

Granular collisions

- Uniformity and variation -

Laurențiu Mihăescu

*

Supplemental

Bucharest, Romania

First Edition, August 19, 2017

www.1theory.com

Table of contents

1. Introduction

2. The theory of large systems

3. Linearity and evolution

4. References

1. Introduction

All the assumptions and postulates made in my books [1] and [2] about the granular medium and about its evolution over time did not give a precise answer and neither formulated a complete scenario for its emergence, regardless of the various cosmogonic theories that were presented until now. Therefore, this is an attempt to compensate this lack of information and to give some plausible explanations for most of the fundamental characteristics of the spatial fluid:

- The huge, but constant number of granules and their identical size/form
- Their uniform distribution throughout the empty space (closed and continuously expanding)
- All granular characteristics are not changing over time
- The granular kinetic energy, a finite value of the granular speed C and its constancy
- The decrease of local granular entropy during the formation of elementary particles
- The variation in time of the granular density and the modelling of intergranular collisions

It has to be mentioned here that all physical quantities associated with the granules will further have only absolute values, even for the simple reason that the relativization makes impossible to observe and measure all things in a closed system. Anyway, all these values are neither too big nor too small, and therefore the properties of the granules are in a Goldilocks zone; this fact is very important, as it will allow the future evolution of the large system made up of granules.

2. The theory of large systems

Regardless of the way the three-dimensional space came into existence, as being an infinite given which represents the absolute nothingness or as a finite void resulted from the spread of the primordial essence, it will be further considered as a passive framework where our granular universe simply "floats". Obviously, as stated in my first book [1], these things could be seen inversely, i.e. to consider space as the "full" component and the essence as the "empty" one. However, as the full/empty ratio would have been too high, it seemed natural to consider the essence as being the material part, i.e. full of something.

A few of the fundamental features of space (seen as a three-dimensional framework):

- Absolute uniformity and isotropy of any region of space
- The lack of any interactions with the essence in granular form
- If finite, its presumed expansion is just an increase in volume

Let us consider the moment when essence came into existence, which may also be the moment when space appeared as an empty frame, as a volume. My favorite scenario is described in article [5], where the essence already exists or it appears as stationary and contiguous substance, and then multiple bangs occurred inside this mass. There is an additional assumption, this elastic substance occupies a limited, finite volume and it is subject to an external pressure, being in compressed state. The distributed process that soon begins is of mechanical nature and it looks more like an extended implosion; it is even possible that it would not have been violent and to have lasted very long at cosmic scale. Anyway, this dynamic process has finally led (through division, internal friction or other mechanical transformation) to a granularized substance (up to a certain size limit) and to an energy transformation (elastic to kinetic). Briefly, a huge number of infinitesimal granules appeared this way, and each of those granules is moving in a random direction at constant speed. Their number and size depended on the quantity of essence and on its degree of elasticity, while their speed was given by the initial elastic energy. A simple representation of the essence is shown in Figure 1A; 1B shows its future granular state (it is not a drawing on scale).

Note 1: The granularization process is irreversible, the kinetic energy is in distributed form at granular level and it may not turn back (the granules cannot be joined together back).

Note 2: What is the source of this initial elastic energy? If we consider the law of conservation of energy as supreme law of the universe, we will need to find out from where it came or what other form of energy cancels it! Anyway, for the time being, it is still a mystery and it is possible to remain so if we continue to think "inside" our universe...

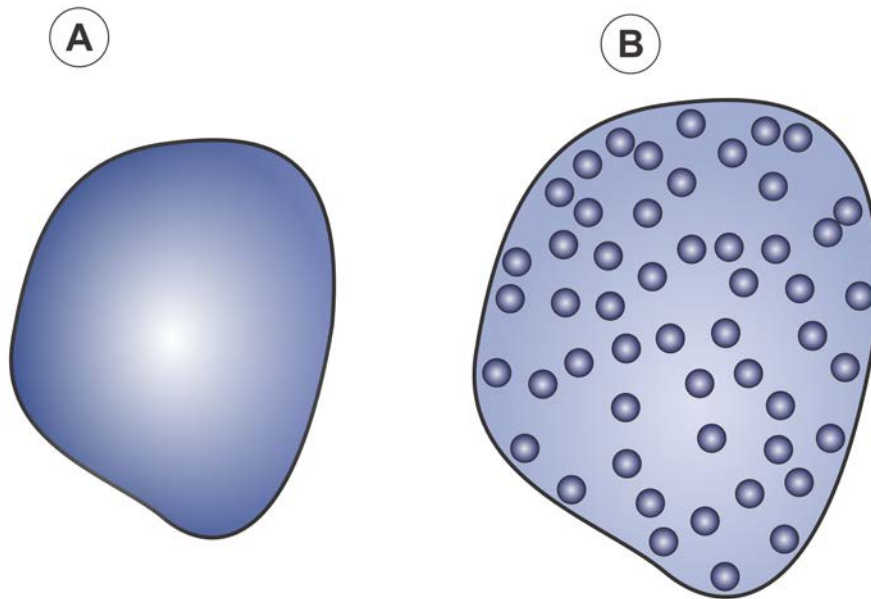


Figure 1 - *The essence and its granular state*

All of the granules are moving freely in that framework described above. Their initial density was huge, and in fact, most of the granules were bonded together in large groups, for large time intervals; collisions between individual granules and those groups were chaotic, but they allowed the leveling of granular speeds values. The collision between two identical granules only means an exchange of speeds, but there is a very high probability (due to the huge density) of simultaneous collisions between three or more granules (grouped or not). This latter process, infinitely repeated, averaged the speed of all granules, and they have reached the final value **C**. A special granular fluid was made this way, similar to a gas, which can exert pressure on the external membrane (transfer of granular impulse) and thus trigger the geometric expansion of the frame described above.

This is the moment when we may speak of normal space, stable and functional, that may be further considered by the laws of physics in his duality of geometric frame and granular matter.

What are the features of this new construction, space? The large system it formed is stable?

- a) If we only look at the geometric component, there is nothing we may say about the size of space (no marks for measurements or estimates, nothing that might be compared). The same thing happens during the periods of quasiuniform granular distribution.
- b) *The really huge number of identical components*, i.e. granules, which may be simply estimated to several googol (10^{100}) - due to the new number of galaxies [10] and due to my assumption that there is a minimum number of 10^{15} granules inside an electron (a

ratio of one-to-one was considered between the number of the free granules and those contained in material structures of any kind).

- c) Seen at granular level, space seems to be amorphous and dynamic; all granules continuously move and collide in a chaotic way. However, if we change the perspective and extend the angle of observation, space is gradually turning into a *fluid with special properties, uniform and isotropic*, that has a certain granular density.
- d) The components of this system are mobile, they all move with a constant speed and collide perfectly elastic. Their really high number makes possible that on any direction we would consider, at any moment of time, there is always a *flux of granules having parallel trajectories*. Taking into consideration the way all material part of space appeared, out of a unique chunk of essence, a postulate was issued in [1] telling that an equal number of granules moves on each possible direction in space (their total impulse is quasi-null).
- e) If we admit that the system is closed and it is continuously expanding in volume, then the density of the granular fluid will decrease over time. It seems normal to assume that there were many initial irregularities in the local granular distributions, as of directions and of density, but they all have diminished and space got even in time.
- f) There have been significant changes in density of the free granules (those generating in fact the directional granular fluxes and which constitute the intrinsic gravitational field of this large system) in the initial stages of the universe (fractions of a second is stated in the Big Bang theory), for example at the time when the majority of elementary (quarks) and composite particles formed. Once the density got low enough, the moments when electrons and positrons formed and then annihilated have also led to rapid oscillations in the granular density of space.
- g) The granular spatial system cannot be partitioned, divided and analyzed as separate regions; both nature and dynamics of the granular fluxes show us that any area we would consider, it is "connected" with all the adjacent and more distant ones, mutually influencing each other in a continuous manner. However, this influence is transmitted at a limited speed, the speed of light at that time and place.
- h) The granular space seems to be a stable automatic system, behaving in a *linear and predictable* fashion; this means it could remain in a steady state, just its density will be decreasing over time... Therefore, all its physical quantities could be described by equations and statistics similar to those of the ideal gas. We may even introduce the concepts of *granular time* and *granular entropy* (seen as a measure of chaos at this level), which could be included in a law where the value of global entropy will only increase in time.

By analysing this entire system, we may generalize and emit the following general theory of space, similar to second law of thermodynamics (the properties of constituent granules are all known [1]):

A closed system that consists of a fixed number of identical material components, being in continuous expansion, has a constant or an increasing value of the global entropy. There may be spontaneous transitions of the local states - when the local entropy will decrease - only if the number of components exceeds a critical value and if their density lies within a critical range.

3. Linearity and evolution

The observation of objective reality shows us that things did not evolve in a linear manner, and the granular space passed in fact through a stage that complies with all conditions of the theory above! Even if the perfectly elastic collisions transform and maintain the granular trajectories absolutely straight, whether or not there is a global asymmetry in the distribution of impulses, even if the granular kinetic energy is conserved in this closed system...

There was nonuniformity in the granular distribution during the initial stage of space emergence, and the granular fluxes were warped in those regions with density gradient. Everything has happened because these primary fluxes had very close granules and therefore they behaved as large groups (as bigger granules, see the *Elementary Particles* application [6]). Once curved and turned into a vortex of the right size, a flux maintains its regular discoidal shape due to the uniform pressure exerted by the omnidirectional fluxes that flow in any spatial region. This presence of the denser granular fluxes and their aggregation in stable formations practically represents the nonlinearity that is superposed over the granular uniformity of space and changes all dynamics of the system... In addition, this process has triggered drops of the local entropy, exactly as in above theory of space. This self-organized system now contains larger components, granular structures of several types. The omnidirectional fluxes, i.e. the gravitational ones, will provide support for the new fields that allow these granular formations to interact. The charged particles will speed up or slow down in their fields, creating this way other granular structures, *the photons*.

Therefore, the huge number of granules and their perfect elasticity, their directional fluxes, all of them have allowed the natural emergence of some structures with stable shape, which will further act as new entities - the elementary particles. Quarks have immediately grouped into protons and neutrons, attracting free electrons; bigger structures formed this way, *the atoms*.

We may say in conclusion that the initial nonuniformity of space, corroborated with the nonlinearity of granular dynamics, started a vast creation and organization process of the elementary particles and atoms (irreversible for now); these formations may freely move through the granular fluid and interact with each other through various fields, and thus they may evolve and build more complex structures in the future. The matter created this way will indirectly reflect the internal structure and mechanics of the spatial fluid, it will continuously move and transform, grouping and regrouping the primordial energy of space. The granular fluxes and collisions will impose dimensional and speed limitations, but the uniformity of the impulse distribution will allow the inertial movement on any direction with no kinetic energy loss. Moreover:

- The current space's density is lower than that it had in the beginnings, and this changes the absolute values of the constants of physics, but we cannot observe that easily.
- Current density no longer allows spontaneously particle and antiparticle production.
- Photons and fields are granular structures that are increasing the local density.
- The space is crossed, especially in the vicinity of cosmic bodies, by numerous fragments of particles and photons, and this causes a permanent fluctuation of its density.

4. References

- [1] Laurentiu Mihaescu, 2014. *Prime Theory*, Premius Publishing House
- [2] Laurentiu Mihaescu, 2016. *The Universe*, Premius Publishing House
- [3] Laurentiu Mihaescu, 2016. *The theory of granular gravitation*, article
- [4] Application "*Particle Simulation*", Microsys Com, 2015,
<http://www.1theory.com/software.htm>
- [5] Laurentiu Mihaescu, 2016, *The First Bangs*, article
- [6] Application "*Elementary Particles*", Microsys Com, 2017
<http://www.1theory.com/software.htm#2>
- [7] Laurentiu Mihaescu, 2017, *The formation of elementary particles*, article
- [8] Laurentiu Mihaescu, 2017, *The shape of elementary particles*, article
- [9] Laurentiu Mihaescu, 2017, *Mass-energy equivalence*, article
- [10] Christopher J. Conselice and others, 2016, *The evolution of galaxy number density at $z < 8$ and its implications*