Total theory of all physics.

Sha S.V.

I proceeded from the method of V.S. Sorokin ("Uspekhi fizicheskih nauk", t.LIX, issue 2, 1956, pp. 325-362) in the presentation of M.A.Aizerman, MIPT ("Classical Mechanics", Moscow, Nauka, 1974, p. 44 et seq.).

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Introduction

Friends!
The essence of my work is not in the solution of any problems, and to bring together all parts of physics.
You know that in physics there are mechanics, thermodynamics, quantum mechanics, relativity, etc.
Each section begins with sets its laws. A physicist must have at disparate laws and uniform. In this work, for the original was taken as the principle of relativity of Galileo, and from there by means of deduction to get a start in all sections.

I liked the beginning of the General Theory of Physics Vladi online Lebedev Institute. Here it is:
Einstein linked the creation of the general theory of physics to search for "the general elementary laws from which, by pure deduction, you can get a picture of the world"
http://forum.lebedev.ru/viewtopic.php?t=6648

I got about what I wanted Einstein.

Good or bad, but it turned out.

By the way, mathematics is also constantly seeking a common approach to all sections.

Can one obtain any conservation laws from general considerations without resorting to a multitude of experiments and not elevating them to the rank of laws, as it was with the laws of conservation of energy, momentum, and mass?

We consider the derivation of conservation laws from general considerations (Galileo's principle of relativity).
- The formulas of energy and momentum are derived in the classical form (equations (11-12), in them the mass is represented as a coefficient.
- In the further consideration, new conservation laws have been obtained, from which the formulas similar to the canonical Gibbs distribution (statistical physics) (equation 16) and the wave properties of bodies follow.
- The Higgs potential was also obtained; an equation that differs from Einstein's SRT only by an exponential; and the potential of Yukawa's strong interaction.

1 Measure of movement

(in the presentation of MA Aizerman "Classical mechanics", Moscow, Nauka, 1974, p.44 and further, VS Sorokin's method "Uspekhi fizicheskih nauk", vol. LX, issue 2, 1956, p. .325-362).

Observing the movements of bodies, people have long been paying attention to the fact that the greater the mass and velocity of a moving body, the stronger the effect occurs in collisions with other bodies. Thus, for example, when the nucleus moves, its destructive force is greater, the greater its mass and velocity; when the moving ball o is stationary, the latter acquires a greater velocity than the first ball has a greater velocity; The meteorite reaching the Earth penetrates into the ground deeper, the more the mass and velocity of the meteorite. These and many other examples of this kind suggest the existence of a measure of mechanical motion (in short, the measure of motion) and the dependence of this measure on the speed and mass of the moving material object.
Observing the motion of the balls before and after the collision, it can be seen that if the movement of one of the balls "decreased" as a result of the collision, then

the motion of the second ball "increased" and moreover, the more the motion of the first ball decreased "more significantly." It therefore appears that, although the measure of the movement of each of the balls varies during the impact, the sum of such measures for both balls remains unchanged, i.e. that under certain conditions a "traffic exchange" occurs while the measure of motion as a whole is preserved. The history of mechanics is connected with long disputes of scientists about what size is a measure of movement, in particular, whether the measure of motion is a scalar value or a vector. This dispute has only historical interest, but it was during this discussion that the two main characteristics of the motion were introduced: kinetic energy and momentum (momentum), which play a central role in the entire construction of mechanics. We will therefore try to more accurately determine the concept of motion that has been intuitively introduced above and from general considerations to clarify certain properties that it must possess.

We start from the assumption that the measure of the motion of a material point is the scalar mass and velocity function of the point $f(m_i, \vec{v}_i)$, satisfying the following conditions:

1° The measure of motion is additive. This requirement means that the measure of the motion of the system f_c is obtained as the sum of the measures of motion of all N points entering the system

$$f_c = \sum_{i=1}^{N} f_c(m_i, \vec{v}_i) \ .$$

2° The measure of motion is invariant with respect to the rotation of the reference frame. From this intuitively obvious requirement (which naturally follows from the basic assumptions about space and time) it immediately follows that the measure of motion should not depend on the position of the point, on the direction of its velocity and on time, and can depend only on the velocity modulus $|\vec{v}_i| = v_i \ : \quad f = f(m_i, v_i) \ .$

3° The measure of the motion of a closed system of material points should not change with time interactions. Intermediate interactions that last only a finite time τ and are not necessarily caused by direct contact of bodies are called temporary. It is assumed that during the time τ only the mechanical characteristics of material points-their positions and velocities-change, but other parameters that characterize their physical states-temperature, electric charge, etc., remain unchanged. The term "time interaction" is a natural generalization of the concept of "collision". This requirement means then that the measure of the motion of the entire closed system of material points f_c, calculated before the beginning of the interaction and after its termination, should be the same.

Of course, the condition for preserving the measure 3° must be invariant with respect to the Galilean transformations. This requirement is a direct consequence of Galileo's relativity principle.

We now define the form of a scalar function that satisfies all these conditions.

Consider a closed system consisting of two material points with masses m_1 and m_2. Let the velocities of these points relative to the inertial frame of reference be equal to v_1, v_2 at the instant t (before the interaction) and v'_1, v'_2 - in the moment $t'=t+\tau$ in (after interaction). If the function $f(m_i, v_i)$ serves as a measure of motion, then, by condition 3°, equality

$$f(m_1, v_1)+f(m_2, v_2)=f(m_1, v'_1)+f(m_2, v'_2) \qquad (1)$$

We choose a frame of reference moving with respect to the original translational and uniformly with speed ***-u***. This system is also inertial. The points under consideration have velocities in it v_1+u, v_2+u in the moment *t* and v'_1+u, v'_2+u in the moment *t'*. By virtue of Galileo's relativity principle, the function f must be a measure of motion in this system, i.e. equality must hold

$$f(m_1, v_1+u)+f(m_2, v_2+u)=f(m_1, v'_1+u)+f(m_2, v'_2+u) \qquad (2)$$

In the "old" inertial frame of reference, we choose the Cartesian coordinate system **x, y, z** so that the coordinates of the vector u are equal (u, 0, 0), i.e. let us assume that the "new" inertial system moves relative to the "old" system with the velocity **-u** along the **x**-axis. Then

$$f(m, v+u)=f(m, v_x+u, v_y, v_z),$$

where v_x, v_y, v_z are the coordinates of the vector **v**, and equality (2) takes the form

$$f(m_1, v_{1x}+u, v_{1y}, v_{1z})+f(m_2, v_{2x}+u, v_{2y}, v_{2z})=f(m_1, v'_{1x}+u, v'_{1y}, v'_{1z})+f(m_2, v'_{2x}+u, v'_{2y}, v'_{2z}) \quad (3)$$

We now expand the functions in this equation into Taylor series in powers of **u**. Write out only the linear terms and replace the higher-order terms by dots, we obtain

$$f(m_1, v_1)+u\cdot\left(\frac{\partial f}{\partial v_x}\right)_1+\ldots+f(m_2, v_2)+u\cdot\left(\frac{\partial f}{\partial v_x}\right)_2+\ldots=f(m_1, v'_1)+u\cdot\left(\frac{\partial f}{\partial v_x}\right)'_1+\ldots+f(m_2, v'_2)+u\cdot\left(\frac{\partial f}{\partial v_x}\right)'_2+\ldots$$

(4)

where $\left(\frac{\partial f}{\partial v_x}\right)_k$ and $\left(\frac{\partial f}{\partial v_x}\right)'_k$ (k=1, 2) conditionally mean the derivative $\frac{\partial f(m, v_x, v_y, v_z)}{\partial v_x}$ after substituting into it instead of ***v_x, v_y, v_z*** coordinates of vectors v_1, v_2 and v'_1, v'_2 respectively. Discarding the equal (by (1)) The free terms on the right and left sides of (4), dividing the result by ***u***, letting **u** tend to zero and discarding terms replaced by an ellipsis, we obtain in the limit

$$\left(\frac{\partial f}{\partial v_x}\right)_1 + \left(\frac{\partial f}{\partial v_x}\right)_2 = \left(\frac{\partial f}{\partial v_x}\right)_1' + \left(\frac{\partial f}{\partial v_x}\right)_2' \quad (5)$$

Equality (5) is of the same structure as the equality (1), only in place of the measure of motion f in (5) there is a partial derivative $\frac{\partial f}{\partial v_x}$. But this means that if a function f satisfies equality (1), then its partial derivative $\frac{\partial f}{\partial v_x}$ also satisfies equality (1).

We came to this conclusion, assuming that the new inertial frame of reference moves along the x axis, i.e. that the vector **u** has coordinates (u, 0, 0). Suppose now that it moves relative to the old reference frame along the y axis or along the z axis, i.e. that the vector **u** has coordinates (0, u, 0) or (0, 0, u). Repeating the above arguments verbatim, we establish that an equation of the type (1) partial derivatives also satisfy $\frac{\partial f}{\partial v_y}$ and $\frac{\partial f}{\partial v_z}$.

We now introduce the vector **q** with the coordinates $\frac{\partial f}{\partial v_x}$, $\frac{\partial f}{\partial v_y}$ and $\frac{\partial f}{\partial v_z}$. Each of these partial derivatives is a function of the variables v_x, v_y, v_z and m. Therefore, the vector **q** is a function of the variables v_x, v_y, v_z and m, i.e. **q** is a vector-valued function of m and a vector argument **v** that satisfies (1). Function $q(m, v)$ is additive and, being a vector, is invariant with respect to the rotation of the reference frame. Thus, relying only on Galileo's relativity principle, we established an important fact: if there exists a scalar function $f(m, v)$, satisfying conditions 1°, 2° and 3°, then there exists a vector function **q** satisfying these three conditions, and **f** and **q** are connected by the relations

$$q_x = \frac{\partial f}{\partial v_x}, q_y = \frac{\partial f}{\partial v_y}, q_z = \frac{\partial f}{\partial v_z} \quad (6)$$

Now, proceeding from Galileo's principle of relativity, we require that equality (5) (and similar equalities for $\frac{\partial f}{\partial v_y}$ and $\frac{\partial f}{\partial v_z}$) was preserved under Galileo transformations. It is easy to see that repeating similar arguments, but only on the basis of not equality (1), but from equality (5) (and similar equalities for $\frac{\partial f}{\partial v_y}$ and $\frac{\partial f}{\partial v_z}$), we establish that an equality of the type (1) must satisfy all the second derivatives, i.e. six functions

$$\frac{\partial^2 f}{\partial v_x^2}, \frac{\partial^2 f}{\partial v_y^2}, \frac{\partial^2 f}{\partial v_z^2}, \frac{\partial^2 f}{\partial v_x \partial v_y} = \frac{\partial^2 f}{\partial v_y \partial v_x}, \frac{\partial^2 f}{\partial v_x \partial v_z} = \frac{\partial^2 f}{\partial v_z \partial v_x}, \frac{\partial^2 f}{\partial v_y \partial v_z} = \frac{\partial^2 f}{\partial v_z \partial v_y}$$

It was established above that equations of type (1) can be written out for ten functions, namely for

$$f, \frac{\partial f}{\partial v_x}, \frac{\partial f}{\partial v_y}, \frac{\partial f}{\partial v_z}, \frac{\partial^2 f}{\partial v_x^2}, \frac{\partial^2 f}{\partial v_y^2}, \frac{\partial^2 f}{\partial v_z^2}, \frac{\partial^2 f}{\partial v_x \partial v_y}, \frac{\partial^2 f}{\partial v_x \partial v_z}, \frac{\partial^2 f}{\partial v_y \partial v_z} \quad (7)$$

The statement of the problem assumes that the masses m_1 and m_2 of two interacting points and their velocities before interaction are given v_1 and v_2 and that the specification of these quantities completely determines six unknown quantities-the projections of the velocities of these same points after interaction $v'_{1x}, v'_{1y}, v'_{1z}, v'_{2x}, v'_{2y}, v'_{2z}$. Thus, ten equalities of type (1), of which we spoke above, constitute a system of ten equations containing only six unknowns. This system of equations must have a solution (and the only one). It is therefore clear that of the ten equations only six are independent, i.e. of functions (7) only six are functionally independent.

The function f is included in the number of six independent, and whatever the other five functions entering this six, at least one second derivative does not enter into it - after all, among the ten functions (7) contains six second derivatives. Our further arguments do not depend on which particular second derivative is a dependent function-let, for example, this be $\frac{\partial^2 f}{\partial v_x \partial v_y}$, - and on what exactly five derivatives are included in the number of six independent - let, for example, this $f, \frac{\partial f}{\partial v_x}, \frac{\partial f}{\partial v_y}, \frac{\partial f}{\partial v_z}, \frac{\partial^2 f}{\partial v_x \partial v_z}, \frac{\partial^2 f}{\partial v_y \partial v_z}$. This means that there exists a function

$$\frac{\partial^2 f}{\partial v_x \partial v_y} = F\left(f, \frac{\partial f}{\partial v_x}, \frac{\partial f}{\partial v_y}, \frac{\partial f}{\partial v_z}, \frac{\partial^2 f}{\partial v_x \partial v_z}, \frac{\partial^2 f}{\partial v_y \partial v_z}\right).$$

In view of the additivity of all the functions considered, F can only be a linear function with coefficients independent of the required velocities [1)], i.e.

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1) Indeed, from the preceding arguments it follows that $\left(\frac{\partial^2 f}{\partial v_x \partial v_y}\right)_c = F\left[f, \left(\frac{\partial f}{\partial v_x}\right)_c, \left(\frac{\partial f}{\partial v_y}\right)_c, \left(\frac{\partial f}{\partial v_z}\right)_c, \left(\frac{\partial^2 f}{\partial v_x \partial v_z}\right)_c, \left(\frac{\partial^2 f}{\partial v_y \partial v_z}\right)_c\right]$; the index c indicates that the functions are counted for the system as a whole, for example: $f_c = f(m_1, v_1) + f(m_2, v_2)$, $\left(\frac{\partial f}{\partial v_x}\right)_c = \frac{\partial f(m_1, v_1)}{\partial v_{1x}} + \frac{\partial f(m_2, v_2)}{\partial v_{2x}}$.

$$\frac{\partial^2 f}{\partial v_x \partial v_y}=\alpha_1 f+\alpha_2\frac{\partial f}{\partial v_x}+\alpha_3\frac{\partial f}{\partial v_y}+\alpha_4\frac{\partial f}{\partial v_z}+\alpha_5\frac{\partial^2 f}{\partial v_x \partial v_z}+\alpha_6\frac{\partial^2 f}{\partial v_y \partial v_z} \quad (8)$$

Recalling now that, because of considerations related to the isotropy of space, the function f can depend only on the modulus v, that is, has the form $f(m,|\vec{v}|)$, calculate the derivatives, where i, k=x,y,z,

$$\begin{cases} \dfrac{\partial f(m,|\vec{v}|)}{\partial v_i}=\dfrac{\partial f(m,|\vec{v}|)}{\partial |\vec{v}|}\cdot\dfrac{\partial |\vec{v}|}{\partial v_i}=\dfrac{\partial f}{\partial |\vec{v}|}\cdot\dfrac{v_i}{|\vec{v}|} \\ \dfrac{\partial^2 f(m,|\vec{v}|)}{\partial v_i \partial v_k}=\dfrac{v_i v_k}{|\vec{v}|^2}\cdot\left(\dfrac{\partial^2 f}{\partial |\vec{v}|^2}-\dfrac{\partial f}{\partial |\vec{v}|}\cdot\dfrac{1}{|\vec{v}|}\right);(i\neq k) \\ \dfrac{\partial^2 f(m,|\vec{v}|)}{\partial v_i^2}=\dfrac{1}{|\vec{v}|}\cdot\dfrac{\partial f}{\partial |\vec{v}|}+\dfrac{v_i^2}{|\vec{v}|^2}\cdot\left(\dfrac{\partial^2 f}{\partial |\vec{v}|^2}-\dfrac{\partial f}{\partial |\vec{v}|}\cdot\dfrac{1}{|\vec{v}|}\right) \end{cases} \quad (9)$$

Here it is taken into account that $\dfrac{\partial |\vec{v}|}{\partial v_i}=\dfrac{\partial\sqrt{v_x^2+v_y^2+v_z^2}}{\partial v_i}=\dfrac{v_i}{\sqrt{v_x^2+v_y^2+v_z^2}}=\dfrac{v_i}{|\vec{v}|}$.

It follows from (9) that the left-hand side of (8) contains a factor $v_x v_y$; At the same time, no term on the right-hand side of (8) does not contain such a factor. Therefore, equating the coefficients of the terms containing vxvy to the left and to the right in (8), we get

$$\frac{\partial^2 f}{\partial |\vec{v}|^2}-\frac{1}{|\vec{v}|}\cdot\frac{\partial f}{\partial |\vec{v}|}=0 \quad (10)$$

(here there is a mass)

The solution of which is:

$$f=a(m)\left(v_x^2+v_y^2+v_z^2\right)+b(m) \quad (11)$$

Thus, from the requirements 1°-3° it follows that if there exists a scalar measure of motion , $f(m,|\vec{v}|)$ then it has the form (11) and then what there is a vector measure of motion ***q***: $q_i=2a(m)v_i$, where i = x, y, z or in a vector record

$$\vec{q}=2a(m)\vec{v} \quad (12)$$

In classical mechanics **f** is normalized so that b (m) = 0 and a (m) = m / 2.

As $\left(\dfrac{\partial^2 f}{\partial v_x \partial v_y}\right)_c$ is also represented by an analogous sum, the function F must have this property, and this is possible only under the condition that F is linear in all arguments and the coefficients α do not depend on velocities.

2 (My continuation)

Number of possible functions is **ten**:

$$f,\frac{\partial f}{\partial v_x},\frac{\partial f}{\partial v_y},\frac{\partial f}{\partial v_z},\frac{\partial^2 f}{\partial v_x^2},\frac{\partial^2 f}{\partial v_y^2},\frac{\partial^2 f}{\partial v_z^2},\frac{\partial^2 f}{\partial v_x \partial v_y},\frac{\partial^2 f}{\partial v_x \partial v_z},\frac{\partial^2 f}{\partial v_y \partial v_z} \quad (7).$$

Number of variables $v'_{1x}, v'_{1y}, v'_{1z}, v'_{2x}, v'_{2y}, v'_{2z}$ is **six**,
and equations of the type (8)

$$\frac{\partial^2 f}{\partial v_x \partial v_y}=\alpha_1 f+\alpha_2\frac{\partial f}{\partial v_x}+\alpha_3\frac{\partial f}{\partial v_y}+\alpha_4\frac{\partial f}{\partial v_z}+\alpha_5\frac{\partial^2 f}{\partial v_x \partial v_z}+\alpha_6\frac{\partial^2 f}{\partial v_y \partial v_z}$$ is

three.
So, 10-6-3=1.
Therefore, we try to find one more equation.

In the search for equations satisfying (8), we equated terms with the same velocity components, for example, $v_x v_y$.
Now note that in the third equation of the system (9) there is a member with v_i^2 , having summed over all i={x,y,z}, we reduce it to v^2 .
Thus we obtain the equation:

$$\sum_{i=x,y,z}\frac{\partial^2 f}{\partial v_i^2}+\alpha f=\beta \qquad (13)$$

(where α, β - constants). Constant β inessential, it is always possible to make a replacement f to $f+const$, nulled β . Therefore, we write 0 instead of β .
Substituting the values of the derivatives (9) into (13):

$$\frac{\partial^2 f}{\partial |\vec{v}|^2}+\frac{2}{|\vec{v}|}\cdot\frac{\partial f}{\partial |\vec{v}|}+\alpha f=0 \quad (14)$$

His decision:

$$f=C_1\cdot\frac{\exp(-\sqrt{-\alpha}|\vec{v}|)}{|\vec{v}|}+C_2\cdot\frac{\exp(\sqrt{-\alpha}|\vec{v}|)}{|\vec{v}|} \qquad (15)$$

where C_1 and C_2 - constants.

This is a **new measure of motion** that generates a new conservation law. Let's explore it.

2.1 Lagrangian

The system of equations (10) and (14) , of course, hasn't common solutions. But if the particle tries to satisfy both of them, then it tends to choose the place where the values of the functions and their derivatives in these equations will differ the least. Ideally, it chooses the point in the phase space where they coincide.

From the point of view of mathematics (10) and (14) are not a system of independent equations. This, in general, is not a system. These equations are obtained as functionally dependent. Their solution domain is not the intersection of the decision domains of each individual. To obtain the solution domain of the original problem, we must combine the solution domains (10) and (14). (Look (7) and a paragraph of explanations on.)

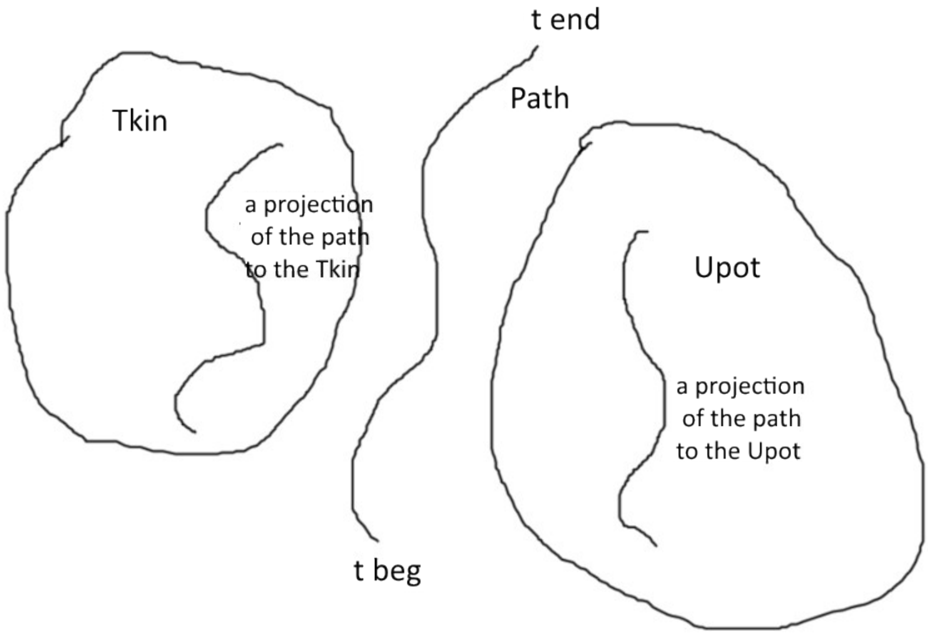
This also explains the subtraction and addition of equations (10) and (14) in chapter **2**.

If the areas (10) and (14) do not intersect. It is better to look for the points of their closest rapprochement. (And you can what-want.)

Finding the minimum difference of equations (10) and (14) justifies the principle of the optimal path in the variational analysis, from which follows the principle of the least action of Lagrange with its Lagrangians. And the fact that the Lagrangian is equal to the difference between the kinetic and potential energies.

Consider the set of material bodies. Their full measure of motion is the sum of the kinetic energies $T_{kin}=\sum_i f(|\vec{v}_i|)$ from the equation (10). These fields interact through the filds particles (FP). Not to take into account the state of emergency, it is necessary to express their action through the potential of the field-dependent position vectors. To do this, we introduce $\vec{r}=\vec{v}*(\textit{the average lifetime of } FP)$, and average $\vec{r}$ to radius vectors between the material bodies. Thus introduce potential fieldи $U_{pot}=\sum_i f(|\vec{r}_i|)$, where f is taken from the equation (14) .

Ranges of values (10) and (14) do not intersect. To be able to work with these equations simultaneously, it is necessary to find the minimum difference T_{kin} и U_{pot} on a path of movement of material bodies.



That is, to find the minimum $\int_{t_{beg}}^{t_{end}} (T_{kin} - U_{pot})\, dt$, where t is time. This is the principle of Maupertuis-Lagrange (least action).

Explanation of gauge invariance:

If the potential energy Uot has two different minima of values, but they make the same contribution to the Lagrangian, then one potential plus the difference to the second one can be represented, which will correspond to one second potential. This difference is expressed as another field in which you can search for your particles.

2.2 The canonical Gibbs distribution

We will look for other laws using the preserved functions.
Thermodynamic potentials do not take into account the kinetic energy of the whole object. That is, the kinetic energy is removed from the total energy. Let's try to act similarly.

If from equation (14) deduct (10), then we get: $\frac{\partial f}{\partial|\vec{v}|} \cdot \frac{3}{|\vec{v}|} + \alpha f = 0$,

Integrating it, we obtain:

$$f = C \cdot \exp\left(-\frac{\alpha}{6} \cdot |\vec{v}|^2\right) \qquad (16)$$

, where C is a constant. Equation (16) is very similar to the statistical distribution (the canonical Gibbs distribution).
Also, formula (16) is a solution of equation (14) at $|\alpha| \ll 1$.

When adding equations with different coefficients α, the average value of the new α is obtained. That is, the minimum α can not decrease, and the maximum can not increase. Which proves the second law of thermodynamics.

2.3 The wave equations

As when obtaining the Hamiltonian, the Lagrangian is subtracted from the doubled kinetic energy, so let's try to play with doubling.
If to equation (14) add double (10), then we get:

$$3\frac{\partial^2 f}{\partial|\vec{v}|^2} + \alpha f = 0 \qquad (17),$$

This is the equation of a simple oscillator. Integrating it, we get:

$$f = C_1 \cdot \sin\left(\sqrt{\frac{\alpha}{3}}|\vec{v}|\right) + C_2 \cdot \cos\left(\sqrt{\frac{\alpha}{3}}|\vec{v}|\right) \qquad (18)$$

so we got wave equations similar to those used in quantum mechanics.
Applying the expansion in Fourier series in coordinates (x), we obtain
$f = C_1 \cdot \sin(C_3 v x) + C_2 \cdot \cos(C_3 v x)$
Which certainly shows wave properties.

2.4 Einstein's Special Theory of Relativity

The multiplier $\frac{1}{|\vec{v}|}$ in $\frac{\partial f}{\partial |\vec{v}|} \cdot \frac{2}{|\vec{v}|}$ - conditionally permanent, $\approx \frac{1}{|\vec{v}_0|}$, where $\vec{v}_0 = const$.

This case can be justified by the fact that the particle consists of subparticles. We divide the time movement of these subparticles into intervals, and assuming that at the end of each interval the interaction is disconnected and at the beginning of the next one is included, we obtain the case when f corresponds to the conditions of this article. We simplify the model to 2 particles moving with velocities $\vec{v}_0 + \vec{u}$ and $\vec{v}_0 - \vec{u}$, where $\vec{v}_0$ - center velocity, and $\vec{u}$ - relative speed. We obtain for $|\vec{u}| \ll |\vec{v}_0|$; and $\vec{v}_0$, $\vec{u}$ - collinear; The expansion of f and its derivatives in a Taylor series up to the second order $\vec{u}$:
(for brevity, we do not write the sign of the vector and the absolute value function, and $v \approx v_0$, where v - variable)

$$f(v \pm u) = f(v) \pm \frac{\partial f(v)}{\partial v} \cdot u + \frac{\partial^2 f(v)}{\partial v^2} \cdot \frac{u^2}{2} \;;$$

$$\frac{\partial f(v \pm u)}{\partial (v \pm u)} = \frac{\partial f(v)}{\partial v} \pm \frac{\partial^2 f(v)}{\partial v^2} \cdot u \;;$$

$$\frac{\partial^2 f(v \pm u)}{\partial (v \pm u)^2} = \frac{\partial^2 f(v)}{\partial v^2} \;.$$

Substituting these series of Taylor into equation (14) and summing it, we get:

$$\frac{\partial^2 f(v)}{\partial v^2} \cdot \left(1 - \frac{2 \cdot u^2}{v_0^2 - u^2} + \frac{\alpha}{2} \cdot u^2 \right) + \frac{2 \cdot v_0}{v_0^2 - u^2} \cdot \frac{\partial f(v)}{\partial v} + \alpha \cdot f(v) = 0 \;.$$

Discarding terms that are comparable and less u^2 , we get:

$$\frac{\partial^2 f(v)}{\partial v^2} + \frac{2}{v_0} \cdot \frac{\partial f(v)}{\partial v} + \alpha \cdot f(v) = 0 \quad (19).$$

The solution of this equation is:

$$f = const_1 \cdot \exp\left(+\frac{\sqrt{1-\alpha\cdot v_0^2}}{v_0}\cdot v\right) + const_2 \cdot \exp\left(-\frac{\sqrt{1-\alpha\cdot v_0^2}}{v_0}\cdot v\right) \quad (20).$$

Taking into account $v \approx v_0$, and substituting $\alpha = \frac{1}{c^2}$, we get

$$f = const_1 \cdot \exp\left(+\sqrt{1-\frac{v^2}{c^2}}\right) + const_2 \cdot \exp\left(-\sqrt{1-\frac{v^2}{c^2}}\right) \qquad (21),$$

which is very close to the Einstein formulas of the special theory of relativity. The same formulas are obtained by rotating the constituent particles with velocities much larger (and not only smaller) of mass center $|\vec{u}| \gg |\vec{v}_0|$.

2.5 The Yukawa Potential of Strong Interaction

If we multiply the pion lifetime by its velocity, we obtain the distance **r** of the interaction of the nucleons. Its potential is obtained by replacing the velocity **v** by **r** in the first term of equation (15)

$$f = const \cdot \frac{\exp(-\sqrt{-\alpha}\, r)}{r} \qquad (22)$$

This is exactly the same as the Yukawa potential.

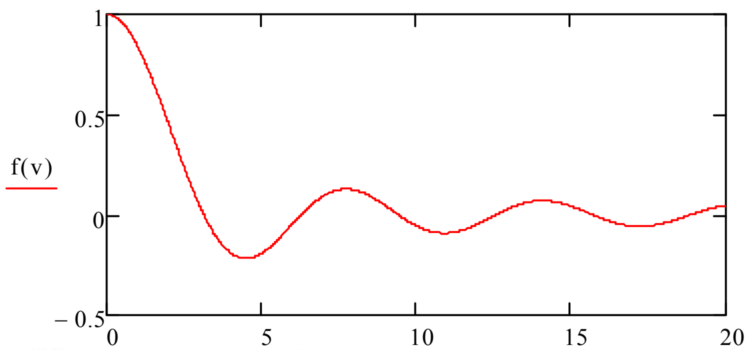
2.6 Graphs of the equation (15)

at:

$\alpha := 1$

$f(0) = 1$

$f'(0) = 0$

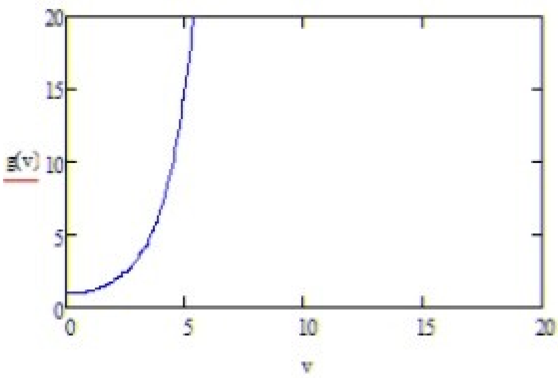


at:

$\alpha := -1$

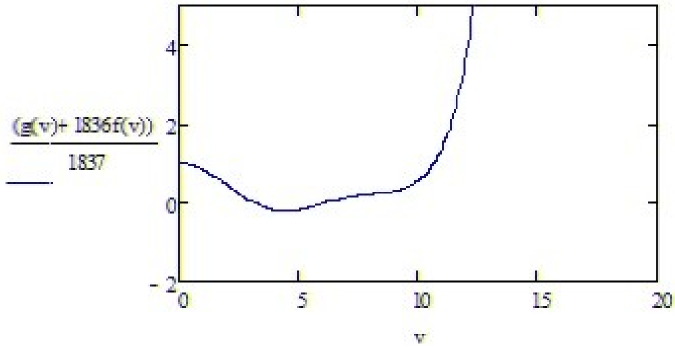
$f(0) = 1$

$f'(0) = 0$



g(v):=f(v)

We add these two graphs with coefficients proportional to the masses of the electron and proton:



(this is reminiscent of the Higgs potential). If we take into account Higgson's lifetime, then the speed on the graph will be transformed into a radius of action. And no scalar fields (new ethers) are needed. Everything is determined by the internal structure of elementary particles. In this case, a proton and an electron.

And from equation (15) follows that at the rate zero the function zero is lost if it were strictly periodic. This can be interpreted as a loss of π in phase. In the wave function this is interpreted as spin 1/2. And bosons are obtained in the form of derivatives, and they have losses of 2π, and spin is 1.

If we consider not 2, but 3 or more particles, then nothing significant in 3-dimensional space is obtained. With 3 particles, 4 terms of the form (15) with 4 constants are obtained. In the collision of a larger number of particles, such components will be even more, but their general appearance will be the same.

I do not remember who, but someone from the wise said that all the potential energy must be reduced to kinetic. Here it is.

Friends! There is one BUT in my theory: the universe is not infinite and the Galileo principle is not entirely true.

In the paragraph "Einstein's SRT" the energy obtained, possibly potential, differs from the famous $E = mc^2$ exponential. The exponent is easily translated into sines / cosines. If we take into account the explanations of the Lagrangian in paragraph 2.1, then the sines of mc^2 can get into the smallest action. It is quite possible that at some angles the difference in kinetic and potential energies can be even less than without angles. This is how the famous Lagrangian correction for $\sin(28^o)$. 28^o very close to 30^o , and hence the confirmation of the arrangement of quarks in the form of a regular triangle, as in the article "Fields and Particles". There the proton is represented by a regular triangle of quarks.