Scientific Research Publishing

Journal of High Energy Physics, Gravitation and Cosmology, 2025, 11(2), 403-437
https://www.scirp.org/journal/jhepgc
ISSN Online: 2380-4335
ISSN Print: 2380-4327

Gravitation through Information Exchange

Hans Joachim Dudek

Auf dem Komp, Germany (Retired)
Email: hans.dudek@t-online.de

How to cite this paper: Dudek, H.J. (2025) Gravitation through Information Exchange. *Journal of High Energy Physics, Gravitation and Cosmology*, **11**, 403-437.
https://doi.org/10.4236/jhepgc.2025.112031

Received: January 6, 2025
Accepted: April 19, 2025
Published: April 22, 2025

Abstract

Einstein's field equations are used to develop an information-exchange formalism for the interaction between the masses. Under the conditions of the Hamiltonian principle, information is exchanged between two masses during an interaction by gravity, which leads of masses to a movement towards each other.

Keywords

Physical Information, Action as a Building Block of Nature, Hamiltonian Principle, Correlation Space, Einstein's Field Equations of Gravity

1. Introduction

In previous reports [1]-[3], it was shown that the elementary objects, such as the photons of light and the electromagnetic fields, the vacuum and the gravitons can be described by a uniform three-dimensional structure, called the four block. The four blocks are formed on a correlation space by correlations of four-dimensional fields. Figure 1 shows as an example the flow of the currents, generated in the correlation structure of two gravitons of two different masses m1 and m2. The gravitons are formed on the correlation space, as are the photons of the static Maxwell fields, by a central four block and four other peripheral four blocks, in which, in contrast to the photons of static Maxwell fields, the currents are canceled by superposition of a structure with rectified currents of different signs (not shown in Figure 1).

The four blocks in Figure 1 are formed by four unit-cubes of coordinates $\mu = 0$, 1, 2, 3, which are unit generators of action. The unit cubes are shown in Figure 2. The unit cubes produce the action by correlation strings, which are formed by correlations of the communication relations of quantum mechanics and are interpreted as currents between creator and annihilator. The correlation structures are thus quantized. Two strings between a positive creator and a negative annihilator

and a negative creator and a positive annihilator generate positive or negative action, depending on the direction of circulation of the currents in the unit cubes, and if both currents with different signs circulate equally, they cancel each other out [3].

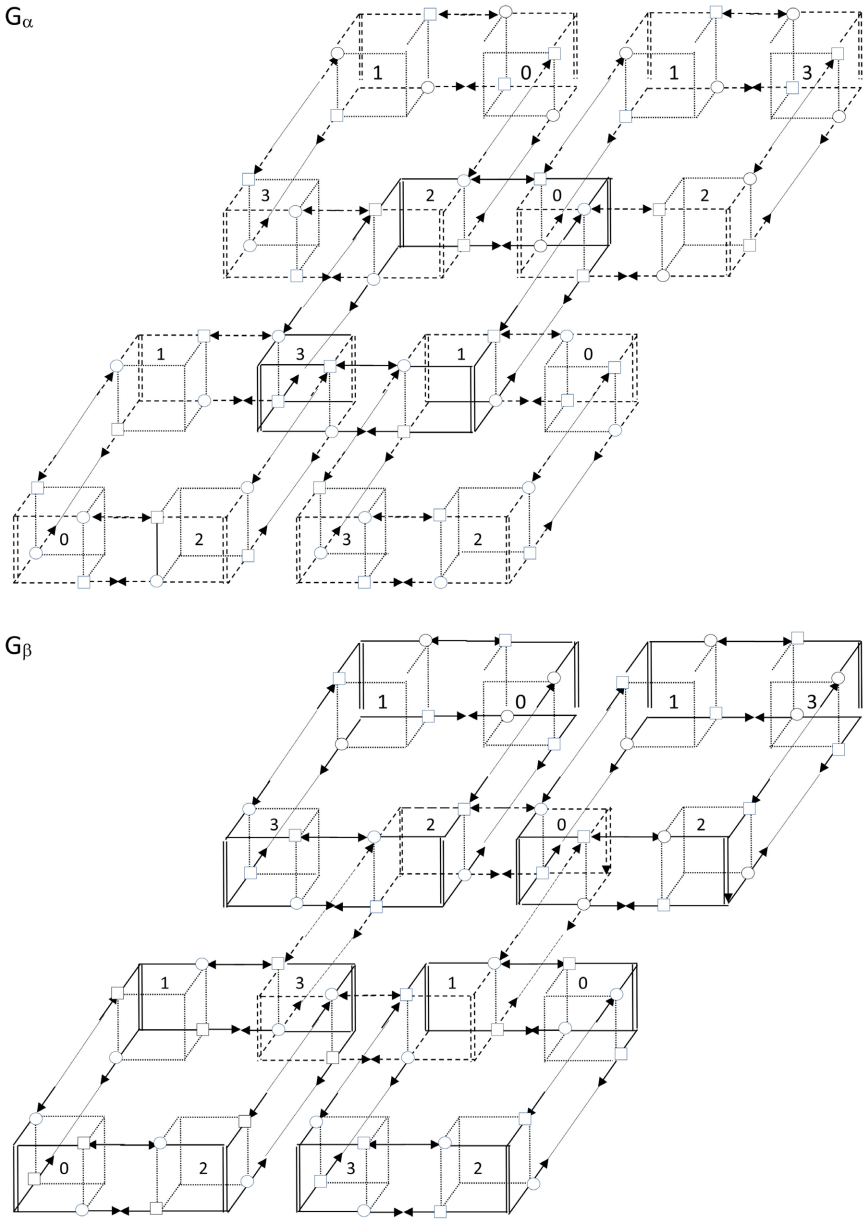

Figure 1. Currents in the correlation structure of gravitons: The sources of the action and their (commutator) currents are shown in the correlation structures of two gravitons G_α and G_β of two different, opposite masses in two different oscillation states. The arrows represent correlations; they always point from a creator to an annihilator of the vector potential. Positive currents represented by solid lines, negative ones by discontinuous lines; Rectangles positive, circles negative sources of action. The currents form four blocks, which consist of unit cubes of the four μ dimensions ($\mu = 0, 1, 2, 3$).

The strings of the cubes are linked to each other via their creators and annihi-

lators and thus form two currents that also connect the four cubes in a four block, Figure 1. In the following, a distinction is made between the horizontal and vertical correlations in the cubes (Figure 2). In the vertical correlations in the cubes, the currents in the rest frame cancel each other out, the object is then in a constant uniform motion; during the interaction, the currents in the vertical correlations of the cubes change: the object is accelerated.

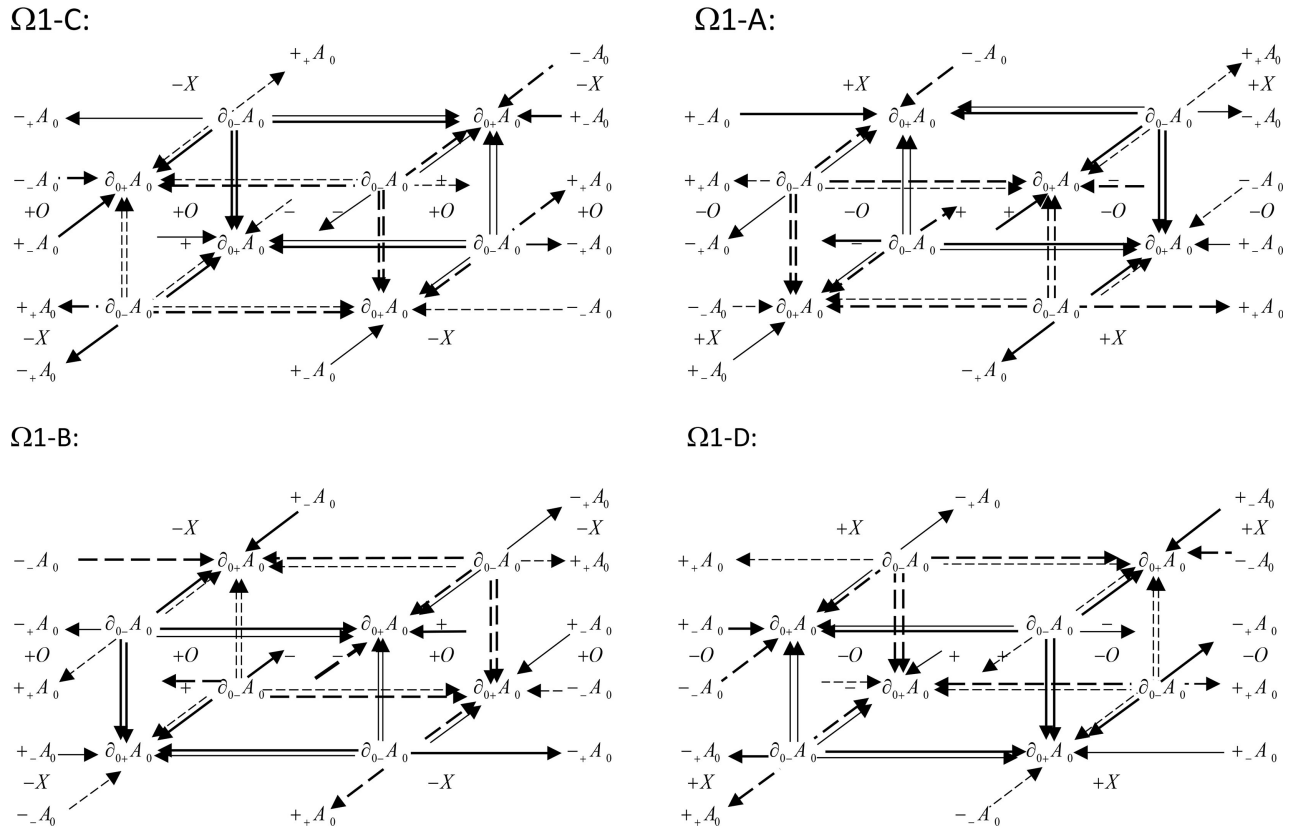

Figure 2. Four characteristic unit cubes of the basic structure: The unit cubes undergo four different modifications, depending on the oscillation state and the position on the basic structure. Solid lines and arrows positive currents, discontinuous lines and arrows negative currents. The sources of the currents are the creators to the annihilators.

The correlation structures of gravitons consist of two oscillation states, which differ from each other in the direction of correlation and the signs of the action. The unit cubes that make up the four blocks, contain O and X oscillators, which are formed by fields conjugated to each other. The source of the action is the $\mu = 0$ oscillator, which oscillates between two states by forming its signs and its correlation directions and thus the sign of the action between the state Ω1 with positive signs and the state Ω2 with negative signs. The outer horizontal correlations of the $\mu = 0$ oscillators are traced back to the communication relations of quantum mechanics in space time [2].

In the report [2], a correlation structure for oscillators of the nuclei of elementary particles was proposed, which on the correlation space also consists of four blocks and which we have called the basic structure, because of its function in

forming mass and charges, Figure 3. Each of the two oscillator pairs O(+)-X(−) and O(−)-X(+) forms two four blocks in the basic structure, each of which connects the four-unit cubes with positive and negative currents. Two of the four blocks of the basic structure: one with positive currents, denoted by α and one with negative currents, denoted by β, are formed by a four-dimensional O-X-oscillator and are connected to the gravitons (and static photons of electromagnetic fields, [3]), represented by reinforced lines and arrows in Figure 3. Another pair of O-X-oscillators with opposite oscillation directions (thin lines and arrows in Figure 3) forms the mass in the basic structure. The mass oscillators are not directly bound to the gravitons.

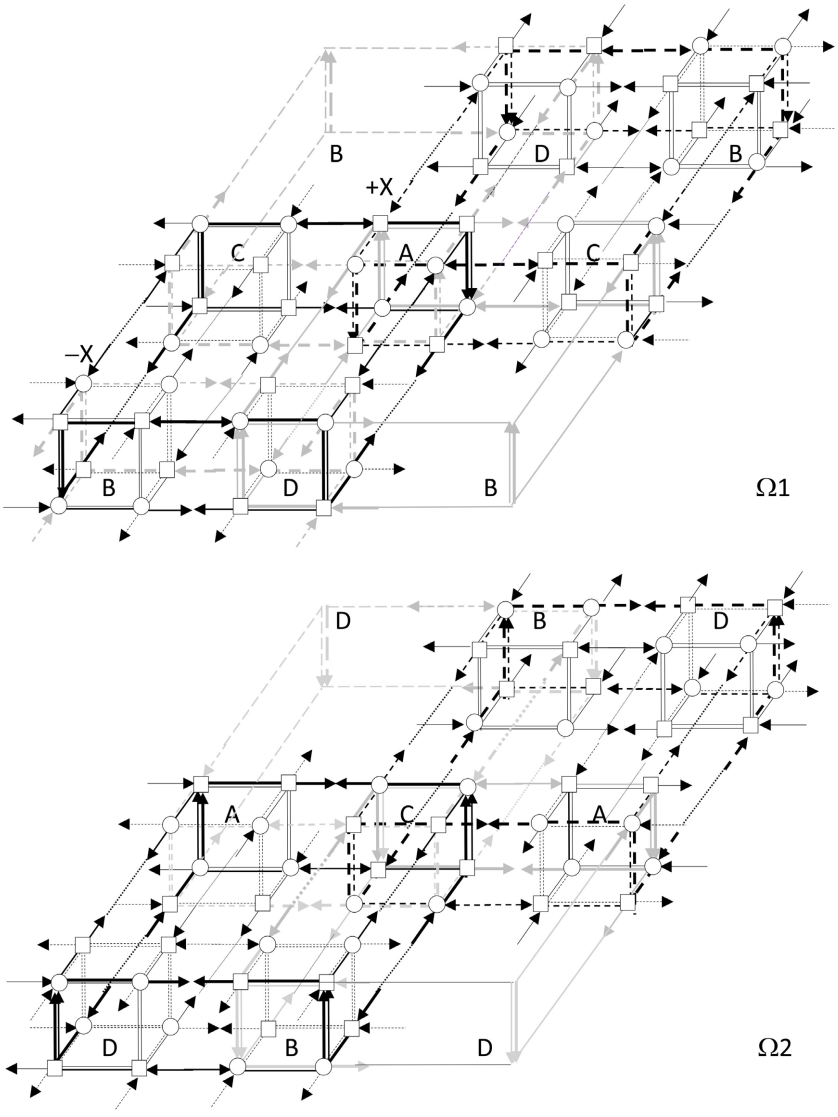

Figure 3. Details from the basic structure in the two states Ω1 and Ω2: only the active four blocks are shown, the non-active four blocks are indicated by weak lines. The four blocks are formed by four-unit cubes, each with the two oscillator pairs O(+)-X(−) and O(−)-X(+). Positive currents represented by continuous lines, negative ones by discontinuous lines. Arrows describe correlations.

In the context of Physical Information Theory (PIT) matter, charge, radiation and the vacuum on the correlation space consist of a uniform structure: the four blocks. The four blocks are also the information that is exchanged during an interaction. The formation of the structures and the description of their interaction is based solely on the Hamiltonian principle: the minimization of the action.

After a short description of the gravitons and the basic structure, the details of which can be found in the previous reports, [1], the present work will investigate the interaction between the basic structure that describes the mass, and the information carriers, *i.e.*, the gravitons. The interaction between the basic structure and gravitons takes place by exchanging the four blocks that form the physical information. In order to analyze the details of this interaction on the formation and mechanism of information exchange in gravity between masses, the statements of Physical Information Theory (PIT) are compared with those of the field equations of General Relativity Theory (GRT).

2. Properties of the Basic Structure and the Gravitons

According to considerations in [1] and the illustration in Sections 5 and 6, each state of an oscillator of the basic structure forms two gravitons in the vacuum G_α and G_β, each of which has a central four block and four peripheral four blocks with a four-dimensional coordinate system; Example **Figure 1**. The gravitons interact with the surface of the basic structure on the basis of the Hamiltonian principle, [1]. In the following, we mostly will consider the central four blocks of the gravitons, whose information is exchanged during the interaction. The gravitons G_α describe the interaction with the α -four-block, which is formed by positive currents in **Figure 3**, and the gravitons G_β are connected to the β -four-block, which is formed by the negative currents in the central four block.

All gravitons of a state Ω of the basic structure have the same directions of the currents, but generally different signs of the current; they can overlap in a vacuum. Their formation and interaction with the vacuum are described in [1]. Two of the superimposed gravitons contain two four-dimensional virtual O-X-oscillators with opposite signs of action: O(+)-X(−) and O(−)-X(+) (sign of action in parentheses), whose action in O and X is neutralized by superposition. Action that is formed by superimposing gravitons with different signs and the same magnitude, e.g. O(+)-X(−) and O(−)-X(+), is called virtual. In the formation of the virtual action, the creator and annihilator do not overlap as this is in entanglement, but the two superimposed oscillators produce the same action with opposite sign.

The four different unit cubes of **Figure 2** are found in the four blocks of the basic structure, **Figure 3**. For example, if we look at the state Ω1 in **Figure 3** and here the four block α with the positive currents, it contains all four unit cubes A, B, C and D from **Figure 2**, which form in gravitons the longitudinal ($\mu = 0$ and $\mu = 3$) and the transverse oscillators ($\mu = 1$ and $\mu = 2$). Accordingly, in the state Ω1 in the four blocks β with the negative currents, all four unit-cubes are also found, whereby the cubes of different four blocks α and β can overlap in the

basic structure. If one passes into the state Ω2 of the basic structure and the gravitons, the cubes are transformed with those with the opposite sign of the action, *i.e.*, A pass into C and B into D and vice verse C into A and D into B. In the oscillation of the basic structure between the states Ω1 and Ω2, all four unit-cubes are present in each state, whereby the unit-cubes A and C and B and D merge into each other during the oscillation. The oscillation of the gravitons between the states goes back to this form of the basic structure and causes that in each state there are gravitons with four-unit cubes during an interaction.

In the basic structure, a distinction is made between active and non-active four blocks. They are each formed separately by the O(+)-X(−) and O(−)-X(+) oscillators, which can have different virtual actions. The active and non-active four blocks consist of one positive (α) and one negative (β) four blocks, which are formed by positive and negative currents, **Figure 3**. The active four blocks are connected via their surface [2], to the photons of the electric and magnetic fields and to the gravitons, and form the memories of motion, while for the non-active four blocks we assume that they form the mass of the elementary objects and are the source of the action in the gravitons [3]. This will be discussed in more detail below.

As an interaction partner in a vacuum, generated by the oscillator of a mass, the graviton pair G_α&G_β then appears in two oscillation states, consisting of four blocks with the oscillators O(+)-X(−) and O(−)-X(+) in the four-unit cubes. If we consider two masses m1 and m2 interacting with each other via gravity, then this interaction can be described between two such graviton pairs G_μ&G_ν1 and G_ρ&G_σ2. In the event of an interaction, they overlap in a vacuum. Since each graviton in principle contains different action in the four unit-cubes and therefore has a four-dimensional coordinate system in its four-dimensional four block, within this superposition, the superimposed pairs G_μ&G_ν1 and G_ρ&G_σ2 have four different four-dimensional coordinate systems: μ, ν, ρ and σ. The superimposed graviton pairs must be linked to the source of gravity, from where the masses m1 and m2 transmit the information in the form of four blocks to the graviton pairs G_μ&G_ν1 and G_ρ&G_σ2. For this source, we choose two more graviton pairs. We describe these two graviton pairs, each of which acts from the masses m1 and m2 on the pairs G_μ&G_ν1 and G_ρ&G_σ2, with the four-dimensional coordinate systems α and β.

3. Analysis of Einstein's Field Equations

For the geometry of the interaction of the graviton pairs G_μ&G_ν1 and G_ρ&G_σ2 in a vacuum, one has two possibilities in a comparison with the Ricci tensor of the field equations: 1) The interaction at a point of manifold outside a mass is considered the source of gravity, then the two superimposed gravitons G_α and G_β join the pairs G_μ&G_ν1 or G_ρ&G_σ2 in the direction of the mass, or if one considers 2) the interaction between two masses m1 and m2 at a point of the manifold, then e.g. G_α is connected to the pairs G_μ&G_ν1 for the mass m1 and the pairs G_ρ&G_σ2

are connected with the graviton G_β in the direction of the other mass m2. Case 2) in Figure 4 will be discussed further in the following. In order to describe the interaction in gravity by gravitons between two masses, at least six independent four-dimensional gravitons μ, ν, σ, ρ, α and β with different action are required.

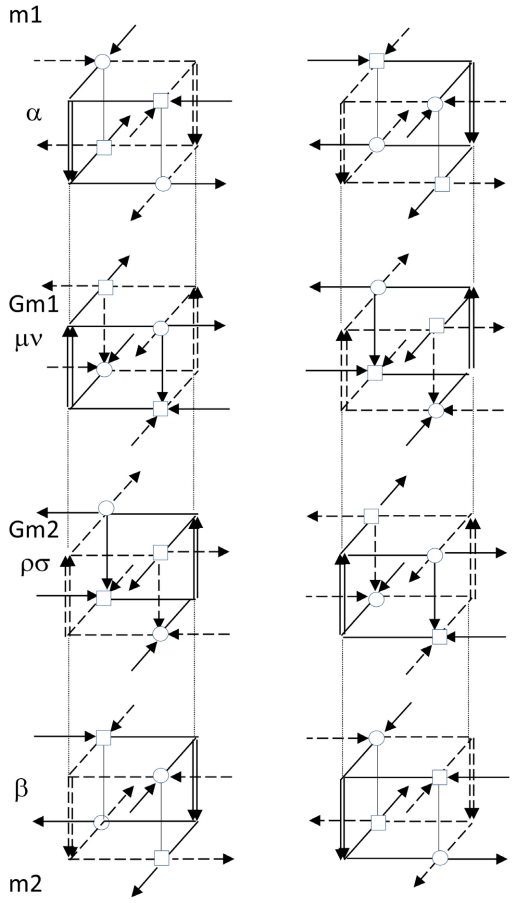

Figure 4. Simulation of the Ricci tensor on the correlation space. Only one cube of the four μ coordinates of the virtual gravitons of the respective four blocks is displayed in a state. The overlapping gravitons are reproduced separately in the form of unit cubes. Left row and right row and the two graviton pairs Gm1 and Gm2 must be superimposed for the observation of an interaction. Positive currents, represented by solid lines and arrows, negative ones by discontinuous lines and arrows. The gravitons G_α and G_β dock with their creator and annihilator levels respectively to the corresponding planes of the superimposed graviton pairs Gm1 and Gm2.

We first analyze the Ricci tensor for their endowment with independent coordinate systems and choose the following representation for it, [4] (p. 1000):

$$R_{\mu\nu} = \frac{1}{2} g^{\rho\sigma} \left(g_{\mu\nu,\rho,\sigma} + g_{\rho\sigma,\mu,\nu} - g_{\rho\mu,\mu,\sigma} - g_{\mu\sigma,\rho,\nu} \right) + g^{\rho\sigma} g_{\alpha\beta} \left(\Gamma^{\alpha}_{\rho\sigma} \Gamma^{\beta}_{\mu\nu} - \Gamma^{\alpha}_{\rho\nu} \Gamma^{\beta}_{\mu\sigma} \right) \quad (1a)$$

$$R_{\rho\sigma} = \frac{1}{2} g^{\mu\nu} \left(g_{\rho\sigma,\mu,\nu} + g_{\mu\nu,\rho,\sigma} - g_{\mu\rho,\rho,\nu} - g_{\rho\nu,\mu,\sigma} \right) + g^{\mu\nu} g_{\alpha\beta} \left(\Gamma^{\alpha}_{\mu\nu} \Gamma^{\beta}_{\rho\sigma} - \Gamma^{\alpha}_{\mu\sigma} \Gamma^{\beta}_{\rho\nu} \right) \quad (1b)$$

(1a) describes the curvature in the pairs μ,ν and (1b) the curvature in the

pairs ρ,σ, both at the site of the interaction between the gravitons ρ,σ and μ,ν. The graviton pair σ,ρ in (1a) acts on the graviton pair μ,ν, from which the curvature $R_{\mu\nu}$ and in (1b) the graviton pair μ,ν acts on the graviton pair σ,ρ, from which the curvature for $R_{\rho\sigma}$ follows. The six coordinate systems are visible in the Ricci tensor: μ, ν, σ, ρ, α and β. Thus, the Ricci tensor also contains six four-dimensional coordinate systems. Two further coordinate systems are also contained in the Christoffel symbols and in the metrics,

$$\Gamma^{\alpha}_{\rho\sigma}dx^{\rho}dx^{\sigma}=\frac{\partial x^{\alpha}}{\partial\xi^{\gamma}}\frac{\partial^{2}\xi^{\gamma}}{\partial x^{\rho}\partial x^{\sigma}}dx^{\rho}dx^{\sigma},\quad g_{\rho\sigma}=\eta_{\kappa\gamma}\frac{\partial^{\kappa}\partial\xi^{\gamma}}{\partial x^{\rho}\partial x^{\sigma}} \tag{2}$$

We want to designate the coordinate systems contained in the Christoffel symbols and in the metrics uniformly with κ and γ and initially refrain from detailing the individual expressions.

To compare gravity in the PIT with the curvature of GRT, let's assume that each individual graviton can be assigned to one of the coordinate systems of GRT with a four-dimensional coordinate system of a central four block. Each of the metrics, e.g., $g_{\alpha\beta}$, contains, apart from their representation by κ and γ, two four-dimensional coordinate systems, in this case α and β, *i.e.*, in the sense of the PIT, the interaction of two individual gravitons of the form $G_{\alpha}\&G_{\beta}$. This interaction is discussed in detail in Section 5 and Section 6.

Following the representation of the Ricci tensor, we describe the interacting graviton pairs $G_{\rho}\&G_{\sigma}2$ and $G_{\mu}\&G_{\nu}1$ with a product of the metrics of the shape $g^{\rho\sigma}g_{\mu\nu}$, in which there are four coordinate systems corresponding to four individual gravitons (their central four blocks). These represent the overlying gravitons $G_{\mu}\&G_{\nu}1$ and $G_{\rho}\&G_{\sigma}2$. In order to transfer the events from the GRT reality to the correlation space, we choose the distance between the creator and annihilator plane in the correlation structure of the gravitons, which is described by the vertical correlations in the cubes, for the distance between the respective coordinate systems, e.g., dx^{μ} and dx^{ν}. This choice is based on the fact that the vertical correlations in the correlation structures represent the connection of the correlation space with space-time and, through currents, represent the content of action generated by currents from the creators to the annihilators [3]. In the illustration in **Figure 4**, the vertical correlations interact directly with each other through overlap, as will be discussed below, and therefore allow a simple interpretation of the information transfer via the vertical correlations between the gravitons in the vacuum and with the basic structure representing the masses. The choice of thus corresponds to the overlap of the two graviton pairs Gm1 = $G_{\mu}\&G_{\nu}1$ and Gm2 = $G_{\rho}\&G_{\sigma}2$ of two different masses m1 and m2.

For the interpretation of the gravitational interaction in the context of the PIT, based on the representation of the curvature tensor in the GRT, we choose as a model the schematically described relationships between the gravitons by correlations in **Figure 4**. (To put it simply, only one of the four μ coordinates is shown in **Figure 4** by a unit cube of the four block.) The two graviton pairs Gm1 = $G_{\mu}\&G_{\nu}1$ and Gm2 = $G_{\rho}\&G_{\sigma}2$ overlap in a common oscillation and the gravitons

interacting with them from the masses with the four blocks α and β provide additional information of the masses m1 and m2 into the two graviton pairs G_μ&G_ν1 and G_ρ&G_σ2 by docking to them.

Due to the interaction of the two graviton pairs with each other and with the gravitons, which transmit the information of the masses m1 over G_α and m2 over G_β, the vertical correlations in the graviton pairs are on top of each other and the gravitons emitted by the masses are attached to the graviton pairs in the direction of the masses. This is indicated in Figure 4 by the dotted connecting lines. **The vertical correlations therefore together form a common current during an oscillation phase, which is generated by the contributions of the action of the gravitons involved and the masses.** This current, generated by the creators to the annihilator, is formed by the contributions of all the O-X oscillators involved and determines the interaction between the oscillators of the two masses via the interaction between the graviton pairs in a vacuum.

The changes of the creators and annihilators in the basic structure during the oscillation of information between active and non-active four blocks, are transferred to the gravitons in a vacuum. The information formed by this interaction is content in the vertical correlations during the superposition of the gravitons, es depicted in Figure 4. The oscillation between two states occurs simultaneously between the two overlapping graviton pairs in direct connection with the masses m1 and m2; this can be seen as an entanglement between gravitons and the oscillators of the masses[1]. According to the Ricci tensor the two oscillation phases on the correlation space form a point of manifold in space-time. The individual contributions will now be discussed in more detail on the basis of the Ricci tensor.

In order for the two graviton pairs G_μ&G_ν1 and G_ρ&G_σ2 to overlap for an interaction, they must have rectified correlations and therefore, if they come from different sources, they must be in different states, Figure 1. This is the case, for example, if we consider two masses that interact with each other in a straight line of connection and overlap in two different states. As shown in Section 6.3, during the interaction the currents cancel each other out, except for the difference of currents, leaving the differences, the four-dimensional deltas of information, which are absorbed by both masses and, due to the minimization of the action, trigger the movement towards each other. The superimposed graviton pairs G_μ&G_ν1 and G_ρ&G_σ2 are joined by the two gravitons G_α and G_β by docking the annihilators of the graviton plane α and β to the annihilator plane (or creator plane to creator plane) of the graviton pairs Gm1 and Gm2, Figure 4.

The first summand in the Ricci tensor (1) contains only the four coordinate systems μ, ν, ρ, σ *i.e.* the coordinates of the graviton pairs G_μ&G_ν1 and G_ρ&G_σ2, *i.e.* it describes the interaction between them. In the PIT this always takes place in two full oscillation phases (in four states), in which all correlation directions are reversed during the oscillation between two states and the signs of all $\mu = 0$ oscil-

[1]Entanglement in the PIT is described by the superposition of creators among each other and annihilators among each other [1].

lators change. In order to transfer the statements of the first summand in the Ricci tensor to the interaction of the gravitons of the PIT, we consider the interaction between the two graviton pairs G_μ&$G_\nu 1$ and G_ρ&$G_\sigma 2$ from the point of view of the PIT, based on the structure of the first summand of the Ricci tensor. In the following discussion, it should be noted that in the oscillation phases between two states, all changes in the properties under the flow of currents take place simultaneously due to the Hamiltonian principle and that in the absence of further interaction in the rest frame (*i.e.*, the lack of influence of gravitons G_α and G_β), the initial state is reached after two oscillation phases.

The first summand in the brackets formulates in the Ricci tensor the interaction of the two graviton pairs G_μ&$G_\nu 1$ and G_ρ&$G_\sigma 2$ in two full oscillation periods, described in the Ricci tensor by the products of the form: $g^{\rho\sigma}g_{\mu\nu}$. Thus, while in GRT we consider a point of manifold, in PIT we have to consider the emergence of this point on the correlation space during two two-phase oscillations.

We first consider the product: $+g^{\rho\sigma}g_{\rho\sigma,\mu,\nu}$, which represents the superposition of two phases of the graviton pair $g^{\rho\sigma}$, where one of the phases has been changed by currents of the pair $g_{\mu\nu}$. The product describes the change of coordinates μ and ν in the graviton pair $g_{\rho\sigma}$ as a result of the changes in the currents in the graviton pair $g_{\mu\nu}$. In GRT, the metrics are defined in the form (1) by (2). However, the expression is missing the coordinates μ and ν. In the sense of GRT, the metrics in the Ricci tensor are unknown and sought in the field equations. The μ and ν dependencies are contained in the gravitons that are formed in the product $g^{\rho\sigma}g_{\mu\nu}$ as a result of the interaction with the graviton pair $g^{\rho\sigma}$. This interaction takes place in $+g^{\rho\sigma}g_{\mu\nu,\rho,\sigma}$, *i.e.*, also simultaneously in the pair $g_{\mu\nu}$.

With the two summands $+g^{\rho\sigma}g_{\rho\sigma,\mu,\nu}$ and $+g^{\rho\sigma}g_{\mu\nu,\rho,\sigma}$, the currents are recorded from $g^{\rho\sigma}$ to $g_{\mu\nu}$ and from $g_{\mu\nu}$ to $g^{\rho\sigma}$ after two full oscillation periods. The internal opposing flows taking place simultaneously in an oscillation, which take place in $g^{\rho\sigma}$ and in $g_{\mu\nu}$ and collectively determine the final result $+g^{\rho\sigma}g_{\rho\sigma}$ by the two-part oscillation period in $-g^{\rho\sigma}g_{\mu\sigma,\rho,\nu}$, and $-g^{\rho\sigma}g_{\rho\nu,\mu,\sigma}$ (see Section 6.2). The expression in the brackets of the first summand thus results in the balance of the interaction of two graviton pairs $g^{\rho\sigma}$ and $g_{\mu\nu}$ after two full oscillation periods. The reflux affects all four gravitons: μ,ν,ρ,σ. If the action contained in both pairs is the same, then nothing changes after an oscillation period and the sum in parentheses at the end of the two-part oscillation period is equal to that at the beginning of the oscillation phase (it is equal to zero in the rest frame, see Section 6.3). If the action is different between the two pairs, which is usually the case, then the oscillation period has led to a balancing of the action in both pairs $g^{\rho\sigma}$ and $g_{\mu\nu}$ and has passed the information on to the masses.

In the sense of the PIT, the changes in coordinates in the first summand of the Ricci tensor describe the dynamic flow of action between both graviton pairs G_μ&$G_\nu 1$ and G_ρ&$G_\sigma 2$ during two full oscillation periods, during which information is exchanged between them. The oscillation phase leads to a balancing of

the information in both pairs. On the basis of the oscillation within the framework of the PIT, this is discussed further in Section 5.

The graviton pairs G_μ&G_ν1 and G_ρ&G_σ2 naturally interact with their surroundings, which is represented by the second summand in the Ricci tensor (1). The essential content of the second summand is the Christoffel symbols (2). In the PIT, the product of the Christoffel symbols $\Gamma^\alpha_{\rho\sigma}\Gamma^\beta_{\mu\nu}$ represents a correlation between two pairs of gravitons[2] $\mu\nu$ with $\sigma\rho$, which also undergo a change as a result of the interaction between $g_{\alpha\beta}$, *i.e.*, the action of the masses m1 and m2 and the changes in $g^{\rho\sigma}$ and in $g_{\mu\nu}$, described by the products of the Christoffel symbols. In this context, κ and γ are two other four-dimensional systems with action, generally described in the PIT as peripheral four blocks of gravitons, **Figure 1**, whose changes influence the second (and first via the metrics) summand. We consider the four Christoffel symbols separately and assume that the dynamics in the second derivative represent the change of currents beyond the internal oscillation, *i.e.*, the inflow/outflow of the action, from the gravitons G_α and G_β into the double pair G_μ&G_ν1 and G_ρ&G_σ2.

As a result of the changes in the graviton G_β the vertical distances dx^β change by ∂x^β and the changes $\partial\xi^\kappa$ and $\partial^2\xi^\kappa$ in the peripheral four blocks cause additional changes in dx^μ and dx^ν by ∂x^μ and ∂x^ν: The changes in the action in the gravitons G_α and G_β cause changes in the vertical correlations of the graviton pairs. As a result of the influence of the mass m2 by means of the graviton G_β, a change in the vertical correlations in the graviton G_β and in the superimposed gravitons G_μ and G_ν is affected. The changes $\partial\xi^\kappa$ and $\partial^2\xi^\kappa$ thus mediate changes in the pair $g_{\mu\nu}$ during the influence of gravitons of the mass m2. Similarly, the correlation of $g_{\alpha\beta}$ with the symbol $\Gamma^\alpha_{\rho\sigma}$ in the graviton G_α causes a change in the currents in the vertical distances dx^ρ and dx^σ with ∂x^ρ and ∂x^σ. These changes cause changes in the vertical correlations of the gravitons: $g^{\rho\sigma}$.

As a result of the action of the mass m1 over the graviton G_α a change in the gravitons G_ρ and G_σ is affected. The product $\Gamma^\alpha_{\rho\sigma}\Gamma^\beta_{\mu\nu}$, whose factors $\Gamma^\alpha_{\rho\sigma}$ and $\Gamma^\beta_{\mu\nu}$ correlations describe them on the correlation space, therefore causes further changes due to the masses m1 and m2 during their oscillation behavior, in addition to the changes resulting from the oscillation of the graviton pairs Gm1 = G_α&G_β1 and Gm2 = G_α&G_β. Since in a full oscillation period there is always a simultaneous flow of information in the opposite direction (Section 6.2), the simultaneous flow back to the masses must also be taken into account the contribution of $-\Gamma^\alpha_{\rho\nu}\Gamma^\beta_{\mu\rho}$ for the flow from $g^{\rho\sigma}g_{\mu\nu}$ to $\Gamma^\alpha_{\rho\sigma}\Gamma^\beta_{\mu\nu}$ for a balance of the action; both together determine the action in the superimposed graviton pairs Gm1 = G_μ&G_ν1 and Gm2 = G_ρ&G_σ under the influence of the masses m1 and m2 after

[2]The two states of a graviton on the correlation space can be regarded as the two conjugated complex representations of the graviton, because they have opposite correlation directions. A state on the correlation space of a graviton therefore corresponds to a complex representation on space-time. The occurrence of graviton pairs causes the masses to be real. The field equations are real because they contain the real mass and energy on the right side and products of gravitons on the left.

a full oscillation period.

The balance of the action in the graviton pairs that are decisively effective in G_ρ&$G_\sigma 2$ on m2 or G_μ&$G_\nu 1$ on m1 is, as a result of the superposition of the gravitons, doubly described after their interaction with two superimposed graviton pairs; therefore, only one of the two graviton pairs in m1 or in m2 is effective. Therefore, the Ricci tensor needs a factor of 1/2 in its first summand. In this form, it represents one of the two products G_μ&$G_\nu 1$ or G_ρ&$G_\sigma 2$.

The field equations also contain the summand $-\frac{1}{2}g^{\mu\nu}R$ [3]. The value $-g^{\mu\nu}R$ subtracts from the double of the Ricci tensor $2R_{\mu\nu}$ each a four block μ and ν. This corresponds to a four block in each of the two overlapping gravitons G_μ or G_ν; In an oscillation process, one of the two gravitons G_α and G_β is absorbed and the other is emitted at the same time (Section 6.2), whereby only one is deposited in each case for the change of action in the respective memory of the movement of the mass (cf. (4) in Section 6.3). The curvature represented by the Einstein tensor can therefore be formally interpreted in the PIT by the oscillation model of Figure 4 by the interaction of the gravitons with each other and with the basic structure for the masses.[4]

The metric $\eta^{\kappa\gamma}$ in $g^{\mu\nu}$ indicates that the action always interacts with different signs between $\mu = 0$ and $\mu = \mathrm{i}$. This applies in general to the action, *i.e.*, also to the action of gravitons. Since the peripheral four blocks act on the central four block, which then determines the properties of the interaction, it can be assumed that it is mainly the central four-block that is active in the properties and interaction of the gravitons.

On the basis of the comparison of the Ricci tensor with the structure of the gravitons of the PIT, the joint oscillation of the basic structure with the gravitons in the vacuum and the interaction between the masses will be investigated using the illustration of Figure 4. In the present work, it is shown that the interaction between masses can be described with the help of the exchange of physical information in the form of four blocks. By assuming that the influence of the peripheral four blocks is already at work in the central four block and that the action on the vertical correlations is described, we simplify the representation of the interaction between the unit cubes of the central four blocks. The model of information exchange thus offers the possibility to describe all information by overlapping the vertical correlations. In physical reality, it must be assumed that both the gravitons and the oscillators of the basic structure are networked and that in the case of strong curvature, the peripheral areas of this network must be taken into account.

4. Oscillation Behavior of the Basic Structure

According to the pattern of Figure 4, the oscillation in the overlapping gravitons

[3]The influence of cosmological constants $+\Lambda g^{\mu\nu}$ will be briefly discussed in Section 7.

[4]The second summand of the Ricci tensor contains the break of the symmetry, caused by interaction, present in the first summand. Symmetry break is always associated with the formation of space-time: as a result of the interaction, there is a change in the motion in space-time.

in a vacuum, Figure 1, is to be connected with the interaction in the masses, *i.e.*, within the framework of the PIT with the basic structure, Figure 3. For this purpose, the oscillation behavior of the basic structure is analyzed in the following. This is responsible for the formation of gravitons and their information.

The basic structure contains two independent oscillation systems, activated by two different O-X oscillators. One system: the positive (α) and negative (β) active four blocks, is connected to the gravitons (and static photons, [1]) and performs a common oscillation with them. According to our ideas, they store the information of the movement. The second O-X oscillation system, which is also formed by a positive and a negative non-active four block, is not directly connected to the gravitons $G_{\mu}\&G_{\nu}1$ and $G_{\rho}\&G_{\sigma}2$, forms a fixed amount of action according to our ideas and describes the oscillators of mass. In this section, we will investigate, how the mass in the non-active four blocks forms gravity in the vacuum, *i.e.*, in the gravitons. This is done by transferring the information of the non-active four blocks of the mass to the active four blocks of the motion in a common oscillation.

The currents of the two O-X oscillator systems leading from the creators to the annihilators overlap in a common oscillation in the cubes of the basic structure, Figure 2, and thus exchange their information. Figure 5 schematically describes the interaction of the correlations between the changes in the vector components within the four different cubes that make up the four blocks of the basic structure for the state Ω1 of the α-four block, Figure 3. For the analysis of the information transfer between the active and non-active four blocks of the basic structure, the four unit-cubes Ω1-A, Ω1-B, Ω1-C and Ω1-D from Figure 2 in Figure 5 are considered, which in the event of an oscillation in interaction with the gravitons enter the corresponding states Ω2 and return to Ω1 in the following phase. Each unit cube in the four block of the basic structure contains two O-X oscillators of the coordinate $\mu = 0$, each of which is formed independently of each other by vector components and can therefore generate different actions.

One of the two O-X oscillators is formed by the active four blocks, Figure 3, and is highlighted in Figure 5 by reinforced lines for the currents between creator and annihilator. The second O-X oscillator in the cubes of the four blocks is formed by the non-active four blocks and is represented by thinner lines for the flows between creator and annihilator in Figure 5 and only indicated in Figure 3. The directions of the arrows in Figure 5 indicate the current circulation directions in the O-X oscillators (not the directions of the vertical correlations); Positive from right to left. Thus, in Ω1-A and in all other representations, the upper arrows from right to left indicate the positive direction of circulation in the cubes and the corresponding lower three arrows the negative direction of circulation. The addition and subtraction between the correlations of the overlapping changes within the cubes are indicated by rectangles as follows: rectangles up as addition and rectangles down as subtraction. Addition is defined as an overlap of rectified correlations if the overlapping correlations have the same signs, as subtraction if they have different signs.

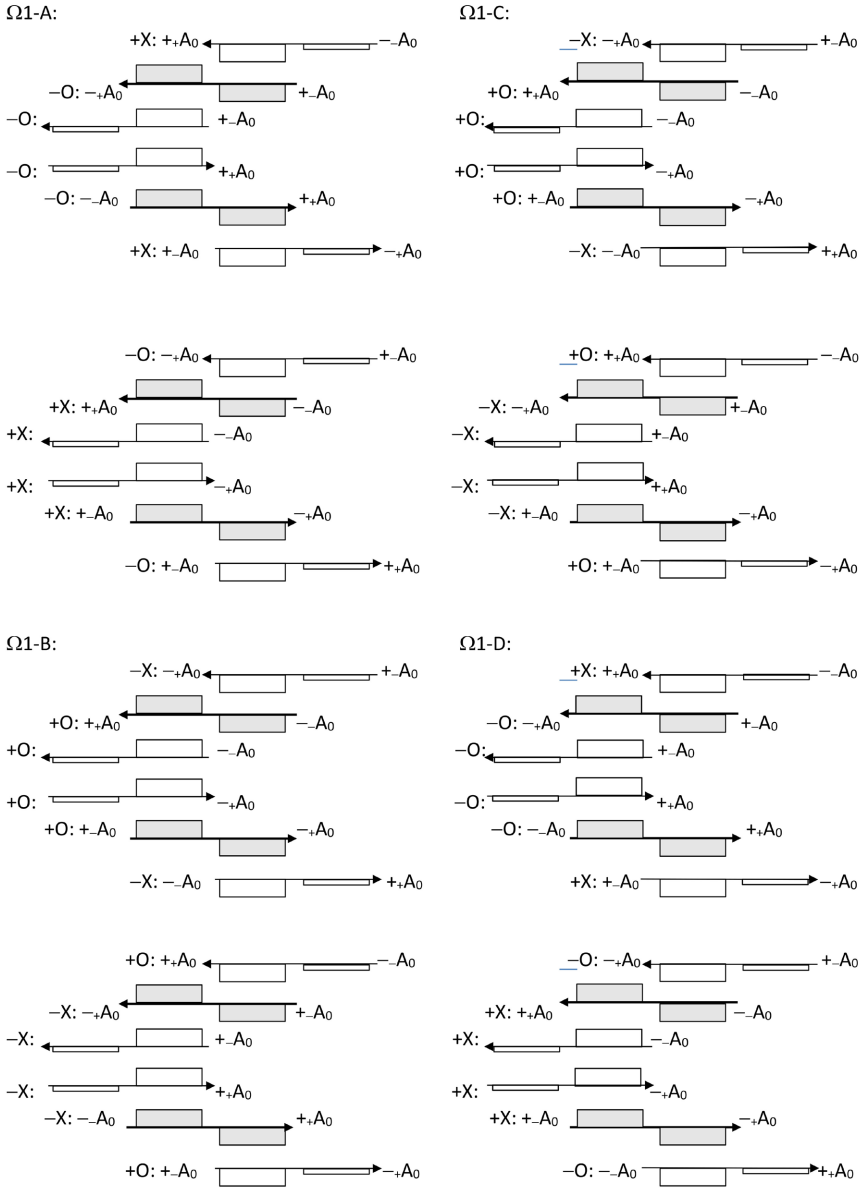

Figure 5. Information transfer between active and non-active four blocks of the basic structure during oscillation within the four different unit cubes of the state Ω1 in the α-four block (**Figure 2**, **Figure 3**). Arrows indicate the direction of current circulation within the cubes, positive from left to right, reinforced arrows describe the currents in the active four blocks, thin arrows of the non-active four blocks. Rectangles upwards positive, downwards negative information transmission.

Starting from the creator, two horizontal correlations overlap within the cubes between active and non-active currents, and in this way mutually transfer their information to each other as the difference or sum of the currents in the form of correlations of the changes of the creators and changes of the annihilators. We want to refer to the correlations at the creator plane as those of the past and that of the annihilator plane as that of the future. The horizontal correlations are followed by a vertical correlation in the cubes, in which the correlations interact ad-

ditively only within equal four blocks, *i.e.*, there is no direct exchange of information between active and non-active four blocks (they are formed separately by the active O-X oscillator). These correlations are not shown in Figure 5, they are located between past and future and are discussed in Section 6.4. After the vertical correlations in the direction of the annihilators, there is again an overlap between horizontal active and non-active correlations; these, formed in the annihilator plane, we call the ones in the future. The overlap that takes place here always has the opposite sign to the sign of information in the past. The transfer of information within the cubes corresponds to an oscillation between positive and negative values of the correlations, formed by the superposition between changes in the creators and the changes in the annihilators.

First, the information transfer for the active O-X oscillators in Ω1-A is considered. The currents are marked by reinforced lines in Figure 5. Information from the non-active O and X correlations is transferred to the active correlations. On the positive current of the active O(−) oscillator (sign in brackets, sign of the action of oscillators), the past of the non-active O(−) transmits a positive signal to its future, and the future of the non-active X(+) oscillator to the past of the active O(−) oscillator a negative signal. If we assume that the process corresponds to an oscillation, then a negative signal is finally transmitted to the annihilator of the active O(−) oscillator by the two O- and X-non-active oscillators, reversing the sign as a result of the oscillation[5]. This signal increases the negative value of the active annihilator of O(−) as a result of the interaction with the non-active four block.

If we consider the negative O(−) current of the active oscillator in Ω1-A, Figure 5, a positive signal is transmitted to the future from the non-active O(−) oscillator to its past, and from the past of the non-active X(+) oscillator to its future a negative signal that appears as a positive signal in the following annihilator and thus increases the positive value of the vector potential component. By negatively increasing the negative value of the annihilator in O(−) and positively increasing the positive value of the annihilator, the active O(−) oscillator is increased in its negative action by a contribution, caused by the inactive four block. The size of the creators and annihilators determines the amount of action in an oscillator. The two O and X oscillators of the non-active four block contribute to the amplification of the active O(−) oscillator.

If we consider the active X(+) oscillator in the same way in Ω1-A, then the positive values of the action are simultaneously reduced by the non-active O-X oscillators by the same value as the negative O(−) oscillator is increased in its negative value. Thus, the action of the negative O(−) oscillator is increased in its negative

[5]We interpret the mutual transfer of information between active and non-active currents within the cube as the generation of an oscillation between positive and negative values of the currents. If there is a positive signal in one area, then an oscillation in the following correlation area will result in a negative signal and vice verse. However, one could also assume that the last signal occurring in the cube with the same sign is also transmitted to the annihilators. In this case, all signs of the signals must be reversed in the following. The principle of information transfer would not change fundamentally. We therefore stick to the interpretation of information transfer as a process of oscillation.

value and at the same time the positive X(+) oscillator is reduced in its positive value.

Consequence of the oscillation phase Ω1-A in the interaction between the active and non-active O-X oscillators in the unit cubes Ω1-A is thus a decrease in X(+) of the positive action and an increase of the same amount in O(−) of the negative action of the active O-X oscillator. Positive and negative information (in the form of four blocks) has been transferred from the non-active four block to the active four block, *i.e.*, information from the oscillators of the mass to the oscillators of the information of motion.

At the same time as the oscillation of the active O-X oscillator in Ω1-A, the non-active O-X oscillator is also affected. In the future, the non-active O(−) oscillator receives a positive signal for its negative current, which corresponds to a negative signal in the positive annihilator. The positive current receives a negative signal, which corresponds to a positive signal in the negative annihilator, so its value is reduced, and thus the action is reduced. Accordingly, the non-active X(+) oscillator is increased in its action as a result of the interaction. **During the oscillation phase Ω1-A, the action in the active O-X oscillator is increased in O and decreased in X, and in the case of the O-X oscillator of the non-active currents, there is at the same time a decrease in O and an increase in X.**

Figure 5 shows the following changes in the action during a full phase of the oscillation of the cubes, Figure 2, between the states Ω1 and Ω2:

Ω1-A: active O(−) is increased, active X(+) is decreased, non-active O(−) is decreased, non-active X(+) is increased,

Ω1-B: active O(+) is decreased, active X(−) is increased, non-active O(+) is increased, non-active X(−) is decreased,

Ω1-C: active O(+) is decreased, active X(−) is increased, non-active O(+) is increased, non-active X(−) is decreased,

Ω1-D: active O(−) is increased, active X(+) is decreased, non-active O(−) is decreased, non-active X(+) is increased.

The above analysis of the formation of a signal of the non-active four blocks on the active four block concerns only one phase of the oscillation. In the following part of the two-part oscillation period, the creator, who then becomes the annihilator, undergoes a corresponding change in the information. The analysis of all cubes in both oscillation phases for the two four blocks α and β and the active and non-active currents are summarized in Table 1 and schematically shown in Figure 6(a).

The information transmitted from the non-active currents to the creators and annihilators of the active four blocks causes opposite changes in the action in O and X: if the action is increased in one of the two O or X oscillators, it is reduced in the other with the opposite sign and the same amount. The transmission of the signals from the non-active to the active four blocks creates a **spread of the action** in the O-X oscillators. The oscillation of the active and non-active four blocks against each other is the **basis of inertia**.

Table 1. Result of the transfer of information between active and non-active four blocks: sign of the delta Δ for all four unit cubes A, B, C and D, for the two four blocks α and β, for both states Ω1 and Ω2 and for the active a and non-active na four blocks (The delta Δ describes, depending on the sign, the increase or decrease of the action in the oscillator, e.g. from Ω1-A the action in the O(−) oscillator increases and decreases in X(+). The delta Δ is already the result of a full oscillation, *i.e.* after the creator and annihilator have been changed.)

aΩ1-A + Xa − Δ	Ω1-A + Xna + Δ	aΩ1-A − Oa + Δ	Ω1-A − Ona − Δ
aΩ1-C − Xa − Δ	Ω1-C − Xna + Δ	aΩ1-C + Oa + Δ	Ω1-C + Ona − Δ
aΩ1-B − Xa + Δ	Ω1-B − Xna − Δ	aΩ1-B + Oa − Δ	Ω1-B + Ona + Δ
aΩ1-D + Xa + Δ	Ω1-D + Xna − Δ	aΩ1-D − Oa − Δ	Ω1-D − Ona + Δ
aΩ2-C − Xa + Δ	Ω2-C − Xna − Δ	aΩ2-C + Oa − Δ	Ω2-C + Ona + Δ
aΩ2-A + Xa + Δ	Ω2-A + Xna − Δ	aΩ2-A − Oa − Δ	Ω2-A − Ona + Δ
aΩ2-D + Xa − Δ	Ω2-D + Xna + Δ	aΩ2-D − Oa + Δ	Ω2-D − Ona − Δ
aΩ2-B − Xa − Δ	Ω2-B − Xna + Δ	aΩ2-B + Oa + Δ	Ω2-B + Ona − Δ
βΩ1-B − Xa + Δ	Ω1-B − Xna − Δ	βΩ1-B + Oa − Δ	Ω1-B + Ona + Δ
βΩ1-D + Xa + Δ	Ω1-D + Xna − Δ	βΩ1-D − Oa − Δ	Ω1-D − Ona + Δ
βΩ1-C − Xa − Δ	Ω1-C − Xna + Δ	βΩ1-C + Oa + Δ	Ω1-C + Ona − Δ
βΩ1-A + Xa − Δ	Ω1-A + Xna + Δ	βΩ1-A − Oa + Δ	Ω1-A − Ona − Δ
βΩ2-D − Oa + Δ	Ω2-D − Ona − Δ	βΩ2-D − Oa + Δ	Ω2-D − Ona − Δ
βΩ2-B + Oa + Δ	Ω2-B + Ona − Δ	βΩ2-B + Oa + Δ	Ω2-B + Ona − Δ
βΩ2-A − Oa − Δ	Ω2-A − Ona + Δ	βΩ2-A − Oa − Δ	Ω2-A − Ona + Δ
βΩ2-C + Oa − Δ	Ω2-C + Ona − Δ	βΩ2-C + Oa − Δ	Ω2-C + Ona + Δ

The effect of the interaction between the active and the non-active currents on the creators and annihilators is shown in Figure 6 for the active four blocks for α and β and for the two states Ω1 and Ω2. Figure 6(a) graphically shows the change of action transferred from the non-active four blocks to the active four blocks. A positive or negative current circulating in a four-block has in common the creators and annihilators. With the change of state, the deltas reverse their signs together with the action of the movement. The linking of the transmitted information of the unit cubes in the four block ensures that after a full oscillation, all parts of the four blocks experience an information change (although only two of the four cubes receive information from the interaction, Section 6.2).

As can be seen from Figure 6(a), the deltas of the masses on the active four blocks form changes in action in the same way as the unit cubes are linked to each other by currents: **the deltas of the action form four blocks, they are the information of the mass that is transferred to the active four blocks and is exchanged as information in an interaction**. As can be seen in Figure 6(a), the four blocks oscillate between the states by exchanging directions of the currents and the signs of the action. The illustration in Figure 6(a) also describes the internal

oscillation of the active four-block of the basic structure, without the involvement of the gravitons. If Figure 6(a) were supplemented by the non-active four blocks, they would have the opposite correlation directions and the opposite values of the delta Δ, which is shown from the cubes of Figure 2 and would correspond to the basic structure that is missing in the gravitons. **The opposing behavior of the active and non-active four blocks is the basis of inertia**.

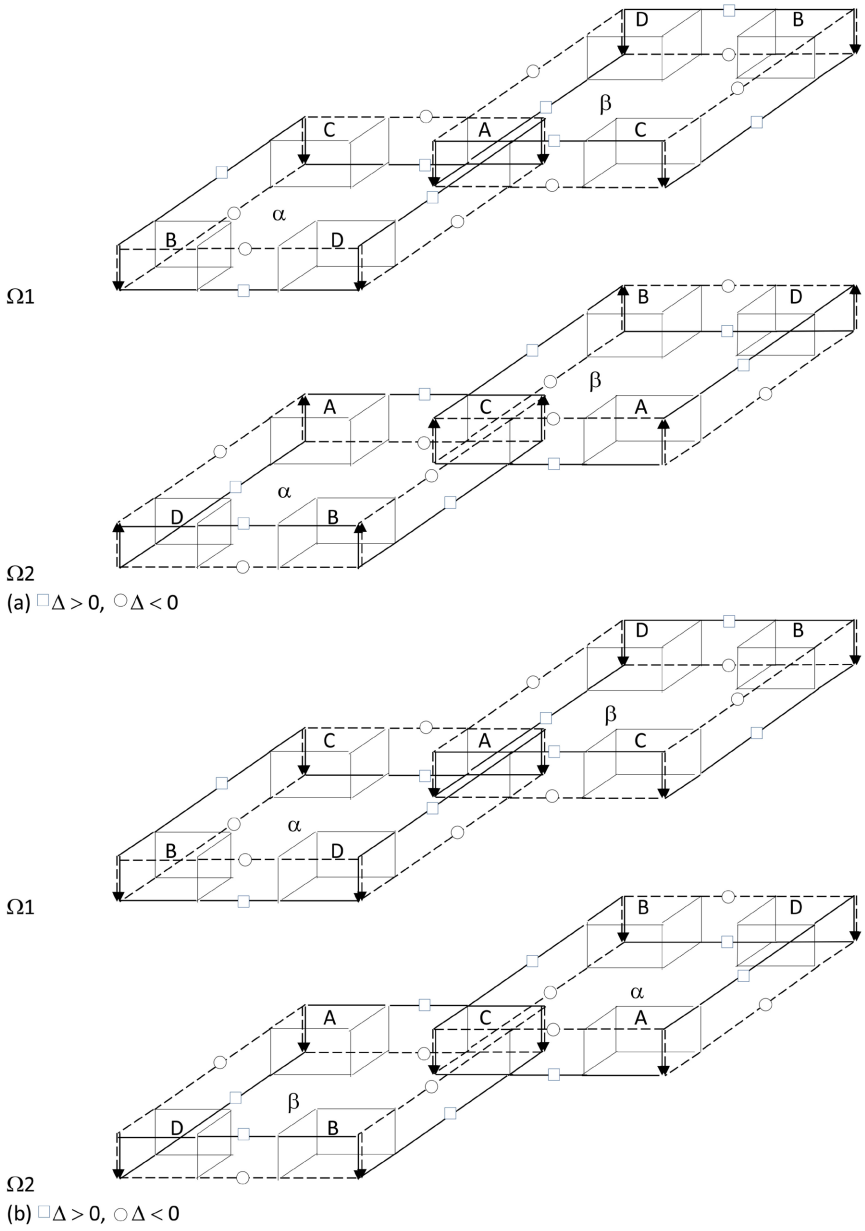

Figure 6. Schematic representation of the active α and β four blocks. The deltas Δ describe the change of action (squares positive, circles negative) in the O-X-oscillators of active four blocks. The continuous lines connect positive deltas of the action, the discontinuous lines negative deltas of the action, generated by the mass in the active four blocks. (a) Two oscillation states, (b) One state of the interaction geometry for two masses in two different states of the gravitons.

5. Oscillation between Basic Structure and Gravitons at a Rest Frame

In the field equations, the curvature of space is caused by the mass, which is described by the equality of the Einstein tensor with the energy momentum tensor. In the present investigations, the link between the interaction of gravitons in the vacuum and the source of gravity in the mass is to be described by a joint oscillation process of the gravitons with the oscillators of the mass, *i.e.*, the basic structure. In such a linkage, this interaction corresponds to entanglement and should first be considered for a mass in a vacuum otherwise free of gravity.

For a geometrical reason, as **Figure 6(a)** shows, the information is exchanged between the α four blocks among themselves and between the β four blocks among themselves. Schematically, this is shown in **Figure 4** by the fact that the two gravitons G_α and G_β adhere to the graviton pairs Gm1 and Gm2. In this case, the properties of the oscillator of the basic structure α are transferred to the properties of the graviton α and correspondingly for β. If the basic structure is in the states Ω, then the properties of the gravitons G_α and G_β are determined by the properties of the active four blocks α and β of the basic structure. In detail, the oscillation mechanism (3) is obtained, which proceeds differently for both oscillators G_α and G_β. The oscillation of the gravitons G_α and G_β is out of phase. The phase-shifted oscillation of α and β causes the interaction to oscillate not in two, but in four states.

According to **Table 1**, for a joint oscillation of the gravitons in a vacuum and of the masses under the condition that there is a causal connection between the oscillators of the masses and the gravitons in the vacuum, the oscillation behavior results in the representation of (3).

Emission	Absorption
$\alpha\Omega$1-A$\rightarrow$ $\alpha\Omega$2-C	$\beta\Omega$1-C$\rightarrow$ $\beta\Omega$2-A
$-+\Delta\rightarrow+-\Delta$	$++\Delta\rightarrow--\Delta$
Interaction	Signal processing
$\alpha\Omega$2-C$\rightarrow$ $\alpha\Omega$1-A$\rightarrow$ $\alpha\Omega$2-C	$\beta\Omega$2-A$\rightarrow$ $\beta\Omega$1-C$\rightarrow$ $\beta\Omega$2-A
$+-\Delta\rightarrow-+\Delta\rightarrow+-$	$--\Delta\rightarrow++\Delta\rightarrow--$
Absorption	Emission
$\alpha\Omega$2-C$\rightarrow$ $\alpha\Omega$1-A	$\beta\Omega$2-A$\rightarrow$ $\beta\Omega$1-C
$+-\Delta\rightarrow-+\Delta$	$--\Delta\rightarrow++\Delta$
Signal processing	Interaction
$\alpha\Omega$1-A$\rightarrow$ $\alpha\Omega$2-C$\rightarrow$ $\alpha\Omega$1-A	$\beta\Omega$1-C$\rightarrow$ $\beta\Omega$2-A $\rightarrow$ $\beta\Omega$1-C
$-+\Delta\rightarrow+-\Delta\rightarrow-+$	$++\Delta\rightarrow--\Delta\rightarrow++$

(3)

When the α-four block is in emission state, the structure $\alpha\Omega$2-C is emitted, which changes in a vacuum to the state $\alpha\Omega$1-A and this changes its state into $\alpha\Omega$2-C, in which the signal is reabsorbed to form the state $\alpha\Omega$-A. In the absorbed state, the state $\alpha\Omega$2-C is formed. In this state, the signal changes within the basic structure to the state $\alpha\Omega$1-A and is emitted in the state $\alpha\Omega$2-C. With the emission of the state $\alpha\Omega$2-C, the state $\beta\Omega$2-A is absorbed and emitted in the β-four block via the oscillations $\beta\Omega$1-C in $\beta\Omega$2-A. As shown in (3), the two four blocks oscillate in the phase shifted.

If one follows for a mass in otherwise gravitation-free space, the information of the graviton G_α or G_β from the emission, the transition in the vacuum, to the following state of absorption and this in the following state and a new emission in the state, then the correlation direction and the sign of the action change with every change of the state, but after a full oscillation, the same initial state is reached again.

The two four blocks α and β are formed by the positive and negative currents of the two active oscillators O and X. In Ω1-A, for example, the positive current X(+−) and the positive current O(++) together form the positive currents in the α-four block, and the negative currents X(−+) and O(−−) the negative currents in the β-four block (First sign, sign of current, second sign, sign of circulation direction.). In Ω1-B, the positive currents X(++) and O(+−) form the positive currents of α and the negative currents X(−−) and O(−+) the negative currents of the β-four block. The four-block is always formed by currents of the same sign, but different direction of circulation of both O and X oscillators. There is always a connection between the α and the β four block in each unit cube.

In (3) the signals of the memory of the motion and the sign of the information by a delta of the information of matter are reproduced as follows: first sign, sign of the action of motion, second sign, sign of delta Δ; the change of action is a result of the action of mass on the oscillators of motion. Both unit cubes are linked to each other in a basic structure, they interact between both four blocks by having common creators or annihilators. The interaction within the basic structure ensures the same signals with different signs: α-Emission: +−Δ, β-Emission: ++Δ. The same signs of motion are emitted, but different signs of the influence of gravity. The signs for motion change in a vacuum from "+ over − again to +", where they are absorbed. The accidentals of the gravitons change in α from "− to + back to −" and at β from "+ to − again to +".

In the case of the emission of the action of the gravitons with different signs for α and β, which is shifted in the phase, the mass is still active, if the emission were simultaneous, both signals of α and β would cancel each other, the signals of the motion, on the other hand, would oscillate in α and β together. Active signals of motion are a prerequisite for the equilibrium between the oscillators in the vacuum and the oscillators of the storage memories. The phase-shifted oscillation makes it possible to circulate the signals of the form: signal 1 passes through the basic structure, signal 2 passes through the vacuum, then signal 1 pass through the vacuum, signal 2 through the basic structure.

A mass in a vacuum without gravity oscillates in four states, separated between the α and β four blocks, two states occur in the mass and two in the gravitons. This model assumes the entanglement of the gravitons in a vacuum with the oscillators of the mass and corresponds to the model of curvature in the Ricci tensor. But one can also imagine field lines linking between the oscillators of mass and the gravitons in a vacuum, which oscillate in such a way that there is a common rhythm of oscillation in the masses and in the gravitons. In any case, this is a sim-

plistic representation of a reality given by a gravitational field that oscillates together with the networked oscillators of mass; the presented model describes only a section of this field.

The interaction between the basic structure in the form of the two four blocks α and β and the gravitons G_α and G_β is analyzed for a mass isolated in a vacuum. It is assumed that the two four blocks oscillate separately together with gravitons and that the oscillation between them occurs in four oscillation states. The oscillation does not lead to a change in the state of the mass, because the emitted information is equal to the absorbed information (compare the oscillation sequence during interaction between two masses, **Figure 8**).

6. Interaction between Two Masses

What causes the masses in the GRT to move in the direction of greater curvature of space [5]? The Einstein tensor only describes the curvature of space, which, when equated with the energy-momentum tensor, describes the curvature caused by mass and energy at a point of manifold, represented by this tensor. For a second mass, one can obtain a second such Equation (1b), which gives two sources of the curvature of space. Two different masses then generate in a common point of manifolds the curvature, which is the cause of the attraction between them. Why does the superposition of the curvatures of the space of both masses cause an attractive force between the masses? The answer to this question by GRT is provided by the equation of motion (8). The object that would move at a constant speed in a non-curved space is accelerated by the curvature of space.

In the PIT, two masses generate gravitons in the vacuum surrounding them. Instead of the curvature of space, the gravitons of both masses interact with each other in a vacuum. The interaction of two masses can thus be described by a force; in PIT, any force acting between two objects is described as an exchange of information. Under the conditions of the Hamiltonian principle, the exchange of information causes a change in the relative motion of the interaction partners; this corresponds to a force in classical physics. In the PIT, the curvature of the space of the GRT is the interaction of the action between the gravitons. In the case of interaction, if the density of the two sources and their signs is different, a difference in information arises, which is the cause of the movement of the masses in relation to each other after absorption by the masses[6]. The unit of information is described by a four block, which is formed for the four space-time coordinates by sources of action. The attractive force is caused by the change in the action in the oscillators of the masses under the condition of the Hamiltonian principle. The cause of acceleration is the change in the action in the memories of the motion of the oscillators of the masses, acceleration occurs by changing the currents in the

[6]It is not the sum of the action, and therefore not the sum of the curvatures of the two masses at the site of the interaction, but their difference that constitutes the interaction. This is the case in the PIT because the superimposed gravitons have opposite signs of the action. In GRT, this is expressed by the different signs of the summands in the Einstein tensor.

vertical correlations[7].

In the preceding sections, we have described how mass (the basic structure) generates information in the gravitons in a vacuum by oscillation between the memories of motion and the memories of mass, which corresponds to the GRT of generating the curvature at a point of manifold by a mass. We simulate the superposition of the curvature of the space of two masses of GRT by **superimposing the information and interaction between the gravitons of two masses at a point in space time and want to show that this interaction causes a movement of the masses to each other**.

6.1. Interaction Formalism

For the interaction between two opposing masses, the interaction geometry given in the image of Figure 6(b) is effective. To do this, the gravitons of the two opposite masses must overlap in different directions of propagation and in different states. The structure of two such gravitons is shown in Figure 1. If, on the other hand, the gravitons are considered in the same direction of propagation, Figure 6(a), then they do not overlap in different states, because their correlation directions have different directions of propagation. They overlap in the same state and reinforce each other.

To simulate the interaction between two masses, let's assume that at the site of the interaction of the gravitons in a vacuum, the gravitons of one of the two masses, be it m2, contains a higher concentration of the action than the other mass m1. To this end, we consider the interaction between the graviton pairs Gm1 and Gm2 of the two masses, assuming that the delta Δ of both graviton pairs of m1 and m2 differ by one delta $\delta = \Delta_2 - \Delta_1 > 0$. The two graviton pairs Gm1 and Gm2 overlap at the site of the interaction (point of manifold, Figure 4) with different emission directions in two different states and, as Figure 6(b) shows, between the two four blocks α and β.

Figure 6(b) shows the properties of the information transferred from the masses to the active four blocks by a delta Δ. The interaction takes place between cubes A and C and between B and D. In the diagram (4), this is indicated by the signs $\uparrow\downarrow$ or $\downarrow\uparrow$ and the sign of the action of the motion from Table 1 of the oscillator by (±). The first arrow up in $\uparrow\downarrow$ describes a positive (down a negative) delta Δ in the oscillator O and the second arrow down describes a negative (up a positive) delta Δ in the oscillator X.

Superimposed are two pairs of gravitons in two states with opposite directions of propagation. Oscillation in two states changes the creator and annihilator of an oscillator. In each interaction between two assigned cubes of the two masses m1 and m2, four transitions overlap in (4) during a full oscillation, two each with a back-and-forth oscillation. Under the assumption $\delta = \Delta_2 - \Delta_1 > 0$ during the two oscillations, these generate two deltas: a positive $+\delta$ and a negative $-\delta$.

[7]The vertical correlations in the cubes correspond to the products of the derivatives in the equations of motion.

Due to the conditions of the Hamiltonian principle, the changes in the information in the form of the delta δ are transferred to the mass m1 and to the mass m2. The oscillation is schematically shown in Figure 7. The interaction between the masses m1 and m2 results in the four-part oscillation of masses and gravitons (gr: graviton, discontinuous parallel lines in Figure 7 mark the area of Figure 4) in (4).

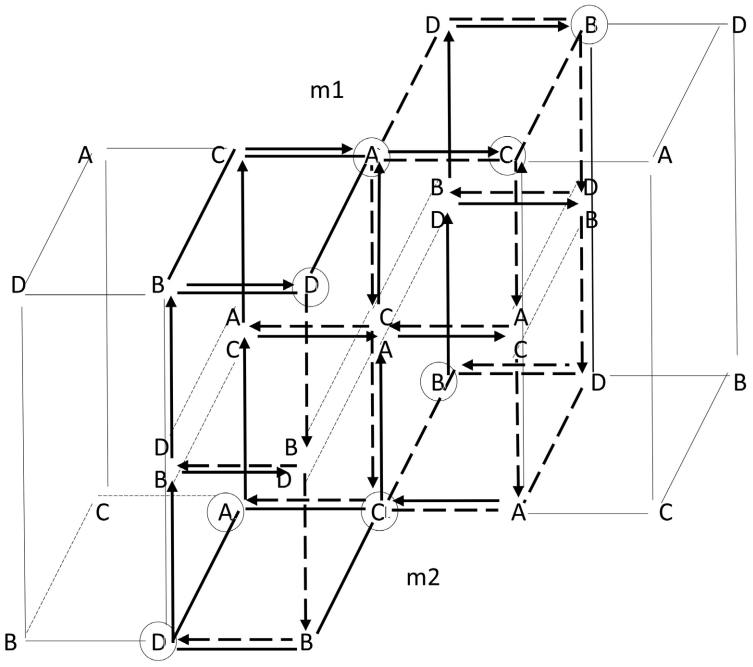

Figure 7. Schematic representation of the changes in the state of the information course between the masses m1 and m2 during the interaction: continuous lines describe the α-four-blocks, discontinuous lines the β-four-blocks, continuous arrows the information flow to the mass m1, discontinuous arrows the information flow to the mass m2. Each arrow signifies a change of state.

$$
\begin{array}{llllll}
\beta m1 & \beta m1 & & & & \\
\beta m1\Omega 1A(-) \leftarrow & \beta m1\Omega 1A(-) & & & & \\
\downarrow & \uparrow & & & & \\
\beta m1\Omega 2C(+) & \beta m1\Omega 2C(+) & & & & \\
\downarrow & \uparrow & & & & \\
: & : & & & & \\
\downarrow & \uparrow & & & & \\
\beta gr\Omega 2C(+) & \beta gr\Omega 1A(+) & fig.4 & & G_\alpha\ \mathrm{G}_\beta & \\
\downarrow & \uparrow & & & & \\
\nu gr\Omega 1A(-) & \mu gr\Omega 1A(-) & \rho gr\Omega 2C(+) \rightarrow & \sigma gr\Omega 2C(+) & \text{Superposition} & \\
\downarrow & \uparrow & \uparrow & \downarrow & \text{Interaction} & (4a) \\
\nu gr\Omega 2C(+) \rightarrow & \mu gr\Omega 2C(+) & \rho gr\Omega 1A(-) & \sigma gr\Omega 1A(-) & Gm1, Gm2 & \\
 & & \uparrow & \downarrow & & \\
 & & \alpha gr\Omega 2C(+) & \alpha gr\Omega 2C(+) & G_\alpha\ \mathrm{G}_\beta & \\
 & & \uparrow & \downarrow & & \\
 & & : & : & & \\
 & & \uparrow & \downarrow & & \\
 & & \alpha m2\Omega 2C(+) & \alpha m2\Omega 1A(+) & & \\
 & & \uparrow & \downarrow & & \\
 & & \alpha m2\Omega 1A(-) \leftarrow & \alpha m2\Omega 1A(-) & & \\
 & & \alpha m2 & \alpha m2 & &
\end{array}
$$

$$
\begin{array}{llllll}
\alpha m1 & \alpha m1 & & & & \\
m1\Omega1C(+) \leftarrow & \alpha m1\Omega1C(+) & & & & \\
\downarrow & \uparrow & & & & \\
\alpha m1\Omega2A(-) & \alpha m1\Omega2A(-) & & & & \\
\downarrow & \uparrow & & & & \\
: & : & & & & \\
\downarrow & \uparrow & & & & \\
\alpha gr\Omega2A(-) & \alpha gr\Omega1A(-) & fig.4 & & & G_\alpha\ \mathrm{G}_\beta \\
\downarrow & \uparrow & & & & \\
\mu gr\Omega1C(+) & \nu gr\Omega1C(+) & \sigma gr\Omega2A(-) \rightarrow & \rho gr\Omega2A(-) & & \text{Superposition} \\
\downarrow & \uparrow & \uparrow & \downarrow & & \text{Interaction} \\
\mu gr\Omega2A(-) \rightarrow & \nu gr\Omega2A(-) & \sigma gr\Omega1C(+) & \rho gr\Omega1C(+) & & Gm1, Gm2 \\
 & & \uparrow & \downarrow & & \\
 & & \beta gr\Omega2A(-) & \beta gr\Omega2A(-) & & G_\alpha\ \mathrm{G}_\beta \\
 & & \uparrow & \downarrow & & \\
 & & : & : & & \\
 & & \uparrow & \downarrow & & \\
 & & \beta m2\Omega2A(-) & \beta m2\Omega1A(-) & & \\
 & & \uparrow & \downarrow & & \\
 & & \beta m2\Omega1C(+) \leftarrow & \beta m2\Omega1C(+) & & \\
 & & \beta m2 & \beta m2 & &
\end{array}
\tag{4b}
$$

$$
\begin{array}{llllll}
\alpha m1 & \alpha m1 & & & & \\
m1\Omega1B(+) \leftarrow & \alpha m1\Omega1B(+) & & & & \\
\downarrow & \uparrow & & & & \\
\alpha m1\Omega2D(-) & \alpha m1\Omega2D(-) & & & & \\
\downarrow & \uparrow & & & & \\
: & : & & & & \\
\downarrow & \uparrow & & & & \\
\alpha gr\Omega2D(-) & \alpha gr\Omega1D(-) & fig.4 & & & G_\alpha\ \mathrm{G}_\beta \\
\downarrow & \uparrow & & & & \\
\mu gr\Omega1B(+) & \nu gr\Omega1B(+) & \sigma gr\Omega2D(-) \rightarrow & \rho gr\Omega2D(-) & & \text{Superposition} \\
\downarrow & \uparrow & \uparrow & \downarrow & & \text{Interaction} \\
\mu gr\Omega2D(-) \rightarrow & \nu gr\Omega2D(-) & \sigma gr\Omega1B(+) & \rho gr\Omega1B(+) & & Gm1, Gm2 \\
 & & \uparrow & \downarrow & & \\
 & & \beta gr\Omega2D(-) & \beta gr\Omega2D(-) & & G_\alpha\ \mathrm{G}_\beta \\
 & & \uparrow & \downarrow & & \\
 & & : & : & & \\
 & & \uparrow & \downarrow & & \\
 & & \beta m2\Omega2D(-) & \beta m2\Omega1D(-) & & \\
 & & \uparrow & \downarrow & & \\
 & & \beta m2\Omega1B(+) \leftarrow & \beta m2\Omega1B(+) & & \\
 & & \beta m2 & \beta m2 & &
\end{array}
\tag{4c}
$$

$$
\begin{array}{llllll}
\beta m1 & \beta m1 & & & & \\
\beta m1\Omega1D(-) \leftarrow & \beta m1\Omega1D(-) & & & & \\
\downarrow & \uparrow & & & & \\
\beta m1\Omega2B(+) & \beta m1\Omega2B(+) & & & & \\
\downarrow & \uparrow & & & & \\
: & : & & & & \\
\downarrow & \uparrow & & & & \\
\beta gr\Omega2B(+) & \beta gr\Omega1B(+) & fig.4 & & & G_\alpha\ \mathrm{G}_\beta \\
\downarrow & \uparrow & & & & \\
\nu gr\Omega1D(-) & \mu gr\Omega1D(-) & \rho gr\Omega2B(+) \rightarrow & \sigma gr\Omega2B(+) & & \text{Superposition} \\
\downarrow & \uparrow & \uparrow & \downarrow & & \text{Interaction} \\
\nu gr\Omega2B(+) \rightarrow & \mu gr\Omega2B(+) & \rho gr\Omega1C(-) & \sigma gr\Omega1D(-) & & Gm1, Gm2 \\
 & & \uparrow & \downarrow & & \\
 & & \alpha gr\Omega2B(+) & \alpha gr\Omega2B(+) & & G_\alpha\ \mathrm{G}_\beta \\
 & & \uparrow & \downarrow & & \\
 & & : & : & & \\
 & & \uparrow & \downarrow & & \\
 & & \alpha m2\Omega2B(+) & \alpha m2\Omega1B(+) & & \\
 & & \uparrow & \downarrow & & \\
 & & \alpha m2\Omega1D(-) \leftarrow & \alpha m2\Omega1D(-) & & \\
 & & \alpha m2 & \alpha m2 & &
\end{array}
\tag{4d}
$$

The four interaction loops for the four μ coordinates and the two masses that

exchange information in the form of a four block between the two masses m1 and m2 during a full oscillation period are shown. In each of the four loops, the source of the information for the mass m1 is shown at the top and the source for the mass m2 is shown at the bottom. The circulation directions for the information of two masses are different: the mass m1 has a positive circulation direction, the mass m2 a negative circulation direction of information. Both sources emit a graviton G_α or G_β to the site of the interaction and via the graviton G_β or G_α from this back to the source of the two graviton pairs Gm1 and Gm2, where it is absorbed and the changed information is processed. The site of the interaction is outlined; it represents the event at the point of manifolds and corresponds to the representation of Figure 4. Between sources of the masses, represented by two oscillation steps that store the information, change the motion, mediate the interaction between the two four blocks, and emit the information. To the (bordered) location of the interaction, field lines can be thought of transmitting the information from the basic structure to the location of the interaction.

Within the area of the interaction (bordered part, Figure 4), the interaction for both graviton pairs take place simultaneously in four phases: the information is introduced by the masses m1 and m2 into the superimposed graviton pairs via the gravitons G_α and G_β. Two oscillations of the overlapping states take place, forming the delta of the information and the information is transmitted with the gravitons G_α and G_β to the masses m1 and m2. The information of the mass emitted in α or β four blocks in a cube is absorbed in the cube of α or β four blocks.

6.2. Oscillation Behavior

With reference to the Ricci tensor (1), the interaction region in the form $m1\alpha\beta$ contains the graviton pairs $\mu\nu$ and by $m2\alpha\beta$ the graviton pair $\rho\sigma$. Of these, in this area in m1 and correspondingly in m2, the inflow of information is positive and the outflow of information is negative. The two contributions e.g. G_α and G_β of m1 with G_α and G_β of m2 describe the influence of the masses on the interaction region and correspond to the second summand of the Ricci tensor. The loops for each of the two masses contain in (4) an information transfer to the place of interaction and an information transfer from the site of the interaction back to the sources. At the site of the interaction, there is a graviton pair for each mass, which contains the information of the source and corresponds to the graviton G_α or G_β in Figure 4. These gravitons act on the two graviton pairs Gm1 and Gm2. The latter are shown at the site of the interaction for two oscillation phases each. The two four blocks α and β are involved in the emission and absorption of the information of the masses.[8]

Each four block always contains four unit-cubes. Due to the common creators

[8]The starting point for the oscillation under consideration is always the change of state: $\Omega 1 \rightarrow \Omega 2$. If this order is reversed: $\Omega 2 \rightarrow \Omega 1$, then all signs change. If the output in m1 and m2 is different, then G_α and G_β (of m1 and m2) must also change the sign. In all cases, information is exchanged between the two graviton pairs. To do this, the transitions between the source and gravitons, *i.e.*, the field lines, must be adjusted.

and annihilators of two of the four unit-cubes, the change in the action of two cubes changes all four cubes of the four blocks α and β, cf. Figure 3. Each oscillation process changes the content in action in both α and β four blocks of both masses. The changes are made by spreading the action, which will be discussed below.

In Figure 7, the information exchange between the two masses m1 and m2 is schematically shown for the geometry of the interaction described in Figure 6(b). In the upper part of Figure 7 the two four blocks α and β are represented by two parallelograms for the mass m1 and in the lower area for the mass m2. The parallelograms for the masses m1 and m2 are connected with long vertical arrows for the exchange of information between the masses m1 and m2 and for horizontal arrows for information processing in the four blocks of the masses and in the gravitons. Continuous arrows are used for the transmission of information to the mass m1, and discontinuous arrows are used for the transmission of information to the mass m2. Only the two four blocks alpha and beta of both masses and their interaction are shown. Both the oscillators of the basic structure and the gravitons are embedded in a three-dimensional network.

In an interaction scheme of Figure 7 the loops of the interaction (4) can be represented with four circumferential states for the interaction between the two masses in four oscillation stages. From the illustration in Figure 7, after four oscillation stages, the information storage of the deltas of the information formed in the interaction follows.

In Figure 7, the cubes are surrounded by circles, into which the information after four oscillation phases is deposited after a full oscillation course in (4)[9]. The formation of the places where the information is deposited in the annihilators can be traced from the course of the states from the creator of one mass to the annihilator of the other mass. The path leads from the creators of both masses at the same time via the gravitons to the annihilators of the other mass. This behavior is caused by the superposition of the gravitons and by the conditions of the Hamiltonian principle. As information the deltas of action in the four units cubes is transferred, because the interaction in the oscillators of the masses and in the oscillators of the gravitons occurs in two oscillation states, changing the creators and annihilators.

In Figure 8 an oscillation sequence[10] of a unit cube of the active four blocks α and β for the masses m1 and m2 is shown. The arrows describe the changes of the states. The distances between the gravitons from the basic structure are displayed by vertical arrows showing the direction of information flow. In each interaction sequence there are two oscillation states in the gravitons and two in the

[9]In the model of the basic structure discussed here, only one layer of the oscillators for mass and for motion is used. However, the basic structure consists of a superposition of such layers, [2]. In the case of an interaction, the information is likely to be stored in the entire volume of the basic structure.

[10]On the correlation space, both directions of current circulation and therefore both directions of oscillatory sequences are possible; these correspond to two opposite directions of time on space-time. On space-time, however, only one direction of time is realized, because the two longitudinal oscillators have different signs of the action, but the same directions of circulation.

four-block of the basic structure. The discontinuous arrows between gravitons and basic structure symbolize the field lines.

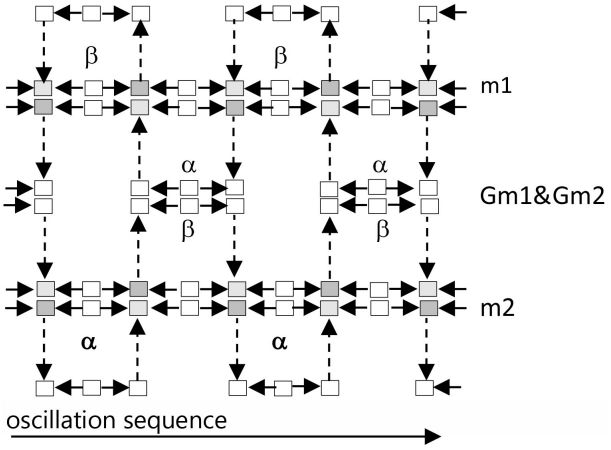

Figure 8. Schematic representation of the oscillation sequence of an interaction between two masses for a unity cube of the active four blocks. Each arrow describes a change of state. The two masses are represented by basic structure for the alpha and beta four block and by emitted gravitons G_α and G_β, in the middle the two gravitons-pairs Gm1 and Gm2 overlap. The squares symbolize the position of the state.

Without taking into account the mediation of the information via the vacuum (vertical arrows in **Figure 8**), the following course of information of the mass results in this oscillation scheme: If the emission of the information takes place in the alpha four block, then it returns to the basic structure after two oscillations between two states in the vacuum and is absorbed by the alpha four block. After absorption, two state changes occur within the alpha four block, after which the information is emitted again and the process in the vacuum is repeated. With the absorption of the information in the alpha four block, an emission of the information of the beta four block occurs, which change two states in the gravitons, after which they are absorbed again in the beta four block and after two states in the beta four block are emitted again. With the absorption of the information in the beta four block, the emission of the information of the alpha four block takes place and vice verse. Apart from the mediation via the gravitons in the vacuum, the alpha- and beta-information pass through the alpha and beta four blocks with two states in the basic structure and in the gravitons of the vacuum. In this model, the cross-linking of oscillators of the basic structure and in the gravitational field is not taken into account.

6.3. Outcome of the Interaction

Using the four oscillation loops (4), illustrated in **Figure 7** and the results of information generated by the masses in the gravitons according to **Table 1**, the interaction of the differences in the information $+\delta = \Delta_2 - \Delta_1$ and $-\delta = -\Delta_2 + \Delta_1$ formed in the superposition of the gravitons are determined. All four interaction loops work on the same principle, so it is sufficient to reproduce the result of the

formation of the delta δ for one of the loops. This is to be done for the formation of the A&C cubes of the two masses in (5):

$$\begin{array}{ll}
\mu\text{gr}\Omega 1\text{C}\downarrow\uparrow(+)\leftarrow\mu\text{gr}\Omega 2\text{A}\downarrow\uparrow(-) & \text{O}(+-\Delta_2)\text{-X}(--\Delta_2)\,\&\,\text{O}(-+\Delta_2)\text{-X}(++\Delta_2)\\
\nu\text{gr}\Omega 2\text{A}\downarrow\uparrow(-)\rightarrow\nu\text{gr}\Omega 1\text{C}\downarrow\uparrow(+) & \text{O}(-+\Delta_2)\text{-X}(++\Delta_2)\,\&\,\text{O}(+-\Delta_2)\text{-X}(--\Delta_2)\\
\sigma\text{gr}\Omega 2\text{A}\downarrow\uparrow(-)\rightarrow\sigma\text{gr}\Omega 1\text{C}\downarrow\uparrow(+) & \text{O}(-+\Delta_1)\text{-X}(++\Delta_1)\,\&\,\text{O}(+-\Delta_1)\text{-X}(--\Delta_1)\\
\rho\text{gr}\Omega 1\text{C}\downarrow\uparrow(+)\leftarrow\rho\text{gr}\Omega 2\text{A}\downarrow\uparrow(-) & \text{O}(+-\Delta_1)\text{-X}(--\Delta_1)\,\&\,\text{O}(-+\Delta_1)\text{-X}(++\Delta_1)
\end{array}\quad(5)$$

The delta δ follows from addition:

$$\text{O}(-+\Delta_2)\text{-X}(++\Delta_2)\,\&\,\text{O}(+-\Delta_2)\text{-X}(--\Delta_2)$$

$$\text{O}(+-\Delta_1)\text{-X}(--\Delta_1)\,\&\,\text{O}(-+\Delta_1)\text{-X}(++\Delta_1)$$

$$\Delta_2-\Delta_1=+\delta\qquad -\Delta_2+\Delta_1=-\delta$$

On the left in (5) the oscillations of the gravitons in the area of interaction for the two masses m1 and m2 are reproduced. On right, the corresponding O-X oscillators are shown with the differences of the action Δ related to the masses m1 and m2 and below the results of the interaction δ, resulting from the masses, are calculated.

The formation of the deltas of information occurs by interaction within the graviton pairs. These interactions take place under the conditions of the Hamiltonian principle. Four oscillation steps are required for the interactions. The four interactions for the four coordinates take place simultaneously, each corresponding to the formation of a four block for each of the two masses. The exchange of the delta δ is thus specific for the four cubes A, B, C and D, *i.e.*, for the four μ coordinates of both masses (which is significant only for the gravitons, while in the basic structure the cubes α and β overlap and contain only the $\mu=0$ coordinates.). The transfer of the $\mu=0$ unit-cubes of the basic structure into the four μ coordinates of the gravitons is described in [1]. According to (4), the four simultaneous transmissions of information during a four-part oscillation are:

$$\begin{array}{ll}
\beta\text{m}1\Omega 1\text{A}\downarrow\uparrow(-)\leftarrow\alpha\text{m}2\Omega 1\text{A}\downarrow\uparrow(-) & \beta\text{m}2\Omega 1\text{C}\uparrow\downarrow(+)\leftarrow\alpha\text{m}1\Omega 1\text{C}\uparrow\downarrow(+)\\
\beta\text{m}1\Omega 1\text{D}\uparrow\downarrow(-)\leftarrow\alpha\text{m}2\Omega 1\text{D}\uparrow\downarrow(-) & \beta\text{m}2\Omega 1\text{B}\downarrow\uparrow(+)\leftarrow\alpha\text{m}1\Omega 1\text{B}\downarrow\uparrow(+)\\
\alpha\text{m}1\Omega 1\text{C}\uparrow\downarrow(+)\leftarrow\beta\text{m}2\Omega 1\text{C}\uparrow\downarrow(+) & \alpha\text{m}2\Omega 1\text{A}\downarrow\uparrow(-)\leftarrow\beta\text{m}1\Omega 1\text{A}\downarrow\uparrow(-)\\
\alpha\text{m}1\Omega 1\text{B}\downarrow\uparrow(+)\leftarrow\beta\text{m}2\Omega 1\text{B}\downarrow\uparrow(+) & \alpha\text{m}2\Omega 1\text{D}\uparrow\downarrow(-)\leftarrow\beta\text{m}1\Omega 1\text{D}\uparrow\downarrow(-)
\end{array}\quad(6)$$

The arrows show the direction of the information transfer; it follows from (4). After a complete four-part interaction, the following cubes receive information (bordered states in **Figure 7**):

$$\beta\text{m}1\Omega 1\text{C}\uparrow\downarrow(+),\beta\text{m}1\Omega 1\text{B}\downarrow\uparrow(+),\quad\alpha\text{m}1\Omega 1\text{A}\downarrow\uparrow(-),\alpha\text{m}1\Omega 1\text{D}\uparrow\downarrow(-)$$

$$\beta\text{m}2\Omega 1\text{A}\downarrow\uparrow(-),\beta\text{m}2\Omega 1\text{D}\uparrow\downarrow(-),\quad\alpha\text{m}2\Omega 1\text{C}\uparrow\downarrow(+),\alpha\text{m}2\Omega 1\text{B}\downarrow\uparrow(+)$$

The transport and fixation of the information δ formed during oscillation in a vacuum in the memories of the basic structure takes place under the conditions of the Hamiltonian principle, which causes a balance of the information in the two masses m1 and m2 as a result of the interaction in the gravitons. In this pro-

cess, the information is deposited in the form of a four block in each oscillation process with different signs in the active and in the non-active four blocks. In the present illustration, the same value has been used for the delta δ for all four dimensions. For the two longitudinal oscillators, the magnitude of delta δ is always the same due to the overlap of the two associated cubes in basic structure, while the transverse oscillators can be different because of the interaction geometry of the gravitons, [1].

During a movement in the gravitational gradient, as shown in (5), the delta δ is added up in the form of $\mathrm{O}(-\pm\delta)\text{-}\mathrm{X}(+\mp\delta)$ or $\mathrm{O}(+\mp\delta)\text{-}\mathrm{X}(-\pm\delta)$ in the memories of the basic structure. The type of storage in the individual unit cubes can be found in (5). Operation (4) leads to the following results ($\delta=\Sigma\delta_n$):

Storage of information:

$$\begin{array}{ll}\beta\mathrm{m1\Omega1C}\uparrow\downarrow(+):\mathrm{O}(++\delta)\text{-}\mathrm{X}(-+\delta) & \beta\mathrm{m2\Omega1A}\downarrow\uparrow(-):\mathrm{O}(-+\delta)\text{-}\mathrm{X}(++\delta)\\ \beta\mathrm{m1\Omega1B}\downarrow\uparrow(+):\mathrm{O}(+-\delta)\text{-}\mathrm{X}(--\delta) & \beta\mathrm{m2\Omega1D}\uparrow\downarrow(-):\mathrm{O}(--\delta)\text{-}\mathrm{X}(+-\delta)\\ \alpha\mathrm{m1\Omega1A}\downarrow\uparrow(-):\mathrm{O}(-+\delta)\text{-}\mathrm{X}(++\delta) & \alpha\mathrm{m2\Omega1C}\uparrow\downarrow(+):\mathrm{O}(++\delta)\text{-}\mathrm{X}(-+\delta)\\ \alpha\mathrm{m1\Omega1D}\uparrow\downarrow(-):\mathrm{O}(--\delta)\text{-}\mathrm{X}(+-\delta) & \alpha\mathrm{m2\Omega1B}\downarrow\uparrow(+):\mathrm{O}(+-\delta)\text{-}\mathrm{X}(--\delta)\end{array} \quad (7)$$

The delta is controlled by the oscillators of the masses and leads to a change in the action by transferring the spread of action in the same way to both masses. This is because we are ultimately looking at two equal oscillators at this point, which, according to our ideas, have the same properties in both masses and the change in the action is controlled solely by the mass oscillators, provided that the geometry of the interaction is correct. The result is determined solely by the spread $\uparrow\downarrow$ or $\downarrow\uparrow$ generated by the oscillators of the masses. Es can be seen from **Figure 8**, the cycle of four changes of the state leads always to the same kind of deposited information: **the generated action is added during movement in a gradient of gravitation**.

6.4. Changes in Movement as a Consequence of the Change in Action

A unit oscillator in the basic structure of mass m1 is considered, consisting of the two active and two non-active four blocks and their interaction with the corresponding gravitons, according to the illustration (4). The mass m1 may be located in the gravitational gradient of a mass m2, which is not examined in detail at this point. We analyze the behavior of the oscillator in two consecutive points of the manifold P1 and P2. The successive interactions in the two points in the gradient lead, according to the discussion in paragraph 6.3, to the formation of the two changes in the information δ_1 and δ_2, where due to the gradient $\delta_2-\delta_1>0$.

In each cube, the horizontal correlations of the active four blocks are superimposed with the horizontal correlations of the non-active four blocks with different signs at the creator and annihilator planes. The information in the non-active four blocks comes from a preceding interaction, so it contains in P2 the information δ_1. In the vertical correlations, the two active positive and correspondingly the

two active negative correlations of the oscillators O and X are superimposed, and are influenced by the superposition in the vertical correlations in P2 by superimposing the horizontal non-active currents in the creator plane with the information from P1.

δ_1 is the information that has been added to the information already present in state P1 according to the oscillation described in Section 4. In the following oscillation at the location P2, a delta δ_2 is then formed again and added to the memories of the basic structure. The information originating from the interaction in P1 has no influence on the storage in state P2, because it is added once and subtracted once. The memories of the information are changed by the sum of the absorbed information $\Sigma\delta$. However, in the vertical correlations that cause the change in velocity, the absorbed information is modified only once, at the creator plane. The positive vertical correlations are formed by superimposing the active positive currents of O and X, and separately the negative vertical correlations are formed by superimposing the active negative currents of O and X. Since O and X contain different information after an interaction in the form of spreading, they contain only the spread of 2δ when superimposed in the vertical correlations, while the contribution of the currents of the motion is annihilated due to the two vertical correlations with different signs:

Example according to **Table 1**, **Figure 2** the cub $\alpha\Omega\mathrm{A}-\mathrm{Oa}+\delta,+\mathrm{Xa}-\delta$:

positive vertical correlations — negative vertical correlations

$-\mathrm{Oa}+\delta$: positive current: $-\mathrm{Oa}+\delta\uparrow$ — $-\mathrm{Oa}+\delta$: negative current $-\mathrm{Oa}+\delta\uparrow$

current increases by δ

$+\mathrm{Xa}-\delta$: positive current $+\mathrm{Xa}-\delta\downarrow$ — $+\mathrm{Xa}-\delta$: negative current $+\mathrm{Xa}-\delta\downarrow$

current decreases by δ

However, before the superposition of the positive and negative active currents takes place in the vertical correlations, they are superimposed by the horizontal non-active currents of O and X from the preceding state P1. The currents of the state P1 contain the information δ_1 in the form of spreading. Their effect on the information in the vertical correlations of P2 will again be considered using the example of cube $\alpha\Omega$1-A (**Table 1**, **Figure 2**):

• The active positive currents of +Xa are superimposed by positive non-active currents of +Xna, *i.e.* added. The positive currents of +Xa are getting larger.

• The active positive currents of −Oa are superimposed, *i.e.* subtracted, by negative non-active currents of +Xna. The positive currents of +Xa are getting smaller.

The amounts of the non-active positive and negative currents in +Xna are the same: the same amount is added once to the two positive vertical currents of +Xa and −Oa and subtracted once. The positive currents of +Xa and −Oa due to the interaction with the not active currents do not change in the positive vertical correlations in state P2. The same applies to the active negative currents of +Xa, which are superimposed by the non-active currents of −Ona. The superposition of the non-active currents resulting from the preceding interaction at point P1 has no effect on the vertical correlations in the cubes of the basic structure at the os-

cillation at point P2.

When the mass m1 moves in a gradient of the mass m2, the information formed during the interaction is added up in the memory of the basic structure in the form of a spread, and the information formed in the vertical correlations in the form of a spread causes an acceleration of the movement. The acceleration generated in the vertical correlations causes the energy released in the event of an impact. It is stored in the sum of the changes in the vertical correlations $\Sigma\delta$, *i.e.*, the change in the action passed through the gradient.

6.5. Cosmological Constant

The field equations describe the formation of the curvature at a point of manifold as a result of the masses present in the vacuum, described by the energy momentum tensor. This is especially also true for the cosmological constant $+\Lambda g^{\mu\nu}$: The method presented here for interpreting the interaction between masses suggests that the cosmological constant appearing in the field equations is to be regarded as a source or sink of information. If one wants to use the constant to describe the increase in the escape velocities of galaxy clusters, one can interpret it as an additional source of information.

The modification of movements of elementary objects always takes place under the conditions of the Hamiltonian principle within the framework of the PIT. In our model, the attraction of two masses in gravity is caused by the difference in the action in the superimposed graviton pairs. The minimization of the action is already effective in the interaction in the overlapping gravitons. If the masses are to repel each other instead of attracting, this can only be done under the conditions of the Hamiltonian principle. We obtain such conditions between two masses, if the action in the space between them is greater than both masses can absorb in their memories at a given relative velocity and given distance. If only action of the memory of movement and of masses are present in the vacuum, there will be an equilibrium of action between the present masses and the masses will be attracted. If additional action is present, this equilibrium changes the conditions of interaction. Under conditions of the Hamilton principle this results in a repulsion.

From this point of view, there is a repulsive force between galaxy clusters, if there is another source of information in the space between them. From the point of view of the PIT, [2], there are three sources of physical information (four blocks) in the universe: a part that determines the motion of objects (memory of motion), a part that determines gravity (memory of mass), and a part that was formed at the Big Bang. The increase in the escape velocity of the galaxy clusters should be due to the fraction formed during the Big Bang. This has an effect when the distances between the masses are large and outweigh the small proportion of gravity at this point. With the decrease of the relative velocity, the proportion of the action in the memories of the basic structure decreases and increases in the vacuum, therefore, so that with increasing expansion of the universe, the relative propor-

tion of information in the vacuum increases.

7. Interpretations

In the PIT, the mass is described by the basic structure and the gravitons assigned to it. Simplifying, let's consider a four-dimensional oscillator of the basic structure, which consists of an active and a non-active four block. Each of the two four blocks consists of a four block with positive currents and the corresponding graviton G_α and a four block with negative currents and the graviton G_β. We think of the density of mass as the density of these oscillators. The information contained in the oscillators is determined by a fixed amount of the action in the non-active four blocks, and by the action contained in the relative velocity in the memory of the motion (together with the memory of the masses). Information in the memories of the basic structure and in the gravitons are in equilibrium at a rest frame. From the considerations on the interaction between two masses in the preceding sections, the following properties for gravity result:

• The correlation space describes the correlation of the fields, defined on the coordinates of space time. The correlation of the fields is generated by the action, under the conditions of the Hamiltonian principle.

• All masses fall at the same rate in the gravitational gradient along the same paths, because each oscillator of the mass has the same information at the same velocity and experiences the same change of information when passing through the same change of information in the gradient.

• Inertial and heavy masses are the same, because every change in the information in the oscillator of motion undergoes the same change in the information in the oscillator of the mass; equal currents in the oscillators of motion and in the mass run simultaneously in opposite directions. Any change in the information in both oscillators occurs with the same amount at the same time.

• Inertia is caused by the oscillators of the mass: if all gravity is switched off, an object retains its inertia: if a non-gravitational force acts, then both memories react as if a gravitational force were at work: both four blocks the active and the non-active become active.

• The principle of equivalence in GRT states that a free-falling observer in a gravitational field is equivalent to a not-accelerated observer far away from a gravitational field. Since, as shown in this work, in a gravitational field between interacting masses there is an exchange of information that causes a movement of the objects towards each other, it follows in the PIT that there is a difference between a mass in a space without gravity and a mass in space with additional gravity. The principle of equivalence is nevertheless valid, because in both cases all physical laws are valid. The reason for this is that in both cases the oscillating system of masses and gravitons is complete. If external forces act, they relate to the entire system in both cases.

• In the mass oscillators and in the interaction region of gravitons, the information alternates between the alpha- and beta-four blocks. This creates a circula-

tion of information between the sources in the basic structure and the gravitons in the vacuum. The result is a uniform distribution of the action in the oscillators of the A, B, C and D in the unit cubes of both masses (7). The circulating information is formed by minimizing the action on the formation of deltas $\delta = \Sigma\delta_n$ and is the source of the energy released on impact. In order to separate the masses from each other, the state in vacuum before the interaction of the gravitons of both masses must be restored.

• In the PIT, the principle of equivalence follows from the Hamilton principle. Every change in a state of motion in one sub-area requires at the same time a change in another sub-area in such a way that the change in action is minimized.

• The model of the PIT to gravity basically agrees with the model of the GRT, because in a parallel transport the information density of the PIT leads to the same explanation as the curvature of the GRT. Physically, the density of the information differs from the curvature, but they are the same in their effect on gravity.

• The curvature in GRT is explained as the non-commutativity of the parallel transports and is determined by Einstein's field equations. In the PIT, the strength of the curvature is described by the delta δ, the change in information.

• In this paper presented formation of gravity by information exchange, describes only the behavior of dark matter, because the basic structure also contains the formation of charges by interaction with the photons of static Maxwell fields, [1].

• On the question of quantization of the field equations, [6]: From the point of view of the PIT, the field equations lack the sources of the action, they contain only the consequences of the presence of action in the form of currents.

• The equations of motion of a force-free particle in the gradient of gravity [4] (p. 1000),

$$m\ddot{x}^{\mu} + m\Gamma^{\mu}_{\lambda\nu}\dot{x}^{\lambda}\dot{x}^{\nu} = 0 \quad \text{with} \quad \Gamma^{\mu}_{\lambda\nu} = \frac{g^{\mu\rho}}{2}\left(\partial_{\lambda}g_{\nu\rho} + \partial_{\nu}g_{\lambda\rho} + \partial_{\rho}g_{\lambda\nu}\right) \tag{8}$$

can be interpreted on the basis of the explanations in this thesis as follows: Let a single oscillator of the mass at the point x^{μ} be considered, to which the single oscillators of the masses at the positions x^{λ} and x^{ν} move relative with the velocities $\dot{x}^{\lambda}$ and $\dot{x}^{\nu}$. According to our considerations in Section 3, the Christoffel symbols describe the supply of information from the gravitons λ and ν generated by the oscillators in x^{λ} and in x^{ν} to the graviton pair $g^{\mu\rho}$. We have interpreted the partial changes ∂_{λ}, ∂_{ν} and ∂_{ρ} as the changes in the currents in the vertical correlations of the gravitons λ, μ and ρ that occur in the graviton pairs $g_{\nu\rho}$, $g_{\lambda\rho}$ and $g_{\lambda\mu}$. The changes in the currents flow, according to the diagram (4), occurs back to the ground oscillators in x^{ρ} and in x^{ν} [11]. The oscillator of the mass at point x^{μ} thus experiences an acceleration due to the interaction of its gravitons g^{μ} with the gravitons of the masses of x^{λ} and x^{ν}.

[11]The component $\partial_{\mu}g_{\rho\lambda}$, which causes the change in the μ current of the graviton ν and describes the return flow to the mass oscillators in x^{λ} is missing in the Christoffel symbol.

• Minimizing the action determines the curvature of space: By requiring that the variation of the Einstein-Hilbert action δW[g] disappears, for each variation of the metric $g^{\mu\nu}$, the Einstein equations of the vacuum are obtained, ([4] p. 1003 ff) [6]. The action produced by the product of the graviton-pairs in the metric, generates the curvature of space. The content of the action in the gravitons causes the curvature in the deactivated Maxwell vacuum [1].

8. Summary and Discussion

In the preceding works, [1]-[3], a model was developed to describe the structure and interaction of elementary objects, in which electromagnetic fields, photons of light, gravitons, the vacuum, the charge and the mass can be represented by information. Three-dimensional correlation structures, generated by four-dimensional fields, formed by four unit-oscillators of the action, turned out to be the information. In the present report, the interaction between two masses is analyzed using these methods. To this end, we consider Einstein's field equations and assign the structures of mass and gravitons to the six four-dimensional coordinate systems of the field equations, by describing the six four-dimensional coordinate systems of the Ricci tensor with six four-dimensional gravitons, which exchange information in a vacuum (at the point of manifold) by common oscillation of two graviton pairs of masses and transmit it to the two interacting masses. The development of formalism takes place in three steps: 1) the oscillation of the masses is determined as the oscillation of the information of the basic structure, 2) the influence of the oscillation of the information of the masses on the gravitons in the vacuum is analyzed, and 3) the interaction of two masses is determined by superposition of the gravitons of both masses in a vacuum and their effect on the behavior of the masses is determined. It is shown that on the basis of the Hamiltonian principle, the masses exchange and store information, and that the exchange of information causes the movement of the masses towards each other. The inertia of the masses is due to their oscillator systems of the masses, oscillating against each other. Repulsive effect in gravity between masses can be interpreted by additional sources of information.

A comparison of the results describing the interaction of the masses with the help of the exchange of physical information, with the formulations of the field equations seems possible, because both: the structures of the masses and the information in the PIT, and the statement about the curvature of the space of GRT lead to a comparison of four-dimensional structures. Both formulations represent an abstraction of the statements because they represent only a section of the events in a networked four-dimensional space. In our presentation, we have neglected the influence of the peripheral information carriers by assuming that the transmission of information takes place solely through the vertical correlations in the unit cubes. This makes it possible to easily present the exchange of information. The similarities in both cases result from the use of six four-dimensional coordinate systems.

Mass and energy are equivalent, because energy can be obtained from mass. But what is mass and what is energy? The energy obtained from the mass is detected as radiation (pair annihilation) and in pair generation radiation becomes mass and charge. In the PIT, the radiation consists of four blocks that are formed by action. It is therefore obvious to describe the mass by action. For the structure of the mass, we proposed the basic structure, which consists of four blocks, *i.e.*, of action. Mass is characterized by gravity and inertia. In the present work, it is shown that the proposed basic structure of a mass can be generated in the form of gravitons and characterized by inertia. This is done under the assumption that elementary objects, described in space-time with the Lagrange density and the communication relations of quantum mechanics, can be represented on the correlation space as three-dimensional structures, formed by four-dimensional fields and action under the conditions of the Hamiltonian principle.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Dudek, H.J. (2024) Building Blocks of Nature. *Journal of High Energy Physics, Gravitation and Cosmology*, **10**, 1226-1303. https://doi.org/10.4236/jhepgc.2024.103073

[2] Dudek, H.J. (2023) Action Origin of the Cosmos. *Journal of High Energy Physics, Gravitation and Cosmology*, **9**, 850-887. https://doi.org/10.4236/jhepgc.2023.93065

[3] Dudek, H.J. (2022) Physical Information Generated by Action in Maxwell Fields. *IJQF, Quantum Speculations*, **4**, 1-35.

[4] Rebhan, E. (1999) Theoretisch Physik I. Spektrum Verlag, 1000, 1003 ff.

[5] Carlip, S. (2001) Quantum Gravity: A Progress Report. *Reports on Progress in Physics*, **64**, 885-942. https://doi.org/10.1088/0034-4885/64/8/301

[6] Hilbert, D. (1915) Die Grundlagen der Physik, Koenigl. Gesell. D. Wiss., Goetingen, Nachr. Math.-Phys. KI 295-407.