Universe (Part 4). Relations between Charge, Time, Matter, Volume, Distance, and Energy.

By Alexander Bolonkin

C&R, 1310 Avenue R. #6-F,Brooklyn, NY 11229, USA

abolonkin@gmail.com

Abstract - In given article author has summarized and corrected a theory [1 -4] which allows derivation of the unknown relations between the main parameters (energy, time, charge, distance, volume, matter) in the Universe. He finds also the quantum (minimal values) of energy, time, charge, distance, volume and matter and he applied these quantum for estimations of quantum volatility and the estimation of some values of our Universe and received both well-known and new unknown relations.

   Author offers possibly valid relations between charge, time, matter, charge, volume, distance, and energy. The net picture derived is that in the Universe exists ONLY one substance – ENERGY. Charge, time, matter, volume, fields are evidence of this 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.

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

1. Introduction

In the theoretical physic the next fundamental constants presented in Table 1 are important .

Table 1: Fundamental physical constants

Constant	Symbol	Dimension	Value in SI units with uncertainties
Speed of light in vacuum	c	$L\,T^{-1}$	2.99792458×10^8 m s^{-1}
Gravitational constant	G	$L^3\,M^{-1}\,T^{-2}$	$6.67384(80) \times 10^{-11}$ m^3 kg^{-1} s^{-2}
Reduced Planck constant	$\hbar = h/2\pi$ where h is Planck constant $h = 6.625\ 068\ 76(52) \times 10^{-34}$	$L^2\,M\,T^{-1}$	$1.054571726(47) \times 10^{-34}$ J s
Coulomb constant	$(4\pi\varepsilon_0)^{-1}$ where ε_0 is the permittivity of free space $\varepsilon_0 = 8.854\ 187\ 817\ldots \times 10^{-12}$	$L^3\,M\,T^{-2}$ Q^{-2}	k = $8.9875517873681764 \times 10^9$ kg m^3 s^{-2} C^{-2}*(exact by definitions of ampere and meter)*
Boltzmann constant	k_B	$L^2\,M\,T^{-2}$ Θ^{-1}	$1.3806488(13) \times 10^{-23}$ J/K

Where are: L = length, M = mass, T = time, Q = electric charge, Θ = temperature.

If we take these constants as base units, we get the Planks units:

Table 2: Base Planck units

Name	Dimension	Expression	Value (SI units)
Planck length	Length (L)	$l_P = \sqrt{\dfrac{\hbar G}{c^3}}$	$1.616\ 199(97) \times 10^{-35}$ m

Planck mass	Mass (M)	$m_P = \sqrt{\dfrac{\hbar c}{G}}$	$2.176\,51(13) \times 10^{-8}$ kg
Planck time	Time (T)	$t_P = \dfrac{l_P}{c} = \dfrac{\hbar}{m_P c^2} = \sqrt{\dfrac{\hbar G}{c^5}}$	$5.391\,06(32) \times 10^{-44}$ s
Planck Charge	Electric charge (Q)	$q_P = \sqrt{4\pi\varepsilon_0 \hbar c}$	$1.875\,545\,956(41) \times 10^{-18}$ C
Planck temperature	Temperature (Θ)	$T_P = \dfrac{m_P c^2}{k_B} = \sqrt{\dfrac{\hbar c^5}{G k_B^2}}$	$1.416\,833(85) \times 10^{32}$ K

From data Table 2 we can receive the derived Planck units (Table 3).

Table 3: Derived Planck units

Name	Dimension	Expression	Approximate SI equivalent
Planck area	Area (L^2)	$l_P^2 = \dfrac{\hbar G}{c^3}$	2.61223×10^{-70} m^2
Planck volume	Volume (L^3)	$l_P^3 = \left(\dfrac{\hbar G}{c^3}\right)^{\frac{3}{2}} = \sqrt{\dfrac{(\hbar G)^3}{c^9}}$	4.22419×10^{-105} m^3
Planck momentum	Momentum (LMT^{-1})	$m_P c = \dfrac{\hbar}{l_P} = \sqrt{\dfrac{\hbar c^3}{G}}$	6.52485 kg m/s
Planck energy	Energy (L^2MT^{-2})	$E_P = m_P c^2 = \dfrac{\hbar}{t_P} = \sqrt{\dfrac{\hbar c^5}{G}}$	1.9561×10^9 J
Plank force	Force (LMT^{-2})	$F_P = \dfrac{E_P}{l_P} = \dfrac{\hbar}{l_P t_P} = \dfrac{c^4}{G}$	1.21027×10^{44} N
Planck power	Power (L^2MT^{-3})	$P_P = \dfrac{E_P}{t_P} = \dfrac{\hbar}{t_P^2} = \dfrac{c^5}{G}$	3.62831×10^{52} W
Planck density	Density ($L^{-3}M$)	$\rho_P = \dfrac{m_P}{l_P^3} = \dfrac{\hbar t_P}{l_P^5} = \dfrac{c^5}{\hbar G^2}$	5.15500×10^{96} kg/m^3
Planck energy density	Energy density ($L^{-1}MT^{-2}$)	$\rho_P^E = \dfrac{E_P}{l_P^3} = \dfrac{c^7}{\hbar G^2}$	4.63298×10^{113} J/m^3
Planck intensity	Intensity (MT^{-3})	$I_P = \rho_P^E c = \dfrac{P_P}{l_P^2} = \dfrac{c^8}{\hbar G^2}$	1.38893×10^{122} W/m^2
Planck angular frequency	Frequency (T^{-1})	$\omega_P = \dfrac{1}{t_P} = \sqrt{\dfrac{c^5}{\hbar G}}$	1.85487×10^{43} s^{-1}
Planck pressure	Pressure ($L^{-1}MT^{-2}$)	$p_P = \dfrac{F_P}{l_P^2} = \dfrac{\hbar}{l_P^3 t_P} = \dfrac{c^7}{\hbar G^2}$	4.63309×10^{113} Pa
Planck currency	Electrictric currency (QT^{-1})	$I_P = \dfrac{q_P}{t_P} = \sqrt{\dfrac{4\pi\epsilon_0 c^6}{G}}$	3.4789×10^{25} A

Planck voltage	Voltage $(L^2MT^{-2}Q^{-1})$	$V_P = \dfrac{E_P}{q_P} = \dfrac{\hbar}{t_P q_P} = \sqrt{\dfrac{c^4}{4\pi\epsilon_0 G}}$	1.04295×10^{27} V
Planck impedance	Resistance $(L^2MT^{-1}Q^{-2})$	$Z_P = \dfrac{V_P}{I_P} = \dfrac{\hbar}{q_P^2} = \dfrac{1}{4\pi\epsilon_0 c} = \dfrac{Z_0}{4\pi}$	$29.9792458\ \Omega$

Universal units do not depend from Earth units. That is suitable for the Universe communication. They also give the more simple physical equations.

2. Theory. Relation between charge, 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:

$$c = 2.997925 \cdot 10^8\ m/s;\quad e = 1.60219 \cdot 10^{-19}\ C;\quad G = 6.6743 \cdot 10^{-11}\ m^3/kg \cdot s^2\ ; \tag{1}$$

$$\varepsilon_0 = \frac{1}{36\pi \cdot 10^9} = 8.854188 \cdot 10^{-12}\ \frac{F}{m};\quad k = \frac{1}{4\pi\varepsilon_0} = 8.987551787 \cdot 10^9\ \frac{kg \cdot m^3}{s^2 C^2}\ \ \frac{Jm}{C^2};$$

$$\mu_0 = 4\pi \cdot 10^{-7} = 1.2566 \cdot 10^{-6}\ \frac{N}{A^2};\quad h = 6.6261 \cdot 10^{-34}\ \frac{kg \cdot m^2}{s},\quad Js;\quad \hbar = h/2\pi = 1.054571\quad Js\ ;$$

$$\sigma = 5.67032 \cdot 10^{-8}\ W/m^2 K^4\ ,\quad \pi = 3.141592654,\quad k_B = 1{,}3806503 \cdot 10^{-23}\ J \cdot K^{-1};$$

where c is speed of light in vacuum, m/s; e is electronic charge, C; G is a Newton gravitation constant, Nm²/kg²; ε_o is electric constant, F/m; μ_o is magnetic constant, H/m; h is Planck constant, J·s; σ is Stefan – Boltzmann constant, W/m²K⁴ ; k_B is Boltzman constant, J/K; F - farad; N - newton; A – amper; K – kelvin.

The author postulated the following relations:

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

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

$$\text{or}\quad T = 2.755956 \cdot 10^{-53}E,\quad T = 2.47693 \cdot 10^{-36}M,\quad T = 2.874464 \cdot 10^{-26}Q\ ,$$

$$T = 3.33564 \cdot 10^{-9}R\ ,\quad T = 1.2240865 \cdot 10^5 \rho^{-1/2},$$

where T is time in sec; E is energy in J; M is mass, kg; v is volume in m³; R is distance, m; ρ_M is specific density of matter in given volume, kg/m³, Q is charge, C. (Only the first 4-5 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. If we use the Plank units, this factor equals 1 in many cases. This factor has been neglected in cosmology and high-energy physics. But these equations cannot be derived ONLY from dimensional theory because dimensional theory does not contain the physical constants.

Equations (2) may be written in form

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

$$\text{or}\quad E = 3.628505 \cdot 10^{52}T,\quad M = 4.037256 \cdot 10^{35}T,\quad Q = 3.4789094 \cdot 10^{25}T,\quad \rho = 1.5 \cdot 10^{10}/T^2.$$

From these equations follow some interesting propositions. Time is energy, Time depends upon mass, volume, length, electric charges and density of matter. If time simultaneously produced the positive and negative charges, the total charge is zero. Time can create the energy, mass, distance, volume change and the density of matter in the Universe or the energy produce time, matter, distance, volume and charge (positive and negative simultaneously).

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

$$v = \frac{4\pi}{3}\left(\frac{GE}{c^4}\right)^3, \quad v = \frac{4\pi}{3}c^3T^3, \quad v = \frac{4\pi}{3}\frac{G^3}{c^9}M^3, \quad v = \frac{4\pi}{3}R^3,$$

(4)

$$or \quad v = 2.2630235\times10^{-132}E^3, \quad v = 1.1286275\times10^{26}T^3, \quad v = 1.715109\times10^{-81}M^3,$$

where v is volume of 3-demantional space, m^3.

3. Relations between matter, time, volume, distance, energy, charge and temperature are

$$M = \frac{c^3}{G}T, \quad M = \frac{c^2}{G}v^{1/3}, \quad M = \frac{c^2}{G}R, \quad M = \frac{1}{c^2}E, \quad M = \left(\frac{k}{G}\right)^{1/2}Q, \quad M_1 = \frac{k_B}{c^2}t,$$

(5)

$$M = 4.0369797\times10^{35}T, \quad M = 1.34659\times10^{27}v^{1/3}, \quad M = 1.34659\times10^{27}R,$$

$$M = 1.16047\times10^{10}Q, \quad M_1 = 2.316404\times10^{-40}t.$$

where t is temperature, K; k_B is Boltzmann constant, J/K; v is volume, m^3; M_1 is mass of one atom/particle, kg.

4. Relations between distance and time, matter, charge, energy and matter density

$$T = \frac{R}{c}, \quad M = \frac{c^3}{G}T = \frac{c^2}{G}R, \quad Q = \frac{c^3}{(kG)^{1/2}}T = \frac{c^2R}{(kG)^{1/2}}, \quad E = \frac{c^5}{G}T = \frac{c^4R}{G}, \quad \rho_M = \frac{1}{GT^2} = \frac{c^2}{GR^2}.$$

(6)

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

$$E = \frac{c^5}{G}T, \quad E = \frac{c^4}{G}v^{1/3}, \quad E = \frac{c^4}{G}R, \quad E = \left(\frac{k}{G}\right)^{1/2}c^2Q, \quad E = c^2M, \quad E_1 = k_Bt.$$

(7)

$$E = 3.62825745\cdot10^{52}T, \quad E = 1.21022562\cdot10^{44}v^{1/3}, \quad E = 1.2102562\cdot10^{44}R,$$

$$E = 1.04297\cdot10^{27}Q, \quad E = 8.98755\cdot10^{16}M, \quad E_1 = 1\cdot38066\cdot10^{-23}t.$$

Here t is temperature, K; v is volume, m^3; E_1 is energy of one atom/particke, J.
Fifth equation in (7) 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) – (6) as a special case.

6. The relations between the density of matter, energy, charge and time (frequency) are following:

$$\rho_M = \frac{1}{G}\frac{1}{T^2}, \quad \rho_M = \frac{1}{G}v^2, \quad \rho_E = \frac{h}{c^3}\frac{1}{T^4}, \quad \rho_E = \frac{h}{c^3}v^4, \quad \rho_E = \frac{hc}{R^4},$$

(8)

$$\rho_E = \frac{c^2}{GT^2}, \quad \rho_Q = \left(\frac{hc}{k}\right)^{1/2}\frac{1}{T^3}, \quad \rho_Q = \left(\frac{hc}{k}\right)^{1/2}v^3,$$

Where ρ_M, ρ_E, ρ_Q are density of matter, energy and charge respectively, kg/m^3, J/m^3, C/m^3; v (Greg) is frequency, 1/s.

3. Application to current Universe

Let us 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 is about 14 billion years now (13.75±0.17 billion years). Check up all numbers.

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

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

$$R \approx 3 \cdot 10^8 T, \quad \rho_M = 1.5 \cdot 10^{10}/T^2. \tag{9}$$

Substitute in (9) the age of Universe after Big Bang (T=14 billions years = $4.4 \cdot 10^{17}$ sec) we receive:

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

$$R = 1.32 \cdot 10^{26} \; m < 4.4 \cdot 10^{26} \; m, \quad v = 10^{79} \; m^3, \quad \rho_M = 7.75 \cdot 10^{-26} \; kg/m^3 > 10^{-26} \; kg/m^3. \tag{10}$$

In right side of the inequality (9) 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 other methods have similar 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:

$$w_a = \frac{1}{G}\frac{a^2}{2}, \quad w_g = \frac{1}{G}\frac{g^2}{2}, \quad w_e = \varepsilon_0\frac{E^2}{2}, \quad w_m = \mu_0\frac{H^2}{2}, \quad w_{en} = \frac{\varepsilon_0 E^2 + \mu_0 H^2}{2} \quad w_r = \frac{\sigma}{c}t^4,$$

$$w_E = \frac{1}{c^2 GT^2}, \quad w_E = \frac{1}{c^2 G}v^2, \quad w_E = hc\frac{1}{R^4}, \quad \rho_Q = \left(\frac{h}{kc^5}\right)^{1/2}\frac{1}{T^3}, \quad \rho_Q = \left(\frac{h}{kc^5}\right)^{1/2}v^3. \tag{11}$$

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_{em} is density of beam energy J/m^3; w_r is density of radiation energy, J/m^3; w_E is time energy density, J/m^3; ρ_Q is time charge density, Q/m^3; a is acceleration, m/s^2; g is gravitation , m/s^2; $\sigma = 5.67032 \cdot 10^{-8}$ is Stefan – Boltzmann constant, W/m^{2}K^4 ; E is electric intensity, V/m or N/C; H is magnetic intensity, T (tesla) or Vs/m^2 or Wb/m^2; t is temperature , K; T is time, sec. The formulas show the energy density depends from temperature and time: R is distance to cingular point, m.

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

$$W = \int_v w dv$$

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 "c" in the equations (2)-(11) may be changed in conventional speed V. That means we can verify the formulas (2)-(11) and find the correct constant factor.

4. Quanta of energy, charge, time, matter, volume, and distance.

It is known the energy of photon is

$$E_q = h\nu, \quad h = 6,626068 \cdot 10^{-34} \quad Js: \quad \hbar = h/2\pi = 1.0541571 \cdot 10^{-34} \; Js \tag{12}$$

where ν is frequency, 1/s (ν = 1, 2, 3, …). The minimal quantum of photon energy is when ν = 1,

$$E_q = 6.626068 \cdot 10^{-34} \; J \tag{13}$$

Let us substitute (13) into (2)-(11), we receive the quanta of time, mass, length, volume (size) and charge:

$$T_q = \frac{G}{c^5} E_q = 1.82624 \cdot 10^{-86} \ s, \quad M_q = \frac{E_q}{c^2} = 7.37249 \cdot 10^{-51} \ kg,$$

$$R_q = \frac{G}{c^4} E_q = 8.62713 \cdot 10^{-45} \ m, \quad v_q = R_q^3 \ m^3,$$

$$Q_q = \left(\frac{G}{k}\right)^{1/2} \frac{1}{c^2} E_q = 6.330261 \cdot 10^{-61} \ C, \tag{14}$$

where v_q is quantum of volume, m^3.

5. Heisenberg uncertainty principle

Heisenberg uncertainty principle are
$$\Delta I \cdot \Delta R \geq \hbar / 2, \quad \Delta E \cdot \Delta T \geq \hbar / 2, \quad \hbar = h / 2\pi, \tag{15}$$
where ΔI, ΔR, ΔE, ΔT are uncertainty of momentum, length, energy and time respectively.

Substitute into (14) the quanta (15) we receive the following the uncertainties the main quanta (15)

$$\Delta T_q = \frac{h}{2E_q} = \frac{1}{2} \ s, \quad \Delta R_q = \frac{h}{2\Delta I} = \frac{h}{2c \cdot \Delta M_q} = \frac{hc^2}{2cE_q} = \frac{1}{2} c \ m \tag{16}$$

As you see, the uncertainties of quanta are large. These maximum values ΔE, ΔR, appears when are appeared in the first quantum of time T_q. The ΔM, ΔQ not appeared yet. They are equivalent the given ΔE.

The probability serve of inequality (15) is normal. If we take (15) in the more common form
$$\Delta I \cdot \Delta R \geq h, \quad \Delta E \cdot \Delta T \geq h, \tag{17}$$
the multiplier 1/2 in equations (16) become 1 and $\Delta R = c$. That means the speed in the first quantum of time equals the light speed.

Note: For getting the values (2)-(17) we also used the dimension theory and some of them may be defined with accuracy the constant factor. This factor equals 1 in many cases, if we use as base the Planck's units.

5. Main Results and Discussion

Main result of this research (part 4) is correction part 1-3 and equations with result that energy can be the universal source of Universe (see Eq.(7)). Energy can produce time, mass, charge and volume. The same role/factor also can act as time (see Eq. (2)). All main components of Universe (size, matter, energy, volume, time, charge) are closely connected and can transform from one to another.

That means at the foundation of the Universe is ONE factor, which creates our diverse world.

The reader can ask: How we can convert time to energy? I can ask a counter question: The equation $E = Mc^2$ (here M is mass) was open about hundred years ago. In that (past) time nobody could answer: How to convert the matter into this huge 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 such quantity of energy. In 2006 the author offered the method which can convert any matter to energy with according to the equation $E = Mc^2$ [5] – [6].

In Universe (Part 1)[1] author has developed a theory, which allows derivation of the unknown relations between main parameters (energy, time, volume, matter) in Universe. In next part 3 he added charge as main parameter in this theory. He finds also the quantum (minimal values) of energy, time, volume and matter and he applied these quantum for estimations of quantum volatility and the estimation of some values of our Universe and received both well-known and new unknown relations.

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

The authors other works closest to this topic are presented in references [1] – [8].

References:

1. Bolonkin A.A., Universe (part 1). Relations between Time, Matter, Volume, Distance, and Energy. JOURNAL OF ENERGY STORAGE AND CONVERSION, JESC : July-December 2012, Volume 3, #2, pp. 141-154. http://viXra.org/abs/1207.0075 , http://www.scribd.com/doc/100541327/ , http://archive.org/details/Universe.RelationsBetweenTimeMatterVolumeDistanceAndEnergy

2. Bolonkin A.A., "Remarks about Universe" (part 1-2), International Journal of Advanced Engineering Applications, IJAEA. Vol.1, Iss.3, pp.62-67 (2012). http://viXra.org/abs/1309.0196 , http://fragrancejournals.com/wp-content/uploads/2013/03/IJAEA-1-3-10.pdf

3. Bolonkin A.A., Preon Interaction theory and Model of Universe (v.4). USA, Lulu, 2017. http://viXra.org/abs/1703.0200.

4. **Bolonkin A.A., Femtotechnology: Nuclear AB-Material with Fantastic Properties.** American Journal of Engineering and Applied Science, Vol. 2, #2, 2009, pp.501-514. Presented as paper AIAA-2009-4620 to 7th Annual International Energy Convention Conference, 2-5 August 2009, Denver, CO, USA. http://viXra.org/abs/1309.0201.

5. Bolonkin A.A., Converting of Any Matter to Nuclear Energy by-AB-Generator American Journal of Engineering and Applied Science, Vol. 2, #4, 2009, pp.683-693. Presented as paper AIAA-2009-5342 in 45 Joint Propulsion Conferencees, 2-5 Augest, 2009, Denver, CO.   http://viXra.org/abs/1309.0200.

6. **B**olonkin A.A., Universe, Human Immortality and Future Human Evaluation. Lulu. 2010г. 124 pages, 4.8 Mb. http://www.archive.org/details/UniverseHumanImmortalityAndFutureHumanEvaluation

7. AIP Physics Desk Reference, Springer. 3-rd Edition.

8. Wikipedia. Universe. http://Wikipedia.org .
27 June, 2017.

Short biography of Bolonkin, Alexander Alexandrovich (1933-)

Alexander A. Bolonkin was born in the former USSR. He holds doctoral degree in aviation engineering from Moscow Aviation Institute and a post-doctoral degree in aerospace engineering from Leningrad Polytechnic University. He has held the positions of senior engineer in the Antonov Aircraft Design Company and Chairman of the Reliability Department in the Clushko Rocket Design Company. He has also lectured at the Moscow Aviation Universities. Following his arrival in the United States in 1988, he lectured at the New Jersey Institute of Technology and worked as a Senior Scientist at NASA and the US Air Force Research Laboratories.

Bolonkin is the author of more than 250 scientific articles and books and has 17 inventions to his credit. His most notable books include The Development of Soviet Rocket Engines (Delphic Ass., Inc., Washington , 1991); Non-Rocket Space Launch and Flight (Elsevier, 2006); New Concepts, Ideas, Innovation in Aerospace, Technology and Human Life (NOVA, 2007); Macro-Projects: Environment and Technology (NOVA, 2008 LIFE; Human Immortality and Electronic Civilization, 3-rd Edition, (Lulu, 2007; Publish America, 2010): LIFE. SCIENCE. FUTURE (Biography notes, researches and innovations). Scribd, 2010, 208 pgs. 16 Mb.; Innovations and New Technologies. Lulu, 2013. 309 pgs. 8 Mb. http://viXra.org/abs/1307.0169.

Home page: http://Bolonkin.narod.ru.