The matter's inertia and interaction in an isolated system

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Abstract

Investigations into the intrinsic inertia and interactions of matter in isolated systems with constant density demonstrate that spin constitutes a provable form of material inertia, characterizable by the angular velocity of the isolated system wn=d dtn= ×u. Upon consideration and supplementation of the concept that the space occupied by a material point possesses a volume approaching zero yet non-zero, the conclusions and evidence of this study may supplement Newton' s first law and can explain the wave-particle duality of matter. Further research was conducted on a fundamental isolated system containing two coupled substances. The revealed coupling characteristics can account for DNA structure, light cones, and the topological sphere of motion trajectories. The interaction between the two substances is proven to result from the coupling of the isolated system' s uniform linear motion and uniform angular velocity spin, which may contribute to the unification of gravitation and electromagnetic force.

Full Text

The Inertia and Interaction of Matter in an Isolated System

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Abstract. This study investigates the intrinsic inertia and interaction of matter with constant density in an isolated system. We demonstrate that matter exhibits an inherent spin inertia characterized by the angular velocity $\vec{\omega}_n = \hat{n} = \nabla \times \vec{u}$ of the isolated system. This rigorous proof reinforces Newton' s first law by considering points with non-zero volume approaching zero without limit, and provides explanations for matter waves and seismic waves. Furthermore, we examine a fundamental isolated system containing two coupled

matters. The revealed coupling characteristics are applied to explain DNA structure, the Time Cone, and the topological sphere of moving traces. The proven interaction between two matters emerges from the coupling of uniform rectilinear motion and spin in an isolated system, which may contribute to unifying gravitation and electromagnetic force.

Introduction. Conservation laws for matter can be classified into two distinct categories: scalar quantities including mass, energy [1], and electric charge; and vector quantities including momentum, angular momentum, acceleration, angular acceleration, and the spin of quantum particles such as electrons or atoms [2,3]. Based on the perspective that matter depends on defined space-time rather than mass points without volume [4], systems can be analyzed as follows.

Model. We employ an infinitesimal yet isolated system as our physical model, from which the continuous equation of matter can be derived using the Lagrangian method. According to conservation laws, the matter content of an infinitesimal system remains constant as the product of density ρ and volume V, expressed as $T = \rho V = C$. Its time derivative yields:

$$\frac{dT}{dt} = \frac{d(\rho V)}{dt} = 0 \quad (1)$$

The center of this infinitesimal isolated system is established as the origin of a proprio-coordinate system to characterize its intrinsic properties, analogous to the center of mass. The velocity of any point in the system is described by $\vec{u} = \frac{d\vec{l}}{dt}$, where $d\vec{l}$ represents the displacement vector within an infinitesimal time interval dt. The divergence, first noted in Chinese by the Mohist Canon, is expressed as:

$$\operatorname{div}\vec{u} = \nabla \cdot \vec{u} = \frac{\oint \vec{u} \cdot d\vec{S}}{V} = \frac{\oint \frac{d\vec{l}}{dt} \cdot d\vec{S}}{V} = \frac{\oint d\vec{l} \cdot d\vec{S}}{V dt} = \frac{\oint d(\vec{l} \cdot \vec{S})}{V dt} \quad (2)$$

Substituting equation (2) into equation (1) yields:

$$\frac{d\rho}{dt} + \rho \operatorname{div}\vec{u}\Big|_{\rho} = 0 \quad (3)$$

This differential form of the matter conservation law represents the most important and fundamental theory in transport mechanics, where either density ρ or velocity $\vec{u}$ may vary with time t while volume V or density ρ remains constant, respectively.

The following analysis proceeds from equations (1-3):

Part ( ): Kinematics of a Single Homogeneous Matter Within an Isolated System

If a single homogeneous matter T_1 exists in the isolated system, as described in the *Dao De Jing*—like deformable soft-body [5] water or a rigid top—its volume V_1 fills all space within the system [6]. The matter content is:

$$T_1 = \lim_{\rho_1 \to \infty} \rho_1 V_1 = \rho_1 \lim_{V_1 \to 0} V_1 = \lim_{\rho_1, V_1 \to \infty} \rho_1 V_1 = C_1(t)$$

From equation (3), we obtain:

$$\frac{dV_1}{dt} = \frac{dC(t)}{dt} = -\rho_1 \operatorname{div} \vec{u}_1 \Big|_{\rho_1} \quad (4)$$

Since $C_1(t)$ must be a finite, non-zero constant for physical meaning, we have $\rho_1 \operatorname{div} \vec{u}_1\big|_{\rho_1} = 0$ or $\operatorname{div} \vec{u}_1\big|_{\rho_1} = 0$, which integrates to:

$$\vec{u}_1 = C' \quad (C' \neq \pm\infty) \quad (5)$$

When the single homogeneous matter T does not completely fill space V, the remaining space has volume V', density $\rho' = 0$, matter content $T' = 0$, and velocity $\vec{u}' = 0$. Thus $T = T_1 + T' = T_1 \neq 0$, $V = V_1 + V' \neq 0$, and from equation (1):

$$\frac{dT}{dt} = \lim_{\rho_1 \to \infty} \frac{d(\rho_1 V_1)}{dt} + \lim_{\rho' \to 0} \frac{d(\rho' V')}{dt} = \frac{dC_1(t)}{dt} V_1 + \frac{dC(t)'}{dt} V' = \frac{dC_1(t)}{dt} = \frac{d(T_1 + T')}{dt}$$

For the entire system:

$$\frac{dT}{dt} + \rho \operatorname{div} \vec{u}\Big|_T + T \operatorname{div} \vec{u}\Big|_\rho = 0 \quad \Rightarrow \quad \operatorname{div} \vec{u}\Big|_T = 0 \quad (4')$$

The average velocity becomes:

$$\vec{u} = \frac{\vec{u}_1 T_1 + \vec{u}' T'}{T_1 + T'} = C' = \vec{u}_1 \quad (C' \neq \pm\infty) \quad (5')$$

These equations reveal that the velocity of homogeneous matter remains constant and equals the average velocity of the isolated system, whether the single homogeneous matter fills the space completely or not. If the matter is mass, the total momentum of the system remains invariant as the product of its mass and velocity.

Suppose $\vec{l}_1 = l_1\hat{r}$ at time t. In a polar coordinate system sharing the same center, the velocity is:

$$\vec{u}_1 = \frac{d\vec{l}_1}{dt} = \dot{l}_1\hat{r} + l_1\dot{\hat{r}} = \dot{l}_1\hat{r} + l_1\omega_n\hat{\tau} = \vec{u}_r + \vec{u}_\tau + \vec{u}_n = \vec{u}_r + \vec{u}_\tau \quad (\vec{u}_n = 0\hat{n} = 0) \quad (6)$$

Here, $\hat{r}$ is the unit displacement vector from the center to any point; $\hat{\tau}$ is the unit vector perpendicular to $\hat{r}$ lying in the plane defined by the system center and $\hat{r}$ ($\hat{\tau} \perp \hat{r}$); and $\vec{\omega}_n = \hat{n} = \nabla \times \vec{u}_1$ is the angular velocity of spin directed along unit vector $\hat{n}$, which is simultaneously perpendicular to both $\hat{\tau}$ and $\hat{r}$. The magnitude is:

$$|\vec{u}_1| = \sqrt{\dot{l}_1^2 + (l_1\omega_n)^2} = |C'| = \|\vec{u}\| = \sqrt{\dot{l}_1^2 + (l_1\omega_n)^2}$$

Given α as the angle between $\vec{u}_1$ and $\hat{r}$, equal to the product of ω_n and some parameter Δ, we have $\sin\alpha = \frac{l_1\omega_n}{|\vec{u}_1|}$, $\cos\alpha = \frac{\dot{l}_1}{|\vec{u}_1|}$, $\tan\alpha = \frac{l_1\omega_n}{\dot{l}_1}$, and $\alpha = \tan^{-1}\left(\frac{l_1\omega_n}{\dot{l}_1}\right) = \omega_n\Delta$. Thus:

$$\vec{u}_1 = \sqrt{\dot{l}_1^2 + (l_1\omega_n)^2}\,[(\cos\alpha)\hat{r} + (\sin\alpha)\hat{\tau}] = A\omega_n\,[(\cos\omega_n\Delta)\hat{r} + (\sin\omega_n\Delta)\hat{\tau}] = C'$$

where $A = \sqrt{\dot{l}_1^2 + (l_1\omega_n)^2}/\omega_n$. This velocity $\vec{u}_1$ can be identified as a wave with spin ω_n in the space field.

Discussions: 1. If l_1 remains constant, then $\alpha = 90°$, $\vec{u}_1 \perp \hat{r}$, and $\vec{u}_1 \parallel \hat{\tau}$, revealing circling motion about an axis aligned with $\hat{n}$ through the system center. Considering the system volume approaches zero without limit ($V \to 0$, $V \neq 0$), we conclude that matter spin occurs with uniform angular velocity:

$$\vec{u}_1 = \vec{u}_\tau = l_1\omega_n\hat{\tau} = C' \quad (8)$$

2. If θ remains constant, then $\alpha = 0°$, $\vec{u}_1 \perp \hat{\tau}$, and $\vec{u}_1 \parallel \hat{r}$, revealing uniform rectilinear motion along $\hat{r}$ through the system center:

$$\vec{u}_1 = \vec{u}_r = \dot{l}_1\hat{r} = C' \quad (9)$$

3. If both l_1 and θ remain constant, the system matter is static with $\vec{u}_1 = 0$ (10).

Assuming the matter is mass, equations (8), (9), and (10) constitute a proven and reinforced version of Newton' s first law [4]—not for mass points with zero volume, but for single homogeneous systems with non-zero volume approaching zero without limit, and with density remaining a finite, non-zero constant. The inertia of moving matter in an isolated homogeneous system, including quantum particles, is to maintain a static state, uniform rectilinear motion, or uniform angular spin [7].

4. If both l_1 and θ vary, with α taking any defined value between 0° and 90°, the matter exhibits a combined motion of uniform rectilinear motion and uniform angular spin along the $\hat{r}$ and $\hat{\tau}$ directions, respectively, resembling two types of seismic waves. As expressed in equation (7), the velocity $\vec{u}_1$ displays polarized transverse wave motion, where wave properties arise from the extension of uniform angular spin along the direction of uniform rectilinear motion, and particle properties arise from the uniform rectilinear motion itself—analogous to matter waves in de Broglie' s hypothesis [8].

Part ( ): Kinematics and Dynamics of Two Homogeneous Matters Within an Isolated System

If two homogeneous matters T_1 and T_2 exist in an isolated system, as noted in the *Book of Changes*, their volumes V_1 and V_2 do not fill all space within the system. At initial time t_0, the origin O of the proprio-coordinate system is marked by the center of the infinitesimal isolated system, shifting to O_1 at time t_1 and further to O_d at time t with interval $dt = t - t_1$. The spins of matters T_1 and T_2 can be neglected, assuming the distances between the matters and the system center are much larger than their dimensions. All motion of the integrated system is discussed using a two-point model for matters T_1 and T_2, as described in the *Dao De Jing*. For matter point T_1, its location is described by vector $\vec{r}_{11}$ relative to center O_1 and another vector $\vec{r}_1$ relative to center O_d. Similar vectors $\vec{r}_{21}$ and $\vec{r}_2$ are defined for matter point T_2. The center points O, O_1, and O_d define a plane $\overline{OO_{1O}d}$, with $\vec{l} = \overline{OO_1}$ and $d\vec{l} = \overline{O_{1O}d}$ defined as the displacement and unit displacement of the entire isolated system, as shown in Fig. 1 [Figure 1: see original paper]. The characteristics of matters T_1, T_2, and remaining space in the isolated system are $(T_1, V_1, \rho_1, \vec{r}_{11}, \vec{r}_1, \vec{u}_1; T_2, V_2, \rho_2, \vec{r}_{21}, \vec{r}_2, \vec{u}_2; T_3 = 0, V_3, \rho_3 = 0, \vec{u}_3 = 0)$, with relationships $T = T_1 + T_2 + T_3 = T_1 + T_2 = C \neq 0$ and $V = V_1 + V_2 + V_3 \neq 0$.

FIG. 1. The geometric graph of moving matters T_1 and T_2 in an isolated system.

From equation (3), we have:

$$\frac{dT}{dt} = \lim_{\rho_1 \to \infty} \frac{d(\rho_1 V_1)}{dt} + \lim_{\rho_2 \to \infty} \frac{d(\rho_2 V_2)}{dt} + \lim_{\rho_3 \to 0} \frac{d(\rho_3 V_3)}{dt} = \frac{dC_1(t)}{dt} V_1 + \frac{dC_2(t)}{dt} V_2 + \frac{dC_3(t)}{dt} V_3 = 0$$

with $T_1 + T_2 + T_3 = \rho_1 V_1 + \rho_2 V_2 + \rho_3 V_3 = C_1(t) V_1 + C_2(t) V_2$. Substituting these parameters into equation (3) for the entire isolated system yields:

$$\frac{d(T_1+T_2)}{dt}+\rho\,\mathrm{div}\,\vec{u}\big|_T+(T_1+T_2)\,\mathrm{div}\,\vec{u}\big|_\rho=0\quad\Rightarrow\quad(T_1+T_2)\,\mathrm{div}\,\vec{u}\big|_\rho=0$$

This implies that the average velocity $\vec{u}$ of the two-matter isolated system remains a constant vector C'. If the matters have mass, the total momentum $\vec{P}$ of the system also remains invariant, representing the conservation law of momentum:

$$\vec{P}=T_1\vec{u}_1+T_2\vec{u}_2=(T_1+T_2)\vec{u}=(T_1+T_2)C'\quad(C'\neq\pm\infty)\quad(11)$$

The average velocity of the entire isolated system is:

$$\vec{u}=\frac{T_1\vec{u}_1+T_2\vec{u}_2}{T_1+T_2}=C'\quad(C'\neq\pm\infty)$$

Analogous to equation (6), $\vec{u}$ represents the combined motion of uniform rectilinear motion and angular spin of the whole system' s center. Taking the time derivative yields:

$$\frac{d(T_1\vec{u}_1+T_2\vec{u}_2)}{dt}=T_1\frac{d\vec{u}_1}{dt}+T_2\frac{d\vec{u}_2}{dt}+\frac{d(T_1+T_2)}{dt}C'=(T_1+T_2)\frac{dC'}{dt}=0$$

Defining $\vec{a}_1=\frac{d\vec{u}_1}{dt}$ and $\vec{a}_2=\frac{d\vec{u}_2}{dt}$, we obtain:

$$T_1\vec{a}_1+T_2\vec{a}_2=0$$

Further defining $\vec{F}_1=T_1\vec{a}_1$ and $\vec{F}_2=T_2\vec{a}_2$, analogous to Newton' s second law [4], we find $\vec{F}_1+\vec{F}_2=0$, i.e., $\vec{F}_1=-\vec{F}_2$, which represents Newton' s third law [4].

Relative to system center O_1, the proper orthogonal decompositions of vectors $\vec{u}_1$, $\vec{u}_2$, $\vec{u}$, and C' along unit vectors $\hat{r}$, $\hat{\tau}$, and $\hat{n}$ can be substituted into equation (11) as:

$$\vec{P}=T_1(\vec{u}_{1r}+\vec{u}_{1\tau}+\vec{u}_{1n})+T_2(\vec{u}_{2r}+\vec{u}_{2\tau}+\vec{u}_{2n})=(T_1+T_2)(\vec{u}_r+\vec{u}_\tau+\vec{u}_n)=(T_1+T_2)(C'_r+C'_\tau+C'_n)\quad(C'\neq\pm\infty)\quad(11$$

Thus, the system components along $\hat{r}$, $\hat{\tau}$, and $\hat{n}$ directions obey the same conservation law:

$$\vec{P}_r=T_1\vec{u}_{1r}+T_2\vec{u}_{2r}=(T_1+T_2)\vec{u}_r=(T_1+T_2)C'_r\quad(11\text{-}1)$$

$$\vec{P}_\tau = T_1\vec{u}_{1\tau} + T_2\vec{u}_{2\tau} = (T_1+T_2)\vec{u}_\tau = (T_1+T_2)C'_\tau \quad \text{(11-2)}$$
$$\vec{P}_n = T_1\vec{u}_{1n} + T_2\vec{u}_{2n} = (T_1+T_2)\vec{u}_n = (T_1+T_2)C'_n \quad \text{(11-3)}$$

Since $\vec{u}_n = 0$ in equation (6), equation (11-3) becomes:

$$\vec{P}_n = T_1\vec{u}_{1n} + T_2\vec{u}_{2n} = 0 \quad \text{(11-3')}$$

This indicates that the center of the two-matter isolated system experiences no translation or rotation, but only harmonic vibration of the two matters acting as spring oscillators around the center along direction $\hat{n}$ for convergence, with velocities satisfying:

$$\vec{u}_{1n} = -\vec{u}_{2n} \quad \text{(12-1)}$$

The system exhibits combined uniform rectilinear motion and uniform angular spin in the $\overline{OO_{1O}d}$ plane spanned by $\hat{r}$ and $\hat{\tau}$. Thus, translation, spin, and vibration are orthogonal along the $\hat{r}$, $\hat{\tau}$, and $\hat{n}$ directions, respectively.

Similar equations to (12-1) can be derived:

$$\vec{u}_{1r} = -\vec{u}_{2r} + (1+\delta)C'_r \quad \text{(12-2)}$$
$$\vec{u}_{1\tau} = -\vec{u}_{2\tau} + (1+\delta)C'_\tau \quad \text{(12-3)}$$

If the angles between the $\hat{r}$, $\hat{\tau}$, or $\hat{n}$ directions and the line connecting the two matters through the isolated system center are defined as α, β, or γ ($\alpha, \beta, \gamma \in [0, \pi/2]$), the projection of vector $\vec{r}_1$ in the $\hat{r}$ direction is $\vec{r}_{1\perp} = \vec{r}_1 \cos\alpha$. Considering the same angular velocity $\vec{\omega}_n$ for the isolated system and that $\vec{r}_1$ and $\vec{r}_2$ lie on the same line with opposite directions relative to the two-matter system center, the velocities $\vec{u}_{1\tau}$ and $\vec{u}_{2\tau}$ have opposite directions and magnitudes satisfying $\vec{u}_\tau = \vec{r}_\perp \omega_n \hat{\tau}$ from $\vec{u}_\tau = \vec{\omega}_n \times \vec{r}_\perp$. Equation (11-2) then transforms to:

$$\vec{P}_\tau = T_1 r_{1\perp}\omega_n\hat{\tau} - T_2 r_{2\perp}\omega_n\hat{\tau} = (T_1 r_{1\perp} - T_2 r_{2\perp})\omega_n\hat{\tau} = (T_1 r_1\cos\alpha - T_2 r_2\cos\alpha)\omega_n\hat{\tau} = (T_1 r_1 - T_2 r_2)\omega_n\cos\alpha\,\hat{\tau} = (T_1$$

Thus:

$$\omega_n = \frac{(T_1+T_2)C_\tau}{(T_1 r_1 - T_2 r_2)\cos\alpha} \quad \text{(12-4)}$$

Discussions: 1. When $\alpha = \pi/2$, $\vec{P}_\tau = 0$ and $C'_\tau = 0$, equation (11-2) takes the same form as equation (11-3), and equation (12-4) becomes meaningless. The combined polarizing motions with opposite phases in both $\hat{n}$ and $\hat{\tau}$ directions, along with motionless or uniform rectilinear motion in the $\hat{r}$ direction, should produce trajectories resembling Lissajous figures or plant vines [9].

2. When $\alpha \neq \pi/2$, $\omega_n = \frac{(T_1+T_2)C_\tau}{(T_1 r_1 - T_2 r_2)\cos\alpha}$. Especially for $\alpha = 0$, $\cos\alpha = 1$ and ω_n reaches its minimum value: $\omega_n = \frac{(T_1+T_2)C_\tau}{T_1 r_1 - T_2 r_2}$. The combined polarizing motions with opposite phases in the $\hat{n}$ direction, uniform spin with angular velocity $\vec{\omega}_n$ in the $\hat{\tau}$ direction, and motionless or uniform rectilinear motion in the $\hat{r}$ direction should produce trajectories resembling the familiar double helix structure of DNA (whose physical mechanism was previously unknown [10]) or funnel-shaped Time Cones revealed by Einstein [11].
3. When $C'_r = C'_\tau = 0$, equations (11-1, 2, 3) take identical forms and reduce to equation (11) after vector superposition. The combined polarizing motions with opposite phases in $\hat{n}$, $\hat{\tau}$, and $\hat{r}$ directions should produce a topological spherical trajectory, with the opposite spins of the two matters both perpendicular to the sphere' s surface [12].
4. Taking time derivatives, equations (12-1, 2, 3) become:

$$\vec{a}_{1r} = -\vec{a}_{2r}; \quad \vec{a}_{1\tau} = -\vec{a}_{2\tau}; \quad \vec{a}_{1n} = -\vec{a}_{2n} \quad (13)$$

These properly orthogonal decomposed equations (13) establish the relationship $\vec{a}_1 = -\vec{a}_2$ along the line connecting matters T_1 and T_2, relative to the isolated system center O_1 rather than the centers of T_1 or T_2.

From equation (6), the velocities of matters T_1 and T_2 are:

$$\vec{u}_1 = \frac{d\vec{r}_1}{dt} = \dot{r}_1\hat{r}_1 + r_1\dot{\hat{r}}_1 = \dot{r}_1\hat{r}_1 + \omega_n r_1\hat{\tau}_1 = \vec{u}_{r1} + \vec{u}_{\tau 1} + \vec{u}_{n1} = \vec{u}_{r1} + \vec{u}_{\tau 1} \quad (\vec{u}_{n1} = 0\hat{n}_1 = 0) \quad (6\text{-}1)$$

$$\vec{u}_2 = \frac{d\vec{r}_2}{dt} = \dot{r}_2\hat{r}_2 + r_2\dot{\hat{r}}_2 = \dot{r}_2\hat{r}_2 + \omega_n r_2\hat{\tau}_2 = \vec{u}_{r2} + \vec{u}_{\tau 2} + \vec{u}_{n2} = \vec{u}_{r2} + \vec{u}_{\tau 2} \quad (\vec{u}_{n2} = 0\hat{n}_2 = 0) \quad (6\text{-}2)$$

Their accelerations are:

$$\vec{a}_1 = \frac{d\vec{u}_1}{dt} = \left[\ddot{r}_1 - r_1\omega_{n1}^2\right]\hat{r}_1 + (2\dot{r}_1\omega_{n1})\hat{\tau}_1 + 0\hat{n}_1$$

$$\vec{a}_2 = \frac{d\vec{u}_2}{dt} = \left[\ddot{r}_2 - r_2\omega_{n2}^2\right]\hat{r}_2 + (2\dot{r}_2\omega_{n2})\hat{\tau}_2 + 0\hat{n}_2$$

The relationships between unit vectors $(\hat{r}_1, \hat{\tau}_1, \hat{n}_1)$ and $(\hat{r}_2, \hat{\tau}_2, \hat{n}_2)$ are:

$$\hat{r}_2 = -\hat{r}_1; \quad \hat{\tau}_2 = -\hat{\tau}_1; \quad \hat{n}_2 = \hat{n}_1$$

Considering the isolated system shares the same angular velocity as matters T_1 and T_2, these angular velocities have equal magnitude: $\omega_{n1} = \omega_{n2} = \omega_n$ for the binary system [13].

The forces $\vec{F}_1$ and $\vec{F}_2$ along and/or across the line connecting matters T_1 and T_2 are:

$$\vec{F}_1 = T_1\vec{a}_1 = T_1\left[\ddot{r}_1 - r_1\omega_{n1}^2\right]\hat{r}_1 + T_1(2\dot{r}_1\omega_{n1})\hat{\tau}_1$$

$$\vec{F}_2 = T_2\vec{a}_2 = T_2\left[\ddot{r}_2 - r_2\omega_{n2}^2\right]\hat{r}_2 + T_2(2\dot{r}_2\omega_{n2})\hat{\tau}_2$$

Using $|\nabla \times \vec{u}|$ to replace ω_n, the unified expression from the isolated system center is:

$$\vec{F} = T\vec{a} = T\left[\frac{d^2r}{dt^2} - r|\nabla \times \vec{u}|^2\right]\hat{r} + T\left(2|\nabla \times \vec{u}|\frac{dr}{dt}\right)\hat{\tau} \quad (14)$$

Equation (14) reveals that interaction between two matters in a composite isolated system exists simultaneously along and across the radius, including attractive forces [14]. This equation can be expressed in quantum form if vectors $\vec{r}$ and $\vec{u}$ are replaced by wave functions. As the simplest fundamental model of interacting moving matters with identified spin, it may help unify the four interactions in the field of space and velocity, though experimental verification is needed.

Conclusions. We have studied the inertia and interaction of constant-density matter in an isolated system. The spin inertia with angular velocity $\vec{\omega}_n = \hat{n} = \nabla \times \vec{u}$ has been revealed and incorporated into Newton' s first law for matter in isolated systems, considering points with non-zero volume approaching zero without limit. The inertias of uniform angular spin and uniform rectilinear motion can explain wave-particle duality and seismic waves. Furthermore, the coupled isolated system with two matters serves as a second fundamental model. The coupling characteristics within two matters can prove Newton' s second and third laws, and explain DNA structure, Time Cone shapes, and topological sphere trajectories. The force for two coupled matters is expressed as the unified formula $\vec{F} = T\left[\frac{d^2r}{dt^2} - r|\nabla \times \vec{u}|^2\right]\hat{r} + T\left(2|\nabla \times \vec{u}|\frac{dr}{dt}\right)\hat{\tau}$, where $\vec{r}$ and $\vec{u}$ share the same origin at the isolated system center and can be replaced by wave functions to conform to quantum mechanics [15,16]. This interaction of coupled matters may help unify gravitation and electromagnetic force in the future.

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Figure 1

Note: Figure translations are in progress. See original paper for figures.