Bio quantum path duality metamorphosizes Newtonian rigid inertia into bio-inertia

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Bio quantum path duality metamorphosizes Newtonian rigid inertia into bio-inertia

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Abstract

Newtonian inertia has initiated science centuries ago and dictates modern society with isolated logic systems. The hidden premise of this system is rigid existence in an isolated environment that defies any internal motion. The equivalent principle from general relativity and the T-symmetry reversible processes from thermodynamics also rely on such a notion. However, bio-inertia originates from the blind spots of this system; surface tension region inversion as the most general interactions is sacrificed for methodological isolation/test purposes and then neglected by science. We define and experiment bio-inertia as “parameter-against-gravity-recovery”, revealing the interaction between Planck regions and surface tension regions issues negentropy, conventional quantum collapse period is then extended to lifespan. This modulation which integrates quantum mechanics, gravitational waves, thermodynamics into surface tension bio quantum path duality needs to break the isolated logic method and takes musical inversion as structural dynamics in bio-systems, generalized as **Basic Law of Evolution**. An original evolutionary physical string oscillation memory equation is unveiled for the first time.

Results, empirical section

1. Mutations of legendary Galileo falling body experiment for non-living objects

Legend says that Galileo Galilei has dropped two cannonballs of different masses from the Leaning Tower of Pisa to show that their speed of descent was independent of their weight. One of the famous thought experiments acts as the physical basis of Newton's Three Laws of Motion. Now we mutate this experiment to understand the quiddity of this basis (We need to define the “falling height difference” indicator. Release two objects simultaneously from a certain height, at the moment when the first falling object hits on the ground, the height of the second object from the ground is defined as the “falling height difference”. Legendary Galileo's experiment tells people for centuries that the “falling height difference” of the two objects he released from the Leaning Tower of Pisa is zero. Any significant non-zero “falling height difference” over the tolerable accuracy means the masses of two released objects are not independent of their weight. The **Falling height difference** is symbolized as **FHD**, tested by camera video in this paper.):

Figure 1 | Measuring the “weight” of human *in vivo* gravitational waves by mutations of legendary Galileo falling body experiments

a) a pair of slinky toys with the same mounted height **b)** hung up the slinky pair, A is free suspension, B with a metal rod fixed to avoid coil back **c)** A is free suspension, B mounted and tie with silk to avoid extension **d)①** A is free suspension slinky, B is a same length metal chain **d)②** the snapshot of the pair from d) ① released from height (**Suppl. Movie 3**) **e)①** inside view of the bi-layer metal balls **e)②** hang up the bi-layer metal balls for experiment **f)** a bottle pair hung on the rack, one with half bottle of water and another with full water, note the ice-cream clips design by a six-year-old girl **g)①** a bottle pair hung on the rack, A with half bottle of water, B with half bottle of oil **g)②** the 4 laboratory bottles among more than one thousand commercial bottles for mutation 1.5 **h)①** the bottle pair from g)① hang on the rack from height for experiment **h)②** the snapshot of the bottle pair experiment, refer to (**Suppl. Movie 4**) **i)①** apple pair hang on the rack from height, one is a fresh apple and another is cooked apple **i)②** snapshot of the apple pair from i)①, refer to (**Suppl. Movie 6**) **j)** bio quantum path, refer to (**Suppl. Movie 5**) **k)** chayote fruit pair hang on the rack, one is fresh, another is cooked **l)** a commercially packed vegetable bag experiment with a metal weight, a solid metal ball is not obvious in photos, so we use the metal parts in this shape instead. The *FHD* between a cooked organism and the metal weight is quite small, therefore, while a sample is rare to acquire we then use the metal weight to replace the cooked sample **m)** mung bean seeds hang on the rack, one is raw seeds and another is soaked for 24H **n)** soybean seeds hang on the rack, one is raw seeds and another is soaked for 24H **o)** the 10m diving platform we performed the first human bio-inertia trial in the world in Etobicoke, Ontario, Canada at Feb. of 2020. **p)** crab free-fall experiment, one is alive, and another is cooked **q)** fish free-fall experiments, one is living, and another is cooked. Before the experiment, we carefully choose two fishes with the same length; however, the cooked one is shortened after boiling. Deprive of bio-inertia also induce a space-time deformity. For these types of animals, it is difficult to use the “ice-cream” clips, we have to hand-hold for stable and then release **r)** rat free-fall experiment with the metal weight, still need the handhold **s)** sketch of the ideal diving posture with a rack for testing *FHDs*

Mutation 1.1: slinky free fall mutation

(**Fig.1a**) shows two slinky toys with a free mounting height of 55 mm and a free suspension length of 1120 ± 2 mm. We hang them as in (**Fig.1b**①), slinky A is free suspension, and slinky B is tied with a metal bar inside to prevent recoil back. Release them from the same height simultaneously, B hits on the ground first. Following the conventional Galileo experiment, the difference in the mass amount of the two rigid bodies will not influence the falling time; then, what makes the difference of the falling time should come from the difference in the inner motion of the non-rigid bodies. (After release, slinky A allows recoil back motions and the slinky B does not, the recoil back motion is a kind of inner motion that induces the differences of accelerations. In the experiment, a rack is used to calm the falling bodies to have a long enough stable time before releasing; thus, no extra holistic kinetic energy is resident on to the released objects. Such a non-external kinetic energy driving state shows maximum inner motion effects. The conventional Newtonian rigid body concept means inner motion is zero. Here just amplify the inner motions to show the hidden premises.)

NASA has a video on its website to show Apollo astronauts performed the Galileo experiment on the Moon in 1971 with a hammer and a feather as shortened in (**Suppl. Movie 1**). If we carefully observe the video, we could find the feather has already lagged the hammer for a few centimeters, also inversion a few times in the falling. NASA wanted to show the difference of masses will not impact the *FHD* of objects on the Moon without atmosphere. They did fail to realize that besides the atmosphere factor, the inner motion also plays a role. The feather is softer than a hammer; it possesses much more inner motion in the falling process than that of the former. Even under an environment without atmosphere friction like on the Moon, we can see such an inner motion difference has already induced a visible difference in the NASA experiment at a lower height. (If the falling distance is enlarged to over 20m, we could expect a larger observable *FHD* originates from the inner motion difference between them.) From this video, we can say that mutation 1 equivalent experiment had been performed by NASA “unintentionally” on the Moon half a century ago. Shortly, while China landing humans on the Moon, we’ll suggest the legendary Galileo experiment slinky mutations to be executed there; we can then clearly see how the inner motions of a falling object impact gravity.

Mutation 1.2: Le Châtelier’s effect of slinky conservative force binding

Slinky mutation of the Galileo experiment can also use (**Fig.1c**), slinky A is free suspension, and slinky B is tied with thin threads while mounted to prevent stretch if falling. We hold slinky A and slink B with their bottom at the same level at the height and then released simultaneously. The *FHD* is still non-zero, B hits on the ground

first. We put the bottom of A and B as the falling level is to show Le Châtelier's effect of gravity. As in (**Suppl. Movie 2**), release a free suspension slinky from a height, there is almost no displacement of the bottom until the top of it can reach the slinky uncompressed position. This type of motion is Le Châtelier's effect of gravity since the top gets the highest elastic potential which stores gravitational potential, and the bottom gets the minimum. This elastic potential is held by the hand, while release, Le Châtelier's effect will happen in the direction of reducing this potential; therefore, the highest potential points first move to reach an uncompressed position, then the whole structure moves down with some oscillations. (The concept of the "center of mass" doesn't fit for a slinky since it is shifting.) From here, gravity follows Le Châtelier's effect on non-rigid bodies in a free-fall state. In a surface tension region structure such as a soap bubble with difform motions, or a multi-surface tension bio-system, gravity can be shifted to various directions. Even under such complex conditions, the movements of gravity polarization regions still follow Le Châtelier's effect. (Gravity polarization roughly means changing the direction of the gravity vector from its original or opposite direction to other ways induced by surface tension.)

Mutation 1.3: modulation of internal motion from a slinky and a free chain

We still have not differed between inner motion & internal motion before, now we'll show this conceptual difference. A is a free suspension slinky, and B is a metal chain with the same free suspension length as it (**Fig.1d①**), release them from height, the metal chain will hit the ground first as in (**Fig.1d②**) and (**Suppl. Movie 3**). Both the slinky and the chain are not rigid bodies; the only difference is that the motion of the slinky is highly recoverable and the metal chain is almost no recoverable. Take Hamiltonian, $\hat{H} = \hat{T} + \hat{V}$ (T: kinetic energies, V: potential energies), the more gravitational potential energy is transferred to total energy, the more internal motion an object will possess. For the metal chain, the transferring efficiency from the gravitational potential is lower, and the efficiency of maintaining the transferred gravitational potential energy by internal motion is also lower than that of the elastic slinky. The Hamiltonian can then be written as $\hat{H}_{\text{Internal}} = \hat{V}_{\text{gravity}}$. (In bio-systems, almost all motions are internal motions; it is the reason why it is challenging to transfer kinetic energy to an animal. For a non-living rigid metal ball, we can take another metal ball to hit it, follows the Law of Conservation of Momentum, $p = \sum m_i v_i$, total kinetic energy is easily transferred to it and show out. For an animal, it is difficult to increase its system kinetic energy to it by hitting a metal ball on it due to its $\hat{H}_{\text{Internal}}$. If we use this way, the holistic kinetic energy of the metal ball needs to first transfer to an *in vivo* potential energy type to the whole body of the animal, then follow the potential energy structure regenerate back into kinetic energy. The recovering efficiency of kinetic energy in this process is quite lower. From this fact we then can know that the classical physical Law of

Conservation of Momentum and the Conservation of Energy is also not fit for bio-systems due to the high percentage of *in vivo* internal motions maintained and the potential energy structure involved. The ancient physical strike training method (p1681,→)¹ was designed for improving the internal motion gravitational binding of human bodies, with more than 1500 years of history. The mechanism is still the human body can transfer more kinetic energy to potential energy after training. Now, we can differ the concept of internal motion VS inner motion; for a non-rigid body, internal motion generally means recoverable motion and inner motion does not. We can easily understand that the conservation of momentum relies on rigid body characteristics since the transferring of internal motion must rely on surface tension. The original format of Newton's Second Law of motion is the impulse-momentum theorem: $\vec{F} = k \cdot \frac{d(m \cdot \vec{v})}{dt}$, even rely on rigid body conditions more than the later version, $\vec{F} = m\vec{a}$.

Mutation 1.4: two bi-layer metal balls free-fall experiment to modulate relative mobility

As in (**Fig.1e①**), we order 8 stainless steel hemispheres, four with 100mm radii, and four with 51mm radii, thickness 1mm, from a manufactory with ISO standards. Four small hemispheres were soldered into two 51mm metal hollow balls, one hollow ball also soldered with two small rings and fixed into one larger hemisphere with two rubber or metal springs. After the small 51mm hollow ball was fixed into one larger hemisphere by rubber bands or metal springs, solder another hemisphere on it (assure not damage the rubber bands). Then we get a 100mm hollow ball with rubber bands or metal springs to suspend a 51mm hollow metal ball inside it. Another small hollow ball was soldered inside another hollow hemisphere with two metal rods. Finally, we get two bi-layer hollow metal balls, A with inner small metal hollow ball connects to the larger metal ball with rubber bands or metal springs. The B is similar to A; just the connection is soldered metal bars, then it is difficult to swing compares to that of A. Release them from a height as in (**Fig.1e②**), B hits on the ground first (with 5 min of calm time on the rack). This mutation can modulate the internal motion clearer; in this case, the small hollow metal ball relatively oscillates to the large metal ball or the whole system. We can call this type of internal motion as relative mobility which adapts to *in vivo* conditions well; it can bind gravity. (This mutation has not only modulated relative mobility but also excluded air friction impact quite well than that of mutation 1.1.)

Mutation 1.5: free fall of bottles with different mobile liquid contents

(**Fig.1f**) shows two water bottles, the B full of water, no visible bubbles, A only with half bottle of water,

release them from height, B falls on the ground first. We should carefully note that the reason that B hits first is not due to that B is heavier than A. That is due to the water inside A (half bottle) possesses higher relative mobility to the bottle wall than that of B (which fully occupies the bottle, then the water relative mobility is confined). From the next experiment, we can see the impact of relative mobility on *FHD* more clearly. (**Fig.1g①**) shows two water bottles, A with a half-bottle of water and B with a half-bottle of plant oil, release them from height, B hits on the ground first. While design these two experiments, I thought they need a very high place to show a visual *FHD*, even prepare to rent a helicopter. However, only with 4.82 m height, they did show an indisputable *FHD* (**Fig.1h①**, **Fig.1h②**). (**Suppl. Movie 4**) shows a video with the original video binds with its slow-motion version together; the bottles come from two 330ml drinking water bottles in the same batch. We can see from (**Fig.1h②**) snapshot, the *FHD* between half a bottle of vegetable oil and half a bottle of water has already attained around 1.5 bottle length from a height of 7.04 m, which is, $1.5 \times 14.5 = 21.75$ cm. (The length of the bottles in the video is 14.5cm, diameter 6.5cm. Before releasing the bottles, we need to hang them on a rack in still states for at least 5 min. The human hands cannot stably hold before releasing objects for a long time; therefore, a rack (**Fig. 1f, etc.**) is necessary. The releasing process needs two persons to open the clips simultaneously.) This mutation has been performed in Guizhou, Shanxi, and Heibei Province of China; Ontario of Canada; Buffalo, New York, USA, for around 600 experiments at different places, from different falling heights from 4.82m to 23.65m, with different types of commercially available drinking bottles from 330ml, 500ml, and 750ml (in all the 600 experiments, only four laboratory containers were used, as in (**Fig.1g②**), the remaining 1200 more bottles were commercial drink water bottles), different oil types from canola oil, vegetable oil, sunflower oil, peanut oil, soybean oil, car engine oil. The *FHD* difference is unavoidably presented in every trial; in contrast, no single falling experiment from all above 600 trials could get any two bottles with *FHD* result lower than 20 cm, and the oil bottle unexceptionally hit first. We carefully arranged so many tests just to assure that longitudes, latitudes, altitudes above sea level, types of oils, locations, etc., will not impact the relative mobility driving result. We use commercial products instead of laboratory containers is to give the data reproducibility to the global public then every unprofessional people can validate the results directly. (This experiment is so simple that a six-year-old kindergarten girl has participated in the video of (**Suppl. Movie 4, 6**), with rock climbing safety rope for safety. This kindergarten girl not only performed experiments to challenge Newtonian, Einstein, Planck, and Schrödinger but also design a device to defeat me. In the beginning, I designed mechanical devices to hold slinky before releasing them. It was the kindergarten girl whose favorite ice cream told me to use the clips. Her ice-cream clip "devices" (**Fig.1f**) did perform better than all of my designs.) For the concept of "hitting the ground simultaneously", the smallest bottle

diameter is 6.5cm, length 14.5cm. Generally, human eyes can discern an *FHD* of 0.5cm, even if we enlarge the condition "hitting the ground simultaneously" from 0.5cm to a wide 6.5 cm tolerated range, the ideal story which stated in the legendary Galileo falling body experiment still never existed. The Leaning Tower of Pisa is 58.36 meters tall, the largest height of our 600 trials only 23.65m which failed to attain the half-height of that Tower, and we also enlarged the tolerable measuring range, even so, no single piece of result can get a zero *FHD* within acceptable standards. If half a bottle of water and half a bottle of oil are released from that famous Tower, we can expect a much larger *FHD* than those in all our validations. (This fact means people have lived in the illusion of a legendary result for centuries. It is not the mistakes of Galileo or Newton, for rigid bodies, they were not wrong, and they had transcended their era greatly. The problem is the whole human society believes the isolated logic methods that make Galileo or Newton's success is the only approach for scientific study. Such an illusion does restrict the regenerative of science.)

Before releasing, the oil bottle measured 173.274g, and the water bottle measured 184.125g in the video. The lighter object falls on the ground first, which means relative motility has become the critical impact factor in *FHD* than those of the weights or the masses. We only weighed the two bottles for preparing the video, not for all the 600 trial experiments. However, due to the density difference, the visually checked oil bottles should be lighter than those of the water bottles by visual check for over 98% of the conditions. From here, we can see that relative mobility has exceeded mass or weight in the *FHD* for non-rigid bodies under certain conditions. This reveals there exists "incompleteness" for Newton's and Einstein's systems for explaining weight, mass, and gravity under high potential energy bodies (means with more surface tension regions and in a non-isolated environment).

Mutation 1.6: liquid nitrogen mutation of bottle pairs (with a half-bottle of oil and a half bottle of water)

The quiddity of our mutation experiments refers to as the weak equivalence principle (WEP) in conventional physics. (Tab. 1) shows the historical validations of this principle in macrocosmic conditions (slightly modified from the original reference book² and only keep the references of Newton and Eötvös.); (Tab. 2) shows the modern validations in microcosmic terms.

Tab. 1 | Historical test of weak equivalence principle (WEP) in the macrocosmic world²

Year	Investigator	Sensitivity	Method
500 ?	John Philoponus	small	Drop tower

1585	Simon Stevin	5×10^{-2}	Drop tower
1590 ?	Galileo Galilei	2×10^{-2}	Pendulum, drop tower
1686	Isaac Newton ³	10^{-3}	Pendulum
1832	Bessel	2×10^{-5}	Pendulum
1908 (1922)	Loránd Eötvös ⁴	2×10^{-9}	Torsion balance
1910	Southerns	5×10^{-6}	Pendulum
1918	Zeeman	3×10^{-8}	Torsion balance
1923	Potter	3×10^{-6}	Pendulum
1935	Renner	2×10^{-9}	Torsion balance
1964	Dicke, Roll, Krotkov	3×10^{-11}	Torsion balance
1972	Braginsky, Panov	10^{-12}	Torsion balance
1976	Shapiro, et al.	10^{-12}	Lunar laser ranging
1981	Keiser, Faller	4×10^{-11}	Fluid support
1987	Niebauer, et al.	10^{-10}	Drop tower
1989	Stubbs, et al.	10^{-11}	Torsion balance
1990	Adelberger, et al.	10^{-12}	Torsion balance
1999	Baessler, et al.	5×10^{-14}	Torsion balance
2017	MICROSCOPE	10^{-15}	Earth orbit

“?” in the table means “lack reliable direct historical documents, only indirect references available”, or simply marked as “legendary”.

Tab. 2 | Validation of weak equivalence principle (WEP) in the microcosmic world

Year	Investigator	Sensitivity	Method
2004	Fray ⁵ et al.	10^{-7}	Atomic Interferometer
2015	Zhou ⁶ et al.	10^{-8}	Atomic Interferometer
2017	Rosi ⁷ et al.	10^{-9}	Atomic Interferometer

The principle refers to the equivalence of gravitational and inertial mass in Einstein’s general theory of relativity. Historically, the first free fall validation should perform by Simon Stevin at the Delft Church Tower in 1586 (He also contributed his role in 12-TET). Not surprisingly, the legendary Galileo’s story lacks narration from himself albeit it is so famous, only available a biography from his student: Vincenzo Viviani. As in the table, even as

earlier as Newton's time, this experiment had reached a higher enough sensitivity. Later, accuracy was continuously enhanced. However, the claimed higher sensitivity of those validations in (Tab.1) is possibly due to the use of solid metal objects closed to rigid bodies, thus restricting the internal motions (relative mobility of the different parts) of them in the experimental processes. Once experiments use non-rigid bodies that can show significant geometrical shifting in the falling processes, such as the mutation 1.5 of bottle contents, or mutation 1.4 of bi-layer metal balls, the accuracy will quickly be decayed to an unacceptable level. To confirm this non-rigid body impact hypothesis, we perform the nitrogen mutation of the mutation 1.5. As mentioned before, in more than 600 experiments, each with a half-bottle of oil and a half bottle of water fell from over 4.82 m, all acquired *FHDs* > 20cm; that is due to the different relative mobility of the oil and the water inside the bottles. We then put 12 bottles into a liquid nitrogen jar, six 330ml and six 500ml commercial drinking water bottles, compose six experimental pairs (a half bottle of oil and a half bottle of water), and another 12 equally prepared bottles without nitrogen treatment as CK, released from the heights of 5.28 m, 7.04m, and 23.65m; each pair hits on the ground simultaneously as in (Tab.3):

Tab. 3 | Liquid nitrogen mutation for *FHD(s)* of bottle pairs with a half-bottle of oil and a half bottle of water

falling height (m)	commercial bottle size (ml)	liquid nitrogen treated pair <i>FHD</i> (cm)	CK group (without liquid nitrogen) <i>FHD</i> (cm)
5.28	330	0	21 (water bottle first)
	500	0	22 (water bottle first)
7.04	330	0	28 (water bottle first)
	500	0	34 (water bottle first)
23.65	330	0	44 (water bottle first)
	500	< 2	39 (water bottle first)

* non-detectable recorded as 0. Liquid nitrogen frozen bottles only stable on the rack for 20s after hanging, lower than the general 5min calm time for other mutation experiments. The height is measured by a laser distance meter that can reach mm, the *FHD* is estimated from a video which can touch 0.5cm accuracy; both are rounded to cm. This mutation was only performed in Ontario of Canada with 12 bottles to validate the relative rigid body hypothesis, and the CK equivalent experiments have been performed on different locations of Earth with enough generality.

From this mutation, we can further see how internal motion (relative mobility) impact *FHD*. Historical experiments in (**Tab. 1**) used solid metal objects; then the *FHDs* induced by the internal motions are undetectable. While we change the solid metal into liquids inside bottles, it easily shows detectable *FHDs*. Now, we use liquid nitrogen overnight to fix these liquids again, then in the falling process, the results recover back to conventional undetectable *FHD* again. This proves again that internal motions of an object play a critical role in the *FHDs*; we call such difference as internal motion Le Châtelier gravitational binding, which means inside the internal motion gravitational binding structures, Le Châtelier effect controls substantial parameters.

In classical physics, the corollary that "inertial mass equals gravitational mass" is the foundation of Newtonian and Einstein's system, even classical quantum mechanics indirectly concerned with it. Now from mutation 1 till mutation 6 of the legendary Galileo falling body experiment, we can clearly see that once the internal motions (relative mobility) of objects reach certain levels, this foundation will be melting. And due to entirely relying on the foundation, no existing theories in physics have ever experimented or theoretically clarified that internal motion or relative mobility of a system can bind gravity or conservative forces. Such kind of "physical disciplinary neglected" relative mobility gravitational binding is where life originates and evolves. ((**Tab. 2**) refers to the validation of WEP in the microcosmic world; at this level, these validations still seriously neglect the larger internal motion gravitational binding that originated from the surface tension region in microcosmic conditions.)

2. Bio quantum path experiment and the definition of bio-inertia, inversion energy & time

The bio quantum path model has been initiated by the paper (p1682,→)¹ with (**Fig. 1j**) and (**Suppl. Movie 5**). A ball running on path B gets the help of gravity, $dF_{forward} = F_0 + mg \cdot dtg\theta \cdot \theta$ periodically change from 0 to close to $\frac{\pi}{2}$ thus it can "splice out" non-conservative forces such as frictions. On path A the ball only gets $dF_{forward} = F_0$ to overcome the friction, then the friction counteraction regions represented by the red color in the figure will be significantly larger than those on path B; path B can then accumulate more gravitational to counteract frictions. This explanation still utilizes the Newtonian inertia; now, we'll see a totally different kind of inertia:

From (**Fig. 1j**), we can write the force that drives the ball on path B as, $dF_{forward} = F_0 + mg \cdot dtg\theta_B$, equally, the force that drives the ball on path A still can be written as, $dF_{forward} = F_0 + mg \cdot dtg\theta_A$; the only difference between them is that $dtg\theta_B$ always changes, and $dtg\theta_A$ always equals to 0, then:

$$\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta| \downarrow \quad (1)$$

Eq. 1 can be regarded as a modified Newton's second law of motion for non-rigid bodies. (The non-rigid

body item $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$ can also be roughly called a “gravitational binding” item, note the quantum mechanics symbol “ $| \rangle 1\downarrow$ ” only means continuously part or full recovery is the only way to accumulate bio-inertia in a non-isolated environment, which is different from conventional wave function must theoretically present in an isolated condition. We can easily find the law of conservation of momentum only effect for the rigid body item and the error of which will accumulate with the increasing of the non-rigid body gravitational binding item: $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$.) The physical significance of Eq. 1 means the persistent recovery rate of a physical parameter can bind extra gravity other than those written down in the rigid body format Newtonian laws. Here the angle θ between the moving vector and gravity is persistently shifting, therefore, it binds gravity. Suppose we choose other physical parameters, such as the metal ball height, speed, etc., still can get similar results; we call such a process as “parameter-against-gravity-recovery” gravitational binding movement. (We can also understand such a “parameter-against-gravity-recovery” process by Polymerase chain reaction (PCR). People put PCR premix including a DNA template, polymerase, two DNA primers, dNTPs, buffer solutions, etc., into a PCR tube; then use 15-40 thermal cycles (each cycle: denaturation: 94-97, annealing: 50-65, elongation: 70-75°C) to synthesis DNA segments for analysis. Each *in vitro* thermal cycle is a temperature parameter-against-gravity-recovery process; therefore, accumulates gravitational binding or bio-inertia for the DNA synthesis requirements. *In vivo* processes are similarly need “parameter-against-gravity-recovery” to bind gravity for life function, just the binding capacity enlarged greatly by all parameters get well optimized by *in vivo* surface tension regions thus not like the *in vitro* PCR process needs so drastic temperature parameter cycles.

The function of “parameter-against-gravity-recovery” to bio-systems can be described as all the system-sensitive or gravitational binding parameters that survive from evolution are fluctuation pairs with a certain range which can be expressed as a minimum & maximum value. Suppose a research target can be described by bundles of fluctuation parameter pairs each with a certain minimum & maximum value. For non-living systems, there are no correlations among these minimum & maximum value pairs we acquired or the fluctuation stability of each parameter pair close to zero. For bio-systems, all the minimum & maximum value pairs are strongly correlated by inversion to get holistic stability; the lifespan of a bio-systems means the period while such an “inversion” correlation is effective, senescence is the decaying of such parameter pair stability. (The inversion simply means some parameter pairs fluctuated from minimum to maximum, then other pairs reversely fluctuate from maximum to minimum as compensation, then all the system parameter pairs’ stability can maintain for a long time. If there are gradients among minimum & maximum value pairs, these gradient levels will equivalently participate in the inversion processes. Suppose an animal lives well in a temperature from 10-20°C,

due to environmental shifting, it is forced to survive under a temperature range of 0-10°C. The adaptation capability from 10-20°C shift to 0-10°C is never like mechanic systems can be attributed to certain isolable reasons such as cooling the system to adapt to a lower temperature. The bio-system adaptation capability originates from the inversion of other system parameters. Given the temperature fluctuation correlated to some parameters as $protein X_{maximum}^{minimum}$, $gene Y_{maximum}^{minimum}$, $RNA Z_{maximum}^{minimum}$, then to acquire the temperature adaptation range, the relevant protein X, gene Y, and RNA Z, etc., need to inverse from their previous states. It is the inversion from other parameter pairs that supply this capability, not only certain isolable factors can issue this temperature adaptation like for non-living beings. No matter how many parameter pairs are inside and how complex a bio-system is, all system parameters are working in this way. Lower evolved species lack the spinal cord, still possess similar mechanism structures. Later, we'll see, just to adapt from mathematic linear superposition into surface tension inversion superposition, then the conventional wave function will be equivalent to bio-inertia.)

From here we can also naturally get the concept of inversion energy or inversion time in bio-systems which are different from conventional time & energy. Inversion energy means the energy required or used for bio-system inversion processes. (Growth is such a kind of inversion energy, the common energy types we usually see lack such function which comes from surface tension regions.) We should note, inversion time and energy are happening on an open system. Diverse conventional energy types are happening in or mathematically "made" into certain isolated systems. For non-living systems, we can set a reference for time. However, for a bio-system, once the *in vivo* inversion processes are reduced to a certain threshold, life will be ended. The time or life span relies on whether the *in vivo* surface tension inversion processes are running in a certain environment, defined as inversion time. (According to the uncertainty principle, all commuting observables can't be tested simultaneously, and the discrepancy will be Planck constant combination, $[\hat{x}, \hat{p}_x] = i\hbar$. We widen this discrepancy range, then the driving forces which make observables can't be simultaneously tested can roughly serve as the recovery capability steered by a surface tension region, this recovery capability functional time is then the inversion time.)

For our previous mutations 1.5, half bottle of liquids, in the free-fall process, the liquids still oscillate the "parameter- against-gravity-recovery" process, due to oil or water possessing different interaction with the bottle walls or with different gravitational binding efficiency, then accumulates different *FHDs*. We must note, a bottle wall is critical for a non-isolated environment, which acts as the wave function inversion protection we'll refer to later. We also note, inside different bottles, oil and water show different internal motion gravitational binding as in our experiments. If we mix water and oil inside a bottle and let them free fall, the gravitational binding of water and that of oil inside one bottle still can't get any optimization. However, if we blend the oil and water vigorously

to get emulsion with small enough liquid particle sizes into a bottle, then the gravitational binding in the free fall can be transferred among oil particle complex and water particle complex since the surface tensions of liquid particle complex have been enlarged exponentially. Here the surface tension is critical for the transferring of gravitational binding among bottle liquids. For bio-systems, not to mention two types of liquids, the gravitational binding of thousands of *in vivo* liquids and other gel structures can be optimized to inversion quite well, such super-efficient optimization still originates from the huge surface tension of bio-systems.

Einstein's Theory of Special Relativity equation: $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$, could be regarded as a special type of internal motion effect, the mass measurement of an object shifts with the speed means it binds more gravity with the speed parameter. However, the value from Einstein's equation is so small in quantity due to his “loyalty” to the Newtonian system to create another rigid body. He never imagined that the Newtonian system hid large discrepancies even under nonrelativistic conditions while surface tension effects are large enough. From **(Fig. 1j)**, the gravitational binding of the ball on path B should be equal to: $\overline{mg} \cdot t$, here t is the time advance which the ball acquires on path B. If we use the mutation 1.5, the gravitational binding of the water bottle should be larger than the oil bottle by: $\overline{mg} \cdot FHD$, here FHD represents the failing height difference between the two bottles; so “huge” a visually watchable gravitational binding shift can’t be acquired from any extant physical theories including Einstein’s curved space equation. In Einstein’s theory, mass turns out to be part of a more general quantity called the energy-momentum tensor. With the equivalence principle, this tensor is readily generalized to curved spacetime. Einstein’s gravity is a pure geometric gravity since all other parameters can be logically equation from geometry. For biosystems, not just geometrical indicators, any parameters will issue Le Châtelier gravitational binding via internal motion difference if the concerning parameter pair is sensitive for this *in vivo* environment. Different from Einstein’s system which other non-geometrical parameters can be logically acquired from the geometry, bio-systems geometry only have inversion relationships with other non-geometrical parameters. The gravitational binding via surface tension region will be larger than those acquired from rigid mass or a curved space.)

3. Mutations of legendary Galileo falling body experiment for living beings

The Cavendish experiment, performed in 1797–1798 by English physicist Henry Cavendish, was the first experiment to measure the gravitational constant G in the laboratory. Directly test the affinity of two living organisms on a Cavendish device is quite challenging. Mutations of the Cavendish experiment alternatively test

the gravitational difference between the dead and alive state of living beings. The mutation experiments had been initiated in Tsinghua University, Beijing in 2012, with results show that the gravitational loss of a living being reached 0.14-3.8% (1684, →)¹, which means the gravity has been enlarged for 10⁹ in bio-systems than those measured in historical Cavendish experiments for non-living beings. It is due to this level of enlargement; mutation of Cavendish experiments can be performed by the public instead of restricted to professional physicists with advanced skills. (The term “gravitational binding energy” has been used to designate the minimum energy which must be added to it for the system to cease being in a gravitationally bound state, with a formula: $U = \frac{3GM^2}{5R}$. To avoid confusion, the “gravitational binding” term in this paper refers to *in vivo* conditions.)

It took years for the mutation of Cavendish experiments to be performed on different locations on Earth with various samples. However, such a 7-year probing fell into an imperfect experimental method since it cannot get *in vivo* gravitational binding in this way. Till Jan.8, 2020, we began to systematically use the falling body experiment for *in vivo* gravitational binding. (Before that time point, we only occasionally used the free-fall method to validate the Cavendish mutation experiments and did fail to realize it has surpassed the Cavendish mutation experiments for modulation bio-inertia.) (Suppl. Movie 6) shows an apple and a cooked apple fall from 7.04m; from (Fig.1i②) snapshot we can get the *FHD* (19cm brick thickness, mortar bed 1.3cm thickness): $2.7 \times 19 + 2 \times 1.3 = 53.9$ cm. (Suppl. Movie 7), (Suppl. Movie 8) are also part of the experiments in (Tab.4):

Tab. 4 | The *FHD*(s) of some plant and animal samples for their alive and dead state (autoclave well-cooked and then wipe clean water) from the legendary Galileo falling body experiment

Falling Height (m)	living spl VS cooked spl or a metal weight*	sample 1 <i>FHD</i> (cm)	Sample 2 <i>FHD</i> (cm)	Sample 3 <i>FHD</i> (cm)	Ave	STDEV
7.04	cat fish	37	25	31	31.00	6.00
	salmon	15	27	23	21.67	6.11
	blue crab	29	18	12	19.67	8.62
	tilapia	31	24	27	27.33	3.51
	perch fish	39	45	32	38.67	6.51
	rock crab	21	30	33	28.00	6.24
	lobster	25	33	28	28.67	4.04
	rainbow trout	22	41	33	32.00	9.54

golden fish	15	23	31	23.00	8.00
mussels	14	21	25	20.00	5.57
oyster	26	31	35	30.67	4.51
geoduck	34	29	37	33.33	4.04
Sinotaia quadrata	15	19	22	18.67	3.51
chicken	57	48	41	48.67	8.02
rat (vs metal weight)	67	58	37	66.00	7.55
mouse (vs metal weight)	70	61	50	60.33	10.02
rabbit	38	44	52	4.33	3.06
apple	66	54	49	56.33	8.74
orange	54	63	45	54.00	9.00
chayote fruit	48	57	41	48.67	8.02
tangerine	43	35	32	36.67	5.69
pear	37	39	44	40.00	3.61
tomato	42	37	45	41.33	4.04
squash	66	54	63	61.00	6.24
purple onion	44	37	39	39.00	6.00
Haden Mango	43	37	33	37.67	5.03
persimmon	28	39	34	33.67	5.51
mangosteen	27	38	31	32.00	5.57
kiwi fruit	35	41	39	38.33	3.06
lime	36	32	41	36.33	4.51
purple yam	28	36	31	31.67	4.04
pomelo	62	53	51	55.33	5.86
granadilla	27	43	37	35.67	8.08

*** Most of the samples use the cooking method, while the sample is rare, use a solid metal weight (**Fig.1r**) to replace the dead sample. An autoclave is applied for the cooking method to assure cell death is well done. From fresh observation¹, cell migration can be observed even after 9 hours of the killing of the animal. In the free-fall experiment, all samples need at least 30 seconds to settle time before releasing from the rack. Most of the samples are purchased from the markets without DNA identification to species since these tests are quite general to neglect species.

(**Tab. 4**) gives part of the *FHD* data of organisms with a falling height of 7.04 meters, which has been performed in China and Canada. From Newtonian mechanics:

$$\begin{aligned}\vec{F} &= m_a \cdot \vec{a} & \vec{F} &= G \frac{M_{earth} \cdot m_G}{r^2} \\ \text{Then} & & m_a &= \frac{g}{a} \cdot m_G\end{aligned}\quad (2)$$

For rigid bodies, Eq.2 is a constant. For non-rigid bodies, it can be regarded as “holistic surface tension forces” or “inversion ratio”. Due to different living beings possess diverse surface tension structures, g/a is no longer a constant, which must test individually as in (**Tab.4**). For bio-systems, diverse parameters such as organism growth period, foods, mature stages, healthy conditions, etc. will play a role in the bio-inertia results. (**Tab.5**) uses two types of seeds to demonstrate the germination *FHD* difference (**Fig. 1m**, mung bean; **Fig. 1n**, soybean.). Seed’s germination activates metabolisms that are equivalent to internal motion; therefore, for all the samples released from 7.04m height, raw seeds always hit the ground first. (If we regard Einstein’s theory as a kind of gravitational binding by geometric indicators, bio-inertia still possesses “extra” binding from other parameters and the quantity levels are much higher than Einstein’s gravity even if we only restrict it to geometric parameters. We can simply regard the mass inertia in Newtonian and Einstein’s systems as “*in vitro*” inertia and internal motion gravitational binding as “*in vivo*” bio-inertia which can’t be solely acquired from geometry.)

Tab. 5 | Impact of seeds germination soaking to *FHDs* of soybean seeds and mung bean seeds by the legendary Galileo falling body experiment

Seeds	raw seeds weight (g) in the 50ml tube	<i>FHD</i> (cm), Raw / 24H, 3samples	Ave, STD	<i>FHD</i> (cm), Raw / 48H, 3samples	Ave, STD
Mung bean	46±0.27	8, 12, 17	12.33, 4.51	6, 11, 13	10.00, 3.61
Soybean	40±1.03	9, 15, 12	12.00, 3.00	11, 9, 15	11.67, 3.06

*** For soybean and mung bean, select seeds with over 98% germination rate naturally put into a lab centrifuge tube to the 50ml marker and capped as CK, 24H & 48H means soaking the same seeds in water for 24H, 48H at 20°C, use a paper towel to wipe clean the soaked seeds surface water and naturally put in the empty centrifuge tube to 50ml marker, cap; and measure the *FHDs* of raw seeds VS the soaked seeds, raw seeds never soaked to germination. However, in all 7.04 m releasing, always raw seeds hit the ground first. (Averagely from 10 tubes, raw seeds, 24H seeds, 48H seeds weigh 46±0.27, 43±0.92, 42±0.83 grams for mung bean seeds, and 40±1.03, 37±1.26, 36±1.14 grams for soybean, respectively.) Here, we only perform two species, however, this experiment can adapt to all seeds or even animal embryos on Earth. Physiological activities sensitive to *FHD* tests again validate the quiddity of life is gravitational binding or waves.

In (Tab.4), all the falling pairs composed of a living and dead organism show significant *FHDs*, to further confirm these *FHDs* come from internal motion gravitational binding; we select some of the falling pairs to perform the liquid nitrogen mutation again. We can see that the significant *FHDs* in (Tab.6) recover back to zero again, which means it is internal motion plays the role:

Tab. 6 | Liquid nitrogen overnight makes the *FHDs* of living and dead falling organism pairs become zero.

falling height (m)	liquid nitrogen treated pair	<i>FHD</i> (cm)
5.48	living apple - cooked apple	0
	living pear - cooked pear	0
	living tomato - cooked tomato	0
	living lobster - cooked lobster	0
	living mouse - metal weight	0
7.54	living apple - cooked apple	0
	living pear - cooked pear	0
	living tomato - cooked tomato	0
	living lobster - cooked lobster	0
	living mouse - metal weight	0

* Pre-treatment same as in (Tab.4), then all experiment pairs are labeled and put into liquid nitrogen overnight. (Tab.4) supplies CK. (From these experiments, we can easily understand that a frozen process including liquid nitrogen storage does hurt life function.)

4. Measuring of human *in vivo* gravitational binding on a commercial 10m diving platform

In 1907, Albert Einstein devised the “elevator” thought experiment, which was nothing less than the principles underlying the General Theory of Relativity. Einstein imagined an observer inside a closed elevator equipped with a complete physics lab, in which one can perform any physics experiment, but one cannot communicate directly with the outside world. He believed that no experiment performed inside the closed lab could distinguish between the lab’s being in a strong gravitational field and its being accelerated rapidly upward. Einstein formulated this insight in what is known as the “equivalence principle”. His curved space is theoretically composed of countless local “elevators”. However, almost all our previous mutations can challenge such a rigid body insight. We can see, even if biological experiments are not allowed, non-living being mutations still compose the challenge. E.g., with the bi-layer metal ball pair or the half water bottle VS half oil bottle pair is released inside,

if the enclosed lab is being in a strong gravitational field, then *FHDs* will be observed as demonstrated in our mutation experiments. However, if the pair is released in an enclosed lab that moving with acceleration g , then no *FHD* can be presented since acceleration only contributes to the spatial displacement of the experimental pair members and cannot supply them internal motion gravitational binding which can accumulate the *FHD* between them. From here, we can also understand that Einstein's gravitational lens that came from his elevator thought experiment is also not correct for *in vivo* or other conditions while surface tension is large enough. However, we should note, albeit Einstein's thought experiment is unsuccessful for general non-rigid bodies, the historical significance of it is still greatly pioneering. At least it does "unintentionally" **remind** us of the physical conditions of the bio-inertia that are fully different from the conventional Newtonian rigid body inertia as below:

- 1) bio-inertia is a type of internal motion binding process based on a strong gravitational field that it evolved from. If the strong gravitational field does not exist, only by an equivalent of acceleration, the binding process can't be fulfilled, or bio-inertia will not be accumulated to a detectable level. (We must note, the gravitational binding basis of a "strong gravitational field" can be further enhanced by bio-systems nearby. A person's gravitational binding is different while he is in an environment without living beings and in an environment with other bio-systems nearby. People prefer a biodiversity environment since in there they can feel more gravitational binding in there.)
- 2) in bio-systems, gravitational mass never equals inertia mass due to the internal motion surface tension regions of bio-systems, or life automatically transfers the most kinetic energy into potential energy by a certain ratio. Once the transferring efficiency between these two types of energy is lower than a certain threshold means the life system is senescence or even die. (For dead bodies, the gravitational mass roughly equals inertia mass since surface tension retrograded greatly. The difference between masses comes from surface tension amplification.)

From the abovementioned Einstein's pioneering **reminder**, measuring bio-inertia becomes critical for theoretical understanding and application in bio-systems, especially the human *in vivo* bio-inertia. Unlike non-living beings that can test the object's weight or mass by a balance for calculating inertia from the Newtonian system, the only available *in vivo* measuring method for bio-systems is acquiring the *FHDs*. On the Feb.15 of 2020, we performed the first human *in vivo* bio-inertia measure in the world from the 10m diving platform in Etobicoke, Ontario, Canada, with 8 volunteers as in (**Tab.7**).

Like the previous mutation experiments for non-living beings, we need to assure no extra system kinetic energy before diving. We first design the diving posture as in the left hand of the (**Fig.1s**), hope people can hold

the brink of the platform for a while, and then release. However, this is impracticable even for athletes. We then realized that for the public test, it should make a horizontal bar rack like in the right hand of (**Fig.1s**), people hold the bar for enough stable time and release. This is the most ideal way for measuring bio-inertia. At that time, we lacked the horizontal bar rack as shown in the figure, then compromise to two postures as in (**Suppl. Movie 9**) and (**Suppl. Movie 10**) albeit they unavoidably have some errors than the ideal “horizontal bar rack release” posture. While people use these two inferior postures for diving, a metal weight as in (**Fig. 1r**) is releasing simultaneously to get the *FHDs*. (For the first posture in the video, people like a walk down from a step and naturally fall into the water. It looks simple however still needs some training to combat psychology. The second posture just naturally lies down backward, also needs some training to avoid extra body movements.) The diving water only prevents free-fall people from fall to death. We need to assure no extra holistic kinetic energy shift, therefore, diverse showy diving postures in Olympic competitions are not allowed, all these showy styles will create wide errors for the *FHD* results.

Tab. 7 | Calibration of human *in vivo* bio-inertia by *FHDs* on a 10m commercial diving platform

volunteer	1 st diving <i>FHD</i> (cm)	2 nd diving <i>FHD</i> (cm)	3 rd diving <i>FHD</i> (cm)	Ave	STDEV
1	41	56	67	54.7	13.05
2	33	51	42	42.0	9.0
3	46	29	37	37.3	8.50
4	22	37	40	33.0	9.64
5	75	66	82	74.3	8.02
6	36	27	17	26.7	9.50
7	45	58	33	45.3	12.50
8	51	43	39	44.3	6.11

*** For volunteers for Etobicoke diving club, they don't like to reveal their age and health condition, only follow two diving postures in the videos and train them to try to avoid extra body movements in the falling process. Everyone performed 5 diving with the same posture, the interval at least 20min, no eating or drinking between, record middle three *FHDs* to the table. We don't distinguish the age and gender; the names are also covered as requested by volunteers due to people nowadays still don't understand the method. We only got a few chances and suspended due to the COVID-19 pandemic. However, the significance of this test for future medical sciences and sportive applications is unprecedented. In a long period of history, no alternative way can replace the fundamental *FHD* test.

FHD results in the table will be influenced by various factors. Even for the same person to test at a different location, or with different styles of diving, etc., the results will be significantly different. However, if we can monitor the personal *FHD* standard curve on a lifetime basis with fixed test conditions, available life potential or bio-inertia will be unveiled. We have suggested the individual physical training and species gravitational binding pattern (p1682, $\rightarrow$)¹ before as in (Fig. 2a, 2b). To use the only available Cavendish mutation experiments in the past to get such curves is almost impossible; at that time these curves are only imaginary. Now, with the newly established *FHD* test, all similar curves become technologically feasible.

Figure 2 | Inversion of Newton's Laws of Motion into the Basic Law of Evolution

a) lifetime gravitational binding curve pattern¹ b) evolutionary gravitational binding pattern¹ c) short of inversion in Einstein's gravitational theory d) *in vitro* and *in vivo* gravitational waves e) light cone and inversion time f) Planck regions and surface tension regions in quantum superposition g) surface tension region and its characteristics h) photoelectric effect and the inversion model i) GPCR inversion model cross the membrane j) the difference between the quantum mathematic superposition and music inversion superposition k) bio quantum path inversion superposition under a surface tension region l) Basic Law of Evolution based on bio quantum path duality.

According to the diving coach, diving from a 10m platform can be started as early as 6 years old, a lower platform such as 3m, can even be started at 2 years old and move to a 10m platform shortly. (More generally

speaking, a human baby can give birth inside water, possibly even just after birth, a baby can dive from 1-2m in height after six months.) Not considering these earlier possibilities, it is still estimated 98% of humans on earth can participate in such a test unless with very serious birth defects. A free-fall state is the most optimized condition for the living being gravitational binding process, till now we still cannot find any alternative test method. Even 10m water diving is dangerous for very old age people who lack preparation training, we can know the risk time point from the earlier monitor start from 6 years old for the same person and take rational precautions. At least 90% of the lifetime of people can regulate such a test if we understand its historical role. (E.g. In immunology, there are a lot of acquired immunity indicators; however, no innate immunity indicator is available. Also, the senescence of a person is challenging to be calibrated. The only solution to understanding or quantify innate immunity is through the lifetime *FHD* standard curve, or alternatively, by ancient Chinese Kungfu training system (p1681, →)¹. *FHD* tests can also be integrated with physical training, no matter which sportive activity one person participates in, such as running, jumping, kicking a ball, etc., the biological benefit before and after a certain period of training can be indisputably calibrated by *FHD*s.) In a long period of history, the *FHD* will be an irreplaceable indicator for medical & sportive, theoretical & application tests for life functions

5. Measuring the gravitational binding of animal sexual behavior to explore for human data

Among all animal or human behaviors, sexual behavior should be the most impact factor on *FHD*s since such behaviors lose the highest recovery structure or most vigorous oscillation inversion energy of the body. Suppose an adult man gets *FHD*s on the 10m platform under normal conditions, after a sexual behavior, the *FHD* data or the somatic bio-inertia will be reduced, then need a certain time to gradually recover back the gravitational binding and the recovery rate decaying with age and health condition. Such a reduction is sensitive to the *FHD* detection even one week after the behavior. (Ancient Chinese people did not know gravitational binding and our *FHD* test; however, they did test the impact of sexual behavior by their Kungfu training methods for thousands of years. Our *FHD* test can conveniently get equivalent results to those in ancient times.) However, while suggested the human volunteers perform such a test, they all rejected it because of privacy. No one likes such a result to be exposed to other people. This reminds us, we should give personal lifetime *FHD* standard curve enough privacy in the future application or scientific study. Also due to this reason, we have to use animals to perform the sexual impact test to replace human data as in (**Tab. 8**), albeit the sexual capacity and relevant parameters of human somatic bodies should be significantly higher than those of animals:

Tab. 8 | *FHDs* of animals before and after sexual behaviors

animal	Falling height	<i>Pre-sex FHD</i> (cm)			Ave	STDEV	<i>Post-sex FHD</i> (cm)	<i>FHD</i> sexual loss
rooster 1	5.28	44	52	45	47	4.36	32	31.9 %
rooster 2	5.28	33	41	48	41	7.50	26	36.1 %
rooster 3	5.28	57	43	52	51	7.09	38	25.0 %
rabbit 1	5.44	38	33	28	33	5.0	23	30.3 %
rabbit 2	5.44	42	40	39	42	3.51	31	26.8 %

*** For roosters, separately from hen to feed for 3 months, tie the wing and fall from 5.28m to a children trampoline with 1.5m enclosure, three repeats; after 2 hours rest to calm the animal, use chicken artificial insemination technologies to make the rooster ejaculation, then the same manner to test *FHDs*. Rabbits use the same way, separately feeding the male animal, release 3 times, after 2 hours of calm down, supply female animal for mating, after sexual behavior, release the male animal for *FHDs* test. We also prepare rats and mice, however, failed to arouse their sexual behavior after release from height three times. Therefore, no data can be collected on these two animals. However, this experiment should be universal for sexual behavior for all living beings including humans.

Here, we only test a few animals; however, the sexual behavior impacts on bio-inertia should be more general in animals or even the whole biological kingdom, based on thousands of years' test by ancient Chinese people with their unique Kungfu system and try to make some improvements. Compared to humans, the sexual behavior frequencies of most animals are quite less in quantity which controls more by the estrous cycle. It seems those processes such as plant proliferations or bacterial plasmid transmissions (It is a "limited sexual behavior" that only refers to around 2% of the total genome) are quite different from animals in sexual behaviors, they should still be accompanied by large gravitational binding shifting, otherwise, there is no chance for evolution to happen due to the offspring cannot get a potentially higher internal motion gravitational binding than their parents.

Results, theoretical section

1. The limitations of Newtonian three laws of motion for modulation bio-inertia

In classical mechanics, Newton's laws of motion are three laws³ that describe the relationship between the motion of an object and the forces acting on it. Together with his law of universal gravitation³ and the mathematical techniques of calculus, provided for the first time a unified quantitative explanation for a wide range of physical phenomena, which was first published in 1687 and laid the foundation for Newtonian mechanics and

modern science³. The fundamental method of this system is the isolated logic method, which means the logic predicate(s) is isolable & testable. (This method greatly impacts human history for centuries, even today for disciplines that do not fit with Newtonian mechanics, still fall into this system due to the earlier influence of Newtonian theory.

The concept of inertia could trace back to ancient Greek philosopher Aristotle, physicist Galileo Galilei, and astronomic Johannes Kepler; their insights were refined by Newton, who made it into his first law, all called the "law of inertia". It states that an object either remains at rest or continues to move at a constant velocity unless it is acted upon by an external force³. Newtonian inertia describes an ideal theoretical acceptable state in which a rigid object will keep its motion state in an absolute isolated environment. Also implies that inertia as an indicator is absolute can be isolated from the environment. Here, the ideal rigid body means without any surface tension region internal motion, also means absolute isolable and measurable. These prerequisite conditions are quite different from those for bio-systems. First, bio-systems full of surface tension regions that belong to the standard non-rigid bodies. Second, all bio-systems live in a non-isolated environment and most of the interaction parameters are challenging to isolate and test. (Mathematically, all commuting observables can't be tested simultaneously, bio-system surface tension regions are vigorously commuting to be routinely tested.) Third, bio-systems are to keep alive or metabolisms instead of keeping a certain motion state with isolable & testable parameters against a Newtonian reference frame. However, their quiddity is the same: just "keeping a certain state with the previous unless upon enough impacts". Here, rigid bodies' "keeping motion state" becomes equivalent with bio-systems "keep alive by surface tension inversion (gravitational binding)". With such a quiddity, we can adapt the Newtonian first law into *in vivo* environments (with enclosed surface tension region) as the following:

All *in vivo* active biomaterials or biostructures remain their state on certain bio quantum path(s) unless they are acted upon by its internal motions or the state inversion of relevant bio quantum paths.

Note: here the bio quantum path replaces the constant velocity on a straight line in Newton's system. From the bio-inertia definition equation, $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1|$, for an absolutely rigid body, $\vec{F} = m \cdot \vec{a}$ moving along a straight line, any non-zero item $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1|$ will make the object tend to bio quantum path to a certain degree. While the environmental impacts accumulate such a trend under a gravitational field to a certain threshold, we can see the object move into a bio quantum path. (We should note, albeit this item is minor for routine conditions, it will never "exist there and then collapse to eigenvalue $m \cdot \vec{a}$ due to testing" as claimed by conventional quantum mechanics. Later we'll see, evolution driving force is the inversion superposition of this item $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1|$.) It is certain kinds of bio quantum paths instead of a straight line that represent the

shortest distances or the most efficient gravitational binding functioning path under surface tension. For the evidence of bio quantum path as the most efficient gravitational binding functioning path, the restriction enzyme is a good example. Restriction enzymes are found in bacteria and archaea to provide a defense mechanism against invading viruses. To cut DNA, all restriction enzymes make two incisions through each sugar-phosphate backbone of the DNA double helix. Inside a prokaryote, the cutting process evolved into restriction digestion with host DNA protected. More than 3,600 restriction endonucleases are known which represent over 250 different specificities⁸. Restriction enzymes are commonly classified into five types, with the recognition sequences usually between 4 and 8 bases (a 4-base pair sequence would theoretically occur once every 4^4 or 256bp, 6 bases, 4^6 or 4,096bp, and 8 bases would be 4^8 or 65,536bp), most of them are palindromic. There are two types of palindromes: the mirror-like palindrome is similar to those found in ordinary text, in which a sequence reads the same forward and backward on a single strand of DNA, and the inverted repeat palindrome is found in complementary DNA strands. Inverted repeat palindromes are more common and have greater biological importance than the former. Restriction enzymes evolved to cut the palindromes means the highest gravitational binding is on the palindromes (bio quantum paths). Now, with the basis of the modified first law, we can get the modified second law:

To change the state of active *in vivo* biomaterials or biostructures on a bio quantum path, any force or operation must fall into this bio quantum path pattern and then can issue impacts.

This modification reminds us we can't simply impose a force on an object moving along a bio quantum path to change its state as we routinely utilize $\vec{F} = m \cdot \vec{a}$ to change the state of a non-bio quantum path running object. To change the state of an object moving on a bio quantum path, we must first make the force falls into the bio quantum path pattern, then can change its state. (This means in the equation $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$, once the second item $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$ has significantly functioned, then the forces that are modulated by $\vec{F} = m \cdot \vec{a}$ have little impact on objects with the bio quantum path state. Only impacts from a large gravitational field plus forces that have been patterned to the bio quantum path can accumulate effects for changing states. And while impacts can accumulate, the Le Châtelier effect replaces the Newtonian acceleration of an object for the state shifting level evaluation.) The acceleration in Newtonian or Einstein's system is never described as a bio quantum path that originates from surface tension regions. Also, the concept of mass no longer fits bio-systems (the more surface tension region gravitational binding of an object, the more errors for it to use mass indicator). Some fashionable stories such as CRISPR/Cas9 genome editing, synthetic biology, etc., always face difficulties. The jinx is still above Newtonian second law modification; it tells us about the prerequisite requirement for changing the states of something on a bio quantum path. If we edit the linear nucleic acid sequence, only while such editing

falls into the system bio quantum path superposition, then it can work; otherwise, the linear nucleic sequence editing only gets “dead DNA segments” without any (memory) biological function. The Newtonian third law states that all forces between two objects exist in equal magnitude and opposite directions. This law is still only correct for rigid bodies, just to write the modified version needs some further understanding, we then put that later.

Newton's law of universal gravitation³, the first inverse-square law in physics and human history, got much insight from Kepler's laws of planetary motion. Therefore, it can contribute greatly to astronomy and the discovery of planets. (Actually, we can note that Kepler's law has included relative mobility components; just Newton's later equation shields these components. Albeit planets are not idea rigid bodies, the impact of their internal motion will not influence the results if no large celestial body is nearby.) However, transfer from astronomy pattern to universal beings on earth with an inverse-square formula, later established Cavendish or other experiments only comply with original Newtonian G format, never prove that such a transfer is yet “universal”. From our previous experiments, for bio-systems, the inverse-square gravitational law will fall in quite an intolerable discrepancy. If people still like to arbitrarily transfer from astronomical conditions to existing on earth, we have suggested modifying the original equation to $\vec{F} = K^N \cdot G \frac{m \cdot M}{r^2}$, (K^N is used to calibrate the 10^9 shifting) for some *in vivo* conditions (p1684,→)¹.

Albert Einstein had made substantial modifications to Newtonian mechanics; however, still rarely referred to the shifting of the G range on a substantial scale. He only adopted the original format of inverse-square law into Poisson Equation: $\nabla^2 \Phi = 4\pi G \rho$ (here, $(r) = -G \frac{M}{r}$), and then further infer his field equation. Under nonrelativistic conditions, the results from his theory are still the same as that of Newton's. For bio-inertia that can't be “universally” included by the Newtonian equation, Einstein's theory equally can't handle with.

2. The limitations of Einstein's equivalent principle for modulation bio-inertia

We have referred to Einstein's elevator thought experiment used to justify inertia mass = gravitational mass before. We can understand the prerequisite condition of this equivalence is that there is no exchange between inertia mass and gravitational mass. For rigid bodies or space-time that not moving along a bio quantum path, this prerequisite condition roughly exists. For non-rigid bodies or a space-time patterned by bio quantum paths (or surface tension regions), physical laws can no longer be equivalent. From our bio-inertia definition equation: $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1l$, the item $m \cdot \vec{a}$ equivalent to inertia mass, and $|m\vec{g} \int tg\theta \cdot d\theta \rangle$ equivalent to gravitational mass; this equation means inertia mass oscillates around gravitational mass then issues bio-inertia,

and it can be enlarged by surface tension under certain conditions. (If inertia mass always equals gravitational mass and no such oscillation exists, then life can't be presented. The conventional system only fits for dead things.)

The left of **(Fig.2c)** shows Einstein geodesics that modulate gravity is entirely geometrical by nature (that is, the metric alone determines the effect of gravity) and does not have any extra fields associated with it. This geometrical gravity is somewhat different from internal motion gravitational binding, not only in scale (astronomical VS individual organism), gravitational strength ($10^9 \times G$), relativistic condition, and time, but also critically in inversion (p1694, $\rightarrow$)¹ processes. At the right of **(Fig.2c)**, we added some inversion units on the geodesics that previously modulate massive object curves space and a light object moving along the geodesic. Einstein never described gravitational waves could inverse perpendicularly along the geodesics as shown in the bottom sketch. If we reluctantly regard Einstein's quadrupole polarization which issues *in vitro* gravitational waves as a kind of special inversion that can happen along the geodesics, the level of which is still too weak. (Einstein himself never believes gravitational waves can produce in such a way. As in **(Fig.2d)**, for the quadrupole that issues Einstein's gravitational waves, $\delta L/L = 10^{-21}$, for that to change to an inversion process does need " $\delta L/L$ " to be enlarged to a level close to a range lower than 1:10. This means that Einstein never realized any inversion process or similar modulation that correlates with surface tension forces, albeit his field equation reveals something close to a huge surface tension region on an astronomical scale.)

Einstein's gravitational waves are disturbances in the curvature of space-time, generated by accelerated masses that propagate as waves outward from their source at the speed of light. Newton's law of universal gravitation does not provide for their existence, since that law is predicated on the assumption that physical gravity propagates instantaneously (at infinite speed), albeit Newton himself didn't satisfy with such kind of instantaneousness. Inside bio-systems, there also exist *in vivo* gravitational waves which are totally different from Einstein's gravitational waves. The speed is lower (estimated not far away from nerve conduction velocity of 120m/s), and the function range only *in vivo* or slightly goes outside the organism (estimated less than 100m). These types of gravitational waves which originate from bio quantum path superposition or surface tension inversion, shape the *in vivo* functioning, and are impacted greatly by almost all *in vivo* active ingredients, are quite different from the *in vitro* Einstein gravitational waves that defined as "ripples" in space-time caused by some of the most violent and energetic processes in the Universe, which rarely impacted by the things it propagates by. (Einstein never realized that his gravitational waves impact or be impacted by a surface tension region greatly. Such an impact needs aether under the surface tension region. The results of Einstein's gravitational waves have given up the concept of "aether" albeit he theoretically believes in it. In bio-systems, the *in vivo* gravitational waves

are “aether”, human CSF is such a kind of *in vivo* aether with the highest gravitational binding.)

(**Fig. 2e**) shows Einstein Light cone, the time in the past and future are separated. However, in bio-systems, sometimes these two parts can partially inversion. Organism lifespan is a kind of inversion time that originates from surface tension region(s). While inertia mass oscillates around gravitational mass, time is also inversion.

3. The limitations of conventional quantum mechanics for modulation bio-inertia, the interactions between Planck region(s) & surface tension region(s) initiating and sustaining life function

Quantum mechanics, albeit originated from macrocosmic measurable Planck's law of black-body radiation, only modulates the physical properties of nature at the scale of atoms and subatomic particles. There are no convincing explanations why a discipline based on energy can only be restricted into the microcosmic world.

The Schrödinger equation is a linear differential equation that governs the wave function of a quantum mechanical system, which assumes that if two wave functions ψ_1 and ψ_2 are solutions, then so is any linear combination of the two: $\Psi = a \cdot \psi_1 + b \cdot \psi_2$, where a and b are any complex numbers normalized by $|a|^2 + |b|^2 = 1$. This linearity axiom has been regarded as the most charming characteristic of quantum mechanics since a quantum system can have two classical states, one particle can have different positions, different energies, etc. However, if we carefully watch (**Fig.2f**), a series of multi-slit interference experiments, we can easily find the linear region is not unlimited or can be existed independently; always linear region enclosed or interweaved with the non-linear region. This should be a very general experiment, no matter we use light, water, mechanical wave, or any method, once interferograms are present, we always can find the above two types of inseparable regions. Now we can simply call the linear region “Planck region”, which can be written as $E = nh\nu$ and has also been studied extensively by conventional quantum mechanics, and the non-linear region as the “surface tension region”, which has been neglected by quantum mechanics. (All surface tension regions are intrinsically unsymmetrical, can't be existed flat; unsymmetrical originates inversions.)

Wave function collapse is another much-debated problem of this discipline. Wave function collapse occurs when a wave function-initially in a superposition of several eigenstates-reduces to a single eigenstate due to interaction with the external world. This interaction is called an "observation". Substantial reports are challenging this story. E.g. Calculations of quantum decoherence show that when a quantum system interacts with the environment, the combined wave function of the system & environment continues to obey the Schrödinger equation⁹, as decoherence does not reduce to a single eigenstate¹⁰. However, to fully understand this problem, we

still need to go to the surface tension inversion processes that enclose and structure Planck's region(s).

The left of **(Fig. 2g)** shows a soap bubble maintains by Minimal surface tension, a colorful film. The right top of **(Fig. 2g)** draws the oscillation and inversion of the film; compared to the right bottom of **(Fig. 2g)**, the solid metal ball can easily transfer holistic kinetic energy to each other by the law of the conservation of momentum. The holistic kinetic energy item $\frac{1}{2}mv^2$ even can be almost 100% transferred from one end to another end for the metal ball queue with 5 members in the figure since these balls have no surface tension regions to shift the momentum process. For the soap bubble, the transferring efficiency of kinetic energy is quite lower. It is then difficult to get what in the bottom figure of the transferring efficiency for kinetic energy even for two bubbles. Then the general function of all surface tensions: transfer kinetic energy to potential energy. (In conventional quantum mechanics, the wave function is not a bound state in an isolated environment. The energy levels come from the energy intrinsic properties instead of the wave function itself. However, for a wave function in a non-isolated environment, it is indeed in a bound state with inversion protection. Without realizing this inversion protection, conventional quantum mechanics has to "theoretically" claim it only studies isolated systems. The Schrödinger's cat must be inside an absolutely isolated system to justify the open box behavior can collapse to a dead or alive state. Once the cat is inside an enclosed surface tension region and possesses any inversion correlation with the surface (duality), then there is no instant quantum collapse story as claimed in the discipline.)

The surface tension inversion is so general in a natural environment. Even the famous photoelectric effect is also mechanized by it. As in **(Fig. 2h)**, the process is the emission of electrons when electromagnetic radiation hits a material, getting results that disagree with classical electromagnetism. In 1905, Einstein proposed that light consists of tiny packets of energy $h\nu$ known as photons. The maximum kinetic energy of the electrons is:

$$K_{max} = h(\nu - \nu_0)$$

Einstein's formula, however simple, not only explained all the phenomenology of the photoelectric effect but also had far-reaching consequences in the development of conventional quantum mechanics. This process has already included inversion as in the left bottom of **(Fig. 2h)** albeit people rarely realize that. The electrons on the metal surface are composed of oscillation energy with inward vector (blue) and outward vector (red), once the photon $h\nu$ hits the inversion unit, the inward and outward vector change each other and release current. This way follows the principle of least action to deliver electrons to currents. Such an inversion model agrees with photoelectric results since the response time is lower than 10^{-9} seconds. It is a very general characteristic of all

surface tension regions; interaction with the external world by means of inversion, here the inversion processes are the manner for a surface tension region to comply with the principle of least action.

Quantum entanglement was first presented in Einstein's paper as EPR paradox¹¹. An entangled system is defined to be one whose quantum state cannot be factored as a product of states of its local constituents; that is to say, they are not individual particles but are an inseparable whole. In entanglement, one constituent cannot be fully described without considering the other(s). It is entangled if this sum cannot be written as a single product term. Experiments have validated entanglement at a large distance to the satellite orbit; however, still does not correlate the process with gravity. We believe that not only quantum entanglement must rely on gravity but also wave function can't be exempt from that. With gravity as a mechanism, quantum entanglement is no longer adapts to Einstein's comment "spooky action at a distance". The entangled state just means the surface tension region of the wave function which initiating the quantum state is still functioning; it is only a very general inversion.

In bio-systems, G protein-coupled receptors (GPCRs) form a large group of evolutionarily related proteins that are cell surface receptors that detect molecules outside the cell and activate cellular responses. G protein-coupled receptors are found only in eukaryotes, including yeast, choanoflagellates¹², and animals. The ligands that bind and activate these receptors include light-sensitive compounds, odors, pheromones, hormones, and neurotransmitters, and vary in size from small molecules to peptides to large proteins. GPCR demonstrates a perfect inversion model as in **(Fig.2i)**, which possibly includes many subordinate inversions, evolution from simple molecules to large seven cross-membrane complexes still comply with the cross-membrane surface tension inversion pattern. (Later we'll see, the difference between the surface tension inversion in non-living beings and living beings is that the latter possesses a resonance correlation which can be called as "bio quantum path duality". Such duality can enlarge the gravitational binding up to 10⁹ levels.) Surface tension inversion is the blind spot of the isolated logic system since this system seeks isolable and testable variables and inversion units lack such characteristics. The inversion unit has been written as (p1685,→)¹:

$$\left\{ \begin{array}{l} x = A_x \cos(\omega t + \varphi_x) \\ y = A_y \cos(\omega t + \varphi_y) \\ z = S_z \cos(\omega_z t + \varphi_z), \left\{ \frac{S_z^2}{S_z} \right\} = k, \end{array} \right. \quad (3)$$

E.q 3 means each inversion unit is inseparable from other inversion units on the same surface tension region, three-dimensional oscillation can impact each other while inversion or all these inversion units must function holistically no matter which molecules or structures are involved. The reason why conventional quantum

mechanics totally remove surface tension and only leave the Planck region in the discipline is possibly due to the lack of a method for such system correlation and then have to use the unitary time modulation, and the wave function collapse story is the direct result of unitary time. It is a restriction on the allowed evolution of quantum systems to ensure the sum of probabilities of all possible outcomes of any event equals 1, $\int_{-\infty}^{+\infty} \Psi^*(x)\Psi(x)dx = \int_{-\infty}^{+\infty} |\Psi(x)|^2 dx = 1$. That means those involved are identical particles or possess rigid body characteristics. For bio-systems, a biomaterial's normal state and its inversion state cannot be normalized into 1, the time in bio-systems is correlating with the environment deeply and non-unitary. From the definition equation: $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1$, if we can regard the gravitational binding item $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1$ or its superposition as a wave function, then there is no collapse come from observation even if this item sometimes could be very weak. If some reasons induce any kind of collapse, it is a process, not something that happened instantly which the "observation impact" can't be noticed. For bio-systems, a lifespan is a period in which a spinal CSF wave function collapse. E.g. A person living for 90 years means his CSF wave function has 90 years of functioning before it finally collapsed; this is what inversion time means, which is totally different from the theoretical "spooky collapse" processes in conventional quantum mechanics. Not only does the collapse of the bio-system wave function need a certain period, but even the establishment of it needs a certain period, such as developing from a fertilized egg.

There is no gravity parameter in Schrödinger's equation. Another equation in quantum mechanics known as Dirac equation¹³ is written as:

$$(\beta mc^2 + c \sum_{n=1}^3 a_n p_n) \psi(x, t) = i \hbar \frac{\partial}{\partial t} \psi(x, t)$$

Dirac's purpose in writing this equation was to explain the relativistic moving electron, and so to allow the atom to be treated in a manner consistent with relativity. It predicted negative-energy quantum states for relativistic electrons and later be explained as the Dirac Sea. We believe the quiddity of negative-energy states is also a kind of special inversion which equivalent to the photoelectric effect or other inversions. (The Dirac equation only means energy inversion, never means the evidence for dark matter. And it is closer to surface tension regions than that of Schrödinger's equation. We should note, both dark matter and Mass-energy equivalence equations are easily misleading. Theoretically, they neglect the inversion energy. Practically, even so-called dark matter can present and meet with other non-dark matter, the energy can be released still quite limited since the time for the energy process under a surface tension is non-unitary; therefore, restricting the theoretical transfer efficiency between matter and energy.)

4. From non-living being mathematic superposition in conventional quantum mechanics evolve into bio-system surface tension inversion superposition establishes bio recovery capability and inversion time

A wave function in conventional quantum physics is a mathematical description of the quantum state of an isolated quantum system with discrete degrees of freedom corresponding to some maximal set of commuting observables. (In the classical system, knowledge of the state uniquely defines the system's behavior and what measurements we shall take from the system, whereas for a quantum system the state defines probability distributions for measurements.) It could be regarded as a human pre-determined linear pattern probability to describe the Hamiltonian: $\hat{H} = \hat{T} + \hat{V}$. The definition of bio-inertia: $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$, is equivalently a method to describe the Hamiltonian ($m \cdot \vec{a}$ issues kinetic energy and $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$ issues gravitational potential energy, and in bio-systems the kinetic energy is vigorously transferring to potential energy.). There are significant differences between the bio-inertia item $|m\vec{g} \int tg\theta \cdot d\theta \rangle$ and conventional Schrödinger wave function: 1) bio-inertia is gravity or gravitational waves concerning and wave function is not. (While Planck initiates quantum mechanics from his black body, the research targets are indeed inside Earth's gravitational field, which means we shouldn't neglect wave function gravitational component.) 2) bio-inertia doesn't describe the probability distribution of measurements, it describes the accumulation of measurements' fluctuation against gravity under a non-isolated environment, whereas the conventional wave function has to theoretically claim it is in an isolated environment 3) the pattern is not human pre-determined linear probability; it has been evolved for geological time and is based on *in vivo* structural internal motion. 4) surface tension concerning, means bio-inertia is to demonstrate the inversion or holistic dynamic effects of bundles of parameters in response to the environment, conventional wave function tries to describe commuting observables' adaptation to a human pre-determined pattern 5) inversion is the only driving dynamics. (It is the inversion that offers the recovery capability for a bio-system, and conventional wave function lacks such dynamics and lack recovery capability.) However, due to all of them describing Hamiltonian, we can modulate them equally and regard bio-inertia as an *in vivo* wave function or gravitational waves that under certain surface tension regions.

By carefully observing a surface tension, such as a soap bubble or a water drop rolling on an oiled surface, we can easily find the recovery characteristics. For specks of dust or a colored region on the surface, if some factor makes them move in a direction or rotate in a way, then the bubble surface will issue reverse action on these happening. This reverse action, albeit quite weak and even unobservable under a normal condition, is the fundamental characteristic of surface tension regions, which can be generalized as to issue recovery capability for

outside impact or something falling on the surface. (The mechanism is due to all surface tension inversion units as in Eq.3 needing to work holistically, the inversion of one unit will drive nearby units to move in a similar way and remote units to run in a reverse way, those inversion movements will inevitably induce recovery capability in a certain degree.) Such kind of surface tension recovery capability, as mentioned in (Fig.2f), is not only demonstrated on the surface tension region but also can be superposed in a certain region enclosed by it under *in vivo* conditions. For non-living beings, like a soap bubble, the Planck region, and surface tensions region superposition are all happening in the surface, what connects these two regions are only oscillation soap bubble walls. For living beings, the Planck regions (spinal cord) are evolved to detach from the surface tension regions (skin), which between these two regions are somatic body structures. The huge recovery capabilities of bio-systems originate from the resonance between these two regions. We can call such correlation that initiating and sustaining life as “bio quantum (path) duality” which means the bio quantum paths superposition on the surface tension can resonate with the bio quantum path superposition inside the enclosed region.

From the earlier equation: $\hat{H} = \hat{T} + \hat{V} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$. At Newton and Einstein's time, $m \cdot \vec{a}$ is the “inertia mass item”, and $|m\vec{g} \int tg\theta \cdot d\theta \rangle 1\downarrow$ is the “gravitational mass item”. Einstein's equivalent principle needs to equivalent these two items since it still follows the rigid body model. Once gravitational mass oscillates with inertia mass, bio-inertia or *in vivo* gravitational waves will exist, then life is initiated under certain conditions, and bio quantum path duality is existing. To Planck and Schrödinger's time, gravitational waves were replaced by the mathematic wave function and only leaves the Planck region. Described as the probability density of the presentation of electrons, such a presentation probability never correlates with any inner path(s) of the electron bodies to issue recovery capability. Suppose Schrödinger equation can penetrate inside the electron body and make different effects from its surface, the bio quantum path duality will present again. (The bio quantum path duality is fully different from the wave-particle duality in conventional quantum mechanics. It only means the interaction of bio quantum paths' superposition in surface tension regions and the superposition inside inner Planck regions, never means the presentation probability of identical “rigid” particles without any internal motions or inner structures. We also note it is due to such different spatial duality (the surface tension region and Planck region are spaced on different locations), quantum collapse processes can't be instantly and become a process that equivalent to the bio-system lifespan.)

The recovery capability, especially the bio quantum path duality is the blind spot of the conventional isolated logic system since Newtonian time. The isolated logic system seeks the transitive property: if A=B, B=C, then A=C,

etc. To comply with such a transitive law and other logic rules, it does not allow inversion or similar operations such as circular reasoning in the system. However, we must carefully note, this forbidden only decides whether the result can be validated by the logic system or comply with the transitive law, never means whether the result is close to fact or not. For some results that disobey the logic forbidden, they are still closer to facts or even truth, surface tension regions or bio-systems are such examples. (The logic forbidden requires the recovery rate for any logic process must be 0, that is, if A induces B, no part of B can recovery back to A to any degree.)

Conventional quantum mechanics has already realized the requirement of the logic forbidden; however, took commuting observables and probability to shield it. Given a pair of operators follow $[\hat{F}, \hat{G}] = \hat{F} \hat{G} - \hat{G} \hat{F}$, if $[\hat{F}, \hat{G}] = 0$, they are commutation; if $[\hat{F}, \hat{G}] \neq 0$, they are not commutation. A typical example in quantum mechanics is, $[\hat{x}, \hat{p}_x] = i \hbar$, means they can't be measured simultaneously, that is the Heisenberg uncertainty principle. This uncertainty principle means that quantum mechanics has already broken through the range of pure isolated logic transitive law, just in the discipline, the "uncertainty potion" $i \hbar$ is fixed and never be regarded as the inversion energy that originates from surface tension regions. Suppose a process from parameter X to Y satisfy the logic transit law. If there is any recovery, means X goes to Y with pure transit property, then pulls back to a certain degree in a non-isolated environment. Then $X = Y - \text{recovery} = Y - [\hat{X}, \hat{Y}]$, we use another symbol to represent the recovery process as $|X\rangle \rightsquigarrow |Y\rangle$. For a series of parameters from "A→G", we can get:

$A \rightsquigarrow B$	or	$A = B - [\hat{A}, \hat{B}]$
$B \rightsquigarrow C$	or	$B = C - [\hat{B}, \hat{C}]$
$C \rightsquigarrow D$	or	$C = D - [\hat{C}, \hat{D}]$
$D \rightsquigarrow E$	or	$D = E - [\hat{D}, \hat{E}]$
$E \rightsquigarrow F$	or	$E = F - [\hat{E}, \hat{F}]$
$F \rightsquigarrow G$	or	$F = G - [\hat{F}, \hat{G}]$

Sum up all the right side equations: $A = G - ([\hat{A}, \hat{B}] + [\hat{B}, \hat{C}] + [\hat{C}, \hat{D}] + [\hat{D}, \hat{E}] + [\hat{E}, \hat{F}] + [\hat{F}, \hat{G}])$, the left side $A \rightsquigarrow G$ is equivalent to $A = G - [\hat{A}, \hat{G}]$, then we can get:

$$[\hat{A}, \hat{G}] = [\hat{A}, \hat{B}] + [\hat{B}, \hat{C}] + [\hat{C}, \hat{D}] + [\hat{D}, \hat{E}] + [\hat{E}, \hat{F}] + [\hat{F}, \hat{G}] \quad (4)$$

Eq.4 means, Newtonian isolated logic systems use definitions and logic methods to make all the $[\hat{X}, \hat{Y}]$ and their combinations to zero, then can follow the transit law. The conventional quantum mechanics uses their five postulates to make $[\hat{A}, \hat{G}] = [\hat{A}, \hat{B}] = [\hat{B}, \hat{C}] = \dots = i \hbar$, then can get its $E = h\nu$, this $i \hbar$ method induces the explanation that a wave function collapses to eigenvalue while observing. (This story seems to offer a wave function the supernatural power that can discriminate what it encounters is another wave function or an

observation.) Eq. 4 means a wave function $[\hat{A}, \hat{G}]$ can be expressed as the sum of certain wave functions $[\hat{X}, \hat{Y}]$ with some constant k between. The only difference between the left side and right side of Eq.4 is that $[\hat{A}, \hat{G}]$ is an already superposed wave function, and the right hand is the sum of a few wave functions $[\hat{X}, \hat{Y}]$ with the environment between them and deeply correlated, or the left side is a “naked” wave function stripped down by conventional quantum mechanics, and on the right side, each wave function has an “environmental protection”, which means an “environmental protection” for a wave function is indispensable under a non-isolated environment. Following its own quantum entangle modulation, the environmental protection should be in a reverse direction with the inside wave function. (This result agrees with **(Fig. 2f)** which Planck regions integrate with surface tension regions since the recovery capability of a surface tension now gets the same effect with the quantum entanglement. It is due to the conventional quantum mechanism stripping the surface tension region then the quantum entanglement phenomenon becomes “spooky”).

From Eq.4 we can see, if observation happens to one of them can also induce claimed quantum collapse, the “instant collapse” still becomes impossible. One or few wave functions collapse as claimed, remaining wave functions are still there and can adapt to new conditions which continuously comply with the equation. As mentioned before, quantum collapse time is bio-system lifespan, such a conclusion does come from Eq.4. It means the “quantum collapse process or effect” can be transferred among different wave functions with protection in a non-isolated environment. (The communication between individuals follows this equation. For this reason, Eq. 4 is also can be regarded as a spinal equation. Lifespan becomes the period to collapse the whole spinal cord CSF.)

The stability of the logic system comes from the transitive property. The more transitive steps a logic statement holds, the more logic stability it will possess. Eq. 4 is an inversion system, equivalently, it is still the more inversion steps on the right-hand side, the more stability or recovery capability they hold. Science from Newtonian time tries to make their logic statement more stable until challenged by a fact, and evolution tries to make each species more stable (holds more inversion steps) until endangered by the environment. For this reason, Eq.4 can also be called an evolutionary equation.

It is challenging for the isolated logic system to find its blind spots. Music and some ancient systems are rare approaches to modulate an inversion structural system. In music, an interval is a difference in pitch between two sounds. (An interval may be described as horizontal, linear, or melodic if it refers to successively sounding tones, such as two adjacent pitches in a melody, and vertical or harmonic if it pertains to simultaneously sounding tones, such as in a chord.) No matter how complex or how simple of intervals, or how many techniques for composing sheet music, the only motion of music is the inversion of various intervals. (Music scale can be written as $|f_n\rangle =$

$f_0 \times \sqrt[12]{2^{n-1}}$, omit f_0 of 440Hz tuning frequency we then can get Chu's constant notation $\sqrt[12]{2^{n-1}}$. Interval is the dynamic distance or difference between different "n" in the formula $\sqrt[12]{2^{n-1}}$. Music relies on the inversion of all these intervals, never modulate as a certain note corresponds to a certain logic unit; therefore, is a standard inversion structural system. As mentioned before, all bio-system parameter fluctuation is composed of inversion correlations to issue recovery capabilities, which are equivalent to the musical intervals. The more of a biostructure close to the spinal cord, the more we can modulate it with Chu's constant. Scale can be defined as the common fluctuation level for all system-sensitive parameters which combinations describe all the parameter inversions of the system. Therefore, Eq.4 is also a musical scale equation. From here, we can also understand the fundamental difference between inversion structural systems and Newtonian mechanic systems. In conventional physics, we can calculate a distance by equation, not matter by Euclidean geometry or in curved space, $ds^2 = g_{\mu\nu} dx^\mu dx^\nu$ we can acquire a relative "independent" distance, which means you test the distance of site A is not impacting with the distance acquired in B so much. However, in music, an interval is never so independent, it concerns all other intervals by inversion relationships. You can't say you get this interval and use an equation to get the structures of other intervals. Unless the music is stopped then all interval relationships will not disappear. Bio-systems running in the same way, all parameter fluctuations are deeply concerned like the above musical intervals' relationships. In conventional quantum mechanics, "quantum" means the smallest part of something holding its properties, this doesn't refer to the motion state. In bio-systems, bio "quantum" means the least inversion unit of biomaterials or bioprocesses, concerning internal motions. For the latter, "quantum collapse" means the loss of system inversion correlations; therefore, the "quantum collapse" period equals lifespan.)

We have suggested applying Chu's constant to express bio quantum path duality in bio-systems; that is to take $|E_n\rangle = \sqrt[12]{2^{n-1}}h\nu$ or its combinations to replace $|E_n\rangle = nh\nu$ (p1692,→)¹, also use the frequency notation (p1709,→)¹. We then need to understand the difference between quantum mechanics superposition and music scale frequency inversion superposition, which originates bio-recovery capability at all levels:

As mentioned, quantum superposition is a kind of linear process: $\Psi = a \cdot \psi_1 + b \cdot \psi_2$. This linearity is prided of by the Schrödinger equation since it can change complex processes into linear processes. However, such a linear process is a mistake in the music scale superposition; the latter needs the inversion superposition instead of the "allele superposition". Suppose $|\phi_n\rangle$ and $|\psi_n\rangle$ need to be superimposition, quantum mechanics always takes ϕ_1 with ψ_1 , ϕ_2 with ψ_2 , ..., and ϕ_k with ψ_k , for superposition (or randomly selected). Music takes ϕ_1 with ψ_n , ..., and ϕ_n with ψ_1 , this is a full inversion; or ϕ_k with ψ_j , however, compensate with some inversion

combination of ψ_j , this is a partial inversion. (Note: even partial inversion is not randomly selected, deeply concerned with other inversions. Existing of partial or full inversion means system time is non-unitary.) No matter partial inversion or full inversion, no inversion means the stop of music; or in life, stop inversion means the end of the recovery capability or even life. The left hand of **(Fig.2j)** and **(Fig.2j④)** are quantum superposition (with red color). **(Fig.2j①)** shows the scale and Chu's constant $|\sqrt[n]{2^{n-1}}|$). As our modification of Newtonian first law, we could regard a scale in the right hand of **(Fig.2j)** as the environmentally adapted lowest entropy state.

With the scale as a relatively lower entropy static state, any musical note combination different from the scale sequence in **(Fig.2j①)** can be defined as dynamic. The “dynamic” of a note means it possesses a tension against the scale or certain note combinations. Such tension is usually incorporated in a chord or a movement. **(Fig.2j②)** shows the simplest cord: a major triad composed of $C(\sqrt[n]{2^0}) - E(\sqrt[n]{2^4}) - G(\sqrt[n]{2^7})$ that comes from a scale. All the three notes, C, E, G can fall on the root position of the triad structure, different root position represents different inversion. E.g. C-E-G is the primary triad, E-G-C, 1st inversion, G-C-E, 2nd inversion. The tension of a note against a lower entropy static scale is dynamic in such a way. If we regard composing of sheet music as a kind of superposition, then the superposition of the same pitch or frequency still results in the same frequency, however, need to compensate with the above tension. We superimpose an $E(\sqrt[n]{2^4})$ in one movement with another $E(\sqrt[n]{2^4})$ from another movement (these two notes must with different vector directions such as $|\uparrow\rangle, |\downarrow\rangle$ to superposition), the resulting frequency still $\sqrt[n]{2^4}$ which frequency keeps the same; however, must compensate with the inversion tension structure of another $E(\sqrt[n]{2^4})$, such an inversion structure could be a chord or its inversion, or any movements, etc. **(Fig.2j③)** shows a piece of sheet music, due to a pair of same pitches or frequencies after superposition can omit one, then it composes of a melody and an accompaniment. In conventional quantum mechanics, if we record electrons' transitions or rabi oscillation probability among energy levels by time, the result still looks like single melody music, just lacking the relevant recovery capability.)

All the music, no matter which style, is relied on inversion superposition for composing, which is totally different from quantum superposition. Here, we also need to understand inversion energy. As in the left of **(Fig.2j)** for quantum superposition, if one electrons transmission between two levels, the energy shifting is $\hbar\omega$ and this $\hbar\omega$ as a step only concerns this electron. (In quantum mechanics, “a complete set of commuting observables” means the observables are all compatible so that the measurement of one observable does not affect the result of measuring another observable in the set, which mathematically makes the independence of observables.) Go to the right hand of **(Fig.2j)** for music inversion superposition; if a note shifts one level, we can't simply say the

shifting is one step $\sqrt[n]{2^{n-1}}$ or certain value since this step connects with a complex combination of notes to compensate for its inversion. A note shifts for one step must drive all the relevant notes with inversion motion, which means the shifting issues inversion energy that is different from the quantum mechanics $\hbar\omega$. The relationship among observables in conventional quantum mechanics is relatively independent; however, among bio-systems or musical intervals is inversion correlation or recovery capability. This is the fundamental difference between energy and inversion energy. (We can also understand this from the human CSF tap; people who perform this test must keep body posture for at least three hours without moving. Because all body structures that inversion superposed with these CSF will get impacts or loss gravitational binding then must get enough rest. This somewhat likes what happens when we remove a note from sheet music. The impact of the removal is structural, not just a certain note position. We should also carefully note, what we do here with musical patterns never means we do art. No matter which kind of art is to arouse human feeling and the works of artists are individual. However, science seeks objective results no matter who deals with will get equivalent results. We use Chu's constant to modulate inversion structural systems, still seek objective results, therefore, belong to science instead of arts.)

5. Inversion of Newtonian third law into the Basic Law of Evolution

From the earlier equation $\vec{F} = m \cdot \vec{a} + |m\vec{g} \int tg\theta \cdot d\theta \rangle 1|$, inversion energy has been incorporated in the item $|m\vec{g} \int tg\theta \cdot d\theta \rangle$. In (Fig.1j), we have drawn some red segments (claimed as friction counteract region) on each path B arc. If we pick up these red segments out, they will compose a quantum gradient. For a quantum gradient establish under such a non-isolated environment, the discrepancy between it with the ideal equation $E = nh\nu$ (without surface tension) or $E = K \sqrt[n]{2^{n-1}}$ (with surface tension) is still substantial. However, the more superposition of this gradient with other gradients by certain manners, the closer the result is to $E = nh\nu$ (via conventional math superposition) or $E = K \sqrt[n]{2^{n-1}}$ (via surface tension inversion gravitational binding superposition). This means the inversion superposition round number under a surface tension region stable the quantum energy levels. (For math superposition, the pattern is human pre-determined; stability of which is never concerned with the superposition number; no recovery capability among energy levels in response to environmental stress, the quantum state stability is theoretically too weak to be collapsed by observation.)

Supposition round number is not only concerned with inversion superposition but also concerned with entropy in bio-systems. Historically, entropy arises directly from the Carnot cycle, which describes as the reversible heat divided by the temperature $ds = \frac{\delta Q_{rev}}{T}$. A consequence of entropy is that certain processes are

reversible, $\oint \frac{\delta Q_{rev}}{T} = 0$, beyond those are irreversible, also suggests the concept of the arrow of time. However, such an entropy or irreversible concept largely comes from failing to realize the difference between energy and inversion energy, or it assumes a system can be completely depicted by a single cyclic process. If we accept the Carnot cycle thought experiment in a system, then simply add another Carnot cycle with reverse direction to this system to compose a “dual” system, the entropy generation from the first Carnot cycle will then be compensated back by the second Carnot cycle to a certain degree even for an isolated system. We can call the entropy shifting compensated by the second Carnot cycle as negentropy, which is mainly composed of inversion energy. (The concept of “negentropy” was introduced by Schrödinger. The Carnot cycle uses ideal gas to suggest the model by a few isolable & testable parameters, bio-inertia gravitational binding can adapt to all system-sensitive parameters including non-isolable parameters such as those on a surface tension region.)

Carnot and later people believe that only T-symmetric processes are reversible, which is based on a system without any stratification or surface tension (above dual Carnot cycle is a stratified system), also parameters that depict entropy are isolable and testable. A reversible process in that discipline is even described as a quasistatic one that does not deviate more than infinitesimally from thermodynamic equilibrium and avoids friction or other dissipation. However, in a non-isolated system, entropy could be regarded as inversion energy. (The simplest definition of inversion energy is any type of energy that possesses stratification or must be modulated by a non-unitary time. Entropy as a state nearby equilibrium has already been stratified to a certain degree.) This type of energy generally is non-isolable, can be deployed as a gradient in an environment, or concerning with surface tension, etc. The most general interpretation of entropy is as a measure of uncertainty instead of disorder about a system as the routine belief. As mentioned before, any bio quantum path will compose a quantum gradient that can be amplified by inversion superposition round number. In a non-isolated environment, this type of energy can be partially radiated to the environment especially nearby the surface tension region. (E.g. The gravitational binding is a type of inversion energy, like in our free fall bottles with liquid or bio-systems, part of the gravitational binding goes to the environment then we get the *FHD* difference.) Such kind of inversion energy radiation to the environment is also the reason for conventional quantum mechanics uncertainty. Under conditions with maximum entropy generation of a thermodynamic system, the negentropy can also be produced equivalently to drive evolution under certain conditions. Bio-systems are inversion energy conservative systems. The accumulation or structural fixation of negentropy from non-living entropy generation processes by surface tensions is evolution.

Possibly thermodynamics’ using T-symmetric cycle to define reversible processes is to avoid entropy

generation to make accompanied inversion energy (uncertainty part) leak from the system then assure the energy transfer efficiency. Bio-reversible processes are mainly composed of and only can utilize inversion energy; therefore, there is no need for bio-systems to conserve common energy. In contrast, they make use of the discharging processes of common energy to acquire more inversion energy. Therefore, bio-reversible processes which can be defined as multi-Carnot structures are never T-symmetric. The simplest way to modulate bio-reversible processes is through the process VS inversion process or the melody VS accompaniment relationship. The equation can be written as: $|\text{melody}\rangle - |\text{accompaniment}\rangle = |\text{environment}\rangle$, which means due to the accompaniment, the deviation of melody to the environment is greatly reduced, the music gets more inversion time (the period between the initial state to the equilibrium state) or negentropy to survive. (We can also use an octave scale and triad to understand a bio-reversible process. A scale (major) is $|\sqrt[12]{2^{n-1}}\rangle$ or unfold as $C^{\sqrt[12]{2^0}}$, $D^{\sqrt[12]{2^2}}$, $E^{\sqrt[12]{2^4}}$, $F^{\sqrt[12]{2^5}}$, $G^{\sqrt[12]{2^7}}$, $A^{\sqrt[12]{2^9}}$, $B^{\sqrt[12]{2^{11}}}$; a triad just three major notes $C^{\sqrt[12]{2^0}}$, $E^{\sqrt[12]{2^4}}$, $G^{\sqrt[12]{2^7}}$ pick up from the scale with diverse inversions (must with the same “converging” position). One melody movement, accompanied by the inversion combination(s) of triads or other chords, then becomes a (bio) reversible process. No matter naive music composed by a kindergarten student, or the sophisticated music composed by Beethoven, all follow the same mechanism. The evolution from one melody and accompaniment to multi-melody counterpoint can be regarded as making one bio quantum path duality into the combination of a few duality structures. Now for a concrete example, every day we can hear diverse sounds for various reasons; however, people prefer to hear good music, since musical sounds are more bio-reversible patterns or negentropy than non-musical sounds. Human bodies gradually trim various non-musical sounds into bio-reversible sounds by multi-surface tension regions for reversing the entropy generation; therefore, the closer a structure to CSF, the closer of the oscillation patterns to Chu’s constant. The fundamental difference between musical sounds and non-musical sounds is the internal inversion correlations with human bodies. We then can use music to modulate bio-structures that survive evolution. Not only sounds, all other parameters such as foods, water, gene expression, RNA profile, etc., are all trimmed in such a way to become bio-reversible and excrete “wastes”. Here “wastes” just mean anything with a lower negentropy value selected by surface tension regions. Finally, all of them can be modulated by Chu’s constant for inversion patterns.)

We have written down the modifications of Newtonian 1st, 2nd laws before, now with the above discussions we can modify the 3rd law for bio-systems into the **Basic Law of Evolution** as follow:

Bio quantum path duality originates negentropy (or memory) for bio-reversible processes that are indispensable for bio-systems. Evolutionary memory physically tends to the ideal string equation: $Wavelength = \frac{2}{n}L$, $frequency = nf_0$

This law means memory is a kind of negentropy that is indispensable for life functioning, which originates from surface tension duality. From the lower evolved species till advanced ones, even for biomaterials, such as a DNA segment, etc., all need memory that originated from surface tension for active functioning. Memory was born at the start of life, never like people's belief that memory only happens in advanced species. (Here, the term "memory" is a general term that includes the fundamental origin, not just the human memory. The human memory we usually know is only the advanced format that is still based on such original memory.) The only active structural pattern in bio-systems is inversion or bio-reversible processes. (The wound induces pain since it breaks the bio-reversible processes. Something can induce happiness since it strengthens bio-reversible processes or system inversion.) Under the same surface tension, the structures acquired with more inversion superposition round numbers will possess more negentropy or gravitational binding than those similar structures with less inversion round numbers. There are two fundamental characteristics for the bio quantum path(s):

First, the bio quantum path(s) of a system is the oscillation inversion energy that superposition structures tend to the recovery capability of an ideal oscillation string. As in (**Fig. 2k①**), for an ideal string, the oscillation length and frequency relation should follow the same pattern no matter we move upstream or downstream unlimitedly. In the real condition, due to the impacts of the environment or diverse reasons, a string only can effectively follow the formula: $Wavelength = \frac{2}{n}L$, $frequency = nf_0$ in a certain range. E. g. upstream 5 lines and downstream 6 lines fall into acceptable recovery rate. We can define this range as the actual recovery range of a string. This recovery range modulation adapts for both a musical string as well as all *in vivo* active biomaterials, such as DNA, RNA, protein, etc. (A string issues mechanic waves; however, *in vivo* gravitational waves still follow the same inversion pattern that is based on surface tension regions; therefore, we can use the same music patterns to modulate *in vivo* gravitational waves, with no need to differ them.)

Second, the direction of evolution happens in a manner to make all inversion superpositions follow or maximize the recovery capability of the above ideal string model. (E.g. a DNA follows the above upstream 5 lines and downstream 6 lines gets acceptable recovery capability, which means all the genes on it follows the above " $Wavelength = \frac{2}{n}L$, $frequency = nf_0$ " equivalent for 5 to 6 lines recovery capability, here the wavelength becomes the number of effective nucleotides, frequency becomes the optimized *in vivo* environment, then no matter how this DNA segment regulated, mutation, absorption new segments, or cutting some parts, etc., all must maintain or even enhance the above 5 to 6 lines recovery capability. From here we can understand, modern biology is still in a chemical empirical state which unrealizes this physical string model.) To obtain such recovery capability-based

physical evolution direction, memory or negentropy steers all inversion superpositions in bio-systems at all levels.

(**Fig. 2k②**) shows the wave or quantum mechanics superposition in conventional physics, two wave sources in phase get constructive interference, and two wave sources are 180° out of the phase, get destructive interference. The conventional quantum mechanics superposition only refers to the Planck region; disciplinarily “neglect” the inseparable surface tension region as shown in (**Fig.2f**). Via evolution, all bio-system superpositions become inversion superpositions. As in (**Fig. 2k③**), two waves (red & blue solid lines) need to superpose inside an enclosed surface tension region. They will first interact (reflect) with the surface tension region (reflective zones) to get their inversions (red & blue dotted lines), then superposition by the inversed waves (blue & red dotted lines). This type of inversion superposition is in a lower probability and weak strength to happen for non-living beings (due to very lower inversion energy available); however, becomes the basic superposition manner inside living beings. (Bio-systems only superpose the waves correlate to certain surface tension regions.) Life evolution takes geological time to involve the inversion superposition is to acquire the recovery capability to resist environmental change. (In physics, waves are generally expressed into a Cosine/Sine wave, these curves are symmetric. While we constructed the rigid bio quantum path in (**Fig.1j**) to show parameter-against-gravity-recovery accumulation, we still use symmetric format, but it has already included polarized or asymmetric gravitational binding tend to a quantum gradient. We modify the term of wave(s) into bio quantum path(s), since after an effective surface tension region is presented and functioning for a wave, the amplitudes of each arc of the wave become gradually increased or decreased, no longer symmetric. (The term of bio quantum path is not only used to differing symmetric Cosine/Sine waves from surface tension polarized asymmetric waves but also means inversion superposition.) We refer to the modified law to Newtonian 3rd Law of Motion since the original rigid body modulation equivalent action and reaction, which must under the conservation of momentum and energy. However, conventional energy is greatly non-conservative for bio-systems. Only for inversion types of energy, bio-systems are roughly conservative. (Similar to Newton’s “equivalent” action and reaction, the modified law just conserves inversion energy in bio-systems.)

(**Fig. 2k③**) refers to non-living being surface tension inversion superposition, from it with the increase of gravitational binding; we can get the “duality” structure as in (**Fig. 2l①**). This structure can be a cell, or a virus, a DNA/RNA segment, or even the primitive forms of life with surface tension inversion which we still don’t know. No matter any kind of life forms including the most advanced human beings are unexceptionally inversely superposed from this simple structure. Inside the structure, we use a musical scale to represent the highest superposed bio quantum path (not necessarily the DNA or RNA); on the surface tension region or the outside layer, we draw some

inversion units (These inversion energy units are evolved from diverse “reflective zones” in **(Fig. 2k③)**, in advanced species are more complicated; however, still originates from the basic type. We can simply regard the core bio quantum path as Planck region and the outside layer as surface tension region, then all bio-structures are inversion superposed from them. As in **(Fig.2k③)**, there are some reflective zones (different size and strength) on the surface tension region, once two or more gravitational waves share the same reflective zones or inversion units for inversion superposition, then establish the memory for these gravitational waves. If more reflective zones share the same bio quantum path superposition, then establishes thinking. Memory and thinking are only characteristics of a surface tension region while it is functioning, here we don’t differ them and all call memory.)

No matter how simple or how complex a bio-system is. All biological functions are following this inversion resonance model. **(Fig.2g)**, a soap bubble, and **(Fig.2h)**, photoelectric effect, only possess surface tension inversion; therefore, just non-living beings. If a cell only has DNA and some inner cell contents but lacks the outside surface tension layer or cell membrane with enough inversion proteins, still can’t survive; life relies on bio quantum path duality at all levels. Maxwell’s demon is a thought experiment that tries to hypothetically explain the violation of the second law of thermodynamics, which was proposed by James Clerk Maxwell in 1867. He imagined one container divided into two parts and each filled with the same gas at equal temperatures placed next to each other and separated by a wall. An imaginary demon controls the trapdoor in the wall to only allow faster-than-average molecules, in such a way the result will be contrary to the second law of thermodynamics. As we can see, the thought experiment still only refers to the surface tension regions in **(Fig. 2l①)** (Maxwell’s trapdoor wall as the surface tension region), and never refers to the resonance with the core bio quantum path; therefore, indeed cannot exist in a natural environment. However, under the duality conditions that satisfy the Basic Law of Evolution or in **(Fig. 2l①)**, we can resurrect Maxwell’s demon by adding the (superposed) core bio quantum path. (Note, once Maxwell’s demon is resurrected, Laplace’s demon will die since people can’t create a world without such surface tension “reflected” or “inversed” superpositions. With the resurrection of Maxwell’s demon and the death of Laplace’s demon, equivalently add inner core bio quantum path to Einstein’s field equation, or add surface tension regions to Schrödinger equation, then bio-system gravitational binding increases for Newtonian G to 10^9 levels due to the bio quantum path duality resonance. We can say, this 10^9 is the “weight” of memory or negentropy. Einstein’s gravitational waves and Schrödinger wave function are therefore integrated into bio-systems by surface tension duality or surface tension inversion superposition.)

From duality, we also can understand why we need to sleep. CSF is the largest gravitational binding or surface tension structure that inversely regulates the somatic body. The recovery capability of CSF substantially

comes from parental generations. Therefore, in a surface tension duality structure, the inner bio quantum path(s) will be lower entropy than the bio quantum path superposition on surface tension regions. In the process of adaptation to the environment, inner bio quantum path(s) will be relatively easy to adjust the out-layer inversion and the reverse adjustment will be quite weak. For this reason, while the entropy of CSF reaches a certain threshold and needs to recover, it has mainly relied on self-adjustment. This self-adjustment is the sleep, which requires surface tension activities become least. With the process of senescing, old people's sleep time dampens since their CSF self-adjustment gradually loses, CSF can't recover their surface tension by sleep as before.

This duality also reminds us, in a reproduction process what transfers to offspring is memory instead of nucleotide sequence; the nucleotide sequence is only the “carrier” of memory; without memory to be delivered, these sequences are just dead segments. Any level of biomaterial, even as a small DNA or RNA segment, does need surface tension duality for functioning. A reproduction process will assure all surface tension membranes of offspring to recover duality. Processes such as developmental cleavage, milking, or yolk sac homing, etc., are existing for the recovery of the surface tension of inherited DNA. Even bacterial plasmid follows a similar mechanism. Nowadays, almost all prevailing hypotheses of the origin of life like to find clues for the origin of biomaterials such as RNA, DNA, proteins, etc. We must realize that the establishment of the duality structure in (Fig. 21①) should be much earlier than the existence of these nowadays known biomaterials. The story of the RNA world without surface tension duality is still non-living beings, so do the DNA segments from it. It is surface tension duality steering biomaterial functions, never reversely happened. Right now, the challenge of synthetic biology is still the duality, to edit genes is not so difficult for modern biologists; however, to recover the physical surface tension duality or memory for these acquired segments (dead segment due to lack duality) seems beyond the handling of modern technologies. Some crazy people even hoped to edit human embryos to cover the technological weakness. They never realized that editing embryo genes require much higher surface tension handling capability than editing somatic cells, their insane came from the discipline ignorance of surface tension.

6. Validation of surface tension duality or physical memory modulation from ancient and modern evidence

Historically, matter and consciousness are different terms, conservation of mass is quite general in physics and even the whole scientific kingdoms; however, no available scientific model for consciousness. Now, from (Fig.21①), we could realize that matter and consciousness are inseparable even from the very beginning, the consciousness has broken the conservation law since then. For matter, it will cost energy to transfer between the surface tension inversion units and core bio quantum path(s) no matter more or less; however, for consciousness,

we believe that the transferring between these two spatial distancing structures will have no energy cost base on the system aether. For a duality unit in **(Fig.21①)**, the more matter inside, the more conventional energy needs to move them. However, the more consciousness in the life unit, the more discrepancy will be presented while we use the conventional law of conservation or equivalent. We can simply say that in the real world, matter follows energy with $1_{\text{unit}}+1_{\text{unit}}\leq 2_{\text{units}}$, and consciousness follows energy with $1_{\text{unit}}+1_{\text{unit}}\geq 2_{\text{units}}$. The law of energy conservation for matter only tries to increase to close to $1+1=2$, and for consciousness works in a reverse tendency, tries to decrease to close to $1+1=2$. While we study the matter property, we can roughly use the conventional conservation law. While refers to the spiritual world or a mixture system, we should realize its energy reverse tendency. (Historically, resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force (or a Fourier component of it) is equal or close to a natural frequency of the system on which it acts. Under resonance condition, a small amplitude can drive a large amplitude or possess amplification functions.)

(Fig.21①) is the equivalent of **(Fig. 2k③)**, only different in superposition complexity. All life structures and even biomaterials, such a DNA segment, unexceptionally follow **(Fig.21①)** as the fundamental memory duality unit. While evolution hits human beings, the memory model is still the same, just with more inversion superposition. As the right hand of **(Fig.21②)**, the human spinal cord composes of C1-7 cervical, T1-12 thoracic, and L1-5 lumbar spines. In the left hand of **(Fig.21②)**, suppose a memory process only composes of C1, T8, L2, then the hippocampus equivalent to the core bio quantum path and the cerebral cortex equivalent to the surface tension region as in the **(Fig.21①)** to compose the memory of $|C1, T8, L2\rangle$; C1, T8, L2 compose of certain regions on the hippocampus, and also certain regions on the cerebral cortex, we use some arrows to connect these regions. These regions on the hippocampus connect to certain regions on the spinal cord, then connect to certain regions on the somatic body. Totally, the spinal cord composes the inversion of the brain, and the somatic body composes the inversion of the spinal cord. Each inversion is also possibly composed of a lot of sub-inversions. No matter how complex or how simple of a memory process, all fit into the inversion superposition of series of duality structures. (In advanced animal species, there are complex central nervous systems; however, we still can use the same surface tension modulation and neglect their complexity.)

Food digestion is a process that makes use of the non-unitary characteristics of surface tension to acquire negentropy; gut peristalsis is also to get more negentropy. In an ideal condition, only the duality lower entropy part of the bio-reversible processes can be absorbed into the gut. **(Fig.3a)** demonstrates the food digestive inversion which takes the same modulation of **(Fig.21①)** at the somatic level. Left of **(Fig.3a)** shows the evolution

of the digestive systems from single-cell endocytosis, to hydra, and to humans. For endocytosis, the vesicle is established by inversion of the cell membrane; therefore, even a vesicle is inside the cell, the physical exchange between the vesicle wall and *in vivo* cell environment should be equivalent to the surface tension inversion units on the left hand of (Fig.3a). Similarly, the trans-somatic body digestive canals from hydra till humans, all foods

Figure 3 | Memory characteristics of inversion energy and its surface tension driving functions

a) digestive (bio quantum path duality) inversion at the somatic level b) digestive inversion at the cell level c) photosynthesis inversion at the cell level d) sexual inversion model e) tail evolution reflect the spinal inversion f) ancient kungfu training system evidence for spinal inversion g) modern RNA splicing inversion grant the spliced segments for enough surface tension h) CRISPR/CAS 9 inversion model for identification and genomic immunity i) a model for the tendency of self-establish of surface tension duality in a non-isolated environment while gravitational waves are transmission

inside them are still physically regarded as surface tension inversion, digestive canal wall become the inversion units of the life unit on the left hand of (Fig.3a). No matter which evolution level of food digestion, all can be fit

into this model. For humans, the food ingredients are repetitively in-and-out of the gut wall composed of the outside surface tension inversion layer oscillation, and spinal cord CSF oscillation composed of core bio quantum path inversion. The oscillation duality of these two parts following the basic law of evolution composed of the digestion and excrement process, the higher inversion parts can be modulated by Chu's constant at the somatic level. (Suppose there is an amino acid *in vivo* inside the blood and there is the same amino acid in the gut chyme, the entropy of these two amino acids is quite different. The amino acid inside the gut must be inversion in-and-out of the gut wall for many rounds and then can get the same entropy with the same amino acid in the blood or they belong to the same quantum gradient. Only after this internal motion adaptation process, the amino acid can then be absorbed by Le Châtelier's effect. The amino acid example is only locally happening. The in-and-out or inversion processes still need to be further adjusted through a holistic surface tension region to be bio-reversible. The small intestine itself is a large surface tension region, digested intestinal juice surface lining the small intestinal walls. While part of the nutrients is finally absorbed into a certain location of the intestinal walls, the whole intestinal surface continuously peristalsis to make the high surface tension absorption active ingredients tend to a bio-reversible pattern. The digestive capability difference between an old man and a young man is only the inversion number; for a young man, the food ingredients can repetitively inversion in-and-out of the gut wall for many rounds, with the degree of senescence, such an inversion number is gradually decaying.) The digestive mechanism of other bio-systems including lower evolved single-celled species, all follow this bio-reversible process model. From here we can understand that digestion is still driving by memory, or it takes the same physical duality model. The "memory" we usually know is only a small part of the whole memory of an organism.

(**Fig.3b**) shows the digestive inversion at the cell level. A series of respiratory chain complexes on the cell membrane or mitochondrial cristae composed of the surface tension inversion. Electrons cross each membrane complex from reducing power (NADH, NADPH, etc.) to electron acceptors (O_2 , NO_3^- , SO_3^{2-} , Fe^{2+} , etc.), following the basic law of evolution, such a cross membrane inversion should resonate with the inner bio quantum path superposition, Mitochondrial DNA possibly plays the role. (Convention quantum mechanics can only modulate electrons of elements, can never modulate compounds or such kind of cross membrane electron behavior is possibly due to lack of inversion or deprivation of the inversion protection of wave function.)

(**Fig.3c**) shows the photosynthesis at the cell level, a process reversed in the direction from respiratory in which electrons raise electromotive potential from electron acceptors to reducing power or call proton transmembrane inversion. This process still follows the surface tension duality model.

Memory as negentropy for life function can't make life generation becomes eternal. As in the duality model, a

series of bio quantum paths superposition $|\Psi_n\rangle$ composed of an event and leaves memory $|k_n\rangle$ on the surface tension region. Later, another series of bio quantum path superposition $|\Phi_n\rangle$ events in which the inversion number will slightly impacted by the memory $|k_n\rangle$, or portion of the inversion energy has been transferred from $|\Psi_n\rangle$ to $|\Phi_n\rangle$ albeit their time is non-unitary. As mentioned, the inversion number on the same surface tension roughly represents the level of negentropy. With more and more memory events happening on the surface tension, inversion time will gradually use out or memory function will be dampened. As the basis of Life, surface tension is not eternal, then the lifespan for generation is limited.

However, limited generation lifespan never stops evolution moving forward by cross-generation negentropy transmission. In conventional quantum mechanics, the ground state of a series of energy levels can't be reduced since it fully excludes surface tension. As mentioned in the basic law, under the same surface tension or *in vivo* environment, the structures with more inversion rounds will possess lower entropy or more gravitational binding than those with less inversion round number; therefore, one series of scale $|\sqrt[n]{2^{n-1}}\rangle \uparrow$ superposed with its full inversion $|\sqrt[n]{2^{n-1}}\rangle \downarrow$ will get a lower than parent entropy ground state via surface tension since this process superpose two surface tension potential together. If this lower entropy ground state finally gets developed, the result will be a full lower entropy scale. The rate of the lower ground state getting full development is not high. However, to population-level will drive cross-generation negentropy transfer. (All the claimed randomly happened nucleotide sequence shifting will still be made into a bio-reversible pattern to resist the change. Even the mutation signal is random, the selection and fixation processes are no longer random. For the reproduction process, the meiosis and mitosis modulation in conventional genetics possibly also need modification, the DNA sequences from parents are less likely 50% ratio. The oval cleavage process is a standard memory process to adjust the ratio.) This is the cross-generation negentropy transmission in biological reproduction and evolution. (**Fig.3d**) shows a general sex inversion model for bio-systems; in human beings, it means the full inversion of the spinal cord CSF. From invertebrates to single-celled lower-evolved species, the mechanism of acquiring sexual negentropy is the same, just taking full inversion of the largest gravitational binding structure. (A man and a woman can fall in love only because their spinal cords oscillate with a close reversible process scale. Therefore, love is still the special transmission of *in vivo* gravitational binding in a short range, never escaping the surface tension duality.)

The negentropy induced by full inversion of the largest gravitational binding only presents on the ground state location or nearby structures never happens in the whole system. In human or animal sexual behavior, sperms become the lowest entropy part that goes out of the *in vivo* environment, for this reason, the entropy of parents will be unavoidably decreased and wait for later recovery. The process of reducing the ground state or

acquiring negentropy generally will make the lower ground state part automatically detach from the previous structures, we can call it “ground state-generation-driving forces” which still originate from surface tension. The driving force of enough surface tension nutrients absorption into cells, or animal sperm ejaculation, etc., is the same sort of “ground state-generation-driving force” across the whole biological kingdom. And in each ejaculation, there are a lot of spermatozoa; finally, only the spermatozoon with the same surface tension oscillation frequency with that of the oval can get insemination. Following the life unit in **(Fig. 2I①)**, the inversion on the sperm surface and the oval surface physically oscillates with their inner genomes to compose certain bio-reversible processes; therefore, before insemination, the genome of the sperm and oval make a physical bio-reversible process selection again. Both the oval and the sperm full genomes get a reversible process inversion on their surfaces which is reversible with their inner genomes, the final successful sperm should be those with a surface tension inversion frequency close to those from the oval. In conventional quantum mechanics, the ground state is only used to justify the correlation between measurement and quantum state; also, never concerns with entropy and gravitational binding. However, in bio-systems, surface tension binds all these concepts together. (For sexual loss of gravitational binding or negentropy, experimental validation is relatively easy as our previous **(Tab. 8)**, just it is a little challenging to test the gravitational binding after digestion of foods by *FDHs*.)

Animal and human tail evolution offers some indirect evidence for sexual inversion. In early lower evolved species, the distance between the brain and the sex organ is small (such as a Trilobita). With the progress of evolution, this distance is gradually enlarged. Such an enlargement means the accumulation of surface tension. Till vertebrates as in the right hand of **(Fig.3e)**, sexual organ roughly locates in the middle of the spinal cord and the tail. Therefore, in sexual behavior, the spinal cord and the tail establish the sex inversion that generates negentropy for the offspring. (The CSF in the vertebrae correlates with a different part of the body. Sexual behavior drives the CSF in the spinal cord section to the tail location and the CSF in the tail mainly goes out with the sperms, and the inversion of this highest gravitational binding structure offer sperms with much negentropy.) While evolution hit human beings, the somatic surface tension increased greatly, the tail no longer needs to participate in the sexual inversion, therefore, no CSF inside the caudal vertebrae. For humans, there are 5 lumbar vertebrae, generally the second to the fourth lumbar vertebrae function as the sexual inversion center for different people. That means in sexual behavior the CSF above this center is inversed with the CSF below this center and accompanied with relevant somatic change.

The above models about memory, food digestion, and sexual behavior had been applied in ancient Chinese Kungfu for a long time. Shaolin, with more than 1500 years of history, and Wudang, with 590 years of history, have

systematic physical training methods incorporated albeit ancient Chinese people lacked theoretical modulation and modern knowledge for the explanation. (**Fig.3f**) is one of the easy understanding training methods for somatic inversion. Starts at around seven years old with a headstand till very old ages, this training is a kind of basic spinal inversion training at the somatic level. Spinal CSF is the highest surface tension or gravitational binding structure in human bodies, for most people's daily activities the head is always higher than the feet, this training force the body to adapt to a reverse direction CSF; therefore, increases the surface tension of CSF or makes the CSF coordinate well with the somatic body. This training can increase the sexual performance of people is historical evidence for bio-reversible model. (Just remind, like most of the ancient kungfu training methods which directly targeted CSF, must take abstinence way of living style to increase lifespan. Shaolin totally forbids any sexual behavior or related. Wudang, albeit not fully forbids, has sexual control kungfu system in which sexual behavior is only technologically arranged for reproduction and never for pleasure like modern society. Since sexual behavior refers to the full inversion of the spinal CSF, if any physical training or aphrodisiac drug can increase the sexual performance of a person, they will unavoidably impact the recovery capability of the spine or the lifespan if not arranged in a controlled manner.)

Hypertension and cerebral hemorrhage are modern problems dangerous to people over 40 years of age. Modern medical sciences never regard it as a physical disease and generally offer chemical medications which side effects are challenging to control. The training in (**Fig.3f**), if started earlier, even use individually and not combined with other training, still can significantly solve the modern problems of hypertension and cerebral hemorrhage at an old age. Different from the modern Olympic Games which originated from Ancient Greece, Rome and emphasize muscle strength and various techniques but rarely train spinal cord; ancient Chinese kungfu took another way, people must integrate spinal physical training as the basis for muscle and any other training. We have referred to Wudang converging and Shaolin converging training before ((p1707,→)¹. Also, (**Suppl.Movie 11**) shows a preparation as well as lifetime training. The purpose of this training is to increase the surface tension gravitational binding of each vertebra as well as the whole CSF. All these have offered evidence for the basic law.

Besides ancient systems, modern biological sciences still “unintentionally” offer broad evidence for the memory mechanism. As in the top right of (**Fig.2g**), all genes in eucaryotes need “RNA splicing” which spins off introns (3'AG-----GU-5') from pre-mRNA to reconstruct into mature. Intron to intergenic sequence is around 1:1 across animal species¹⁵ and a large gene will then cover a lot of palindromes in scale. Alternative splicing¹⁶ is claimed to result in large numbers of protein isomers and for humans, 95% of multi-exonic genes are alternatively spliced¹⁷. It is usually also claimed that the purpose of alternative splicing is to “increase isomer number for

adaptation” and *Drosophila* Dscam which potentially produces 38,000 isomers¹⁸, possibly with the highest hypothesis isomer number in literature. However, we believe the purpose of splicing is for the negentropy or memory of the segments and not for “more isomers”; among a large number of combinations, only a small part of them acquire enough memory and go to the next step, for those segments fail to get enough duality will go to decomposing process. As in the bottom right of (Fig.2g), the surface tension of that environment first issue exons base on previous “memory”(the number of exons will be influenced by the *in vivo* environment especially the nuclear membrane), we suppose that *in vivo* surface tension can give K number of exons. For these k number of exons, they potentially have different kinds of combinations, such as $k-1, k-2, \dots, K-i$ as in the figure. Going back to (Fig.2k①), the general string elastic recovery model for evolutionary direction, we then can understand the bio-reversible memory mechanisms of splicing. As in (Fig.2k①), an ideal string will be unlimited downstream or upstream following the equation “ $Wavelength = \frac{2}{n}L, frequency = nf_0$ ”, here for RNA splicing, the equation becomes to: $L_{exon} = \frac{2}{n} L_{mRNA}$, then $f_{exon} = nf_{mRNA}$, which means after splicing, the oscillation frequencies of one segment of exon (no matter which sequence) or the combinations of certain numbers of exons follow: $f_{exon(s)} = nf_{mRNA}$

In the real world, like a musical instrument string, a segment of RNA/DNA can only demonstrate a limited downstream and upstream recovery range following the above equation. To select the right RNA/DNA oscillation frequencies based on the segment nucleotide sequence (segments) integrated with on-site *in vivo* environment, eukaryotes evolved out pre-RNA splicing, this is what memory or negentropy means. E.g. Given a target DNA segment TATCATCGTAAGGTA (Tyr-His-Arg-lys-Val), to issue the right oscillation frequencies for Tyr, or His (means there are active and not dead units that go to the decompose) based on the on-site *in vivo* environment or available surface tension regions, splicing first make the pre-mRNA into k number of exons, the ideal frequency should be $f_{exon} = nf_{mRNA}$; however, only part of exons get the right frequencies, the surface tension duality can make the first selection via resonance, only the right frequency exons can go to the next step; then the combinations of each step such as $n= k-1, k-2, \dots, K-i$, etc., all use the same mechanism to get the on-site surface tension selection. Now we can define memory, under a surface tension region, it can make all spliced exons and any of their combinations tend to the ideal string equation **$Wavelength = \frac{2}{n}L, frequency = nf_0$** based on the on-site memory. (Here not considering the membrane inversion or reflection. If we add membrane structures, it still adapts to the string equation, just multi-counterpoint melodies. We also need to note, in conventional biology, a splicing process is claimed to be operated by certain complexes such as spliceosomes; however, it is these claimed structures operated by surface tension to result into the string equation, not claimed structures make a splicing process

happen without surface tension. Even before the spliceosome or even exon/intron presents, surface tension regions are physically performing the equivalent jobs.) Musical instrumentalists can utilize that equation to make better strings or instruments. Splicing equivalently plays the role of physically selecting a better "string" (elastic DNA) from **memory** for that *in vivo* environment. The successful splicing candidates are those who get correct memory or oscillation frequencies by sacrificing a large number of other combinations under the same surface tension (or inversion units). (Such a "sacrifice" process is the same mechanism as digestion or sexual ejaculation we mentioned before. If the memory or surface tension of a certain segment can't be finally recovered by splicing or similar processes, then it will be decomposed.) For this model, a lot of indirect evidence is available. Recursive splicing^{19,20} is another type of alternative splicing, for large intron need to be spun off by multi-steps and needs days to finish. Self-splicing occurs for rare introns that form a ribozyme, performing the functions of the spliceosome by RNA alone. Studies from a wide range of organisms show that the intron-exon structure of homologous genes in different organisms can vary widely²¹. More recent studies of entire eukaryotic genomes have shown that the lengths and density (introns/gene) of introns varies considerably between related species²². Intron loss is demonstrated to correlate with gene expression^{23,34}, etc.

In prokaryotes, there is no intron/exon. However, CRISP/Cas9 still takes the same bio-reversible memory mechanism with eukaryotic gene splicing for segment identification and system immunity. The CRISPR array comprises an AT-rich leader sequence followed by short repeats that are separated by unique spacers. CRISPR repeats typically range in size from 28 to 37 bp, though there can be as few as 23 bp and as many as 55 bp. The size of spacers in different CRISPR arrays is typically 32 to 38 bp (range 21 to 72 bp). There are usually fewer than 50 units of the repeat-spacer sequence in a CRISPR array²⁵. As in right of (**Fig.3h**), we use a blue and a red-colored DNA segment in the spacers that will be splicing into segments from $n=1$ to K , and green color to show the equation in the figure: $L_{segment} = \frac{2}{n} L_{DNA}$ then $f_{segment} = n f_{DNA}$ (here L means length), then equivalent with eucaryotes splicing, prokaryotes use the same equation for identifying invading sequences. We even can directly use a musical pattern for understanding since Chu's constant still originates from the above equation. Suppose a segment with seven genes oscillates into a scale as $C^{12}\sqrt[12]{2^0}$, $D^{12}\sqrt[12]{2^2}$, $E^{12}\sqrt[12]{2^4}$, $F^{12}\sqrt[12]{2^5}$, $G^{12}\sqrt[12]{2^7}$, $A^{12}\sqrt[12]{2^9}$, $B^{12}\sqrt[12]{2^{11}}$; the simplest triad in major is $C^{12}\sqrt[12]{2^0}$, $E^{12}\sqrt[12]{2^4}$, $G^{12}\sqrt[12]{2^7}$, then all the combinations of the genes follow the same converging pattern are belonging to host. However, if certain triad combinations change the converging position, such as $C^{12}\sqrt[12]{2^0}$, $\#D^{12}\sqrt[12]{2^3}$, $G^{12}\sqrt[12]{2^7}$ (note the shifting from $^{12}\sqrt[12]{2^4}$ change to $^{12}\sqrt[12]{2^3}$, in music, means major structure to minor structure), then they belong to invading, will go to decompose. No matter how these gene combinations change,

once the converging position is the same, they belong to the host, and once the combination converging position changes, they belong to invading. The cas 9 issuing RNAs just identify the segment combinations by synthesis the same converging RNA or different converging RNA for the purposes. Bacterial transformation is a process of incorporation of exogenous genetic materials from its surroundings; the incorporated genetic materials should be able to activate the memory based on the interaction between the cell membrane and the environment. Bacteria can't discriminate nucleotide sequence but can discern from their own surface tension memory that certain segments can be incorporation well.

From here we can clearly know, no matter splicing in eukaryotes or the Crisp/Cas 9 identification in prokaryotes, all follow the surface tension "memory" (this original "memory" means equals the string frequency equation. No matter oscillation frequencies are from different materials such as DNA, proteins, etc., once get the resonance frequencies from certain surface tension regions then can interact with each other by inversion superposition, different biomaterials only mean f_0 are different, once establish the gradient, then can inversely superposition. The memory of which is the basis of all biological functions.). Using the surface tension "memory" to identify a DNA segment will maximize the tolerance of linear nucleotide variation by adaptation. For linear sequence, one nucleotide change for various reasons will induce a great impact on all genes on the whole DNA segment. Utilizing "memory" and inversion can avoid such impact to a large degree, also potentially driving genetic favorable mutations even from invading segments. Till now, conventional genetics linear nucleotide sequence story never knows what a favorable mutation is; however, a duality system with nucleotides and memory will establish favorable mutations under almost all conditions. In practice, human memory generally can't compete with a computer or AI for accuracy since the basis of it is surface tension reflected or inversion format. However, it possesses real creativity. Such creativity is still equivalent to the mechanism of Crisp/Cas 9 integrating genetic copy and genetic mutation by surface tension memory. (The weakness of AI is due to it can't deal with non-isolable or non-testable parameters such as those on surface tension, and human memory creativity relies on non-isolable parameters that AI can't handle.) The concept of innate immunity which still lacks a modulation could be regarded as the surface tension memory stored in CSF that nowadays only can be tested by our *FHDs*. (In biological or medical sciences, people try to test the chemical ingredients inside CSF to find something. However, the primary function of CSF is the largest surface tension pool of the body, physical memory properties are a priority to all chemical properties, without realizing this role and only blindly focusing on chemical ingredients can't solve any problem. Both physics and biological sciences need to recover surface tension regions.)

Back to the rigid bio quantum path we constructed in (**Fig.1j**), we believe while the metal ball running on it,

a self-established surface tension region should also exist, based on our previous studies for bio-systems. Possibly in (Fig.3i) with our rigid bio quantum path under a non-isolated environment, there will accumulate a surface tension region that comes from “parameter-against-gravity-recovery” interacts with the environment such as air molecules, etc., then can establish a surface tension; we drew a hypothesized surface tension region by a dotted line to enclose the rigid bio quantum path in right of (Fig.3i). The range may be rough 1-2m. Part of the gravitational waves possibly reflects or inverses back while the metal ball is running on the rigid bio quantum path. The position of the ball can be written as $|r_n\rangle$ and the reflective surface tension region that comes from the environment can be written as $|s_n\rangle$. Then each position of the metal ball such as $|r_1\rangle, |r_2\rangle, \dots |r_k\rangle$ on the bio quantum path can reflect on the hypothesized surface tension region we drawn to leave “memory” as $|s_1\rangle, |s_2\rangle, \dots |s_k\rangle$, then the system can bind gravity. Due to all surface tension regions possessing non-unitary time; this “invisible surface tension” first demonstrates the time effect as we have seen. The *in vivo* gravitational waves should follow nonrelativistic conditions. We believe in the process of gravitational waves traveling, it is the surface tension we drew as in (Fig.3i) that accumulates nonrelativistic gravitational binding that drives evolution. If we abruptly draw such a surface tension for a ball running on a wave-shaped orbit and explain a nonrelativistic gravitational wave story, people will be reluctant to accept it. However, we can't find any exception in the whole biological kingdom as well as board observations. Now that gravitational waves can be impacted by surface tension, then they can establish surface tension in the process of traveling. (The term surface tension is not what we can see, any layer of motions with enough inversion units will possess surface tension effects.) The phenomenon that gravitational waves can establish surface tension regions in the processing of spreading in a non-isolated environment can be called as gravitational “self-quantization”. Evolution relies on the self-quantization of *in vivo* gravitational waves in such an environment. Consciousness is a kind of advanced *in vivo* gravitational self-quantization.

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Authors' contributions

L.Y.Y. perceived the models, performed all the experiments, and wrote the manuscript.

Competing financial interests

The authors declare no competing financial interests.

Supplementary information

Supplementary information is available in the online version of the paper.

Supplementary movie 1 to 5 and datasets can also be downloaded at: Dryad Digital Repository with the keyword: bio-inertia_ *FHD*, <https://doi.org/10.5061/dryad.8931zcrr9>

Supplementary Movie 1. part of the Apollo 15 experiment video on the Moon (1971 by astronaut David Scott)

Supplementary Movie 2. the movement of a free suspension slinky after release

Supplementary Movie 3. the *FHD* of a metal chain and a same length slinky from 7.05m

Supplementary Movie 4. the *FHD* of a half-bottle of oil and a half bottle of water from 7.04m_video by a 6-year-old kindergarten girl from Dorset Public School, Brampton, Canada

Supplementary Movie 5. bio quantum path experiment for definition of bio-inertia

Supplementary Movie 6. the *FHD* of a dead(cooked) apple and an alive apple from 7.04m_video by a 6-year-old kindergarten girl from Dorset Public School

Supplementary Movie 7. the *FHD* of a rat and a metal weight from 7.04m

Supplementary Movie 8.the *FDH* of soybean seeds after soaking 24H against raw seeds from 7.04m

Supplementary Movie 9. accepted diving posture 1

Supplementary Movie 10. accepted diving posture 2

Supplementary Movie 11_ancient training for increasing the surface tension of spinal vertebrae

Data Availability Statements

The datasets generated during and/or analyzed during the current study are available in the Dryad Digital Repository.

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(*** for the reference format (p1681,→)¹, p means page,“→” means the referred clause presents more than one time in the paper. Reference paper 1 only offers reliable historical data. However, at the publication time,

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