

**Universe (Part 2):
Rolling of Space (Volume, Distance), Time,
and Matter into a Point**

By Alexander Bolonkin



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Universe (Part 2): Rolling of Space (Volume, Distance), Time, and Matter into a Point

By Alexander Bolonkin
C&R, abolonkin@juno.com

Abstract

Previously [1], this author developed a theory which allows derivation of the unknown relations between main parameters in a given field of nature. Using this theory, the outcomes of the derived formulas to estimate some values of our Universe uncovered both well-known and new unknown relations. That paper [1] which should be considered part 1 of this series offers possibly valid relations between time, matter, volume, distance, and energy. The net picture derived is that there exists in the Universe ONLY one primary factor – ENERGY. Time, matter, volume, fields are all evidence of the energy and can be transformed one to other, such as the transformation in the famous formula $E = mc^2$.

In this paper, part 2 of that series, 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 universe is commonly defined as the totality of everything that exists, including all physical matter and energy, the planets, stars, galaxies, and the contents of intergalactic space. The term *universe* may be used in slightly different contextual senses, denoting such concepts as the *cosmos*, the *world*, or *nature*.

Observations of earlier stages in the development of the universe, which can be seen at great distances, suggest that the universe has always been governed by the same physical laws. The Solar System is embedded in a galaxy composed of billions of stars, the Milky Way, and other galaxies that exist outside it, as far as astronomical instruments can reach. Modern cosmology is the careful studies of the distribution of these galaxies and their spectral lines. Discovery of the red shift and cosmic microwave background radiation revealed that the universe is expanding and apparently has had a beginning. This high-resolution image of the Hubble ultra deep field shows a diverse range of galaxies, each consisting of billions of stars.



Figure 1: This high-resolution image of the Hubble Ultra-Deep Field shows a diverse range of galaxies, each consisting of billions of stars. The equivalent area of sky that the picture occupies is shown as a red box in the lower left corner. The smallest, reddest galaxies, about 100, are some of the most distant galaxies to have been imaged by an optical telescope, existing at the time shortly after the Big Bang.

In Part 1 [1] author offers possibly valid relations between time, matter, volume, distance, and energy. The net picture derived is that in the Universe there exists ONLY one substance – ENERGY. Time, matter, volume, fields evidence energy and they can be transformed one to other. Author gives the equations which allow to calculate these transformation in addition to the famous formula $E = mc^2$.

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

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 well-known constants used in his equations are:

$$\begin{aligned}
 c &= 2.997925 \cdot 10^8 \text{ m/s}, \quad e = 1.60219 \cdot 10^{-19} \text{ C}, \quad G = 6.6743 \cdot 10^{-11} \text{ Nm}^2 / \text{kg}^2, \\
 \varepsilon_0 &= \frac{1}{36\pi \cdot 10^9} = 8.8542 \cdot 10^{-12} \frac{\text{F}}{\text{m}}, \quad \mu_0 = 4\pi \cdot 10^{-7} = 1.257 \cdot 10^{-6} \frac{\text{H}}{\text{m}}, \\
 h &= 6.6261 \cdot 10^{-34} \text{ J} \cdot \text{s}, \quad \hbar = h / 2\pi, \quad \sigma = 5.67032 \cdot 10^{-8} \text{ W} / \text{m}^2 \text{K}^4,
 \end{aligned} \tag{1}$$

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, J s; σ is Stefan – Boltzmann constant, $\text{W}/\text{m}^2\text{K}^4$.

The author postulated the following relation:

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

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 (2) 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/m^2 :

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

where p is current pressure, N/m^2 ; p_0 is maximal possible pressure, N/m^2 .

Influence of mass density (kg/m^3)

$$\gamma = \left(1 - \frac{\rho}{\rho_0}\right)^{1/2} = \left(1 - \frac{M^2 G^3}{c^6} \rho\right)^{1/2}, \quad \text{where } \rho_0 = \frac{c^6}{G^3} \frac{1}{M^2}, \quad (4)$$

where ρ is current mass density, kg/m^3 ; ρ_0 is maximal possible mass density, kg/m^3 .

Influence of specific energy density (J/m^3) for volume $v = \text{const}$

$$\gamma = \left(1 - \frac{E_v}{E_{v,0}}\right)^{1/2} = \left(1 - \frac{M^2 G^3}{c^8} E_v\right)^{1/2}, \quad \text{where } E_{v,0} = \frac{c^8}{G^3} \frac{1}{M^2}, \quad (5)$$

where E_v is specific current energy density, J/m^3 ; $E_{v,0}$ is maximal possible energy pressure, J/m^3 .

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

$$\gamma = \left(1 - \frac{t}{t_0}\right)^{1/2} = \left(1 - \frac{3k_B}{2c^2} t\right)^{1/2}, \quad \text{where } t_0 = \frac{2c^2}{3k_B}, \quad (6)$$

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

$$\gamma = \left(1 - \frac{\nu}{\nu_0}\right)^{1/2} = \left(1 - \frac{GM}{c^3} \nu\right)^{1/2}, \quad \text{where } \nu_0 = \frac{1}{T} = \frac{c^3}{G M} = (G\rho_0)^{1/2}, \quad (7)$$

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

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

$$\gamma = \left(1 - \frac{\nu_{B,0}}{\nu_B}\right)^{1/2} = \left(1 - \frac{h}{2c^2 M} \frac{1}{\nu_B}\right)^{1/2}, \quad \text{where } \nu_{B,0} = \frac{h}{2c^2} \frac{1}{M}, \quad (8)$$

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]

$$\gamma = \left(1 - \left(\frac{E_e}{E_{e,0}}\right)^2\right)^{1/2} = \left(1 - \frac{\varepsilon_0 G^3 M^2}{2c^8} E_e^2\right)^{1/2}, \quad \text{where } E_{e,0}^2 = \frac{2c^8}{\varepsilon_0 G^3} \frac{1}{M^2}, \quad (9)$$

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]

$$\gamma = \left(1 - \left(\frac{H}{H_0}\right)^2\right)^{1/2} = \left(1 - \frac{\mu_0 G^3 M^2}{2c^8} H^2\right)^{1/2}, \quad \text{where } H_0^2 = \frac{2c^8}{\mu_0 G^3} \frac{1}{M^2}, \quad (10)$$

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]

$$\gamma = \left(1 - \left(\frac{a}{a_0}\right)^2\right)^{1/2} = \left(1 - \left(\frac{4MG}{c^4}\right)^2 a^2\right)^{1/2}, \quad \text{where } a_0 = \frac{c^4}{4G M}, \quad (11)$$

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

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

$$\gamma = \left(1 - \left(\frac{r_s}{r} \right)^4 \right)^{1/2} = \left(1 - \left(\frac{2GM}{c^2} \right)^4 \frac{1}{r^4} \right)^{1/2}, \quad \text{where } r_s = \frac{2G}{c^4} M, \quad (12)$$

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, $r_E < r$:

$$\gamma = \left(1 - \left(\frac{r_E}{r} \right)^4 \right)^{1/2} = \left(1 - \left(\frac{k_e Q}{c^2 M} \right)^4 \frac{1}{r^4} \right)^{1/2}, \quad \text{where } r_E = \frac{k_e Q}{c^2 M}, \quad (13)$$

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

$$\rho_0 = \left(\frac{32\pi}{3} \right) \frac{c^6}{G^3} \frac{1}{M^2}. \quad (14)$$

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:

$$\frac{T}{T_0} = \sqrt{1 - \frac{V^2}{c^2}}, \quad \frac{l}{l_0} = \sqrt{1 - \frac{V^2}{c^2}}, \quad (15)$$

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):

$$\begin{aligned} p_0 &= \frac{c^8}{G^3} \frac{1}{M^2} = 2.1962 \cdot 10^{98} \frac{1}{M^2}, \quad N/m^2; & \rho_0 &= \frac{c^5}{G^3} \frac{1}{M^2} = 2.4405 \cdot 10^{81} \frac{1}{M^2}, \quad \frac{kg}{m^3}; \\ E_{v,0} &= \frac{c^8}{G^3} \frac{1}{M^2} = 2.1962 \cdot 10^{98} \frac{1}{M^2}, \quad \frac{J}{m^3}; & v_{B,0} &= \frac{h}{2c^2} \frac{1}{M} = 3.68627 \cdot 10^{-51} \frac{1}{M}, \quad \frac{1}{s}; \end{aligned} \quad (16)$$

$$v_0 = \frac{c^3}{G M} 4.002 \cdot 10^{35} \frac{1}{M}, \quad \frac{1}{s}; \quad t_0 = \frac{2c^2}{3k_B} = 4.33975 \cdot 10^{39} \text{ K};$$

$$E_{e,0}^2 = \frac{2c^8}{\varepsilon_0 G^3} \frac{1}{M^2} = 3.25144 \cdot 10^{110} \frac{1}{M^2}, \quad \frac{N}{C}, \frac{V}{m}, \frac{kg \cdot m}{s^3 A};$$
(17)

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

$$a_0 = \frac{c^4}{4G M} = 3.02639 \cdot 10^{43} \frac{1}{M}, \quad \frac{m}{s^2}; \quad r_s = \frac{2G}{c^4} M = 1.65213 \cdot 10^{-43} M, \quad m;$$
(18)

$$r_E = \frac{1}{4\pi\varepsilon_0 c^2} \frac{Q}{M} = 10^{-7} \frac{Q}{M}, \quad m; \quad E_0 = c^2 M = 8.98752 \cdot 10^{16} M, \quad J$$

$$F_0 = M a_0 = 3.02639 \cdot 10^{43} N.$$
(19)

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 [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 (2) – (13) are fundamentally different from the relativistic equation (15). Equations (15) measure the time and length of a body in a MOVING system of coordinates. The equation (2) – (13) 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 [1] – [7].

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