Study of Relativistic Gravity-Clock in Egg-Sperm Combination Process

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Abstract: In the present paper, de Broglie matter wave has been generalized in terms of the ultimate acceleration on a cell-scale. A sperm fuses with an egg to begin the process of fertilization. In a fertilized egg, it is subject to the interference of the gravity-associated relativistic matter waves between egg and sperm in the cell, which would produce a beat phenomenon. The beating pulse as a gravity-clock will evolve into the embryo's heart beat, from then on for the whole life, no matter how many times the fertilized cell reproduces itself, the body is driven by the gravity-clock. The fertilized cell will develop 5 prominent proteins on its surface, finally the human body will evolve into 5 prominent branches: one head, two arms and two legs. The mean human lifespan is determined as 84 years; the total number of heart beats for a lifespan is determined as 3.08e+9 pulses, it holds for human being, mammals, birds and fishes. These predictions agree well with the experimental observations. Filter mechanism in kidney, liver and brain are investigated. It is found that the entanglement of the gravity-associated relativistic matter waves actually establishes a filter mechanism for the organs.

1. Introduction

The concept of generalized relativistic matter wave and its applications were proposed and investigated in the author's early paper [1], the present paper continues to discuss the generalized relativistic matter wave and its extensions to the biophysics and life science [2,3,4].

In recent years, de Broglie matter wave [5,6,7] has been generalized in terms of the ultimate acceleration in a many-particle system. Consider a particle in a biological cell, its generalized relativistic matter wave is given by the path integral

$$\psi = \exp(\frac{i\beta}{c^3}\int_0^x (u_1 dx_1 + u_2 dx_2 + u_3 dx_3 + u_4 dx_4)) \quad . \tag{1}$$

where u is the 4-velocity of the particle, β is the ultimate acceleration determined by experiments. The β has replaced the *Planck constant* in this quantum gravity theory so that *its wavelength becomes a length on a macro-scale*.

The present paper shows that this generalized matter wave theory with the ultimate acceleration provides a mechanism to explain how egg-sperm to combine and how to grow up.

2. Human lifespan and gravity-clock

In the Earth system, the ultimate acceleration is determined to be β=1.377075e+14(m/s^2) by the generalized relativistic matter wave [1][2].

Human body consists of five parts: one head and four limbs, a heart pumps the blood to the whole body circularly. Consider a person sleeping in a bed with the head pointing to the North Pole, as shown in Figure 1(a), the five red lines from the heart represent its five artery tubes.

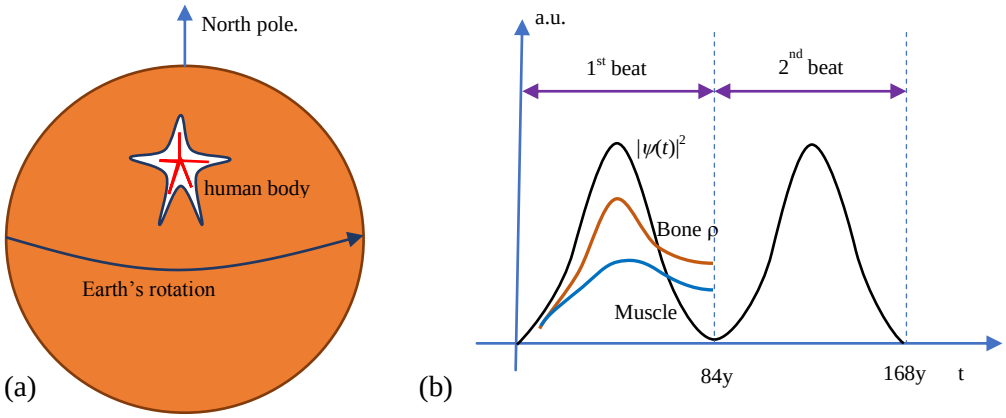

Figure 1 (a)A human sketch with the head pointing to the North Pole. (b) the biological gravity-clock.

Apparently, the arterial blood flows into the two arms with a speed, whose blood gravity-associated matter wave would interfere with the Earth-shell's gravity-associated matter wave, they are

$$\psi_{blood}=\exp[\frac{i\beta}{c^3}\int_0^x(v_{blood})dl+\frac{i\beta}{c^3}\int_0^t(\frac{-c^2}{\sqrt{1-{v_{blood}}^2/c^2}})dt]$$
$$\psi_{shell}=\exp[\frac{i\beta}{c^3}\int_0^x(v_{shell})dl+\frac{i\beta}{c^3}\int_0^t(\frac{-c^2}{\sqrt{1-{v_{shell}}^2/c^2}})dt];\quad v_{shell}=\omega r \qquad (2)$$

The interference will produce a beat phenomenon

$$|\psi|^2=|\psi_{blood}+C\psi_{shell}|^2=1+C^2+2C\cos[\frac{2\pi}{\lambda_{beat}}\int_L dl-\frac{2\pi}{T_{beat}}t]$$
$$\frac{2\pi}{T_{beat}}\simeq\frac{\beta}{c^3}(\frac{{v_{blood}}^2}{2}-\frac{{v_{shell}}^2}{2});\quad \frac{2\pi}{\lambda_{beat}}=\frac{\beta}{c^3}(v_{blood}-v_{shell}); \qquad (3)$$

where C represents the coupling coefficient, ω is the Earth's angular speed, r the Earth's radius. The shell's ψ_{shell} is with spherical symmetry because the Earth's density $\rho(r)$ is approximately spherical symmetry, so that this calculation carries out on the Earth's equator. The blood flow velocity varies with the location of blood vessels. Suppose the mean blood speed in human arms is 1m/s near the heart, in the frame of Earth-orbital reference, the flowing blood suffers a beat with the period as the follows

$$v_{shell} = r\omega = 463.8m/s; \quad v_{blood} = v_{shell} \pm 1m/s$$
$$T_{beat} \simeq \frac{4\pi c^3}{\beta\left(v_{blood}{}^2 - v_{shell}{}^2\right)} = \pm 84\,(years); \quad \lambda_{beat} = 1.2e+12(m) \quad . \tag{4}$$

```
<Clet2020 Script>// C source code [8]
double beta,H,M,r,rc, rs, rot,v1,v2, Year,T,Lamda,V,a,b,x,y,w;
int main(){beta=1.377075e+14; H=SPEEDC*SPEEDC*SPEEDC/beta;
M=5.97237e24; rs=6.378e6; rot=2*PI/(24*3600); Year=24*3600*365.2422;
v1=rot*rs;v2=v1+1; a=v2*v2-v1*v1; T=4*PI*H/a;
T/=Year; Lamda=2*PI*H/(v2-v1); b=Lamda/(2*PI*rs);
TextAt(100,20,"v1=%f, v2=%f, T=%f, L=%e, b=%e",v1,v2,T,Lamda,b);
T=2*PI*H/v1;T/=0.86;TextAt(100,50,"T=%e",T);
}#v07=?>A
```

In fact, the blood is pumped from the heart into both the eastern arm and western arm in Figure 1(a), producing a positive beat and a negative beat in the two arms with the same period 84 years, the two beats form an overall beat through the two arms. It is found that the mean human lifespan is just confined within the single period duration, this beat period is recognized as the human biological **gravity-clock**. The beat wavelength λ is 30000 times the circumference of the Earth, so its λ effects are hardly observed.

According to the explanation to ψ in the quantum gravity theory, the beat $|\psi|^2$ is proportional to the matter density, i.e.

$$|\psi|^2 \propto \rho \quad . \tag{5}$$

The $|\psi|^2$ oscillation of the beat in Figure 1(b) represents the variation of a human body density in his whole life confined within one beat period. The human bone density (red line) and muscle (blue line) in a human life vary as function of age, also responding to the $|\psi|^2$ oscillation, as shown in Figure 1(b). After astronauts entered the space station, the coupling between the astronauts and the Earth's rotation decreased, and there was a significant decrease in bone density, indicating that the bone density of normal people on the Earth's surface is strongly related to $|\psi|^2$.

This formula can also be applied to estimate animal lifespan. Wikipedia lists some long-lived creatures in the entry of "List of longest-living organisms" [17], for example, Harriet, a Galápagos tortoise, died at the age of 175 years in June 2006. Lin Wang, an Asian elephant, was the oldest elephant in the Taipei Zoo, he died on February 26, 2003 at 86 years. The oldest goat was McGinty who lived to the age of 22 years and 5 months until her death in November 2003 on Hayling Island, UK. The Greenland shark had been estimated to live to about 200 years. A goldfish named Tish lived for 43 years after being won at a fairground in 1956. Geoduck, a species of saltwater clam native to the Puget Sound, have been known to live more than 160 years. The longevity formula in this paper can cover these longevity animal examples.

3. Model of relativistic gravity-clock in a fertilized cell

If the total mass M of a many-particle system decreases, it was found that $\beta=\beta_0/M$, the system's constant β increases as M decreases [13], so that the gravity-associated matter waves have a wavelength on a cellular scale. For instance, if the system's constant β increases to 1.377075e+30(m/s^2), particle at the speed of 100(m/s) has the wavelength of 1(μm).

Consider a hydrogen atom in a sperm cell, in which the electron moves in a circular orbit with speed v around the much more massive nucleus, here using the Bohr model. Besides the de Broglie matter wave that governs the quantized orbits, the electron also is governed by another gravity-associated relativistic matter wave on a cell-scale that is

$$\psi(x) == \exp[\frac{i\beta}{c^3}\int_0^x (v)dl + \frac{i\beta}{c^3}\int_0^x (g_{cell})dl + \frac{i\beta}{c^3}\int_0^t (\frac{-c^2}{\sqrt{1-(v+g_{cell})^2/c^2}})dt] \quad . \qquad (6)$$

where g_{cell} represents the overall interaction to which the electron is subject from numerous nuclei and electrons in the cell. To note that the cell-scale relativistic matter wave has a micro wavelength in the many-particle system. As illustrated in Figure 2, the longer wavelength makes all oscillators to move almost in phase, the most long wavelength makes all oscillators to move in a synchronized rhythm; assume that a human cell has a longer wavelength so that all oscillator's g_{cell} terms in the cell are synchronized. Therefore, we simply assume that all electron's g_{cell} in the cell takes the same value.

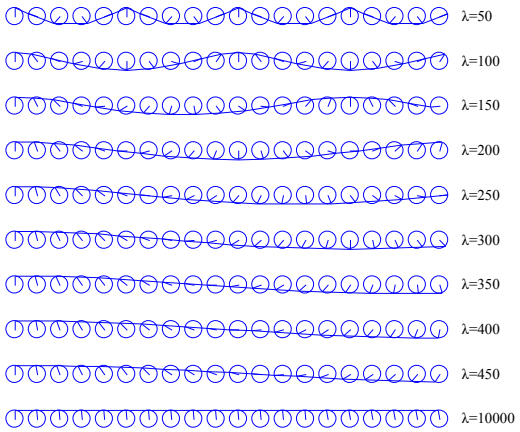

Figure 2 longer wavelength makes all electrons to move in synchronization.

```
<Clet2020 Script>// C source code [8]
double a,b,c,d,r,x,y,R,L, D[100],W[200];
int i, j, k, n, nP[10];
int main(){ a=-100;b=100; R=4; nP=ELLIPSE;nP[1]=0;nP[2]=2;nP[3]=XY;
DrawFrame(FRAME_NULL,2,0xffffff); SetPen(1,0xff); L=50; d=0; n=0;
for(j=0;j<10;j+=1) { for(i=0;i<20;i+=1) {
D[0]=a-R;D[1]=b-R;D[2]=a+R;D[3]=b+R; nP=ELLIPSE;Draw(nP,D);
c=PI/2+2*PI*d/L;x=R*cos(c);y=R*sin(c);
D[0]=a;D[1]=b;D[2]=a+x;D[3]=b+y; nP=LINE;Draw(nP,D);
W[n+n]=a+x;W[n+n+1]=b+y; n+=1;a+=10;d+=10;}
Polyline(n,W);TextHang(a,b,0,"λ=%d",L);
a=-100; b-=20; d=0;L+=50; n=0; if(L>=500) L=10000;
}}#v07=?>A
```

A sperm fuses with an egg to begin the process of fertilization. Consider a fertilized egg, it is subject to the interference of the cell-scale matter waves between egg's ψ_{egg} and sperm's ψ_{sperm} in the cell, the gravity-associated relativistic matter waves are given by

$$\psi(x) = \psi_{egg} + C\psi_{sperm}$$

$$\psi_{egg} = \exp[\frac{i\beta}{c^3}\int_0^x (v+g_{cell\_egg})dl + \frac{i\beta}{c^3}\int_0^t (\frac{-c^2}{\sqrt{1-(v+g_{cell\_egg})^2/c^2}})dt] \quad . \qquad (7)$$

$$\psi_{sperm} = \exp[\frac{i\beta}{c^3}\int_0^x (v+g_{cell\_sperm})dl + \frac{i\beta}{c^3}\int_0^t (\frac{-c^2}{\sqrt{1-(v+g_{cell\_sperm})^2/c^2}})dt]$$

where C is the coupling constant. The interference between egg's ψ_{egg} and sperm's ψ_{sperm} in the cells would produce a beat phenomenon [1]:

$$\frac{2\pi}{\lambda_{beat}} = \frac{\beta}{c^3}(g_{cell\_egg} - g_{cell\_sperm}); \quad \frac{2\pi}{T_{beat}} = \frac{\beta}{2c^3}(g_{cell\_egg}{}^2 - g_{cell\_sperm}{}^2) \quad . \tag{8}$$

We at once find that the beating pulse will evolve into the baby's heart beat, from then on for the whole life of the child, no matter how many times the fertilized cell reproduces itself, the body is driven by an almost-invariant heart period T_{heart}

$$T_{heart} = T_{beat} = \frac{4\pi c^3}{\beta(g_{cell\_egg}{}^2 - g_{cell\_sperm}{}^2)} \quad . \tag{9}$$
$$human: T_{heart} \approx 1s$$

This is a **gravity-clock**. Why is T_{heart} almost-invariant? because it is associated with cell-scale interactions rather than electromagnetic interactions in a cell; for example, one can walk, run, jump, twist, bend or bow, these all are electromagnetic deformations for the body; the gravity-clock is related to the gravity-associated matter waves.

The beating wave $\psi(x)$ belongs to all electron in the fertilized cell with a longer wavelength, that is

$$\lambda_{beat} = \frac{2\pi c^3}{\beta(g_{cell\_egg} - g_{cell\_sperm})} \quad . \tag{10}$$

In the fertilized cell, if the coherent length of the beating wave is long enough, its head may overlap with its tail when the wave moves in a closed orbit, as shown in Figure 3(a). Consider a point on the equatorial plane of the cell ball, the overlapped beating wave is given by

$$\psi_{beat} T_{beat}(t) = \psi_0(1 + e^{i\delta} + e^{i2\delta} + ... + e^{i(N-1)\delta}) T_{beat}(t) \quad . \tag{11}$$

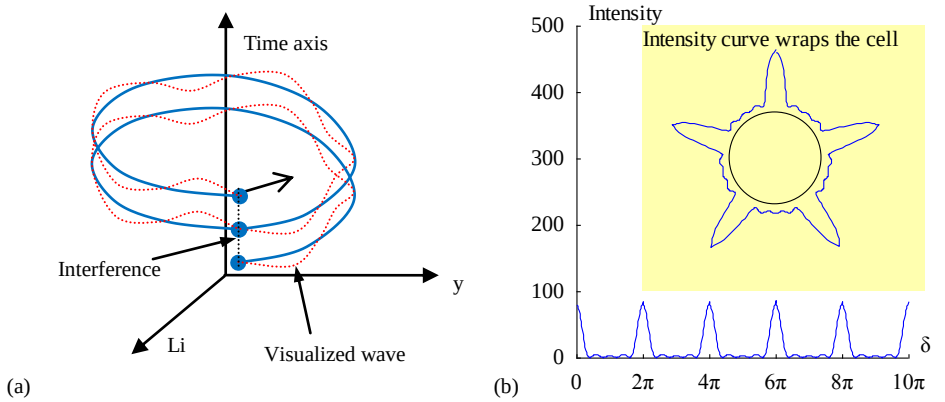

Figure 3 (a)The head of the matter wave may overlap with its tail. (b) The intensity curve wraps the cell.

```
<Clet2020 Script>// C source code [8]
double a,b,c,d,x,y,D[1100],S[1100];
int i, j, k, N,m, n;
int main(){SetAxis(X_AXIS,0,0,500,"δ;0;2π;4π;6π;8π;10π;");
SetAxis(Y_AXIS,0,0,500,"Intensity;0;100;200;300;400;500;");
DrawFrame(FRAME_SCALE,1,0xffffff); m=500; N=5; j=300;
for(i=0;i<=m;i+=1) { a=i*5*PI/m; d=sin(N*a)/sin(a)*N; if(i==0) d=1;
d=80*d*d; D[i+i]=i;D[i+i+1]=d;
b=2*a/5; d+=80; x=j+d*sin(b); y=j+d*cos(b); S[i+i]=x;S[i+i+1]=y; }
Draw("RECT,3,2,XY,0xffffaf,","100,100,525,500,");
Draw("ELLIPSE,0,2,XY,0,","230,230,370,370,");
SetPen(1,0xff); Polyline(m+1,D); Polyline(m+1,S);
TextHang(100,480,0,"Intensity curve wraps the cell");
}#v07=?>A
```

where N is the overlapping number which is determined by the coherent length of the beating wave, δ is the phase difference between the neighboring wavelets. The above equation is a multi-slit interference formula in optics. Where $|\psi|^2$ represents the density of matter in terms of quantum mechanics, but jelly-like matter of the cell turns out that $|\psi|^2$ usually represents the surface form of the cell.

For instance, if the coherent length L of the beating wave is 5 times of λ_{beat}, i.e. $L=5\lambda_{beat}$, the $5\lambda_{beat}$ length wraps the cell with a overlapping number N, this situation means that there is extra 10π phase-angle being inserted into the circumference around the cell. Because the cell has jelly-like soft matter rather than solid matter, the extra 10π phase-angle would uniformly distribute into the circumference, thus the intensity of the interference of the overlapped beating waves around the cell is calculated by the above equation with an overlapping number $N=5$, as shown Figure 3(b).

4. Five parts in an embryo

The fertilized cell try to rotate its body with an angular speed ω as the overlapped beating wave propagates on the cell surface, that is

$$\omega r = \frac{\lambda_{beat}}{T_{beat}}; \quad v_{beat} = \frac{\lambda_{beat}}{T_{beat}} \quad . \tag{12}$$

where r is the radius of the cell. But its jelly-like environment would resist this rotation because the cell may rebound, sometime it may be success and some time it may fail; but finally it gets to grow to become an embryo. As a result, the embryo will split its body into multi-parts which have the same beating period T_{beat}. As the embryo grows, the body splits into two parts, as illustrated in Figure 4(a), further into 3 parts, into 4 parts, until into 5 parts which then the cell lives in a stable stage.

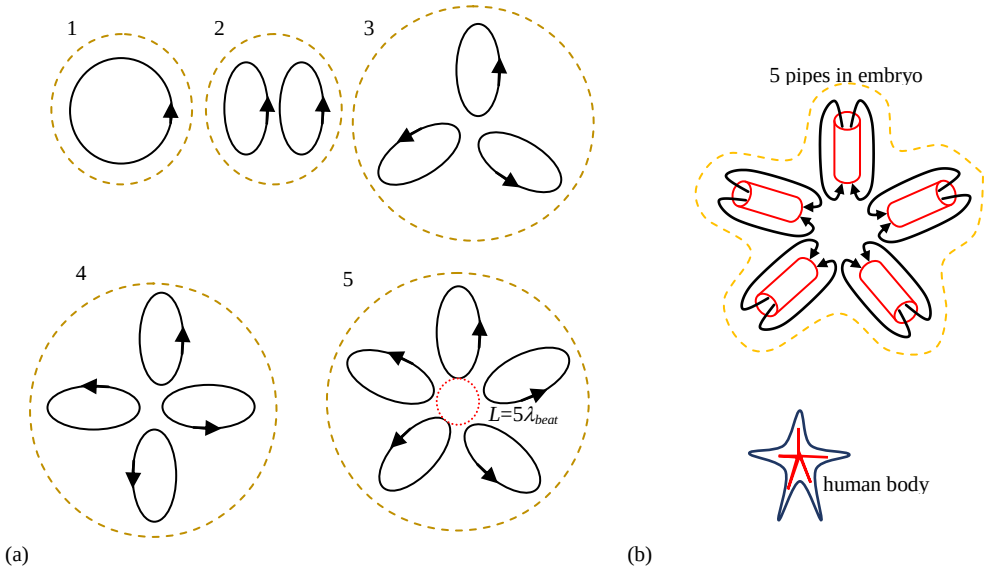

Figure 4 (a) Topological view of an evolving embryo. (b) Stereo view of the embryo which consists of 5 pipes.

The 2D topological picture of the evolving embryo in Figure 4(a) is not real, because

practically the embryo should evolve into 5 pipes as the stereo view of the embryo in Figure 4(b); generally speaking, the heart at the center, the inner flows of the pipes represent artery-flow, the outer flows represent vein-flow; the blood has un-uniform speed in or out the pipes but holds the conservation law of matter. The fertilized cell will develop 5 prominent proteins on its surface, finally the human body will evolve into 5 prominent branches: one head, two arms and two legs. Why has it 5 stable parts? Because the boundary condition: coherent length $L=5\lambda_{beat}$ wrapping up the heart of the embryo, see the Figure 4(a) topological picture 5, which essentially represents a stationary state in quantum physics.

5. Blood circulations in an embryo and a body

Remember that in Figure 2(b) the intensity curve of $|\psi|^2$ wrapping the cell consists of 5 peaks, i.e. the 5 prominent beating pulses in the circulating loop with the speed v_{beat}. Remember that in Figure 3(b) 5 prominent beating pulses continue to flow in 5 pipes respectively with the same circulating speed v_{beat}. Because the difference of fluid viscosity in artery and vein, averagely speaking, we can say that one pulse moves in the artery while other four pulses move in the vein in a main blood pipe, as shown in Figure 5(a). Actually the last pulse almost has lost its kinetic energy before entering the heart. Finally, the embryo with five main blood pipes will evolve to become a human body, as shown in Figure 5(b).

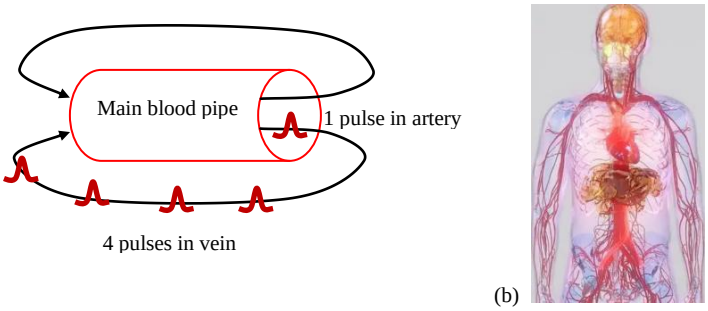

Figure 5 (a)Averagely speaking, one pulse moves in the artery while other four pulses move in the vein in a main blood pipe. (b) Finally, the embryo will evolve to become a human body.

To note, once the hart beat is established, it will never stop for the whole life, driven by the cell-scale relativistic gravity-clock. Therefore, the following clock equation has been locked for the whole life.

$$g_{cell\_egg}{}^2 - g_{cell\_sperm}{}^2 = \frac{4\pi c^3}{\beta T_{heart}} \approx const. \quad . \tag{13}$$

The DNA or other gene codes as explicate physical quantities will maintain the gravity-clock for the whole life. The 5 blood branches of human body are precisely synchronized by the gravity-clock in the heart.

The blood pulses emit from the heart to the terminals (two palms, two feet, head top) in one period t, they simultaneously arrive the terminals, as illustrated in Figure 6, i.e., the beating wave of the heart propagates in phase at the terminals. Thus, the topological speed of human blood is defined in terms of heart rate h by

$$v_t = \frac{R}{t} = \frac{R}{1/h}; \quad R \approx \frac{height + width}{4} \quad . \tag{14}$$

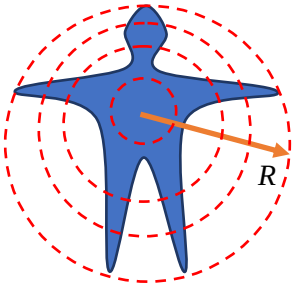

Figure 6 The pulses emit from the heart to the terminals in one period *t*, they simultaneously arrive the terminals.

For example, an adult's R=0.86m, the heart rate h=70pluses/min=1.167pulses/s, then the adult's blood topological mean speed is 1.003m/s. The blood mean speed has been used to calculate the mean human lifespan --- based on Earth's gravity-clock, which predicts $T_{lifesapn}$ =84 years. The paper [2] also shows that the total number of heart beats for a human lifespan is given by

$$T_{lifespan} h = 3.08e + 9(pulses) \quad . \tag{15}$$

It also holds for any kinds of animals such as human being, mammals, birds and fishes. Therefore, the gravity-clock of the beating waves is the most important lifespan-counter. Consequently, we arrive at a point where we should stay to check the validity of the new lifespan formula.

At the first, the production of lifespan and heart rate holds a constant in mammals and birds. In 1997, H. J. Levine [14] reported that despite wide variations in body size and heart rate, the total number of heart beats/lifetime among mammals is remarkably constant, as shown in Figure 7, which confirms the above lifespan formula.

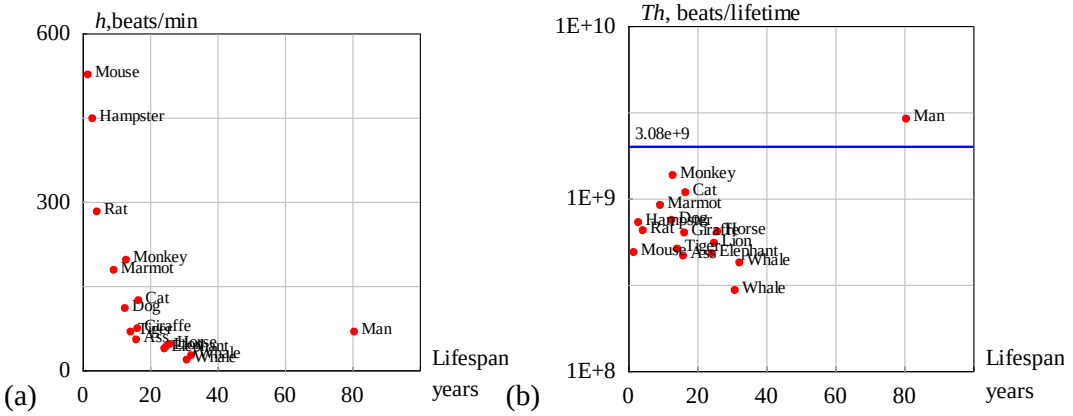

Figure 7 The relation between rest heart rate and life expectancy in mammals. Data source: H.J. Levine [14].

```
<Clet2020 Script>//Levine
char
str[50],str1[50],D[600]={"Man;80.70,1.83;Whale;31.14,1.25;Whale;32.46,1.39;Elephant;24.34,1.57;Lion;25.00,1.62;Horse;26.3
2,1.66;Ass;16.23,1.73;Tiger;14.47,1.82;Giraffe;16.45,1.86;Dog;12.94,2.04;Cat;16.67,2.09;Marmot;9.65,2.25;Monkey;13.16,2.29
;Rat;4.39,2.45;Hampster;3.07,2.65;Mouse;1.75,2.72;end;0,0;"};
double w,h,a,R,x,y,dP[10],S[10]; int i,j,k,m,nP[10];
main(){j=1; k=30;
```

```
SetAxis(X_AXIS,0,0,100,"Lifespan#nyears;0;20;40;60;80; ;");
if(j==0) SetAxis(Y_AXIS,0,0,600,"#ifh#t,beats/min;0;300;600;");
else if(j==1) SetAxis(Y_AXIS,8,8,10,"#ifTh#t, beats/lifetime;1E+8;1E+9;1E+10;");
DrawFrame(0x0154,1,0xafffaf);SetFont(SMALL,0,0,0); SetPen(2,0xff0000);
for(i=0;i<k;i+=1) {nP[0]=TAKE; nP[1]=i+i; TextJob(nP,D,str); nP[1]=i+i+1; TextJob(nP,D,str1);
nP[0]=14; m=TextJob(nP,str1,dP); a=dP[0]; h=dP[1]; h=pow(10,h); if(a<1) break;
S[0]=a; S[1]=h; if(j==1) {x=a*h*365*24*60; S[1]=log(x);}
Plot("OVALFILL,0,1,XY,3,3,",S); TextHang(S[0]+2,S[1],0,str);}
if(j==1) {SetPen(2,0xff);Polyline(2,"0,9.3,100,9.3,");TextHang(2,9.36,0,"3.08e+9");}
}}#v07=?>A
```

The one conspicuous exception to this observation is humans. One might speculate as to the reasons why, or more specifically how, modern humans have stretched the boundaries of biology to achieve a life expectancy of 84 years. Perhaps the most obvious explanations would credit advances in science, medicine and sociology.

Figure 8 shows another data source [15][16] that indicates that the total number of heart beats/lifetime among 34 species of mammals and birds is remarkably constant, which confirms the above lifespan formula.

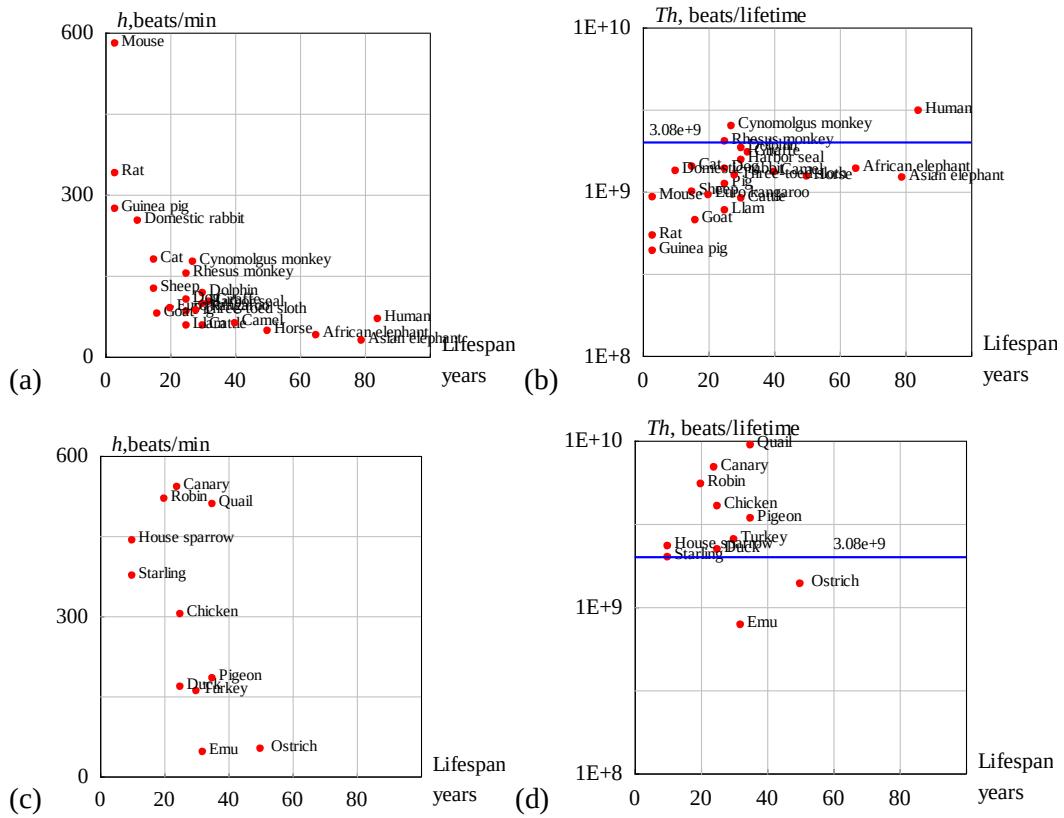

Figure 8 The relation between rest heart rate and life expectancy in mammals and birds. Data source: R.S. Seymour et al [15], Z.C. Lian et al [16].

```
<Clet2020 Script>//Mammal & Bird
char D[600]={"African elephant;4080,40,65;Asian
elephant;2860,29,79;Giraffe;651,102,32;Cattle;508,57,30;Horse;422,47,50;Camel;369,62,40;Llam;108,58,25;Pig;102,84,25;Dol
phin;93.1,117,30;Human;68.8,70,84;Harbor seal;60.3,98,30;Sheep;47.5,126,15;Goat;31.2,79,16;Euro
kangaroo;30.3,90,20;Dog;19.2,105,25;Cynomolgus monkey;4.6,175,27;Rhesus monkey;4.25,154,25;Three-toed
sloth;3.73,85,28;Cat;3.03,179,15;Domestic rabbit;2.51,251,10;Guinea
pig;0.52,273,3;Rat;0.34,340,3;Mouse;0.03,580,3;end;0,0,0;"};
//char D[600]={"
Ostrich;110,52,50;Emu;37.5,46,32;Turkey;4.77,160,30;Chicken;1.95,304,25;Duck;1.89,167,25;Pigeon;0.36,184,35;Quail;0.13,5
10,35;Robin;0.08,520,20;Starling;0.06,375,10;House sparrow;0.03,442,10;Canary;0.01,542,24;end;0,0,0;"};
double w,h,a,R,x,y,dP[10],S[10]; int i,j,k,m,nP[10];char str[50],str1[50];
main(){j=1; k=30;
SetAxis(X_AXIS,0,0,100,"Lifespan#nyears;0;20;40;60;80; ;");
if(j==0) SetAxis(Y_AXIS,0,0,600,"#ifh#t,beats/min;0;300;600;");
else if(j==1) SetAxis(Y_AXIS,8,8,10,"#ifTh#t, beats/lifetime;1E+8;1E+9;1E+10;");
DrawFrame(0x0154,1,0xafffaf);SetFont(SMALL,0,0,0); SetPen(2,0xff0000);
```

```
for(i=0;i<k;i+=1) {nP[0]=TAKE; nP[1]=i+i; TextJob(nP,D,str); nP[1]=i+i+1; TextJob(nP,D,str1);
nP[0]=14; m=TextJob(nP,str1,dP); w=dP[0]; h=dP[1]; a=dP[2]; if(a<1) break;
S[0]=a; S[1]=h; if(j==1) {x=a*h*365*24*60; S[1]=log(x);}
Plot("OVALFILL,0,1,XY,3,3,",S); TextHang(S[0]+2,S[1],0,str);}
if(j==1) {SetPen(2,0xff);Polyline(2,"0,9.3,100,9.3,");TextHang(2,9.36,0,"3.08e+9");}
}}#v07=?>A
```

6. Body construction by magic digit 5

The fertilized cell will develop out 5 prominent proteins on its surface as the embryo grows, finally the human body will evolve into 5 prominent branches: one head, two arms and two legs, with a magic digit 5. A hand or foot grows out 5 fingers, which can trace to its initial boundary condition $L=5\lambda_{beat}$ on an initial palm, as shown in Figure 9(a) and (b).

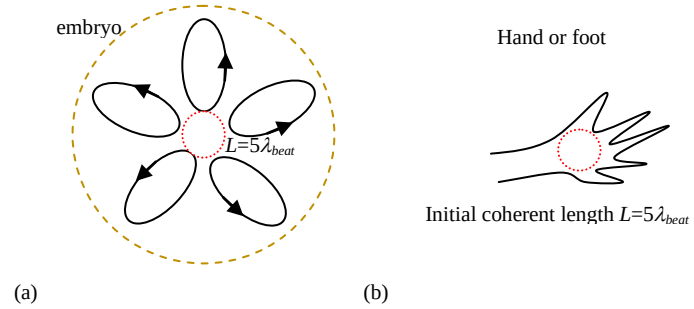

Figure 9 (a) Topological view of the embryo. (b) Stereo view of the hand or foot which consists of 5 pipes.

The magic digit 5 also appears on the head, which consists of four holes: mouth, nose, eyes, ears; the 4 holes is equivalent to 5 prominent branches topologically. The magic digit 5 also appears on the bottom, which consists of four holes: anus, urethra, genitals, belly button; they also have equivalent 5 prominent branches topologically. So, the initial boundary condition $L=5\lambda_{beat}$ in an embryo is a physically invariant quantum condition.

7. Filter mechanism in kidney, liver and brain

The kidney is an organ in vertebrates, belonging to the urinary system. It is responsible for filtering impurities in the blood, maintaining the balance of body fluids and electrolytes, and finally producing urine that is excreted through the urethra. Each kidney has 7~8 renal calices, which converge into a flattened funnel-shaped renal pelvis. As shown in Figure 10, apparently the topological picture of kidney favors the quantum condition $L=7\lambda_{beat}$, which cultures a beating wave ψ_{kidney} in the kidney with a beat period T_{kidney}. The interference between the normal ψ_{beat} and ψ_{kidney} will produce urine which can be distinguished by its characteristic period T_{urine}.

$$\begin{aligned} \psi_{urine} &= \psi_{beat} - \psi_{kidney} \\ \frac{1}{T_{urine}} &= \frac{1}{T_{beat}} - \frac{1}{T_{kidney}} \end{aligned} \quad . \tag{16}$$

For instance, if T_{beat}=1s, T_{kidney},=1.1s, then T_{urine} =10s, this so long characteristic period means the excreted urine actually contains no living tissues but only water and waste compounds. The entanglement of waves actually establishes a filter mechanism for the kidney. In other

words, T_{beat} means a living tissue; T_{kidney} means another living tissue; but longer T_{urine} means a no living tissue, the kidney uses these characteristic periods through their entangling resonance to distinguish these matters.

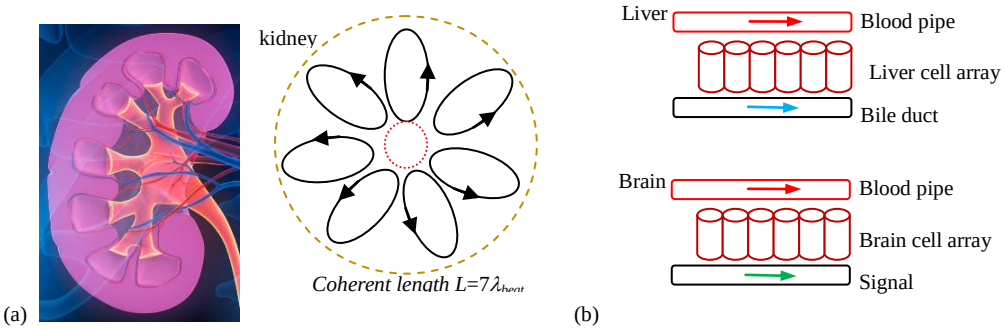

Figure 10 (a) Topological view of a kidney. (b) Topological view of a liver and a brain.

When bloods pass through a liver or brain, as shown in Figure 10(b), the normal beating waves ψ_{beat} will interfere with locate beating waves ψ_{liver} or ψ_{brain}, will produce bile duct or signal, which are characterized by their periods and their resonances

$$\frac{1}{T_{bile}}=\frac{1}{T_{beat}}-\frac{1}{T_{liver}};\quad \frac{1}{T_{signal}}=\frac{1}{T_{beat}}-\frac{1}{T_{brain}}\quad . \tag{17}$$

Thus they establish a filter mechanism for the liver and brain. One filter's characteristic period corresponds to one certain matter or signal. Comparing to smart DNA, a longer wavelength of the beating waves and an associated gravity-clock know how better to adapt to the environments in a complicated system, the longer wavelength gives it another kind of smart.

8. Ovaries and testes

The ovaries are the reproductive organs of female animals. The function of the ovaries is to produce eggs and steroid hormones. The testes are the main reproductive organs of males, located in the scrotum, and are the organs that produce sperm and male hormones. The ovaries and testes are filters that are managed by their characteristic periods and resonances

$$\frac{1}{T_{egg}}=\frac{1}{T_{beat}}-\frac{1}{T_{ovarry}};\quad \frac{1}{T_{sperm}}=\frac{1}{T_{beat}}-\frac{1}{T_{teste}}\quad . \tag{18}$$

Ovaries and testes can precipitate egg matter or sperm matter by their characteristic periods through the above filter mechanism. To note that egg cell only contains g_{cell_egg} on its all electronic orbits without g_{cell_sperm} and ***without clock***, conversely, sperm cell only contains g_{cell_sperm} on its all electronic orbits without g_{cell_egg} and ***without clock***. Only under comfortable temperature and environment, the egg cell merges with the sperm cell, they produce the relativistic gravity-clock T_{beat}.

9. Conclusions

In the present paper, de Broglie matter wave has been generalized in terms of the ultimate acceleration on a cell-scale. A sperm fuses with an egg to begin the process of fertilization. In a fertilized egg, it is subject to the interference of the gravity-associated relativistic matter waves between egg and sperm in the cell, which would produce a beat phenomenon. The beating pulse as a gravity-clock will evolve into the embryo's heart beat, from then on for the whole life, no matter how many times the fertilized cell reproduces itself, the body is driven by the gravity-clock. The fertilized cell will develop 5 prominent proteins on its surface, finally the human body will evolve into 5 prominent branches: one head, two arms and two legs. The mean human lifespan is determined as 84 years; the total number of heart beats for a lifespan is determined as 3.08e+9 pulses, it holds for human being, mammals, birds and fishes. These predictions agree well with the experimental observations. Filter mechanism in kidney, liver and brain are investigated. It is found that the entanglement of the gravity-associated relativistic matter waves actually establishes a filter mechanism for the organs.

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