Chapter 12:

Cosmology. Stationary Universe and Galactic Cycle.

Hypothesis about the matter evolution beyond the "Big Bang".

12.A.1. Introduction

The analysis of the cosmological observations from a point of view of the new space concept inevitably leads to a new vision about the Universe and its evolution. Relying on the idea of a common origin of the material substance, we have to relate the analysis of the cosmological phenomena with the structures of the CL space and the elementary particles, which were derived in the previous chapters of BSM.

In order to provide realistic scenario about the Universe, the following basic problems should be analysed:

- the lowest level structure of the intrinsic matter

- understanding the similarity and differences between the two substances of the Intrinsic Matter

-understanding the relation between: the Intrinsic Gravitational field, the energy at lowest level of matter organization and the intrinsic time constants for the both substances of intrinsic matter.

This chapter is devoted on the analysis of the above problems. The outcomes of such analysis lead to a new concept about the evolution of the galaxies, their connections in supergalaxies and finally to a new vision about the Universe.

In Chapter 11 the relation of the BSM to other theories has been discussed. BSM is able to provide quite logical physical explanation of all observed phenomena. The output results of the Quantum Mechanics - especially about the atomic and molecular spectra are compatible with the BSM concept of the elementary particle. In such aspect BSM uses some selected results from the existing theories. In respect to the lower level structure of the matter and space, however, the outcomes of BSM theory are significantly different. They sharply contradict to the presently adopted concept of Big Bang.

Even Albert Einstein has been suspicious about the concept of Big Bang and expanding universe. The great physicist Edwin Hubble also said in 1937 that he accepted the redshift only as a "forced solution" (in his Book Observational approach to cosmology).

The inconsistencies of many phenomena to the Big Bang concept has been lately discussed in number of papers (see "Big bang theory under fire", by W. Mitchel, Physics Essay vol. 10., No 2, June 1997).

12.A.2. Weak points of the Big Bang concept

The weak points of the Big Bang concept are of theoretical and observational aspect. We may denote them as theoretical and experimental problems. They are listed below with assigned number in order to be referenced later.

12.A.2.1. Weak points from a theoretical point of view:

(1) The Big Bang concept of birth of the Universe from one infinite small point involves a singularity problem in the initial conditions. From a physical point of view it inevitably leads to the assumption that the energy could be created from nothing and could exist apart of the matter.

(2) The existing theoretical concept about physics of the black holes leads also to a singularity.

(3) The adopted concept about photon as a carrier of energy without mass and travelling billion light years away from the matter invokes also an energy conservation problem. In addition to this the present theories could not explain the physics of the constant light velocity and accept it as a postulate.

(4) The concept of the relict radiation is mind confusing. The experimentally estimated temperature of 2.72 K is a parameter of CL space Zero

Point Energy. (The method of its theoretical estimation is provide in Chapter 5 of BSM).

(5) Lack of consistency between the Big Bang concept, the particle physics and the theory of relativity.

In fact the first three weak points leads to an energy conservation problem. The validly of energy conservation is proven in all physical fields including the quantum mechanics. There is not a single case where it is violated. That's why it must be considered as a basic postulate in all phases of Universe evolution. The forth weak point is that the concept of the relict radiation has been invented to support the concept of Big Bang. Its logical explanation is quite controversial. It is not consistent even with the postulate of the constant light velocity. In fact the explanation of the spatial geometry of the relict radiation in consecutive evolutionary phases of the Big Bang is intentionally avoided, because it leads to contradictions. The fifth weak point is known from decades. Number of unified field theories has been proposed but no one is universally accepted because of their weakness.

Large number of the experimental observations contradict to the concept of Big Bang. The tendency to fit them to the Big Bang theory leads to not adequate theoretical explanations of the observed phenomena.

12.A.2.2. Weak points from observational aspect:

(1) Discrepancy between the age of some old stars in our galaxy and the estimated age of the Universe

(2) Discrepancy between theoretically estimated mass of the Universe and the observed one (in result of this a concept of dark matter is adopted)

(3) The recently estimated trend of Hubble constant for red shifts larger than 0.8 leads to a concept of "open Universe" (will be disintegrated) - an explainable enigma.

(4) Some of the neighbouring galaxies from the local group show blue shift

(5) The Cosmic Microwave Background (CMB), considered as a relict radiation shows anisotropy the axis of which coincides with the solar system motion around the Milky way

(6) The galaxy rotational curves are not explained satisfactorily

(7) A recently discovered spiral galaxy only one billion years after the Big Bang contradicts to the Big Bang concept of matter evolution

(8) Red shift periodicity of the galaxies from the local supercluster is not explained

(9) The physics of the globular clusters and the star population of type II are note explained satisfactorily. This refers also for the difference between the classical cepheids and the cepheids of second type.

(10) The pulsation mechanism of the variable stars is not explained satisfactorily

(11) Pulsars ("neutron stars"): steps in rotation rate, spin down rate, micro glitches and timing noise in pulsars - not satisfactorily explained

(12) Pulsars velocities and observed escaping pulsars from Milky way - not satisfactorily explained

(13) Not explained phenomena about the quasars:

- physical mechanism
- broaden lines
- multiple red shifts of absorption lines

(14) Lyman alpha forest - not correctly explained

(15) Not explained phenomena of Supergalaxies formations:

- large non-uniformity in galaxy distribution, cluster formations, voids and "God's effect"
- anisotropy in the galaxy plane orientations

(16) Distortion of CMB in gravitational lensing (Sunaev-Zeldovich effect)

(17) Galaxy collisions and related phenomena - not satisfactorily explained

(18) GRB (gamma ray bursts) - not explained

(19) Diffused X- ray and gamma radiation - not explained

12.A.2.2.A. Main reasons for the inconsistencies in the Big Bang theory

The major problems of the Big Bang theory are consequences from the following not correctly accepted assumptions:

(A) considering the Universe space as homogeneous.

(B) assuming that the observed red shift is only of Doppler type

In fact the assumption (B) is a consequence of the assumption (A).

12.A.3. Introduction into the BSM concept about the Universe:

The vision about the Universe and its evolution is formed through the prism of the concept about space (physical vacuum). The BSM concept, which is an Ether-like concept not explored so far inevitably leads to a different vision about the Universe. The red shift according to BSM is contributed by two components: a Doppler shift and a cosmological one. The first component may dominate only for small distances (for neighbouring galaxies). For larger distances the second component is strongly dominative, because it is accumulative with the distance (see §12.B.4.2.4). This feature is so important that it leads to a profound change of our vision about the Universe. The Universe appears to be a stationary instead of expanding. In such aspect the cosmological phenomena and their observational characteristics become fully compatible with the concept of the atomic particles (according to BSM). The parallel analysis of the phenomena with all aspects of the BSM concept about the matter space and time allows also to infer the whole process of matter evolution with identification of some cosmological cycles. The most important cosmological cycle appears to be the cycle of the individual galaxy. We may call it simply a **galactic cycle**. It is valid for all galaxies in our observational perimeter.

The galactic cycle includes the following major phases:

- **particle incubation**
- **active life**
- **recycling**

The BSM analysis of the cosmological phenomena provides strong evidence, that the Universe is stationary. The galaxies have own CL spaces and the Z-shift of the distant galaxies is predominated by a cosmological Z-shift , which is not of Doppler origin. The galaxies undergo multiple life cycles with phases of death and a new birth in the same place. The prisms undergo through a recycling process during a hidden phase between two active lives of the galaxy. A very low level memory of the intrinsic matter, however, survives the recycling process. It carries the correct information about prisms handedness. This predetermines the new born matter to be of same type (matter) and not of opposite one (antimatter). All the processes from the micro to macro Cosmos are in three dimensional space with a time flowing in a positive direction only. The intrinsic matter never disappear or annihilate. The energy conservation principle is valid from micro to macroscale and for any phase and moment of the galaxy cycle.

Before presenting the details of BSM concept about the Universe and galaxies, it is necessary to provide some insight about the lower level structure of the intrinsic matter and its relation to the very basic law: the Law of Intrinsic Gravitation.

12.A.4. Low level structural organization of the intrinsic matter

The more general properties of the intrinsic matter are presented as a “guessed properties of the primordial matter” (§2.3, Chapter 2 of BSM). Some of their parameters has been additionally discussed in §6.9.4.2, (Chapter 6 of BSM). The inferred properties are completely consistent with the developed concept of the matter structures above the prism’s level. Now we need to unveil some additional structural properties of the matter from which the prisms are made. This requires some insight into the very basic structure of the primordial matter and into the basic concept of the Intrinsic Gravitational attraction with its relation to the intrinsic time constants of the both substances.

12.A.4.1. Basic rules as inferred postulates

The following rules are inferred as a logical consequence from a broad aspect analysis according to BSM concept about the space and matter. They will be useful in the further analysis.

Inferred Postulates:

P1 The intrinsic matter is composed of two not mixable substances

P2 Spatial geometrical formations of intrinsic matter substances contain internal vibrational energy

P3 A finite quantity of matter is able to handle a finite amount of internal vibrational energy

P4 The Intrinsic Gravitation (IG) is a process of external interaction between formations of intrinsic matter. It involves energy that is a complementary to the total internal vibrational energy of the interacting formations. We may refer to this energy as Intrinsic Gravitational energy.
IG attraction between spatially separated formations is a manifestation of IG interactions.

P5. A system of formations may handle a finite amount of total energy, equal to the sum of the vibrational and IG energy.

P6 The strength of IG forces are inversely proportional to the cube of distance, while the interaction process is characterized by intrinsically small time constant, not dependable of the distance.

P7 The energy conservation principle is valid from the lowest to highest level of matter organization and from the micro to the macro scale of the Universe.

The formulated postulates can be indirectly proved by the physical analysis provided by BSM. In such aspect they could be considered as rules. The following analysis will provide additional arguments for such consideration.

The initially defined postulates are useful especially for unveiling the structure of the lower levels of matter organization involved in the prisms.

12.A.4.2. Structure components of the matter

12.A.4.2.1. Lowest level structures of the matter and basic characteristics

A. The Primary ball as a most fundamental particle in the Universe

The primordial bulk matter of anyone of the two substance is made of indivisible tiny balls in which the radial dependence of the intrinsic matter density is a nearly bell-shape symmetrical curve. The balls could not be molted or destroyed in any kind of processes in the Universe. We may call them **primary balls**. Following the volume ratio between right and left handed prisms, determined in §2.3 (Chapter 2 of BSM) as $V_R/V_L = 27/8$, the radius ratio between the primary balls of the two substances is 3/2. They are characterised by the following features:

- they are indivisible
- all the primary balls of a same substance contain exactly one and a same quantity of matter
- the radial dependence of the intrinsic matter density in the primary ball is a bell shape curve falling to zero at some finite value of the ball radius
- the primary balls may congregate into closed packed structures in which the individual balls may vibrate
- the distinguishable matter parameters in the balls of both substances are: the matter density and the radius referred to a common length scale

Inferred conclusion:

The primary balls are the most fundamental particles of the Universe.

The primary balls may congregate in primary structures with equal number of balls.

The primary structures may congregated in additional structures.

The process of congregation is accompanied with structural change and internal energy change. We may call this process **a growing process belonging to the low level matter organization, or simply a growing process.**

B. Regular tetrahedron as a basic structure in the Universe.

The IG forces between single primary balls could not be defined until they are collected in congregations. The most compact congregation of balls has a shape of **tetrahedron,** denoted as **TH.** It is shown in Fig. 12.1.

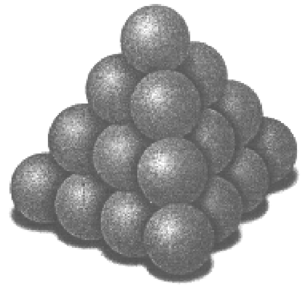
Fig. 12.1

The shape of tetrahedron allows the most compact arrangement of the primary balls. In such configuration the individual balls have freedom for vibrational motion due to the bell-shape of their radial density. In the tetrahedron configuration, their interaction energy is maximal. Their individual vibrations, however, are mutually dependent. This feature leads to appearance of synchronized **common mode of vibrations**. If considering a sphere instead of tetrahedron a stable common mode could not be obtained, because the spatial momentum is isotropical. The tetrahedron shape, however, assures variations of the spatial momentum if the common mode exhibits a rotational precession. If making analogy with the CL node, the existence of rotational precession of common mode oscillations in the primary tetrahedron seams quite reasonable. Then the common mode of oscillations could be characterised by vectors of resonance and spatial precession momentum similar like NRM and SPM vectors of an individual CL node.

Another important feature of the primary tetrahedron is that **all external shells are completed**. If the primary tetrahedron is in environment of bulk matter containing primary balls a damaged tetrahedron will either get repair or could be destroyed.

C. IGRM and IGSPM vectors

By analogy to the NRM vector of the CL node, the resonance momentum vector of the tetrahedron will be named **IGRM (Intrinsic Gravitation Resonance Momentum)**. Number of IGRM cycles will provide one complete cycle of **IGSPM vector (Intrinsic Gravitation Spatial Precession Momentum)**. It has similarity with the SPM vector of CL node. Its behaviour can be described by a quasisphere. The **IGSPM quasisphere** has a similar meaning as the CL node quasisphere. It is a 3D plot of the spatial density momentum of the IGSPM vector. But the IGSPM quasisphere is distinguishable from the quasisphere of the CL node. It possesses four bumps (corresponding to the tetrahedron vertices) and four flats, instead of dimples, (corresponding to the median centre of the tetrahedron planes).

The differences between the CL node SPM quasisphere and the IGSPM quasisphere of the tetrahedron are the following:

CL node SPM vector quasisphere:

- the bumps are aligned to the orthogonal *xyz* axes

- the dimples are aligned to the *abcd* axes (the angle between any of them is 109.5^{o})..

tetrahedron IGSPM quasisphere:

- the bumps are aligned to the *abcd* axes (the angle between any of them is 109.5^{o}.

- the flats are aligned to the orthogonal *xyz* axes.

- the four bumps are connected by riffs corresponding to the tetrahedron edges.

The IGSPM quasisphere shows, that the vector IGSPM spends more time around the bumps and riffs. Then **congregations of same type of tetrahedrons will be preferentially connected by these parts.**

In §12.A.5.3 (Chapter 12 of BSM) it is shown how the number of cycles of IGRM in one cycle of IGSPM vector might be equal to $1/\alpha = 137.036$, where α - is the fine structure constant - a fundamental physical parameter.

D. Quasipentagon

The preferential connection between tetrahedrons leads to the next compact configuration in which five tetrahedrons are congregated into one structure. The new configuration small angular gaps between the tetrahedrons. In fact the tetrahedrons have some limited freedom and the angular gaps may combine into one gap. For simplicity, we may call this structure a **quasipentagon** (QP), because one of its envelope projection is a pentagon. This structure possesses rotational symmetry, so a polar axis could be defined. Fig. 12.2 shows two orthogonal projections of quasipentagon with equally distributed gaps

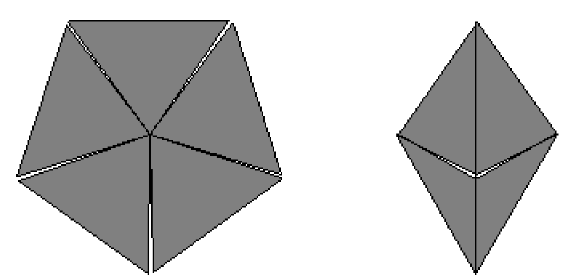

Fig. 12.2. Quasipentagon formed of 5 tetrahedrons

For a single (not integrated) QP the option of one common gap is more stable. The quasipentagon is still quite compact structure with closed packed primary balls in tetrahedrons. Therefore, we may accept that the IGSPM of the tetrahedrons are united in a common mode. Then the quasipentagon will posses a own quasisphere of IGSPM. The latter will be distinguishable from this of the tetrahedron mostly by the shape, but the number of precession cycles might be very close to this of the tetrahedron, because the fractional volume of the gaps is small. The IGSPM quasisphere of the quasipentagon exhibits the following features:

- a well defined polar symmetry (using the similarity between the overall shape of the quasipentagon and the oblate spheroid)
- a **spatial anisotropy**: the quasisphere is flatter in direction of the polar axis
- distributed gaps or single angular gap of 7.355^{o}.
- an azimuthal ununiformity of the quasisphere additionally affected by the combined angular gap position

The polar symmetry and spatial anisotropy defines the axis of rotating component of IGSPM, but the density of the spatial momentum is still stronger around the equatorial plane. The equatorial section of the IGSPM quasisphere (angular density of spatial momentum) is shown in Fig. 12.2.A. for two directions of vector rotation: clockwise and counterclockwize.

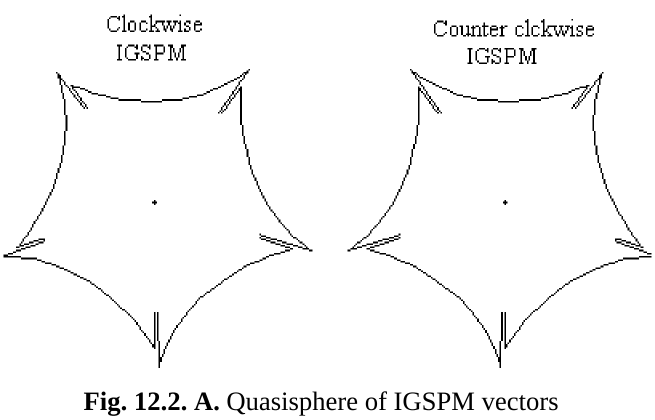

Fig. 12.2. A. Quasisphere of IGSPM vectors

A quasipentagon formed of primary tetrahedron is called a primary quasipentagon.

The angular gap plays important role of higher order congregations, comprised of aligned pentahedrons. **When number of QPs are integrated into larger structures, the existing gaps provides unique feature of distortion with ability to preserve the distorted shape.**

E. Column structure of aligned quasipentagons

Now let suppose that a large number of QPs are gathered in a cylindrical column whose length is a few time larger than its diameter. The QPs are aligned in a way so their individual polar axes are parallel to the column axis. Such configuration is illustrated in Fig. 12.3.

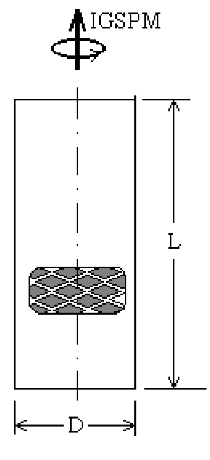

Fig. 12.3

The angular gaps in the quasipentagons allow the column structure to be additionally right or left hand twisted. In this case the angular gaps are distributed in a particular order. Once the structure is twisted this order is held strongly by the IG forces. In such configuration a common mode of IGSPM is obtained with well defined rotational direction. The quasisphere of the common IGSPM, however, is distinguished from the quasisphere of PQ, shown in Fig. 12.2.A. It obtains a **stronger gravitational and twisting component along the column axes** and weaker gravitational component in the plane normal to this axis. The azimuthal non-uniformity of the individual QPs is smeared in the IGSPM common mode of the structure. It is evident, that **the described structure possesses many of the properties of the prisms introduced in Chapter 2, even when the external shape is not a hextogram prism, but cylindrical.** The most important properties are:

- the **IG spatial anisotropy**
- the **handedness**, defined by the direction of twisting.

It is the handedness that provides the left or right handed rotational component of IGSPM vector of this column structure.

In the model of externally twisted prisms, used for simplicity, the twisting properties of IG field has been regarded as contributed by their external envelope. It has been mentioned, however, that the twisting property is a feature cause by the lower level structure of the prism.

F. Quasiball (QB)

The next distinctive congregational structure is a multihedron that could be inscribed in a sphere. We will call such structure a **quasiball (QB)**, for simplicity. There are two options in the growing process for forming a quasiball:

- quasiball option (1) (QB1): comprised of 12 quasipentagons

- quasiball option (2) (QB2): comprised of 20 tetrahedrons

QB1 could be regarded as a regular dodecahedron, in which all flat sides are replaced by QPs.

QB2 could be regarded as a regular polyhedron, but integrated by whole tetrahedrons.

Figure 12.4. shows external and internal sectional views of a mock-up of QB1 type of formation.

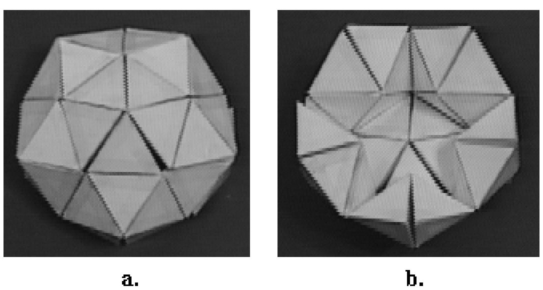

Fig. 12.4. Quasiball of type QB1 made of 12 pentahedrals; a. external view; b. internal view of half QB1 (the empty space in the internal view is seen as a pentagon star)

The shown QB1 formation is characterised by the following features:

- it contains exactly 12 pentagons (60 tetrahedrons)

- it contains enclosed empty space

- it has inevitably a right or left hand twisting

The twisting property is possible due to the angular gaps of the embedded 12 QPs, that are properly spatially arrange in the QB1 formation. Consequently **QB1 is a low level 1 bit memory structure of the intrinsic matter**. It is used for memorizing the handedness.

Figure 12.5.shows 3D view of quasiball of type QB2, formed by 20 THs with equally distributed gaps between the tetrahedrons. The analysis mentioned later, however, indicates that this growing option could be excluded from the possible process of matter self-organization involved in the galactic cycle.

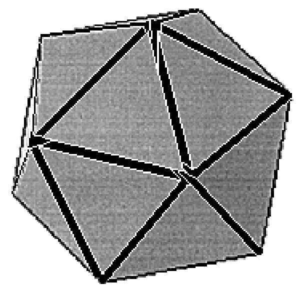

Fig. 12.5. Quasiball of type QB2

G. Congregational order

Quasiballs could congregate in a new tetrahedron, that will belong to next upper order of the low level of matter organization. Then the growing process may follow a similar trend. The congregational process from tetrahedron to quasiball could be considered as a common trend, which is repeatable in any upper consecutive order. So we may address the congregational repeatability as congregational order. The primary TH, QP, and QB, for example, are from the first congregational order. In the growing process, the congregational order increases by one for any transition between a QB from lower order and TH from the next upper order.

One specific feature arising from the congregational order is the **handedness preference**. The upper order quasiball will get preferable handedness of the lower order quasiballs. Then for a congregation of p-th order, the handedness is memorised in the quasiballs from all lower orders. From this feature one important conclusion could be made:

- **If the prisms are destructed by number of congregational order, but some quasiballs of lower order are preserved, the memory of the handedness is still preserved.**

The above feature has very important role in the provided in this chapter scenario about the process of galaxy recycling. Finally, it gives a reasonable reply of the question: Why the observed

Universe seams to be only of matter, without a signature of antimatter?

The meaning of matter and antimatter according to BSM is associated to the two substances of intrinsic matter, so it is some kind distinctive but more specific. When applied to the proton configuration, it means, that the proton external shell of helical structures, is made of shorter prisms (right handed, if the handedness is correctly assigned) and the electron external shell - from longer prisms (left handed). So if the internal twisting is correctly associated the meaning of matter and antimatter are defined by the following conditions:

longer prism - lefthanded - negative charge - > matter
longer prism - righthanded - positive charge - > antimatter
where: the sign - > means "leading to".

Observing galaxies only of matter and not antimatter means that the correct handedness (prisms twisting) is preserved in the prism recycling process in the galactic cycle.

H. Propagation of handedness from lower to higher orders

The lowest order structure, with 2 bits memory feature is the primary quasiball. The structure is able to obtain a right or left handed twisting. The twisting feature is possible due to properly distributed angular gaps in the integrated QPs and small slidings between their edges. Let call the axes along which the twisting is made a polar axis. The quasiball obtains a IGSPM aligned with their polar axis. This vector is a common mode of the 12 QP's IGSPM vectors, whose quasispheres are slightly modified due to the redistributed angular gaps and slidings. The twisted position is kept stable due to the angular momentum of IGSPM vector.

In the second order of the tetrahedron, the involved twisted QB's have a tendency to align their polar axes according to the quasisphere of IGSPM of the tetrahedron. Then the four apexes of TH obtain the same handedness as the primary QBs. In the next structure - the quasipentagon of II-nd order, the involved five tetrahedrons provide their handedness to the polar axis of the quasipentagon quasisphere. In the next structure - the quasiball of II-nd order, the handedness of involved 12 quasipentagons, causes a twisting of the quasiball in the same direction. The strength of provided handedness is proportional to the cosine of the angles between polar axes of involved QPs and the polar axis of the QB of II-nd order. The propagation of the handedness in the upper order of low level structures follows a similar way.

The provided concept shows:

(b) The quasiball is able to be twisted, memorising in such way the handedness

(b) The memorised handedness is possible to be propagated from lower to higher congregational orders in the lower level of matter organization.

(b) In any upper order of quasiball the strength of the handedness is reinforced by the twisting of that quasiball

I. Two growing options in the range of one congregational order

Taking into account the two options for QBs, we have to investigate the possibility of two possible growing processes within the range of one congregational order. Let regarding the consecutive structures as consecutive phases in the growing process. Then the two growing options will contain the following phases:

Option (1): TH -> QP -> QB1
Option (2): TH -> QB2

In option (1) the lower level structures TH and QP are integrated constructively into QB1. So we may consider that any one of the phase is predominated by the own characteristic structures.

In option (2) the phase (QP) is excluded. From one side QP is the next possible growing structure, but from the other it should be excluded from this option, because QB2 could not be integrated by whole QPs. Some of them have to be disintegrated into THs. (Studying the QB2 structure we see, that it may involve two whole QPs but the other two has to be disintegrated into ten THs, in order these THs to be integrated into the QB2). Consequently, the option (2) does not have a same growing feature as the option (1). The growing trend of option (2) contains a partially reversed process (disintegration of some QPs into THs). Additional considerations about the angular gaps between THs is also in favour of option (1). The angular gaps QPs that are integrated in a QB1 could be kept stable. In QB2 option, some ambiguity exits for the angular gaps, so their position could not be kept so stable. The stability of the angular gaps is important feature for the reliable memorizing of the handedness.

From the provided considerations we see, that the option (1) is more probable than the option (2). The option (2) however is not excluded in the very low orders. The both options could affected differently by the “order homogeneity” of the primordial matter. The option (2) might be more critical to the “order homogeneity”. Then this option may exist in the lowest congregational order, while the option (2) is more probable to exist in the higher orders.

J. Intrinsic matter quantity of the low level structures

According to defined growing process, the matter quantity of any type of low level structure could be expressed by the number of primary tetrahedrons or primary balls. If assuming that any upper order TH contains N_{PB} number of lower order QBs, then any structure (TH, QP or QB) from any particular order can be expressed by the number of primary balls, N_{PB}, contained in the primary tetrahedron.

Table 12.0 shows the matter quantity of TH, QP and QB from different orders, expressed by N_{PB}.

Intrinsic matter quantity ***Table 12.0***

Congregation order	TH	QP	QB
1-st	N_{PB}	$5N_{PB}$	$60N_{PB}$
2-nd	$N_{PB}(60N_{PB})$	$5N_{PB}(60N_{PB})$	$(60N_{PB})^2$
p-th	$N_{PB}(60N_{PB})^{p-1}$	$5N_{PB}(60N_{PB})^{p-1}$	$(60N_{PB})^{p-1}$

Dozation mechanism:

It is apparent from Table 12.0 that the lower level growing mechanism possesses a unique Dozation properties

Every upper order structure contain exact number of primary balls. If the growing process contains phases characterized by selection of structures of same type and order, then all of them will contain exactly the same quantity of intrinsic matter. The propagating of the fine structure constant, as characteristic parameter of the PT to any upper order TH and structures is also a signature of the natural dozation mechanism embedded in the growing process. The natural operation of the dozation mechanism is discussed in §12.A.5 to §12.A.8.3 of Chapter 12 of BSM.

Summary:

(a) The three types of low level structures are: tetrahedron, quasipentagon and quasiball (1)

(b) The quasipentagon (QP) provides anisotropy of IGSPM vector

(c) The QB(1) (a Quasiball option 1) possesses a stable twisting that caries the memory of the handedness

(b) Dozation features: The formations from one and a same congregational order and type of the structure contain exactly equal quantity of intrinsic matter (exact number of primary balls).

12.A.4.3 Intrinsic Gravitation and mass-energy balance of the primordial matter

12.A.4.3.1. Stable parameters of the primary tetrahedron

The spectral observations from different galaxies show that the observable Universe is made of common elements. The study of the Universe indicate that the galaxies are made of matter, and not antimatter. It is reasonable to admit that there is low level structure, which is common for all observed galaxies and caries the necessary 1 bit information about the handedness. Evidently, this memory should be not destroyable in the process of the prisms recycling. This process takes place between two consecutive active lives of every galaxy, according to the later following analysis.

The only possible structure capable to carry that memory of handedness is the quasiball QB1. Consequently some low order quasiballs survive the recycling process. **This automatically means that the primary tetrahedrons and quasipentagons also survive.** Consequently they are created in some earlier process of the Universe evolution.

The surviving of the primary tetrahedron means that it is one and a same for all galaxies and for all of their active lives. So it is a stable universal structure containing well defined number of primary balls.

Consequently, the number of primary balls, N_{PB}, in the primary tetrahedron is a constant, which should be valid for different galaxies and for different galactic lives.

$$N_{PB} = const \text{ - number of primary balls contained in the primary tetrahedron} \quad (12.1)$$

The above conclusion provides us with a reliable reference point for further analysis. Hence, the number of primary balls in the primary quasipentagon is $5N_{PB}$ and in the primary quasiball: $60N_{PB}$. If assuming that a tetrahedron of secondary order possesses a same number of quasiballs as the N_{PB}, then one quasiball of second order should contain $60^2N_{PB}^2$, and one quasiball from order *p* should have $(60N_{PB})^p$ primary quasiballs. Assuming that the same trend is conserved in the upper order congregation, we may reference the parameters of any upper order structure to the parameters of the primary tetrahedron.

12.A.4.3.2 Mean intrinsic matter density of a structure

One basic parameter of the low level structures is the intrinsic matter density. The three different types of structures within one congregational order posses different ratio between their envelope volume and the full content of intrinsic matter. The latter could be normalized to the primary tetrahedron. The intrinsic matter also is not uniformly distributed in the structure envelope volume. For this reason a mean matter density is convenient to be used.

The mean (intrinsic) matter density of any structure is a ratio between the total intrinsic mass and the external envelope volume of the structure.

In the following expression the mean matter density is referenced to the matter density of the tetrahedron. It could be either the primary one or one from some upper congregational order.

$$\rho_{ST} = \frac{N_T\, m_T}{V_{env}} = \frac{N_T\, V_T\, \rho_T}{V_{env}} \quad (12.2)$$

where: ρ_{ST} - is mean matter density of the structure; V_T and ρ_T are respectively the tetrahedron volume and the matter density; V_{env} - is the external envelope volume of the structure; N_T - is a total number of tetrahedrons in the structure

It is more convenient to normalize the structure mean matter density to the density of the tetrahedron. Then we get a dimensionless parameter. We may call it a **structure intrinsic matter number density.** It is given by the equation:

$$\rho_{ST}/\rho_T = N_T\frac{V_T}{V_{env}} \quad (12.3)$$

If assuming that the number of QBs in the tetrahedron in any upper order structure is equal to N_{PB} (number of primary balls in the primary tetrahedron), then Eq. (12.3) is valid for structure of any order. The volume ratio could be easily calculated if expressing the volume of QP and QB(1) (the envelope volume enclosed by the structure) as normalized to the volume of TH. Using this consideration the intrinsic matter density is estimated for TH QP and QB from one congregational order as an intrinsic matter number density normalised to the intrinsic matter density of the TH. The results are shown in Table 12.1.

Normalized intrinsic matter number density ***Table 12.1***

structure type	ρ_{ST}/ρ_T
tetrahedron	1
quasipentagon	0.98
quasiball (1)	0.1326

Both parameters: the structure matter density and the number density decrease slightly between the quasiball of lower order and the tetrahedron of the next upper order due to the empty spaces between the quasiballs. If the growing trend is preserved, they increase by a constant factor, which is determined by N_{PB} (number of primary balls in the primary tetrahedron).

Note: It is possible to express the structure matter density of any formation of any congregational order by the matter density of the primary balls if knowing N_{PB} (number of primary balls in the primary tetrahedron).

12.A.4.3.3 Energy well and energy balance

According to postulate P3 (see §12.A.4), the primary tetrahedron could handle a finite amount of energy or it could posses an **energy**

well. So if the total energy is increased by external pressure, the structure has to be freed from this energy. If such structures are quite a lot (as a see of similar structures) without freedom of motion (as energy interaction) they might be involved in a growing process in which upper type structures (in a scheme (TH->QP->QB)) or congregational order is formed. Consequently:

(a) Every low level structure is characterized by energy well

(b) If a see of low level structure obtains additional energy due to an external pressure and its total energy exceeds the individual energy well, then these structures may form upper type or upper order structures.

The energy well may be filled or not filled with energy. The total energy of the structure is contributed by two types of energy:

- internal vibrational energy
- external interactions in form of IG energy

It is apparent that the energy balance for a given structure should fulfil the condition:

$$E_V + E_{IG} \le E_W \qquad (12.4)$$

where: E_V - is the internal vibrational energy, E_{IG} - is the intrinsic gravitational energy, E_W - is the energy well

While the energy E_V is a constant for one type of structures, the energy E_{IG} depends of mutual structure positions and distances. **Therefore, the condition for existing of IG interactions between same type of structures is the sum of the two type of energies (EV and EIG) to be smaller than the energy well for that type of structure.**

It is apparent that structures of same type and order occupying a common volume will not only interact by IG forces, but a tendency of equalization of their individual total energies $(E_V + E_{IG})$ will exist. Then the condition (12.4) may be fulfilled for all individual structures, making their common existence more stable.

From the above considerations the following conclusions could be made:

(a) The total amount of energy for a stable structure is lower, than the energy well.

(b) Structures of the same type and order occupying a common volume obtain more stable existence.

When the condition (b) is satisfied, the individual structures of the same type will have energies centred around some mean value. This energy is similar to the zero point energy in CL space. Let call it a **mean energy** of the structure, denoted by ρ_E

Note: The energy is a scalar parameter and should not be confused with the IGRM and IGSPM vectors.

12.A.4.3.4. Mean energy density of the structure from particular type and order

In order to compare the energy wells between structures of different types and orders it is useful to define a parameter of mean energy density of the structure.

The mean energy density of a structure from a given type and order is equal to the mean energy divided on the volume enclosed by its external envelope surface.

According to P3 and the analysis in the previous paragraph, it is evident that the mean energy density is proportional to the mean matter density.

$$E_\rho \sim \rho_{ST} \qquad (12.5)$$

This relation allows estimating the energetic parameters by the geometrical parameters of the structure. It is more convenient to estimate the energy of a particular structure as normalized to the energy of some lower order structure, for example, the TH.

12.A.4.3.5. Summary

- **The main characteristic parameters of the low level structures are the structure type and the congregational order**
- **Any upper order structure above the primary tetrahedron is comprised by lower order structures with preserved spatial configuration and properties.**
- **The intrinsic mass distribution is well defined by the type of the structure and its congregational order.**
- **The mean energy density is proportional to the mean intrinsic mass density. Therefore, it could be estimated by pure geometrical considerations. This allows expressing the energy of a given structure by normalized energy units using some lower level structure for talon.**
- **Many parameters of the upper level structures could be normalized to the primary tet-**

rahedron. The latter is a stable structure, capable to survive the recycling process of the prisms.

- **It is reasonable to look for embedded features of the fine structure constant into the primary tetrahedron.**

12.A.4.4. Relation between the dynamical properties of the lower level structures and some parameters of CL space

Let considering the three types of formations from one congregational order: a tetrahedron (TH), a quasipentagon (QP) and a quasibal (QB). The mean mass densities, ρ_{ST}, for the first two structures are very close, so the frequency of their IGRM and IGSPM vectors must also be close. Consequently, the IGSPM quasisphere of the quasipentagon could be regarded as combined of five tetrahedron quasispheres with vectors possessing almost the same frequencies. The case of the quasiball (1), which is formed of 12 pentahedrals, however, is different. The parameter ρ_{ST} is reduced. In the same time, the preservation of integrity of the included quasipentagons and tetrahedrons means a preservation of the frequency of their IGRM vectors. The new feature that will appear in the quasiball is a common mode of the IGSPM vectors of the involved quasipentagons. It is quite logical that the frequency of this common mode could be regarded as obtained by division (by integer) of the frequency of the IGRM vector (using the analogy with the CL space vectors NRM and SPM). Propagating the same feature for higher congregational order we arrive to the following conclusions:

(a) IGRM vector is a feature of the primary tetrahedron and its parameters are preserved in the higher congregational order

(b) The frequency of IGSPM vector of any structure has well defined dependence on the congregational order and the structure type

The conclusions (a) and (b) might put a light on the physical meaning of one well known theoretical parameter - the Plank's time. In Chapter 2 we have tried to find the relation between the three important physical parameters: the Plank's time (or frequency), the CL node frequency and the Competing frequency, assigning to them three consecutive levels of matter organization. If putting the Plank constant frequency and the CL node frequency as consecutive level of the matter organization the plot in *ln* scale shows a significant deviation from a robust line. From the provided analysis about the IGRM and IGSPM it becomes apparent, that one additional level may exists between the Planck's time and the resonance period (frequency) of CL node. Such assignment of the level of matter organization and the corresponding frequencies are given in Table. 12.1.

Levels of matter organization Table 12.1.

Level x	Time (sec)	Frequency ν (Hz)	ln(ν)	Type of oscillation
0	5.39E-44	1.855E43	99.629	(Plank's)
1				IGSPM
2	9.152E-30	1.0926E29	66.86	CL node resonance
3	8.093E-21	1.236E20	46.26	SPM; electron proper frequency

Level "0" is assigned to the Planck's frequency, f_{pl}, (the reciprocal of the Planck's time). The latter is given by the expression:

$$f_{pl} = \sqrt{\frac{2\pi c^5}{Gh}} = 1.855\times10^{43} \text{ (Hz)} \qquad [(2.67)]$$

where: G - is the gravitational constant, h - is the Plank constant , c - is the light velocity.

The natural logarithm of frequency versus the assigned level of matter organization is shown in Fig. 12.6.

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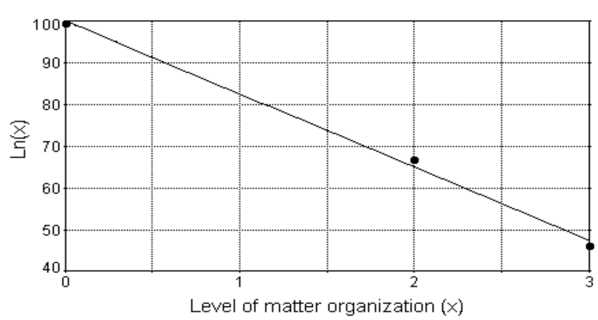

Fig. 12.6.

The three known frequencies now are better aligned in a line. According to the BSM concept, the new identified level 1 may correspond to the

IGSPM vector frequency of the prism. Then the following relations are inferred:

Level "0": corresponds to the **IGNRM frequency of the primary tetrahedron**

Level "1": corresponds to the **IGSPM frequency of the prism, defined by the highest order quasipentagon embedded in the internal structure of the prism.**

where: **IGSRM** vector (Intrinsic Gravitational Structure Resonance Momentum) is similar as NRM vector for CL node; **IGSPM** vector (Intrinsic Gravitational Spacial Precession Momentum) is similar as SPM vector for CL space.

Note: Using a fitting by a robust line may allow to calculate the IGSPM frequency for the level 1, but its value might be very approximate (involving a large error).

It is reasonable to accept that all QPs from one prism have synchronized common mode of IGSPM vector. Then if a structure formed of aligned prisms with touching ends exists, the vector IGSPM will propagate between two prisms for one full cycle. This is analogous to the NRM vector propagating in CL space (determining the light velocity). Then in such case the gravitation will be propagated with a velocity according to the expression:

$$\frac{\nu_{IGSPM}}{\nu_R}c \qquad (12.5.a)$$

where: ν_R - is the resonance frequency of a normal CL node, and c - is the light velocity.

The expression (12.5.a) provides a hyperlight (superluminal) velocity. Such phenomena may exist in the initial phase of CL space formation. This is discussed in §12.B.5.3. (Chapter 12 of BSM).

12.A.5. Formation of upper order congregations in the surface region of the bulk matter.

12.A.5.1. Energy balance between structures of same type but different congregational order

Let considering the growing option (1), discussed in §12.A.4.2.1.H.

If the primary tetrahedron contains N_{PB} number of primary balls, then the primary QP contains $5N_{PB}$ primary balls and primary quasiball contains $60N_{PB}$. If the same growing trend is preserved in the upper congregational orders, a structure of *p* order will contain the following number of primary balls:

$$(5N_{PB})^p \quad \text{- for QP of p-th order} \qquad (12.5)$$

$$(60N_{PB})^p \quad \text{- for QB of p-th order}$$

Let regarding the quasiball shape as spherical, for a simplicity. The distance between the QBs is proportional to their radius. The volume of the upper order QBs will grow proportionally with the order number. Then the distance between QBs will grow by cubic root of the volume. But IG forces are inverse proportional to the cube of the distance. **Then the growing process will not involve consumption of IG energy**. For explanation of this phenomena, illustrations of the relative positions between the bulk matter and two consecutive orders of the same type are shown in Fig12.7.

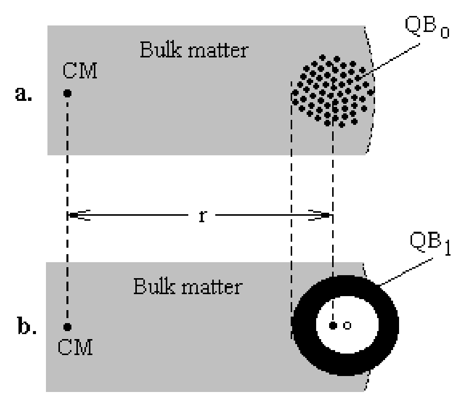

Fig. 12.7. Geometrical comparison between structures of a same type (QB) but of different congregational orders

In case **a.**, lower order quasiballs are shown as QB_o. In case **b**. one quasiball of upper order is shown as QB_1. If the growing trend between the QB_o and a tetrahedron of upper order is the same as between the primary balls and the primary tetrahedron, then QB_1 will contain $(60N_{PB})$ numbers of QB_o. Therefore, the total intrinsic masses in case a. and b. are equal. In Fig. 12.7 the position of the geometrical centre of QB1 is indicated by an empty circle. The following features are necessary to be emphasized:

(a) QB_1 contains a large internal empty space

(b) All QB_o structures are immersed in the bulk matter, that could be of lower order congregations. So they may contain internal empty spaces, but the same spaces are contained in the black section of the single QB_1.

(c) For QB_1 structures formed at the edge of the bulk matter the equivalent CM (centre of mass) of QB_1 (shown by a black point) is displaced from the geometrical centre of the structure.

While the feature (c) is not valid for Newton's gravitation, it is very important for the Intrinsic Gravitation because the IG forces are inverse proportional to the cub of the distance. (The gravitational potential for the Newton's law is inverse proportional to the distance, while in IG case it is inverse proportional to the square of the distance).

As a result of the above considerations, it may appear that the distance, *r*, between CM of the bulk matter and the equivalent CMs in cases **a**. and **b.** could be one and a same. **At such conditions, the formation of QB_1 structure from QB_o structures will not involve work against IG forces between these formations and the bulk matter.**

The formation of upper from lower order structures could be called a **low level growing process**. The therm "low level" is used to distinguish this range of matter organization from the range above the prisms level. More often the therm **growing process** could be only used, knowing that it is related to the low level of matter organization.

The provided example is simplified. In the real case some small energy could be involved. If the concept is true, however, the following phenomena could be formulated:

(A) The formation of upper order structures in the growing process does not involve significant consumption of IG energy.

The above phenomena could be approximately valid due to the simplification of the analysis, but it is of great importance in the process of formation of higher order congregations. It allows formation of shell with higher order QBs without significant energy expense. In the same time the growing shell will be able to preserve a big portion of the vibrational energy for itself (borrowed from the bulk matter energy).

The energy balance analysis described for the phenomena (A) could be applied not only for QB's of different order, but for other structures of same types and different order, as well (THs and QPs).

Note: The same amount of IG energy is referenced to the same number of primary structures.

In the next paragraph it will be shown, that there is a tendency for uniformity of the upper order of the quasiballs.

Conclusions for the growing process within one congregation order.

Considering that the growing option (1) is only valid for the galactic recycling process and accepting the primary tetrahedron as a lowest order structural formation of the growing process we may summarize:

(a) The primary tetrahedron contains N_{PB} primary balls

(b) The number of quasiballs in any upper order of tetrahedrons is equal also to N_{PB}.

(c) The growing option within the range of one congregational order is: TH -> QP -> QB.

12.A.5.2. Frequency dependence of the IGRM and IGSPM vectors on the type and congregational order of the structure

The inertial properties for structure of intrinsic matter has been discussed in Chapter 2 of BSM. The mass corresponding to such interactions is called intrinsic inertial mass. In the following analysis an assumption is made that the classical equation for the proper frequency is valid also for the intrinsic inertial masses. If this assumption is valid, the vibrational frequency, of the primary quasipentagon, $\nu_{QP}^{(1)}$, can be expressed by the equation:

$$\nu_{QP}^{(1)} = \frac{1}{2\pi}\sqrt{\frac{k}{5N_{PB}m_o}} \qquad (12.6)$$

where: the superscript index (1) means a first congregational order, m_o - is the intrinsic inertial mass of the primary ball, N_{pb} is the number of primary balls in the primary tetrahedron and *k* - is a force constant between the primary balls.

The parameter *k* is determined from the IG forces between the primary balls in the primary tetrahedron. For the primary quasipentagon it will be approximately the same, because these two structures have very close intrinsic matter density. Using Eq. (12.6) in the following analysis let assuming that the parameter *k* does not depend of the type and order of the formation. This assumption is based on the consideration that the structure of the primary QP is preserved in all higher order structures. The matter quantity expressed by the intrinsic mass, however, is dependable on the structure type and order.

Let determine the frequency of the common vibrational mode for a QP of some upper congregational order *p*. All lower order structures included in this QP preserve their configuration. So the same parameter *k* between primary balls should be valid (according to the above made assumption), while the mass of the QP of order *p* could be estimated by the matter quantity given by Table 12.0.

Having in mind Eqs, (12.5) and (12.6) the common mode frequency of the QP of p-th congregational order could be expressed as:

$$\nu_{QP}^{(p)} = \frac{1}{2\pi}\sqrt{\frac{k}{5N_{PB}m_o(60N_{PB})^{p-1}}} \qquad (12.7)$$

We see, that the common mode frequency falls pretty fast with the order number *p*. Having in mind the quantum features described by the IGSPM quasisphere, the obtained common mode frequency might be considered as a proper frequency of the IGSPM vector.

Making a ratio between $\nu_{QP}^{(1)}$ and $\nu_{QP}^{(p)}$ we get:

$$\frac{\nu_{QP}^{(1)}}{\nu_{QP}^{(p)}} \approx \sqrt{(60N_{PB})^{p-1}} \qquad 12.8)$$

The mass of the primary PQ is five times the mass of primary TH, but the mass to volume ratio (neglecting the small gaps between TH in the QB structure) is approximately the same. Then parameter *k* for TH and QP is also the same and the expression of the frequency ratio between IGSRM vectors of the primary TH and the IGSPM of highest order QP in the prism will become:

$$\frac{\nu_{TH}^{(1)}}{\nu_{QP}^{(p)}} \approx \sqrt{5(60N_{PB})^{p-1}} \qquad (12.9)$$

Note (1): The factor of 5 refers to the QP's IGSPM , that is a common mode of IGSRM of the included TH's. The real factor might be slightly lower than 5 due to the angular gap in the QP. So IGSPM of TH is approximately equal to 5 times IGSPM of QP (within the same congregational order).

According to the considerations in 12.A.4.4 the Planck's time regarded as a period of IGSRM vector, may correspond to $\nu_{TH}^{(1)}$ or $\nu_{QP}^{(1)}$, while $\nu_{QP}^{(p)}$ could be the IGSPM frequency of the quasipentagons from which the prisms are made.

Let analysing how the IGRM period changes during the growing process: tetrahedron - quasipentagon - quasiball - upper level tetrahedron.

The IGRM is defined for the primary TH. The period of IGRM may be slightly decreased in the primary quasipentagon, due to the close accumulation of intrinsic mass and obtaining a different shape of IGSPM quasisphere. In a growing process from a QP to a QB within one congregational order the period of IGRM should not be significantly affected, because QPs are connected by small volume sections. In the growing process between a QB and a upper order TH the IGRM period could not be affected significantly because the mean matter density, ρ_{ST}, is approximately the same as of QB. The change of IGRM period in the upper order growing will be smaller and smaller, following a continuously decreasing step function with progressively smaller steps. Consequently:

(a) The change of IGRM of the growing structures is a decreasing steplike function with progressively decreasing steps.

(b) The step change have two periodical progressions:

- between congregational orders

- between different type of structures of same order

12.A.5.3. Hypothesis of embedded fine structure constant in the lower level structures of matter organization

Considerations related to the concept of embedded fine structure constant

From the previous chapters it was shown that the fine structure constant is embedded not only in the electron structure but also in its dynamical properties in CL space and many other interactions between the elementary particles and the CL space (for instance: in the quantum motion of the electron (positron); in the quantum orbits conditions for atoms and molecules; in the atomic and molecular spectra). In Chapter 10 of BSM it was shown that α is also involved in the inertial interactions between the elementary particles and the CL space (Eqs (10.36), (10.39), (10.39a). It was even found that the signature of α is involved in the inertial interaction balance of the solar system in our home galaxy - the Milky way (see §10.6.4, Chapter 10 of BSM).

From the analysis of the lower level of the matter organization and the concept of the galactic cycle (provided later) it becomes apparent that α is a common fundamental physical parameter for all observable galaxies. Consequently α is a parameter of very low level structure the signature of which is preserved even in the galactic recycling process (discussed later in this chapter). The basic repeatable structure which possesses IGSPM vector is the primary tetrahedron, so it is reasonable to look for a possible signature of α in this structure. One very basic physical parameter of the primary tetrahedron is the number of primary balls. Keeping in mind that all the shells of the tetrahedron should be completed, a simple rule follows that a strong relation must exist between the number of balls along the edge and the total number of balls. For example, if the edge number of balls, N_{edge}, corresponds to the set: 10, 11, 12, 13, 14, 15, 16, 17, 19 and so on, then the total number of balls, N_{tot}, should be respectively: 220, 286, 364, 455, 560, 680, 816, 969, 1140, 1330 and so on.

The experimental value of this constant is measured with very high accuracy. Finding a theoretical derivation of the fine structure constant, however, have been one of the most difficult problems in mathematical physics and it is still unresolved (see J. G. Gilson)[1] In fact number of empirical formulae have been suggested, but without understanding what kind of physical mechanism could be behind them. One of these formulae (shown as Eq. (F1)) gives a value, which is very close to the measured one recommended by CODATA 98 (if the two involved integer parameters have value: $n_1 = 137$ and $n_2 = 29$):

$$\alpha = \frac{n_2}{\pi}\cos(\pi/n_1)\tan(\pi/(n_1 n_2)) = 7.2973525\times10^{-3} \qquad (12.12)$$

$$\alpha = 7.2973525\times10^{-3} \quad \text{(CODATA 98)}$$

Recently another simple expression has been proposed by I. Gorelik[2], as a system of two simple equations (written in this way to show the separation of into a whole and a fractional number):

$$n + k = 1/\alpha$$

$$k(n+k) = \pi^2/2$$

The common mode oscillations of all primary balls embedded in the primary tetrahedron could be described by two vectors: IGRM and IGSPM (see §12.A.4.2.1 C). Making analogy with the CL node dynamics, the primary tetrahedron has the same two set of axes: *abcd* (non-orthogonal) and *xyz* (orthogonal). Then to analyze the dynamics of oscillations of the primary tetrahedron, we may use a concept similar as the CL node dynamics (presented in “Brief intro to BSM...” and Chapter 2 of BSM), but instead of NRM we have IGRM and instead of SPM we have IGSPM. One major difference is that the primary tetrahedron has relatively large intrinsic matter density for the volume it encloses, while the CL node has much smaller intrinsic matter density. For this reason we must expect much smaller number of IGRM cycles in one IGSPM cycle in comparison to the CL node dynamics (NRM cycles in one SPM cycles). Due to the two sets of axis the trace of IGRM will not be circular and will note lie in a plane. We may simplify the analysis if replacing the real trace of IGRM with an equivalent elliptical trace having a dipole moment equal to the real precession moment of IGRM vector for one cycle.

Figure 12.8 illustrates the dynamical behavior of the IGRM vector. .

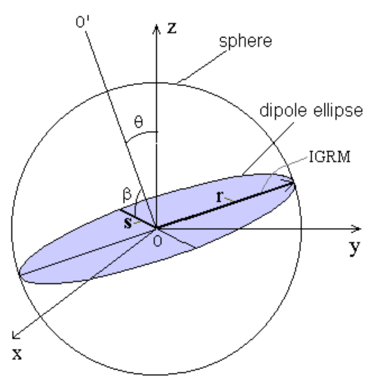

Fig. 12.8. Spatially precessing dipole momentum expressed by IGRM vector.

The origin of the IGRM vector is always fixed at the origin O of a coordinate system *xyz*, while having a freedom to rotate in the spherical space volume. Due to the different stiffness along the two sets of axes xyz and abcd (not shown in this figure) the vector IGRM will performs a helical rotational motion with a very small but constant helical step. This means that after one cycle its tip will not pass through the same point but through a point closer to the previous one, so the distance between them is much smaller than the trace of the vector's tip. We may call this a quasicycle. After many quasicycles, however, the tip of the SPM vector will pass exactly through the same initial point (arbitrary selected). This cycle we may call a full cycle. Then the full cycle will contain many quasicycles, but their number may not be an integer. In this kind of motion, the tip of the IGRM vector will circumscribe a trace, which lies in a spherical surface. It is apparent that for one quasicycle, the trace of the vector IGRM will not lie in a plane, but we may consider an equivalent plane, defined by the condition that the average distances between the points of the vector's tip (through equal time intervals) and this plane is a zero. This will simplify the analysis and will allow us to define the following parameters:

-selection of an initial reference point

-definition of a dipole momentum in a plane

-definition of the step between two neighboring equivalent planes (corresponding to the helical step of the IGRM vector) as an angle between them.

It is apparent that the dipole momentum of IGRM vector could be expressed by an ellipse lying in the equivalent plane. We may call it a "dipole ellipse". The rotational axis OO` will be perpendicular to the major semiaxis r of the dipole ellipse, but not perpendicular to the minor semiaxis. In other words the plane of the dipole ellipse will be rotating with a small pitch angle of $(\pi/2-\beta)$ defined by the helical motion of the IGRM vector. Then for one quasicycle, the dipole ellipse will sweep a volume of an oblate spheroid with a major semiaxis r and a minor semiaxis defined by the product: $s\cos\beta$.

In every quasicycle, the dipole ellipse will sweep the same volume, while the initial angle q (arbitrary selected) will change with one and a same step. This angle is shown for reference only. It could be defined for any one of the orthogonal axes. The rate of q change will define the number of completed quasicycles within one full cycle. The latter, however, may not contain an exact number of quasicycles but a whole number plus a fraction, so we have:

Full cycle = n + k

Where: n - is the number of completed quasicycles contained in one full cycle, k - is a fraction of a quasicycle

Our goal is to express the fraction parameter (k) as a function of the whole number (n) using the defined model. We will derive expression using the relation between the volume of the circumscribed sphere and the volume of the oblate spheroid.

The volume of the circumscribed sphere is: $V_{SP} = (4/3)\pi r^3$

If the full cycle contains a large number of quasicycles, then: $\cos\beta \ll 1$. We may associate this with the fractional part of $1/\alpha$, so we may write: $\cos\beta = k$. Then, the volume of the oblate spheroid is: $V_{OS} = (4/3)\pi r^3 s\cos\beta = V_{OS} = (4/3)\pi r^3 sk$

The tip of the SPM vector is associated with the point of interception of the dipole ellipse with the major semiaxis. This means that for a full cycle of the IGRM vector, the volume of the oblate spheroid swept by the rotating dipole ellipse will be twice the volume of the circumscribed sphere, or we have $V_{OS} = 2V_{SP}$. The expression corresponding this is:

$$(4/3)\pi r^3 sk(n+k) = 2(4/3)\pi r^3$$

Multiplying both sides by 1/r and using a normalized parameter $s_r = s/r$, we arrive to:

$$0.5 s_r k(n+k) = 1 \qquad (12.13)$$

Now we may look for a possible reasonable value of the product $(s_r k)$, while trying to relate the parameter s_r to π. Knowing that (n+k) is equal to $1/\alpha$, we should have $0.5 s_r k \approx \alpha$. For this purpose we will use the experimental value of alpha given by CODATA 98. Then the normalized minor semiaxis of the oblate spheroid should be close to the value: $s_r = 0.40552$. This value is very close to: $\left(\frac{1}{\pi/2}\right)^2 = \frac{4}{\pi^2} = 0.40548$. The difference between them is only 0.59%, so we may accept:

$$\sqrt{s_r} = (2\pi) \text{ or } s_r = 4/\pi^2 \qquad (12.13.a)$$

The idea to relate the parameter s_r to π is reasonable if examining the more accurate formula (12.12), where π participates. It complies also with the Feynman's idea[1] that alpha should be somehow connected to the numbers e or π.
Substituting (12.13) in (12.13.a) leads to Eq. (12.13.b). It is a quadratic equation. The root leading to a correct expression for alpha is:

$$k = -0.5[(n^2 + 2\pi^2)^{1/2} + n] \qquad (12.13.b)$$

Using the module of the solution (10) and combining with the expression $(n+k) = 1/\alpha$ we get the explicit theoretical expression for the fine structure constant (denoted as α_c)

$$\alpha_c = 2/[(n^2 + 2\pi^2)^{1/2} + n] = 7.29735194 \times 10^{-3} \qquad (12.14)$$

Conclusion: In the obtained equation for theoretical value of the fine structure constant only one number must be selected: n.

Equation (12.14) provides a pretty accurate value for alpha, if the accuracy of its experimental value exceeds some level. This requirement is overly satisfied that is evident from the plot illustrated by Fig. 12.9, according to which we can use n = 137 with a high level of confidence.

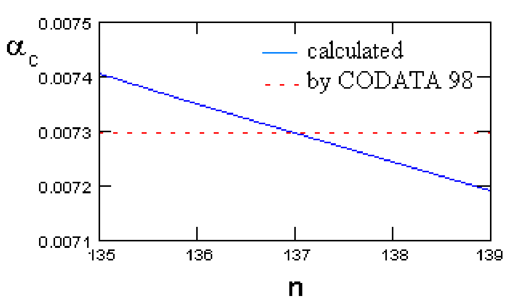

Fig. 12.9. Plot of the fine structure constant, by the theoretical Eq. (11) (blue line) and by CODATA 98 value (red dashed line). The experimental accuracy better than 0.7% allows to use only n =137 for which a quite accurate value for the fine structure constant is obtainable.

Discussion:
The suggested method provides a simplified physical picture of the common oscillating mode in the primary tetrahedron, whose signature is the fine structure constant. Evidently the fine structure constant is defined by the intrinsic features of the primary ball: an intrinsic time constant and a level of deformation. These two parameter are constant for the primary balls of both intrinsic matters

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12.A.6. Intrinsic Gravitational Constant

12.A.6.1. Difference between IG constants G_{os} and G_{od}.

The Intrinsic Gravitational constant G_o has been introduced and partially discussed in Chapter 2 of BSM. Now keeping in mind the oscillation properties of the primary balls and TH, QP and QB formations of any congregational order it becomes apparent that IG field could be defined by the interaction energy E_{IG} between two structures of a same type placed in a void space at unit distance. It is reasonable to chose a stable length parameter for a unit distance. For this reason we must be able to scale the chosen unit distance to the dimension of the primary ball. This distance is preserved in all upper order structures. Having in mind the robustness of the formations from intrinsic matter including the prisms it is apparent that the prism length could be also used as unite length. (When analysing phenomena in CL space, however, we consider the internode distance as an unite length keeping in mind that it is only weakly dependable on the mass of a large body (a General Relativity effect).

From the presented in §12.A.4.2 and §12.A.5 scenario of the prisms formation it becomes apparent that the prism is formed of aligned quasipentagons of one and a same order (and from one type of intrinsic matter substance). The analysis made for the prisms should be valid for the structures of the same congregational order. Because we have two types of intrinsic matter substances, we must consider two types of IG constants:

G_{os} - is the IG constant between structures of intrinsic matter substance of same type

G_{od} - is the IG constant between intrinsic matter substances of different type.

The volume ratio between the primary balls from the two substances should be equal to the prisms volume ratio $V_1/V_2 = 27/8$. Then the radius ratio of the primary balls is $r_1/r_2 = 3/2$. Even without knowing the common estimated mass density and the force constant, it is evident that the IGRM vectors of the primary tetrahedrons of both substances will have **different periods** (estimated by a common time base). IGSPM vectors (for TH, QP or QB) of both substances will have a period multiple of IGRM period (for the primary ball).

Let accept that a complete IG energy exchange between the spatially separated structures (in a void space) is achieved for a finite time, defined by the time constant of the intrinsic matter, t_{IM}. While it is intrinsically small and could be near the range of the Planck's time, it is quite important. As discussed in Chapter 2 of BSM, without such constant the energy conservation could not be defined, but all analysis and observations show that this principle is an iron rule.

Let associate the intrinsic time constant, t_{IM}, with the cycle of the IGSPM frequency. From the analysis of the IGSPM frequency in §12.A.5.2 we found that it decreases as a step like function in the growing process of lower level of matter organization. Consequently, the intrinsic time constant will be respectively an increasing step-like function.

Let considering the two types of prisms which play the role of fundamental particles in CL space. While keeping in mind that the prism has anisotropic IG field, let us focusing on its axial IG field. Since the prisms are formed of aligned QPs, the combined IGSPM of the QPs will define the IGSPM vector of the prism.

Let consider two cases of spatially separated prisms in a void space.

(1) Case: The prisms are of same intrinsic matter and handedness

(2) Case: The prisms are of different intrinsic matter and handedness

Then the interaction IG energy could be presented as integration of IGRM cycles for the time duration of the IGSPM cycle.

The complex trace of the IGRM vector for a full IGSPM cycle is difficult to be expressed mathematically. We may simplify the problem, by replacing this two vectors with a simplified model of linear interaction between two slightly different frequencies and estimate the product of their interaction. Then the analysed problem could be regarded as the energy transfer between two PLL (phase looked loop) oscillators. The case (1) corresponds to two PLL oscillators with equal proper frequencies ($a = 1$). They need very short time interval in order to get in synchronization and exchange energy. The case (2) corresponds to two PLL oscillators with slightly different proper frequencies ($a \neq 1$). They need a significantly larger time interval and at different moments the biting effect could be constructive or destructive. The associated energy exchange for this simplified model is given by the expression.

$$E_{IG} = \int_0^{\theta} \sin(2\pi\theta)\sin(a2\pi\theta)d\theta \qquad (12.15)$$

$a = f_1/f_2$ - is the frequency ratio associated to the ratio of IGRM frequencies of the two types of prisms.

For case (1) we have $a = 1$, while for case (2) this factor is $a \neq 1$.

Figure 12.12 shows a plot of E_{IG} for case (1) - the black line ($a = 1$), and for case (2) at three values of *a* parameter: 0.6, 0.66 and 0.73.

:

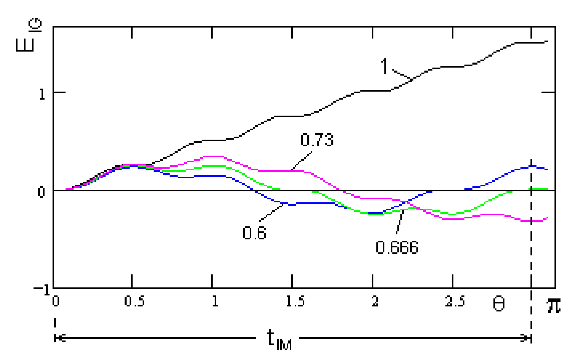

Fig. 12.12. Plot of E_{IG} for different value of *a* parameter.

While for case (1) the interaction energy is always positive, for the case (2) the interaction energy for elapsed time of t_{IM} (corresponding to IGSPM) could be positive, zero or negative depending on the value of the parameter *a*. **When considering that the two prisms are part of a lattice structure from the aspect of the energy conservation principles the negative interaction energy will cause an increase of the internode distance until the total energy balance is restored.**

It is interesting to analyse the expression by replacing the factor of 2π with 4π and integrate up to 4π. This may simulate better the IGRM, which in fact rotates in 4π spatial angle. While it is still not equal to the real model, it shows that the plot for $a = 1$ drops to zero for some particular values of θ. This leads to important conclusion that in some particular arrangement of the prisms the IG attraction could be lost. This, however, could be possible only for extremely short time interval, because the IGRM and IGSPM frequencies of the prisms are slightly influenced from their common positions and distances, especially in a lattice configuration.

Despite the simplicity of the model, it allows to derive some important **conclusions**.

A. The attraction between the same type of prisms is always stronger, but in some particular structural arrangement it may be decreased significantly

B. In the CL structure where the prisms are arranged alternatively in nodes, the node distance is supported automatically, due to the slight dependence of the IGRM and IGSPM frequency from the internode distance.

C. The influence of the interaction energy puts alight on the IG constants G_{os} and G_{od}

The conclusions A. and B.put a light on the stability of the LC structure of the physical vacuum and the structural stability of the elementary particles. The conclusion C. puts a light on the non-mixability of the low level formations from the two different substances. This is important feature in the phases of the matter evolution during the hidden phases of the galactic cycle.

Note: The evaluation of both IG constants is only possible by the parameters of CL space, so the asymmetrical factor a_{sym} should be taken into account (see §6.9.4.2 in Chapter 6 of BSM, related to a_{sym}).

12.A.6.2. Intrinsic time constants of the prism.

The provided concept of IG energy exchange between low level matter formations shows, that the IGSPM cycle defines one important feature of the prisms - their **intrinsic time constant**.

When the concept of IG interaction was introduced in Chapter 2 of BSM, it was emphasized, that the intrinsic matter of the prisms should posses intrinsic time constant. Only in such way a finite time could be assign to any interaction process. This is a very important requirement for assuring a finite energy exchange in any kind of interactions, or in other words complying to the energy conservation principle. Having in mind the prism's internal structure of aligned QPs, as shown in fig. 12.3, we arrive to the following conclusion:

The intrinsic time constant of the prism is defined by the IGSPM period of the uppermost quasipentagons, which are embedded in the internal prism's structure.

It has been mentioned in the previous chapters (and used in analysis) that the IG field of the prism exhibit an axial anisotropy. The above defined time constant is valid for the prism's axis direction. In a direction normal to the prism's axis another time constant might be important defining the radial IG field of the prism. This time constant may have a cirality feature, so it could be related to the period of IGSPM vector of the most upper order quasiballs (possessing twisting that defines the handedness) embedded in the QPs from which the prism is built. Having in mind that the QP contains a large number of lower order QBs the radial IG field time constant might be much shorter than the axial IG field one. In such case one important feature of the prisms could be explained: why the prisms of CL nodes do not stack together. They may stack only if the prisms are axial aligned and closer below some limited distance. Such condition may appear only in a very special environment where a crystalization of helical structures from a same type of prisms is possible. The scenario for such process is described in §12.A.11.3.

Summary:

- **- both type of prisms have own set of intrinsic time constants: one per axial direction and another per radial direction**
- **- the prisms of CL nodes are not stacked due to the different value of their axial and radial intrinsic time constants**
- **- free prisms may stick along their long side if they are closer below some critical distance. (valid only in suitable environments for crystallization of helical structures from which the elementary particles are built.**

12.A.6.3. About the possible equivalence between G and G_0 that could allow an estimation of the intrinsic masses of some low level formations.

12.A.6.3.1. Considerations

In CL space the both IG constants could appear as one constant properly corrected by CL space asymmetric factor. The Planck's time (see Eq. [(2.67)]) is defined by the gravitational constant G which is valid for CL space. The analysis in §12.A.5.3 shows that the embedded fine structure constant could be directly related to the Planck's time. Then it may appear, that the expressed by CL space Intrinsic gravitational constant G_0 might be the same as the universal gravitational constant G. This conclusion may seams suspicious in a first gland because the IG forces are quite much stronger than the Newton's gravitation. But when expressed by the equation of the IG law these forces may appear large due to the larger intrinsic masses (involved in the elementary particles) and the inverse cubic dependence of the forces on the distance.

If the above consideration is true, then the intrinsic masses of all structures from the lower level of matter organization including the primary ball could be found (if the parameters N_{tot} and p discussed in §12.A.5.3 are correctly determined).

Note: The intrinsic mass could be estimated only by the units valid for CL space. In such aspect the asymmetric factor should not be discussed here with the presumption that it is valid when distinguishing the right-handed from the left-handed prisms.

12.A.6.3.2. Equivalent intrinsic mass and matter density of the CL node

The two types of prisms are respectively from two different intrinsic matter substances, but the intrinsic mass related to the IG law we may estimate only in CL space using the Newton's mass unit. For this reason we call it an equivalent intrinsic mass.

The factor C_{IG} has been accurately determined in Chapter 9 as:

$$C_{IG} = G_o m_{po}^2 = 5.276867\times10^{-33} \qquad [(9.25)]$$

where: m_{po} - is the intrinsic mass involved in the proton (neutron).

The similar factor for a Newtonian gravitation is:

$$C_N = Gm_p^2 = 1.866772\times10^{-64}$$

where: G -is the Newtonian gravitational constant and m_p - is the proton mass.

We must keep in mind that C_{IG} is related to the inverse cubic law, while C_N - to an inverse square law, so they have a different dimensions. Then, the following analysis could be valid if the assumption that $G = G_o L_{SI}$ is correct, where $L_{SI} = 1(\mathrm{m})$ is the unit length in the system SI, in which both factors are compared. Then we have:

$$\frac{Gm_p^2}{C_{IG}} = \frac{Gm_{CL}^2}{Gm_{CLo}^2} \qquad (12.15.a)$$

where: m_p is the Newtonian mass of the proton, G_o - is the intrinsic gravitation, m_{po} - is the intrinsic mass of the proton, m_{CL} - is the CL node inertial mass (CL node mass as a Newtonian mass), m_{CLo} - is the intrinsic CL node mass expressed by the Newtonian mass.

The inertial node mass has been determined in Chapter §2.11.3, Eqs (2.48) and (2.57):

$$m_{CL} = 6.94991\times10^{-66} \ (\mathrm{kg})$$

Solving Eq. (12.15.a) for the intrinsic mass of the CL node, m_{CLo}, we obtain the intrinsic mass of the CL node:

$$m_{CLo} = m_{CL}\sqrt{\frac{C_{IG}}{m_p^2 G}} = 3.691\times10^{-50} \qquad (12.16)$$

Now we may calculate the approximate value of the CL node matter density. In $.211.3, Chapter 2 of BSM the CL internode distance was found to be $d_{nb} = 1.0975 \times 10^{-20}$ (m). Let accept that the aspect ratio (length to diameter) of this prism is obtained initially by the first crush of the higher order QB into QPs in a way that the QPs become axially aligned and it is preserved in the further process of moulding. Then we may obtain the approximate aspect ratio of the prism using the relative dimensions of the QP shown in Fig. 12.2. One prism will contains 12 QPs, so the obtain aspect ratio is

$$(diameter)/(length) \approx 1/5.4$$

If assuming a gap of 1/3 of the internode distance we obtain:

prism diameter: 1.04×10^{-21} (m)
prism length: 5.616×10^{-21} (m)
prism volume: 4.45×10^{-63} (m^3)

Keeping in mind that the CL node contains four prisms, we get the CL node matter density.

$$\rho_{node} = 2.07 \times 10^{12} \text{ (kg/m}^3\text{)}$$

Having in mind that the two prisms are formed of two intrinsic matter substances with different densities, the obtained value for the prisms density must be considered is an equivalent one.

12.A.6.4. Summary about the gravitation

(A) The Intrinsic Gravitation can be regarded as a result of energy interaction process between intrinsic matter objects in empty space
(B) The QPs are characterized with IGSPM vectors. All upper order QPs from one prisms have synchronized common mode of their quasispheres
(C) IG forces of the prisms exhibit anisotropy due to the strong alignment of the higher order quasipentagons
(D) The propagation of IG forces between prisms in empty space is carried out by the IGSPM vector
(E) IG forces between prisms of the same type (substance) are quite stronger than IG forces between prisms of different types, but in some particular cases they may decrease significantly
(F) The handedness of the IG field of the prism is memorized in its lower level structures. Some of the lowest level memory about the handedness (cirality) is able to survive the prism's recycling process (taking place in the galactic cycle).
(G) The newtonian gravitation is a manifestation of the intrinsic gravitation in CL space environments. The velocity of its propagation is limited by the CL node resonance frequency, which also defines the light velocity.

The feature (E) may explain the refurbishment of the lattices in some particular cases.

12.A.8. Processes of primordial bulk matter of two substances leading to eruption

12.A.8.1. Considerations for the low order structure growing

Let considering a quantity of bulk matter (of primary balls) of a single substance only, possessing the lowest possible energy. In such conditions even a primary tetrahedrons could not be stable, because it posses increased total energy due to the common mode oscillations providing IGSRM vector. If a second bulk matter of same substance approaches and collide with the first one, the resultant object will obtain energy larger that the sum of both individual energies. Then the energy to mass ratio of the new object of bulk matter may increase to a level when conditions for creation of PTs and even primary QPs and QBs. The primary QB already have a possibility for 1 bit memory and due to a common mode interactions an one common state will dominate (right or left-hand twisting of the primary QBs).

Now let considering a system of common bulk matter containing equal amounts of the two intrinsic matter substances. The formations from these substances are not mixable due to different geometrical dimensions and the difference in their oscillation properties defining the attraction or repulsion. It is known from the classical physics that a system composed of mixture tends to occupy the lowest energy state. Following this principle, both substances should possess, for example, formations of primary QBs with opposite handedness. It is reasonable to accept that the common total energy of such object is properly distributed between both substances. Such formations could be stable if their total energy (based on the mean energy density) does not exceed the energy well of any one of both substances. It is reasonable to accept that a growing process (within one congregational order and more than one order) may take place if the total energy of the existing formations exceeds the energy well of the system. Then part of the substance energy could go into the structural formations.

Conclusion:

Lower level structure growing process is possible only when the total energy of both intrinsic matter objects exceeds the energy well of the system.

12.A.8.2. Formation of homogeneous layer of quasiballs

Let suppose that the bulk matter has a shape of sphere and contains primary QB's (formed of 60 primary THs) which are not destructible in the process of the prism's recycling. The growing process of the low level structure should be possible due to the feature (a) in §12.A.5.1 and it will start from the surface. In the growing process, the features (a) and (b) will lead to slow change of the IGRM frequency of the growing layer of THs at the surface of the bulk matter in comparison to the IGRM of the primary THs frequency in the bulk matter. This will cause structures of same type and order to be attracted together and to be segregated from the bulk matter forming in such way a spherical shell at the surface of the bulk matter. It is more reasonable to expect predomination of quasiballs than tetrahedrons and pentagons, because:

- QB is a complete structure
- tetrahedrons and QP are substructures contributing to building of QB
- the interaction energy between QB's is smaller than between other two types of structure

The growing process will lead to formation of homogeneous layer of same order QBs. The layer will be position at the surface of the bulk matter and will have a finite thickness. One important feature of the quasiball, discussed in the previous sections is its ability to memorize the handedness. Consequently:

(a) The homogeneous layers of QBs will accept the handedness memorized in the lower level QBs that may exist permanently in the bulk matter.

12.A.8.3. Layers segregation for mixture of two substances

Now let considering a bulk matter containing two substances of intrinsic matter, that are not mixable. The non mixability means, that they could not form structures containing mixed lower order embedded structures from both substances. Having in mind that the ratio of the primary ball radius is 2/3, it is apparent why the substances are not mixable even for the lowest level structure as the primary tetrahedral.

Structures formed from anyone of the both substances could be initially spatially mixed but due to their different intrinsic gravitational constants (G_{OS} and G_{OD}), the structures of same substance will tend to increase their spatial homogeneity. This will lead them to be separated in layers. This will allow the bulk matter containing, for example, lowest order QBs to have a perfect spherical shape.

The different values of G_{os} and G_{od} (see §12.A.6.1 and Fig. 10.13) for the two matter substances occupying a common spherical volume will not disturb the growing process. However they will contribute to one additional feature, described below.

Let accepting that one of the two substances has low order structures with higher mean energy density. Then according to the analysis in §12.A.4.3.3 this structure will be preferentially involved in a growing process taking place at the surface. When the homogeneously growing surface layer reaches some critical thickness, it will obtain slightly different IGRM and IGSPM frequencies. As a result of this the attraction forces between this layer and the bulk matter will be decreased. Underneath the surface layer suitable conditions will be created for growing of second homogeneous layer but from the other substance of matter. In a similar way a third layer from the first substance could grow underneath the second layer. Finally a number of alternative homogeneous layers could grow constructively. This is a guessed scenario, but it might be simulated by mathematical models (not developed yet). A simultaneous growing of such formation of alternative layers to higher congregational orders may also be possible. The layers in some moment of the growing process may have a structure as this illustrated in Fig. 12.13, where the following notations are used for the layers:

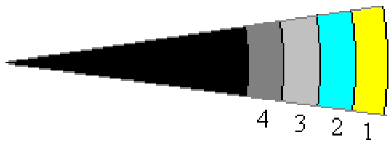

Fig. 12.13. Layer structure; 1 - external layer of *m*-th order QBs of I-st substance, 2 - layer of *m*-th order QBs of II-nd substance, 3 - layer of (*m-1*) order QBs of I-st substance, 4 - layer of (*m-1*) order of QBs of II-nd substance

The shown formation of layer is characterized by the following features:

- All layers are homogeneous i.e. they contain formations of the same type and congregational order.

- The quasiballs from any layer of particular substance accept the handedness memorised in the lower order QBs of the same substance.

- The alternative layer configuration allows to decrease the attraction between the most external layer and the bulk matter (screening the IG interactions due to the righthanded and lefthanded radial arrangement). In the same time it creates better conditions for improvement the homogeneity of the most external layers.

- Every layer carries embedded portion of energy borrowed from the bulk matter in a form of internal vibrational energy (due to the common modes oscillations).

12.A.8.4 Eruption mechanism

The IG attraction between the most external layer and the bulk matter becomes smaller as a result of:

(a) number of alternative layers

(b) decreased interference of the IGRM and IGSPM vectors from the neighbouring layers, which are of different substance and handedness

(c) steplike frequency deviation between the IGSPM vectors of the uppermost layer and the same substance layers underneath.

If some internal layer is of different order (but same type of structures) its IGSPM frequency might be a harmonics of the external layer IGSPM frequency.

Let suppose, that the internal layer 3 is grown to m-th order QBs like the external layer 1. Then their IGSPM frequencies will be slightly different due to their different positions in respect to the bulk matter and all internal layers. Then the interactions between their IGSPM vectors could be regarded as interactions between two oscillators with very close frequencies. The energy exchange between such systems is characterised by a frequency beating. This may lead to the following possible process:

Eruption scenario:

Every layer possesses own internal vibrational energy, that still could be a source for IG interactions. The quantum features of IGSPM may cause a phase locking effect (described below) between IGRM vectors of the uppermost layer and the same substance layers underneath at phase difference of π for number of IGSPM cycles. So for a finite time duration of few IGSPM cycles the IG interactions may cause an opposite effect - a repulsion instead of attraction. Having in mind the inverse cubic law a small time duration might be enough for the inverted IG forces to break and throw the upper layer.

Phase locking effect:

The conditions for a phase locking at phase difference of π are the following:

- The underneath layer (3) is of same order as layer (1), so their IGSPM frequencies are very close

- The quantum features of the IGSPM vectors provide a “catch and hold” effect on the phase. This removes the possibility for fast phase flipping and increases the stability of the phase locking for a finite time.

The effect of frequency beating and IG reversal is illustrated by Fig 12.14. a, b. where a. - is a time diagram showing the frequency beating, b. - is a time diagram showing the duration of the phase locking, t_{inv}, at phase difference of π. The catch and hold effect and the phase locking, both provide the necessary conditions for inverting of IG forces. The phenomena has something similar to the diamagnetism, according to the feromagnetic hypothesis (presented in Chapter 8).

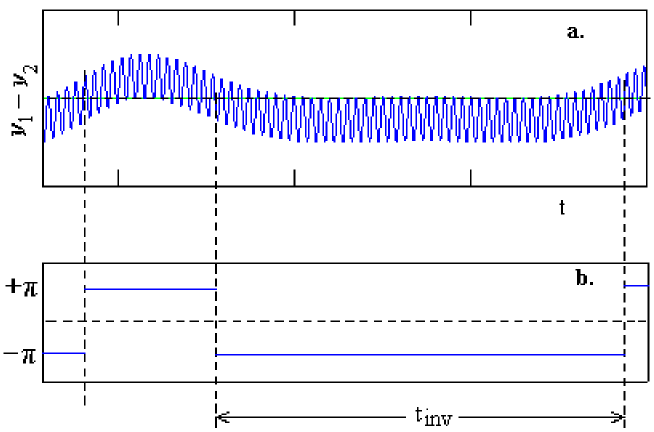

Fig. 12.14

Note: In the classical case of two simple oscillators, a nonlinear media is necessary for a beating effect to occur. In the described above case the nonlinear conditions are created from the quantum interactions of IGSPM vectors. More explicitly it is due to the quasispherical shape of their spatially distributed momentum.

After the first layer eruption the leftover uppermost layer is from the other substance. Assuming that the both substances keep their separate portion of energy, a similar eruption is expected to happens for this layer as well.

As a result of the phase locking effect, the other internal layers lose portion a of their internal energy and further eruptions may not be possible.

12.A.9. Prisms formation

12.A.9.1. Concentric clouds

Only the uppermost shells of the two substances are erupted. The shells underneath lose energy during the eruption process and are not possible to erupt.

Let assuming that the erupted shell could not obtain escaping velocity but is diffusively spread in a spherical cloud. It may obtain a common rotating velocity, because the IGSPM vectors of the homogeneous quasispheres now is completely undisturbed from any other formations. The second erupted shell possesses a smaller energy, so it will reach smaller height. The erupted material will be initially concentrated in two concentric clouds around the spherical bulk matter. The latter still contain the larger portion of the intrinsic matter of the galaxy. It will be apparent from the following analysis that every well formed galaxy able to have multiple life cycle must contain such enormous mass of intrinsic matter in its centre.

12.A.9.2. Column formation and prism molding

The QB's of the layer obtained by the eruption tend to gather together, because their individual IGSPM vectors tend to synchronize. As a result they may obtain a common component which have strong tangential alignment. The inverse cubic law of IG will lead to significant common attraction. From the moment when the QBs gather in a concentric shell the IG forces will be increased tremendously due to the strong commonly synchronised IGSPM and they will crash into QPs. The twelve QPs embedded in every single QB structure, however, are still kept together, due to the own lower order IGSPM vector in the QBs, which has been in common synchronization before the destruction. Due to their shape, the twelve PQs become arranged in column. The common IG pressure, however, might be large enough to cause an additional destruction of the aligned QPs into lower order QBs and QPs. The destruction may happen for a few orders, but the obtained new cylindrical formations obtained from the erupted QBs will be arranged in columns. Finally the destruction process will lead to some lower order of QPs for all structure of the same shell substance. All QPs will appear aligned in columns as shown in Fig. 12.3.

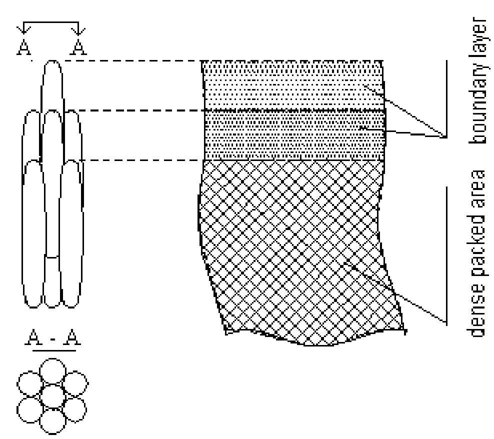

Fig. 12.14.A. Common positions of columns, forming overlapping layers before the formation of the prisms.

The increased common strength of IG forces will cause initially formation of cylindrical rods (with simultaneous destruction process of lower order formations) and then will mould them to a shape close to a hexagonal prism. The common positions of the columns obtained after the process of upper orders QB destruction is illustrated in Fig. 12.14.A.

At the end of the prisms formation phase, their internal structure will be comprised of aligned pentagons of one and a same congregational order. In all next phases of upper level matter organization this internal structure will be preserved, because such strong molding forces are not available any more.

12.A.9.3. Quantity of the intrinsic matter in a single prism.

The quantity of the intrinsic matter in a single prism is equal to the matter quantity contained in the highest order quasiball that was involved in the eruption process.

During the process of prism molding the highest order QB's may crash a few orders ending to some lower order QP. **Then it follows that every single prism is moulded from a single high order QB, which is internally crashed by more than one congregational orders.**

It is apparent that the number of crashing orders could not affect the matter quantity of the obtained prisms, but only the degree of their finishing. If the primary tetrahedron, for example, contains $N_{tot} = 455$ (corresponding to $N_{edge} = 13$) the grade of finishing for one to three level of destruction are shown in Table 12.2.

Example of prism's finishing grade **Table 12.2**

Destructed number of QB orders	Number of PQs in a single prism	Finishing grade
1	12	very low
2	$12(60N_{PB}) = 327,600$	good
3	$12^2(60N_{PB})^2 = 1.07\times10^{11}$	extremely high

The destruction order of 2 provides quite good finishing grade. The first option is not acceptable because of very low grade. The third option will require about 5 orders larger molding forces in comparison to the second option. Consequently, the second option is the most probable (for this example). The same option looks more probable even for higher value of N_{PB} as well as for lower values down to 56 (corresponding to $N_{edge} = 6$, that is a pretty low possible value for the primary TH).

12.A.9.4. A mechanism of same destruction order

The number of crushed orders depends of the common IG forces, which are defined by the IG energy. The latter is involved in the total energy balance normalized to the matter in the structure. We see, that the matter quantity between any two orders of destruction is $60N_{PB}$. This is kind of matter quantity quantization. It allows to remove the effect of possible differences in the molding IG forces. This mechanism is preserved even for eruptions in different galaxies possessing different galactic mass (i. e. different total quantity of erupted matter) and consequently different value of the molding IG forces participating in the prisms formation.

If $N_{tot} = 455$, for example, a variation of the total IG molding forces in range of 27300 will lead to a same order QB's destruction. Therefore, this a kind of Dozation mechanism assuring one and a same matter quantity in every prism. We may call it a **mechanism of the same destruction order**. The importance of this mechanism is not only in the molding quality, but the value of the IGSPM frequency of the upper order QPs. This is the frequency assigned to the level "1" of the matter organization and it determines the node resonance frequency and the SPM frequency of the CL nodes. So the light velocity and the quantum features of CL space are directly dependable on this mechanism.

The same destruction order mechanism assures the prisms from different recycles to posses the same number of QPs from a same type. This is a very important feature allowing the interconnections between the CL spaces of the neighbouring galaxies, which in fact are from different formations. The same order destruction mechanism, however, could not control completely all the geometrical parameters of the prism. While the variation of the IG forces (for different eruptions) are not able to affect the lower order crush, they may provide difference in the molding of the prisms, from different formations. In fact it is a difference of their length to diameter ratio. This is one of the basic reason for the appearance of the cosmological red shift which we observe and for the effect of a matter segregation between the different galaxies (or formations) which will be discussed later in this chapter.

12.A.10. Summary about important structural features and processes at the lower level of matter organization

(A) The fine structure constant is embedded in the lowest level structure - the primary tetrahedron

(B) The acceptance of existence only of matter (and not antimatter) in the observed Universe means that the handedness is memorized in some lower order quasiball type of structure, that is not destroyable in the process of the galactic recycling

(C) The initially deposited energy in the bulk matter defines the eruptions of quasiballs to be at predefined order. This assures one and a same matter quantity in a single prism for prisms from different formations

(D) The same destruction order mechanism assures:

- prisms from different recycles (formations) to be formed of one and a same type of quasipentagons

- definition of the upper level frequencies of the matter organization (NRM and SPM frequencies of the CL node)

(E) The variation of the molding IG forces in different galactic cycles causes variation of the length to diameter ratio for prisms from different galactic recycles (relevant to different galaxies and different galactic lives of one and same galaxy).

(F) The different length to diameter ratio of the prisms from different galactic formations causes a upper level matter segregation between the atomic matter from different galaxies and their CL spaces. One of the effects of this differences is the cosmological redshift.

(G) The upper level matter segregation (valid only for different length to diameter ratio of the prisms) means:

(a) the CL spaces of the different galaxies (and different eruptions) are not mixable

(b) existence of separation surface with infinite thickness between neighbouring galaxies (or matter of different eruptions)

(c) Every observable galaxy possesses own CL space parameters optimized to its total energy.

12.A.11. Protogalactic egg and phases of its internal evolution.

12.A.11.1. Preincubation period

The process of the prisms molding could be quite fast because the time base for the processes between the low level structures is very small in comparison to the processes in CL space.

In the end of the phase of the prisms formation the expected mass distribution is following:

- a huge amount of intrinsic matter in the centre of the galaxy with a spherical shape

- two concentric shells with finite thickness

The two shells contains all of the prisms from which the elementary particle and CL space of the new galaxy will be made.

The two shells of moulded prisms forms the protogalactic egg. The intrinsic matter in the centre of the protogalactic egg becomes later a galactic nucleus.

The galactic nucleus is energetically isolated and its total energy level after the eruption is lower. So it could not provide further eruptions until the next galactic recycling process.

The protogalactic egg, however, undergoes an evolution process. In the end of the prisms molding, the total envelope volume of the material formation is decreased in comparison to the volume it had initially when containing upper order QBs. Although, it contains the same amount of energy. The moulded prisms in the shell are arranged in a partially overlapped layers (along the prisms axis) as shown in Fig. 10.14. As a result of this arrangement, the IG forces are not mutually neutralized and in some final moment of the molding phase the uppermost layer of the internal shell cracks and get momentum toward the external shell. From this moment prism to prism interactions described in Chapter 2 of BSM takes place. The erupted prisms form bundles which propagate and hit the internal surfaces of the external egg-shell. This trigger a similar process from that egg-shell toward the opposite one. Prisms of one type are moving in one radial direction and from the other type in the opposite radial direction. The pair bundles moving in opposite directions may interact between themselves making the dynamics more stable. They are simultaneously rotating and interacting, so these features keep the process self sustainable. In such process the prisms are released from the compressed shells a layer by layer. The effect is like an "onion peeling", so this name is adopted for a shorter reference to the described process.

The process of "onion peeling", however, should not involve a full destruction of the egg, otherwise, the next phase of particle crystalization is not possible. The strength of the peeling effect will be continuously decreasing due to the increased amount of the released prisms in the volume between the two egg-shells. It is reasonable to expect that in the most cases the peeling effect stops completely before the galaxy egg is punched. At this moment most of the prisms are liberated from the shell package, but the galaxy egg still has two solid shell envelopes (external and internal) with finite thickness left from the two concentric egg-shells. The spherical bulk matter is enclosed in the centre of the protogalactic egg.

12.A.11.2. Phase of rectangular lattice

After the peeling effect is terminated, the interior volume of the protogalactic egg encloses an enormous number of both types of prisms. Due to the high prism's density only rectangular lattice is possible. The difference between IG constants G_{OS} and G_{OD}, from one side and the IG anisotropy from the other, allows formation of two types of nodes, each one including 6 prisms of the same substance. The nodes are interconnected in such way, so they form two separate rectangular lattices. The both types lattices are formed one into other, so they occupy one and a same space volume. The neighbouring nodes from longer prisms are interconnected each other. The nodes of the shorter prisms are between them but they are not interconnected. If the occupied space from both lattices is smaller than the total available space, the new formed lattice formation will be closer to one of the egg-shell. From pure geometrical considerations the lattice of longer prisms could touch the own egg-shell without lattice distortion. This is not valid for the lattice of shorter prisms (that is inside of longer prisms lattice). Let assume that:

The external egg-shell is made of longer prisms

This assumption will be confirmed later by interpretation of some observational data. In Chapter 2 and 3 of BSM it has been shown, that the longer prism is related with the negative charge. For convenience, we may refer the shell type to the electrical charge

- the external egg-shell - negative charge
- the internal egg-shell - positive charge

In the described so far phases the CL space is still missing and the charge appearance is not like the charge we are acquainted with. But prisms to prisms interactions due to a different handedness are still valid (see Chapter 2 of BSM).

The protogalactic egg and the intrinsic matter segregation in the end of this phase is illustrated by Fig. 12.15.

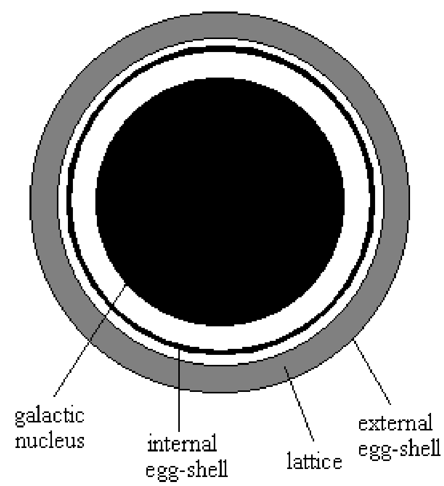

Fig. 12.15. Protogalactic egg

The galactic nucleus shown in Fig. 12.15 contains formations of low congregational order and only its surface may contain some QBs or QPs. The two types of the rectangular lattices are with a radial symmetry. While the length of prisms are infinitely smaller than the size of the protogalactic egg radius, the formed lattices could be practically considered as perfect cubic type lattices.