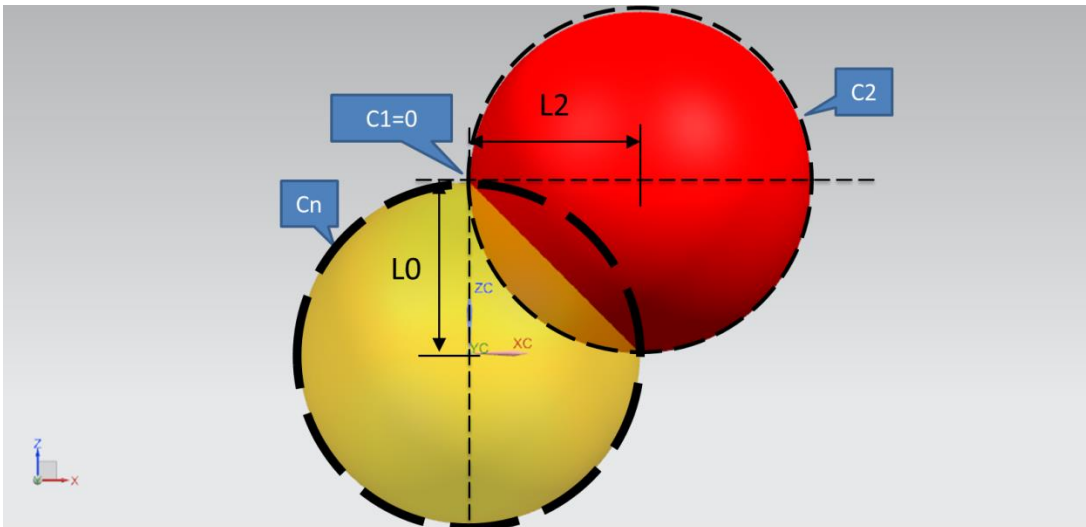
When it go with observation space change, whatever observation changed, it is always in the relative condition $L_1=0$. Per the position A in proposition 8, it is the relative start position of the observation space change. **With observation space change**, the position A changed onto position B. It is the relative end position after observation space change. And it is center O (position B now) after observation.

Expression $L_2=L_0-L_1=(L_1+L_2)-L_1$, it contains two steps

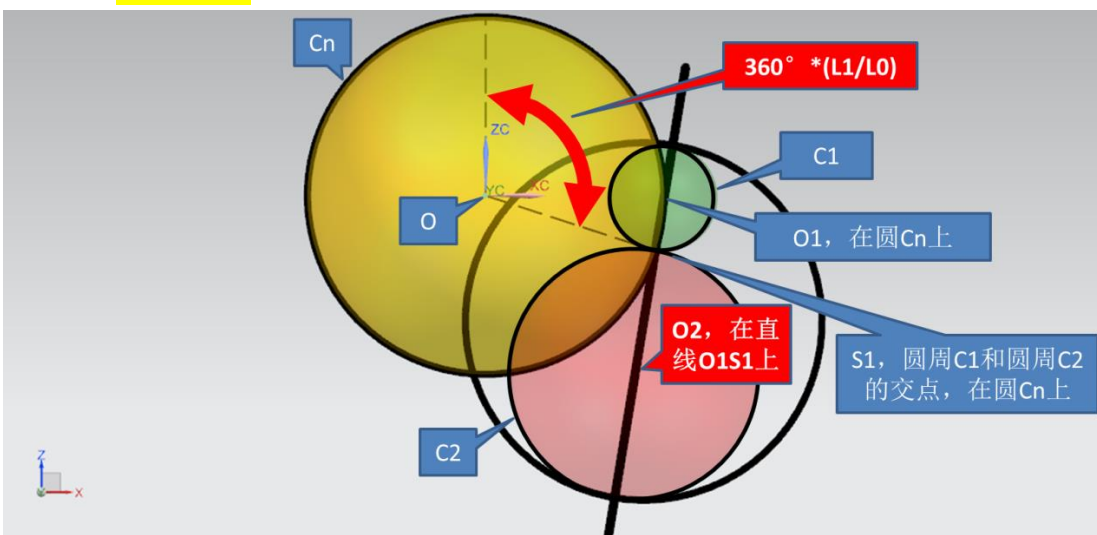
Step1, $L_2=L_0-L_1$

Step2, $L_2=(L_1+L_2)-L_1$

- A. Step 1 first, the space change expression $L_2=L_0-L_1$, there are three kinds of potential positions.
- l) the space change on start position of $L_2=L_0-L_1$
- Per proposition 5, the position of changed space relative with L_1 , it is on the circle C_n
 - When $L_1=0$, there is $L_2=L_0$. As red circle in figure, based on projection only the circle which diameter perpendicular to L_0 , its diameter L_2 is equal with L_0 . So the space-change on start position of $L_2=L_0-L_1$ is as follow figure.



- II) the space change on process position of $L2=L0-L1$
- c) Per proposition 5, the position of changed space relative with $L1$, it is always on the circle Cn . Because the end of $L1$ joins on $L2$, and the end of $L1$ is joins on $L1$ also, so **the joint position between circle $C1$ and circle $C2$, it is on Cn .**
 - d) Per proposition 5, it is conformal for all dimensions. Because the end of $L1$ is on the $L2$, there is the ratio $L1/L0$ on $L0$. The ratio $L0L1/L0$ is not only suit for linear 1-D $L0$ but also 2-D circumference. So the joint position relative with the end of $L1$ between circle $C1$ and circle $C2$, **it is suit for $360^\circ \cdot (L1/L0)$ on Cn .**
 - e) Because $L1$ and $L2$ are on $L0$, so endpoints of $L1$ and $L2$ suit for 1-D property of one same segment. The second endpoint is on the line between two endpoints of $L1$. **So $O2$ is on the line $O1S1$.**



The figure show potential space-change of someone position of circle Cn

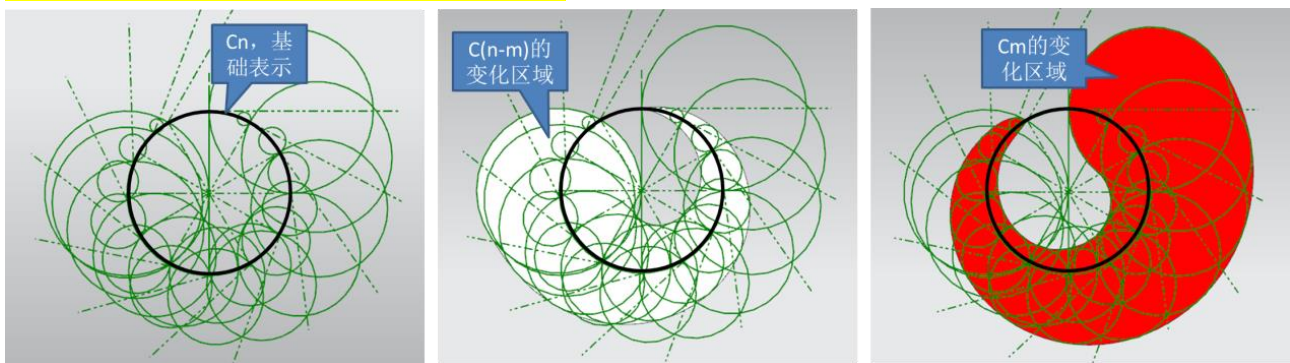
- III) the space change on end position of $L2=L0-L1$

- f) Because proposition 6, condition $L1=0$ is a relative consistent. And as the position A in proposition 8, the center O not only is the relative start position but also the relative end position. So **when $L1=L0$ and $L2=0$** , it is return the origin (the space-change of center A is completely happened by quantization unit $L0$ expression, **so the position of circle C2 are back to the center O.**)

IV) All potential positions of space-change in expression $L2=L0-L1$

- g) Based on the quantum unit $L0$ by space-change of observation, when we unite all these three kinds of potential positions of space-change in expression $L2=L0-L1$, it get the structure of space-change in 2-D expression which is projected from 3-D dimension (including other higher dimensions). The white part is the set of circle C1s of changed space, and the red part is the set of circle C2s of not changed space.

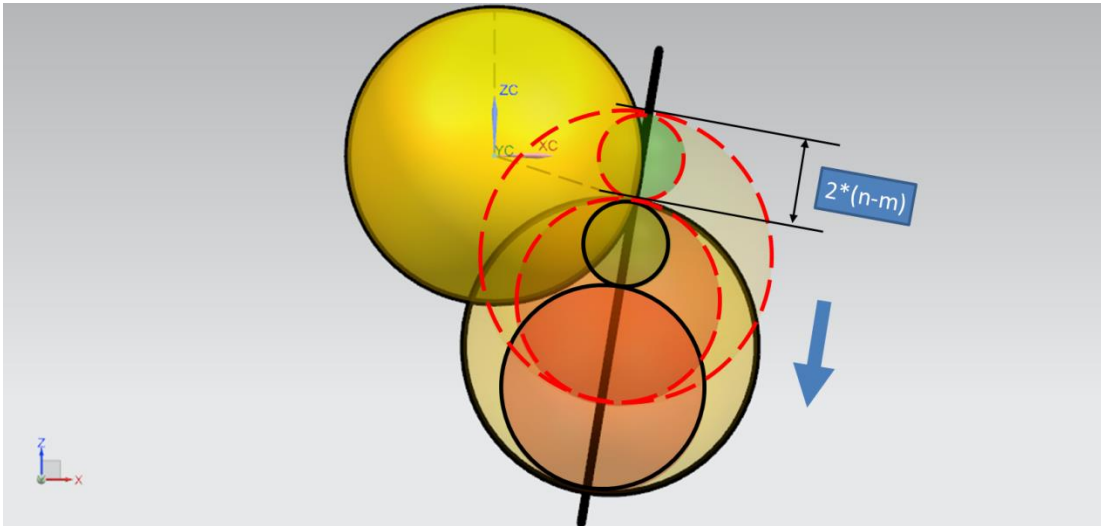
*It build structure circle C1s and C2s on 12 semi-sextile position on circle Cn. (the reason of "why is on 12 semi-sextile position" will be explained in another article) now it show the regularity first. Because the structure curve which is built by any uniform positions on circle Cn, they are same one. So the structure curve which is built anyone uniform positions on the circle Cn, it can represent the structure curve of all uniform positions on the circle Cn. So it avoid the size problem on how to divide $360^\circ * (L1/L0)$ on circumference Cn.*



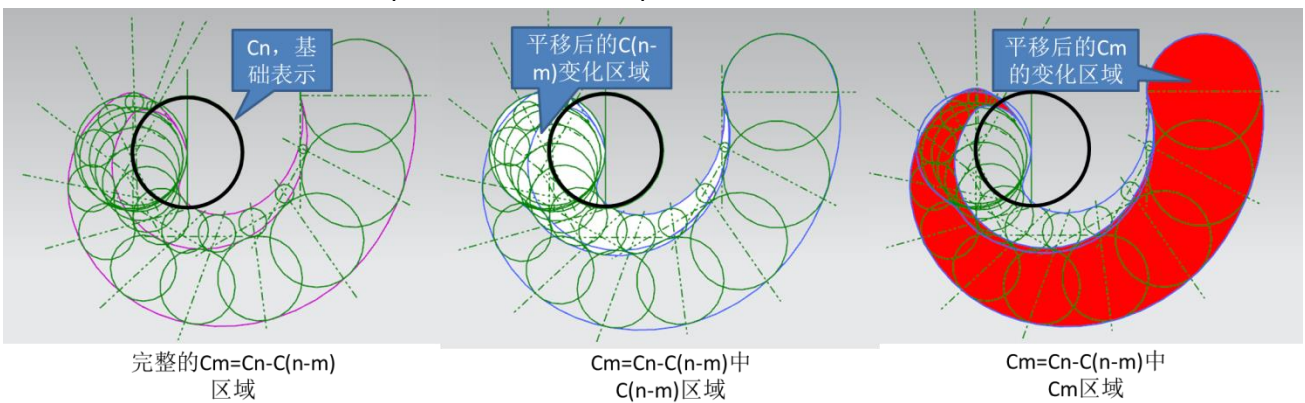
B. The step 2, The offset express the space-change expression $L2= (L1+L2)-L1$ in realization

V) For example by **any one position** of expression $L0-L1$.

- h) It is the space structure of $L0-L1$ when based on relative condition $L1=0$. $L1$ represent changed space, and **because the change of $L1$ is done, so $L1$ will be completely offset in linear 1-D expression**. As the following figure the circle C1 relative with $L1$, it is offset the whole diameter of circle C1. Because proposition 7, the system is synchronizing with units of system. So the whole quantum unit $L0$ is synchronized with $L1$, so when $L1$ is offset. As $L0=L1+L2$, finally $L1$ and $L2$ are offset together.

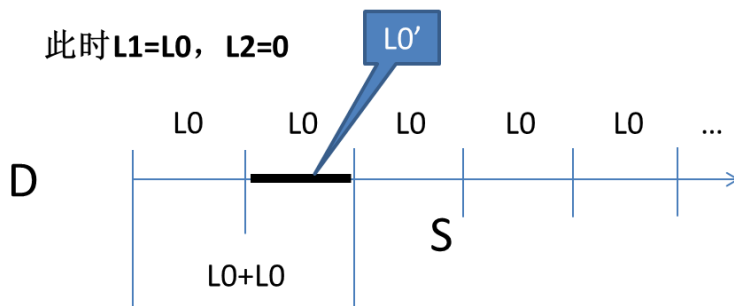


- VI) The transfer on **all positions** of circle C_n in realization which is related with expression L_0-L_1
- i) The previous picture is the expression of offset L_1 on only one position of expression L_0-L_1 on circle C_n . Offset L_1 on all positions of expression L_0-L_1 on circle C_n , it gets the space structure. As the red part and the white part, L_1 and L_2 have their field after offset.

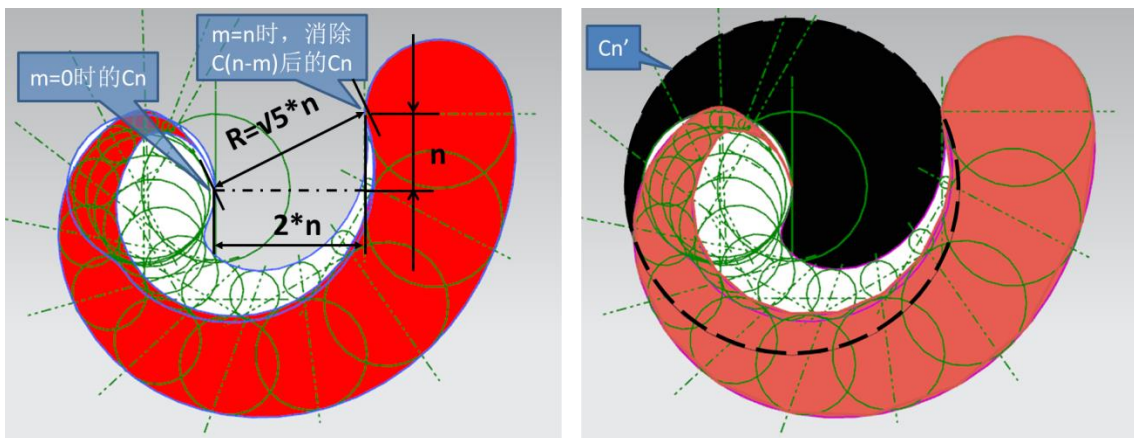


C. the space-change of expression $L_2 = (L_1+L_2)-L_1$ after transferred in realization

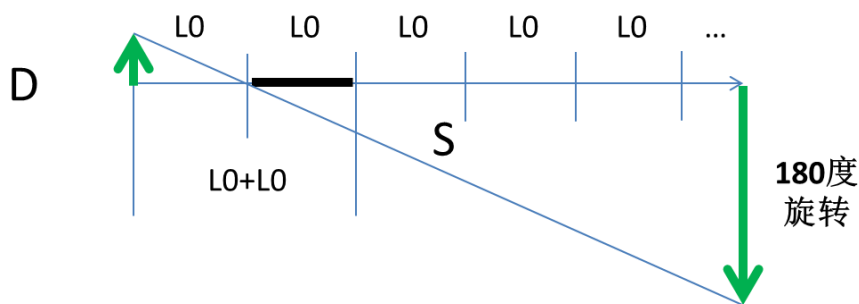
The calipers in precision 0.02, the effective distance in realization is integer times of fundamental distance unit 0.02. **So is the quantization unit L_0 expression. Only the integer times of fundamental unit can be read.** As following figure, when $L_1=L_0$ and $L_2=0$, the space-change of quantization unit L_0 itself can be read in real.



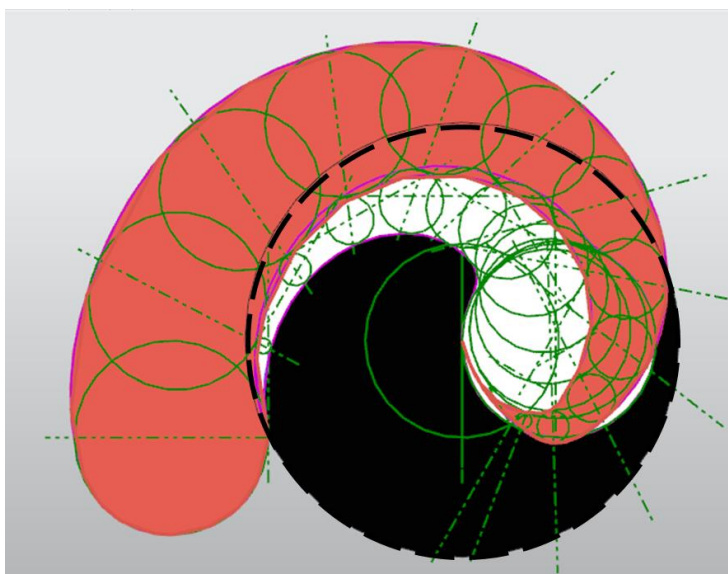
Because natural rounding, the space span could be read as L_0+L_0 before and after space change. Based on the conformal field of 1-D and 2-D and 3-D expressions, this space span L_0+L_0 it obey the cyclized expression as black circle C_n '.



In 1-D expression, the position is $L_1=L_0$ when the changed space joint the not changed space. So every space-change must pass the position. As green arrow of the 2-D expression based on 1-D, it is overturned in 180 degree.



It gets the structure of space-change



When it calculated boolean operations on the C_n' and C_1' and C_2 fields. It is the exactly real structure of dimensional space-change in 2-D, which is projected from 3-D (including higher dimensions above 3-D)



Chapter 3, why there is sign of the string in Cosmos Microwave

Background radiation

Refer theoretical physicist Brian Greene's <the elegant universe> to show the dilemma and potential prospect of the string theory.

36:03 in part 2 <strings the thing>: Now, what string theory does, It comes along and basically calms the jitters of quantum mechanics. It spreads them out by virtue of taking the old idea of a point particle, and spreading it out into a string. That quantum theory and general relativity stitch together perfectly within this framework.

I) What exactly problem the strings theory solved

The strings theory unites the quantum mechanics and general relativity. **So the string theory does not only explain the quantum mechanics but also general relativity.**

42:57 in part 1 <Einstein's Dream>: In the years since, physics split into two separate camps, One that uses general relativity to study big and heavy objects, things like stars galaxies and the universe as a whole. And another that uses quantum mechanics to study the tiniest objects like atoms and particles.

II) The string theory cannot be observed in Microscopic particles

The particle is basis of quantum mechanics, even the particle obey the string theory. But smaller particle is, higher precision requirement the equipment needs. The current experiment equipment doesn't approach the requirement.

38:02 in part 2 <strings the thing>: But this radical new theory contains a chink in its armor. No experiment can ever checks up what's going on at the distances that are being studied. No observation can relate to these tiny distances or high energies. That is to say, there isn't no experiment that could be done, Nor is there any observation that could be made, That would say, "you guys are wrong."

III) Perhaps the string theory could be observed in Macro universe phenomenon

Since the string theory can't be observed on quantum mechanics of microscopic particles, therefore it should change the thinking mind to understand the string theory by macro universe of general relativity.

The string theory is suited for general relativity that means bigger mass of the object the more obvious sign phenomenon it contains. As 42:57 in part 1 <Einstein's Dream>, the universe itself is a big and weight enough object, **so the universe itself must contain the sign phenomenon of the string theory.**

IV) Eliminate the effect of time

As the theory of everything, it is suit for everything in every moment. The thinking logic is locked on the universe itself, and then it should eliminate the effect of time.

The universe is changing every moment, and the time span of universe is huge (about 13.7 billion?). If the truth is universal, it shouldn't be changed by the change of space and time. Because the truth is suit for every moment, so the every moment of universe is suit for the truth (the string theory). Whatever and whenever the universe is, it doesn't change the sign phenomenon of the string theory that contained by the universe itself. **In other word, the bigger time span of the universe phenomenon it is, the more opportunity to show the sign phenomenon of the strings theory from the stable phenomenon of the universe itself.**

The thinking logic is locked in further. **It is with higher opportunity to obvious the sign phenomenon of the string theory in big enough time span of universe phenomenon.**

V) The carrier of the string theory, it is Cosmos Microwave Background radiation

Cosmos Microwave Background radiation, it is such a universe phenomenon without time affect. **It been since the born of the universe until the moment the universe will be gone. It entirely records the universe in every moment.** If we can find the proof of the string theory in Cosmos

Microwave Background radiation, the string theory will be proofed by experiment science. And the string theory will be a real physics theory, not mathematics suppose.

P.S

An article about Cosmos Microwave background radiation, <Let's find the message left by Creator>:

<https://zhuanlan.zhihu.com/p/20616612>

Official website of NASA about Cosmos Microwave Background radiation:

https://wmap.gsfc.nasa.gov/universe/bb_cosmo_fluct.html

If the universe contains the sign phenomenon of the string theory, it should be hidden in the Cosmos Microwave Background radiation. Now it need evidence to support this suppose.

Chapter 4, the irrefutable evidence of the existence of the string theory, is the B-mold Polarization rotation in Cosmos Microwave Background radiation

I) Original gravitational wave and Cosmos Microwave Background radiation

There is information about original gravitational wave in Cosmos Microwave Background radiation. Per the article <See the beginning moment of the universe was born at South Pole> on Chinese science website, to descript the relationship between original gravitational wave and Cosmos Microwave Background radiation.

<https://www.guokr.com/article/437156/>

SPTpol instrument, it was designed to measure polarization of Cosmos Microwave Background radiation. **When original gravitational wave spread in the space-time, it polarizes the electronic particles in certain special method. And then the track of the polarization is remained in Cosmos Microwave Background radiation.**

II) Original gravitational wave and polarization

Refer the article <Let's see the beginning moment of the universe born> on Chinese science website.

<https://www.guokr.com/article/438227/>

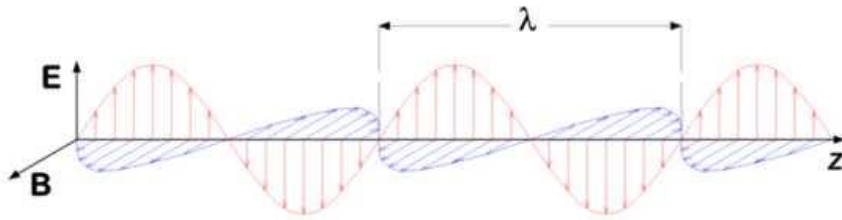
“The directional selectivity exhibited by many photons and electrons after colliding, it could be represented by two physics factors: E-mold Polarization and B-mold Polarization. **People found the B-mold is only happened in huge enough space by original gravitational wave”. It gets easy to find the existence of original gravitational wave by build the better telescope.**

III) Polarization of electromagnetic wave

Before find the sign of polarization, at first we should know what polarization is.

[https://en.wikipedia.org/wiki/Polarization_\(waves\)](https://en.wikipedia.org/wiki/Polarization_(waves))

A "vertically polarized" electromagnetic wave of wavelength λ has its electric field vector E (red) oscillating in the vertical direction. The magnetic field B (or H) is always at right angles to it (blue), and both are perpendicular to the direction of propagation (z).



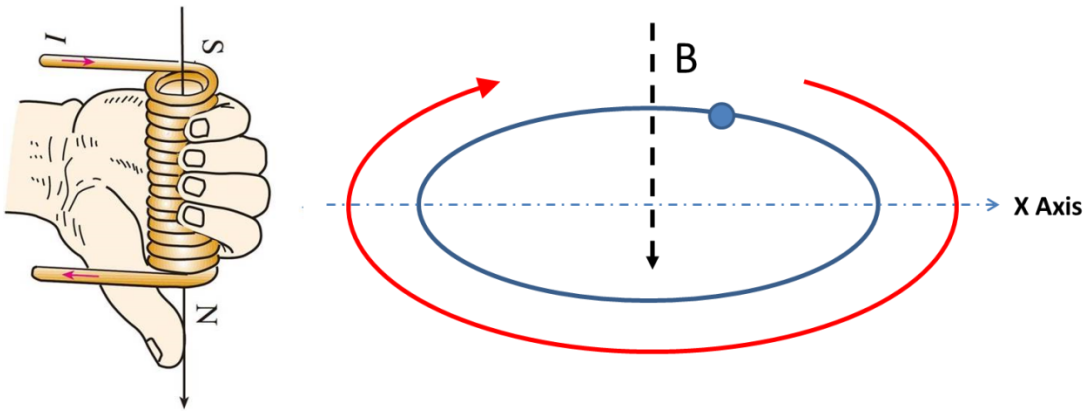
IV) Right-hand rule and Left-hand rule

Based on the electromagnetic field, the left-hand rule and the right-hand rule can explain what the difference between E-mold and B-mold polarization is.

Right-hand rule

https://en.wikipedia.org/wiki/Right-hand_rule

An electric current passes through a solenoid, resulting in a magnetic field. When wrapping the right hand around the solenoid with the fingers in the direction of the conventional current, the thumb points in the direction of the magnetic north pole.



Left-hand rule

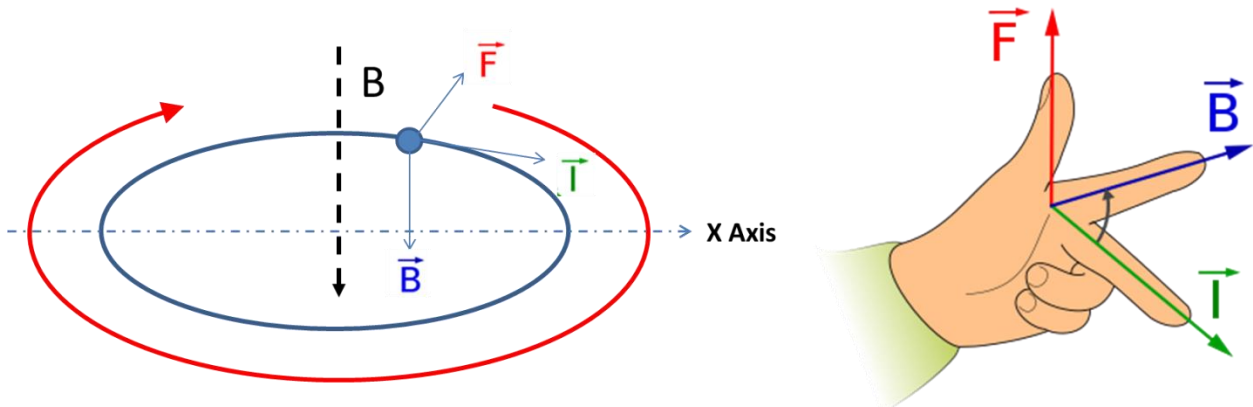
https://en.wikipedia.org/wiki/Fleming%27s_left-hand_rule_for_motors

When current flows through a conducting wire, and an external magnetic field is applied across that flow, the conducting wire experiences a force perpendicular both to that field and to the direction of the current flow (i.e they are mutually perpendicular) .

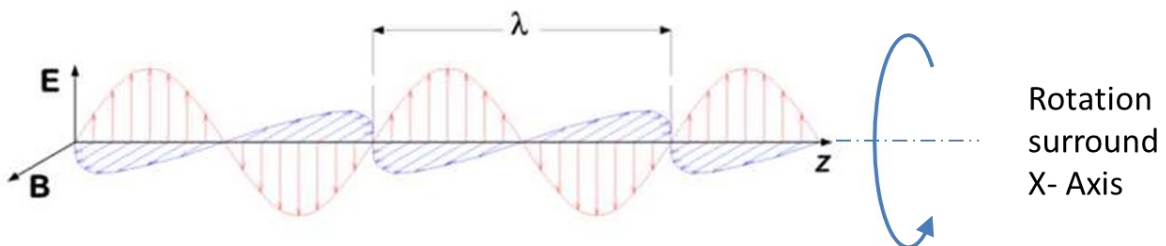
The thumb is the force, F

The first finger is the magnetic flux density, B

The second finger is the electric current, I .

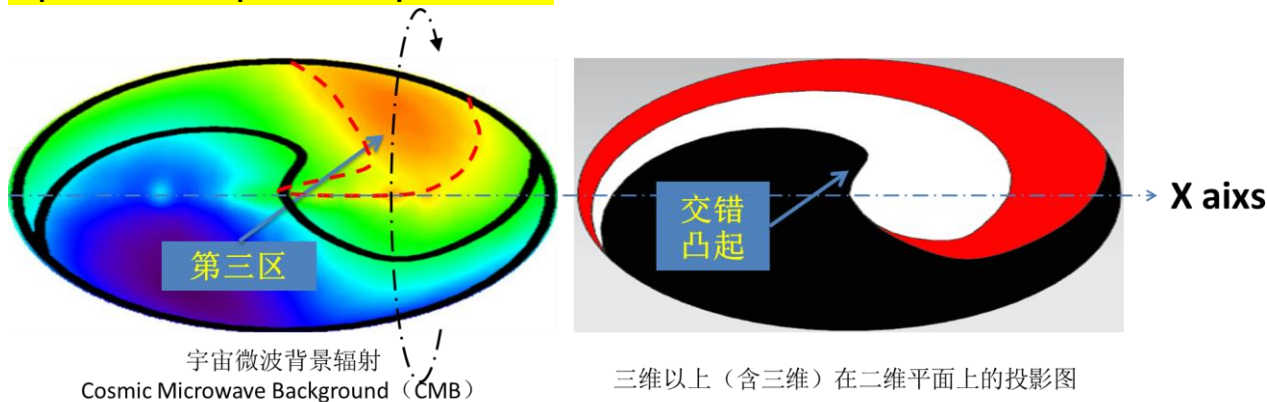


For exactly explain this rotation of electromagnetic force, let's back the figure of polarization (waves). As the blue rotation arrow in figure shows after introduced B axis representation, **the waveform on the E - Z plane rotated surround Z axis.**



V) The rotation around X axis in Cosmos Microwave Background radiation

Per proposition 4 in chapter 1, because L2 is smaller than the quantized unit L0, and L2 is invisible on quantum expression by unit L0, so there must be deviation in realized observation. **Compare Cosmos Microwave Background radiation arisen by NASA experiment, As red dotted line showing the 2-D space-change structure of derivation in the article it happened the rotation surround X axis. And the third area is transferred (shorten) along X axis. It is the existence evidence of expression L2 in quantized expression L0.**



As red dotted line showing the 2-D space-change structure of derivation in the article it is happen the rotation surround X axis. It is the irrefutable evidence of B-mold polarization.

Per proposition 3 in chapter 1, it eliminates the space deviation of changing object itself. Even it eliminates the deviation on different dimension form.

So the space-change of the strings, it obey this space structure also.

Finally the existence of the strings is proved.

Chapter 5, the definition of the strings, and the application rules of four principles of philosophical reasoning in the book < mathematical principle of nature philosophy >

a) The definition of the string

Per the strings definition by theoretical physicist Juan.Maldacena, **the strings is : " Solid Theoretical in Natural Geometric Structures".** The basis of the definition is "Geometric Structures". **The strings in the article, it is represented by the geometric Structures of space-change.**

b) The understanding of <mathematic principle of natural philosophy>

In < mathematical principle of nature philosophy>, Newton started with natural observations and experiments to demonstrate algebraic calculus propositions by geometric methods. And he built a system of universes.

Only based on geometry, algebra can be realized. And only based on realization, geometry can be realized. The connection principle between algebra and geometry and realization, it is the deepest opinion what Newton want to show. This is a return to a natural philosophy of simplicity. It describes the structure of motion track in natural realization world by these two ideals geometry---segment and circle. **The segment is the motion track structure without force in ideal. And the circle is the motion track structure with a gravity force in ideal.** The book refer lots of line (or segment) and circle (or arc) to show the change principle of the universe system in ideal.

Before an experiment the experiment tools should be adjusted by examine tools. So is it to demonstrate algebraic calculus propositions by geometric methods. **But examine tool is tool also and it should be check before use it. So is it to demonstrate geometry method by natural experiment or observation phenomenon.** That is why using lots of natural experiment or observation phenomenon to check the geometrical principle. And that is why the first rule is

c) The application of four rules of reasoning in philosophy

Four rules of reasoning in philosophy of the book < mathematical principle of nature philosophy>, these can be good explains how to formulate change rules by realistic conditions.

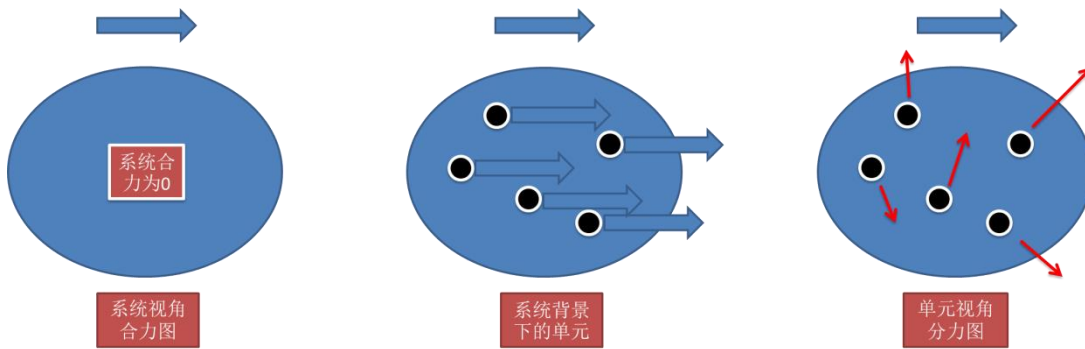
The content in [], it is the understanding of these four rules by author, especial the understanding of the forth rule, it is the most important opinion in whole article logic organization.

rule 1. We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances.

[Rule, it must be matched in the natural phenomena]

The undercurrents are raging under the calm sea surface. **Motion and calm are natural coexists in same time.**

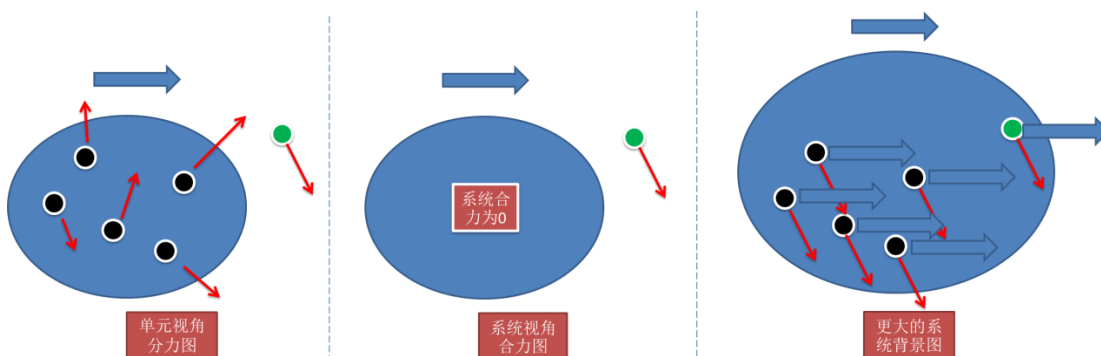
- a) as figure 1-1, the system is in straight motion in ideal;
- b) as figure 1-2, every unit position of the system is in straight motion follow the system;
- c) as figure 1-3, every unit could be in any direction motion;



rule II. Therefore to the same natural effects we must, as far as possible, assign the same causes.

[The rules of natural phenomena must be classified and simplified as much as possible. Per proposition 7 in chapter 1, it is a simplified united a classification of all potential change.]

- d) The objects which can affect the whole system only come from outside of the system. When the number of units within the system is constant, the system is relatively stable. If the system encounters an external object who affects the system, then re-incorporate the external object into a larger system. This eliminates deviations from outside influences and ultimately results in a system that is infinitely close to the ideal. Through this method, the real world can be summarized as a system that is infinitely close to the ideal state.
- e) When the real world is summarized as a system that is infinitely close to the ideal state, every position in natural realization world has a representation directly connected with the whole system.



rule III. The qualities of bodies, which admit neither intensification nor remission of degrees, and which are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever.

[The universality of observation objects in the system]

- f) When the system is represented by a centroid, the change of centroid can be synchronized

to every unit in the system. And it is synchronous between units. **It explains the rule 2.b.**

rule IV. *In experimental philosophy we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, notwithstanding any contrary hypothesis that may be imagined, till such time as other phenomena occur, by which they may either be made more accurate, or liable to exceptions.*

[Among the multiple propositions summarized in the natural phenomenon, only the needed propositions are selected, until they are excluded or optimized.]

d) Practication first, as long as it can be applied in reality, it can be built into ideal.

- 1) Now that the understanding dimension is no more than 3-D, so it builds a 3-D space framework based on 2-D expression.
- 2) Since duality indicates that the spatial positions between dimensions are correspond holographically. (As proposition 3 in Chapter 1) then all higher-dimensional representations above 3D are represented by spatial centroids positions of equivalent quantum states, thereby solving the problems that high dimension cannot be expressed in lower dimension expression.
- 3) Because natural scalars can only be rounded, all representations smaller than scalars are converted into a basic spatial scalars background expression. And then it finds the corresponding equivalent quantum by the spatial positions.

自然哲学的数学原理之下的弦¹

序

如果弦理论统一了量子力学和广义相对论，那么弦理论的适用对象应该包括微观粒子和宏观宇宙。越大时间跨度的宇宙现象，其稳定的部分中包含可显现弦理论迹象的可能性就越大。理论物理学家 Hsu 和 Zee 曾在一篇文章 [arXiv:physics/0510102](https://arxiv.org/abs/physics/0510102) 中讨论过“如果我们这个宇宙是由某个创世主创造的，而这个创世主创造宇宙的时候就想留下记号，让宇宙中将来产生的高级智能生命发现，又不干扰宇宙产生后的变化，那什么记号最普遍最容易实现呢？他们给出的答案是宇宙微波背景辐射”。宇宙微波背景辐射，就是这么一种

跨越时间且几乎没有改变的宇宙现象。如果能够从已知的宇宙微波背景辐射中找到证据，那么弦理论就是可以被实验科学证明的。

要和实验结果作对比，首先要找到观测的理论方法。

想从理论上“观测”到真实的宇宙，就必须消除以下下面几种影响。

1. 宇宙空间本身的极限（宇宙外面有多大？）、
2. 量纲尺度偏差（观察时的量子是几维的，有多大？）、
3. 维度形态偏差（宇宙是几维的？是否不同维度的宇宙表示都不同？）、
4. 物体本身空间偏差（宇宙本身有多大）、
5. 观察本身的空间变化偏差（观测行为是否会造成偏差？）

如能够消除极限偏差、量纲尺度偏差、维度形态偏差、物体本身空间偏差、观察本身的空间变化偏差，就可以找到“观测”弦的方法。

文章通过自然哲学原理下的空间几何的**规则变化**，找到观测“弦”的方法。建立了高维（三维及其以上）在二维表示中投影结构模型。对比模型结构，目前实验观测到的 CMB 结构中存在明显的 B 模极化偏转，从而证明了“弦”这种空间结构存在的真实性。

目录

第一章 由十个命题组成的主体逻辑

前七个命题消除了极限偏差、量纲尺度偏差、维度形态偏差、物体本身空间偏差、观察本身的空间变化偏差，后三个命题提出理论方法。

第二章 第一章后三个命题提出的理论方法的过程展开

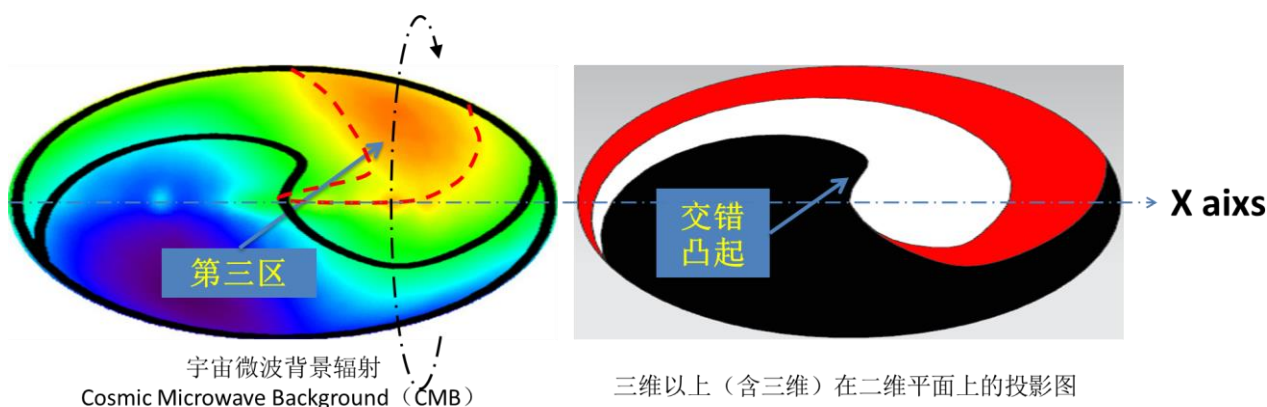
以系统本身作为变化的统一背景时，在二维表示基础上叠加三维的维度空间变化结构表示。得到相对静态观察时，物体在（叠加了三维及其以上维度表示的）**二维表示**中可能潜在的空间变化结构。

第三章 为什么宇宙微波背景辐射包含能够显现弦理论存在的迹象

弦理论统一了量子力学和广义相对论。弦理论的适用对象包含微观粒子和宏观宇宙。现在的实验设备还无法满足观测能够显现弦理论迹象的粒子的要求，所以得改变思路从广义相对论的角度去理解弦理论，把目光放到更为广袤的宇宙中。又宇宙在任何时刻都适用于弦理论，所以越大时间跨度的宇宙现象，其稳定的部分中包含可显现弦理论迹象的可能性就越大。从宇宙诞生的时刻起甚至直到宇宙消亡的那刻，宇宙微波背景辐射都没有改变。所以如果有能够证明弦理论迹象，一定会隐藏在宇宙微波背景辐射当中。

第四章 弦的可证伪性，宇宙微波背景辐射中围绕 X 轴的 B 模极化偏转

通过原初引力波和电磁波极化的关联，由左手定则和右手定则确定了宇宙微波背景辐射中隐藏信息的偏转方向。对比（叠加了三维及其以上维度表示的）空间变化的二维表示结构，NASA 发布的宇宙微波背景辐射存在明显的第三区围绕 X 轴的偏转（前两区分别对应 L1 和 L2，共同构成的不变的 L0 背景，所以第一区和第二区不发生偏转），这是 B 模辐射的铁证。从而证明了弦存在的真实性。



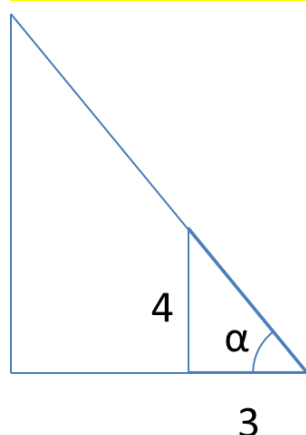
第五章 对弦的定义，对《自然哲学的数学原理》以及其中四条哲学推理原则的应用解读

第一章 逻辑框架的十个命题

(命题 1) 空间结构表示上不仅可以规避极限问题，还可以规避量纲尺度问题。

直角边长为 3 和 4 的直角三角形， $\tan \alpha = 4/3$ 。4/3 在数字表示上是无法绝对精确的无限循环表示，但在空间结构上却是一种准确的表示，空间结构表示规避了极限问题。用任意一个相似三角形都可以相对表示出 $\tan \alpha$ ，并且可以忽略该相似三角形的实际尺度，结构的相似性规避了量纲尺度问题。

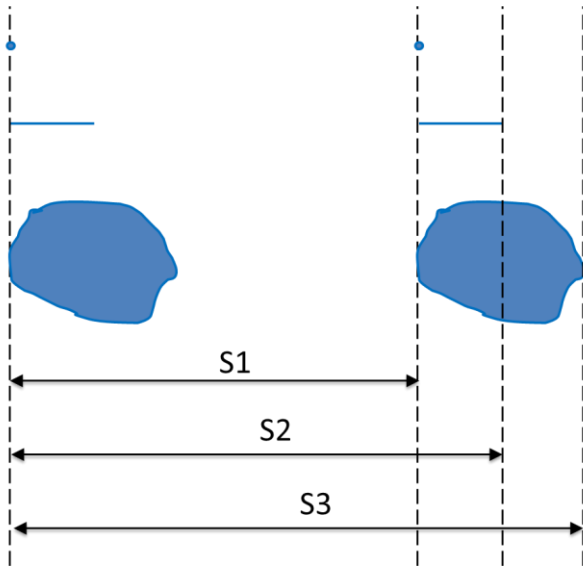
通过命题 1，就可以把宇宙缩小到任意指定的尺度，同时又保有其内在结构表示。这样就规避了结构表示中宇宙有多大这个上限问题。



(命题 2) 用空间位置的变化表示，可以消除运动物体本身空间带来的偏差，甚至可以规避不同维度形态的偏差。

如图，一个零维点、一条一维线段、一个三维物体并排移动距离 S_1 。各自本身的空间不同，运动所需要的空间表示范围也不同。如 $S_1 \neq S_2 \neq S_3$ 所示，空间表示受到物体本身空间的影响。又三者的空间位置变化都等于 S_1 ，由此可知空间变化的表示则不会受到物体本身空间的影响。进一步意味着无论物体对应的维度表示如何（例如 0-D 点，1-D 线段，3-D 体等），空间变化是相同的。

通过命题 2，不论量子、宇宙是几维的、有多大？它们的空间变化都可以一个点去表示。整个理论的核心：文章描述的是空间变化所对应的空间结构。



(命题 3) 每一个量子态点位上，都存在无限方向的运动趋势可能。

空间是连续的，但量子是不连续的，运动方向不等于量子的移动（空间变化）方向。

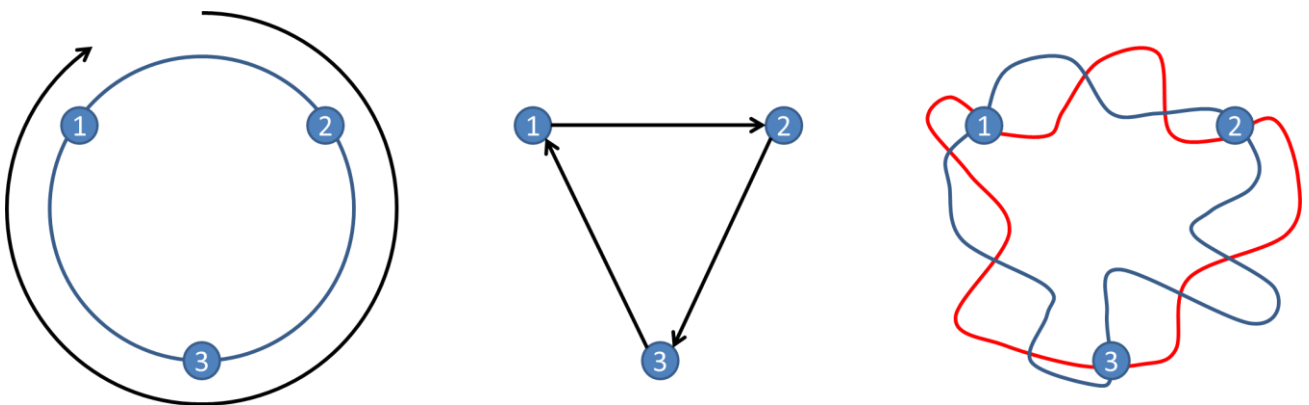
假设一个点在做连续圆周运动，点的连续运动方向为圆的切线方向。从三个不连续的点位来看，其量子态的空间变化是确定的三点之间的两两连线。

从确定的轨道，可以推出三个不连续点位的空间变化表示；

反过来凭借三个不连续点的量子移动（空间变化）表示，无法准确地推断出运动变化趋势。如右图，真实的运动轨迹可能是左图的圆周，也可能是红线，也可能是蓝线，甚至可能是其它的线；（红线蓝线上的三个点位，彼此之间的空间变化也是确定的两两连线。）

如同看电影的一样，现实世界的观测也是存在“帧率”的。达到一定的帧率，观测行为就已经无法辨识出其中的变化。中间这幅图表示的确定的空间变化方向好比是现实观测的结果，而真实的结果可能和右边这幅图一样，该点位上的运动方向其实有着无限的可能。

在某一确定的状态中，包含无限种不确定的可能。这是后续在空间表示中引入量子化的一个基本前提。

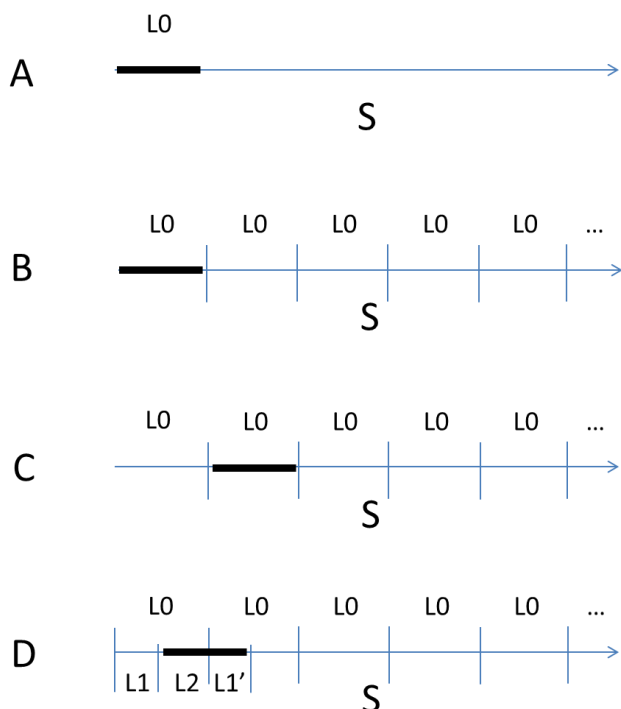


(命题 4) 那些比量纲还要小的空间变化、虽然无法显现，但却是存在的。

如命题 2 中 S1，空间的变化也是由空间来表示的。用空间 S 对应为空间变化的空间表示，接下来通过量纲把量子化引入到用来表示空间变化的空间 S 中。如从图 A 到图 B 表示，空间 S 在量纲 L0 的条件下，被分割为以空间变化 L0 为标准单位的一系列单元。从图 B 到图 C 表示，单元之间的空间变化处于非连续分布。

量子是不连续的，但空间却是连续的。在图 D 表示中，当空间变化小于量纲 L0 时，空间变化仍然是存在的。如图 D 有 $L_0=L_1+L_2$ ，其中 L1 为标量化表示中已经变化的空间，L2 为标量化表示中未变化的空间。由于自然表示取整²的原因，小于量纲 L0 的空间变化，不能在量纲 L0 表示中显现。当 $L_1>0$ 和 $L_2>0$ 时，由 $L_0=L_1+L_2$ ，有 $L_1<L_0$ ， $L_2<L_0$ 。由于 L1、L2 都小于量纲 L0，所以 L1 和 L2 都不能直接在量纲 L0 表示中显现。

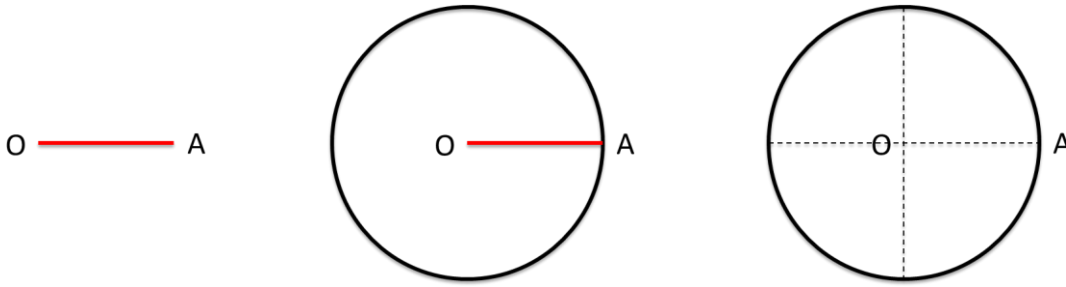
引入量子化后，空间变化的可观测性发生了改变。除了量子单元的临界点，已变化的和未变化的都不可直接观测。



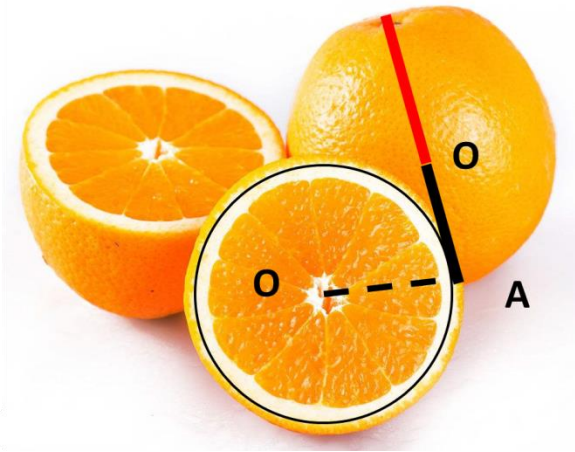
(命题 5) 空间变化的空间（距离）表示，其本身不存在量纲，只有界限。不论是用米和光年作为单位去表示距离，都不会影响距离本身属性。

命题 4 表明在量子化表示中，唯一能够直接观测的是边界位置对应的表示，边界的本质是空间（距离）表示。由命题 3 可知，点位的变化可以规避维度表示的偏差，所有其它的维度表示都在某一个空间变化等距表示的点位上，所以用同一条一维线段就可以表示任意维度表示中的空间变化。由命题 2 可知，两个点位确定的空间变化方向，可能是同步的无数种运动方向中的任意一种。所以命题 5 可以直观理解为以一个点移动一定（一条线段）空间距离后，其可能的位置。从空间变化等距（OA 不变）的角度来说，在二维平面上与线段 OA 等效的边界，是圆周曲线 OA 表示。从直线到圆周的边界等效效应，这是本文几何表示中最

基本的一部分。文章推论的几何图形是建立在（类似于圆周 OA）圆周 C_n 的基础上，其中圆心是变化前的点位，圆周是变化后的点位的存在的可能范围。



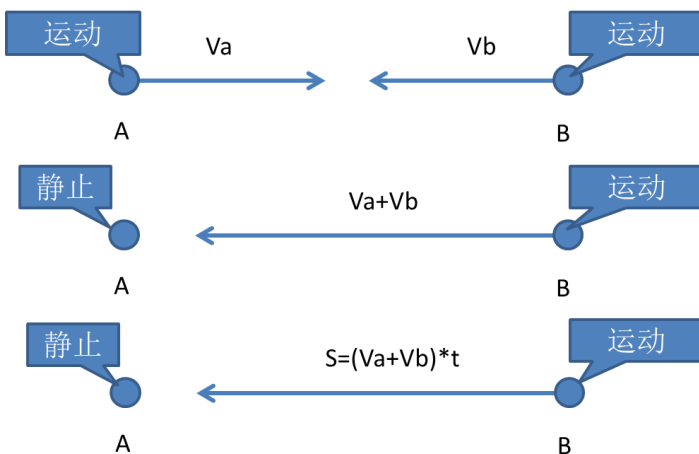
命题 3 表示的空间变化的边界等效效应。命题 5 表示的是：在二维平面表示的基础上，一维线段与二维以上（含二维）空间变化的边界等效对应关系。命题 3 和命题 5 可以直观地解释空间变化上的 AdS / CFT。球面在一维空间上和直径（一维线段）共场，在二维截面投影上球面则表示为命题 5 的圆周 OA。



（命题 6）不同物体之间的空间变化转嫁

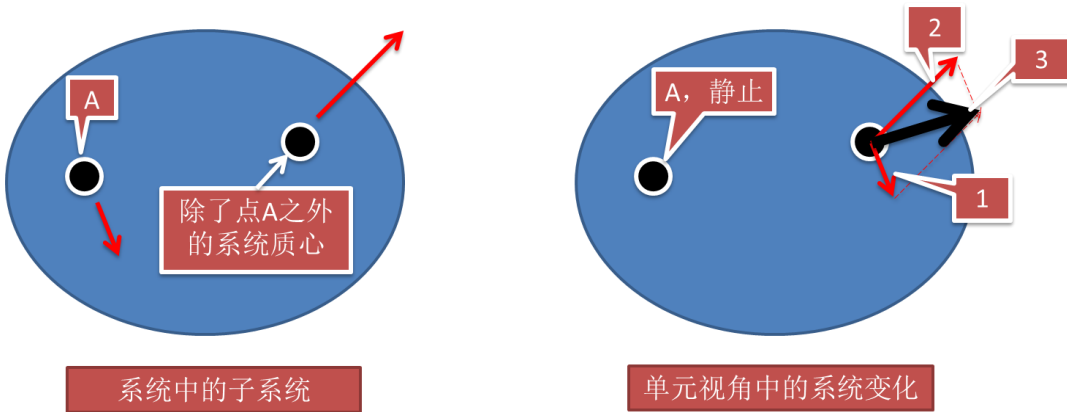
如下图点 A 以速度 V_a 向点 B 运动，同时点 B 以速度 V_b 向点 A 运动。当以点 A 作为观察点时，在点 A 的视角中，点 B 是以 V_a+V_b 的叠加速度向点 A 移动。

当把观察者设定为点 A 时，通过命题 6，消除了观察者本身运动的偏差。



当点 A 表示为宇宙系统中的任意一点时，点 B 表示为除了点 A 之外的次级宇宙系统质心。在以点 A 作为观察点时，点 A 是静止的，原本是点 A 的空间变化趋势叠加到“宇宙系统”上了。**当单元空间变化相对于系统空间来说很小时，子系统空间变化近似等于系统空间变化。**

通过空间变化的转嫁，清除了观察本身变化所带来的偏差。

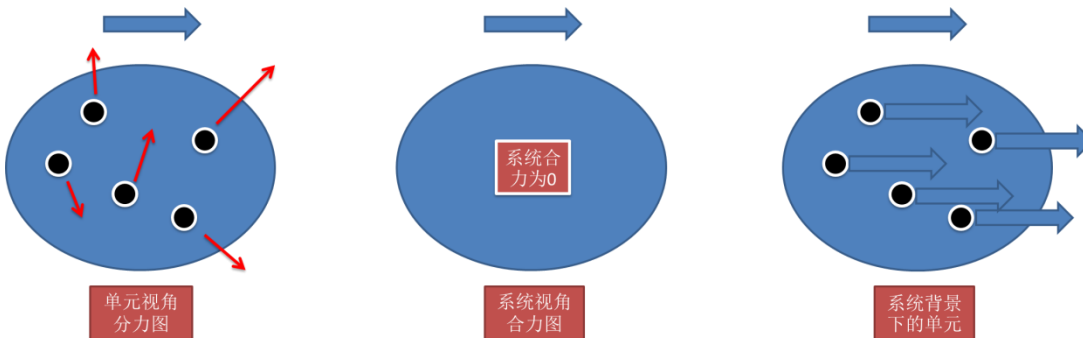


(命题 7) 系统内部的普适性

基于牛顿的《自然哲学的数学原理》一书中的第三条哲学推理原则——III) 物体的特性，若其程度既不能增加也不能减少，且在实验所及范围内为所有物体所共有，则应视为一切物体的普遍属性。

基于这个角度，如下图宇宙内所有的一切都存在一种和宇宙系统本身匹配的表示方式。(命题 7 和命题 3 相互呼应。)

把一个铁球仍出 10 米远，不论铁球内的分子如何运动，对于铁球本身来说，铁球内的分子都是随着铁球被仍出 10 米远。

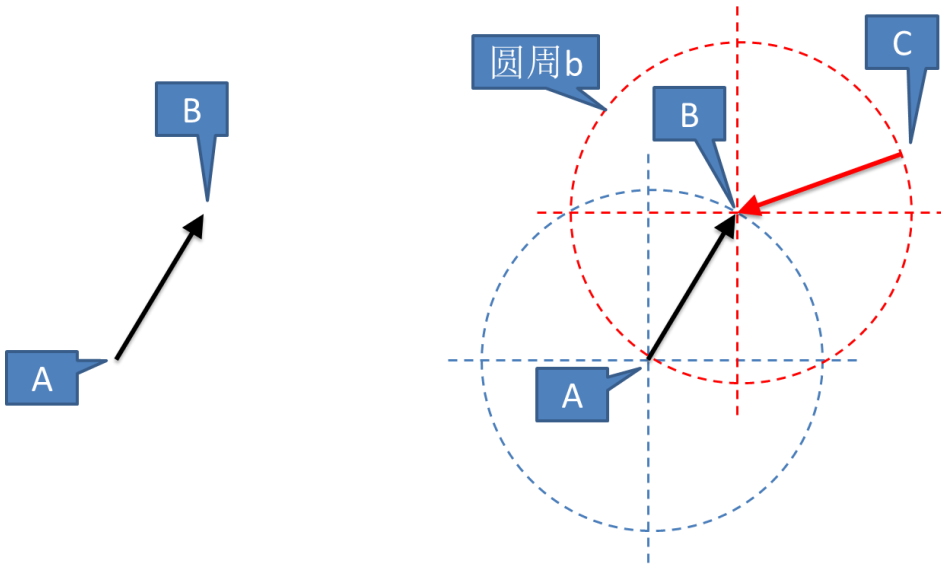


(命题 8) 单元和系统之间，变化空间上的等效性，与不同空间位置上的差异性共存

由命题 4 可知，由于 L2 的存在，观察行为本身可能存在空间变化偏差。基于命题 6 且**以宇宙系统作为观察背景时，如果宇宙系统守恒整体变化为 0 时（即命题 6 中 $v_b=0$ ）。**由命题 7 可知**宇宙系统内被观察目标的空间变化，存在和宇宙系统内的其它任意单元的空间变化是相等的表示。**

如图黑色箭头表示，从点位 A 观察到点位 B 上有一个质点。如图红色箭头表示，实际上这个被观察到的质点（在点位 B 上），在观察行为刚刚开始的时候，该质点是从点位 C 同步于观察本身的变化到达点位 B。如

图红色圆周 b，实际上点位 C 可能是由点位 B 为圆心、以空间距离线段 AB 的圆周 b 上的任意一个点位。
把系统空间变化和观察结果关联，直接从观察结果中去分析系统内部单元的空间变化。



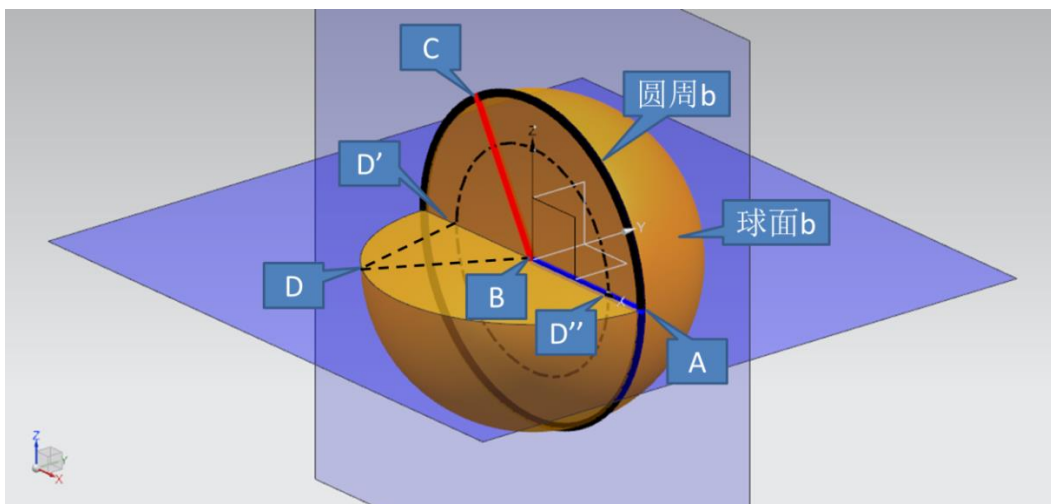
上图仅为二维表示，现实世界不仅有二维表示，还有三维表示。圆周 b 只是球面 b 上的某一个过球心的截面圆周。如图点位 D 在球面 b 上，其中点位 D 在圆周 b 所在的平面的投影位置，是点位 D'。点位 D' 相对圆心的边界圆周交线段 AB 为点位 D''。由于点位 D 是球面 b 上的任意一点，从空间位置变化的角度来看，所以有 $0 \leq \text{线段 } BD'' \leq \text{线段 } AB$ 。

由命题 7，从宇宙系统的角度来看，空间变化在所有维度的表示都存在一种完全相同的表示。如命题 3，通过空间变化的表示，规避了不同维度本身的空间表示偏差，最后有线段 $BD'' = \text{线段 } AB$ 。

$BD'' = AB$ ，和 $0 \leq BD'' \leq AB$ ，这两种表示同时存在，是本文最核心的概念。

其中 $BD'' = AB$ 作为一种不变的背景表示；

$0 \leq BD'' \leq AB$ 作为一种变化的运动表示；

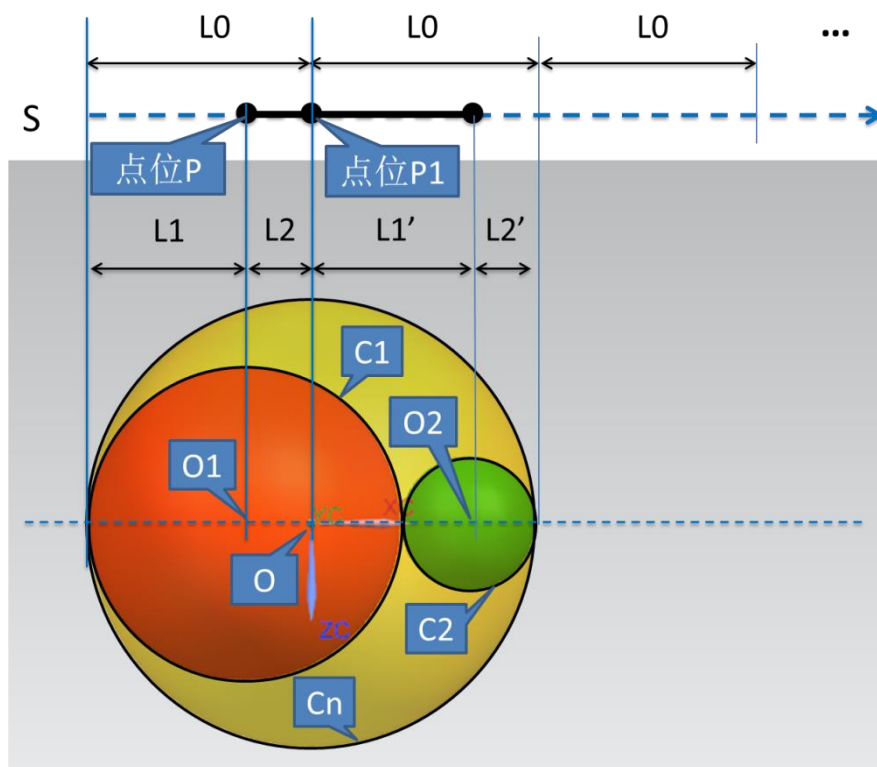


(命题 9) 空间量纲 L0 表示中的某一个点位其所对应的空间位置变化范围的结构表示

上图 D'' 可以是线段 AB 上的任意一点，由点位 D'' 分割线段 AB 而产生的 BD'' 和 D''A，都小于线段 AB。当把 BD'' 和 D''A 以及 AB 分别代入到 L1、L2 和 L0 构成的量子化表示中，如命题 4 的表示，由于无法确定 L1 和 L2 相交点位 P 的具体位置，唯一能够确定的空间位置变化的可能范围。如下图中空间量纲 L0 表示中的某一个点位所对应的空间位置变化范围的结构表示，其中有。

1. L1 与 L2 相接，所以 $L1 + L2 = L0$ 。如命题 7，满足 $L1=L0$ ， $L2=L0$ 。即 L1 和 L2 对应的等效边界，同时分别在某些特定位置和 L0 相切。(由于 $L1、L2 \leq L0$ ，所以只能是相切，不会是相交。)
2. 在量纲表示 L0 中，只有空间位置点位 P1 才能触发测量，所以有 $L1=L0-L2$ 。圆周 C1 的圆心 O1 的空间位置，是从圆周 Cn 的圆心 O 减去 L2 的。
3. 因为 L1 和 L2 位于同一个单元 L0 上，所以 C2 的中心 O2 位于 OO1 线上。又 $L2=L0-L1$ 和 $L1=L0-L2$ 相对，所以圆周 C2 的圆心 O2 的空间位置，减去 L1 的方向相反。

基于空间变化，O1 关联 $L1 = L0-L2$ ，O2 关联 $L2 = L0-L1'$ 。



(命题 10) 在前 9 个命题的基础上，建立以观察空间变化作为量纲、所有维度的空间变化的空间结构

命题 8 表示的空间量纲上所有可能的点位空间位置范围，是空间变化的二维表示；命题 9 表示的是空间量纲 L_0 表示中的某一个点位其所对应的空间位置变化范围的结构表示，是空间变化的三维表示等效投射到二维的结构表示；接下来只要把命题 9 代入到命题 8 上，就可以初步得到以观察本身的空间变化距离为空间

量纲 L0 时，在二维表示基础上叠加三维的维度空间变化结构表示。

在命题 10 之前的命题，已经消除了极限偏差、量纲尺度偏差、维度形态偏差、物体本身空间偏差、观察本身的空间变化偏差。**命题 10 在确保空间变化表示的完整性的前提下，建立了一个以观察空间变化作为量纲，所有维度的空间变化的空间结构。**

命题 1，通过空间结构，消除了极限偏差、量纲尺度偏差

命题 2，通过空间位置的变化表示，消除物体本身空间带来的偏差，规避不同维度形态的偏差

命题 4，空间其本身性质，确定了“无法在量纲表示中体现的变化”仍然是存在的。确保了空间变化表示的完整性。

命题 5，引入对偶性，并直观地理解为空间变化的边界等效效应。

命题 6，通过表示的相对性，消除了观察本身的空间变化偏差

命题 7，建立系统的普适性表示，并以此作为表示的背景

命题 8，引入观察本身空间变化，并以之作为量纲表示的“不变”基础，并引申出“变化”的条件。建立三维（以及三维以上）投影的基础二维表示

命题 9，三维（含三维以上）投影的基础二维表示中，某一个点位所对应的二维空间位置变化范围

命题 10，三维（含三维以上）投影的基础二维表示中，所有点位所对应的完整二维空间位置变化范围

最后得到的空间结构，只和观察（意识）的存在性相关。

第二章 物体在（叠加了三维及其以上维度表示的）二维表示中可能潜在的空间变化结构。

现实中只能观察到已经变化的事物，未变化的事物是不能直接被观察到的。如命题 4，L1 是已变化的空间，L2 是未变化的空间。无法直接被观察到的 L2，通过 L0 和 L1 的转换，可以相对得到 L2 的表示。

由于命题 6 消除了观察本身空间变化产生的偏差，所有的“L1”都已经转换成 L0，所以 L1 始终会相对不变，

第二章描述了相对条件 $L1=0$ 时，后续可能会观察到的 L2，（由 $L0=L1+L2$ 有 $L2=L0-L1$ ）

即 $L0-L1$ 的空间结构表示；又 $L0=L1+L2$ ，第二章最终表示的是 $(L1+L2) - L1$ 的

空间结构表示。当表示建立在观测空间本身变化的基础上，不论观察如何变化，相对条件 $L1=0$ 始终不变。

圆心 O 是所有表示的相对起点，同时也是所有表示的相对终点。如命题 8 的点位 A，它是观察空间变化的相对开始位置，是观测前的圆心 O。点位 A 随着观测空间的变化，在观测后到达圆心 O 现在的位置。

表达式 $L2=L0-L1=(L1+L2)-L1$ ，分为两个步骤

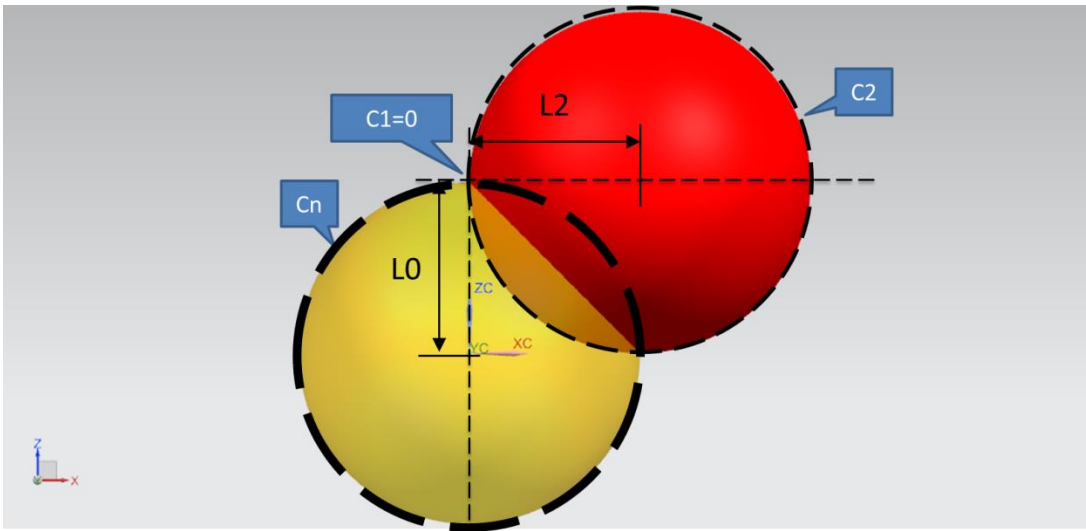
步骤一 $L2=L0-L1$

步骤二 $L2 = (L1+L2)-L1$

(一) 首先来看步骤一，空间变化表示 $L2=L0-L1$ ，其可能存在的三种点位

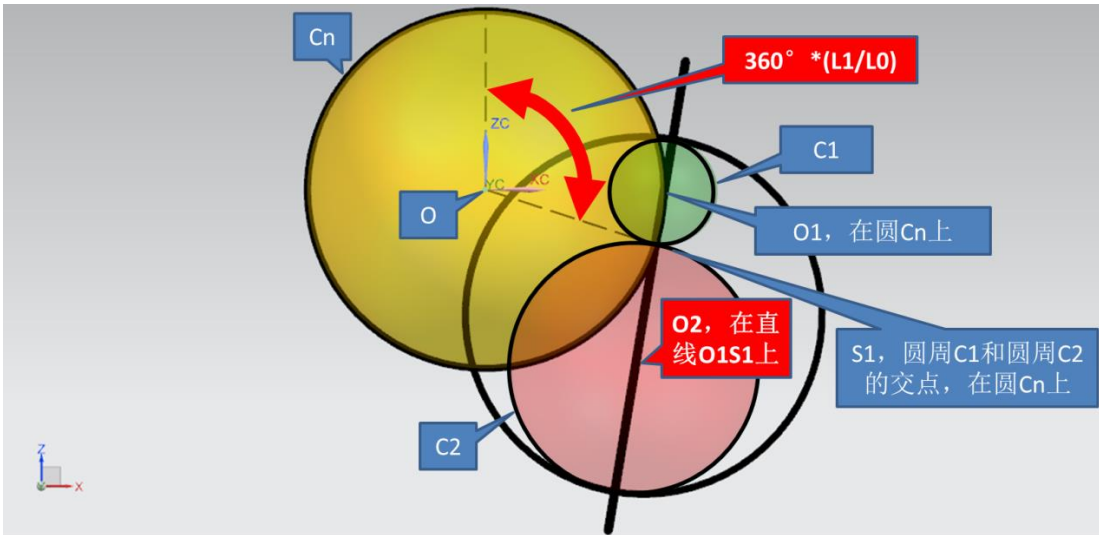
1. 空间变化 $L2=L0-L1$ 表示的起点点位时

1. 由命题 5 可知， $L1$ 对应的已变化点位是在圆周 Cn 上。
2. 又 $L1=0$ 时， $L2=L0$ 。如下图红圆所示，由于投影关系，只有直径垂直于 $L0$ 的圆周，其直径 $L2$ 才能等效于 $L0$ 。所以在空间变化 $L2=L0-L1$ 表示中，起点 $L1=0$ 位置的空间变化表示如下图。



2. 空间变化 $L2=L0-L1$ 表示的过程点位时

3. 由命题 5 可知， $L1$ 对应的已变化点位始终是在圆周 Cn 上。又 $L1$ 的终点和 $L2$ 相交，且 $L1$ 的终点还是在 $L1$ 上，所以圆周 $C1$ 和圆周 $C2$ 的交点也在 $L0$ 上。
4. 由命题 5 中的不同维度的对偶性可知， $L1$ 的终点和 $L2$ 的相交，且在一维线性 $L0$ 上满足 $L1/L0$ ， $L1$ 的终点对应的圆周 $C1$ 和圆周 $C2$ 的交点位置，在二维圆周 Cn 弧长上满足 $360^\circ * (L1/L0)$ 。
5. $L1$ 和 $L2$ 都在 $L0$ 上，所以 $L1$ 和 $L2$ 的端点都满足同一条线段的一维性质。即 $L2$ 的第二个端点在 $L1$ 两个端点的连线上，即如图 $O2$ 在直线 $O1S1$ 上。



上面只是表示了圆周 C_n 上某一个点位对应的潜在空间变化。

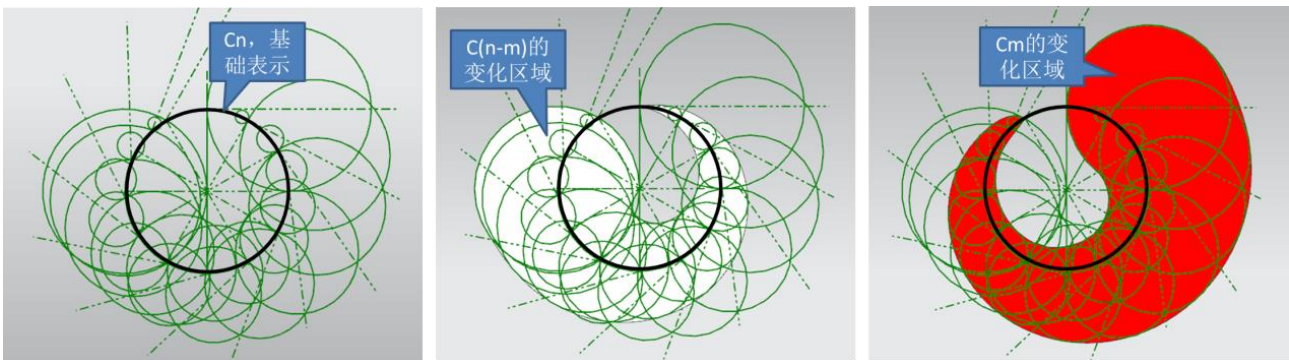
3. 空间变化 $L_2=L_0-L_1$ 表示的终点点位时

6. 由命题 6, 相对条件 $L_1=0$ 始终不变, (如命题 8 的点位 A) 圆心 O 是所有表示的相对起点, 同时也是所有表示的相对终点。所以当 $L_1=L_0, L_2=0$ 时, 相对回到观察原点 (此时原点的空间移动已经完全发生并可以在量纲 L_0 表示中显现, 即圆周 C_2 上的点返回圆心 O)。

4. 空间变化 $L_2=L_0-L_1$ 表示的所有点位的集合

7. 圆周 C_n 上上述三种的所有点位相对应的空间变化表示出来, 初步得到以观察本身的空间变化距离为空间量纲 L_0 时, 在二维表示基础上叠加三维的维度空间变化结构表示。其中白色部分是已经变化的空间对应的圆周 C_1 表示的集合, 红色部分是未变化的空间对应的圆周 C_2 表示的集合。

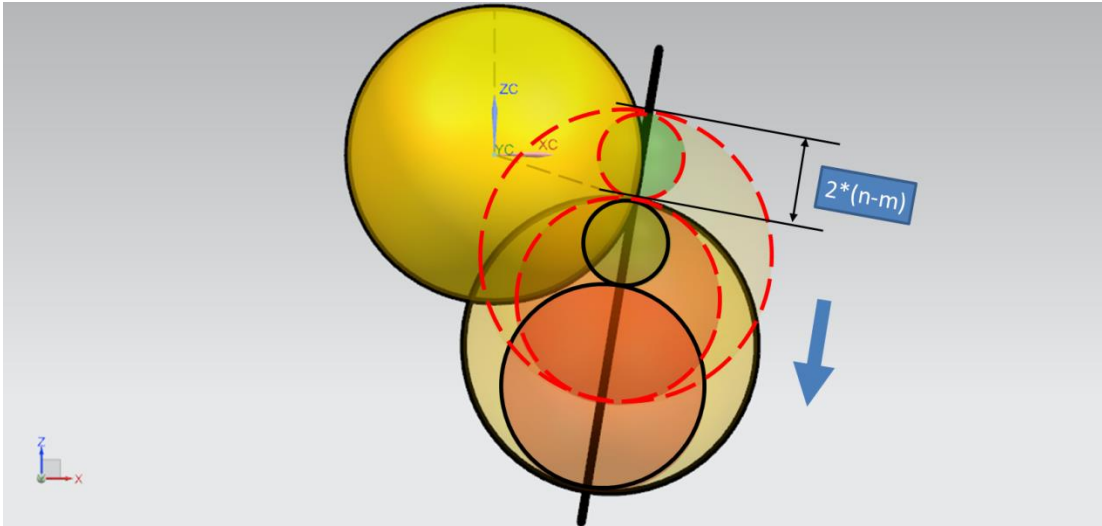
分别在圆周 C_n 的十二等分位上建立圆周 C_1 和 C_2 结构线, 十二等分的原因会在另一篇文章中解释, 此文先看其规律性。因为圆周 C_n 上的任意等分位上建立的结构线都是一样的, 所以可以用任意一种等分位上建立的结构线来表示其它的等分位上的结构线。所以由此规避了由量子化带来的二维圆周 C_n 弧长上满足 $360^\circ * (L_1/L_0)$ 的具体分度大小的问题。



(二) 接下来看步骤二, 空间变化表示 $L_2= (L_1+L_2)-L_1$, 偏置表示的现实变化

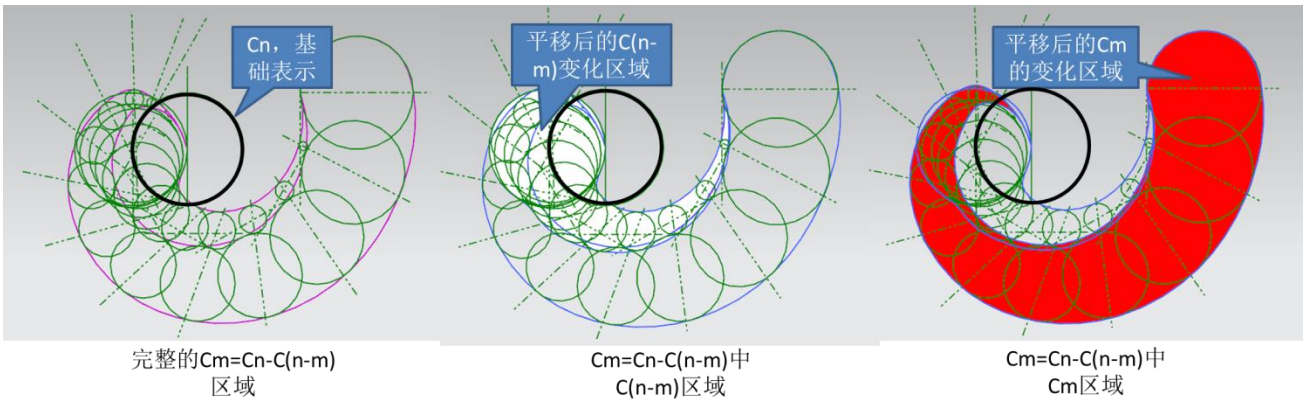
5. 以表示 L0-L1 中的某一个点位为例。

8. 在相对条件 $L1=0$ 的基础上，表示的是 L0-L1 的空间结构。在表示 L0-L1 中，L1 是已变化的空间，空间变化已经完成，所以 L1 在一维线性表示中其实是要被完整地偏置掉的。如下图，L1 对应的圆周 C1 在直线 O1S1 上被偏置了完整圆周 C1 对应的直径。又由命题 7，系统和系统单元的变化同步。所以减掉 L1 时，整个量纲 L0 都会跟随偏移。又 $L0=L1+L2$ ，最后是 L1 和 L2 一起偏置。



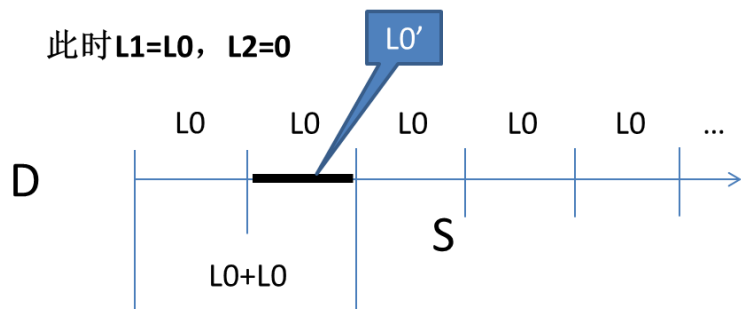
6. 圆周 Cn 上所有点位对应的 L0-L1 中的所有点位对应的现实偏置

9. 上图仅为圆周 Cn 上的某一个点位上对应 L0-L1 表示的 L1 偏置表示。把圆周 Cn 上所有点位对应的 L0-L1 中的所有 L1 偏置都表示出来后得到下图空间结构，如红色和白色区域，可以看到偏移后的表示 $L2=L0-L1$ ，仍然有 L1 和 L2 各自对应的分区。

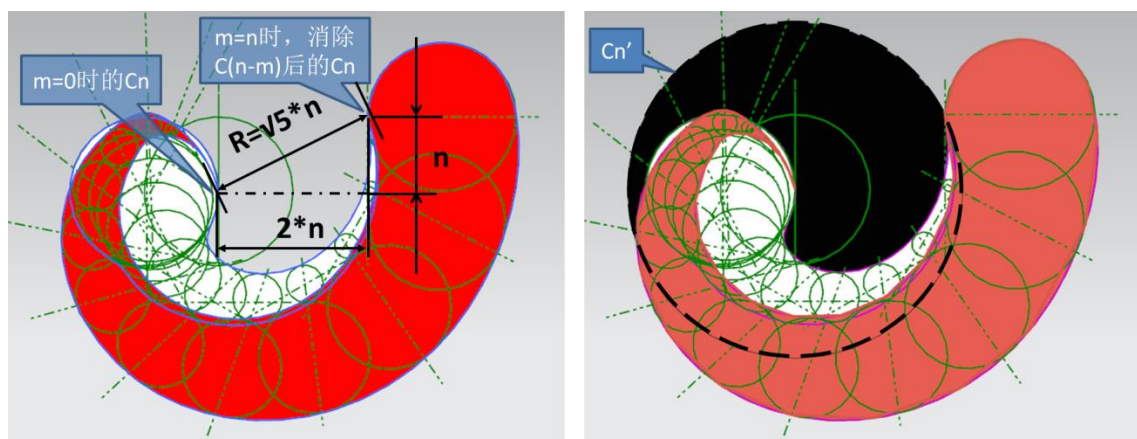


(三) 空间变化表示 $L2 = (L1+L2)-L1$ ，偏置后的现实解读

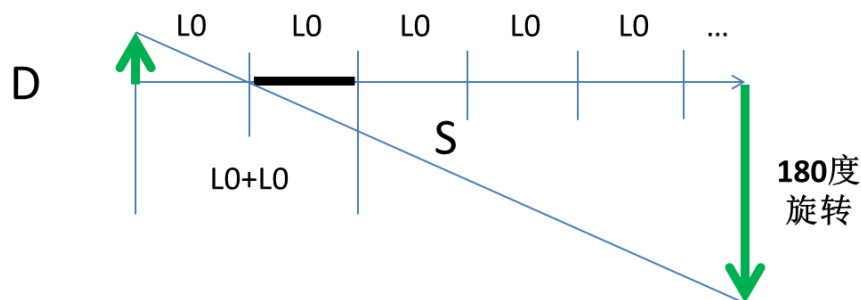
好比精度为 0.02 的游标卡尺，实际上能够真正读准的只有对应整数个的 0.02 的长度。在标量空间 L0 的表示中，只有对应整个标量空间才能真正地被解读。如下图当 $L1=L0$ ， $L2=0$ 时，标量空间 L0 的空间变化才能真正地被解读。



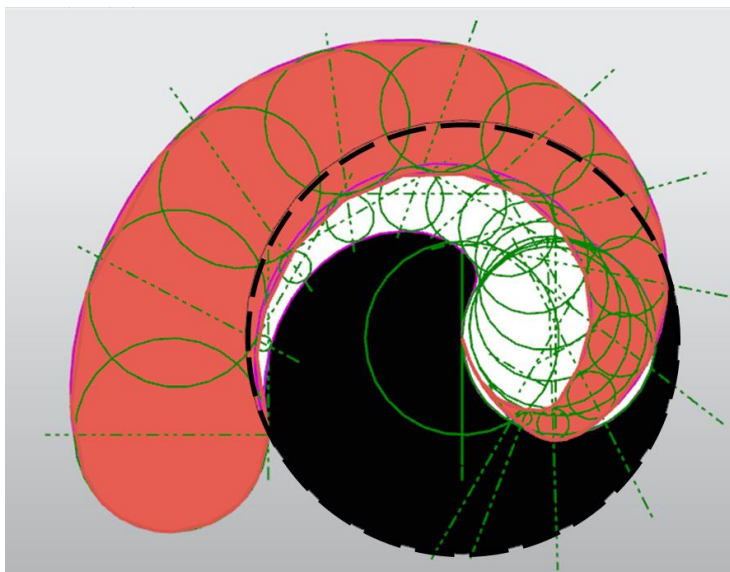
可以看到，从开始到能够准确解读，空间变化前后完整的空间跨度为 L_0+L_0 。和前面的圆周表示一样，在三维和二维以及一维并存的表示中这个 $2*L_0$ 的空间跨度同样遵循圆周表示，如图黑色圆 C_n' 。



在一维空间表示中，只有 $L_1=L_0$ 这个点位同时满足空间变化前后的表示，所有的空间变化表示都要经过 $L_1=L_0$ 这个点位映射。在一维基础上的二维表示，已经发生了 180° 旋转。



旋转 180° 后得到弦的空间变化结构。



再把 Cn' , $C1$, $C2$ 区域分别做布尔运算，在二维表示基础上，叠加三维及其以上维度表示的维度空间变化结构，真实而且准确地展现了出来。



第三章 为什么宇宙微波背景辐射包含可以显现弦理论的迹象

引用理论物理学家布莱恩·格林的《优雅的宇宙》来说明弦论的困境，以及其发展的潜在可能。

第二部万物之弦 36:52: “弦理论解决了，宇宙在亚原子层面的纷杂易变和宏观层面的平滑稳定之间的矛盾，量子论的激烈与爱因斯坦广义相对论的平缓之间很难建立起一座桥梁，把两者统一起来。现在弦理论做到了，它基本平息了量子力学的纷杂，它的发展借助了旧的点粒子理论，并将其发展为一条弦。喧嚣依旧，但却不再那么无规律可寻。量子论和广义相对论，在这一理论（弦理论）框架内得以完美的结合”。

(一) 弦理论到底解决了什么问题。

弦理论统一了量子力学和广义相对论。从视频中引用的话可以知道，弦理论不仅仅适用于量子力学，同时也适用于爱因斯坦广义相对论。

第一部爱因斯坦之梦 42:57：“从那时起，物理学界分成了两派，有些人用广义相对论研究大而沉的物体，例如星球、星系和整个宇宙。而另一派用量子力学，研究最微小的物体，像原子和粒子”。

(二) 微观粒子无法观察到弦理论的迹象

粒子是量子力学中最基本的构成，虽然粒子层面本身包含可以显现弦理论的迹象，要观察的粒子越小，对实验设备的精度等级要求就越高。现在的实验设备还无法满足观测能够显现弦理论迹象的粒子的要求。

第二部万物之弦 38:02：“但这个激进的理论并非天衣无缝，没有实验能证明，在如此小的空间中发生了什么？没有具体的观测能证实这种层面或者能量的存在，换句话说，没有实验可供验证。也没有具体的数据来说明“你们是错的”。

(三) 宏或许在宏观宇宙现象中可以观测到弦理论迹象

既然量子力学的微观粒子无法实现对弦理论迹象的观察，**所以得改变思路，从广义相对论的角度去理解弦理论，把目光放到更为广袤的宇宙中。**

适用于广义相对论，这就意味着质量越大的物体，这种理论迹象就会越明显。从视频中可以知道宇宙本身就是大而沉的物体，那么宇宙本身就一定包含可以显现弦理论的迹象。

(四) 剔除时间的影响

作为万物之理，适用于任何时候的任何事物。思路方向在事物上已经设定为宇宙，接下来就得考虑如何剔除时间上的影响。

宇宙每时每刻都在随着时间变化，宇宙本身的时间跨度非常大（137 亿地球年？）。真理是普适性的，不会因为时间空间而改变的才是真理。假如弦理论是真理的话，那么宇宙在任何时刻都适用于弦理论，可以说宇宙中能够显现弦理论点的迹象在宇宙演变的过程中，几乎不会改变（否则无法在任何时间都满足普适性）。**越大时间跨度的宇宙现象，其稳定的部分中包含可显现弦理论迹象的可能性就越大。**

接下来，思路方向在时间上也已经设定，**弦理论迹象更容易显现于时间跨度大的宇宙现象。**

(五) 选定宇宙微波背景辐射作为弦理论迹象的载体

宇宙微波背景辐射，就是这么一种跨越时间且几乎没有改变的宇宙现象。从宇宙诞生的时刻起，到现在，甚至直到宇宙消亡的那刻，宇宙微波背景辐射一直在忠实地记录着宇宙。如果能够从已知的宇宙微波背景辐射中找到证据，那么弦理论就是可以被实验科学证明的。弦理论将彻底地成为物理理论，而不再停留在数学层面。

P.S

知乎的一位清华大学老师的关于宇宙微波背景辐射的专栏文章《来，让我们看看造物主留下的信息!》。

<https://zhuanlan.zhihu.com/p/20616612>

其中提到理论物理学家 Hsu 和 Zee 对于宇宙微波背景辐射的大胆想法。他们认为宇宙微波背景辐射中包含了宇宙起源的印记。

<https://arxiv.org/abs/physics/0510102>

NASA 发布的宇宙微波背景辐射官网：

https://wmap.gsfc.nasa.gov/universe/bb_cosmo_fluct.html

假如宇宙中存在显现弦理论的迹象，这种迹象应该就隐藏在宇宙微波背景辐射中。接下来，我们需要证据来支持这一猜测。

第四章 宇宙微波背景辐射的 B 模偏振——弦理论存在的铁证

(一) 原初引力波和宇宙微波背景辐射

宇宙微波背景辐射中隐藏着原初引力波的信息，引用文章《[去南极点见证宇宙创生的那一瞬间 | 科学人 | 果壳网 科技有意思](#)》中的一段话，来描述原初引力波和宇宙微波背景辐射的关联。

<https://www.guokr.com/article/437156/>

南极望远镜偏振计（SPTpol）被设计用来精细地测量宇宙微波背景辐射中的偏振。当这些涟漪（原初引力波）在时空中传播时，它们会以一种独特的方式使得电子发生位移，从而在宇宙微波背景中留下它们的印迹。

(二) 原初引力波和极化

引用文章《[我们看到了宇宙诞生的最初瞬间 | 科学人 | 果壳网 科技有意思](#)》中的一段话

<https://www.guokr.com/article/438227/>

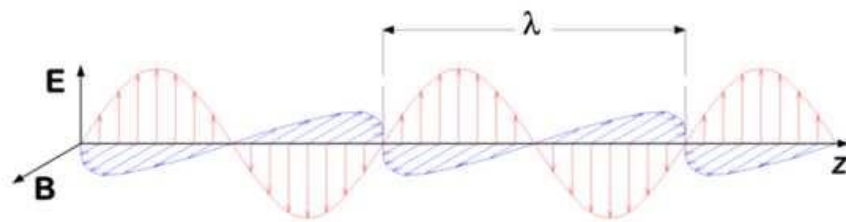
众多的光子与电子碰撞以后集体展现出来的这种方向选择性，可以用两个物理量描述：E 模式极化和 B 模式极化。人们发现，B 模式在足够大的空间尺度上，只能通过原初引力波产生！于是，事情听起来似乎变得很简单：只要建造最好的望远镜，但凡看到这种特殊模式的信号——B 模式极化信号，就能证明原初引力波的存在！

(三) 电磁波极化

要找到极化的信号，得先了解一下什么是极化。[Polarization \(waves\) 维基百科](#)

[https://en.wikipedia.org/wiki/Polarization_\(waves\)](https://en.wikipedia.org/wiki/Polarization_(waves))

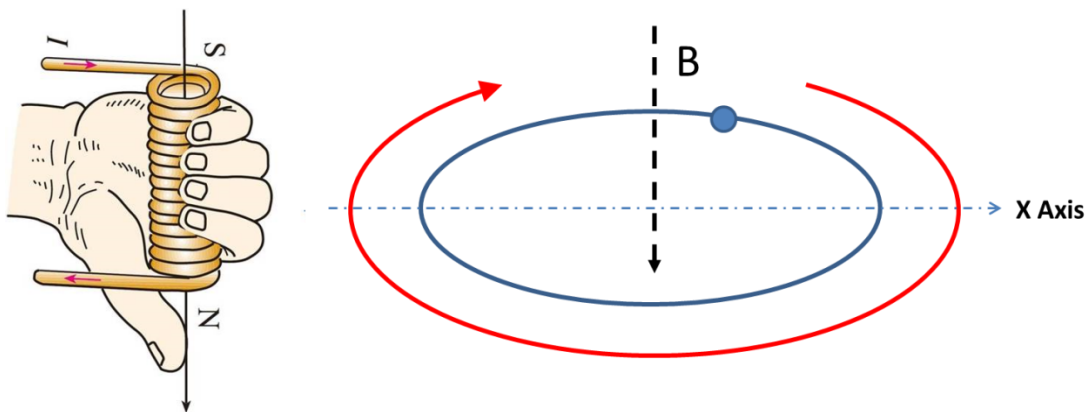
波长为 λ 的“垂直极化”电磁波的电场矢量 E（红色）在垂直方向上振荡。磁场 B（或 H）总是与它成直角（蓝色），并且两者都垂直于传播方向（z）。



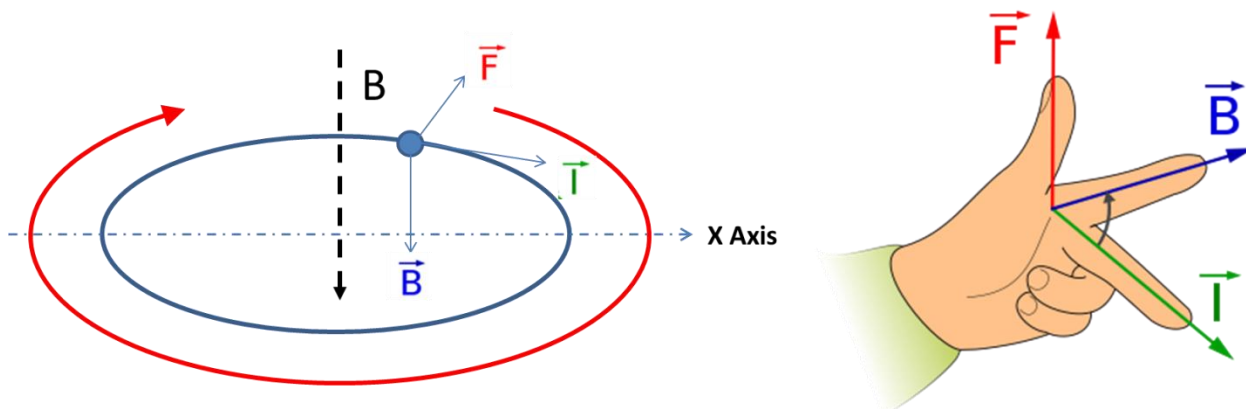
(四) 左手定则和右手定则

从电磁场的角度来理解，右手定则和左手定则能够直观地解释 E-极化和 B-极化。

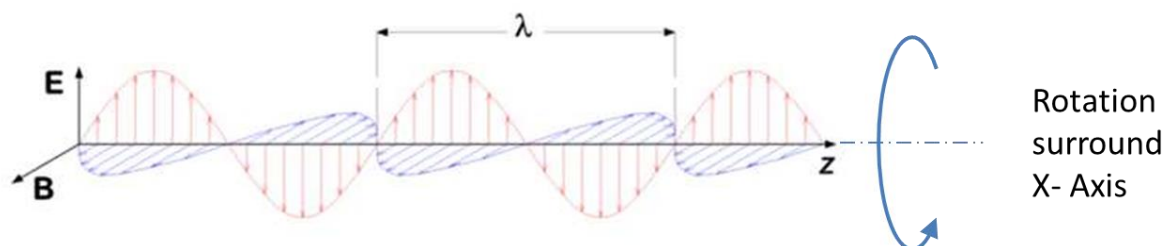
右手定则：当构成环形电流的粒子在 XY 平面通过时，环形中心处会同步产生一个贯穿 Z 向轴线的磁场。



左手定则：粒子在环形轨道上通过，环形中心处的 Z 向磁场会对环形轨道上的粒子产生磁力作用，由此产生偏转。

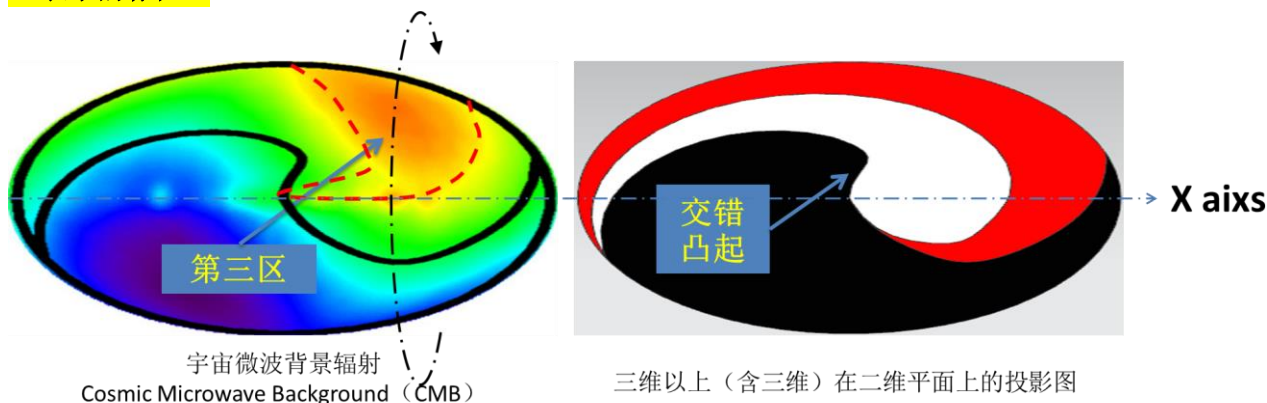


为了更准确地表示这种磁力偏转，回到电磁波的极化图示中。如蓝色旋转箭头所示，可以看到引入 B 轴表示后，原本在 E-Z 平面上的波形明显地产生了围绕 Z 轴的旋转。



(五) 宇宙微波背景辐射中围绕 x 轴的旋转

如第一章命题 4, 由于存在比量纲表示 L0 还要小但又无法直接显现的 L2, 使得现实观察表示必然存在偏差。把 NASA 发布的宇宙微波背景辐射, 对比文章推导的空间变化二维结构, 就会发现第三区围绕 x 轴的旋转 (B-极化)。同时也可以明显看到红色虚线所示第三区沿着 x 轴的偏移 (变短), 由此证实了量纲表示 L0 中 L2 表示的存在。



红色虚线对应的第三区围绕 x 轴偏转, 是 B 模极化偏差的铁证。

又第一章命题 3 消除运动物体本身空间带来的偏差, 甚至可以规避不同维度形态的偏差。

所以“弦”的空间运动变化, 同样符合这种空间结构。

最后证实了“弦”的存在性。

第五章 对弦的定义, 以及对《自然哲学的数学原理》中四条哲学推理原则的应用规则解读

(一) 弦的定义

本文中的“弦”, 请参照理论物理学家 Maldacena 对弦的定义: Solid Theoretical in Natural Geometric Structures。请大家记住弦定义的基础——几何结构(Geometric Structures)。本文的弦, 是指空间变化的几何结构。

(二) 《自然哲学的数学原理》的解读

在《自然哲学的数学原理》一书中, 牛顿从自然观测和实验着手, 通过几何学方法来论证代数微积分命题, 并建立宇宙体系。

建立在几何基础上的代数学才是真实的, 建立在现实基础上的几何学才是真实的。代数、几何、现实三者之间的关联性规则, 是牛顿最想表达的。这是一种自然朴素哲学的回归, 通过直线和圆这两种最基本的理想几何元素, 描述了自然现实世界的运动轨迹结构。直线是理想状态下运动轨迹, 圆是理想状态(系统质心)万有引力作用下的运动轨迹³。书中引用了大量的直线和圆弧或者圆周, 来展示理想状态下的宇宙系统变化规则。

好比做实验之前要用检具对实验工具进行校验，用几何学论证代数学，好比是用检验实验工具的检具去校验实验工具。但检具也是工具，用来校验实验工具的检具，其本身也是需要校验的。用来校验代数学的几何学，同样也是需要校验的，校验几何学的方法是自然（实验）现象，所以书中还引用了大量的自然（实验）研究和自然天文观测作为校验方法。这也是为什么四条哲学推理规则的第一条就是不能超出（自然）现象。

(三) 四条哲学推理规则的应用

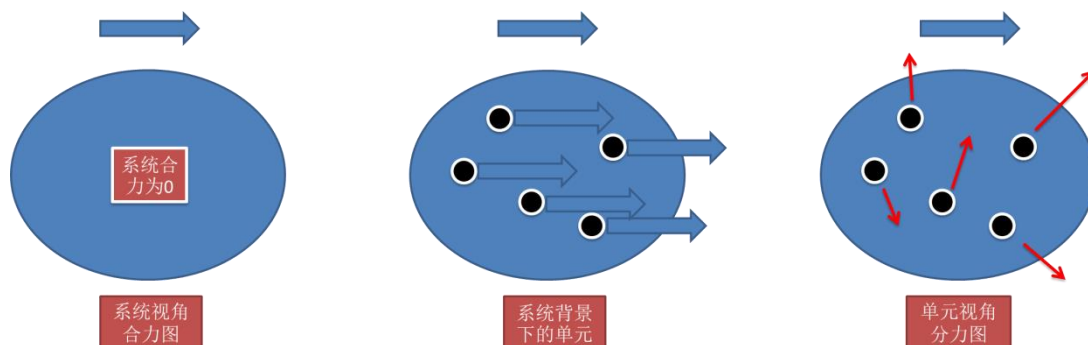
《自然哲学的数学原理》一书中的四条哲学推理规则，能够很好解释本文如何通过现实条件制定变化规则。【】内是本文作者对这四条推理规则的理解，尤其是第四条哲学推理规则，在整个文章思路架构中是非常重要的的一环。

rule I. 寻求自然事物的原因，不得超出真实和足以解释其的（自然）现象者。
为达此目的，哲学家们说，自然不做徒劳的事，解释多了白费口舌，言简意赅才见真谛，因为自然喜欢简单性，不会响应于多余原因的奢谈；

[原理，必须符合自然现象]

平静的海面下暗流汹涌，静止和运动可以同时自然存在。

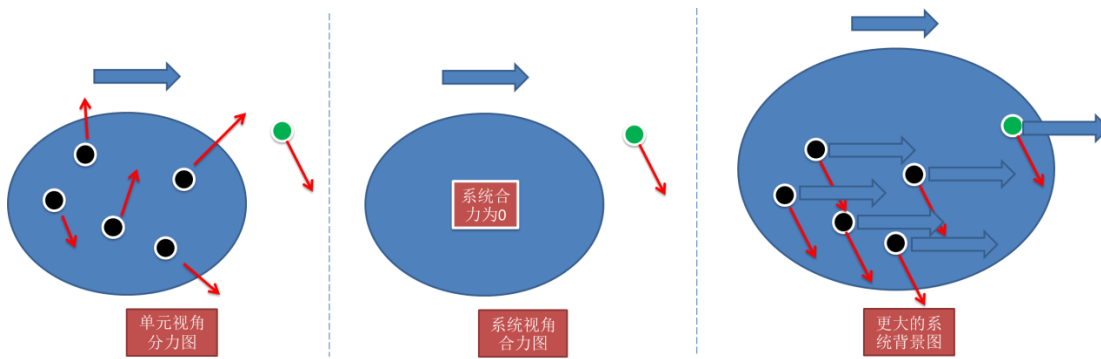
- a.) 如下图 1-1，系统做直线运动；
- b.) 如下图 1-2，系统上的任意一点随着系统做直线运动；
- c.) 如图 1-3，系统中的单元，可以是在做任意方向的运动；



rule II. 因此对于相同的自然现象，必须尽可能地寻求相同的原因。
例如人与野兽的呼吸、欧洲与美洲的石头下落、炊事用火的光亮和阳光、地球反光和行星反光；
[自然现象的规则，必须尽可能地归类、简化。可以看到通过第一章的命题 7，它将所有变化都简化为一种统一的表示。]

d.) 能够影响系统整体状态的，只能来自系统外部。系统内部个体数量不变时，系统相对稳定。如果遇到影响系统的外部个体，把该个体再纳入到一个更大的系统，这样就可以消除外界影响偏差，最后得到一个无限接近理想状态的系统。通过这个方法，现实世界可以被归纳为一个无限接近理想状态的系统。

e.) 当现实世界被归纳为一个无限接近理想状态的系统时，自然现实世界中的任意一个点都存在相对系统整体状态的表示。



rule III. 物体的特性，若其程度既不能增加也不能减少，且在实验所及范围内为所有物体所共有，则应视为一切物体的普遍属性；

[系统内研究对象的普适性]

f.) 当系统用质心来表示时，质心的运动可以表示为系统内的任意一个单元的相对整体运动，而且单元彼此之间是同步的。这个可以用来解释上面的 1.b。

rule IV. 在实验哲学中，我们必须将由现象所归纳出的命题视为完全正确的或基本正确的，而不管想想可能得到的与之相反的种种假说，直到出现了其他的或可排除这些命题、或可使之变得更加精确的现象之时；

[在自然现象归纳的多个命题中，只选择需要的正确命题，直到被排除或者更优化]

(四) 实用至上，只要在现实中能应用的，就可以搬过来。

- a) 既然能够理解的现实空间不超过三维，那么就在二维基础上构建一个三维空间框架；
- b) 既然对偶性表明维度之间的空间位置全息对应，（如第一章命题 3）那么就将所有高于三维的维度表示全都用等效量子态的空间质点点位表示，由此解决高维无法表示的问题；
- c) 既然自然标量只能取整，把标量以内所有的表示，全都转换为以基本空间标量作为背景；再由空间点位反过来找出对应的等效量子。