

Universe. Relations between time, matter, volume, distance and energy. Rolling Space, Time, Matter into Point

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Abstract

In Part1 author has developed a theory which allows derivation of the unknown relations between main parameters in a given field of nature. He applied this theory for estimation of some values of our Universe and received both well-known and new unknown relations.

Author offers possibly valid relations between time, matter, volume, distance, and energy. The net picture derived is that in the Universe exists ONLY one substance – ENERGY. Time, matter, volume, fields are evidence of the energy and they can be transformed one to other. Author gives the equations which allow to calculate these transformation like the famous formula $E = mc^2$. Some assumptions about the structure of the Universe follow from these relations.

Most offered equations give results close to approximately known data of Universe, the others allow checking up by experiment.

In part 2 of the author shows that the parameters of space (volume, distance) and time have limits (maximal values). The volume (distance), time contract (collapse) into a point under the specific density of the energy, matter, pressure, frequency, temperature, intensity of electric, magnetic, acceleration fields. The maximal temperature and force are independent from other conditions.

Key words: Universe, time, matter, volume, distance, energy; limits of specific density of energy, matter, pressure, temperature, intensity of fields; collapse of space and time into point.

Introduction

The **multiverse** is the hypothetical set of infinite or finite possible universes (including the historical universe we consistently experience) that together comprise everything that exists and can exist: the entirety of space, time, matter, and energy as well as the physical laws and constants that describe them. The various universes within the multiverse are sometimes called parallel universes.

The structure of the multiverse, the nature of each universe within it and the relationship between the various constituent universes, depend on the specific multiverse hypothesis considered. Multiple universes have been hypothesized in cosmology, physics, astronomy, religion, philosophy, transpersonal psychology and fiction, particularly in science fiction and fantasy. In these contexts, parallel universes are also called "alternative universes", "quantum universes", "interpenetrating dimensions", "parallel dimensions", "parallel worlds", "alternative realities", "alternative timelines", and "dimensional planes," among others [1]-[3].

Theory of Universe

There is a lot of theories University. Author consider the relations between the most important parameters and conditions when University rolling into point.

Part 1. Relations between time, matter, volume, distance and energy.

The author presents an original theory which allows derivation of unknown relations between main parameters in a given field of nature. He applies his hypotheses to theory of Universe. The next well-known constants used in his equations are below:

$$c = 2.997925 \cdot 10^8 \text{ m/s}, \quad e = 1.60219 \cdot 10^{-19} \text{ C}, \quad G = 6.6743 \cdot 10^{-11} \text{ Nm}^2/\text{kg}^2, \quad (1)$$

$$\varepsilon_0 = \frac{1}{36\pi \cdot 10^9} = 8.8542 \cdot 10^{-12} \frac{\text{F}}{\text{m}}, \quad \mu_0 = 4\pi \cdot 10^{-7} = 1.257 \cdot 10^{-6} \frac{\text{H}}{\text{m}},$$

$$h = 6.6261 \cdot 10^{-34} \text{ J} \cdot \text{s}, \quad \hbar = h/2\pi, \quad \sigma = 5.67032 \cdot 10^{-8} \text{ W/m}^2\text{K},$$

where c is speed of light in vacuum, m/s; e is electronic charge, C; G is gravitation constant, Nm^2/kg^2 ; ε_0 is electric constant, F/m ; μ_0 is magnetic constant, H/m ; h is Planck constant, $\text{J}\cdot\text{s}$; σ is Stefan – Boltzmann constant, $\text{W/m}^2\text{K}$.

The author postulated the following relations:

1. Relations between time, matter, volume, distance, specific density of matter and energy:

$$T = \frac{G}{c^5} E, \quad T = \frac{G}{c^3} M, \quad T = c^{-1} v^{1/3}, \quad T = \frac{R}{c}, \quad T = (G\rho)^{-1/2}, \quad (2)$$

$$\text{or } T = 2.756144 \cdot 10^{-53} E, \quad T = 2.47709939 \cdot 10^{-36} M,$$

$$T = 3.33564 \cdot 10^{-9} R, \quad T = 2.2448563 \cdot 10^{-24} \rho^{-2},$$

where T is time in sec; E is energy in J; M is mass, kg; v is volume in m^3 ; R is distance, m; ρ is specific density of

matter in given point, kg/m^3 . (Only the first 6 digits are right in all our formulas).

The dimensional theory is employed; that way these relations are obtained to within a constant factor. That factor may be derived from experiment. This factor has been neglected in cosmology and high energy physics. But these equations (2)-(6) cannot be derived ONLY from dimensional theory because dimensional theory does not contain the physical constant.

Equations (2) may be written in form

$$E = \frac{c^5}{G} T, \quad M = \frac{c^3}{G} T, \quad v = c^3 T^3, \quad R = cT, \quad \rho = 1/(GT^2), \quad (2a)$$

$$\text{or } E = 3.62825745 \cdot 10^{52} T, \quad M = 4.454628 \cdot 10^{35} T, \quad \rho = 1.5 \cdot 10^{10} / T^2.$$

From these equations follow some interesting propositions. Time is energy, time depends upon mass, volume, length and density of matter. Time can create the energy, mass, distance, volume and change the density of matter in the Universe.

2. Relations between volumes, energy, matter, time, and distance

$$v = \frac{G^3}{c^{12}} E^3, \quad v_n = \frac{G^n}{c^{4n}} E^n, \quad v = c^3 T^3, \quad v = \frac{G^3}{c^6} M^3, \quad v = \frac{4\pi}{3} R^3, \quad (3)$$

$$\text{or } v = 5.64115466 \cdot 10^{-133} E^3, \quad v = 2.694401 \cdot 10^{25} T^3, \quad v = 4.095365 \cdot 10^{-82} M^3,$$

where v is volume of 3-demantional space, m^3 ; v_n is n-dimensional space, m^n .

3. Relations between matter, time, volume and distance

$$M = \frac{c^3}{G} T, \quad M = \frac{c^2}{G} v^{1/3}, \quad M = \frac{c^2}{G} R, \quad (4)$$

$$M = 4.0369797 \cdot 10^{35} T, \quad M = 1.34659 \cdot 10^{27} v^{1/3}, \quad M = 1.34659 \cdot 10^{27} R.$$

4. We can receive from equations (2) - (4) the expressions for the energy from time, volume, distance and matter

$$E = \frac{c^5}{G} T, \quad E = \frac{c^4}{G} v^{1/3}, \quad E_n = \frac{c^{4n}}{G^n} v_n^{1/n}, \quad E = \frac{c^4}{G} R, \quad E = c^2 M, \quad (5)$$

$$E = 3.62825745 \cdot 10^{52} T, \quad E = 1.2102562 \cdot 10^{44} v^{1/3}, \quad E = 1.2102562 \cdot 10^{44} R,$$

$$E = 8.98755 \cdot 10^{16} M.$$

Last equation in (5) is the well known relation between energy and matter. This relationship follows from (2) – (4) as a special case. This indirectly confirms the correctness of the equations (2) – (5) as a special case.

Let us to estimate the real size and parameters (mass, radius, time, density, etc.) of the Universe. We can make it if we accurately know at least one of its parameters.

Thus the most reliable parameter is the lifetime of the Universe after the Big Bang. Estimates of the observed mass and radius are growing all the time. Estimation of the time specified, and it is about 14 billion years now (13.75±0.17 billion years).

$$M = \frac{c^3}{G}T, \quad E = \frac{c^5}{G}T, \quad R = cT, \quad v = \frac{4}{3}\pi R^3, \quad \rho = \frac{1}{GT^2},$$

$$\text{or } M = 4.0369787 \cdot 10^{35}T, \quad E = 3.62825745 \cdot 10^{52}T,$$

$$R \approx 3 \cdot 10^8 T, \quad \rho = 1.5 \cdot 10^{10} / T^2. \quad (6)$$

Substitute in (6) the age of Universe after Big Bang ($T=14$ billions years = $4.4 \cdot 10^{17}$ sec) we receive:

$$M = 1.78 \cdot 10^{53} \text{ kg} > 1.4 \cdot 10^{53} \text{ kg}, \quad E = 1.6 \cdot 10^{70} \text{ J},$$

$$R = 1.32 \cdot 10^{26} \text{ m} < 4.4 \cdot 10^{26} \text{ m}, \quad v = 10^{79} \text{ m}^3, \quad \rho = 7.75 \cdot 10^{-26} \text{ kg/m}^3 > 10^{-26} \text{ kg/m}^3. \quad (7)$$

In right side of the inequality (7) is given the estimations of universal parameters made by other researchers. They are very different. The author took average or approximate values.

As you see the values received by offered equations and others methods have the closed magnitudes. The mass of the Universe is little more because we do not see the whole Universe (only the closer bodies). The estimation of radius is more than light can travel in the time since the origin of the Universe. It is possible the Universe in initial time had other physical laws than now or the expansion of space may account for this. The difference of space density is result of the old methods that do not include invisible matter, dark matter and dark energy.

The main fields are acceleration, gravity, electric, magnetic and photon/radiation. Density of energy in given point of these fields compute by equations:

$$w_a = \frac{1}{G} \frac{a^2}{2}, \quad w_g = \frac{1}{G} \frac{g^2}{2}, \quad w_e = \varepsilon_0 \frac{E^2}{2}, \quad w_m = \mu_0 \frac{H^2}{2}, \quad w_r = \frac{\sigma}{c} t^4, \quad w_E = \frac{c^2}{GT^2}, \quad (8)$$

where w_a is density of acceleration energy, J/m^3 ; w_g is density of gravitation energy, J/m^3 ; w_e is density of electric energy, J/m^3 ; w_m is density of magnetic energy, J/m^3 ; w_r is density of radiation energy, J/m^3 ; w_E is time energy density, J/m^3 . a is acceleration, m/s^2 ; g is gravitation, m/s^2 ; σ is Stefan – Boltzmann constant, $\text{W/m}^2\text{K}$; E is electric intensity, V/m or N/C ; H is magnetic intensity, T or Vs/m^2 or Wb/m^2 ; w_r is density of radiation energy, J/m^3 ; t is temperature, K ; T is time, sec . The last two formulas show the energy density depends from temperature and time.

Full energy, W , we find by integration of density to a full volume.

$$W = \int_V w dv. \quad (9)$$

These computations in analytical form we can take as relating to simple geometric figures as, for example, the spherical forms of fields.

Note: In many cases the light speed in the equations (2)-(6) may be changed in conventional speed V . That means we can verify the formulas (2)-(6) and find the correct constant factor.

Discussion

Main result of this Part 1 is equations with result that energy can be the universal source of Universe (see Eq.(5)). Energy can produce time, mass, volume. The same role/factor also can acts the time (see Eq.(2)). All main components of Universe (size, mass, energy, volume, time) are closely connected and can transformed from one to another.

That means in base of Universe is ONE factor (for example, energy or so on?) which creates our diverse World.

The reader can ask: How we can convert time to energy? I can ask a counter question: The equation $E = m c^2$ (here m is mass) was open about hundred years ago. In that (past) time nobody could answer: How to convert the matter into this big energy using this equation? Only tens of years later the scientists opened that certain nuclei of atoms can convert one to another, significantly change their mass and emit or absorb the big energy. In 2006 the author offered the method which can convert any matter in full energy with according to the equation $E = m c^2$ [8] – [9].

Only time and experiments can confirm, correct or deny the proposed formulae.

Part 2. Collapse of Space, Time, and Matter into a Point

Theory: Parameters of the energy, matter and fields have a limit. Space (volume, distance) and time collapse under these limits.

The author shows the parameters of the energy, matter and fields have limits (maximal values). The volume (distance), time contract (collapse) under the specific density of the energy, matter, pressure, frequency, temperature, intensity of electric, magnetic, acceleration fields.

The author postulated the following relation:

$$\frac{dT}{dT_0} = \left(1 - \frac{E}{E_0}\right)^{1/2} = \gamma, \quad \frac{dl}{dl_0} = \left(1 - \frac{E}{E_0}\right)^{1/2} = \gamma, \quad (10)$$

where T is time in into given volume having given substance (energy, matter, field, temperature, etc.), sec.; T_0 is time of outer observer in his outer space, sec; E is energy into the given volume, J; E_0 is maximal possible energy into the given volume, J; l is length in into given volume having given substance (energy, matter, field, temperature, etc.) and measured by outer observer, sec; l_0 is length into the same outer observer in his space (length measured by outer observer), m; γ is contraction (coagulation, rolling, collapse) coefficient.

The equation (10) for $E_0 = Mc^2 > 0$, $E/E_0 \leq 1$ gives the limits of parameters (maximal pressure, mass and volume density, acceleration, frequency, temperature, intensity if fields, event horizons, etc.) which depend from positive mass.

The following equations (equations for decreasing the time, length from conditions into the given volume) can be derived from the relationship between factors in equation (2). In this step, we use the equation $E_0 = Mc^2$ and the suitable equations from [1] part 1.

Influence of pressure N/m²:

$$\gamma = \left(1 - \frac{p}{p_0}\right)^{1/2} = \left(1 - \frac{M^2 G^3}{c^8} p\right)^{1/2}, \quad \text{where } p_0 = \frac{c^8}{G^3} \frac{1}{M^2}, \quad (11)$$

where p is current pressure, N/m²; p_0 is maximal possible pressure, N/m².

Influence of mass density (kg/m³)

$$\gamma = \left(1 - \frac{\rho}{\rho_0}\right)^{1/2} = \left(1 - \frac{M^2 G^3}{c^6} \rho\right)^{1/2}, \quad \text{where } \rho_0 = \frac{c^6}{G^3} \frac{1}{M^2}, \quad (12)$$

where ρ is current mass density, kg/m³; ρ_0 is maximal possible mass density, kg/m³.

Influence of specific energy density (J/m³) for volume $v = \text{const}$

$$\gamma = \left(1 - \frac{E_v}{E_{v,0}}\right)^{1/2} = \left(1 - \frac{M^2 G^3}{c^8} E_v\right)^{1/2}, \quad \text{where } E_{v,0} = \frac{c^8}{G^3} \frac{1}{M^2}, \quad (13)$$

where E_v is specific current energy density, J/m³; $E_{v,0}$ is maximal possible energy pressure, J/m³.

Influence of temperature (using an additional relation $E = \frac{3}{2}k_B t$):

$$\gamma = \left(1 - \frac{t}{t_0}\right)^{1/2} = \left(1 - \frac{3k_B t}{2c^2}\right)^{1/2}, \quad \text{where } t_0 = \frac{2c^2}{3k_B}, \quad (14)$$

where t is temperature, °K; t_0 is maximal possible temperature, °K ; $k_B = 1.38066 \cdot 10^{-23} \text{ J/K}$ is Boltzmann constant.

Influence of field frequency

$$\gamma = \left(1 - \frac{\nu}{\nu_0}\right)^{1/2} = \left(1 - \frac{GM}{c^3} \nu\right)^{1/2}, \quad \text{where } \nu_0 = \frac{1}{T} = \frac{c^3}{G M} = (G\rho_0)^{1/2}, \quad (15)$$

where ν is field frequency, 1/s; ν_0 is maximal possible frequency, 1/s ; ρ_0 is maximal possible density, kg/m^3 .

Wave De-Broil (using the additional relation $\nu_B = h/2MV^2$):

$$\gamma = \left(1 - \frac{\nu_{B,0}}{\nu_B}\right)^{1/2} = \left(1 - \frac{h}{2c^2 M} \frac{1}{\nu_B}\right)^{1/2}, \quad \text{where } \nu_{B,0} = \frac{h}{2c^2} \frac{1}{M}, \quad (16)$$

where ν_B is wave frequency, 1/s; $\nu_{B,0}$ is maximal possible wave frequency, 1/s ; h is Planck constant, J·s.

Influence of the electric intensity [N/C]

$$\gamma = \left(1 - \left(\frac{E_e}{E_{e,0}}\right)^2\right)^{1/2} = \left(1 - \frac{\varepsilon_0 G^3 M^2}{2c^8} E_e^2\right)^{1/2}, \quad \text{where } E_{e,0}^2 = \frac{2c^8}{\varepsilon_0 G^3} \frac{1}{M^2}, \quad (17)$$

where E_e is electric intensity [N/C]; $E_{e,0}$ is maximal electric intensity [N/C]; ε_0 is electric constant, F/m.

Influence of the magnetic intensity [A/m]

$$\gamma = \left(1 - \left(\frac{H}{H_0}\right)^2\right)^{1/2} = \left(1 - \frac{\mu_0 G^3 M^2}{2c^8} H^2\right)^{1/2}, \quad \text{where } H_0^2 = \frac{2c^8}{\mu_0 G^3} \frac{1}{M^2}, \quad (18)$$

where H is magnetic intensity [A/m]; H_0 is maximal magnetic intensity [A/m]; μ_0 is magnetic constant, H/m.

Influence of the acceleration field [m/s^2]

$$\gamma = \left(1 - \left(\frac{a}{a_0}\right)^2\right)^{1/2} = \left(1 - \left(\frac{4MG}{c^4}\right)^2 a^2\right)^{1/2}, \quad \text{where } a_0 = \frac{c^4}{4G M}, \quad (19)$$

where a is acceleration/gravity, m/s^2 ; a_0 is maximal acceleration/gravity.

Influence of the distance from the center of the central point gravitation field, $r_s < r$:

$$\gamma = \left(1 - \left(\frac{r_s}{r} \right)^4 \right)^{1/2} = \left(1 - \left(\frac{2GM}{c^2} \right)^4 \frac{1}{r^4} \right)^{1/2}, \quad \text{where } r_s = \frac{2G}{c^2} M, \quad (20)$$

where r is distance from the center of the central gravitation field, m; r_s is radius of Schwarzschild, m.

Influence of the distance from center of the central electric field, $r_E < r$:

$$\gamma = \left(1 - \left(\frac{r_E}{r} \right)^4 \right)^{1/2} = \left(1 - \left(\frac{k_e Q}{c^2 M} \right)^4 \frac{1}{r^4} \right)^{1/2}, \quad \text{where } r_E = \frac{k_e Q}{c^2 M}, \quad (21)$$

where r is distance from the center of the central electrostatic field, m; r_E is event horizon of the central electrostatic field, $r_E < r$, m; $k_e = 1/4\pi\epsilon_0 \approx 9 \cdot 10^9$ is electric constant, Nm^2/C^2 ; Q is electric charge of body having mass M , C.

Note: The maximal possible values are given an accuracy with numerical factor/multiplier (about $10^{\pm 1}$). This factor is found from testing/measuring or additional consideration. For example, the maximal possible mass density in equation (4) is

$$\rho_0 = \left(\frac{32\pi}{3} \right) \frac{c^6}{G^3} \frac{1}{M^2}. \quad (22)$$

Substitute the kinetic energy $E = MV^2$ into equation (2) we can easy to get the well-known equations of the special relativistic (Einstein) theory:

$$\frac{T}{T_0} = \sqrt{1 - \frac{V^2}{c^2}}, \quad \frac{l}{l_0} = \sqrt{1 - \frac{V^2}{c^2}}, \quad (23)$$

where V is speed of a moving body, m/s; T is the interval of time in a moving system, sec; l is the interval of length in a moving system, m; T_0 is the interval of time in stationary system, sec; l_0 is the interval of length in stationary system, m;

Note, the resulting equations (2) – (13) are principal differently from the relativistic equation (15). Equations (15) measure the time and length of the body in a MOVING system of coordinates. The equation (2) – (13) show how we must change the state of the MOTIONLESS body that body will be rolling the size and existing time into point.

The numerical value of these limits in equations (2) – (13) are following (accuracy about 4 digits):

$$\begin{aligned} p_0 &= \frac{c^8}{G^3} \frac{1}{M^2} = 2.1962 \cdot 10^{98} \frac{1}{M^2}, \quad N/m^2; \quad \rho_0 = \frac{c^5}{G^3} \frac{1}{M^2} = 2.4405 \cdot 10^{81} \frac{1}{M^2}, \quad \frac{kg}{m^3}; \\ E_{v,0} &= \frac{c^8}{G^3} \frac{1}{M^2} = 2.1962 \cdot 10^{98} \frac{1}{M^2}, \quad \frac{J}{m^3}; \quad v_{B,0} = \frac{h}{2c^2} \frac{1}{M} = 3.68627 \cdot 10^{-51} \frac{1}{M}, \quad \frac{1}{s}; \end{aligned} \quad (24)$$

$$\begin{aligned} v_0 &= \frac{c^3}{G M} = 4.002 \cdot 10^{35} \frac{1}{M}, \quad \frac{1}{s}; \quad t_0 = \frac{2c^2}{3k_B} = 4.33975 \cdot 10^{39} K; \\ E_{e,0}^2 &= \frac{2c^8}{\epsilon_0 G^3} \frac{1}{M^2} = 3.25144 \cdot 10^{110} \frac{1}{M^2}, \quad \frac{N}{C}, \frac{V}{m}, \frac{kg \cdot m}{s^3 A}; \end{aligned} \quad (25)$$

$$H_0^2 = \frac{2c^8}{\mu_0 G^3} \frac{1}{M^2} = 3.40276 \cdot 10^{90} \frac{1}{M^2}, \quad T, \frac{Wb}{m^2}, \frac{Vs}{m^2}, \frac{N}{mA}; \quad (26)$$

$$a_0 = \frac{c^4}{4G} \frac{1}{M} = 3.02639 \cdot 10^{43} \frac{1}{M}, \frac{m}{s^2}; \quad r_s = \frac{2G}{c^2} M \approx 1.4853 \cdot 10^{-27} M, m;$$

$$r_E = \frac{1}{4\pi\epsilon_0 c^2} \frac{Q}{M} = 10^{-7} \frac{Q}{M}, m; \quad E_0 = c^2 M = 8.98752 \cdot 10^{16} M, J \quad (27)$$

$$F_0 = M a_0 = 3.02639 \cdot 10^{43} N.$$

Here F_0 is maximal force, N. The temperature and maximal force are constants; they do not depend from mass.

As you see, the value in numerator is very small; the value in denominator is very large. The conventional conditions are very far from rolling (collapse) state. Rolling the time and space into point (zero) may be in very small volume (nuclear or less) or into a big mass of the gigantic density. The closed conditions may be in the black holes, wormholes, dwarfs and neutron stars.

Remain: the magnitudes (16) – (19) are computed without the individual factor $\approx 10^{\pm 1}$. This factor (± 1) is small in comparison to exponents 98, 81, 41, etc., and may be found from the additional conditions or experiment.

Discussion and Conclusion

In Part 1 of this work author shows the base of the Universe is only ONE substance – ENERGY. Only energy creates other known forms of energy: space, time, matter, electric, magnetic, gravitation, nuclear fields. This result produced a new view of dark energy, dark matter, extension and acceleration of the Universe.

Main result the Part 2 of this research is that every form or condition of energy (density of energy, density of matter, temperature, frequency, density/intensity of the electric, magnetic, gravitation, nuclear fields) have a LIMIT. When we are approaching this limit, space (volume, length, distance) and time roll up (collapse) into point (zero).

The proposed equations (10) – (21) are fundamentally different from the relativistic equation (23). Equations (23) measure the time and length of a body in a MOVING system of coordinates. The equation (10) – (21) shows how we must change the state (density, pressure, temperature) of the MOTIONLESS body or intensity/density of the electric, magnetic, gravitation/acceleration (centrifugal) field that body will be rolling (collapse) the size and its existing time into point. For the outside observer, the approach to the critical state can continue indefinitely.

The critical value/limit may be high, but our abilities increase over time. We can project very strong fields into the micro world. We can better understand the micro/macro processes.

The offered limits are others or absent for negative energy, negative mass. In this case we may receive the faster-than-light speed [8], repel (negative) gravity, unlimited energy from point vacuum, exotic matter, and so on, which may help to explain the inflation of the Universe or to develop the power spaceships for the interstellar travels.

The authors other works closest to this topic are presented in references [4] – [10].

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