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# Measuring the “weight” of human *in vivo* bio-inertia by legendary Galileo falling body experiments on a commercial 10m diving platform and gravitationally inversion of Newton's Three Laws of Motion into the Basic Laws of Evolution

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## Abstract

Mutations of legendary Galileo falling bodies experiment with non-living objects in a non-isolated environment demonstrate that the recoverable internal motions of falling bodies can bind and polarize gravity over conventional Newtonian mass inertia. Bio quantum path experiments further interpret the binding mechanism and reveal the isolated logic restriction of Einstein's equivalence principle. Mutations of the Cavendish experiment unveil  $10^9$  levels of gravitational differences between living and dead states. Mutations of the Galileo falling body experiments for living beings confirmed that such differences come from recoverable internal motion surface tension gravitational binding that can be calibrated as a measurable bio-inertia. We then calibrated the falling height difference for human *in vivo* bio-inertia on a commercial 10m diving platform and verified 98% of populations on Earth can safely be tested in this way with enough preparation training. *In vivo* lifetime gravitational binding curve that governs all biological parameters and reveals life evolutionary mechanisms becomes technologically feasible. These results, along with various facts, modulate the gravitational multi-surface tension region resonating model of *in vivo* bio quantum path inversion superposition. Photoelectric effect, PCR, GPCR, ancient CSF-ligament human Kungfu training systems, music harmonics, and board observations physically sustain this model. Newtonian Third Laws of motion are therefore evolved into **Basic Laws of Evolution** originates from surface tension non-unitary time inversion superposition that is different from the mathematical superposition in quantum mechanics; original memory negentropy is also disciplinarily integrated.

## Results, empirical section

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

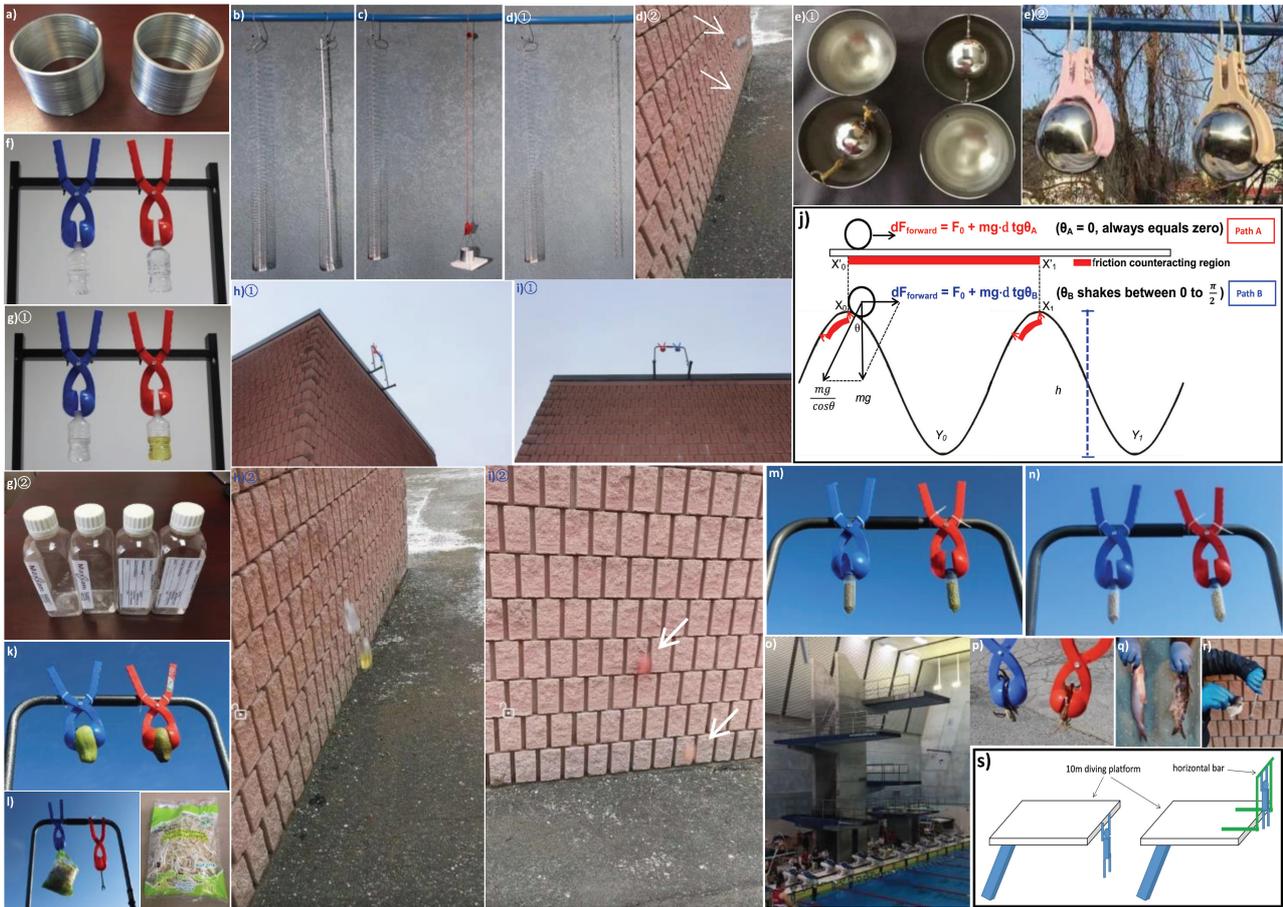
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Legend says that Galileo Galilei has dropped two cannonballs of different masses from the Leaning Tower of Pisa to show that their speed of descent was independent of their weight. One of the famous thought experiments acts as the physical basis of 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 for the purpose. Release two objects simultaneously from a certain height, at the moment the first falling object hits on the ground, the height of the second object from the ground can be 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. **Falling height difference** is symbolized as *FHD*, tested by camera video in this paper.):

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  $1120 \pm 2$ mm. (For slinky toys, it is not easy to find two sets with the same free suspension length even if their mounting height is the same within measuring accuracy of 0.3 mm by a pair of Vernier calipers. Albeit this experiment will not be impacted too much by the exact free suspension length, we still carefully choose two sets with the same free mounting height and their free suspension length difference falls within 5mm from hundreds of commercial products. The final minimum difference of the free suspension lengths of two selected slinky toys is 1118, 1122mm; write as  $1120 \pm 2$ 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 can be regarded as 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.

**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 alive 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*

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The conventional Newtonian rigid body concept means inner motion is zero, the more inner motion, the more errors of the Newtonian system. 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 enlarged to over 20m, we could expect a larger observable *FHD* originates from the inner motion difference between them.) From this fact, 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, I’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 and see how a wave function is moving.

#### 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 tied with thin threads while mounted to prevent stretch if falling. We hold slinky A and slinky 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

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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 means the difference of effects between a certain direction of a vector and its opposite direction induced by gravitational binding.)

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

We still have not differed between inner motion & internal motion, now we’ll use this mutation to show the conceptual difference. A is a free suspension slinky, and B is a metal chain with the same length as the free suspension slinky as in (Fig.1d①), release them from height, the metal chain will fall on 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 be written as  $\hat{H}_{\text{Internal}} = \hat{V}_{\text{gravity}}$  since the system can no longer be sensitive to  $\hat{T}$ . (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,  $p = \int m_i v_i$ , total kinetic energy is easily transferred to it and show out since the transferring efficiency is relatively higher. 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 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

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potential energy structure involved. The ancient physical strike training method (p1681,→)<sup>1</sup> 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. The process also does not fit the law of the conservative of momentum since this law only experimented with rigid bodies. 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 (Later we'll see, 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, 4 with 100mm radii, 4 with 51mm radii, thickness 1mm, from a manufactory complies 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 bands (one larger hemisphere also solder with small rings) 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 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; A with rubber bands or springs then can elastically oscillate freely. 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; it can bind gravity. (This mutation has not only modulated relative mobility but also excluded air friction. For slinky mutation 1.1, some picky people possibly argue with the difference air friction of the A, B

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treatment; now, the air frictions of the two hollow metal balls are the same. Such arguments are then excluded by the two 100mm bi-layer hollow metal balls with different inner metal ball layer's relative mobility under the strictest empirical conditions.)

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

(**Fig.1f**) shows two commercial water bottles, the B full of water, no visible bubbles, A only with half bottle of water (visually prepared, not use of volumetric flask), 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 (fully occupies the bottle, then the relative mobility is confined). From the next experiment, we can see the impact of relative mobility on *FHD* more clearly. (**Fig.1g**①) shows two commercial 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.1h**①, **Fig.1h**②). (**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 a same batch. We can see from (**Fig.1h**②) 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,  $1.5 \times 14.5 =$  to 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; it is to assure two same height bottles do not get extra holistic kinetic energy, or the difference of the total energy of two released objects compare to their height-related potential energies is minimized. The human hands cannot stably hold before releasing objects for a long time; therefore, a rack (**Fig. 1f, etc.**) is necessary to assure the above least difference in all the nonliving being mutations. 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

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containers were used, as in (**Fig.1g**②), 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 (The only requirement is the oil must be flexible, can't contain any semi-solid clots.); 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. Also, to reliably assure the resulted models have been totally disregarded by all the extant physical theories. We use commercial products instead of laboratory containers to perform the experiments, just to give the data reproducibility to the global public then every unprofessional people can validate the results directly. (This experiment is so simple that even a six-year-old kindergarten girl has participated in the video of (**Suppl. Movie 4, 6**), with rock climbing safety rope on the waist. This six-year-old 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 for a long time before releasing them. Without such devices, a slinky will shake to damage the result. 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 released from that famous Tower, we can expect a much larger *FHD* than those in all our validations. (This fact means that all over the world, people have lived in the illusion of a legendary system for more than three centuries. It is not the mistakes of Galileo or Newton, for rigid bodies, they were not wrong, and they had transcended their time greatly. However, 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 for centuries. Such an illusion does restrict

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the regenerative of science. Their methods are one of the successful approaches, but not inclusive of all! People who published the legendary Galileo experiment in textbooks revealed that they “expected” the legendary results instead of really “observing” the experiment.)

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, which also means part of the gravitational waves is measurable instead of Einstein’s modulation. We only weighed the two bottles for preparing the video, not for all the 600 trial experiments. For them, just poured half a bottle of water and half a bottle of oil; visually checked that they were at the same height. However, due to the density difference, the oil bottles should be lighter than those of the water bottles by visual check for over 98% of the conditions. And all of them got the result that the oil bottle hit the ground first. From here, we can see that relative mobility has exceeded mass or weight in the *FHD* for non-rigid bodies. This reveals there exists “incompleteness” for Newton’s and Einstein’s systems for explaining weight, mass, and gravity under high potential energy bodies (with more surface tension regions). For these types of objects, gravitational waves are observable oscillation energy that is much higher in quantity than those acquired from rigid body models, and mass concepts will shift.

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 book<sup>2</sup> and only keep the references of Newton and Eötvös. The original book has a reference index for each person in the table.); (**Tab. 2**) shows the modern validations in microcosmic terms.

**Tab. 1 | Historical test of weak equivalence principle (WEP) in the macrocosmic world<sup>2</sup>**

Year	Investigator	Sensitivity	Method
500 ?	John Philoponus	small	Drop tower
1585	Simon Stevin	$5 \times 10^{-2}$	Drop tower

1590 ?	Galileo Galilei	$2 \times 10^{-2}$	Pendulum, drop tower
1686	Isaac Newton <sup>3</sup>	$10^{-3}$	Pendulum
1832	Bessel	$2 \times 10^{-5}$	Pendulum
1908 (1922)	Loránd Eötvös <sup>4</sup>	$2 \times 10^{-9}$	Torsion balance
1910	Southern	$5 \times 10^{-6}$	Pendulum
1918	Zeeman	$3 \times 10^{-8}$	Torsion balance
1923	Potter	$3 \times 10^{-6}$	Pendulum
1935	Renner	$2 \times 10^{-9}$	Torsion balance
1964	Dicke, Roll, Krotkov	$3 \times 10^{-11}$	Torsion balance
1972	Braginsky, Panov	$10^{-12}$	Torsion balance
1976	Shapiro, et al.	$10^{-12}$	Lunar laser ranging
1981	Keiser, Faller	$4 \times 10^{-11}$	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.	$5 \times 10^{-14}$	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 <sup>5</sup> et al.	$10^{-7}$	Atomic Interferometer
2015	Zhou <sup>6</sup> et al.	$10^{-8}$	Atomic Interferometer
2017	Rosi <sup>7</sup> 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) totally relied on the fact that the solid metal of used objects closed to rigid bodies, thus restricted 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.

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From here, we can further see how internal motion (relative mobility) impact *FHD*. Historical experiments in (**Tab. 1**) used solid metal objects; the falling time only seconds (9.8m/s). In so short a time, the geometrical shifting of those solid metal objects is totally undetectable; therefore, the *FHDs* induced by the internal motions are also undetectable. While we change the solid metal into liquids inside bottles, the geometrical shifting of the liquids in the short falling time becomes obvious; therefore, it easily shows detectable *FHDs*. Now, we use liquid nitrogen overnight to fix these liquids again, then in the falling process, no detectable geometrical shifting or relative mobility for liquids inside liquid nitrogen frozen bottles, the results recover back to conventional undetectable *FHD* again. Liquid nitrogen frozen bottles close to metal weights in historical experiments, 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. (We also note, the term “rigid body” originated in classical physics should be a relative concept that concerns a specific process. Like a half bottle of liquid, if the geometrical parameters changed during the free-falling process; then, it is a non-rigid body. And while we froze it with liquid nitrogen, the geometrical parameters are also frozen in that falling process; thus, it is a rigid body that relates to the falling process. The highest falling distance of our experiments only 23.65m; liquid nitrogen frozen bottles are rigid bodies that relate to free falling with this height. If the bottles fall from a helicopter with thousands of meters height in which the liquid inside them will melt, then they are not the “rigid bodies” relate to that free fall process of that height. The rigid body concept cannot be independent of a concrete process. “Relative rigid body” concept or the “relative mobility” is vital for bio study because up to date, only relative mobility can completely calibrate bio-inertia which is a type of potential energy transfer oscillation inertia. All other conventional biological indicators, such as DNA, protein structures, antibody titer, etc. are quite reluctant for this purpose.)

In classical physics, the corollary that "inertial mass equals to gravitational mass" is the foundation of Newtonian and Einstein's system, even classical quantum mechanics indirectly concern with it. Now from mutation 1 till mutation 6 of the legendary Galileo falling body experiment, we can clearly see that this foundation is only conditional true for rigid bodies. Once the internal motions (relative mobility) of objects reach certain levels, this foundation will be melting.

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Besides the legendary Galileo experiment, Eötvös experiment<sup>4</sup> with  $10^{-9}$  levels of accuracy is also referred to as important evidence of the abovementioned corollary. Now, if we change the solid metal rigid body masses in the Eötvös experiment to our bi-layer metal balls (Mutation 1.4), or bottles of liquids (mutation 1.5), we can see how the officially claimed  $10^{-9}$  levels of accuracy will be decaying. 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 internal motion gravitational binding that originated from the surface tension region, which we will discuss later.)

## 2. Bio quantum path experiment unveils the definition of bio-inertia

The bio quantum path model has been initiated by the paper (p1682, →)<sup>1</sup> 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 within the scope of Newtonian mechanics; now, we have to break such a Newtonian restriction:

Back to (**Fig. 1j**), in one period, 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, integral, then:

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

Eq. 1 can be regarded as a modified Newton’s second law of motion for non-rigid bodies. (The non-rigid body item  $m\vec{g} \int tg\theta \cdot d\theta$  can also be roughly called a “gravitational binding” item. 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:  $m\vec{g} \int tg\theta \cdot d\theta$ .) The physical significance of Eq. 1 means the persistent recovery rate of a physical

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parameter can bind extra gravity other than those written down in the rigid body format Newtonian laws. Here the angle  $\theta$  between the moving vector and gravity 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 thermal cycles (15-40) 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, also, not like the *in vitro* PCR process needs so drastic temperature parameter cycles (each cycle: denaturation: 94-97, annealing: 50-65, elongation: 70-75°C). The optimization process of so many parameters *in vivo* is by bio quantum path superposition which we’ll refer to later. All the mechanism is the same, just “parameter- against-gravity-recovery” accumulation. And 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 possesses different interaction with the bottle walls or with different gravitational binding efficiency, then accumulates different *FHDs*. We must note, a bottle wall is critical. This is the wave function inversion protection we’ll refer to later.)

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 system. He never imagined that the Newtonian system hid large discrepancies 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:  $\overline{m\vec{g}} \cdot t$ , here  $t$  is the time advance which the ball acquires on path B. If we use the previous experiments such as mutation 1.5, the gravitational binding of the water bottle should be larger than the oil bottle by:  $\overline{m\vec{g}} \cdot FHD$ , here *FHD* represents the failing height

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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. Now, we can simply define item  $m\vec{g} \int tg\theta \cdot d\theta$  or its superposition as bio-inertia. (In bio-systems, the vector of gravity usually shifts which different from non-living beings always plumb to the ground; however, no matter the main vector or the integrated gravity change to any direction, bio-inertia still can be modulated with the recovery rate of any leading parameter VS gravity.) And “bio quantum path” concept can preliminarily be defined as the physical or mathematical function which reveals the gravitational binding accumulating by recoverable internal motions. No matter which way it is written down, the recovering shifting of parameters against gravity is the fundamental mechanism. (Note: the rank of a certain parameter shifting against gravity on a bio quantum path is unrestricted for a certain bio-system and shaped by evolution. If one level of bio quantum paths is established, based on  $m\vec{g} \int tg\theta \cdot d\theta$  we get this level of gravitational binding. While the system interaction with environment and new bio quantum path base this  $m\vec{g} \int tg\theta \cdot d\theta$  established, the new binding will then  $m\vec{g} \int (m\vec{g} \int tg\theta \cdot d\theta) \cdot d(m\vec{g} \int tg\theta \cdot d\theta)$ , and so on; just each period must include inversion then can fulfill the accumulation.). We can continuously write down in this way; therefore, the rank is unrestricted and shaped by evolution species. 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 yet a geometric gravity. 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. The bio-inertia of a system is the superposition of all parameters patterned by the item  $m\vec{g} \int tg\theta \cdot d\theta$ .)

### 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 Cavendish experiment alternatively test the gravitational difference between the dead and alive state of living beings. The mutation experiments have been initiated in Tsinghua University, Beijing since 2012. The results show that the gravitational loss of a living being reached 0.14-3.8% (1684, →)<sup>1</sup>, which

means the gravity has been enlarged for  $10^9$  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:  $U = \frac{3GM^2}{5R}$ . This level of this energy is totally different from those in bio-systems induced by internal motions (surface tension region driving). To avoid confusion, the “gravitational binding” term in this paper refers to *in vivo* instead of *in vitro* conditions.)

It took years for the mutation of Cavendish experiments to be performed on different locations on Earth with more than one thousand formal plant source samples from wildness, human cultivars, and more than one hundred animal source samples (excluded pre-trials) from wildness, laboratories, and markets at different seasons. 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, the incorrect experimental method wastes us years.) (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) and some living organism samples in (Fig.1) 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 observation<sup>1</sup>, 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:

$$\vec{F} = m_a \cdot \vec{a} \qquad \vec{F} = G \frac{M_{earth} \cdot m_G}{r^2}$$

Then  $m_a = \frac{g}{a} \cdot m_G$  (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, use of chemicals, feeding, mature stages, etc. will play a role in the 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. (We must note, such kind of gravitational binding is “extra” to Newtonian mass inertia and the quantity of binding concerning the organism structures and internal motions. The fundamental reason is that surface tension regions can procure gravity in the environment and rigid bodies lack such mechanisms. If we reluctantly 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 consider 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.)

**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)	<i>FHD</i> (cm), Raw /	Ave, STD	<i>FHD</i> (cm), Raw /	Ave, STD
	in the 50ml tube	24H, 3samples		48H, 3samples	

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.4) 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.)

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#### 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”. 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 that surface tension is large enough. (Possibly Einstein himself deeply believes that his gravitational waves can’t be measured and then designs this thought experiment. However, *in vivo* gravitational waves do measurable. Our free-fall testing of *FHDs* between live and dead states of a bio-system can be regarded as a measurement of *in vivo* gravitational waves.) We should note, albeit Einstein’s thought experiment is unsuccessful for general non-rigid bodies; however, the historical significance of it is still greatly pioneering. At least it does “unintentionally” **remind** us of the physical aspects 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.

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People prefer a biodiversity environment since in there they can get more gravitational binding.)

2) in bio-systems, gravitational mass never equals inertia mass due to the internal motion 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 lower than a certain threshold means the life system is senescence or surface tension regions are damaged. (For dead bodies, the gravitational mass could roughly equal inertia mass for the same species, or the difference between gravitational mass and inertia mass is generally neglectable.)

3) the gravitational binding concerns the *in vivo* structure of a species and governs all the known and unknown biological indicators. All living functions come from internal motion gravitational binding, without such kind of binding, living and non-living beings will retrograde into the same sort of existence. (Life needs geological time of evolution is to increase the level of gravitational binding capability or potential energy transferring efficiency by *in vivo* structures. The fundamental driving forces of evolution are internal motion gravitational binding.)

From the abovementioned Einstein's **reminder**, to experimentally measure 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 Newtonian or Einstein's system, the only available *in vivo* measuring method for bio-systems is acquiring the *FHDs* since the bodyweight of an organism never concerns with its bio-inertia or health condition. (Not only in medical sciences but also in food industries, we still can use *FHDs*. Nowadays, both nutrient fact tables with chemistry bases and microbial tests with biological bases can only know the conventional regulated food safety. To exactly know the quality or gravitational binding of foods, we have no alternative ways but to rely on *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 have to compromise to two postures as in (**Suppl. Movie 9**) and

(Suppl. Movie 10) albeit they have some errors than the ideal “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, and 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**

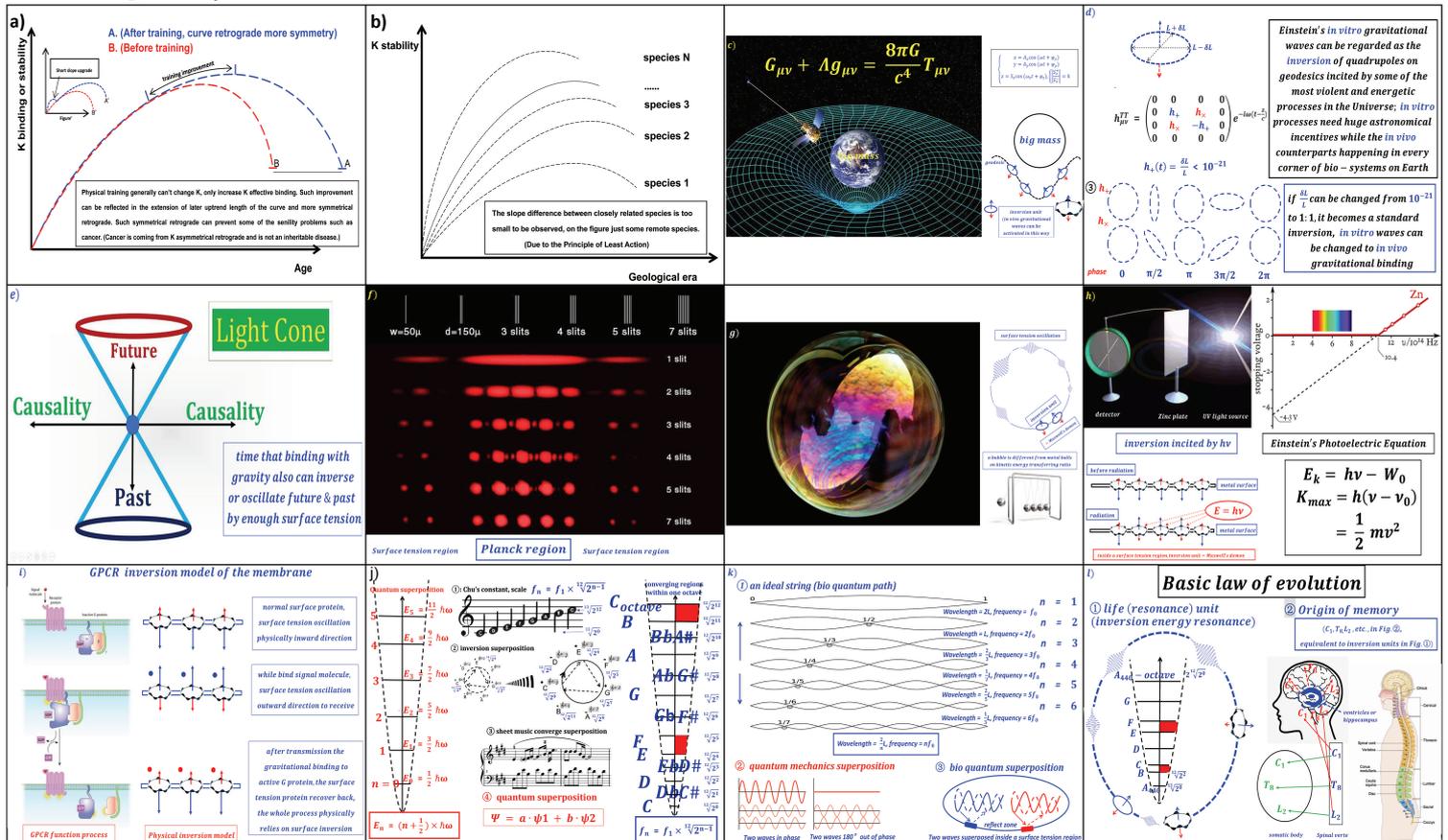
volunteer	<i>1<sup>st</sup> diving FHD</i> (cm)	<i>2<sup>nd</sup> diving FHD</i> (cm)	<i>3<sup>rd</sup> diving FHD</i> (cm)	Ave	STDEV
1	41	56	67	54.7	13.05
2	33	51	42	42.0	9.0
3	46	29	37	37.3	8.50
4	22	37	40	33.0	9.64
5	75	66	82	74.3	8.02
6	36	27	17	26.7	9.50
7	45	58	33	45.3	12.50
8	51	43	39	44.3	6.11

\*\*\* 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,  $\rightarrow$ )<sup>1</sup> before as in (Fig. 2a, 2b). To use the only available Cavendish mutation experiments in the past to get such curves is almost impossible; therefore, at that time these curves are only imaginary. Now, with the newly established *FHD* test, all similar curves become technologically feasible. (Besides water diving, the skydiving free-falling stage possibly can do the same job.)

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



**a)** lifetime gravitational binding curve pattern<sup>1</sup> **b)** evolutionary gravitational binding pattern<sup>1</sup> **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

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

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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. The lifetime *FHD* standard curve monitor for an individual is truly critical since it governs all known and unknown biological indicators. (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 quantified. 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, →)<sup>1</sup>. *FHD* tests can 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 training can be indisputably quantified by *FHDs*.) We believe 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 *FHDs*. Suppose an adult man gets *FHDs* on the 10m platform under normal conditions, once he has a sexual behavior, the *FHD* data or the somatic bio-inertia will be significantly reduced significantly under the same condition, then need a certain time to gradually recover back the large percentage 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 and have also created diverse sexual Kungfu training systems. Our *FHD* test can conveniently get equivalent results to those in ancient times; offer a test that exceeds all known ancient and modern methods.) 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 is 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. 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 (limited sexual behavior that only refers to around 2% of the 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. It is such a kind of gradually accumulated gravitational binding among generations in species that drives evolution. (It also reminds us that while performing the lifetime *FHD* standard curve monitor, should arrange the test date 5-day away

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from the sexual behavior time point; otherwise, there will be divergence on the curve.)

## 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 laws<sup>3</sup> that describe the relationship between the motion of an object and the forces acting on it. Newton's laws of motion, together with his law of universal gravitation<sup>3</sup> 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 science<sup>3</sup>. The fundamental method that originated in this system is the isolated logic method, which means separate the logic predicate(s) from the research environment. (This method greatly impacts human history for centuries, even today for most disciplines that do not fit with Newtonian mechanics, still fall into the isolated logic methods due to the earlier influence of Newton's 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 force<sup>3</sup>. For bio-inertia, we can't simply transfer that as the capability of keeping motion state as for rigid bodies, with the previous bio-inertia discussion basis, we can adapt the Newtonian first law into bio-system *in vivo* environments like the following:

All *in vivo* active biomaterials or biostructures remain their state on bio quantum path(s) unless they are acted upon by its internal motions or the state of relevant bio quantum paths. (Bio quantum paths represent the shortest distances or the most efficient gravitational binding functioning path of the *in vivo* environment.)

Note: here the bio quantum path replaces the constant velocity on a straight line in Newton's system. With the basis of the modified first law, we then can get the modified second law:

To change the state of active 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. (The state shifting demonstrates the Le Châtelier effect for all sensitive parameters.)

This modification reminds us we can't simply impose a force on an object moving along a bio

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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. (The forces that are modulated by  $\vec{F} = m \cdot \vec{a}$  only 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 impacts for changing states. And while impacts can accumulate, the Le Châtelier effect needs to replace the Newtonian acceleration of an object for the biomaterials state shifting level evaluation.) Also, the concept of mass no longer fits bio-systems (the more surface tension regions or gravitational binding of an object, the more errors for it to use mass indicator). The concept of time is also different, must be calibrated by different gravitational binding structures. 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, any linear nucleic sequence editing cannot acquire any biological function. The Newtonian third law states that all forces between two objects exist in equal magnitude and opposite direction. This law is still only correct for rigid bodies, just to write the modified version of this law needs to refer to some future understanding, we then put that later.

Newton's law of universal gravitation<sup>3</sup>, the first inverse-square law in physics and human history, got much insight from Kepler's laws of planetary motion (Also, some reminder from Robert Hooke). 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.) However, compromise to 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, at least for bio-systems, the inverse-square gravitational law will fall in quite an intolerable discrepancy. If people still like to believe that this law can be transferred solely from astronomical conditions to rigid bodies on earth, it is then unclear whether we can do so for most intermediate non-rigid bodies between bio-systems and ideal rigid bodies. Possibly a simple

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way is to shift the G in a wide range instead of creating a new formula, especially for living beings. 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,→)<sup>1</sup>, this is only one of the G shifting probing methods that reminds us what physics as a discipline must realize and deal with.

Albert Einstein had made substantial modifications to Newtonian mechanics; however, still rarely referred to the shifting of the G range on a large 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. Therefore, for bio-inertia that can't be "universally" included in the Newtonian equation, Einstein's theory equally can't handle with. There is a label for Einstein's curved space: "Space-time tells matter how to move; matter tells space-time how to curve." For bio-inertia, this clause possibly should be simply modified as: bio-system internal motion tells gravity where to bind *in vivo*; gravitational binding tells bio quantum paths how to superpose inversely and issue function.

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

We have referred to Einstein's elevator thought experiment which Einstein used to justify inertia mass = gravitational mass before. From our previous experiment we can understand, the prerequisite condition of this equivalence is that there is no exchange between inertia mass and gravitational mass. For rigid body 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 superposition) which is called bio curved space, physical laws can no longer be equivalent. As mentioned before, we can't use the conservation of momentum between a non-living object and a living organism. The quiddity of this problem still traces back from the isolated logic method established in Galileo and Newton's time. We can "isolated logically" separate the research target from an environment and no need to consider the corrections between this target and the environment. However, for bio-systems which inseparable from the environment, the isolated logic way will unavoidably accumulate discrepancy that needs to be resolved later. A bio quantum path itself is superposed by a lot of bio quantum paths and inseparable from the environment.

The left of (**Fig.2c**) shows Einstein geodesics that modulate gravity is entirely geometrical by

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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,  $\rightarrow$ )<sup>1</sup> 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. The gravitational difference between the *in vitro* and *in vivo* boundary of a living organism is usually larger than the difference between the same starting points with a different direction on a perpendicular line that crosses the geodesic (as the inversion units in the figure). And signal inversion usually happens between the *in vitro* and *in vivo* boundary of a living organism. Einstein never described that gravity could inverse perpendicularly along the geodesics as shown in the bottom sketch. If we reluctantly consider 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 (Here we say "reluctantly" since 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.

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 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 inversion, shape the *in vivo* functioning, and impacted greatly by almost all *in vivo* active ingredients, inseparable with active bio 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. (The results of Einstein's gravitational waves have

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given up the concept of “aether” albeit he theoretically believes in it. The challenge of this historical controversy concept rests on the concrete particle composition of aether. Einstein still does not fully solve the modulation of graviton he believes in. However, in bio-system, we can simply use range to solve the problem, the vivo gravitational waves are “aether”, human CSF is such a kind of *in vivo* aether with the highest gravitational binding. Even for the wave-particle duality concept in quantum mechanics, we can simply regard the holistic superposition of all “wave properties” *in vivo* as the concept of aether. Later, we’ll give the memory mechanism of the bound state aether.)

(**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 which different from non-living beings (or an inversion part possibly need a different time from its non-inversion part). Organism lifespan which can only be calibrated by *in vivo* gravitational binding (such as in **Fig.2a, 2b**) is quite insignificant in length compares to Einstein’s time; however, strongly impacts *in vivo* gravitational shifting. Einstein’s time, even considering Lorentz contraction or as the Solar system level mass shifting, impact on the lifespan or *in vivo* gravitational waves is still insignificant.

### **3. The limitations of Schrödinger wave function for modulation bio-inertia, and the unavailability of inversion protection for the wave function in a non-isolated environment**

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 meaning that if two wave functions  $\psi_1$  and  $\psi_2$  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 experienced Planck’s black body, Einstein’s photoelectric effect, till Schrödinger wave function (p1692,)<sup>1</sup>. It 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

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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 present, we always can find the above two types of inseparable regions. Now we can simply call the linear region as “Planck region”, which can be written as  $E = h\nu$  and have also been studied extensively by conventional quantum mechanics; the non-linear region as “surface tension region”, which has been neglected by quantum mechanics, or more precisely, covered by quantum mechanics probability and then no attention (surface tension region is not necessarily symmetric.). These two regions are inseparable in a non-isolated environment albeit quantum mechanics mathematically believes that the Planck region can exist independently. Nowadays quantum mechanics only can deal with non-living beings, the fundamental reason is that it restricts itself to the Planck region with probability and neglects the surface tension regions; however, life functioning must rely on the interaction between the Planck region & surface tension regions. (The folding of a large molecule, the superposition of a DNA chain with ribosomes, etc., all rely on such interactions. If we regard the human spinal cord as a quantum state structure, it also needs such interactions with the spinal cord peripheral human body structures for functioning.) This also challenges the fundamental quantum superposition principle, the principle believes that any two (or more) quantum states can be superposed, and the result will be another valid quantum state; and conversely, that every quantum state can be represented as a sum of two or more other distinct states. This means that whether we can superposition two quantum states is inclusively decided by what we know about the two Planck regions and there is no impact that needs to be considering from the non-Planck regions for the superposition process.

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 equation<sup>8</sup>, as decoherence does not reduce to a single eigenstate<sup>9</sup>. However, to fully understand this problem we possibly can go back to the surface tension regions cover the Planck's regions. The left of (**Fig. 2g**) shows a soap

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bubble maintains by Minimal surface tension, a colorful film. The right top of (Fig. 2g) draws the oscillation and inversion of the film; compare to the right bottom of (Fig.2g) we could understand the energy characteristics between two types of objects. 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% transfer 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. If one soap bubble bumps with another, a lot of conditions could happen. However, it is difficult to get what in the bottom figure of the transferring efficiency for kinetic energy even for two bubbles. The fundamental cause is still the inversion; a surface tension region can transfer the kinetic energy into potential energy by inversion. There are inversion units in the right top figure, these inversion units compose of one inward vector (blue) and one outward vector (red) with a net inward vector to maintain the surface tension. Inversion means the blue vector and red vector exchange each other in response to environmental impacts; this is a type of frequency energy. Soap bubbles can't transfer kinetic energy in a higher efficiency to each other, that is due to the surface tension inversion can transfer the kinetic energy into potential type energy in higher efficiency. In contrast, the efficiency of metal balls to transfer kinetic energy to potential energy is almost zero. We then get the general function of all surface tensions: transfer kinetic energy to potential energy (Einstein's energy-momentum tensor can't adapt to bio-systems is still due to such transferring which comes from surface tension region functioning.). Also due to the oscillation, the bubble film can bind gravity. The bubble only has one layer of surface tension region; therefore, gravitational binding only shifts and inversion around the film layer. Unlike those seen in a rainbow, which arises from differential refraction, the colors are seen in a soap bubble arise from interference of light reflecting off the front and back surfaces of the thin soap film, which is also an inversion process. We can even say that gravitational binding inversion lets us see a colorful soap bubble film. Also, all wave functions must possess "inversion protection" to survive in an open area. 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 albeit

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the discipline lacks such a modulation.

The photoelectric effect is also mechanized by surface tension inversion (p1692, →)<sup>1</sup>. As in **(Fig.2h)**, the process is the emission of electrons when electromagnetic radiation hits a material, get 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 quantum mechanics. This formula has already included inversion as in the left bottom of **(Fig.2h)** albeit people rarely realize that. The electrons on the metal surface compose 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, then inversion becomes the manner to comply with the principle of least action. The more active state of a surface tension region, the more percentages of inversion units will function on that surface. (From here we could also find the weakness of thermodynamics, this theory suggests an isolated system for its second law. However, for any ideal isolated system, once boundary presents, it has inversion units; no matter inversion unit(s) is more or less, there exists! The second law of thermodynamics needs a surface tension region with zero inversion which is impossible to present in the real world. We even can regard inversion units as a group of Maxwell's demons, which mechanisms we'll refer to later.)

Quantum entanglement was first presented in Einstein's paper as EPR paradox<sup>10</sup>. 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. This means the entangled state is yet a special type of inversion albeit people didn't realize that: entanglement =  $|inversion\rangle$ .

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Experiments have validated entanglement at a large distance to the satellite orbit; however, still not correlates the process with gravity. We believe that not only quantum entanglement must rely on gravity but also wave function can't exempt from gravitational binding. With gravity as a mechanism, quantum entanglement is no longer adapts to Einstein's comment "spooky action at a distance".

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, choanoflagellates<sup>12</sup>, 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 include many subordinate inversions, evolution from simple molecules to large seven cross-membrane complexes still comply with the cross-membrane inversion pattern.

Now, back to the wave function collapse; in quantum mechanics, the wave function is claimed as complex-valued probability amplitude, and the probabilities for the possible results of measurements made on the system can be derived from it. The wave function is a function of the degrees of freedom corresponding to some maximal set of commuting observables.  $|\psi|^2$ , is a real number interpreted as the probability density of measuring a particle as being at a given place - or having a given momentum - at a given time and possibly having definite values for discrete degrees of freedom. Most fundamental experiments such as the single slit, double slits, etc. are happening in a natural environment that is never isolated. The application of Schrödinger's equation to an open system in the present sense concerns the relative robustness of wave function, no matter the range of structure. Wave function collapse concerns such robustness in an environment. No matter at any conditions gives a surface tension with inversion to the outside range of the wave function will increase its robustness or extend the wave function collapse to a countable process. It is then understood that wave function must interact with the outside environment via an inversion shell or surface tension inversion protective region. (Whether quantum mechanics can be applied in bio-systems fully relies on such surface tension region, never concerns with the scale of the micro- or macrocosmic world. The conventional wave function collapse model is only a compromised choice that while lacking the inversion region outside the wave function, not happens in the real world. The

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wave function collapse modulation comes from here. Without an outside inversion layer as the environmental cache, a wave function must mathematically collapse instantly once “observe”.) Our previous mutation experiments 1.4, 1.5 still could be modulated as the mutation of the wave function. For the half bottle oil or water, in the process of falling, the liquid oscillates with the bottle wall. This is a kind of oscillation energy that can be regarded as a wave function with the bottle wall as the major inversion protection barrier). Wave function satisfies the equation:  $\hat{H} = \hat{T} + \hat{V}$ , due to the wave function of the oil bottle is different from that of the water bottle, the gravitational binding is different, we then can see the *FHD* between them. For living being mutations, such as mutations 3, 4, 5; still equivalently modulated, just add some conditions:  $\hat{H} = \hat{T} + \hat{V}$ ,  $\hat{V}/\hat{T} = k$ , (as mentioned, living being can high-efficiently transfer the kinetic energy into potential energy, then there is a  $k$  restriction in addition to the Hamiltonian. Living beings transfer efficiency comes from multi-surface tension regions). The *FDHs* between the living being VS non-living being, or a person’s healthy VS Sub-health state, etc., all due to the difference in wave function gravitational binding in the free fall process. There is no gravity parameter in conventional Schrödinger's equation:

$$\hat{H} = \hat{T} + \hat{V} = \frac{\hat{p} \cdot \hat{p}}{2\mu} + V(\mathbf{r}, t) = -\frac{\hbar^2}{2\mu} \nabla^2 + V(\mathbf{r}, t)$$

$$E\psi(\mathbf{r}, t) = -\frac{\hbar^2}{2\mu} \nabla^2 \psi(\mathbf{r}, t) + V(\mathbf{r})\psi(\mathbf{r}, t) = i \hbar \frac{\partial}{\partial t} \psi(\mathbf{r}, t)$$

The conventional quantum mechanics wave function only can modulate simple substance elements, quite challenging for compounds, we believe the reason is still gravity. The extraordinarily higher levels of gravitational binding in our free-fall mutations should come from the complex surface tension inversion regions compose of the bio-systems. There is another equation in quantum mechanics known as Dirac equation<sup>11</sup>:

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

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 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. That means even in a discipline that lacks an inversion model, we still can find some inversion trace evidence. (We should note, both dark matter and Mass–energy equivalence

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are easily misleading. Even so-called dark matter can present, and while it meets with other non-dark matter, the energy can be released still quite limited since the time for the energy process is non-unitary; therefore, restrict the theoretical transfer efficiency between matter and energy. For this reason, the Dirac equation only means energy inversion, never means the evidence for dark matter.)

Applied inversion superposition in quantum mechanics also needs to break the normalized conditions. 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,  $\int_{-\infty}^{+\infty} \Psi^*(x)\Psi(x)dx = \int_{-\infty}^{+\infty} |\Psi(x)|^2 dx = 1$ . For bio-systems, a biomaterial's normal state and its inversion state can no longer be normalized into 1, time is inversion time and not the unitary time in conventional quantum mechanics. It is due to time in bio-systems is inversion time which correlates with the environment deeply; therefore, time travel is impossible, it will damage the bio-system first before travel is fulfilled. There are still other problems for quantum mechanics to adapt to bio-systems which we will refer to later. We can simply call the wave function in conventional quantum mechanics *in vitro* and for bio-systems as *in vivo* wave function. The critical difference between *in vitro* and *in vivo* wave function is mathematic superposition in conventional quantum mechanics and the inversion superposition in bio-systems.

#### **4. From non-living being mathematic superposition in conventional quantum mechanics to bio-system surface tension inversion superposition that possess universal recovery capability**

Under *in vitro* conditions, without considering application range, also neglect the parameter-against-gravity-recovery accumulation process detail, Schrödinger wave function and Einstein's gravitational waves are the same sorts of oscillation energy if we accept wave function can bind gravity. (Schrödinger wave function should be multi-value to modulate parameter-against-gravity-recovery accumulation; however, being written into a single value function. We have to neglect this.) Our testing of the *FHDs* for living beings by free-fall could be regarded as test the *in vivo* Schrödinger wave function or *in vivo* Einstein's gravitational waves, the quiddity of which is still internal motion or inversion of parameters against gravity. Under a free-fall state, gravitational binding can be calibrated efficiently. We have suggested using Chu's constant in quantum mechanics, that is to take  $|E_n\rangle = \sqrt[n]{2^{n-1}}hv$  to replace  $|E_n\rangle = nhv$  (p1692, →)<sup>1</sup>, also suggested frequency notation (p1709, →)<sup>1</sup>. (Music scale can be written as  $|f_n\rangle = f_0 \times \sqrt[n]{2^{n-1}}$ , omit  $f_0$  of 440Hz tuning frequency

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and then can get that notation.) This replacement is not only to apply frequency inversion into the discipline, but it does also issue substantial radical changes. Now, we should understand the fundamental difference between quantum superposition and music scale frequency inversion converge superposition (which is the basis of life memory we'll explain later):

1) Quantum mechanics is mathematically modulated in an isolated system and music happens in a non-isolated system. As a consequence, quantum never clarifies its resonance characteristics, the musical system must rely on resonance. And quantum state collapse is even a fully anti-resonance modulation.

In conventional physical theory, 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. When an oscillating force is applied at a resonant frequency of a dynamical system, the system will oscillate at higher amplitude than when the same force is applied at other, non-resonant frequencies. However, such a model originated from a rigid system only correct while oscillation transfer only restricted to certain research targets or no extension of the oscillation. For liquids or bio-systems, the resonance can be spreading widely which extant physics lacks modulation; we have to rely on music as a tool to understand this process. A music compositing process can be regarded as the macrocosmic superposition of scale note frequency:  $|f_n\rangle = f_0 \times \sqrt[n]{2^{n-1}}$ , and accumulate the inversion resonant driving forces that come from each superimposed frequency. Here, we refer to the term “inversion resonant driving forces” since any resonance must transmission via the process of inversion; just conventional physics doesn't realize that. No matter a small oscillation drives a large one, or reverse, or transmission among equivalent oscillations, all including inversion, only different in the density or inversion round. Conventional music harmonics leave us with great tools for modulation inversion for centuries, while modern science totally short of such tools and theories for inversion. Like the quantum superposition:  $\Psi = a \cdot \psi_1 + b \cdot \psi_2$ , it's only linear sum up. However, in music, if we hope to superpose scale note(s) into a piece of music, that will never be such a linear sum up, the processes of inversion are totally indispensable. The quality of a musical instrument or its combinations relies on the inversion resonant capability between each scale level:  $|f_n\rangle = f_0 \times \sqrt[n]{2^{n-1}}$ , tension among scale levels fully comes from the resonant cavity of the instrument. However, quantum mechanics never believe the robustness of interference fringes comes from resonance. (As our previous mutation 1.5 with half

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bottle of liquid, the oscillation of liquid in the bottles could be regarded as wave functions or gravitational waves which take resonance to transfer gravitational binding with the bottle walls as the major inversion protections. A water bottle has a higher efficiency than those with an oil bottle for transferring, then it falls behind. However, they are still non-living beings; most of the gravitational energy is transferring out to the environment instead of holding inside. For a living being, like the apple free-fall experiment, the fresh apple can use resonance to hold most of the gravitational binding inside. No matter transferring out or holding *in vivo*, all must rely on resonance. In conventional biological science, full of the stories of “self-” process, a structure can be self-assembled, a cell can self-division, etc., we should note, there is no self-process; all such biological processes are happening through inversion resonance. A person’s health condition relies on the CSF resonance robustness among each Spine. Senescence means the decaying of such inversion resonance capability, then all the biomaterials such as DNA, RNA, proteins, etc., all become inactive things, death is approaching.)

2) A large part of quantum mechanics describes the movement of electrons, there are limitations for particle scale it can deal with, compare to music can deal with almost all types of oscillations driving tendency, quantum mechanics only can deal with a few types of particles with probability and a limited number of parameters. Without considering such a description range, what critical is the linear quantum superposition is totally different from the inversion converge superposition in music, and such inversion superposition is what is living organisms fully rely on.

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  $\phi_1$  with  $\psi_1$ ,  $\phi_2$  with  $\psi_2$ , ..., and  $\phi_k$  with  $\psi_k$ , for superposition. Music takes  $\phi_1$  with  $\psi_n$ , ..., and  $\phi_n$  with  $\psi_1$ , this is a full inversion; or  $\phi_k$  with  $\psi_j$ , however, compensate with some inversion combination of  $\psi_j$ , this is a partial inversion. (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 life function. The left hand of **(Fig.2j)** and **(Fig.2j④)** are quantum superposition (with red color). **(Fig.2j①)** shows the scale and Chu’s constant (p1692,→)<sup>1</sup>,  $|f_n\rangle =$

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$f_0 \times \sqrt[12]{2^{n-1}}$ . ( $f_0$  is the tuning frequency, which is widely used with 440Hz, omits it we then get the frequency notation  $|f_n\rangle = \sqrt[12]{2^{n-1}}$ ). As previously our modification of Newtonian first law, we could regard a scale in the right hand of **(Fig.2j)** as the static state. (The bio quantum path we see in **(Fig. 1j)** is uniformly in shape. In the real condition, it will gradually decay, the decaying step will compose of a polarity (or a scale). Quantum mechanics unusually regards Planck's constant  $h$  or  $\hbar$  as the least energy transferring unit of the universe. In bio-systems it is not the least transferring unit; it should be the least decaying unit of a bio quantum path base on certain bio-systems VS environmental interaction; therefore, variable. The step of musical scale  $|f_n\rangle = \sqrt[12]{2^{n-1}}$  is much wider than Planck's constant  $h$  in most conditions; it should compose of certain (inversion) combinations of Planck's constant  $h$ . The arc of the human spinal cord is quite huge than Planck's constant  $h$ ; however, they are the same sort of existence.)

With the scale as a relatively 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  $C(\sqrt[12]{2^0}) - E(\sqrt[12]{2^4}) - G(\sqrt[12]{2^7})$  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, 1<sup>st</sup> inversion, G-C-E, 2<sup>nd</sup> inversion. The tension of a note against a “static” scale is dynamic in such a way. (It can also be regarded as the inversion vector direction, just this “vector” doesn't like a mathematical vector can be expressed and calculation to unlimited directions; it can only be expressed by available musical notes and shows the vector direction of the dynamic of these note combinations.) 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  $E(\sqrt[12]{2^4})$  in one movement with another  $E(\sqrt[12]{2^4})$  from another movement (these two notes must with different vector directions such as  $|\uparrow\rangle, |\downarrow\rangle$  to superposition), the resulted frequency still  $\sqrt[12]{2^4}$  which frequency keeps the same;

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however, must compensate with the inversion tension structure of another  $E(\sqrt[12]{2^4})$ , such an inversion structure could be a chord or chord combinations, or movements, etc. (whether this superposition change the  $|\uparrow\rangle, |\downarrow\rangle$  of  $E(\sqrt[12]{2^4})$  depends on the superposed inversion structure.) (Fig.2j ③) 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. All the music, no matter which style, is composed down from inversion superposition in this way which totally different from quantum superposition. Music offers us great tools for modulating inversion. (In the modern scientific kingdom, there is almost no tool for modulating inversion. Another discipline that can modulate inversion is ancient China I Ching, written in around (1046-771BCE) with 64 sets of symbols to modulate tendency. As is known, modern sciences were initiated from Galileo and Newtown's time characterized by isolated logic methods. The inspiring aspect of this tide is human's great success in engineering and mechanics for centuries since then. However, the negative side is some of the disciplines that do not fit for isolated logic method still have to restrict themselves into this frame. Precision medicine is such an embarrassing discipline that comes from the negative side. Music harmonics and I Ching are rare disciplines that haven't fallen into the isolated system. Today we recover the inversion method from them, just to give bio-systems some non-isolated tools which corresponding to life evolution.) Among all scientific isolated logic disciplines, quantum mechanics closest to inversion processes than all others; however, it still chooses to fix inversion. The commutation relationship in quantum mechanics can be regarded as a type of compressed or "isolated logic" fixed inversion relationship.

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 uncertainty principle. It also means the commutators have a common eigenvalue which can apply to quantum mechanics. The non-commutative item " $i \hbar$ " is then what quantum mechanics can target. (In classical physics, all observables are commutative, or commutator equals zero. Then the item " $i \hbar = 1$ , or  $\{x, p\} = 1$ )

The equations of commutators in classical quantum mechanics can be given as:

$$[\hat{A}, \hat{A}^n] = 0, n=0, 1, 2 \dots \dots \dots K, \quad [\hat{A}, \hat{B}] = -[\hat{B}, \hat{A}]$$

$$\begin{aligned}
[\hat{A}, \hat{B} + \hat{C}] &= [\hat{A}, \hat{B}] + [\hat{A}, \hat{C}], & [\hat{A} + \hat{B}, \hat{C}] &= [\hat{A}, \hat{C}] + [\hat{B}, \hat{C}] \\
[\hat{A}, \hat{B}\hat{C}] &= \hat{B}[\hat{A}, \hat{C}] + [\hat{A}, \hat{B}]\hat{C}, & [\hat{A}\hat{B}, \hat{C}] &= \hat{A}[\hat{B}, \hat{C}] + [\hat{A}, \hat{C}]\hat{B} \\
[\hat{A}, [\hat{B}, \hat{C}]] &+ [\hat{B}[\hat{C}, \hat{A}]] + [\hat{C}[\hat{A}, \hat{B}]] &= 0
\end{aligned}$$

Fixed commutation not only induces the uncertainty principle but also quantum collapse becomes unavoidable since this discipline lacks series of the intermediate states between the quantum state and a full collapsed state, all the intermediate states must collapse instantly without any inversion. Two commutators can't be measured simultaneously in quantum mechanics. However, in bio-systems, an inversion induces the stability or recovery capability of the next levels of inversion. Different structures always need to "connect with" each other by inversions to maintain recovery capability. This is indeed a "measurement", one inversion measures a lower level of inversion, no matter which degrees of inversions. Therefore, the inversion of bio-systems or even non-living surface tension regions will be similar to the commutation relationship in classical quantum mechanics. The way in which quantum mechanics takes  $[\hat{x}, \hat{p}_x] = i\hbar$  to express commutator(s) is similar to music takes a combination of notes (such as chords or movements) to express the inversion superposition between notes, just quantum mechanics "compress" the inversion process into commutator(s) and lacks methods to unfold them into inversion. 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. 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  $\sqrt[n]{2^{n-1}}$  since this step possibly connects with a complex combination of notes to compensate for its inversion. A note shifts for one step must drive all the relevant notes supply inversion tension to this note also follow the shifting. (We can understand this from the human CSF tap process; people who perform this test must keep body posture for at least two hours without moving. Because we tap the CSF from one spine, it never means the human body only loss this potion of CSF liquids. 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.) In music, the probability is almost no use, given a few notes, even if we can "calculate out" the probability of next notes or note combinations, we still can't compose sheet music with these probabilities. Sheet music

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needs a holistic structure, can't be expressed as probabilities between notes. With the progress of sheet music, increased superposition will impact the later superposition to a certain degree thus restrict superposition round number. For quantum superposition, the superposition round number is unlimited since there is no recovery requirement for its non-inversion superposition.

Albeit through the work of Max Planck, Albert Einstein, Louis de Broglie, Arthur Compton, Niels Bohr, and many others, the so-called wave-particle duality in quantum mechanics is still just a compromise which implies all particles study by the discipline exhibit a wave nature and vice versa<sup>13</sup>. However, it seems music harmonics has solved this problem well than the discipline centuries ago. As in (Fig.2j③) for sheet music superposition, the up line is a melody, and the lower line is the accompaniment. For each melody note, accompaniment composes of the combinations of notes use to release the inversion tension against the static scale. We can simply say the note shows particle characteristics and the combination which uses to release its inversion tension possesses wave characteristics. The movement possesses wave-particle duality. It is groundless to say a musical note is a wave, a particle, or a duality, only while it is integrated into a piece of sheet music, we can know it is issuing which role base on the tension release function of that section. This type of wave-particle duality seems different from what quantum mechanics storied. A lot of quantum mechanics textbooks use De Broglie matter-wave  $\lambda = h/mv$  to claim that the wavelengths of macrocosmic objects are so short, then unobservable. This is an unconvincing story. If we take the music system, a human does show wave-particle duality. CSF is the wave function of the holistic somatic body, and locally on each part of the body, we still can find diverse subordinate wave-particle dualities. By means of multi-surface tension regions, the wave-particle dualities of life have been enlarged to a scale that far beyond what a matter-wave formula can include, and the ancient China CSF-ligament Kungfu training system does sustain most of the bio-systems facts. We can say that music “unintentionally” supplies modulation tools better than all extant physical theories including conventional quantum mechanics for life modulation.

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

In quantum mechanics, the round (copy) number that a series of energy levels can be subsequently superposed is axiom into unrestricted. This is possibly why quantum mechanics claim

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that the discipline only deals with an isolated environment. As mentioned, the surface tension region and Planck region are inseparable for superposition in a non-isolated environment. Then for each round of superposition in Planck's region, it should accumulate impact from the surface tension region of that round of superposition, no matter such an impact is high or lower. Finally, for superposition in a non-isolated environment, the round (copy) number which a quantum state can be subsequently superposed will rely on gravitational binding and cannot be unrestricted. (Later we can understand, the five postulates of conventional quantum mechanics are present for probability justification, they contradict with the bio-system inversion superposition from the very beginning.)

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

Bio quantum paths (surface tension region) inversion superposition acquires memory (or negentropy) for bio reversible processes that are essential for life evolution

The literal meaning of the statement: 1) the Planck regions and relevant surface tension regions are inseparable for bio quantum path superposition. 2) inversion superposition of Planck regions needs inversion energy which originates from surface tension via gravitational binding. 3) memory is a kind of negentropy that is essential for life functioning and evolution. From the lower evolved species till advanced one, 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. (The term "negentropy" comes from Schrödinger who initiates but lacks modulation of it. Later, we can see that "memory", "negentropy", "inversion energy", "surface tension energy" and even "resonating energy" etc., follow the same modulation called "life unit". (Here, the term "memory" is a general term that includes the fundamental origin, not just the human memory format we usually see. From here, we can even say that inversion energy is the kind that possesses memory function, human memory we usually know is only the advanced format that bases on such origin.) 4) Under the same surface tension or *in vivo* environment, the structures acquired with more inversion round numbers will possess more negentropy or gravitational binding than those similar structures with less inversion round numbers, which potentially establishes Chu's constant scale:  $|\sqrt[12]{2^{n-1}}|$ . Now go to further detail:

As mentioned in the previous modification of Newtonian 2<sup>nd</sup> law, anything that can change the

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state of a bio quantum path must follow its pattern; those who fail the pattern cannot impact the things moving on a bio quantum path. The reason is due to the surface tension region(s) of bio quantum path(s) albeit we omitted that detail at that time. Now the modification of the third law comes just back to the omitted surface tension functions.

First, the bio quantum path(s) of a system is the oscillation energy that the whole system tends 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 (upstream means in the figure, we connect 2 strings get 4L wavelength or connect n strings get 2nL wavelength, etc.; downstream means hedges the string in n sections.), this is an ideal string. In the real condition, due to the impacts of the environment or the restriction of inversion protection of an ideal string, 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 evolution of inversion superposition is to acquire the recovery capability of a bio-system by inversion. (**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 fundamental superposition manner inside living beings. Life evolution takes

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geological time to involve the inversion superposition which must base on surface tension is to acquire the recovery capability that is essential to life. 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. 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. Also, due to the experiment design in (Fig.1j), we call a wave that shapes by surface tension region to a polarized wave as a bio quantum path. (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. In (Fig.1j), on each experimental rigid and symmetric wave arc, we have drawn some red segments, in an ideal condition, a series of these red segments compose of a quantum scale. This is the from-symmetric -to-asymmetric polarized process. We should note all superposition inside bio-systems come from polarized waves, there are no symmetric waves involved. And more generally speaking, any pattern that can demonstrate parameter-against-gravity-recovery shifting can be called bio quantum path, not just polarized waves. Life is composed of bio quantum paths.)

Suppose one series of bio quantum path  $|\phi_n\rangle$  superpose with another bio quantum path  $|\psi_n\rangle$ , if one tide  $\phi_k$  is damaged due to environmental impact, it is impossible for  $|\phi_n\rangle$ ,  $|\psi_n\rangle$ , or their superposed part to repair  $\phi_k$  if the superposition takes the conventional quantum mechanics manner. However, with bio quantum inversion superposition, the damaged  $\phi_k$  can get Le Châtelier compensation for correction. (A musician writes accompaniment (inversion of notes) to melody is to increase the stability or driving forces of the sheet music. Equivalently, bio-systems superpose inversion structures is to increase the gravitational binding or stability of the system.) In human beings, all the wound healings, bone fracture recoveries, and even tumor cell cleanings, etc., are physical recovery processes, and the mechanism of which is the same. (We can easily understand any part that is capable of healing takes inversion superposition; and some of the parts, such as hairs, nails, horny layers, etc., no inversion superposition. Therefore, wounds induce pain, and cutting hairs, etc., will never induce pain since they don't correlate with other inversion superposition parts.)

We refer to the modified law to Newtonian 3rd Law of Motion since the original rigid body

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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; we then state that this law is modified from Newtonian 3rd law.)

(**Fig. 2k③**) refers to non-living being surface tension inversion superposition, from it with the increase of gravitational binding; we can get the fundamental life unit as in (**Fig. 2l①**). This unit 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 unit. Inside the unit, we use a musical scale to represent the highest superposed bio quantum path (not necessarily the DNA or RNA) since only music can modulate inversion superposition; on the surface tension region or the outside layer, we draw some of the inversion units (on the surface tension, there are horizontal and vertical oscillations. For an actual life unit, all the horizontal and vertical oscillations are complicated superposed; however, can be simplified into only with vertical oscillation. This inversion (energy) unit is evolved from diverse "reflective zones" in (**Fig. 2k③**)). If this whole unit is a rigid body, following the Newtonian 3<sup>rd</sup> Law the net forces acting on it will exist in equal magnitude and opposite direction. Now it becomes a life unit, then all the inversion superposition must resonate between the center core bio quantum paths and the outside surface tension layer inversion units, or they tend to the same oscillation "scale" or the inversion energy of the two parts tend to conservative the negentropy. (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 here.).

The simplest sheet music is at least composed of a melody and an accompaniment, all with the same scale. We can simply put the melody into the core part and the accompaniment into the surface tension region inversion part of (**Fig. 2l①**) albeit both musicians and scientists never realize that life is so naive in a pattern. Resonation just means nothing more than the inner bio quantum path and the surface tension inversion takes the same quantum superposition scale. No matter how simple or how complex a bio-system is. All biological functions, such as digestion of food, sleep, metabolisms, RNA splicing, etc., are following this inversion resonation model. (**Fig.2g**), a soap bubble, and (**Fig.2h**), photoelectric effect, only possess surface tension inversion; therefore, just non-living

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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 be a life; real-life must function via the resonance between these two parts. Evolution takes geological time only to establish the inversion relationship between these two parts, this is what the Basic Law of Evolution physically means. 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 region inversion in **(Fig. 21①)** (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 conditions that satisfy the Basic Law of Evolution or in **(Fig. 21①)**, we can resurrect Maxwell's demon by adding the (superposed) core bio quantum path. (However, we should realize that once Maxwell's demon is resurrected, Laplace's demon will die unless people can create a world that surface tension "reflected" superposition or similar modulation never existed. 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, then bio-system gravitational binding increases for Newtonian G to  $10^9$  levels due to the added core bio quantum path. (Einstein's field equation still equivalently only has an outside "shell" and lacks the core bio quantum path. Following our mutation of Cavendish experiment, the difference between the dead and alive of a bio-system is  $10^9$  G, that is then due to the integration of the "core". We can even say, this  $10^9$  is the "weight" of memory or negentropy. Once death, this  $10^9$  will disappear.)

The Second Law of Thermodynamics says:  $\Delta S \geq 0$ , if all processes in an isolated system are reversible, the entropy is constant, otherwise, entropy generation. However, it doesn't realize the function of surface tension gravitational binding. Also, Schrödinger had utilized his famous "cat" to question the Copenhagen story and published the term "negentropy" in his book. The Schrödinger cat plus negentropy made him as close to life as just one surface tension's thickness. However, both Clausius and Schrödinger never realized that music harmonics as a discipline centuries ago has solved the concept of the reversible process quite well. We use the simplest octave scale and triad to

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demonstrate what is a (bio) reversible process in music; a major scale can be written as  $\{^{12}\sqrt{2^{n-1}}\}$  or unfold as  $C^{12}\sqrt{2^0}$ ,  $D^{12}\sqrt{2^2}$ ,  $E^{12}\sqrt{2^4}$ ,  $F^{12}\sqrt{2^5}$ ,  $G^{12}\sqrt{2^7}$ ,  $A^{12}\sqrt{2^9}$ ,  $B^{12}\sqrt{2^{11}}$ ; a triad just three major notes  $C^{12}\sqrt{2^0}$ ,  $E^{12}\sqrt{2^4}$ ,  $G^{12}\sqrt{2^7}$  pick up from the scale with diverse inversions. One melody movement, accompanied by the inversion combination(s) of triads, then becomes a reversible process. No matter naive music composed by a kindergarten student, or the sophisticated music composed by Beethoven, all follow the same mechanism. If we tell Carnot or Clausius, any process with the above mechanism is a reversible process, just forget about  $\Delta S \geq 0$ . They will possibly don't believe in it. If we tell Schrödinger this is negentropy which is acquired by adding a surface tension region to his cat, also his ground state can be reduced by a simple inversion superposition, he will probably also accept. However, this is what really happened in bio evolution. Thermodynamic  $\Delta S = 0$  reversible cycles are defined as a T-symmetry or time-reversal symmetry at least under acceptable accuracy. (Pure T-symmetry is only theoretically presented so here add a condition of "acceptable accuracy" to reduce the isolated logic prerequisite requirements.) All those that do not satisfy this standard are regarded as "entropy generation" processes and imply as "not conducive" to their ideal purpose such as the "mechanical equivalent of heat". However, a piece of sheet music never needs so-called T-symmetry to become "conductive"; a piece of T-symmetry manner music is not qualified as music. Equivalently, bio-systems never need such a T-symmetry process judgment for a "conductive" way of life. Bio-systems only need to adapt to the environment and deliver the next generations with their "memory" for continued evolution. Adaptation means while environmental parameters change, bio-systems can get higher recovery efficiency with different available resources. Therefore, the recovery capability becomes the only evolutionary "conductive" standard. For this standard, music harmonics supply great tools albeit musicians never realized the melody/accompaniment relationships they used for centuries hidden the maximized recovery rate for a cyclical process, and also don't realize that such a relationship needs surface tension region(s) as a media to unfold for bio-systems. Therefore, we illustrate the basic law with (**Fig. 2I**①). From the "bio reversible process" modulation, it also easily understands why bio-systems need to sleep. CSF is the largest gravitational binding or surface tension structure that inversely connects to the different parts of the body, following a certain reversible process pattern to adjust the body. After the adjustment, CSF itself needs to self-adjust to a close to the previous reversible state for many rounds, CSF self-adjust needs to minimize the activities of the whole body, which is sleep.

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Nowadays, almost all prevailing hypotheses of the origin of life like to find clues for the beginning of biomaterials such as RNA, DNA, proteins, etc. We must realize that the establishment of the resonance structure in (Fig. 2I①) should be much earlier than the existence of these nowadays known biomaterials. All known or unknown biomaterials are the inevitable evolution products from this resonance structure; never reversely happened, such as certain biomaterials or genetic code can bear such a resonance structure. The story of the RNA world without surface tension inversion resonance still 100% belongs to non-living beings, so do the DNA segments produced from the RNA world. It is definitely gravitational binding that governs biomaterial functions, not reversely happened. And we also realize that all the inversion rules that govern bio-systems are more general than the isolated logic methods that originated from Newtonian times.

## **6. The inversion (Le Châtelier effect) between inseparable Planck regions and surface tension regions in superposition process(es) originates memory that is essential to life functioning**

As mentioned, the rigid bodies or equivalent in Newtonian Third Law satisfies conservation of momentum and energy, while a rigid body evolved into the life resonance structure, the momentum and the energy formats we usually see will no longer conserve. The only relative conservative energy type that can function in bio-systems is *in vivo* inversion (or structural) energy, difficult to transfer to any other types of *in vitro* energies without surface tension region. Life is a multi-surface tension structure (roughly one inversion one surface tension region). For inversion energy or structural energy, we have referred to it to some degree before. As discussed in conventional quantum mechanics, if an electron shifting between energy levels, it will emit energy. This type of energy is not inversion energy since it can transfer to diverse types but challenge to maintain structures. However, in bio-systems, if spinal inversion energy shifts from one vertebra to another vertebra, it can only accompany by inversion processes of relevant body structures since this vertebra shift includes the inversion energy of relevant body structures. (Inversion energy is inseparable from surface tension. Under *in vitro* conditions, due to inversion energy is so less in quantity, it is not structural energy. However, under *in vivo* conditions, due to almost all *in vivo* energy is inversion energy, then “inversion energy” becomes equivalent to “structural energy” which connects to a certain surface tension region.)

Conventionally, the manner that people apply the law of conservation of energy is actually by

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means of “neglected” the inversion energy. In quantum mechanics, energy is expressed using the Hamiltonian operator. On a time scale, the uncertainty in the energy satisfies:

$$\Delta E \Delta t \geq \frac{\hbar}{2} \quad (3)$$

Eq.3 is similar in form to the Heisenberg Uncertainty Principle (but not really mathematically equivalent thereto, since H and t are not dynamically conjugate variables). Here the uncertainty item  $\Delta E \Delta t$  could be regarded as a part of inversion energy. It is only a very small portion of total energy. The conventional quantum mechanics usually call its energy as “quantum (energy) level” that follows  $|E_n\rangle = nh\nu$ , in bio-systems we call the energy that satisfies  $|E_n\rangle = f_0 \times \sqrt[12]{2^{n-1}}$  as a “quantum scale”, which can modulate more inversion energy by the combination of the scale oscillations. (The difference between  $nh\nu$  and  $\sqrt[12]{2^{n-1}}$  is the weight of surface tension region;  $\sqrt[12]{2^{n-1}}$  can module ideal multi-surface tension region superposition by the combinations of diverse  $\sqrt[12]{2^{n-1}}$ , such inversion superposition of  $|\sqrt[12]{2^{n-1}}\rangle$  against a system get the model in **(Fig. 21①)**.  $|E_n\rangle = nh\nu$  only based on 5 postulates of conventional quantum mechanics to justify the probability, quite challenging to modulate shifting of Planck regions driven by surface tension regions. In physics, a quantum (plural quanta) is the minimum amount of any physical entity (physical property) involved in an interaction. (The fundamental notion that a physical property can be "quantized" is referred to as "the hypothesis of quantization".) From  $nh\nu$  to  $\sqrt[12]{2^{n-1}}$ , the “minimum physical property” notion changes fundamentally; it becomes the inversion energy. Scale is not “minimum physical property”, it is the inversion optimization of all “parameter-against-gravity-recovery” in a system to establish reversible processes. The interaction like musical melody VS, the ideal efficiency can be expressed in the resonance of **(Fig.21①)**. Under this ideal condition, the surface tension inversion units and core bio quantum path(s) use the same quantum scale to compose reversible processes we mentioned before. Under such environmental conditions, we believe that the inversion energy needs to transfer between the surface tension region and core bio quantum path(s) structure is zero since they compose reversible processes, or the unbalanced energy can be directly compensated from the environment.

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

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matter, it will cost energy to transfers 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 special distancing structures will no energy cost base on the system aether. For a life unit in **(Fig.2l①)**, 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  $1\text{unit}+1\text{unit}\leq 2$  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, we should realize its energy reverse tendency. (The memory of a bio-system, once established from limited biomaterials, will impact the almost unlimited biomaterials in a system; if the life unit becomes a human, he possibly can impact groups of individuals, all these are quite challenging to modulate from the conventional conservation law.)

The difference between common energy and inversion energy in bio-systems is this energy format possesses memory characteristics. **(Fig.2l②)** demonstrates a general human memory model, no matter how complex the memory processes, it still comes from the basic life unit in **(Fig.2l①)** or its original version **(Fig. 2k③)**. In conventional quantum mechanics, time evolution is unitary as disciplinary postulated. However, memory is non-unitary. 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 functions, here we don't differ them and all call memory. (This is a very general term across the biological kingdom that includes the origin, not the memory we usually see.) Now that it is gravitational waves that share one reflective zone and then superposition, the time is no longer unitary evolution. (In bio-systems, all superposition will induce non-unitary or inversion time. Conventional quantum mechanics takes unitary time evolution is only an approximation came from this discipline has already given up the impact of surface tension regions in quantum superposition. It is due to this reason; time in bio-systems is inversion time which concerns the *in*

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*vivo* gravitational structures.)

(**Fig.21①**) is the equivalent of (**Fig. 2k③**), only different in superposition complexity. All life structures and even biomaterials, such a DNA segment, all follow (**Fig.21①**) as the fundamental memory model. While evolution hits human beings, the memory model is still the same: non-unitary surface tension-driven inversion superposition to share the same reflective or inversion region. 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 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 also possibly composes of a lot of sub-inversions. No matter how complex or how simple of a memory process, all fit into the inversion superposition of a simple life unit. (In advanced animal species, there are complex central nervous systems; however, they only transfer surface tension energy and increase the stability of the model in (**Fig.21**), we still can use the same modulation and neglect their complexity if we don't directly study the nerves.)

In conventional thermodynamics, the second law believes in the entropy generation by supposing an isolated system model. However, the memory model in (**Fig.21①,②**) can be regarded as a reverse process of entropy generation. As mentioned, two or more bio quantum paths share the same reflective or inversion region on the surface tension region then composed of the memory. If we regard the two or more bio quantum paths' superposition as entropy generation processes, the reflective or inversion units used for these processes can get memory to reduce the entropy generation processes of later stage superposition, such an impact follows Le Châtelier for within-surface-tension parameters, it can become an entropy decrement process compensated by concerning surface tension region under the environmental negentropy for certain conditions. Life functions, no matter how complex or how simple, all need such kinds of memories for maintaining activities. (E.g. among the biomaterials for a certain process, such as a piece of DNA segments, RNA, cells, etc., all have activity differences, an active segment or an active cell are those that possess

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more memory or inversion energy for this process. And these memory-based activities can pass generations and be fixed in evolution.) We can even say that evolution is the accumulation of memory or increase in inversion energy levels for a certain species. (The problem of conventional thermodynamics has still lacked the memory model. No matter full isolated system, as in (Fig.2k③) which gravitational binding is 100% reflected back, or in (Fig.2l①) which is partially reflected back and partially inversion to outside, once the reflected back gravitational waves can superpose again, it will definitely induce entropy to reduce albeit such decrement only happens in part of the system instead of the whole system.)

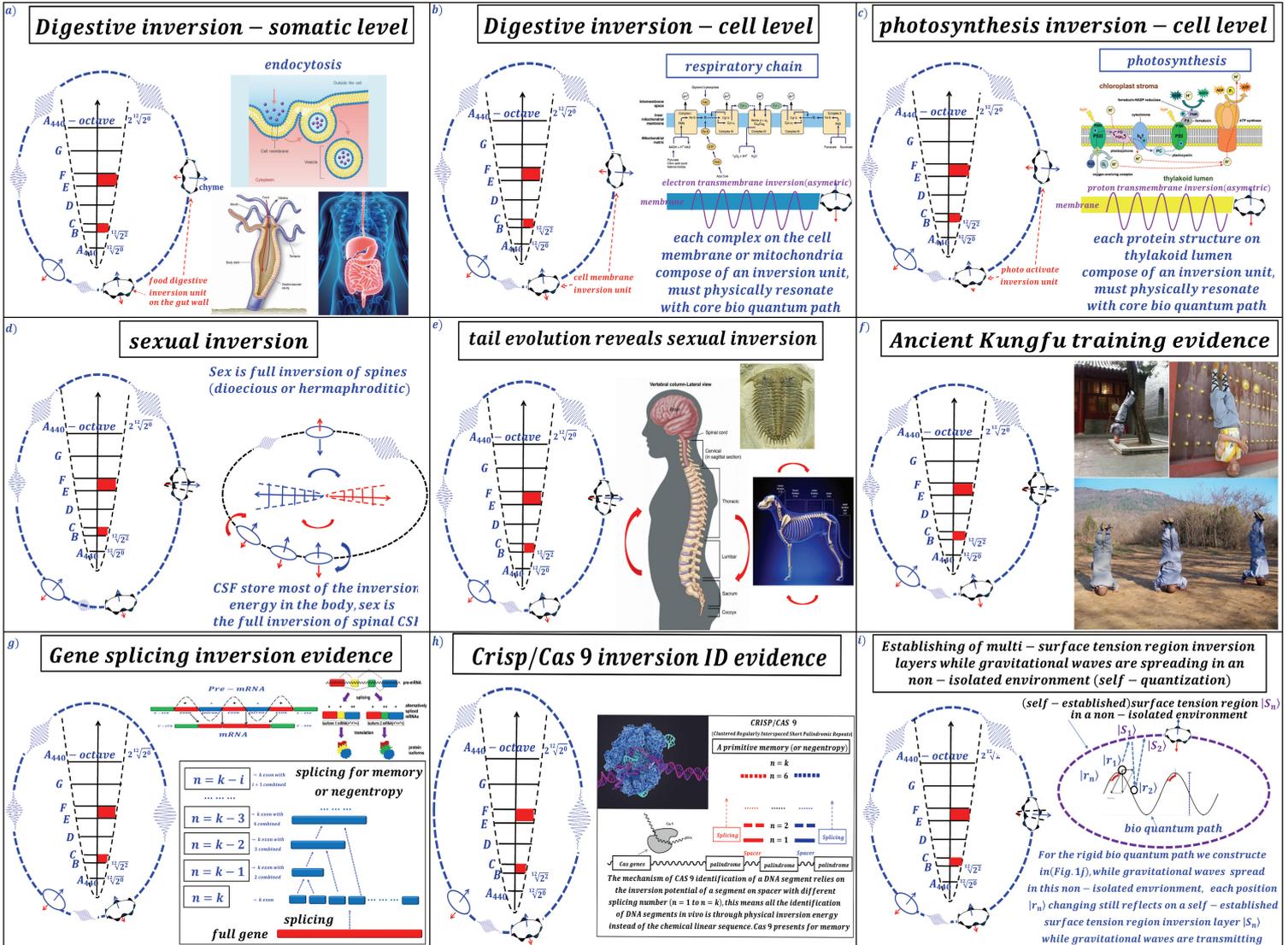
## 7. Inversion time and bio-system reversible processes

The third law of thermodynamics bases on entropy generation belief of the second law to the absolute zero suggested the concept of the arrow of time. The unitary time evolution in quantum mechanics also stealthily relies on the “arrow of time”. However, from (Fig.2l, 3a) about the modulation of memory, a memory process follows non-unitary time based on the issuing surface tension or *in vivo* environment, and the level of non-unitary capability corresponds to evolution levels. E.g. a human knows much more than a lower evolved animal can be regarded as the surface tension of the human cerebral cortex can inversion much wide time range than the cerebral cortex of an animal, or it contains more inversion time. The time in bio-systems is never showing a single direction “arrow” as claimed even if the inversion of time in bio-systems is not always symmetric. A surface tension region can make time into non-unitary while it reflects (or inverts) gravitational waves from the very beginning. The time of a wave and its surface tension reflecting counterpart, or two reflected gravitational waves can't be unitary. Such non-unitary property is where negentropy originated from. (We can say that the limitation of the entropy generation law in thermodynamics is it fully relies on the unitary time; it implies under any circumstance, there is no need for a non-unitary time. However, under an *in vivo* environment, once the surface tension gravitational binding difference between two locations reaches a certain level, the time for them must be non-unitary. Non-unitary time or memory can easily reveal the flaw of the second law.)

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, from the process, only the lower entropy part of the same ingredient can be absorbed into the gut. (The reason why there are many

valves on the intestine and the folding structure of which is also due to non-unitary time.)

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



a) digestive 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 gene splicing inversion for negentropy model h) CRISP/CAS 9 inversion model for gene identification and genomic immunity i) a model for the tendency of self-establish of surface tension region in a non-isolated environment while gravitational waves are transmission

(Fig.3a) demonstrates the food digestive inversion which takes the same modulation of (Fig.2I ①) 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

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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, from the trans-somatic body digestive canals from hydra till humans, all foods 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 compose of the outside surface tension inversion layer oscillation, and spinal cord CSF oscillation composes of core bio quantum path inversion. The oscillation of these two parts following the basic law of evolution composes 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. Only after this process, the amino acid can then be absorbed by Le Châtelier's effect. 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 model. From here we can understand that digestion is still driving by memory, or it takes the same physical model.

(**Fig.3b**) shows the digestive inversion at the cell. A series of respiratory chain complexes on the cell membrane or mitochondrial cristae compose 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.

(**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 life unit resonance.

Memory can let organisms acquire negentropy for life function; however, it can't make life generation becomes eternal. As in the memory model, a series of bio quantum paths superposition

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$|\psi_n\rangle$  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 impact 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 represents the level of negentropy, bio-systems can then use this way via surface tension region to acquire negentropy. With more and more memory events happen on the surface tension, memory function will gradually dampen; therefore, the lifespan for generation is limited.

However, limited in 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  $|\sqrt[12]{2^{n-1}}\rangle \uparrow$  superposed with its full inversion  $|\sqrt[12]{2^{n-1}}\rangle \downarrow$  will get a lower than parent entropy ground state via surface tension. If this lower entropy ground state finally gets developed, the result will be a full lower entropy scale. 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 by means of 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 distance.)

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

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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 insemination. Following the life unit in (**Fig. 21** ①), the inversion on the sperm surface and the oval surface physically oscillate 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 only uses 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,

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with 590 years of history, have systematic physical training methods incorporated albeit ancient 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; however, 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, can significantly solve the modern problems of hypertension and cerebral hemorrhage at an old age. If this training only hopes to reduce hypertension at old age and not for training Kungfu or to increase sexual capability, then no need to consider sex forbidden.

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,→)<sup>1</sup>). Besides those, **(Suppl.Movie 11)** shows preparation training 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. Like all ancient training that refers to CSF, if not control sexual behavior, will decrease lifespan instead of benefits health. All these have offered evidence for the basic law.

Besides ancient systems, modern biological sciences still offer evidence for the basic law. As in

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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 species<sup>15</sup> and a large gene will then cover a lot of palindromes in scale. Alternative splicing<sup>16</sup> is claimed to result in large numbers of protein isomers and for humans, 95% of multi-exonic genes are alternatively spliced<sup>17</sup>. It is usually claimed that the purpose of alternative splicing is to “increase isomer number for adaptation” and *Drosophila Dscam* which potentially produces 38,000 isomers<sup>18</sup>, possibly with the highest hypothesis isomer number in literature. However, we believe that the purpose of splicing is for the negentropy or memory of the segments; 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 memory 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”, we suppose that *in vivo* surface tension can give K number of exons. For these k number of exons, they potentially have a different kinds of combinations, such as k-1, k-2, ..... K-i as in the figure. However, any combination must be acquired by inversion superposition that is driving by that on-site *in vivo* surface tension. DNA is inside a nuclear membrane which memory regulates DNA mobility. RNA splicing goes out of the nuclear membrane thus the memory comes out from the relevant cell membrane or endoplasmic reticulum inversion. Follow the basic law, the more inversion number of the acquired exon combinations, the more negentropy of the protein isomers. Among so many splicing and reconstruction exons, only those finally get enough surface tension or memory can be activated and go to the next step base on the on-site “memory”, or we can say that the successful candidate acquires negentropy by sacrifice a large number of other combinations under the same surface tension (inversion units). Such a "sacrifice" process is the same mechanism as digestion or sexual ejaculation we mentioned before. For this model, a lot of indirect evidence is available. Recursive splicing<sup>19,20</sup> 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 widely<sup>21</sup>. More recent studies of entire eukaryotic genomes have now shown that the lengths and density (introns/gene) of introns varies considerably between related species<sup>22</sup>. Intron loss is demonstrated to correlate with gene expression<sup>23,34</sup>, etc. (Recursive splicing also offers us

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modulation for long-term sleep. As mentioned, ground state generation by inversion superposition is where negentropy from. The largest gravitational binding structure is spinal CSF. The ground state negentropy from its full inversion come out of the body means sexual behavior. If this negentropy stays in the body will induce the relevant body structures to reduce their ground state. This means in a certain period, no matter sex behavior happens or not, the CSF will finish a full inversion to produce negentropy to resistant the entropy generation of bioactivities. Following the basic law, the inversion of the CSF will fully compensate by the surface tension inversion units (mainly food digestion) as in life unit; however, such an ideal condition can't always happen due to memory. E.g., for the first day, the food digestion process  $|\phi_1\rangle$  leaves a memory  $|k_1\rangle$  on the surface tension region; and the second-day food digestion process  $|\phi_2\rangle$  leaves a memory  $|k_2\rangle$  on the surface tension region, and so on; due to the memory of certain digestion will unavoidably impact on the later digestion, food can't 100% compensate for the CSF inversion requirements. The process of CSF takes inversion to compensate for such insufficient inversion energy is sleep. It reduces the surface tension region inversion to a minimum; let the spinal CSF inversion self-adjust the insufficient. Due to the full inversion need of many days, besides daily sleep, there should be some long-term sleep integrated like the RNA recursive splicing model. With senescence, sleep will gradually decay, which means such kind of fully inversion self-adjust capability of CSF is gradually lost. Reduce surface tension region inversion and let the core bio quantum path self-adjust does not restrict to sleep, could happen in any level of processes, such as DNA, cell self-repair, etc.)

In prokaryotes, there is no intron/exon. However, CRISP/Cas9 still takes the same 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 array<sup>25</sup>. 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  $K$ . Suppose the blue segment is a self-segment, its functional translation will leave a memory on the surface tension region. While the red segment into the spacer, the memory of the blue segment will splice it into the same splicing number ( $n=k$ ) with the blue segment, if these spin off  $k$  segments leave the same “memory” on that surface tension region, then the red

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segment will belong to self; otherwise, will be identified as the invading segments and destroy. From here we could know, no matter splicing in eukaryotes or the Crisp/Cas 9 identification in prokaryotes, all follow the surface tension “memory” (this primitive "memory" means the splicing and reconstruction number for on-site condition.) on that surface tension region, never follows the linear nucleotide sequence as we do in the lab. (Use the surface tension “memory” to identify a DNA segment can maximize the tolerance of linear nucleotide shifting. If the system uses 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.) From there it is easily understood that genes plus physical surface tension region “memory” have already composed a perfect evolution system that includes conventional genetic code and variation concepts. The method of modern biology takes linear nucleotide sequence and tries to inclusively decode genetic copy and variation without surface tension is incomplete. For immunological sciences, immune response patterns always need certain surface tensions. The memory B cell is not the original memory concept, however, still needs the original surface tension memory as the basis, so does the advanced human memory we usually see. The concept of innate immunity which still lacks a model in the discipline could be regarded as the surface tension or gravitational binding stored in CSF that nowadays only can be tested by our *FHDs*. We have to say that modern biological sciences should integrate surface tension or memory into their disciplines, equivalently does modern physics.

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. As mentioned, Einstein’s gravitational waves travel at the speed of light; however, Einstein only estimated the range, also his field equation needs to assume a vacuum environment. Possibly in (**Fig.3i**) with our rigid bio quantum path under a non-isolated environment, there exist 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; so 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

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path can reflect on the hypothesized surface tension region we drawn to leave “memory” as  $|s_1\rangle$ ,  $|s_2\rangle$ , ...,  $|s_k\rangle$ , then the system can bind gravity. Due to all surface tension region possesses 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. This is totally contrary to people’s impression about gravitational waves that rarely impact by anything it passes by. However, such a seemly strange surface tension region agrees quite well with life evolution. We can’t find any exception in the whole biological kingdom, in our non-living being experiments, as well as board observations. We have to accept this way. 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 through a certain surface tension region.

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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**

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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.8931zcr9>

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 column

### **Data Availability Statements**

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

### **References**

1. Lai, Y. Y. Bio-inertia resonates life into evolution. *IJSR*, **8**, 1680-1718 (2019).

(\*\*\* for the reference format (p1681,→)<sup>1</sup>, 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, some experimental methods and understanding are incomplete. Therefore, for any points of view discrepancy, please refer to the updated new paper and forget the old paper use only for the historical record.)

2. Ciufolini, I., Wheeler, J. A., Gravitation and Inertia. *Princeton, New Jersey: Princeton University Press*, pp117–119(1995)

- 
3. [In Latin] Isaac Newton's *Philosophiae Naturalis Principia Mathematica*: the Third edition (1726) with variant readings, assembled and ed. by Alexandre Koyré and I Bernard Cohen with the assistance of Anne Whitman (Cambridge, MA, 1972, Harvard UP)
  4. Eötvös, L. Mathematische and naturwissenschaftliche Berichte aus Ungarn 1889; 8 65; *Annalen der Physik* (Leipzig) 68 11 (1922). *Physical Review D*. **61**(2): 022001(1999).
  5. Fray, S., Diez, C. A., Hänsch, T. W. & Weitz, M. Atomic interferometer with amplitude gratings of light and its applications to atom based tests of the equivalence principle. *Phys. Rev. Lett.* **93**, 240404 (2004).
  6. Zhou, L. et al. Test of Equivalence Principle at  $10^{-8}$  Level by a Dual-Species Double-Diffraction Raman Atom Interferometer. *Phys. Rev. Lett.* **115**, 013004(2015).
  7. Rosi, G. et al. Quantum test of the equivalence principle for atoms in coherent superposition of internal energy states. *Nat Commun* **8**, 15529 (2017).
  8. Zurek, W. H. "Quantum Darwinism". *Nature Physics*. **5** (3), 181–188(2009).
  9. Schlosshauer, M. Decoherence, the measurement problem, and interpretations of quantum mechanics. *Rev. Mod. Phys.* **76** (4), 1267–1305(2005).
  10. Einstein, A., Podolsky, B. and Rosen, N. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete? *Physical Review*. **47**, 777-780 (1935).
  11. Dirac, Paul A.M. (1982) [1958]. *Principles of Quantum Mechanics*. International Series of Monographs on Physics (4th ed.). Oxford University Press. p. 255. ISBN 978-0-19-852011-5.
  12. King, N., Hittinger, C.T., Carroll, S.B. Evolution of key cell signaling and adhesion protein families predates animal origins. *Science*. **301**, 361–3(2003).
  13. Greiner, W. (2001). *Quantum Mechanics: An Introduction*. Springer. ISBN 978-3-540-67458-0.
  14. Barrett, J. E., Diane C. W., Avelina Q. P., Gary W. C. Embryonic quail eye development in microgravity. *J Appl Physiol* **88**, 1614–1622(2000)

- 
15. Francis, W.R., Wörheide, G. Similar ratios of introns to intergenic sequence across animal genomes. *Genome Biol. Evol.* **9**(6),1582–1598(2017).
  16. Black, D. L. Mechanisms of alternative pre-messenger RNA splicing. *Annual Review of Biochemistry.* **72** (1), 291–336(2003).
  17. Pan, Q., Shai, O., Lee, L.J., Frey, B.J., Blencowe, B.J. Deep surveying of alternative splicing complexity in the human transcriptome by high-throughput sequencing. *Nature Genetics.* **40**, 1413–1415 (2008).
  18. Schmucker, D. et al. Drosophila Dscam is an axon guidance receptor exhibiting extraordinary molecular diversity. *Cell* **101**, 671–684(2000).
  19. Sibley, C. R. et al. Recursive splicing in long vertebrate genes. *Nature* **521** (7552), 371–375(2015).
  20. Gazzoli, I. et al. Non-sequential and multi-step splicing of the dystrophin transcript. *RNA Biology*, **13**, 290–305(2016).
  21. Rodríguez-Trelles, F., Tarrío, R., Ayala, F.J. Origins and evolution of spliceosomal introns. *Annu. Rev. Genet.* **40**, 47–76(2006).
  22. Mourier, T., Jeffares, D.C. Eukaryotic intron loss. *Science* **300**,1393–1393(2003).
  23. Jeffares, D.C., Penkett, C.J., Bähler, J. Rapidly regulated genes are intron poor. *Trends in Genetics.* **24**, 375–8(2008).
  24. Castillo-Davis, C.I., Mekhedov, S.L., Hartl, D.L., Koonin, E.V., Kondrashov, F.A. Selection for short introns in highly expressed genes. *Nature Genetics.* **31**, 415–8 (2002).
  25. Barrangou, R., Marraffini, L.A. CRISPR-Cas systems: Prokaryotes upgrade to adaptive immunity. *Molecular Cell.* **54** (2), 234–44(2014).

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