On the Derivation of Heim's Mass Formula

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1. Gravitation in the microscopic realm

1. Since Einstein's discovery that the gravitational field (in the context of general relativity theory, GR) can be explained by the geometry of space-time, physicists have attempted to interpret the remaining fields and particles as geometrical structures. Theories that seem most popular of late, in this geometrical setting are strings as causes of physical effects to be examined (see chapter C).

The structure of GR resulted from a deep insight into the logic of the physical laws. On the other hand a general understanding of this logic is missing in string theory. Strings, which determine the physical characteristics of elementary particles, are formulated in ranges where no physics is defined. Because the square of the Planck length is a natural constant (*TREDER* 1974), by the uncertainty relation there cannot be physical objects with smaller expansions. Thus the concept of unphysical points is only insignificantly shifted to that of unphysical strings, if these are comparable with the Planck length.

The attempts of Einstein and his pupils to be able to understand material field quanta by a theory of its geometrical structures seemed at the time to offer no prospects, since accelerators could not reach those elementary particle energies. Today this has turned around, giving too many alternative theoretical beginnings, which forecast many new particles for whose proof enormously high energies must be produced.

The question is justified therefore whether the standardization efforts and investigations of the exchange effects exclude in principle not finding particle masses, because these theories set a second logical step before the first. The first logical step should be finding the internal structures and/or the internal dynamics of matter field quanta and of their masses. Only then we should decide to search for exchange effects and exchange bosons.

Einstein explained how physical fields can be geometricized for the gravitational field as shown in GR. In its field equations the divergence of the Riemann tensor is set equal to the Curvature tensor of the divergence of the phenomenological energy density tensor. This permits global cosmological investigations, if for example the subject of the galaxies is regarded as homogeneously distributed over an area. But in GR, how space-time geometry is linked with the distribution always disturbed even Einstein. He was very conscious that a geometrical representation of the phenomenological energy portion for the gravitational field equation must be developed subsequently, particularly for the elementary sources of gravitation, the particles. The occurrence of the singularity at the beginning of time of the universe goes back only to the fact that Einstein's field equations are still incomplete, i.e. that in his theory space-time exists even if energy subject is present. In a completely geometrical theory only elementary geometrical structures should develop in the course of space-time evolution, which would have the characteristics of energy or matter, and a Big Bang would not need to take place.

2. Starting with Einstein's unified field theory of gravitation and electromagnetism , Burkhard Heim tried at the beginning of the 50's of the last century to modify Einstein's theory in a way that the metric (and likewise of Einstein's non hermitic) tensor of Riemann geometry could be replaced by one polymetric and also replaced Differential geometry by discrete difference geometry. In the micro realm the field equations must go to eigenvalue equations for discrete conditions of space-time geometry.[i]

The logical starting point of a unified description of the subject should be that all particles have common characteristics; the inertia and the equivalence principle of inertia and Gravitation as well as the equivalence principle of mass and energy. To treat gravitation in the microscopic realm, the difference between the mass of the source of field and energy mass of the field must be understood. For the position-dependent mass $m(r)$, Heim derived an expression, as did also *ARNOWITT*, *DESER* and *MISNER* (1962). A relativistic description of moving and rest masses lead Heim to a Field strength tensor of the gravitational field, that has similarities with the electromagnetic Field strength tensor of Maxwell theory. The source of the gravitational field and its excited gravitational field form a unit[ii]. The unified power density tensor is however non hermitic. In GR the fundamental metric tensor of Riemann geometry would likewise be non hermitic. In GR the structure portion that becomes set proportionally to the phenomenological portion, are then non hermitic. To understand field equations as equivalence principles, the non hermitic power density

tensor already uniformly describes field and source. If GR is to be extended into the micro realm and within the range of material sources examined, then the field equations must be brought into a quantized form, which lead to eigenvalue equations. Those must resemble the time-independent Schrödinger equation. These micro realms are not affected by outside fields. The stationary Solutions of the Schrödinger equation then read:

$$H\,\psi_n = E_n\,\psi_n. \qquad (1.1)$$

In equation (1.1) E_n are the eigenvalues of the energy that belong to the eigenfunctions ψ_n [iii]

It has frequently been assumed that the obviously fundamental linear structure of Quantum Theory is only an approximation to something different, and that its approximate character would show clearly in the context of quantum gravitation (*ISHAM* 1998).

An eigenvalue equation, which refers not to the wave ψ, but to the particle and its material character – similar to the GR – must be expressed by curved geometry. In place of the linear operator in the Schrödinger equation this operator becomes nonlinear, as the need also arises in Riemannian geometry.

HEIM (1979/89) proceeds from the following consideration: In Riemann geometry the curvature tensor R^i_{kmp} can be replaced by an operator C_p to be defined later, acting on the Christoffel symbols Γ^i_{km}:

$$R^i_{kmp} = C_p\,\Gamma^i_{km}. \qquad (1.2)$$

The curvature tensor thus is described by the effect of a nonlinear operator on a field Γ^i_{km}. During the transition from the macro realm to the micro realm, these Christoffel symbols go to "particle fields" φ^i_{km}, - which are third rank tensors contrary to the pseudo tensors Γ^i_{km}. It should be understood that no curvilinear coordinate transformations of φ^i_{km} , except affine are possible in the observed final micro realm, in which it is exposed to no outside fields. Because of the correspondence between macro and micro realms the operator C_p within both realms has the same expression:

$$(C_p\Gamma^i_{km} \rightarrow C_p\,\varphi^i_{km}).$$

In the macro realm the contracted curvature tensor ($i = p$) is proportional to energy density. Therefore one has to expect these equations in the micro realm are eigenvalue equations, and λ_p is proportional to energy density (also the dimension energy and/or mass and/or inverse length). Therefore eqn. (1.1) has the form of an equation with tensors on both sides and is rewritten:

$$C_{(p)}\,\varphi^{(p)}_{km} = \lambda_{(p)}\,\varphi^{(p)}_{km}, \text{ with } p, k, m = 1,\ldots, 4. \qquad (1.3)$$

(The parentheses in (1.3) mean that for this index the summation convention is waived).

In this system of tensor operator equations (1.3), three indexes go through independently the four numbers of the space-time dimensions. There are therefore 64 discrete eigenvalue spectra of metric structure stages.

Since this system of eigenvalue equations is nonlinear, $|\varphi_{km}|^2$ cannot be interpreted as a probability amplitude, since the solutions as structure functions of the metric condition of space-time do not superpose additively. The power density that the source of gravitation has defined is therefore a defined situation in the area, which changes continuously and is causally defined.

Due to operator hermiticity and convergence there exists a Hilbert Function space. The functional operator is a conditional operator of the metric space-time continuum, whose effect takes place on a convergent condition function that the one metric continuum of modified Riemann geometry represents. Beside this also all identities and theorems of Riemann geometry apply for circumstances (in particular those of hermitic symmetry).[iv]

In the macro range (1.3) changes into the Einstein field equation:

$$C_p\, \varphi^p{}_{km} \rightarrow R_{km} \text{ and } \lambda_p\, \varphi^p{}_{km} \rightarrow \kappa\,(T_{km} - \tfrac{1}{2}\, g_{km} T) \qquad (1.4)$$

λ_p depends only on k and m, i.e. $\lambda_p = \lambda_p(k, m)$. In the micro realm this gives:

$$C_p\, \varphi^i{}_{km} = \varphi^i{}_{kp,m} - \varphi^i{}_{km,p} + \varphi^i{}_{sm}\, \varphi^s{}_{kp} - \varphi^i{}_{sp}\, \varphi^s{}_{km} \qquad (1.5)$$

(In (1.5) and in the following we use for the partial derivatives wrt m : $(\ )_{,m} = \partial_m = \partial / \partial x_m$).

For m = p, $C_{(m)}\, \varphi^i{}_{k(m)} = 0$ and therefore

$$\lambda_m(k, m) = \lambda_m(m, k) = 0. \qquad (1.6)$$

Here the indices *m*, *k* run from 1 to 4, and there are $2 \cdot 4 \cdot 4 - 4 = 28$ equations. Of the 64 energy density spectra of $T_{km} = \varepsilon^{(p)}{}_{km}$ only 36 remain geometrical energy levels as unified elementary matter field quanta. Because of the demanded invariance of the energy levels, the 36 equations must be elements of a 6 fold real tensor. This tensor can be defined in a 6-dimensional space. Heim therefore designated R_6 as the carrier space of this Hilbert space that represents a space with the signature I (+ + + − − −). The projected solutions of this R_6 structure into the subspace R_4 and/or R_3 represent Elementary structures.

The energy density tensor T_{ik} in the 6-dimension hyperspace R_6 reads for example:

$$T_{ik} = \begin{pmatrix} T_{11} & T_{12} & T_{13} & T_{14} & 0 & 0 \\ T_{21} & T_{22} & T_{23} & T_{24} & 0 & 0 \\ T_{31} & T_{32} & T_{33} & T_{34} & 0 & 0 \\ T_{41} & T_{42} & T_{43} & T_{44} & T_{45} & T_{46} \\ 0 & 0 & 0 & T_{54} & T_{55} & T_{56} \\ 0 & 0 & 0 & T_{64} & T_{65} & T_{66} \end{pmatrix}$$

Differing from Kaluza-Klein's theory the coordinates x_5 and x_6 are not compact, but have physical meaning. They cannot be two additional times, as Penrose in his 6-dimensional (three-dimensional complex) theory has assumed. Also they cannot affect the movements of point particles, because in theories with more than 3 dimensions planet orbit computations would lead to spiral orbits, which are not observed (*COLE* 1980). Therefore these coordinates of Heim will become identified with organizational and informative effects, affecting only structures, not however affecting mass points and their orbits.[v] They are regarded by Heim as genuine world dimensions.

Because of (1.3) and (1.4) $Cp\, \varphi^i{}_{km} + C_m\, \varphi^i{}_{kp} = \lambda_p\, \varphi^i{}_{km} + \lambda_m\, \varphi^i{}_{kp} = 0$, which for $k = p$ leads to

$\lambda_{(p)}(p, m)\, \varphi^i{}_{(p)\,m} + \lambda_m(p, p)\, \varphi^i{}_{(p)\,(p)} = 0$. There $\lambda_{(p)}(p, m) = 0$ (from 1.6) also becomes $\lambda m(p, p) = 0$. Therefore $4 \cdot 4 - 4 = 12$ eigenvalues disappear.

In the tensor identification $T_{km} = \varepsilon^{(p)}{}_{km}$ of R_6 the components T_{k5}, T_{k6} and T_{5m}, T_{6m} with *k*, *m* = 1, 2, 3, remain zero. Structures which depend only on the transcoordinats x_5, x_6 therefore have no influence in the R_3 space.

Elementary structures of the object become after Heim represented by 6-dimensional Eigenvalue equations :

$$C_p \varphi^i{}_{km} = \lambda_p (k, m) \varphi^i{}_{km}, \qquad (1.8)$$

with $i, k, m = 1,\ldots, 6$. Here the eigenvalue $\lambda_p (k, m)$ is proportional to an energy and $\varphi^i{}_{km}$ proportional to a field function. This quantization has the consequence that the eigenvalues $\lambda_p (k, m)$ have a discrete character.

3. In the micro realm the usual differential calculus of geometry no longer applies absolutely. Minimum space-time volumes of the area of integration cannot fall below this limit, which suggests geometrical discontinuities in the sense of geometrical elementary sizes.

Heim's computation of two extremal principles over the gravitational field quantum of a smallest mass gave the product of two lengths resulting in a natural constant. This smallest surface is the square of the Planck length, which was also determined by *TREDER* (1974), and which Heim designated as the Metron τ. Heim was first to draw the conclusion from the discovery of this natural constant that this two dimensional element was necessary for counting and also the Metron calculation makes different cross-sectional areas justified. (Contrary to GR where singularities develop, counting Metrons does not lead to infinities.) Although investigations were already present for differential calculus (*NÖRLUND* 1924, *GELFOND* 1958, *MESCHKOWSKI* 1959), Heim developed his *Metron calculus* independently of these works. The Metron is defined by:

$$\tau = \frac{3}{8}\frac{\gamma\hbar}{c^3} \approx 6{,}15 \cdot 10^{-70} m^2 ,$$

where γ = gravitation constant, h = Planck quantum of action and c = Speed of light. In Heim theory no other natural constants than these three enter.

The infinitesimal tensor eigenvalue relationship of metric structure levels described in the continuous R_6 is transformed by Heim into a discrete R_6 space, where tensor selectors and space curvatures become condensations (of Metrons). In place of space-time curvatures one has to imagine compressions and/or condensations of the smallest surfaces of the intermittent world continuum as a projection on Cartesian reference areas. Correspondences to the Christoffel symbols appear as condensers. Therefore curvatures are in the following identified with condensations.

The Metron appears cosmologically as a very slowly decreasing scalar function of world age. With increasing expansion of the cosmos the Metron continues to divide itself.

It can be determined that at one time in the past a single Metron had been so large that its surface area enclosed the entire cosmos. In place of a Big Bang Heim introduces cosmology as the first division of Metrons and expansion of that area which has continued. A very long time was identified with space-time only by this structure dynamic. As the fluctuations of the compressions and of Metrons and their exchange in the subspaces of R_6 became more numerous, there were formed what we can measure today as energy and matter.

In the context of this essay the ranges of Gravitation theory and cosmology will only be considered that do not need the Metron theory. Four ranges of validity of the components of the fundamental condenser can be related to the three-dimensional volumes to be differentiated:

A. a “ Metron dimension range “, within which the number of Metrons is relatively small,

B. a range of higher Metron numbers,

C. an “ infinitesimal range “, within which the Metron number is so large that structure quantization can be neglected, but quantum levels exist, and

D. a “macroscopic range “, within which the fundamental condenser approaches exponentially a constant fixed value.

The micro-physical processes are empirically only given in the third range of validity (C). **Therefore the use of normal tensor algebra will be used in the sequel without resorting to Metron calculus.** However, where the treatment of the evolution of quantum cosmology is investigated the use of the Metron calculus is essential.

2. The Solutions of the 6-Dimensional Field Equation for the Micro Realm

2.1 The three structure units of the world

1. Before the solutions of the eigenvalue equations (1.8) are undertaken, we will examine whether all or if necessary which of the 6 coordinates must be taken with curvature. The spectrum λ_p could refer for example only to a *k*-dimensional subspace V_k (with $1 \leq k \leq 6$), in which each fundamental tensor deviates from the Euclidean unit tensor. An interpretation of the possible k-dimensional deformable subspaces represents a "***Her***meneutic of world geo***metry*** " (hermetry or Hermetric, not to be confused with hermitic). This depends on physical conditions. If a deviation from Euclidean geometry in V_k is present, then this becomes designated by Heim as Hermetry in those *k* world dimensions. If *k* coordinates are *Hermetric* then the remaining $(6 - k)$ are *anti-Hermetric* or Euclidean coordinates.

R_3 with its three real, interchangeable coordinates appears physically as a semantic architectural subspace of R_6: $(x_1, x_2, x_3) \equiv s_{(3)}$.

The time coordinate differs from the spatial coordinates and forms the unit $(x_4) \equiv s_{(2)}$.

The additional *Transcoordinates* represent something else spatiotemporally and form the semantic unit $(x_5, x_6) \equiv s_{(1)}$.

The coordinates x_4, x_5, and x_6 are imaginary. The solutions of the eigenvalue equations (1.8) must therefore depend in a different way on the groups of coordinates of $s_{(1)}$, $s_{(2)}$, $s_{(3)}$. As physical solutions of the various structure deformations the following coordinate combinations and **Hermetry forms** are:

$$\begin{aligned} a &\equiv s_{(1)} \\ b &\equiv s_{(1)}, s_{(2)} \\ c &\equiv s_{(1)}, s_{(3)} \\ d &\equiv s_{(1)}, s_{(2)}, s_{(3)} \end{aligned} \qquad (2.1)$$

In all physically possible situations the group of coordinates $(x_5, x_6) \equiv s_{(1)}$. The groups of coordinates of R_3 and time x_4 can appear in each case by itself and not together as exclusive structure deformations. In GR only the coordinate Combinations $s_{(3)}$, $s_{(2)}$ – spacetime – are considered. The additional Hermetry forms in Heim theory are the actual cause of the large solution diversity in his theory. It will be shown that interaction effects between these hermetry forms should not be neglected.

First of all it is to be noticed that in place of the Riemann curvature tensor in the GR, following Heim, the space compressor $\rho^i{}_{klm}$ is involved, as this consists of the first derivatives and of products of the connection coefficients and/or fundamental condensers.

The field equations (1.8) are eigenvalue equations with the structure state functions $\varphi^i{}_{kl}$. The contracted curvature tensor (and/or selector) becomes expressed by a state operator $K^k{}_{(p)}$ operating on the state function $\varphi_{kl}{}^i$. The real eigenvalues λ_p of the operators K_p lie in a discrete point spectrum:

$$\rho_{ik} \equiv K^k_{(p)} \varphi^{(p)}_{ik} = \vec{\lambda}_{(p)}(ik) \varphi^{(p)}_{ik}. \qquad (2.2)$$

This equation is an analogue for the eigenvalue problem of infinitesimal operators and can be designated as a metronic eigenvalue problem. Its existence can be deduced from the existence of metronic matrix patterns, which are hermitic and of the quadratic type. K^k is a hermitic state function, which describes the states of the structure.

The eigenvalues λ_{ik} describe real quantum metric structure levels having as their basis metronic hyperstructures, which can be interpreted as structure condensations. Over this hyperstructure an abstract metronic function area exists, in which hermitic state functions operate.

If the different cross-sectional areas (Metrons) within larger space ranges become a continuum and the Partial structure is reduced to only one, then the equations (2.2) change into the field equations (1.4) of GR.

The metric structure levels λ_m correspond to the energetic quantum levels in their R_3-Projections. In the field equations in the micro realm (2.2) – contrary to GR – no physical dimension (e.g. energy momentum density) is introduced. Which physical dimension φ^p_{ik} in (2.2) must be identified, comes from the characteristics the solutions present. Thus one of the hopes of Einstein, to express the phenomenological portion in the gravitational field equations geometrically, is fulfilled. The eigenvalues λ_m are however not to be identified at this point with physical particle attributes.

Using (1.5) for the groups of coordinates equations (2.2 can be written (B. Heim, 1979/89):

$$y_a = \sqrt{x_5^2 + x_6^2}\ ; \quad y_b = \sqrt{x_4^2 + x_5^2 + x_6^2}\ ; \quad y_c = \sqrt{x_1^2 + x_2^2 + x_3^2 + x_5^2 + x_6^2}\ ;$$

$$y_d = \sqrt{\left(\sum_{i=1}^{6} x_i^2 \right)}$$

With the eigenvalue conditions $a_{km} = -\dfrac{\lambda_l(k,k)}{\lambda_k(k,m)}$, with the substitutions:

$$a_m^{(kl)} = \frac{a_{km}}{a_{kl}}\ , \qquad b_{ms}^{(kl)} = \frac{a_{ls}a_{km}}{a_{lk}a_{kl}} - \frac{a_{ms}a_{km}}{a_{mk}a_{kl}}\ , \qquad \varphi_{kl} = b_i^{(kl)}\varphi_{kl}^i \tag{2.3}$$

equation (2.2) becomes:

$$\partial_l \varphi_{km}^i - \partial_m \varphi_{kl}^i + \varphi_{ls}^i \varphi_{km}^s - \varphi_{ms}^i \varphi_{kl}^s = \lambda_m(k,l)\varphi_{kl}^i$$

which can be written using (2.2):

$$\left(a_m^{(kl)}\partial_l - \partial_m\right)\varphi_{kl}^i + b_{ms}^{(kl)}\varphi_{kl}^i\varphi_{kl}^s = \lambda_m(k,l)\varphi_{kl}^i\ . \tag{2.4}$$

One sums over the index *m*, and (2.4) then becomes:

$$a_{kl} = 1/[a(k,l) - 1] - (q-1)\ ,\ a(k,l) = \sum_{m=1}^{q} a_{ms}^{(kl)}\ ,\ b_s^{(kl)} = \sum_{m=1}^{q} b_{ms}^{(kl)}\ ,\ \lambda(kl) = \sum_{m=1}^{q} \lambda_m(k,l)\ ,\ \Phi_{kl} = b_i^{(kl)}\varphi_{kl}^i \tag{2.5}$$

leading to the Bernoulli differential equation:

$$\frac{\partial \Phi_{kl}}{\partial y} + a_{kl}\Phi_{kl}^2 - a_{kl}\lambda(k,l)\Phi_{kl} = 0\,. \qquad (2.6)$$

Let C_{kl} be an integration constant and substitute $\lambda_{kl} = a_{kl}\lambda\,(k, l)$ and $\psi_{kl} = \Phi_{kl}/\lambda\,(k, l)$ resulting in the normalized solution:

$$\boxed{\Psi_{kl} = (E + C_{kl}e^{-\lambda_{kl}y})^{-1}} \qquad (2.7)$$

Equation (2.7) is called by Heim the standardized solution of the monometric field equation. It has a fundamental meaning in his theory.

2.2 The Solution of the Field Equation for the Four Hermetry forms

Translator's note: The symbol $\left\{ {a \atop b\ c} \right\}$ is the older form of writing connection coefficients, also called Christoffel symbols. In newer notation it is equivalent to: Γ^{a}_{bc} . *John Reed*

The eigenvalue spectra λ_{kl} resulting from functions of integers are taken as Quantum numbers of the deformation levels. Only the imaginary part $Im(\lambda_{kl}\ y)$ supplies an eigenvalue spectrum as a discrete point spectrum. The real part remains ineffective regarding the transformation by metric deformations, i.e. only the existence of three imaginary absolute Cartesian coordinates causes metric structure curvature.

The solution for the four individual Hermetry forms supplies two wave equations and two equations, which mean that this Hermetry form cannot move faster than the speed of light. The eigenvalues λ_{kl} must describe c and d quantum levels of ponderable matter field quanta in the case of the complex condensations. The following identifications between Hermetry forms and physical objects can be assigned:

Hermetry form: physical object:

a ≡ s (1):	Gravitation waves	
b ≡ s (1), s (2):	Photons	(2.9)
c ≡ s (1), s (3):	uncharged particles	
d ≡ s (1), s (2), s (3):	charged particles	

An estimation of (a) yields for its mass spectrum:

a) The analysis of the effects of the Hermetry form (a) shows that the imaginary Cartesian coordinates x_5 and x_6 are active in R_3. The solution of the field equation leads to $\varphi\,(\xi) = \varphi\,(x_5, x_6) = \left\{ {5 \atop 5\ 6} \right\} + \left\{ {6 \atop 5\ 6} \right\}$ in the equation:

$$d\varphi/d\xi + \varphi^2 = \lambda\varphi, \quad \text{mit} \quad \lambda = a\ \lambda_6(5,5) + b\ \lambda_5(6,6) \qquad (2.10)$$

where $a = \left\{ {i \atop 5\,5} \right\} / \left\{ {i \atop 5\,6} \right\}$, $b = \left\{ {i \atop 6\,6} \right\} / \left\{ {i \atop 5\,6} \right\}$ where $\xi = (i/2)\,\rho$, with $-\rho^2 = x5^2 + x_6^2$.

Therefore $\varphi(\xi)$ depends only on the imaginary coordinates (but not on the time). A physical interpretation is possible only if the Hermetry form (a) has an effect on R_4, thus if ξ in any form depends on the R_4 -coordinates. That is the case if (a) fulfills the condition of a geodesic null:

$$ds^2 = \sum_{k=1}^{6} dx_k^2 = dr^2 + d\xi^2 = 0\,. \qquad (2.11)$$

Then $d\xi = idr$, and progressive gravitational field disturbances propagate in the area with the speed ω.[vi]

Also the structures (b), (c) and (d) are affected by coordinates x_5 and x_6. Therefore it may be assumed that the inclusion of the hermetry form (a) into the elementary Matter field quanta has the effect of gravitational field interactions.

b) In Hermetry form (b) all imaginary coordinates x_4, x_5, x_6 are Hermetric. The solutions of the field equations lead to a transverse wave equation for matter field photons in space:

$$\nabla^2 \varphi - 1/c^2\, d^2\varphi/dt^2 = 0. \qquad (2.12)$$

In the solution (2.7) for (2.2)

$$\psi_{kl} = [1 - \exp(-\lambda_{kl}\, y)]^{-1} \qquad (2.13)$$

where $y^2 = -(\rho^2 - r^2) = -(c^2 t^2 + \varepsilon^2 + \eta^2 - \sum_{k=1}^{3} x_k^2)$. The function $|\psi_{kl}|$ periodically reaches a minimum, when $\mathrm{Exp}[-i\, y\, \lambda_{kl}] = \cos(\lambda_{kl}\, y) - i \sin(\lambda_{kl})$, assuming the real part has value -1 and the Imaginary part vanishes,[vii] giving:

$$\bar{\lambda}_{kl}\, y = \pi\,(2n - 1)\,, \qquad (2.14)$$

where n is the quantum number. These are described through $\varphi^i{}_{kl}$ as metric deformation states of the hermetric curvature field, as curvature conditions that can arise in the metric subspace R_4 of the R_6 (with $q \le 6$).

From (2.14) :

$$(\bar{\lambda}_{kl}\, y)^2 = (\bar{\lambda}_{kl})^2(\rho^2 - r^2) = (\bar{\lambda}_{kl})^2(\vec{\rho} + i\vec{r})^2 = \pi^2[\mathbf{e}_\rho(2n_\rho + 1) + i\,\mathbf{e}_r(2n_r + 1)]^2. \qquad (2.15)$$

When split up into real and imaginary parts, (2.15) becomes:

$$i\,\bar{\lambda}_{kl}\, r = i\,\pi\,(2n_r + 1), \qquad (2.16)$$

$$\bar{\lambda}_{kl}\,\rho = \pi\,(2n_\rho + 1). \qquad (2.17)$$

Heim forms from these equations the peak-to-trough ratio (2.18):

$$\boxed{r = \frac{(2n_r + 1)}{(2n_\rho + 1)}\rho \ .} \qquad (2.18)$$

c) With the Hermetry form c, $c^2 t^2 = 0$, thus $\rho^2 = \varepsilon^2 + \eta^2$. And (2.18) becomes, if one sets $r = \varepsilon$ on the singular surface:

$$\eta / r = \pm \frac{2}{2n_r + 1 - j} \sqrt{(n_\rho + n_r + 1)(n_\rho - n_r)} \ . \qquad (2.19)$$

Since n_r must be $< n_\rho$, this can be set to $n_r = n_\rho - j$ or with $n_\rho = n$, $n_r = n - j$, giving (2.20):

$$\eta / r = \pm \frac{2}{2n + 1 - 2j} \sqrt{j(2n + 1 - j)} = \pm 2f \qquad (2.20)$$

for $j = 1$, considering the demand for reality, if η/r is to supply a mass spectrum, $\eta/r > 0$:

$$f = \frac{\sqrt{2n}}{(2n-1)} . \qquad (2.21)$$

The investigation of the characteristic lengths η and r leads to the identification of η as the Compton wavelength λ_C: $\eta \equiv r_0 = \lambda_C/2 = \frac{1}{2}\, h/mc$, and r as the gravitation wavelength for a minimum matter field quantum:

$$r = \Lambda = h^2/\gamma m^3. \qquad (2.22)$$

From this a mass spectrum for neutral particles can be formulated:

$\eta/r = r_0/\Lambda = \frac{1}{2}\, m^2 \gamma/hc = 2\, f(n)$, or:

$$\boxed{m(n) = \frac{2\sqrt[4]{2n}}{\sqrt{2n-1}} \sqrt{\frac{ch}{\gamma}}} \qquad (2.23)$$

In the case of space condensations the projections of the x_6 and x_5 -coordinates into the space of the quantum object's matter wavelength ($\eta = \lambda_C/2$) describes these components as the gravitational wavelength Λ giving the range of the attractive gravitational field.

d) Because of the ambiguous square root sign, if (2.23) becomes the 4th Power of the masses, then the relationship changes from an uncharged to electrically charged characteristics. Potential $(m_c/m_d)^4$ equals the sum of w^2 and 1, if w^2 is expressed as the portion of the field mass of the charge field: $(m_c/m_d)^4 = U = 1 + w^2$ or:

$$w^2 = (m_c^4 - m_d^4)/m_d^4. \qquad (2.24)$$

This value will be determined in chapter 2.3.

In the mass formula (2.23) the quantum numbers n occur. They are determined by the mass that is defined by a characteristic distance. Therefore the relationship $n = n$ (R) must be investigated. After Heim each matter field quantum defines m_0 by its Compton wavelength with a maximum radius R_+ for the range

of its gravitational field and the appropriate Schwarzschild radius for the minimum range R_-. The product of the two characteristic lengths is a constant, Λ, and is calculated according to (2.22):

$$\Lambda^2 = R_+ R_- = h^2/\gamma m_0^3. \qquad (2.25)$$

The limit of the attractive gravitational field is defined by:

$$R_+ = \Lambda^2 / R_- = 2\Lambda^2 \lambda / e\tau. \qquad (2.26)$$

When the volume becomes $2\Lambda^2\lambda$ with a lattice selector (an operator C, which affects the number of Metrons τ), projecting into the meridian surface of the matter field quantum m_0, then the source of field is expressed by the Metron number n along the distance R_+: $2\Lambda^2\lambda = C; n$. If ε is a projective factor, then:

$$C;n = \varepsilon \tau n.$$

Let F be the unit area, which is limited after a projection of all spatial Potential surfaces of the field structure into the level R2 by a contour: $F \equiv \pi s_0^2$, and $\varepsilon^2 \sqrt{F} = s_0 = 1$ [m]. Then (2.26) becomes:

$$e \sqrt{\tau}\ R_+ = \varepsilon F n. \qquad (2.27)$$

For the smallest possible mass m_0, n reaches a maximum n_N, and (2.27) (with $\varepsilon = \sqrt{s_0}\ \sqrt[4]{F} = \pi^{(-1/4)}$) becomes:

$$e\sqrt{\tau}\ R_+ = \pi^{-3/4} n_N s_0^2 \qquad (2.28)$$

and with (2.26) and the substitution $\mu = \sqrt{ch/\gamma}$ one obtains for n_N an expression as a function of the lower limit of the mass spectrum m_q :

$$n_N = \frac{16}{3}\pi^{-3/4}\frac{h^2\sqrt{\tau}\mu^4}{s_0^2 \gamma m_q^7} \qquad (2.29)$$

2.3 Theoretical Determination of Elementary Charge and the Fine Structure Constant

The derivation of the elementary charge will be treated here in more detail, because this gives an indication that the foundations of the Heim theory are correct, and because it will be demonstrated that the characteristics of the subject can be understood completely with a geometry in which the partial structures of the Hermetry forms interact with each other.

The space-time condensation of the Hermetry form d is defined as an electrically charged matter field with quanta of the form b. The structure of this field can be derived from the field equation (1.8), if going from the micro realm to the macro realm one makes the changes: $\varphi^i_{kl} \rightarrow \{k^i_l\}$. Designating by $\vec{\xi}_4$ the energy density, equation (1.8) becomes:

$$\vec{\xi}_4 = \mathrm{div}_4\ \mathrm{sp}\ C_q \{k^i_l\}_q = \mathrm{div}_4\ \mathrm{sp}\ \vec{\lambda}_q \{k^i_l\}_q. \qquad (2.30a)$$

λ_q is the energy value, $E = \lambda_q$, and $\vec{F}$ is the geometrical regional structure connection coefficient given by $\vec{F} = \left\{ {}^{i}_{k\,l} \right\}_q$ of the charge field with the index q. Then after trace evaluation:

$$\vec{\xi}_4 = \sim \mathrm{d}\,(\mathrm{E}\,\vec{F})/\mathrm{d}\Omega, \qquad (2.30b)$$

with the four-dimensional volume element $\mathrm{d}\Omega = \mathrm{d}x_1\mathrm{d}x_2\mathrm{d}x_3\mathrm{d}x_4$. On the left side of (1.8) the quadratic terms are compensated as consequence of the trace evaluation summation with $i = k$, so that it leads to a linearization of the component representation, which can be equated to a Rotation field:

$$\mathrm{C_q}\ \{{}^{i}_{k}1\}_\mathrm{q} = \partial_\mathrm{m}\{{}^{k}_{k}1\}_\mathrm{q} - \partial_1\ \{{}^{k}_{k}\mathrm{m}\}_\mathrm{q} = \mathrm{rot_q\ sp}\{{}^{i}_{k}1\}_\mathrm{q}. \qquad (2.31)$$

The source and sink fields between the charge fields Q_+ and Q_- forms an R_4 -rotor unit. The four vector $\vec{K}_{(4)}$ is given by the integral over the force density ξ_4 and the volume element $\mathrm{d}\Omega$:

$$\vec{K}_{(4)} = \int \xi_4\ \mathrm{d}\Omega. \qquad (2.32)$$

$\mathbf{K_q}$ is a force vector in R3 and $\mathbf{K_4^{(4)}}$ a timelike component of the four vector $\mathbf{K}_{(4)} = \vec{K}_{(4)} = \mathbf{K_q} + \mathbf{K_4^{(4)}}$, then:

$$\int \mathbf{K}_{(4)}\mathrm{d}\xi_4 = \int \mathbf{K_q}\mathrm{ds} + \int \mathbf{K}_4^{(4)}\ \mathrm{dx}_4 = \int \mathrm{E}\,\vec{F}\ \mathrm{d}\,\vec{s}_{\,(4)}. \qquad (2.33)$$

Because of the rotor representation (2.31) $\mathrm{rot_q\ spur} \left\{ {}^{i}_{k\,l} \right\}_q = \vec{\lambda}_q \times \left\{ {}^{i}_{k\,l} \right\} \lambda_\mathrm{q}$, $\lambda_q \perp \left\{ {}^{i}_{k\,1} \right\}_q$ and thus $\mathbf{K_4^{(4)}} \perp \vec{x}_{(4)}$. Therefore the second integral disappears in (2.33). In the static case this becomes

$$\int \mathbf{K_q}\mathrm{d}\,\vec{s} = 2\,\pi\,\mathrm{V_q} = 2\pi \frac{1}{4\pi\varepsilon_0} \frac{Q_\pm^2}{r_q} = E\vec{F}d\vec{s}_{(4)} \qquad (2.34)$$

giving $\vec{F}\ \mathrm{d}\,\vec{s}_{\,(4)} = \sum_{k=1}^{4} F_k\, dx_k$. For symmetry reasons it can be accepted that for all components $\int \mathrm{F}_x\ \mathrm{d}x = \mathrm{Z}$ the same kernel function Z exists. Thus this gives:

$$\mathrm{E} \int \vec{F}\ \mathrm{d}\,\vec{s}_{\,(4)} = 4\ \mathrm{EZ}. \qquad (2.35)$$

Then for $2\,\pi\,\mathrm{V_q} = 4\ \mathrm{EZ}$ with $\mathrm{E} = \mathrm{ch}/\lambda_\mathrm{q} = \mathrm{c}\hbar\ /\mathrm{r_q}$ and with (2.34) it follows that

$$\mathrm{Q}_\pm^2 = 2\ \mathrm{c}\,\hbar\,\mathrm{Z} \qquad (2.36)$$

and with the vacuum characteristic impedance $\Re_{--} = 1/\mathrm{c}\varepsilon_0$

$$\mathrm{Z} = 1/(8\,\pi)\ \mathrm{Q}_\pm^2\ \Re_{--}. \qquad (2.37)$$

Because Z ($Q_\pm$) ~ $Q_\pm^2$ and w ($Q_\pm$) there exists a function of the charge field w (Z). For the determination of this relationship the dimensionless quantities w and Z with the unit distance $s_0 = 1$ [m] in distance are dimensioned: G = w s_0, H = Z s_0, so that with unit vectors $\vec{H}_0^2 = \vec{G}_0^2 = 1$ orientated to $\vec{H}$ and $\vec{G}$ are possible and also a triangle ABC constructed from the vectors $\overline{AB} = \vec{x}$, $\overline{BC} = \vec{G}$ and $\overline{AC} = \vec{H}$ with $\vec{G} \parallel \vec{y} \perp \vec{x}$. In this triangle, $\varphi = \angle(\vec{x}, \vec{H})$ and $\angle(\vec{G}, \vec{H}) = \pi/2 - \varphi$.

Then $(\vec{G}, \vec{H})^2 = w^2 / Z^2 Sin^2\varphi$ i.e. $w^2 = Z^2 \sin^2\varphi$. Related to this unit radius s_0 is the charge contained in it

$$\varepsilon_\pm = \int_o^{s_0} Q_\pm 4\pi r^2 dr = \frac{4}{3}\pi Q_\pm \qquad (2.38)$$

If H is taken as the radius of a circle, into which a regular Polygon of N sides is inscribed with $N \geq 3$, then the radian measure for the center angle of a sector is $2\pi/N$ and the edge length is 2H sinα, if $\alpha = \pi/N$ is the half center angle. With the hypothesis $\alpha\varphi = 1/Z$,

$$\varphi\, \pi\, Z = N \qquad (2.39)$$

and $$w(Z) = Z \sin(N/\pi Z). \qquad (2.40)$$

Because $U = 1 + w^2 = 1 + Z^2 \sin^2(N/\pi Z)$ reaches a maximum value for $\sin^2(N/\pi Z) = 1$ or $\sin\varphi' = \pm 1$, $\varphi' = \varphi_{max} = N(\pi Z_{min})$. Then from (2.40):

$$N/\pi Z = \pm \text{ arc sin } 1 = \pm \pi/2\,(2p + 1) \qquad (2.41)$$

with integer $p \geq 0$ and $N \geq 2p + 1$. Starting with (2.37) for Z and $\varepsilon_\pm = 4/3\,\pi Q_\pm$ gives

$$\pm 9\, N (2p + 1)^{-1} = \pi^4/\hbar\, \varepsilon_\pm^2\, \Re\_. \qquad (2.42)$$

For the elementary charge field ε_{min} ($N = 2p + 1$) = $\varepsilon_{0\pm}$, this constant is given by

$$\boxed{\varepsilon_{0\pm} = \pm \frac{3}{\pi^2}\sqrt{\frac{\hbar}{\Re\_}}} \qquad (2.43)$$

This theoretical value is about +0.125% greater than the measured electron charge. With the quantization $\varepsilon_\pm = q\, \varepsilon_{0\pm}$, (2.40) and (2.42) give:

$$w^2 = U_{max} + 1 = (Z^2\sin^2\varphi)_{max} = (2\pi\ \varepsilon_\pm\, \Re\_/9\hbar)^2 = 4q^4/\pi^4 \qquad (2.44)$$

and for the representation of the d-hermetry form

$$m_d^4 = m_c^4/U_{max} \qquad (2.45)$$

and with $m_d = m(n, q)$ and $m_c = m(n)$ from (2.21):

$$\boxed{m(n,q) = m(n)\, \eta_q} \qquad (2.46)$$

where

$$\eta_q{}^4 = 1/U_{max} = (1 + 4\, q^4/\pi^4)^{-1}, \tag{2.47}$$

and:

$$\eta_q = \sqrt[4]{\frac{\pi^4}{4q^4 + \pi^4}} \tag{2.48}$$

The upper limit for possible Energy quantum numbers is represented by $n = 1$:

$$m_{max} = \sqrt{\frac{ch}{\gamma}}\sqrt[4]{2}\eta_q\,. \tag{2.49}$$

This mass will be designated the *Maximon*. In the literature $\mu = \sqrt{(ch/\gamma)}$, is frequently *called Planck's mass*, but μ represents only a single factor in the spectra.

The deviation of the theoretical value (2.43) of the measured value for those elementary charges $e_\pm$ could be justified after Heim due to the fact that it gives different components of the charge field, whose exchange effect causes a reduction of $e_\pm$. V_{xy} is given by the exchange effect of two of such charge components e_x and e_y interacting with the potential field f(r) over the distance *r*:

$$V_{xy} = e_x\, e_y\, f(x), \tag{2.50}$$

where for large values of *r* the central field is assumed to approach the relationship

$$f \rightarrow 1/4\pi\varepsilon_0'\, r \tag{2.51}$$

(ε_0' is the dielectric constant and $\varepsilon_{0\pm}$ is the theoretically determined elementary charge). It is a reduced charge field for $q = 1$, so that the relationship of the energies of a charged to an uncharged term with same quantum number *n* is described by:

$$\frac{E(n,1)}{E(n)} = \frac{V_{r,r}}{V_{\varepsilon,\varepsilon}} = \left(\frac{e_r}{\varepsilon_{0\pm}}\right)^2 \tag{2.52}$$

or

$$\frac{m(n,1)}{m(n)} = \eta_{q=1} = \eta \tag{2.53}$$

with

$$\eta = \sqrt[4]{\frac{\pi^4}{(4 + \pi^4)}} \tag{2.54}$$

Then the reduced charge field is:

$$e_r = \varepsilon_{0\pm}\sqrt{\eta}. \tag{2.55}$$

The difference $e_d = \varepsilon_{0\pm} - e_r = \varepsilon_{0\pm}(1 - \sqrt{\eta})$ supplies a further component, given by the arithmetic mean e_w:

$$2e_w = \varepsilon_{0\pm} + e_r = \varepsilon_{0\pm}(1 + \sqrt{\eta}). \qquad (2.56)$$

The empirically accessible elementary charge field $e_\pm$ is characterized by the potential of $V_{e,e} = e_\pm^2 f(r)$. Therefore the arithmetic mean of $V_{r,r}$ and $V_{w,w}$ is given by:

$$e_\pm = \tfrac{1}{2}(e_r^2 + e_w^2) = \tfrac{1}{4}[4\eta + (1 + \sqrt{\eta})^2]\varepsilon_{0\pm} = \tfrac{1}{4}\varepsilon_{0\pm}^2 \vartheta \qquad (2.57)$$

with the substitution:

$$\boxed{\vartheta = 5\eta + 2\sqrt{\eta} + 1)} \qquad (2.58)$$

the value for the measurable elementary charge results in:

$$\boxed{e_\pm = \pm\frac{3}{4\pi^2}\sqrt{\frac{2\vartheta\hbar}{\Re_-}}} \qquad (2.59)$$

This value agrees with the experimentally measured elementary charge. If (2.59) is used in the relationship for the Sommerfeld fine structure constant $\alpha = e^2/2hc\varepsilon_0$', then the following theoretical value results:

$$\boxed{\alpha = \frac{9}{(2\pi)^5}\vartheta\,.} \qquad (2.60)$$

α depends only on the constant π and has the exchange value $1/\alpha = 137{,}038$. This value lies about 0.0015% above the experimental value. A complete calculation results only with the polymetric theory and its consideration of the exchange effects of partial structure. But this approximate value is already an indication of the correct way to a unified field theory. After *DIRAC* (1964) a correct field theory must be able to calculate α as a pure number using standard constants. The nonlinear spinor theory of *HEISENBERG* (1967) led to a value $1/\alpha \approx 120$, with which Heisenberg was very content at that time.

From the relationship for the ratio between the values of the charged to uncharged measurements in (2.46) the elementary matter field quanta can be calculated directly as functions of the natural constants γ, h and c. From (2.21) and (2.29) with (2.46) for very large $n = n_N$ it follows:

$$\eta_q^{-4}\left(\frac{m_q}{\mu}\right)^4 = \frac{2n_N}{(2n_N - 1)^2} \approx \frac{1}{2n_N}, \qquad (2.61)$$

which results in an expression, which depends only on the natural constants h , c and γ for the smallest matter field quantum which can still carry a charge,. With $s_0 = 1$ [meter] this gives:

$$\boxed{m_q\,\eta_q\sqrt[3]{\eta_q} = \frac{4}{cs_0}\sqrt[4]{\pi}\sqrt[3]{3\pi s_0\hbar}\sqrt{\frac{c\hbar}{3\gamma}}\,.} \qquad (2.62)$$

Because $q = 0$ and $\eta_0 = 1$ the lower limit of the c-spectrum is:

$$\boxed{m_1 = \frac{4}{cs_0}\sqrt[4]{\pi}\sqrt[3]{3\pi s_0 \gamma\hbar}\sqrt{\frac{c\hbar}{3\gamma}}.} \qquad (2.63)$$

On the other hand, because of (2.46), $m_q = m_1 = m_{(0)}\eta$ because $\eta < 1$: $m_{(0)} > m_1 > m_0$. For $\eta = \eta_q$ (2.62) becomes:

$$m_1\,\eta\sqrt[3]{\eta} = m_0 \qquad (2.64)$$

and with $m_1 = m_q = m_{(0)}\,\eta$:

$$m_{(0)}\,\eta^2\sqrt[3]{\eta} = m_0 \qquad (2.65)$$

Since the value of m_1 ($m_1 = 0.5137$ MeV) agrees with the empirical value for the mass of the electron to within 0.53%, Heim interprets m_1 as an approximate value for the electron mass. The minimum condensations of the c-spectrum lead to a somewhat smaller value $m_0 \approx 0.5069$ MeV.

The value of $m_{(0)} = 0.5189$ MeV lies somewhat above the experimental electron mass.

The deviations of m_1 from the experimental electron mass m_e can only be made more exact if a solution is found for the separation of the spectra into imaginary and complex condensations in (2.21). Because the terms in the spectrum that represent inertial masses ($m(n, q)$ with the quantum numbers n and q in (2.21) and/or (2.46)) lie so close to each other only a pseudo continuum can be spoken of. This pseudo continuum contains all possible photon field masses, over which a discrete spectrum of ponderable c and d terms are overlain.

With the completion of these preliminary investigations, we have given fundamental characteristics of material structures, like charged and uncharged particles, and photons and gravitons.

Since the geometrical calculations used for the investigation of the internal structure processes in particles are obviously still too approximate, Heim makes a refinement of Riemann geometry by developing a combination of partial structure fundamental tensors in g_{ik} , as the semantically different geometrical world structure and/or groups of coordinates of s(1), s(2), s(3) suggest. Therefore in the next section an investigation of polymetric non-Euclidean geometry is developed and its structure dynamics are examined.

3. Polymetric Geometry

3.1 The Polymetric Field Equations

1. In the fundamentals of GR the metric is related to the underlying Riemann geometry fundamental tensor g_{ik} by the line element:

$$ds^2 = g_{ik}\, dz_i\, dz_k \qquad (3.1)$$

for a coordinate transformation $x_m = x_m(z_k)$ with x_m as Euclidean and z_k as non-Euclidean coordinates we obtain:

$$g_{ik} = \partial x_m/\partial z_i \cdot \partial x_m/\partial z_i.$$

EINSTEIN identifies the metric tensor g_{ik} as similar to a gravitational potential.

The extension of Riemann geometry thereby introduces two different acceptable coordinate systems, for which an interdependence can be found, so that only a single coordinate system can be used: $y_\alpha = y_\alpha(z_k)$ (*DRÖSCHER* and *HEIM* 1996):

$$x_m = x_m(y_\alpha(z_k)) = u_m(z_k). \qquad (3.2)$$

The metric tensor is defined by:

$$g_{ik} = \partial x_m/\partial y_\alpha \cdot \partial y_\alpha/\partial z_i \cdot \partial x_m/\partial y_\beta \cdot \partial y_\beta/\partial z_k = \sum_{\alpha,\beta=1}^{6} g_{ik}^{(\alpha\beta)}\,. \qquad (3.3)$$

The parentheses indicate that the summation convention for these indices is waived, then:

$$\left(\frac{\partial x_m}{\partial y_{(\alpha)}}\frac{\partial y_{(\alpha)}}{\partial z_i}\right)\left(\frac{\partial x_m}{\partial y_{(\beta)}}\frac{\partial y_{(\beta)}}{\partial z_k}\right) = \kappa_{im}^{(\alpha)}\kappa_{mk}^{(\beta)} = g_{ik}^{(\alpha\beta)} \qquad (3.4)$$

with

$$\kappa_{im}^{(\alpha)} = \left(\frac{\partial x_m}{\partial y_{(\alpha)}}\frac{\partial y_{(\alpha)}}{\partial z_i}\right) \quad \text{and} \quad \kappa_{mk}^{(\beta)} = \left(\frac{\partial x_m}{\partial y_{(\beta)}}\frac{\partial y_{(\beta)}}{\partial z_k}\right).$$

The combined *fundamental tensor* g_{ik} now consists of several *partial structures*. Because $\kappa_{im}^{(\alpha)}$ in $x_m(y_\alpha(z)) = \int \kappa^{(\alpha)}{}_{im}\, dz^I$ is the integral's kernel, it is designated as the polymetric fundamental kernel. Physically the coordinates y_1, y_2, y_3 form a structural unit (R_3), which cannot be exchanged with the structure unit y_4 (time t). Likewise y_5, y_6 are different than the R_3 and t structure units.

The coordinates of R_6 are designated by $\alpha, \beta \in (1, 2, \ldots, 6)$. The groups of coordinates (y_1 y_2 y_3) (y_4) (y_5 y_6) are symbolized by $\mu, \nu = 1, 2, 3$ and the coordinates within the groups are designated:

$$\mu_\alpha\ ,\ \nu_\alpha \quad \begin{matrix} = 1_\alpha \equiv\ 5,\ 6, \\ = 2_\alpha \equiv\ 4, \\ = 3_\alpha \equiv\ 1,\ 2,\ 3. \end{matrix}$$

Then (3.3) becomes:

$$g_{ik} = \sum_{\alpha=1}^{6} \kappa_{im}^{(\alpha)} \sum_{\beta=1}^{6} \kappa_{mk}^{(\beta)} = \left(\sum_{\alpha=1}^{3} \kappa_{im}^{(\alpha)} + \kappa_{im}^{(4)} + \sum_{\alpha=5}^{6} \kappa_{im}^{(\alpha)} \right) \left(\sum_{\beta=1}^{3} \kappa_{mk}^{(\beta)} + \kappa_{mk}^{(4)} + \sum_{\beta=5}^{6} \kappa_{mk}^{(\beta)} \right) =$$

$$= \left(\kappa_{im}^{(3)} + \kappa_{im}^{(2)} + \kappa_{im}^{(1)} \right) \left(\kappa_{mk}^{(3)} + \kappa_{mk}^{(2)} + \kappa_{mk}^{(1)} \right) = \sum_{\mu=1}^{3} \kappa_{im}^{(\mu)} \sum_{\nu=1}^{3} \kappa_{mk}^{(\nu)} = \sum_{\mu,\nu}^{3} g_{ik}^{(\mu\nu)} \qquad (3.5)$$

with:

$$g_{ik}^{(\mu\nu)} = \sum_{\mu_\alpha,\nu_\beta}^{3_{\alpha,\beta}} g_{ik}^{(\mu_\alpha \nu_\beta)}$$

and

$$\begin{aligned} \kappa_{ik}^{(1)} &= \kappa_{ik}^{(1)}(x_5, x_6) && \equiv \kappa^{(1)} \\ \kappa_{ik}^{(2)} &= \kappa_{ik}^{(2)}(x_4) && \equiv \kappa^{(2)} \qquad (3.6) \\ \kappa_{ik}^{(3)} &= \kappa_{ik}^{(3)}(x_1, x_2, x_3) && \equiv \kappa^{(3)}. \end{aligned}$$

Four complexes of metric fundamental tensors can be formed, called **correlators**:

$$\hat{g}^{(x)} = \hat{g}^{(x)}(g_{ik}^{(\mu\nu)}, \kappa_{ik}^{(\mu)}) \ , \qquad x = 1,...,4 \ ; \ \ \mu, \nu = 1,2,3 \ ; \ i, k = 1,...,6. \qquad (3.7)$$

These polymetric fundamental tensors are **partial structures** of R_6, representing mutual correlations.

Because of the difference of the semantic structure units of the world, in accordance with (3.6) four different supertensors or *correlators* $\hat{g}_{(x)}$ can be constructed:

$$\hat{g}_{ik} = \hat{g}_{ik}\left(g_{ik}^{(\mu\nu)}, \kappa_{ik}^{(\mu\nu)}\right)_{\mu,\nu}^{3} = \hat{g}_x \quad \text{mit } x = a,b,c,d :$$

$$\hat{g} = f_d(\kappa_{ik}^{(1)}, \kappa_{ik}^{(2)}, \kappa_{ik}^{(3)}) = \begin{pmatrix} g^{(11)} & g^{(12)} & g^{(13)} \\ g^{(21)} & g^{(22)} & g^{(23)} \\ g^{(31)} & g^{(32)} & g^{(33)} \end{pmatrix} = \hat{g}_d \qquad (3.8)$$

For example $g^{(21)} \equiv g_{ik}{}^{(21)} = \kappa_{mi}{}^{(2)}\, \kappa_{mk}{}^{(1)}$. (i) describes symbolically the coordinates of *i* referred to the metric partial structures:

$$\begin{aligned} {}^{(1)} &\equiv s^{(1)} \equiv (x_5, x_6) \equiv a \\ {}^{(2)} &\equiv s^{(2)} \equiv (x_4) = t \qquad (3.9) \\ {}^{(3)} &\equiv s^{(3)} \equiv (x_1, x_2, x_3) = R_3 \ . \end{aligned}$$

The supertensor sieve operator S [n] identifies which structure units $n = s^{(1)}, s^{(2)}, s^{(3)}$ equation (3.8) is able to make Euclidean. Therefore three further supertensors exist, except for $\hat{g}_d$ (with the substitutions $\kappa_{ik}^{(\mu)} \equiv \kappa^{(\mu)}$ and $g_{ik}^{(\mu\nu)} = g^{(\mu\nu)}$):

$$\hat{g}_c = S(2)\hat{g} = f_c(\kappa^{(1)}, \kappa^{(3)}) = \begin{pmatrix} g^{(11)} & \kappa^{(1)} & g^{(13)} \\ \kappa^{(1)} & E & \kappa^{(3)} \\ g^{(31)} & \kappa^{(3)} & g^{(33)} \end{pmatrix} \qquad (3.10)$$

$$\hat{g}_b = S(3)\hat{g} = f_b(\kappa^{(1)}, \kappa^{(2)}) = \begin{pmatrix} g^{(11)} & g^{(12)} & \kappa^{(1)} \\ g^{(21)} & g^{(22)} & \kappa^{(2)} \\ \kappa^{(1)} & \kappa^{(2)} & E \end{pmatrix} \qquad (3.11)$$

$$\hat{g}_a = S(2,3)\hat{g} = f_a(\kappa^{(1)}) = \begin{pmatrix} g^{(11)} & \kappa^{(11)} & \kappa^{(1)} \\ \kappa^{(1)} & E & E \\ \kappa^{(1)} & E & E \end{pmatrix} \qquad (3.12)$$

In place of the Christoffel symbols Γ^i_{km} in GR in the micro realm we use the polymetric field functions φ^i_{km}, which are called **fundamental condensers**, because they consolidate and/or condense a quantity of Metrons projected on the Euclidean reference space. With:

$$g^{is}_{(\kappa\lambda)} = \sum_{j=1}^{3} \kappa^i_j \kappa^s_j \ .$$

this gives:

$$\varphi^i_{km}{}^{(\mu\nu)} = g^{is}{}_{(\kappa\lambda)}\, \varphi_{skm}{}^{(\mu\nu)} =$$

$$= \tfrac{1}{2} \sum_{\kappa,\lambda=1}^{3} g^{is}_{(\kappa\lambda)} \left(\sum_{\mu,\nu=1}^{3} \left(\frac{\partial g^{(\mu\nu)}_{sk}}{\partial^m} + \frac{\partial g^{(\mu\nu)}_{sm}}{\partial^k} - \frac{\partial g^{(\mu\nu)}_{km}}{\partial^s} \right) \right) \equiv \sum_{\kappa\lambda\mu\nu}^{3} \left[{}^{i}_{km} \right]^{(\kappa\lambda)}_{(\mu\nu)} \equiv \left[{}^{\frown}_{\mu\nu} \right]. \qquad (3.13)$$

In the condensed version of this equation, (κλ) is a way of writing the *basis signature* and (μν) of writing the *contra signature*. (− +) describes the *effect* between contra and basis signatures. It means that index *i* is applied with or against the variant of the Partial structure *κ*. The index *s* indicates the summation variable over the partial structure λ.

The condensers cause the projection of a regular Metron grid onto a curved surface lying on a flat reference area, which appears to project Metrons pressed together and/or condensed. They bring about external exchange effects, which are called correspondences.

In the Metron theory parallel transport of vectors (or *selectors*) can likewise be accomplished as in Riemann geometry. However there are more representations because of the richer structure of the correlators. In place of the Christoffel symbols in Riemann geometry, now $3^4 = 81$ fundamental condensers arise.

Contrary to Riemann geometry, in which the product of covariant and contravariant metric tensors results in the Kronecker symbol:

$g_{ik}\, g^{kj} = \delta^{i}\, j$ (where $\delta^{i}{}_{j} = 1$ for i = j and 0 for i ≠ j), (3.14)

in Metron theory this can be accomplished by a repeated change of variance levels in the sense of an interaction and/or a correlation. Therefore the product of the fundamental tensors results in *correlation tensors*, not the Kronecker symbol, and this equals:

$$g^{ij}_{(\mu\nu)}\, g_{(\kappa\lambda)jk} = Q^{i}_{k}\left(\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right). \qquad (3.15)$$

The correlation tensor couples two different elements from $\hat{g}$ in this case.

Besides, parallel transport with $\left[\begin{smallmatrix}\frown\\ \kappa\lambda\\ \mu\nu\end{smallmatrix}\right]$ correlation tensors can also accomplish this, so that in place of the Riemann Christoffel symbols a four-fold sum of all possible translations (with 81 fundamental condensers) is written:

$$\hat{\varphi}^{i}_{kl} \equiv \sum_{\mu,\nu,\lambda,\sigma=1}^{6}\left(\left[\begin{smallmatrix}\frown\\ \kappa\lambda\\ \mu\nu\end{smallmatrix}\right] + Q^{i}_{j}\left(\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right)\left[\begin{smallmatrix}\frown\\ \kappa\lambda\\ \mu\nu\end{smallmatrix}\right]\right) \qquad (3.16)$$

The correlation tensor $Q^{(\kappa\lambda)}_{(\mu\nu)}$ is also considered in the correlator:

$$\mathrm{p}^{ik} = \left\{ g^{ik}_{(\mu\nu)} + Q^{k}_{j}\left(\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right) g^{ji}_{(\mu\nu)} \right\}. \qquad (3.17)$$

If $\hat{g}$ contains only one element (μμ), then no correlation exists, i.e. $Q^{(\mu\mu)}_{(\mu\mu)} = 0$, as in the monometric Riemann geometry of GR.

Coordinates, which are Euclidean, are called *anti- hermetric* and are represented by the symbol $\tilde{k}$. With an anti-hermetric coordinate $\tilde{k}$, the non-hermetric fundamental condensers disappear:

$$\left[\begin{smallmatrix} l\\ \tilde{j}k\end{smallmatrix}\right]^{(\kappa\lambda)}_{(\mu\nu)} \equiv \left[\begin{smallmatrix}\frown\\ \kappa\lambda\\ \mu\nu\end{smallmatrix}\right]_{-} = 0. \qquad (3.18)$$

Hence it follows that in these antihermetric components the $g^{(\mu\nu)}{}_{-il}$ (after (3.5)) represent an angular rotation field:

$$\partial_{\tilde{k}}\, g^{(\mu\nu)}_{il} = \partial_{i}\, g^{(\mu\nu)}_{\tilde{k}l} - \partial_{l}\, g^{(\mu\nu)}_{\tilde{k}i} \equiv \partial_{\tilde{k}}\, g^{(\mu\nu)}_{-il} \qquad (3.19)$$

which gives the space a superposed spin structure. The hermetric part $g^{(\mu\nu)}_{+il}$ determines the condensation stages as a function of the respective *hermetric* or *anti-hermetric* behavior of the coordinates. A partial hermetry, or a partial metric structure condensation effect, has a consequence in the appropriate non-hermetric structure units of a metronic change of the spin field vector. In the hermetric condensation space the V_k components of $g^{(\mu\nu)}_{-il}$ act *as Field activators*, i.e. as "preliminary excitations of a metric field". If metric condensation stages in the sense of superposed correlations are composed in this way, then the spin field vectors of all Partial structures are compensated.

2. The parallel transport coefficient magnitudes, that in Riemann geometry represent the deviations of a metric structure condition from an Euclidean space, go over in Heim theory, in accordance with (3.16), to a complex multiple of the curvature tensor and its contraction. Riemann geometry is thereby formed around polymetric Fundamental tensors by differential calculation, and GR is extended beyond that of the symmetrical metric fundamental tensor in R_4 by the non-hermetric Tensors in R_6.

The space compressor ρ^{i}_{klm} causes structural condensation levels, i.e. levels of compressions of the Metrons in R_6. The set of equations (1.8) now contains $6^4 = 1296$ equations for all possible condensation measures, i.e. curvatures that leave the metron invariant, but form compressions in the projection onto the flat reference world.

Written in component form equation (1.8) reads:

$$\sum K^{(\kappa\lambda)}_{(\mu\nu)} ; \left[(1 + Q^{(\kappa\lambda)}_{(\mu\nu)}) + D^{(\kappa\lambda)}_{(\mu\nu)} \right] ; \left[\begin{smallmatrix} \kappa\lambda \\ -+ \\ \mu\nu \end{smallmatrix} \right] = \sum \overline{\lambda}^{(\kappa\lambda)}_{(\mu\nu)} \left(1 + Q^{(\kappa\lambda)}_{(\mu\nu)} \right) ; \left[\begin{smallmatrix} \kappa\lambda \\ -+ \\ \mu\nu \end{smallmatrix} \right] . \qquad (3.20)$$

In this equation $K^{(\kappa\lambda)}_{(\mu\nu)}$ is the *structure compressor* in R_6 (corresponding to the curvature tensor of GR), $Q^{(\kappa\lambda)}_{(\mu\nu)} \equiv Q^{i(\kappa\lambda)}_{k(\mu\nu)}$ the correlation tensor and $D^{(\kappa\lambda)}_{(\mu\nu)}$ a characteristic correlation tensor, which is a quadratic product of the correlation tensors and fundamental tensors. With the substitutions $\partial_l = \partial / \partial x^l$, $\hat{\varphi}^j_{kl} \hat{=} \varphi^{j(\kappa\lambda)}_{kl(\mu\nu)}$ and φ^j_{kl} from (3.16), (3.20) reads:

$$\partial_l \hat{\varphi}^i_{km} - \partial_m \hat{\varphi}^i_{kl} + \hat{\varphi}^i_{sl} \left[\begin{smallmatrix} s \\ km \end{smallmatrix} \right]^{(\kappa\lambda)}_{(\mu\nu)} - \hat{\varphi}^i_{sm} \left[\begin{smallmatrix} s \\ kl \end{smallmatrix} \right]^{(\kappa\lambda)}_{(\mu\nu)} = \lambda_m(k,l) \hat{\varphi}^i_{kl} . \qquad (3.21)$$

The metric structure levels λ_m correspond to energetic quantum levels in their R_3-Projection. In these eigenvalue equations – contrary to GR – there are no imported physical quantities (e.g. energy density), but only purely geometrical structures. Thus one of the hopes of Einstein was fulfilled. The eigenvalues λ_m are not to be identified however at this point with physical particles.

3.2 Correlations of Partial Structures and Their Extrema

1. The solution of the eigenvalue equations (3.21) takes place as in the monometric case. The 2. term differs now from equation (2.4):

$$[a_m(k,l)\partial_l - \partial_m] \; \hat{\varphi}^i_{kl} + \{ a_{(1)}[k^s{}_m] - a_{(2)}[k^s{}_l] \} \; \hat{\varphi}^i_{kl} = \lambda_m(k,l) \; \hat{\varphi}^i_{kl} \qquad (3.22)$$

with:

$$a_{(1)} = \hat{\varphi}^i_{sl} / \hat{\varphi}^i_{kl} , \qquad a_{(2)} = \hat{\varphi}^i_{sm} / \hat{\varphi}^i_{kl} , \qquad \hat{\varphi}^i_{sm} \equiv \varphi^i_{sm} \left(\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right) ,$$

$$\underline{\lambda_m}(k,l) \equiv \lambda_m(k,l) \left(\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right) .$$

With the substitution: $\underline{b_s}(k,l) = a_{(1)}[k^s m] - a_{(2)}[k^s l]$, the summation takes place over the index ranges

$$1 \leq m \leq q \qquad \text{and} \qquad a_{kl} = [a(k,l) - 1]^{-1} - (1 - q) \tag{3.24}$$

this gives the gradient equation:

$$\text{grad}_q \; \hat{\varphi}^i_{kl} = a_{kl} \; \{\underline{\lambda_m}(k,l) - \underline{b_s}(k,l)[k^i l] \; \hat{\varphi}^i_{kl}, \tag{3.25}$$

using the substitutions

$$\lambda_{kl} = a^i_{kl} \; \underline{\lambda_m}\,(k, l), \quad c_s = a_{kl} \, \underline{b_s}\,(k, l) \tag{3.26}$$

permits the simplification:

$$\boxed{\partial \ln \hat{\varphi}^i_{kl} \; / \; \partial y = \left\{ \; \lambda_{kl} - c_s[k^s_{kl}] \; \right\}.} \tag{3.27}$$

This integral reads:

$$\hat{\varphi}^i_{kl} = A^i_{kl} \exp[\lambda_{kl} \, y - c_s \int [k^s l] \, \partial y] \tag{3.28}$$

with (2.5) and (2.6) the second exponent simplifies to:

$$c_s \int [k^s l] \, \partial y = \alpha_{kl} \, \lambda_{kl} \int [E - e^{-\lambda_{kl} y}]^{-1} \, \partial y = \ln B_{kl} \, (e^{-\lambda_{kl} y} - E)^{\alpha_{kl}} \tag{3.29}$$

Here $\alpha_{kl} = c_s/(b_s \, a_{kl})$ is the difference between the eigenvalues in the polymetric and those in the monometric cases. α_{kl} is called a *correlation exponent*. $\alpha_{kl} = \lambda_{kl}/\lambda$ when one uses the substitutions

$\lambda_{kl} = \lambda_{kl}{}^{(\mu \, \nu)}{}_{(\kappa\lambda)}$ and $\lambda = \lambda\,(k, l)$. Thus with the new integration constant $C^i_{kl} = A^i_{kl}/B_{kl}$ the solution can be written:

$$\boxed{\hat{\varphi}^{\,i}{}_{kl} = C^i_{kl} e^{\lambda_{kl} y} \, (e^{\lambda y} - E)^{-\alpha_{kl}} \;\; = \;\; C^i_{kl} \, (E - e^{-\lambda y})^{-\alpha_{kl}}} \tag{3.30}$$

The correlative condenser aggregate $\underline{\Psi}_{kl} = \varphi_{kl}/C_{kl}$ for $\alpha_{kl} = 1$ is identical to the linear composition ψ_{kl} from (2.6), i.e. $\Psi_{kl} = \psi^{(\kappa\lambda)}_{kl(\mu\nu)} = \psi^{\alpha_{kl}}_{kl}$.

The correlation exponent can also be expressed as a relationship between the sequence of whole numbers in the monometric case n_{kl} and in the polymetric case $n^{(\kappa\gamma)}_{kl(\mu\nu)} = \underline{n_{k\,l}}$:

$$\alpha_{kl} = n^{(\kappa\lambda)}_{(\mu\nu)kl} / \; n_{kl} \;\; = \;\; \underline{n_{kl}} \; /(2 \, n_{kl} + 1) \tag{3.31}$$

The special correlations in the structures of the condensation levels of the possible hermetry forms a to d can be derived from the specific correlation tensor $Q^{j(\kappa\lambda)}_{k(\mu\nu)}$ in (3.16) using (3.30). The invariant scalar sum

$$\sum_{i,k=1}^{q} Q^{i(\kappa\lambda)}_{k(\mu\nu)} = Q^{(\kappa\lambda)}_{(\mu\nu)}$$

describes the correlative coupling in each case of two elements of the correlator.

2. The metric fundamental tensors can be determined from (3.16):

$$\hat{\varphi}^{i}_{km} = \left[\begin{smallmatrix} i \\ km \end{smallmatrix}\right]^{(\kappa\lambda)}_{(\mu\nu)} - Q^{i(\kappa\lambda)}_{m(\mu\nu)} \left[\begin{smallmatrix} m \\ ki \end{smallmatrix}\right]^{(\kappa\lambda)}_{(\mu\nu)} = \sum_{i=1}^{q} \left(g^{is}_{(\kappa\lambda)} + Q^{i(\kappa\lambda)}_{m(\mu\nu)} g^{ms}_{(\kappa\lambda)} \right) [skl]_{(\mu\nu)}$$

$$= p^{kl} \frac{1}{2} \left[\partial_k g^{(\mu\nu)}_{sl} + \partial_l g^{(\mu\nu)}_{ks} - \partial_s g^{(\mu\nu)}_{kl} \right]. \qquad (3.32)$$

Here the substitution (3.17) was used, which can be written:

$$p_{kl} = \sum_{s} \left(\sum_{i} (g^{is}_{(\kappa\lambda)} + Q^{i(\kappa\lambda)}_{m(\mu\nu)} g^{ms}_{(\kappa\lambda)}) \right)^{-1} = \sum_{s} g^{(\kappa\lambda)}_{ss} (E + Q^{(\kappa\lambda)}_{s(\mu\nu)})^{-1}. \qquad (3.33)$$

From (3.32) this expression follows:

$$\partial g^{(\mu\nu)}_{kl} = 2 \underline{\hat{\varphi}^{i}_{kl}} \; \underline{q_{kl}} \; \partial y \,, \qquad (3.34)$$

with the substitutions:

$$\underline{\hat{\varphi}_{kl}} = \hat{\varphi}^{(\mu\nu)}_{kl(\nu\mu)} \,, \quad \underline{q_{kl}} = q^{(\kappa\lambda)}_{(\mu\nu)} = \underline{C}_{kl} \, p_{kl} \,, \quad \underline{C}_{kl} = \text{const.}. \qquad (3.35)$$

When κ, λ = μ, ν this gives:

$$\hat{\varphi}^{(\nu\mu)}_{(\mu\nu)kl} q^{(\nu\mu)}_{(\mu\nu)} = \hat{\varphi}^{(\kappa\lambda)}_{(\mu\nu)} q^{(\kappa\lambda)}_{(\mu\nu)} \qquad (3.36)$$

with

$$q^{(\nu\mu)}_{(\mu\nu)} = \frac{1}{2} C^{(\mu\nu)}_{kl} g^{(\mu\nu)}_{ll} \,. \qquad (3.37)$$

From (3.34) it follows:

$$\partial \ln g^{(\mu\nu)}_{ll} = \hat{\varphi}_{ll} = \psi^{(\mu\nu)}_{kl} \sum_{l=1} C^{(\nu)}_{ll} \,. \qquad (3.38)$$

With the substitutions $Q_{(\mu\nu)}^{(\nu\mu)} = E$, $x = \underline{\lambda_{ll}}$ iy and $\underline{a_{ll}} = \underline{C_{ll}}^{(\mu\nu)} / \underline{\lambda_{ll}^{(\mu\nu)}}$ along with (3.30), (3.38) can be written:

$$\partial \ln g_{ll}^{(\mu\nu)} = \underline{a_{ll}} (e^x - E)^{-1} e^x \partial x = \partial \ln (e^{\lambda_{kl} y} - E)^{\underline{a_{kl}}} \tag{3.39}$$

giving the solution of the integral as:

$$\boxed{g_{ll}^{(\mu\nu)} = C_{ll}^{(\mu\nu)} \prod_{l=1}^{q} \left(e^{\lambda_{kl} y} - E \right)^{\underline{a_{ll}}}} \tag{3.40}$$

In this equation $C^{(\mu\nu)}$ is an integration constant. This equation does not yield the elements of $\hat{g}$ explicitly, but gives the tensor spectrum of its elements.

3. For <u>the determination of the coupling tensors</u> $Q_{s(\mu\nu)}^{i(\kappa\lambda)}$ the relations (3.34), (3.30) are used, (3.40) is consulted and:

$$p_{(\mu\nu)}^{(\kappa\lambda)} = \sum_{l} \underline{C_{ll}} \underline{\psi_{ll}} = \sum_{l=1}^{q} \underline{C_l} (E - e^{-\lambda_{kl} y})^{-\underline{a_{kl}}} \tag{3.41}$$

is used.

For $\kappa, \lambda = \mu, \nu$ (3.41) becomes:

$$p_{(\mu\nu)} = \sum_{l} C_l^{(\mu\nu)} \psi_{ll}^{(\mu\nu)} = \sum_{l=1}^{q} C_l^{(\mu\nu)} (E - e^{-\lambda_{kl} y})^{-1}. \tag{3.42}$$

The explicit solution for the correlation tensor reads

$$Q_{l(\mu\nu)}^{k(\kappa\lambda)} = g_{ll}^{(\mu\nu)} p_{(\mu\nu)}^{(\kappa\lambda)} g_{(\mu\nu)kl}^{(\kappa\lambda)} p_{(\mu\nu)} - qE \tag{3.43}$$

$$Q_{l(\mu\nu)}^{k(\kappa\lambda)} = \sum_{k=1}^{q} \underline{C_k} \psi_{kl} g_{ll} \left(\sum_{l=1}^{q} C_l^{(\mu\nu)} \psi_{ll} g_{ll} \right)^{-1} - qE$$

component wise:

and expanding with the substitution $A_{(\mu\nu)}^{(\kappa\lambda)} = 2 C_{(\kappa\lambda)} C_{(\mu\nu)}^{-1}$ for a new integration constant:

$$\boxed{\begin{aligned} Q_{l(\mu\nu)}^{k(\kappa\lambda)} &= \sum_{i,l=1}^{q} Q_{(\mu\nu)l}^{(\kappa\lambda)i} = A_{(\mu\nu)}^{(\kappa\lambda)} \sum_{l=1}^{q} C_{(\mu\nu)l}^{(\kappa\lambda)} (E - e^{-\lambda_{kl} y})^{-\alpha_l} \left(\sum_{k=1}^{q} C_k^{(\mu\nu)} (E - e^{-\lambda_{kl}^{(\mu\nu)} y})^{-1} \right)^{-1} \prod_{k=1}^{q} (e^{\lambda_{kl}^{(\mu\nu)} y} - E)^{\alpha_{kl}^{(\kappa\lambda)}} \times \\ &\times \{ \prod_{l=1}^{q} (e^{\lambda_{kl}^{(\mu\nu)} y} - E)^{\alpha_{kl}^{(\mu\nu)}} \}^{-1} - qE \end{aligned}} \tag{3.44}$$

The correlation tensor depends only on the linear combination of the hermetric coordinates

$y^2 = \left(\sum_{k=1}^{3} x_k + i \sum_{l=4}^{6} x_l \right)^2$. The extreme values for the coupling $Q^{i(\kappa\lambda)}_{s(\mu\nu)\,extr}$ are determined by the fundamental tensor $\left[\begin{smallmatrix} \cap \\ \kappa\lambda \\ \mu\nu \end{smallmatrix} \right]_{extr}$ and the elements from $\hat{g}$. With $\overline{g}_{(\kappa\lambda)} = g_{(\mu\nu)ik}$ this gives:

$$\partial Q^{k(\kappa\lambda)}_{i(\mu\nu)} = \partial \psi_{ll} = \partial \left[\begin{smallmatrix} \cap \\ \kappa\lambda \\ \mu\nu \end{smallmatrix} \right] = \partial^2 (\overline{g}_{(\kappa\lambda)}) = \partial^2 (\overline{g}_{(\mu\nu)}) = 0 \qquad (3.45)$$

Within the coupling range a *pseudo anti-hermetry* is present regarding the condenser signature; i.e. there is no condensation of the Metrons and therefore a pseudo Euclidean lattice. In each coupling extremum all possible condensers $\left[\begin{smallmatrix} \cap \\ \kappa\lambda \\ \mu\nu \end{smallmatrix} \right]$ from $\hat{g}$ become pseudo antihermetric. Extrema of the metric components of $\hat{g}_{(x)}$ coincide with the eigenvalues ψ_{kl}. The compression state in the correlator $\hat{g}_{(x)}$ remains independent of the change of the partial structure $g^{ik}_{(\mu\nu)}$. It can be shown that the maximum of the structure deformation $\psi_{kl}{}^{(max)}$ decreases with the minimum of the inner correlation $Q^i_l \left(\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right)_{extr.}$. As will be shown, the condensation maxima exchange themselves (*correspondences*) during a timelike oscillation process constantly over the *correlation* Minima. While GR is a static geometry, by these exchange processes of the maxima and minima condensation dynamics comes into this geometry, which is foreign to Riemann geometry.

From the possible combinations of the indices μ, ν, λ, σ for the correlators $\hat{g}_{(x)}$ (with the hermetry forms x = a, b, c, d) several coupling tensors $Q^j_l \left(\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right)$ are permitted in each case giving a group of couplings as extrema.

The condensation structure ψ_{kl} of a system depends substantially on the inner Correlations Q^i_k or the timelike progresss of the structure of all coupling extrema $g^{ik}_{(\mu\upsilon)}$ and $Q^i_l \left(\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right)$. Therefore the stability time can be determined after the analysis of the entire coupling structure is done. After the duration of that stability time, the Coupling is restructured and the condensation fields change.

3.3 Coupling Groups and Condenser Fluxes

1. According to (3.45) each coupling extremum $Q^{i(\kappa\lambda)}_{s(\mu\nu)extr}$ generates a coupling group which contains all the coupling extrema which result from permutation of the signature numbers κ, λ, μ, ν. Concerning such a group (3.44) must restrain all condensers to appropriate pseudo anti-hermetric forms. Primary pseudo anti-hermetry exists for those condensators, which carry both signature data of the group of couplings as basis and contra signature. Secondary pseudo antihermetries are obtained if condensers contain any pair of numbers of the group of couplings as basis signatures. If all signatures are equal, then there is no correlation and $Q_{(\mu\mu)}{}^{(\mu\mu)} = E$ becomes the unit tensor.

In the simplest case of the hermetry of only one coordinate, for example, there exist no correlation tensors and no metric condensation stages in x_6. Next with self condensations of the Partial structures $\kappa_{ik}{}^{(1)}$ with two coordinates (x_5, x_6) the beginning of condensation stages can start. These project into Space-time as gravitons.

In case of the a-hermetry only two coupling structures exist:

$$\left[\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right] = \left[\begin{smallmatrix}\kappa\\ g\end{smallmatrix}\right] \equiv \left[\begin{smallmatrix}1\\ 11\end{smallmatrix}\right], \quad \left[\begin{smallmatrix}g\\ \kappa\end{smallmatrix}\right] \equiv \left[\begin{smallmatrix}11\\ 1\end{smallmatrix}\right] \text{ and the coupling tensors } Q_{(\kappa)}{}^{(g)}, \; Q_{(g)}{}^{(\kappa)}.$$

Between two coupling groups there are also *condenser sources* and *condenser sinks*, if there are metric condensers (sources), which appear pseudo anti-metric in the other group in a system (primary or secondary sinks). Between two coupling groups there also exist hermetric (h) and anti-hermetric *Condenser bridges* (a), since there are identical condensers, which are primary (Ia) for both groups or secondary pseudo anti- metric (IIa). The condenser sinks therefore always cause the actual coupling of the Partial structure.

An investigation of the coupling structures belonging to the single class of condenser signatures $Q_i = \left(\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right)_i \equiv Q^{(\kappa\lambda)}_{(\mu\nu)extr}$, must be done individually for every one of the four possible structure condensations (3.8), (3.10), (3.11) and (3.12).

2. In the case of the a-hermetry (graviton) there exist 2 coupling groups and ($2^2 - 2 = 2$ condensers). For the b and c-hermetry (photon and/or neutral particle) there are 6 groups of couplings $g(\mu\nu)\, g(\mu\nu) - g(\mu\mu)\, g(\mu\mu) = 6^2 - 6 = 30$ condensers.

The coupling extrema $Q_i = ({}^{\kappa}{}_{\mu}{}^{\lambda}{}_{\nu})$ are caused by the condensers $\left\{\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right\} \equiv \left[\begin{smallmatrix}\kappa\ \lambda\\ \mu\ \nu\end{smallmatrix}\right]$. This gives very many possible combinations of coupling groups. Especially indicated are those hermetry forms b and C cross-linking between different coupling structures.

With the notations $\mu, \nu \equiv g^{(\mu\nu)}$, $\mu \equiv \kappa_{(a)}$ as well as $\hat{g}_{(a)} \equiv (1)$, $\hat{g}_{(b)} \equiv (\alpha) = 2$ and $\hat{g}_{(c)} \equiv (\alpha) = 3$ the six coupling groups for these hermetry forms read:

$1 \equiv (1), 2 \equiv (\alpha), 3 \equiv ((1\alpha)), 4 \equiv (1\alpha), 5 \equiv (1\,(1\alpha)), 6 \equiv (\alpha\,(1\alpha))$

(e.g. $4 \equiv (1\alpha) = \left[\begin{smallmatrix}1\\ 1\ 2\end{smallmatrix}\right]$, if the hermetry form b is used). If these groups are described as Condenser extrema with Qi (i = 1, 6), then the first 3 groups are *homogeneous*, i.e. the condensers exhibit equal basis

and contra signatures. The other 3 groups are *heterogeneous*, i.e. their basis and contra signatures are different. The heterogeneous Groups are divided into the sub-groups a and b: then:

$$
\begin{aligned}
&Q_1 : \begin{bmatrix}11\\1\end{bmatrix}\ \begin{bmatrix}1\\11\end{bmatrix}, \quad Q_2 : \begin{bmatrix}\alpha\alpha\\\alpha\end{bmatrix}\ \begin{bmatrix}\alpha\\\alpha\alpha\end{bmatrix}, \quad Q_3 : \begin{bmatrix}1\alpha\\\alpha1\end{bmatrix}\ \begin{bmatrix}\alpha1\\1\alpha\end{bmatrix},\\
&Q_{4a} : \begin{bmatrix}1\\\alpha\end{bmatrix}\ \begin{bmatrix}1\\\alpha\alpha\end{bmatrix}\ \begin{bmatrix}11\\\alpha\end{bmatrix}\ \begin{bmatrix}11\\\alpha\alpha\end{bmatrix}, \quad Q_{4b} : \begin{bmatrix}\alpha\\1\end{bmatrix}\ \begin{bmatrix}\alpha\\11\end{bmatrix}\ \begin{bmatrix}\alpha\alpha\\1\end{bmatrix}\ \begin{bmatrix}\alpha\alpha\\11\end{bmatrix},\\
&Q_{5a} : \begin{bmatrix}1\\1\alpha\end{bmatrix}\ \begin{bmatrix}1\\\alpha1\end{bmatrix}\ \begin{bmatrix}11\\1\alpha\end{bmatrix}\ \begin{bmatrix}11\\\alpha1\end{bmatrix}, \quad Q_{5b} : \begin{bmatrix}1\alpha\\1\end{bmatrix}\ \begin{bmatrix}1\alpha\\11\end{bmatrix}\ \begin{bmatrix}\alpha1\\1\end{bmatrix}\ \begin{bmatrix}\alpha1\\11\end{bmatrix},\\
&Q_{6a} : \begin{bmatrix}\alpha\\1\alpha\end{bmatrix}\ \begin{bmatrix}\alpha\alpha\\1\alpha\end{bmatrix}\ \begin{bmatrix}\alpha\\\alpha1\end{bmatrix}\ \begin{bmatrix}\alpha\alpha\\\alpha1\end{bmatrix}, \quad Q_{6b} : \begin{bmatrix}1\alpha\\\alpha\end{bmatrix}\ \begin{bmatrix}1\alpha\\\alpha\alpha\end{bmatrix}\ \begin{bmatrix}\alpha1\\\alpha\end{bmatrix}\ \begin{bmatrix}\alpha1\\\alpha\alpha\end{bmatrix}.
\end{aligned}
\tag{3.46}
$$

The primary and secondary pseudo anti-hermetric condensations are marked by Ia and IIa, and the metric condensers by Ih and IIh. The groups of couplings distribute themselves as a consequence of the metric and anti-metric condensers occupation aggregates as follows:

	G_1	G_2	G_3	G_4	G_5	G_6
Ia	Q_1	Q_2	Q_3	$Q_1Q_2Q_4$	$Q_1Q_3Q_5$	$Q_2Q_3Q_6$
IIa	$Q_{4b}Q_{5b}$	$Q_{4a}Q_{6b}$	$Q_{5a}Q_{6a}$	$Q_{5b}Q_{6b}$	$Q_{4b}Q_{6a}$	$Q_{4a}Q_{5a}$
Ih	$Q_2Q_3Q_6$	$Q_1Q_3Q_5$	$Q_1Q_2Q_4$	Q_3	Q_2	Q_1
IIh	$Q_{4a}Q_{5a}$	$Q_{4b}Q_{6a}$	$Q_{5b}Q_{6b}$	$Q_{5a}Q_{6a}$	$Q_{4a}Q_{6b}$	$Q_{4b}Q_{5b}$

(3.47)

Number of condensers in the 3 homogeneous groups G_1 to G_3	Number of condensers in the 3 heterogeneous groups G_4 to G_6
Ia = 2	Ia =12
IIa = 8	IIa = 8
Ih = 12	Ih = 2
IIh = 8	IIh = 8

In these coupling groups common symmetries arise. Combinetric mathematics shows that occupation of all Ia-systems behave antisymmetrically to occupations of the Ih-systems. Within each coupling group the occupation from IIh results in reverse from IIa if the basis and contra signatures are exchanged. Therefore there is still another symmetry of the secondary systems. Within the 6 groups G_i gives the same condensators, which can be connected by one "bridge". (e.g. Q_1 in Ih belongs to G_2 and G_3 and G_6). If the condensers are connected by a bridge K, then the following bridges are indicated

$K(Ih) = K^{++}$ in detail: $K_1^{++} = G_2, G_3, G_6$; $K_2^{++} = G_1, G_3, G_5$; $K_3^{++} = G_1, G_4, G_2$
$K(Ia) = K^{--}$ in detail: $K_1^{--} = G_1, G_4, G_5$; $K_2^{--} = G_2, G_4, G_6$; $K_3^{--} = G_5, G_3, G_6$

and the secondary bridges:

$K(IIh) = K^{+} : K_1^{+} = G_3G_6$; $K_2^{+} = G_2G_6$; $K_3^{+} = G_3G_5$; $K_4^{+} = G_1G_5$; $K_5^{+} = G_2G_4$; $K_6^{+} = G_1G_4$
$K(IIa) = K^{-} : K_1^{-} = G_1G_4$; $K_2^{-} = G_1G_5$; $K_3^{-} = G_2G_4$; $K_4^{-} = G_2G_6$; $K_5^{-} = G_3G_5$; $K_6^{-} = G_3G_6$

In condensation forms the b and c-hermetries give in principle four different classes *q* of source- and sink systems, that can be arranged according to the hermetry gradients Ih, IIh, IIa, Ia according to the strength of the decreasing gradient of the condensations:

q_1 (Ih → Ia)
q_2 (Ih → IIa) bzw. q_3 (IIh → Ia)
q_4 (IIh → IIa)
q_5 (Ih → IIh) bzw. q_6 (IIa → Ia).

(3.48)

From these relations results the primary relation: $q_1 = q_1 (K_j^{++} \rightarrow K_j^{--})_1^3$
and the secondary relation: $q_4 = q_3 (K_j^{+} \rightarrow K_j^{--})_1^6$

In these systems the condenser bridges themselves appear as sources and sinks, which is not the case with bridge-free primary sources.

We obtain: $q_1^{(0)} = q_1 (G_1, G_2, G_3 \rightarrow G_6, G_5, G_4)$,
where G_1, G_2, G_3 refer to Ih and G_6, G_5, G_4 to Ia.

If $K_{\alpha,\beta} \equiv (K_\alpha, K_\beta)$ are two condenser bridges of the same kind then there results from the pattern of the groups of couplings the hermetric primary and secondary sources

$$q_2 = q_2 (G_1, G_2, G_3 \rightarrow K^-_{3,5}, K^-_{1,6}, K^-_{2,4})$$

The same groups of couplings in Ih exist in each case connected to two secondary sink condenser bridges. In the bridge-free anti-hermetric source class in each case two groups of couplings from IIh influence two corresponding couplings in Ia:

$$q_3 = q_3 \{(G_1, G_6) (G_2, G_5) (G_3, G_4) \rightarrow (G_4 G_5) (G_4, G_6) (G_5, G_6)\}.$$

The two external source systems are:

$$q_5 = q_5 (G_1, G_2, G_3 \rightarrow K^+_{5,3}, K^+_{6,1}, K^+_{4,2})$$
$$q_6 = q_6 (K^-_{2,4}, K^-_{1,6}, K^-_{3,5} \rightarrow G_4, G_5, G_6)$$

There are the different dynamic coupling structures of hermetry forms b and c (Fig. 1). Regarding the groups of couplings, all bridges form two primary antisymmetric, pseudocyclic and secondarly two antisymmetric cyclic systems. For condensation forms b and c there are four different classes q of source and sink systems, if these are evaluated following the hermetry gradient Ih, IIh, IIa, Ia. The primary source and sink systems q (Ih → Ia) exhibit the strongest hermetry gradient. With $q_1^{(0)}$ the bridge-free source distributions are frozen.

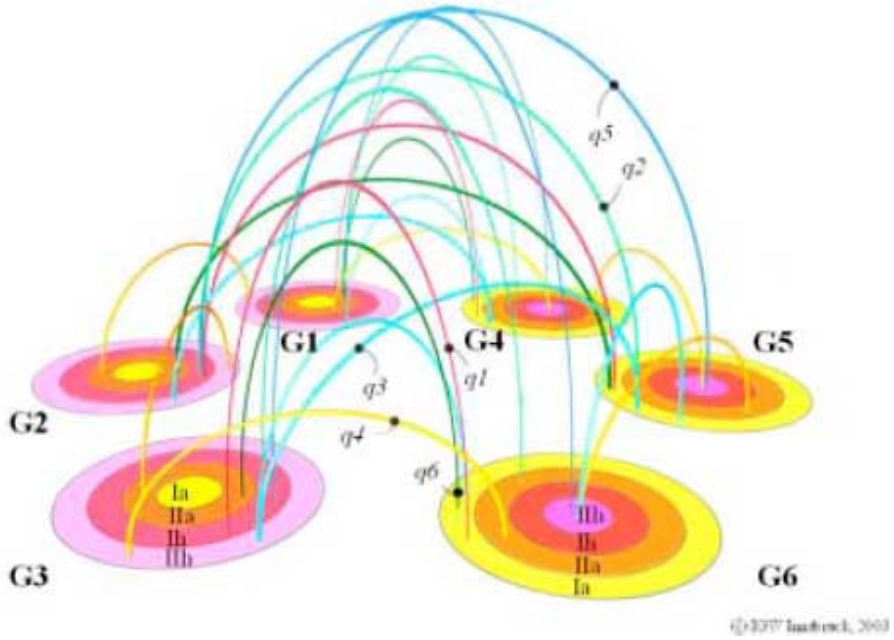


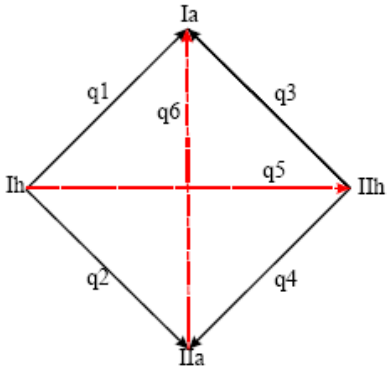
Figure 1 Dynamic exchange processes of maxima and minima of structure condensations in a neutral particle or photon.

In the case of the b-hermetry the coordinate sum *y* is imaginary as in the a-hermetry, but in the c-hermetry it is a complex number *y*, on which the fundamental phenomenological difference of photons and neutral particles must be based.

In these coupling structures the maxima and/or secondary maxima periodically exchange themselves with the minima and/or secondary minima of the structure condensations. In the case of $\alpha = 2$, such a system is the b-hermetry form, illustrated by the imaginary structure dynamics of photons, and for $\alpha = 3$, the c-hermetry form is illustrated by the dynamic processes of neutral particles in R_6.

With the d-hermetry (electrically charged particles) there exist $9^2 - 9 = 72$ condensers groups of couplings. For the coupling extrema $G_i = 18$ there exist three different primary hermetric condenser bridge groups of couplings between the primary anti-hermetric condenser sinks (Ia); between the hermetric condenser sink (Ih) there are 18, and between the secondary systems IIa and IIh in each case 30 Condenser bridges. All condenser bridges form complicated cross-linking systems.

3. In the case of only one condenser flux, **$\nu = 1$**, the number of flux aggregates is 4: q_1, q_2, q_3, q_4. The following diagram is meant to illustrate the possible flux classes in the system of the hermetric and anti-hermetric condenser fluxes. There is in each case $\omega = 1$ cycle, which restores the initial condition, and thus the possibility of a spin of the condenser flux becomes possible.



With **ν = 2**, 2 flux aggregates can be formed from q_1 to q_4 in 3 possible combinations, returning to the initial condition in ω = 3 cycles:

q_1q_2, q_1q_5, q_1q_6,
q_2q_4, q_2q_5, q_2q_6,
q_3q_1, q_3q_5, q_3q_6,
q_4q_3, q_4q_5, q_4q_6.

The condenser spin is ambiguous, which leads to a spin isometry.

For **ν = 3** there is also a Structural isometry (3! = 6). There are 4 possible basic types, if the 3 condenser fluxes are composed of each 4 possible triangle forms of the flux, then ω = 2. Or if 3 condenser fluxes form a bundle with only one the common 4 starting points (Ih, Ia, IIh, IIa), then ω = 4.

With **ν = 4** flux classes there are 4! = 24 Stereo isomers and 15 basic types of compound aggregates.

With **ν = 5** condenser fluxes ν! = 120 structure isomers can exist. There are 6 flux aggregates.

For **ν = 6** flux classes there are 720 possible Structural isomers and a flux aggregate, whose only cyclic figure is compound for 6 flux classes (shown as in the above diagram) for all $q_i = 6$. The actual generated aggregates are selected according to criteria from the theorems of the condenser fluxes.

4. Microscopic structure dynamics as a cause of inertia

4.1 Condenser Fluxes

1. Each condensation form is determined by a system of condensers $\left[\begin{smallmatrix}\overset{\frown}{\kappa\lambda}\\ \mu\nu\end{smallmatrix}\right] \equiv \left[\begin{smallmatrix}\kappa\,\lambda\\ \mu\,\nu\end{smallmatrix}\right]$. In such systems the appropriate geodetic relationship must be applied to each basis signature (κ λ) and (λ κ) (where the point indicates the time derivative):

$$\boxed{\ddot{x}^{(\mu\nu)i}_{(\kappa\lambda)} = -\left[\begin{smallmatrix} i\\ kl\end{smallmatrix}\right]^{(\mu\nu)}_{(\kappa\,\lambda)} \dot{x}^k \dot{x}^l} \qquad (4.1)$$

There is the possibility of transforming away the coordinate system belonging to a basis signature by the choice of a reference system belonging to that signature. The condensations of other basic systems remain however. In the condensations b, c and d there exists the $\hat{g}$ of more than one structure unit, contrary to the hermetry form a. Only the condensations in a can therefore be transformed away by considering the κ, λ = 1, 1 geodetic system. Gravitation is therefore a fictitious force, although the sources of gravitational field remain, due to condensations of the hermetry forms b, c and d. Because of geodetic equation (4.1) the fundamental condensers $\left[\begin{smallmatrix}\overset{\frown}{\kappa\lambda}\\ \mu\nu\end{smallmatrix}\right]$ can be interpreted as Tensor components of possible exchange effects. A condenser defines a compression condition of Metrons and by structure curvatures (1.4) and (2.2), is described by the structure compressor $\rho^{i}{}_{klm}{}^{(\mu\,\nu)}{}_{(\kappa\lambda)} = \rho^{(\mu\,\nu)}{}_{(\kappa\lambda)}$:

$$\rho^{i}{}_{klm}{}^{(\mu\nu)}{}_{(\kappa\lambda)} = K^{i(\mu\nu)}_{klm(\kappa\lambda)} \left[\begin{smallmatrix}\overset{\frown}{\kappa\lambda}\\ \mu\nu\end{smallmatrix}\right] = \lambda_{kl}{}^{(\mu\nu)}{}_{(\kappa\lambda)} \left[\begin{smallmatrix}\overset{\frown}{\kappa\lambda}\\ \mu\nu\end{smallmatrix}\right] \qquad (4.2)$$

or after trace calculations i = m (2.11):

$$\mathrm{sp}\ \rho^{i}{}_{klm}{}^{(\mu\nu)}{}_{(\kappa\lambda)} = \rho^{(\mu\nu)}_{kl(\kappa\lambda)} = \lambda_{kl}{}^{(\mu\nu)}{}_{(\kappa\lambda)} \left[\begin{smallmatrix}\overset{\frown}{\kappa\lambda}\\ \mu\nu\end{smallmatrix}\right] \sim T_{kl}{}^{(\mu\nu)}{}_{(\kappa\lambda)} - \tfrac{1}{4}\, g_{kl} T^{(\mu\nu)}{}_{(\kappa\lambda)} \qquad (4.3)$$

with the energy momentum density tensor T_{kl} : $T^{(\mu\nu)}_{kl\ (\kappa\lambda)} = \rho^{(\mu\nu)}_{kl(\kappa\lambda)} - \frac{1}{2} g_{kl(\kappa\lambda)} \rho^{(\mu\nu)}{}_{(\kappa\lambda)}$

According to the variational principle (1.4):

$$\delta \int \rho^{(\mu\nu)}{}_{(\kappa\lambda)} \sqrt{g}\ d\Omega, \quad \text{with} \quad d\Omega = \prod_{i=1}^{6} dx \qquad (4.4)$$

each structure compressor approaches a minimum value of the curvature and/or compression. The energy conservation is expressed by a divergence calculation, and concomitantly the preservation of the structure compression in the composition field:

$$\mathrm{div}^{(\mu\nu)}{}_{(\kappa\lambda)}\, T_{kl}{}^{(\mu\nu)}{}_{(\kappa\lambda)} = \mathrm{div}^{(\mu\nu)}{}_{(\kappa\lambda)} \left(\rho^{(\mu\nu)}_{kl(\kappa\lambda)} - \tfrac{1}{2}\, g_{kl(\kappa\lambda)}\, \rho^{(\mu\nu)}{}_{(\kappa\lambda)} \right) = 0. \qquad (4.5)$$

The compression condition in the composition field remains, independently of changes of the Partial structure.

The condensation maxima determine the coupling classes Ih and IIh, and within the range N_+ define structure compressors $\rho^{(\mu\ \nu)}{}_{(\kappa\lambda)}$. The minima of the structure compressors lie with N_- , i.e. $\left[\begin{smallmatrix}\cap\\ \kappa\lambda\\ \mu\nu\end{smallmatrix}\right] = 0$. Because of (4.5) there must be an exchange of $\rho^{(\mu\ \nu)}{}_{(\kappa\lambda)}\ N_+ \rightarrow \rho^{(\mu\ \nu)}{}_{(\kappa\lambda)}\ N_-$, or an exchange procedure: $N_+ \leftrightarrows N_-$, by which the coupling extrema can be exchanged. This procedure is called **condenser flux**:

$$N_+\ (\kappa\lambda\ ,\ \mu\nu)\ N_- \qquad (4.6)$$

2. The coupling extrema $\partial Q^i_l \left(\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right) = 0$ characterize through $\left[\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right] = 0$ the coupling classes Ia and IIa, which has the consequence $\hat{\varphi}^j_{kl} = \psi^{\alpha_{kl}}_{kl} \sum_j C^j_{kl} = 0$ because of (3.20). In this case there are no condensations of the Metrons, but a pseudo Euclidean lattice structure. The number of distorted Metrons n is described in this coordinate range by a minimum, N_-. The composited field is defined in the open interval of $0 < \psi_{kl} < 1$. There must be therefore in the definition range also a time, at which the number of condensed Metrons reaches a maximum N_+, and in that extremal condition $\partial Q^i_1 \left(\begin{smallmatrix}\kappa\nu\\ \mu\lambda\end{smallmatrix}\right) = 0$. The situation involving N_+ follows from the relationship:

$$0 = \partial \left[\begin{smallmatrix} i\\ kl\end{smallmatrix}\right]^{(\mu\nu)}_{(\kappa\lambda)} + \partial \left[\begin{smallmatrix} s\\ kl\end{smallmatrix}\right]^{(\mu\nu)}_{(\kappa\lambda)} Q^{(\mu\nu)i}_{(\kappa\lambda)s} + \left[\begin{smallmatrix} s\\ kl\end{smallmatrix}\right]^{(\mu\nu)}_{(\kappa\lambda)} \partial Q^{(\mu\nu)i}_{(\kappa\lambda)s} - \partial \left[\begin{smallmatrix} s\\ kl\end{smallmatrix}\right]^{(\mu\nu)}_{(\kappa\lambda)} \partial Q^{(\mu\nu)i}_{(\kappa\lambda)s} \equiv \partial \psi^{(\mu\nu)}_{(\kappa\lambda)kl} \qquad (4.7)$$

In their definition range the condensation maxima of the Composition field are defined by eigenvalues of the composition field. They determine the coupling classes Ih and IIh.

A condenser flux can arise only under completely determined conditions. It is responsible for the non hermitic part of the fundamental tensor. With notation $g_{(\mu\ \nu)\ ik} = g_{(\mu\ \nu)}$ this becomes, due to (3.5):

$$\begin{aligned} \mathbf{g}_{(\mu\nu)} &= \mathrm{sp}\ (\boldsymbol{\kappa}_{(\mu)} \times \boldsymbol{\kappa}_{(\nu)}) = (\boldsymbol{\kappa}_{(\mu)+} + \boldsymbol{\kappa}_{(\mu)-\_})\ (\boldsymbol{\kappa}_{(\nu)+} + \boldsymbol{\kappa}_{(\nu)-\_}) \\ &= (\boldsymbol{\kappa}_{(\mu)+}\boldsymbol{\kappa}_{(\nu)+} + \boldsymbol{\kappa}_{(\mu)-\_}\boldsymbol{\kappa}_{(\nu)-\_}) + (\boldsymbol{\kappa}_{(\mu)+}\boldsymbol{\kappa}_{(\nu)-\_} + \boldsymbol{\kappa}_{(\mu)-\_}\boldsymbol{\kappa}_{(\nu)+}) = \mathbf{g}_{(\mu\nu)+} + \mathbf{g}_{(\mu\nu)-\_}. \end{aligned} \qquad (4.8)$$

With the linear aggregate for the hermetric coordinates y the lattice kernels can be written $\kappa(\mu)$ as functions of these coordinates, $\kappa_{(\mu)\pm} \sim f^{\pm 1}(y)$. One obtains:

$$\mathbf{g}_{(\mu\nu)+} = \mathbf{a}_{(\mu\nu)+}\ f_\mu\ f_\nu \qquad \text{mit} \quad \mathbf{a}_{(\mu\nu)+} = \text{const.}, \qquad (4.9)$$

$$\mathbf{g}_{(\mu\nu)-\_} = \mathbf{a}_{(\mu\nu)-\_}\ (f^2{}_\mu + f^2{}_\nu)/\ f_\mu\ f_\nu = \mathbf{a}_{(\mu\nu)-\_}\ \beta_{\mu\nu}\,, \qquad (4.10)$$

For $\beta_{\mu\mu} = 2$ with (3.39) the trace is:

$$\mathrm{sp}\ \mathbf{g}_{(\mu\nu)} = \mathrm{sp}\ \mathbf{g}_{(\mu\nu)+} \sim f_\mu\ f_\nu \sim (e^{\lambda_i \mu} - E)^{\alpha_i}\ \delta_{kl}\,. \qquad (4.11)$$

Using (4.9) and (4.10) with the notation:

$$\lambda_{(\mu\nu)skl} = \tfrac{1}{2}\ (a_{(\mu\nu)sl+}\ \partial_k + a^{(\mu\nu)}{}_{ks+}\ \partial_l \ - a^{(\mu\nu)}{}_{kl+}\ \partial_s\ ), \qquad (4.12)$$

the condenser components are:

$$\Lambda^{(\kappa\lambda)i}_{(\mu\nu)kl} = a^{(\mu\nu)}_{(\kappa\lambda)kl}\lambda_{(\mu\nu)skl}\,, \tag{4.13}$$

$$\left[\begin{smallmatrix} i \\ kl \end{smallmatrix}\right]^{(\kappa\lambda)}_{(\mu\nu)} = g^{is}_{(\kappa\lambda)}\left[\begin{smallmatrix} \\ skl \end{smallmatrix}\right]_{(\mu\nu)} = \left(\Lambda^{(\kappa\lambda)i}_{(\mu\nu)kl} \,/\, f_\mu f_\nu + a^{is}_{(\kappa\lambda)-}\lambda_{(\mu\nu)skl}\right) f_\kappa f_\lambda\,. \tag{4.14}$$

The Metron spin tensor $\mathbf{a}_{(\kappa\lambda)}$ − _exists both in N_-_ and in N_+ and causes a spin orientation of the hyperstructure in the definition range N of the condenser concerned, causing a field activation to take place. The same spin orientation makes a condenser flux possible. The constant field activators must exist for both condenser signatures, thus arriving at the condenser flux (4.6), i.e. it must exist in $N_\pm$ besides $\left[\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix}\right]$ and also the Signature transposition $\left[\begin{smallmatrix} \mu\nu \\ \kappa\lambda \end{smallmatrix}\right]$, thus in $N_\pm$ the field activators can generate $g_{(\kappa\lambda)}$ _ and $g_{(\mu\,\nu)}$ _. The existence condition for condenser fluxes therefore is:

$$N_+\left(\left[\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix}\right],\left[\begin{smallmatrix} \mu\nu \\ \kappa\lambda \end{smallmatrix}\right]\right)(\kappa\lambda\mu\nu)\,N_-\left(\left[\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix}\right],\left[\begin{smallmatrix} \mu\nu \\ \kappa\lambda \end{smallmatrix}\right]\right) \tag{4.15}$$

This condition is often fulfilled in the four coupling structures. Therefore it always gives a condenser flux to that individual Hermetry form. During the space compression, (4.4) seeks a minimum level, due to the general field activation of a constant condenser flux, which works against the balance principle of the compressor. This is caused by the condensos flux equilibrium and will be designated as *compression iso stasis*.

In the geometrical dynamics of exchange of maxima and minima in structure deformations i.e. compressions of surface quanta lies the cause of physically observable particles.

3. With (4.15) an explicit analysis of the internal correlations of the coupling structures becomes possible. Different systems of condenser fluxes must be possible, because each system of sources and sinks can cause a condenser flux, if (4.15) is satisfied.

Hermetry forms b and c are possible because of the 6 condenser bridges, the 6 fluxes q_j given in (3.48). The condenser fluxes can unite, as described, to $1 \le \nu \le$ to 6 classes of flux aggregates. Each flux class ν is occupied with $\binom{6}{\nu}$ Flux aggregates $F(q_j)_\nu$. Because $\left[\begin{smallmatrix} \alpha\beta \\ \kappa\lambda \end{smallmatrix}\right]_+$ determines the flux aggregate F_ν, the flux aggregate can be described by:

$$F_\nu = Q_i^k\left(\begin{smallmatrix} \alpha\beta \\ \mu\nu \end{smallmatrix}\right)_{ext} F(q_j)_\nu \;\hat{=}\; N_+(\alpha\beta\mu\nu)\,N_- \quad, \text{mit } \alpha,\beta = \mu\,,\nu \tag{4.16}$$

Such an aggregate depends on the order of the exchange processes, so that it gives to each element of the flux class ν! isomers of flux aggregates. Thus the total number of possible flux aggregates becomes $Z = \sum_{\nu=1}^{6} \nu!\binom{6}{\nu} = 1950$. But this number is reduced by the requirement that a condenser flux should be temporally stable after a state is reached for the condenser signature concerned in the coupling structure after the expiration of a certain time in a final state, which is identical to the original initial state. In this case a stable cyclic circulation of the flux aggregates has developed. The number of stable cyclic flux aggregates is much smaller than Z (which might be attributed to vacuum fluctuations that are seen in quantum field theory). The temporal stability interval becomes determined by a certain number of cyclically rotating transients. Because of its rotation each cyclic condenser flux possesses a spin. If the spins of the condenser fluxes do not balance, the terms of the condensation spectra spins and spinors dominate. Each cyclic condenser flux which can be understood as oscillation process

$$N_{\pm}(\ )\ N_{\mp}$$

can be assigned a natural frequency η, those with the flux frequency w_f those wavelength $\lambda = w_f/\eta$ defines an aggregate diameter. Between inertial masses *m* and η the proportionality $m \sim n \sim 1/\lambda$ exists. Empirical quantum dualism $\lambda = h/mc$ finds a deepener interpretation through the cyclic activity of all flux aggregates. If ω is the number of periods, then an exchange process given by $\omega > 1$ only will be generated. A flux aggregate is therefore defined by:

$$F_\nu = Q_i^k \left(\begin{smallmatrix}\alpha\beta\\ \mu\nu\end{smallmatrix}\right)_{ext} F(q_j)_\nu\ \omega \qquad (4.17)$$

4. The diameter of a condenser flux can be determined as follows: $\mu = \sqrt{\frac{hc}{\gamma}}$ is the condenser constant of the mass spectra of the Hermetry forms c and d. The associated diameter results from the Compton wave length λ_0. Since compressor stasis applies:

$$m\lambda_{(c,d)} = \mu\,\lambda_0 = const. \qquad (4.18)$$

Using the spectral function (2.31) along with (2.56) and (2.57):

$$(\mu / m_c)^4 = (2n-1)^2/(2n\eta^4) \qquad (4.19)$$

and with (4.18) this gives the diameter of a condenser flux as:

$$\lambda_{(c,d)} = \sqrt[4]{\frac{(2n-1)^2}{2n}[1+4(q/\pi)^4]}\lambda_0^4 \qquad (4.20)$$

5. As in the imaginary a-Hermetric magnitudes, in what follows we will demonstrate the cause of space condensations. In space condensations only the real structure unit $s_{(3)}$ exists ($= x_1, x_2, x_3 \equiv R_3$). Then there is, by (3.16) and (3.28) and because the coordinates of the structure are real (in $s_{(3)}$):

$$\Re e\ \{\left[\begin{smallmatrix}\frown\\ 33\\ 33\end{smallmatrix}\right]_+ + Q^{(33)}_{(33)}\left[\begin{smallmatrix}\frown\\ 33\\ 33\end{smallmatrix}\right]_+\} = \Re e\ \{A^i_{kl(3)} \exp\{\lambda_{kl}V - c_i \int \left[\begin{smallmatrix}i\\ kl\end{smallmatrix}\right] \partial V\}; \qquad (4.21)$$

where V designates the coordinate sum $V = \sum_{i=1}^{3} x_i$. In the second exponent the real part can be set to:

$c_s\left[\begin{smallmatrix}s\\ kl\end{smallmatrix}\right] = \frac{c_s}{C_{kl}}\psi_{kl} = a\psi_{kl}$ and with (2.6) is expressed by $\psi_{kl} = \left(E - e^{-\lambda_{kl}Q}\right)^{-1}$. If $Q = \sum_{i=1}^{6} x_i$ is the sum of all coordinates (with $\omega = x_4 + x_5 + x_6$ and $r = x_1 + x_2 + x_3$) then we get for ψ_{kl}:

$$\psi_{kl} = [E - e^{-\lambda_{kl}r}(\cos\lambda_{kl}\omega - i\sin\lambda_{kl}\omega)]^{-1}. \qquad (4.22)$$

Substituting in (4.21) with the notation: $\left[\begin{smallmatrix}\frown\\ 33\\ 33\end{smallmatrix}\right]_+ = \left[\begin{smallmatrix}i\\ kl\end{smallmatrix}\right]_{(3)}$ and $\lambda = \lambda_{kl}$ it follows:

$$\left[{}^{i}_{kl}\right]_{(3)} + Q^{i}_{m(3)}\,[k^{m}l]_{(3)} = A^{i}_{kl(3)}\,e^{\lambda x}\,\{\,\tfrac{1}{2}\,(E + \cos\lambda\omega\,)\cdot$$
$$[E + (e^{\lambda} - \cos\lambda\omega)^2\,]\,\sin^{-2}\lambda\omega\}^{-a/2\lambda} \qquad (4.23a)$$

The imaginary world coordinates cause the space condensations $[3] \equiv [3]^{i}_{kl} \equiv \left[{}^{\cap}_{33}{}^{i}_{33}\right]_{+}$, because if ω = 0, sin λω = 0, and [3] would be a consequence. Maximum space condensations result for the spectrum $\lambda_{kl}\,\omega = \pm\,\pi/2\,(2n + 1)$ and thus (4.23a) simplifies to

$$\{[k^{i}l]_{(3)} + Q^{i}_{m(3)}\,[k^{m}l]_{(3)}\}_{\max} \rightarrow A^{i}_{kl}e^{\lambda_{kl}y}[1/2(E + e^{2\lambda y})]^{-a/2\lambda}. \qquad (4.23b)$$

For large y = *r* with *b* = cosλω = const (R_3) we have:

$$\{[3] + Q^{i}_{m(3)}\,[3]\}_{\max} \rightarrow \hat{\varphi}^{i}_{lk} \sim e^{\lambda_{kl}r}\left(\frac{1}{2}\sqrt{\frac{1+b}{1-b}}(e^{\lambda r} - b)^2\right)^{-a/2\lambda} \qquad (4.24)$$

$$\hat{\varphi}^{j}_{lk} \approx e^{-\alpha r}$$

The space condensations thus form a gradient-free field, contrary to the imaginary structure units, which can form all condensation stages.

4.2 The inertia of all Hermetry forms

Each system of condenser sources and sinks can cause a condenser flux. The correlation minima N_{-} are at the same time maxima of the fundamental condensations, which are centers of maximum acceleration effects. The geodetic equation (4.1) also becomes multiplied by $\dot{x}_m\lambda_m\,(k,l)$, thus giving:

$$\lambda_m(k,l)\left[{}^{i}_{kl}\right]^{(\mu\nu)}_{(\kappa\lambda)}\dot{x}^{k}\dot{x}^{l}\dot{x}^{m} = -\ddot{x}^{i}\lambda_m(k,l)\dot{x}^{m}. \qquad (4.25)$$

The expression on the right side of (4.25) can also be obtained from equation (3.20) (with $\hat{\varphi}^{j}_{kl} = \left[{}^{j}_{kl}\right]^{(\mu\nu)}_{(\kappa\lambda)}$ if the correlation signatures are ignored):

$$\overline{\lambda}\left[{}^{i}_{kl}\right]\dot{x}^{i}\dot{x}^{l}\dot{x}^{m} = \left\{\partial_l\left[{}^{i}_{km}\right] - \partial_m\left[{}^{i}_{kl}\right]\right)\dot{x}^{k}\dot{x}^{l}\dot{x}^{m} + \left(\left[{}^{i}_{sl}\right]\left[{}^{s}_{km}\right] - \left[{}^{i}_{sm}\right]\left[{}^{s}_{kl}\right]\right)\dot{x}^{k}\dot{x}^{l}\dot{x}^{m} =$$
$$= -\left[{}^{i}_{km}\right]\dot{x}^{l}\partial_l(\dot{x}^{k}\dot{x}^{m}) + \dot{x}^{l}\partial_l\left[{}^{i}_{km}\right]\sum_{l=1}^{q}\partial_l(\dot{x}^{k}\dot{x}^{m}) + \left[{}^{i}_{kl}\right]\dot{x}_m\partial_m(\dot{x}^{k}\dot{x}^{l}) - \dot{x}^{m}\partial_m\left[{}^{i}_{kl}\right]\sum_{m=1}^{q}\partial_m(\dot{x}^{k}\dot{x}^{l}) -$$
$$-\left(\dot{x}^{l}\left[{}^{i}_{sl}\right]\ddot{x}^{s} - \dot{x}^{m}\left[{}^{i}_{sm}\right]\ddot{x}^{s}\right) = 0. \qquad (4.26)$$

Here $\ddot{x} \neq 0$ as long as (4.25) disappears and then only if $\overline{\lambda}\dot{x}^{i} = 0$ is true. Since $\overline{\lambda}$ and $\dot{x}^{i} \neq 0$, this means that $\overline{\lambda} \perp \dot{x}^{i}$ must apply. **v** is a possible temporal change of location in the area and **w** is the speed of the cosmic expansion. If $\dot{\varepsilon}$ and $\dot{\eta}$ do not change temporally, **w** = c. When $\dot{x}$ is brought into the *world velocity* **Y (6)** in R_6 it is given by:

$$Y(q) = \sum_{i=1}^{6} \dot{x}_i = \overline{v} + i\overline{w} \quad \text{with} \quad \dot{v}^2 = \dot{x}_1^2 + \dot{x}_2^2 + \dot{x}_3^2 = \mathbf{v}^2 \quad \text{and} \quad \overline{w}^2 = c^2 + \varepsilon^2 + \eta^2 = \mathbf{w}^2 \ ,$$

from this follows the orthogonality of the vector of composited condensation stages λ_m (k, l) in the case of complete hermetry, $q = 6$. For the Partial structures $\overline{\lambda}_{(\mu\nu)}^{(\kappa\lambda)}$ the same consideration applies. Referred to the hermetric subspace x (κ, λ, μ, ν), $\overline{\lambda}_{(\mu\nu)}^{(\kappa\lambda)}, \overline{\lambda}$ forms as a mosaic like synthesis that shows that a congruence must in fact exist between $\overline{\lambda}_{(\mu\nu)}^{(\kappa\lambda)}$ and $\lambda \equiv \lambda_m$ (k, l).

If λ − the structures for the world velocity of **Y**, as a general expansion, must be orthogonal, this means that if related to internal coordinates (**v** = 0) a space movement of the condensation develops, such that $\overline{\lambda}_{(\mu\nu)}^{(\kappa\lambda)}$ and $\overline{\lambda}$ must readjust, which represents one of **v** dependent complex turns in R_6 (and/or in R_4). This new reference is effective during the entire duration of acceleration d**v**/dt ≠ 0. The associated reaction appears as a fictitious force, which goes shows up as inertia. Therefore all condenser terms and thus accordingly also energy terms behave in a slow-acting manner. Also the temporal change of state of a hermetric condenser maximum, thus the cyclic condenser flux, takes place in such a way that the condition $\overline{\lambda} \perp \dot{x}^i$ is fulfilled. Only such flux aggregates exist that give the cyclic flux directions $\overline{\lambda}_{(\mu\nu)}^{(\kappa\lambda)}$ which are orthogonal to Y.[viii]

The condensers $\begin{bmatrix} \mu\mu \\ \mu\mu \end{bmatrix}$ appearing with only one partial structure $\kappa_{(\mu)}$ with indexes μ = 1, 2 or 3 to be described, are correlation-free. Therefore they form no structural flux, but fields of quantized space compressions. The hermetry forms c and d are accompanied by real condensers of the type μ = 3, i.e. $\begin{bmatrix} 33 \\ 33 \end{bmatrix} \equiv [3]$, and are therefore ponderable, contrary to the forms a and b.

All hermetry forms containing the condenser $\begin{bmatrix} 11 \\ 11 \end{bmatrix}$ are hermetry form sources from gravitational fields, because this condenser appears with the projection into R_3 as a gravitational field structure. The gravitational field of each body tries to adjust to a Condition of minimum compression of the Metrons, i.e. an isotropic distribution of the lines of flux. If this structure is disturbed by the field of another body, then a tension develops between both bodies, in which both bodies try to reach an isotropic field distribution. This tension is just as large as that of inertial resistance, which the body develops against a change of movement.

Inertia and weight are equivalent therefore, however having completely different causes relative to structure dynamics. Inertia is a consequence of the expansion of the universe. But, gravity is a force field, which is caused by the condenser with the a-Hermetry form. Inertia is not a characteristic of absolute space. It is not caused by the effect of distant stars (Mach principle) and also is not caused by fluctuations of the vacuum (*RUDEA, HAISCH and PUTHOFF* 1994). It is however after *HEIM* and *DRÖSCHER* a consequence of the expansion of the universe.

5. The prototropic basic flux processes and prototrope conjunctors

In the following, for the real structure $\left[\begin{smallmatrix}\frown\\33\\33\end{smallmatrix}\right]_+ = \left[\begin{smallmatrix}i\\kl\end{smallmatrix}\right]_{(3)} \equiv [3]^i_{kl} \equiv [3]$ and also for condensers of the imaginary structure units [μ] = [1] and/or [2] we will use the notation [μ]:

$$\left[\begin{smallmatrix}i\\kl\end{smallmatrix}\right]^{(\mu\mu)}_{(\mu\mu)} \equiv \left[\begin{smallmatrix}\frown\\\mu\mu\\\mu\mu\end{smallmatrix}\right]_+ , \left[\begin{smallmatrix}\frown\\\mu\\\mu\mu\end{smallmatrix}\right]_+ , \left[\begin{smallmatrix}\frown\\\mu\mu\\\mu\end{smallmatrix}\right]_+ = [\mu]. \qquad (5.1)$$

The condensation stages forming $f = 6$ classes for the Hermetry forms $x \triangleq$ (a, b, c, d) are:

$$[1], [2], [1,2], [1,3], [2,3], [1,2,3] \equiv f$$

(This notation means for example $[1,2] \equiv \left[\begin{smallmatrix}12\\12\end{smallmatrix}\right]_+ + \left[\begin{smallmatrix}21\\21\end{smallmatrix}\right]_+$). For the Hermetry form of x we can also write, using (3.28) for the condenser class f in the metric aggregate $V = s_{(i)}$ and (2.10) (with $i = 1, 2, 3$):

$$F_f(x) = (A^i_{kl})^{-1} \{\left[\begin{smallmatrix}i\\kl\end{smallmatrix}\right]^{(\mu\mu)}_{(\mu\mu)} + Q^i_m \left[\begin{smallmatrix}m\\kl\end{smallmatrix}\right]^{(\mu\mu)}_{(\mu\mu)}\} = \exp\{\lambda_{kl} V - c_i \int \left[\begin{smallmatrix}i\\kl\end{smallmatrix}\right] \partial V\}. \qquad (5.2)$$

Using (2.6) the second exponent in (5.2) is:

$$c_s \int [k^s_l]\, dV = (c_s/V_{kl}) \int \psi_{kl}\, dV = a\, \lambda^{-1} \int (E - e^{-\lambda Q})\, d(\lambda V), \qquad (5.3)$$

where $a = c_s/V_{kl}$ and $Q = s_{(1)} + s_{(2)} + s_{(3)}$. With the splitting of the Hermetric gradient into $Q = V + P$ this is:

$$c_s \int \left[\begin{smallmatrix}s\\kl\end{smallmatrix}\right] \partial V = \frac{a}{\lambda} \int (E - e^{-Q})^{-1} \partial(\lambda V) = \frac{a}{\lambda} \ln(e^{\lambda V} - e^{-\lambda P}) + const = \ln\left(\frac{e^{\lambda V} - e^{-\lambda P}}{E - e^{-\lambda P}}\right)^{\alpha}. \qquad (5.4)$$

Starting with (5.2) it follows that $F_f(x)$ can be written:

$$F_f(x) = e^{\lambda_{kl} V} \left(\frac{e^{\lambda V} - e^{-\lambda P}}{E - e^{-\lambda P}}\right)^{-\alpha} \qquad (5.5)$$

The eigenvalue spectrum of the correlating fields $\lambda_{kl} \equiv \lambda^{(\mu\nu)}_{kl\,(\kappa\lambda)}$ differs only by the Factor α of the spectrum for the condensation stages of only one Partial structure and becomes identical for $\alpha = 1$: $\alpha = \lambda_{kl}/\lambda$ (with $\lambda \equiv \lambda(k,l)$).

The individual gradient-forming condensation classes for $Q = V$ can now be examined for possible types using (5.5), and/or (3.30). The cyclic processes express themselves by the fact that imaginary coordinates appear in the exponent.

The condenser fluxes in (5.5) can now be indicated explicitly. The minimum of a condenser of N_x^- (for $F_{\{f\}}(x) = 0$) changes periodically to the condenser maximum N_x^+:

$$\boxed{N_x^+(f)\,N_x^- \equiv F_f(x) \quad \text{mit} \quad x = a,b,c,d} \tag{5.6}$$

For V and *P* the following notation is introduced:

$$s_{(3)} \equiv r = x_1 + x_2 + x_3, \qquad s_{(2)} \equiv t = x_4, \qquad s_{(1)} \equiv \omega = x_5 + x_6$$

The simplest possible processes for the cyclic structure condensations $F_f(x)$ are:

$$\begin{aligned}
F_1(a) &= [E - e^{-i\lambda\omega}]^{-\alpha} \\
F_1(b) &= e^{i\lambda_{kl}\omega}(E - e^{-i\lambda t})^{\alpha}(e^{i\lambda\omega} - e^{-i\lambda t})^{-\alpha} \\
F_2(b) &= e^{i\lambda_{kl}t}(E - e^{-i\lambda\omega})^{\alpha}(e^{i\lambda t} - e^{-i\lambda\omega})^{-\alpha} \\
F_{1,2}(b) &= [E - e^{-i\lambda(\omega + t)}]^{-\alpha} \\
F_1(c) &= e^{i\lambda_{kl}\omega}(E - e^{-\lambda r})^{\alpha}(e^{i\lambda\omega} - e^{-\lambda r})^{-\alpha} \\
F_{1,3}(c) &= [E - e^{-\lambda(r + i\omega)}]^{-\alpha} \\
F_{1,3}(d) &= e^{\lambda_{kl}(r+i\omega)}(E - e^{-i\lambda t})^{\alpha}(e^{\lambda(r+i\omega)} - e^{-i\lambda t})^{-\alpha} \\
F_{2,3}(d) &= e^{\lambda_{kl}(r+it)}(E - e^{-i\lambda\omega})^{\alpha}(e^{\lambda(r+it)} - e^{-i\lambda\omega})^{-\alpha} \\
F_{1,2,3}(d) &= [E - e^{-\lambda(r + it + i\omega)}]^{-\alpha}
\end{aligned} \tag{5.7}$$

The Hermetric types d [1] and [2] act only in the form of $\begin{bmatrix} 11 \\ 11 \end{bmatrix}$ and $\begin{bmatrix} 22 \\ 22 \end{bmatrix}$, thus without correlation and therefore form no condenser flux: $F_1.(d) = 0$.

The coupling maxima of all condenser systems are given by $F_f(x)_{extr}$, if those condensations have a minimum of N^-. The density of Metrons $N^{\pm}$ depends only on the correlation exponent α of the condenser signature concerned. If that Condenser system fulfills the conditions of field activation of the condenser fluxes and the cyclic condition $N^{\pm}$ is present, this gives the condenser fluxes (4.16), whereby some the flux correspond to this, if $\lambda_{kl} = \alpha\,\lambda$ is used. For a shorter representation the classes are symbolized by numbers:

$$\begin{aligned}
1 &\mathrel{\hat{=}} F_1(a) = F_1(b) = F_1(c) \equiv N_a^+(1)N_a^- \equiv N_b^+(1)N_b^- \equiv N_c^+(1)N_c^- \\
2 &\mathrel{\hat{=}} F_2(b) \equiv N_b^+(2)N_b^- \\
3 &\mathrel{\hat{=}} F_{1,2}(b) = F_{1,2}(d) \equiv N_b^+(1,2)N_b^- \equiv N_d^+(1,2)N_d^- \\
4 &\mathrel{\hat{=}} F_{1,3}(c) = F_{1,3}(d) \equiv N_c^+(1,3)N_c^- \equiv N_d^+(1,3)N_d^- \\
5 &\mathrel{\hat{=}} F_{2,3}(d) \equiv N_d^+(2,3)N_d^- \\
6 &\mathrel{\hat{=}} F_{1,2,3}(d) \equiv N_d^+(1,2,3)N_d^-
\end{aligned} \tag{5.8}$$

For these six condenser fluxes the coupling structures of the Hermetry forms must be examined. There starting from the flux class 3 two different indexes of Partial structures arise, and are described by the internal correlation of the structure unit's cyclic Condenser fluxes and their superpositions into a composite field. The Classes 1 to 6 are *prototropic basic flux processes*, which develop in each flux aggregate. Heim calls such a basic flux process **Fluxions**. For a degenerate condenser flux, i.e. if basis and contra signatures are identical, there is no correlation and therefore no Condenser fluxes. Such condensers produce static fields, corresponding to (4.24). If in those condensers $\begin{bmatrix} \cap \\ \mu\nu \\ -+ \\ \mu\nu \end{bmatrix}$ the signatures are $\mu = \nu$, then **singular screening fields** occur, and for $\mu \neq \nu$ correlative screen fields develop. If these act with spacelike i.e. $\mu = \nu = 3$, hermetric coordinates, then the singular Screening field mentioned is called a **straton**.

In the case of gravitons, $x \triangleq a$, this gives one singular screening field and two possible condenser fluxes. For photons and neutral particles, $x \triangleq$ b and c, there exist 6 screening fields, of which 4 are singular screening fields $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \begin{bmatrix} \mu & \mu \\ \mu & \mu \end{bmatrix}, \begin{bmatrix} \mu \\ \mu \end{bmatrix}$,… and 2 correlative screening fields, $\begin{bmatrix} 1 & \mu \\ 1 & \mu \end{bmatrix}, \begin{bmatrix} \mu & 1 \\ \mu & 1 \end{bmatrix}$ and they give 30 condenser fluxes in the coupling structure.

In the case $x \triangleq$ d (charged particles) it gives 9 screening fields (3 singular and 6 correlated) and among them a Straton, which includes 72 coupled condenser fluxes. From 6 no screening field can be deduced.

Because it exists in all subspaces of R_6 it is called a **world fluxion**. The classes 1 to 6 are primitive forms of World architecture or **Prototropes**. However the material characteristics develop only through Correlation of several Prototypes. The following notation is appropriate:

F*luxion derived prototrope*	$\triangleq [-(1,\ldots,6)] = (-k)$
F*orce field prototrope*	$\triangleq \begin{bmatrix} \mu & \nu \\ \mu & \nu \end{bmatrix} \triangleq [+(1,\ldots,5)] = (+k)$
Straton	$\triangleq \begin{bmatrix} 3 & 3 \\ 3 & 3 \end{bmatrix} \equiv [3] \triangleq (+7)$

Straton: A structure field which is determined by the coupling structure of a complex hermetry but free of condensation steps (levels). It is a near force field that has a steep exponential decay.

Prototrope: Primary structures of elementary symmetric condensation steps (levels), which appear in the form of Fluxions or Screening fields. They structure Protosimplexes.

The screening fields with condensation stages (+k) include Fluxions, thus forming the Prototropes (−k). The Straton (+7) determines the Ponderability of Hermetry forms c and d. The Prototropes $k \leq 5$ form the simplest structural systems (± k), which are called **Protosimplexes**. There are in the world fluxions (−6) and (−7) no screening fields and therefore no Fluxions. There exist only 5 Protosimplexes:

$$p_x = (\pm k), \qquad 1 \leq k \leq 5 \tag{5.9}$$

the groups of couplings consist of Protosimplexes whose sources and sinks can exchange themselves over q_j. The hermetry form x is defined as follows by the Protosimplexes:

a: (± 1) A	Self	condensation,
b: $(\pm (123))_b$	Time	condensation,
c: $(\pm (14))_c (+7)_c$	Space	condensations,
d: $(+ (127))_d (\pm (345))_d (-6)_d$	Spacetime condensations[ix]	(5.10)

particles	x\k	(±1)	(±2)	(±3)	(±4)	(±5)	(-6)	(+7)	protosimplexes
gravitons	a	(1)							$p[1] \equiv (\pm 1)_a$
photons	b	(1)	(2)	(1,2)					$p[123] \equiv (\pm 123)_b$
neutral particles	c	(1)			(1,3)			(3)	$p[14][7] \equiv (\pm 14)_c (+7)_c$
charged particles	d			(1,2)	(1,3)	(2,3)	(1,2,3)	(3)	$p[123][4567] \equiv (+127)_d, (\pm 345)_d (-6)_d$
		(x_6x_6)	(x_4)	$(x_4x_5x_6)$	$(x_1x_2x_3x_5x_6)$	$(x_1x_2x_3x_4)$	$(x_1x_2x_3x_4x_5x_6)$	$(x_1x_2x_3)$	condensations
		x			x			x	inertia field
			x	x		x	x		charge field
		fluctons					world flucton	straton	

Table 1: Basic Elements of Hermetries a-d

The number of at all possible Isomers of a Fluxion composed of *N* different basic fluxes is extremely large. Each Fluxion includes a number of elementary basic fluxes, which differ by the number of possible signature permutations.

The eigenvalue spectral values λ and λ_{kl} are constructed from $n_x^{(k)} \geq 1$ protosimplexes $(\pm k)_x$. It will be called therefore the *Protosimplex charge*

$$Q_x^{(k)} = n_x^{(k)} (\pm k)_x \tag{5.11}$$

for the description defining the real Hermetric terms. To the condensation stages composed from partial structures this equation is applicable:

$$(\lambda, \lambda_{kl}) \sim Q_x^{(k)}. \tag{5.12}$$

The composition of the terms of the respective Hermetry forms is determined by Correlation laws, which are defined by a conjunction rule of the Prototrope. There must be given *prototrope conjunctors* −( )−, which make possible the composition of the following coupling structures:

$(\pm 1)_a$
$(\pm 1)_b\ (\pm 2)_b\ (\pm 3)_b$
$(\pm 1)c\ (\pm 4)c\ (+7)c$
$(\pm (127))_d\ (\pm (345))_d\ (-6)_d$

to the appropriate hermetry form. The appropriate conjunction law consists of an exchange process of the fluxion with (±p) and (±q). The exchange takes place only if the correlating condenser fluxes lie in the same subspace of R_6. They must possess the same structural unit $\kappa_{(\mu)} \triangleq \kappa_{kl\ (\mu)}$ (with μ = 1,2,3), with the **conjunctor** −(μ)− over the same structure unit (**conjunction**):

$$(\pm p)\ -(\mu)-\ (\pm q). \tag{5.13}$$

Three conjunctions are to be investigated:

a) *Correlation conjunction* as in (5.13). In this case μ refers to the fluxion relation giving: $\kappa_{(\mu)}$: $-(\mu)- \triangleq \kappa\ (\mu)$

b) *Contact conjunction*: $(\pm q)\ -(\mu)-\ (\mp q)$. A fluxion −(μ)− changes over into a screening field, which changes the contact to another fluxion.

c) *Straton conjunction*: If μ = 3 and the mediating screening field is (+7) : $(\pm q)\ -(3)-\ (+7)$

However all basic fluxes of a fluxion do not have to change into a conjunctor for the correlating change. In the case of the a-hermetry $(\pm 1)_{a,}$ no conjunctor exists. On the other hand the protosimplex triad becomes in accordance with the b-hermetry

$$(\pm 1)_b\ -(1)-\ (\pm 3)_b\ -(2)-\ (\pm 2)_b$$

determined only by the correlation-conjunctions. In the triad of the c-hermetry

$$(\pm 1)_c\ -(1)-\ (\pm 4)_c\ -(3)-\ (\pm 7)_c$$

still another Straton conjunction works along with the correlation-conjunction. With the d-Hermetry the screening field triad (+ (127)) shows up. It comes from the influence of $(-6)_d$ in the contact conjunction giving (+ (127)). The cyclic contact structure is therefore:

$$(+1)_d\ -(1)-\ (-6)_d\ -(2)-\ (+2)_d\ -(2)-\ (\pm 5)_d\ -(3)-\ (-6)_d\ -(3)-\ (+7)_d\ -(3)-\ (\pm 4)_d\ -(1)-\ (+1)_d$$

The fluxions coming into the conjunction (−(q, p)) aggregates are cyclic condenser fluxes, which correlate between structures of maximum N^+ and minimum N^-. The spin of a flux aggregate is specified by the number of cycles necessary to re-establish the initial conditions. The cyclic condenser fluxes become activated by the anti-hermetric portion of its contra signature.

Assuming that *p* and *q* are characterized by the signatures

$$(-p) \triangleq \begin{pmatrix} \kappa & \lambda \\ \nu & \nu \end{pmatrix} \quad and \quad (-q) \triangleq \begin{pmatrix} \alpha & \beta \\ \eta & \mu \end{pmatrix} \tag{5.14}$$

then the same structural unit κ (μ) is contained in both condensers, and over these the conjunction −(μ)− can take place. If $N^{\pm}$ (p, q) represents the corresponding maxima for *p* and *q* in μ, then the following equations apply:

$$(-p) \equiv F_p(\mu) = N^+(p)\begin{pmatrix} \kappa & \lambda \\ \mu & \nu \end{pmatrix} N^-(p) \tag{5.15}$$

$$(-q) \equiv F_q(\mu) = N^+(q)\begin{pmatrix} \alpha & \beta \\ \eta & \mu \end{pmatrix} N^-(q) \tag{5.16}$$

In $\kappa_{(\mu)}$ there exists a phase difference of $\varphi = \pi/2$ between the periods of maximum condensations in F_p and F_q. The conjunction refers to the respective condenser maximum in N^+, if F_p ($N^{\pm}$) coincides with F_q ($N^{\mp}$). Then *Fp*, *Fq* are oriented with respect to κ (μ). Therefore the current vectors of the flux aggregates *F* can be set to $\vec{F}_{pq} \triangleq$ **F.** Regarding κ (μ) there also exist partial spin vectors σ_{pq}, with the number of cycles ω_{pq}: $\sigma_{pq} = \omega_{pq}\, \mathbf{s}_{pq}$, where $\mathbf{s}_{pq}$ is the *fluxion spin* in κ (μ) ($\mathbf{s}_p$ must be parallel to $\mathbf{s}_q$). After correlation the conjunctor (5.13) is only possible if the condition

$$\mathbf{F}_{pq}(\mu) \perp \sigma \tag{5.17}$$

is true. With the spin unit vector $|\ \mathbf{s}_{pq}\ | = 1$, $\mathbf{s}_{pq} = \mathbf{s}^0_{pq}\, s_{pq}$. In this expression $\mathbf{s}^0_p = \pm\, s^0_q$. If $\mathbf{s}^0_p = +s0_q$ −(μ)− would be an *Orthoconjunction*. For $s^0_p = +s_0{}^q$, i.e. in case of anti-parallelism, −(μ)− is a *Paraconjunction*. Through −(μ)− correlation flux called a *conjunctor* is designated. From this ambiguity the existence of a general *conjunctor spin* follows:

$$S\,[(\pm p)_x\ \text{-}(\mu)\text{-}\ (\pm q)_x] = {}^{p}{}_{x}(\mu)^{q}{}_{\pm} \equiv (\mu)_{\pm} \tag{5.18}$$

with $\cos[(\mu)_+, (\mu)_-] = -1$ and $x \triangleq$ (a, b, c).

The Protosimplex conjunctor structure always defines all hermetry forms *x* which are defined by conjunctor structures, a structure of conjunctor spins. That leads to a further isometry: The conjunctor Isometry.

For the time condensations (b) this gives 16 conjugation isometries. In the space condensation of (c), 4 exist, and in the space-time condensation (d) there are 512 conjugation isomers.

6. The Geometrodynamic Origins of Spin, Isospin, Helicity and Anti-particle Structures

1. Similar to flux aggregates, the conjunctor spins are cyclic structure processes whereby the appropriate conjunctive law describes a stable condensation. For the description of the spin of prototrope conjunctions the law of the preservation of angular momentum must apply. If M^{i}_{kl} is an angular momentum tensor in R_6 and w is the Imaginary part of the world velocity vector Y_k (i.e. $w^2 = c^2 + \dot{\varepsilon}^2 + \dot{\eta}^2$), then :

$$w\, M^{i}_{kl} = \xi \times T_{kl} \tag{6.1}$$

where T_{kl} is an energy density tensor in R_6 and $\xi = \sum_{i=1}^{6} x_i$ is a radius vector. For the source of $w\, M^{i}_{kl}$ we have:

$$\mathrm{div}_6 (w\, M^{i}_{kl}) = \mathrm{div}_6 (\xi \times T_{kl}) = T_{kl} - T_{kl}{}^{*} = 2\, T_{kl-}$$

There the anti-hermetric energy density tensor $T_{kl-} = 0$, forces the preservation of the angular momentum in the Hermitesation, and because of (1.4)

$$T_{kl+} \sim (R_{kl} - \tfrac{1}{2} g_{kl} R)^{*}. \tag{6.3}$$

On the other hand the field activation (3.18) causes a spin overlay (3.19) and thus the preservation of the angular momentum of all structures in R_6. M_{kl} is an angular momentum density, when referenced to the spatial spin density $\sigma = \mathrm{sp}\, M^{i}{}_{kl}$ giving:

$$\sigma = M_{ik} = (1/w)\, \mathrm{sp}(\xi \times T_{kl}) = (1/w)\, \xi T_{ik}\,, \tag{6.4}$$

and for the spin moment (spin):

$$s = \iiint 1/w\, \xi T_{ik} dx_1 dx_2 dx_3 \tag{6.5}$$

(in the Euclidean case). In the non-Euclidean continuum $\lambda_{kl}{}^{(\kappa\lambda)}{}_{(\mu\,\nu)}$ describes condensation stages of the structural units, so that in the case of the divergence (3.20) results in the energy density tensor W_{ik}

$$\mathrm{sp}\, K_{ik}{}^{(\kappa\lambda)}{}_{(\mu\nu)} \left[\begin{matrix} \kappa\iota \\ \mu\nu \end{matrix} \right]^{\frown} \sim W_{ik}{}^{(\kappa\lambda)}{}_{(\mu\nu)} \tag{6.6}$$

When an *x*-hermetry is present with a correlation conjunctor (5.13) this entails the conjunctor spin (5.18), whose spatial density is described by (6.4), if $\xi(\mu)$ is the radius of the cyclic conjugation in $\kappa_{(\mu\,\nu)}$ and $P_{ik}(\mu) = \sum_{\varepsilon} W^{(\mu\nu)}_{ik(\kappa\lambda)}$ is that energy density tensor which is compounded from all portions in which the Protosimplexes *p* and *q* are constructed in the conjunction $-(\mu)-$:

$$d\,[\varkappa^{p}(\mu)^{q}\Xi]/dV = 1/w\, \xi(\mu) P_{ik}(\mu). \tag{6.7}$$

ε is the number of signature isomers of basic fluxes. From (6.7) the conjunctor spin in a space with the volume element $dV = dx_1\, dx_2\, dx_3$ results in:

$$ {}_{x}{}^{p}(\mu)^{q}_{\pm} \sim \int (1/w)\, \xi(\mu) \sum_{\varepsilon} spK^{(\kappa\lambda)}_{ik(\mu\nu)} \left[\begin{smallmatrix} \kappa\lambda \\ \mu\nu \end{smallmatrix} \right] dV \qquad (6.8) $$

or approximately:

$$ {}_{x}{}^{p}(\mu)^{q}_{\pm} \sim \int (1/w)\, \xi(\mu) P_{ik}(\mu)\, dV = \int (1/w)\, \xi(\mu)\, dE_{ik}(\mu) \qquad (6.9) $$

with the energy differential $dE_{ik}(\mu) = h\, \nu_{\mu}\, m_{ik(\mu)}{}^{(pq)}$.

The components of $m_{ik\,(x)}{}^{(pq)}$ consist within μ of the simplex with the designated quantum numbers (*p*, *q*). $\xi_i(\mu) = \xi_i{}^{(0)}(\mu)\, u_i(\mu)/2\pi$ is interpreted as the radius of the cyclic conjunction flux path u (μ), that with a "recurrence rate" exists in condensations ν '(μ) of the connection u (μ) ν' (μ) = w. ν' (μ) can be expressed by the rotation frequency ν (μ) of the condenser flux in the conjunctor. A conjunctor is a condenser exchange between two Fluxions of the protosimplexes in the conjunction. Therefore "extended" on u (μ) in each case there are 2 condensers with the flux frequency run ν (μ) "over" and for the recurrence frequency of the condensers are set at u (μ) are ν' (μ) = 2 *ν* (μ). Then from (6.9):

$$ {}_{x}{}^{p}(\mu)^{q}_{\pm} = \pm\, \hbar / 2 \int_{\gamma(\mu)}^{\varepsilon 0} \partial m^{(pq)}_{ik(x)} . \qquad (6.10) $$

$\mathbf{m}_{(x)}{}^{(pq)}$ are tensors of whole positive quantum numbers, which are formed from $m_{ik(x)}{}^{(pq)}$ and $\mathbf{s}_{\mu}$, the unit vector of this conjunctor spin:

$$ \xi_i{}^{(0)}(\mu)\, \partial m^{(pq)}_{ik(x)} = s_{\mu}\ \partial \mathbf{m}^{(pq)}_{ik(x)} . \qquad (6.11) $$

therefore this gives for (6.10):

$$ \boxed{ {}_{x}{}^{p}(\mu)^{q}_{\pm} = \pm \frac{\hbar}{2} s_{\mu} \int \partial\, \mathbf{m}_{(x)}{}^{(pq)} = \pm \frac{\hbar}{2} s_{\mu}\, \mathbf{m}_{(x)}{}^{(pq)} } \qquad (6.12) $$

This spin is called a **Straton spin**, because it arises in R_3, in which each Straton (+7) is defined for the hermetry forms c and d. The sum of the conjunctor spin integrals applies also to the imaginary condensations in a and b. Like those in R_3, these are described by (4.23). The imaginary structure units coming into the condensations cause an R_3-condensation, which, when stratons appear determine the ponderability of the c and d-hermetry, or as pseudo-stratons determine the spatial effective range. Thereby the empirically observed transformations make possible more imaginary (photons) into complex forms (electrons). The imaginary hermetry forms also come into the pseudo-straton characteristics of a space spin.

If $m_x = \sum_{p,q} \mathbf{m}_{(x)}{}^{(pq)}$ is the sum of whole spin quantum numbers and the straton or pseudo-straton spins and $\mathbf{s}_x$ or $\mathbf{s}_0 = \mu \sum s\mu$ are the appropriate unit vectors, then (6.12) is:

$$ s_x = \sum_{p,q,\mu} {}_{x}{}^{p}(\mu)^{q}_{\pm} = \pm \sum_{\mu} s_{\mu} \sum_{p,q} \mathbf{m}_{(x)}{}^{(pq)} . \qquad (6.13) $$

Then for the Straton spin:

$$\boxed{s_x = \pm\frac{\hbar}{2} s_0 m_x} \qquad (6.14)$$

and with the notation $\boldsymbol{\sigma}(x) = \mathbf{s}_0 m_x / 2$:

$$\mathbf{s}_x = \pm\hbar\sigma(x)$$

The Straton spin consists of a portion σ_r in R_3, and a portion σ_t, which exists in V_3 ($x_4\, x_5\, x_6$), with $\sigma_r(R_3) \perp \sigma t(V_3)$. σ_r indicates the **space spin** J of the stratons or pseudo-stratons given by $J = Q/2$:

$$\mathbf{s}_x = z\, J,$$

where z is a direction vector in space, which depends on the flux phase φ fluxion conjugated condenser extrema:

$$z = \cos(\mathbf{v}, \mathbf{e}_r)\, e^{i(\pi J + \varphi)}. \qquad (6.17)$$

σ_r is to be understood as a cyclic movement of the inertial mass of the term x. Therefore each R_3-velocity must adjust itself as $\mathbf{v} \parallel \mathbf{e}_r$, and this becomes $\alpha_P = \cos(\mathbf{v}, \mathbf{e}_r) = \pm 1$. Since $\varphi = \pi/2$, (6.17) becomes :

$$z = i\,\alpha_P\, e^{i\pi J} = i\,\alpha_P\,[\cos(\pi J) + i\sin(\pi J)]. \qquad (6.18)$$

For $Q = 2n$ (n = positive whole numbers), $J = Q/2 = n$, and (6.18) becomes $z = i\alpha_P\,(\pm 1)$. $Q = 2n + 1$ in (6.18) becomes: $z = -\alpha P$. From this follows $z(J) = i\,\alpha P\,(-1)^J$. Here $\alpha_P\,(-1)^J = P_\alpha$ will be designated as the **parity** of the term x. With the two components $\sigma_t = i\,s$ and $\sigma_r = i\,J\,P\alpha$ this is the general straton spin:

$$\boxed{\sigma(x) = i\,(\mathbf{e}_t\, s + \mathbf{e}_r\, J\, P_\alpha)} \qquad (6.19)$$

with $s = P/2$, $J = Q/2$, $P_\alpha = \alpha_P\,(-1)^J$, where s, J, Q, P are real numbers. The component σ_t is always imaginary; and σ_r in this case becomes a real half integer J. J is interpreted as a quantum number of the space spin $\hbar\,\sigma_r$, i.e. as quantified angular momentum of the hermetry form x. The imaginary part s of the straton spin is an internal characteristic of the straton's R_3 -projected conjugate structure, a conjugate isometry projected structure representing an R_3-projection. With same protosimplex structure arise different projected conjunctor structures in the c and d forms. The terms of this conjugate isometry combination are subject to an isomorphism regarding J, which is expressed in s. Because of this spin isomorphism one calls $\sigma t = i\,s$ the **isomorphic spin** (isospin).

(Isospin usually denotes a shortened form of isotopic spin in particle physics, not related to angular momentum)

The number of spin isomorphic transformations λ_{kl} gives a term I resulting in $I = 2s + 1 = P + 1$, and for the maximum number of spin isomorphisms $\lambda_{kl,}$ $P = P_{max}$ is an index which describes a structural class of the straton fields (+7) in R_3 which appear in the form of $P_{max} + 1$ multiplets.

If the number k contains the configuration characteristics of the condenser source systems (Ih, IIh, Ia, IIa), then there is a k for each (−7) characteristic index. $P_{max} = G(k)$ indicates the number of sub

constituents of the stratons, and G is a positive whole number, $G = k + 1$. Therefore all components of a spin isomorphic multiplet with different hermetry forms must be characterized by the same k-value.

The algebraic character of the space spin σ_r depends on P_α, thus on the even or uneven character of $J = Q/2$. With a positive whole number n it follows that $Q = 2n \rightarrow J = n$, and the space spin is imaginary: $\sigma_r = \pm i\, n$. In the case $Q = 2n + 1$, J becomes half-integer and $P_\alpha = \pm i$, so that $\sigma_r = \pm J$ is real and half-integer. λ_{kl} − terms with $J = (2n + 1)/2$ are called **spinor terms**. Since $\sigma_r = \pm J\, s$ is real, such a spinor in the real R_3 space is forbidden and the existence for every different Spinor term is impossible. Therefore no intensity is definable in the sense of tensor terms. But spinor terms *justify the use of the object*. It is therefore used to differentiate between the spatial object of spinor terms and the nonobjective tensor terms.

2. After Heim there would result possible anti-structures if in R_6, besides the Space-time R_4 with $x_4 = i\,ct$ there exists another anti-space-time R_4^- with $-i\,ct$. This however can not be directly proven. Related to $R_4 \mathrel{\hat{=}} R4^+$ there would be besides the fluxions and conjunctor spins of the flux aggregates and besides the Straton spin $s_x^+ \mathrel{\hat{=}} s_x\,(R_4^+)$ an appropriate enantio stereoisomer giving structures such as anti-structures and an anti Straton spins $sx \mathrel{\hat{=}} sx\,(R_4^-)$. Their spin structures are mirror-symmetric to R_4^+ oriented structures and appear in R_4^- as a normal structure. The investigation with anti conjunctors $-(\mu^-)-$ and anti- protosimplexes result in anti-gravitons and anti-photons that differ from the normal only by the orientation of the polarization plane. On the other hand the neutral anti-particle c differs as enantio stereoisomer Spin structures of the normal c^+, which on the mirror-symmetric permutation of all conjunctor spins and Straton spins go back. The same applies also to the d-Hermetrie. But in this case the protosimplex (±5) and the world fluxion (−6) arise. Both are caused by the conjunctor $-(2\pm)-$ in electrical charge structure, which entails a simultaneous electrical charge conjugation.

In that R_6 is independent of the $R_4^\pm$ -dependence, $\lambda_{kl} \perp \mathbf{x}_4$ is always attainable. Therefore it is possible to refer integral cyclic condenser flux to a temporal sense of rotation $\mathbf{S} \parallel \mathbf{x_4}$ in such a way that

$$\varepsilon = \cos(\mathbf{S}, \mathbf{x}_4) \qquad (6.20)$$

is defined as **time helicity**. In relation to $R^4_\pm$ this gives:

$$\cos((\mathbf{S}, \mathbf{x}_4) = \pm 1 \quad \text{or} \quad \varepsilon\,(R_4^\pm) = \pm 1 \qquad (6.21)$$

All quantum numbers $C_\pm\,(R_4^\pm) = -C_\mp$ become with $\varepsilon\, C_\pm = C$ of **S** and thus from the $R_4^\pm$ -related independently.

The R_4^- -hermetry forms a^- and b^- are imponderables like a and b, and the complexes c^- and d^- are ponderables like c and d. Regarding conjunctor and straton spins as well as the electrical charge differentiates R_4−-structures from those of R_4^+, because of the symmetry of all these flux aggregates, are related to $x_4^\pm$ – the direction of the cosmic expansion of all $R_3^\pm$, those are oriented taking place in the $R_4^\pm$ with antiparallel world velocity **Y**±. Spin and charge conjugations are relative, related to the **Y**± -direction.

3. The composited condenser terms λ_{kl} (x) are identical to the empirical elementary matter field quanta M_q. The coupling structure, which determines λ_{kl} (x), becomes mediated by cyclic condenser fluxes $N^\pm(\ )N^\mp$ over internal correlation maxima N^- by the conjunctors $-(\mu)-$. The coupling structure is overlaid on the general integral Straton spin. Therefore there are two classes of possible correspondences (for example, outer stronger Exchange effects):

With *space spin correspondences Rk* a matter field quantum M_X, represented by λ_X, is disturbed by another M_y. For the correspondences, symbolized by the *Spin conjunctive*

$$-[M_X, M_Y]- \mathrel{\hat{=}} -[J_X, J_Y]-, \qquad (6.22)$$

the approach to parallelism of the spin vectors must be demanded $\mathbf{s}_X \parallel \mathbf{s}_Y$, i.e. cos ($\mathbf{s}_X$, $\mathbf{s}_Y$) = ±1. Then this space spin correspondence exists:

$$\lambda_X - [M_X, M_Y] - \lambda_Y \qquad (6.23)$$

The *structure correspondence Sk* indicates the coupling structure of a λ-term. In cyclic condensation fluxes $N^{\pm}$ ( ) $N^{\mp}$,the correlation minima of a fluxion are the N^{+} maxima of the fundamental condensation flux. These maxima are because of the geodetic characteristic (4.1) which is a maximum at the same centers of maximum accelerations (correspondence maxima). N^{+} is identical with $\lambda_{kl} \equiv \lambda_{kl}{}^{(\kappa\lambda)}{}_{(\mu\,\nu)}$. These λ_{kl} exist in $\lambda \equiv \lambda\,(k, l)$ to metaphorical mosaic samples together.

The elements $n = n\,(\hat{g}\,(x))$ define n^2 fundamental condensers, less the number of screening fields thus $Z = n\,(n - 1)$.

For the hermetry form a this is applicable:	$n_a = 2$	and $Z\,(a) = 2$,
for the type $x \mathrel{\hat{=}}$ b, c :	$n_b = n_c = 6$	with $Z\,(b) = Z\,(c) = 30$,
and for $x \mathrel{\hat{=}}$ d :	$n_d = 9$	with $Z\,(d) = 72$.

λ is a "model of structural source of correspondence fields". The number of sources of correspondences in field Z is equal to the number of the condensers which do not contain screening fields. $Z\,(x)$ must be determined from $\hat{g}\,(x)$. These $Z\,(x)$ arise not individually, but they form condenser maxima λ_{kl} for signature isomers of the basic flux of a Fluxion (−p), which is supplemented by the screening fields (+p) in the protosimplex (±p). In each case such a structure (±p) contains a whole spectrum of sources of correspondence fields.

If a matter field quantum M_X, which is in undisturbed dynamic equilibrium, is disturbed by another structure M_Y and/or λ_Y, then a general *Sk* is introduced by a *screening field correspondence*, which is a superposition of the screening fields $(+p)_X$ and $(+q)_Y$. This **superposition conjunctive** is symbolized by:

$$(+p)_X - [\hat{\mu}] - (+q)_Y. \qquad (6.24)$$

By the disturbance of the correlation state (5.13) a new integral structure of both matter field quanta causes development by the **correspondence conjunctive** $M_X \rightarrow M_Y$:

$$(\pm p)_X - |\mu> - (\pm q)_Y, \qquad (6.25)$$

if M_X causes a condenser flux toward M_Y. A stable structure requires that a reversal of the flux takes place:

$$(\pm p)\,X - <\mu| - (\pm q)_Y. \qquad (6.26)$$

A super ordinate aggregate develops, if both conjunctives are super ordinates to the **simultaneous conjunctives**. In this way a correspondence system is formed, Sk gives, from M_X and M_Y: $\Lambda\,(M_X\,M_Y)$ which produces:

$$(+p)_X - [\hat{\mu}] - (+q)_Y \rightarrow (\pm p)_X - |\mu> - (\pm q)_Y \rightarrow (\pm p)_X - <\mu| - (\pm q)_Y \rightarrow$$

$$(\pm p)_X - |\mu> - (\pm q)_Y + (\pm p)_X - <\mu| - (\pm q)_Y \mathrel{\hat{=}} (\pm p)_X - (\hat{\mu}) - (\pm q)_Y. \qquad (6.27)$$

Besides the Rk with (+p) and (+7) with $p < 5$ still gives 6 classes of screen field correspondences, and because of (− p) and (−6) there are still additional classes of 6 flux Correspondences. From (6.27) with (6.24) Heim develops a general theory of the correspondence fields, which leads to a unified spectrum of possible elementary particles and their inner structures.

7. Determination of the sum of the partial masses in an elementary structure

From the mass spectra $m(n, q)$ from (2.21), which represents a pseudo continuum, those ponderable mass terms are separated from all possible terms with a term selector T; $m\,(n, q) = M\,(\mathrm{c}, \mathrm{d})$.

With a second selector the logically possible mass terms M (c, d) which have a sufficiently long life span to be measurable, will be extracted from these.

The fluctuation characteristic of each Protosimplex $(\pm\mathrm{p})_x$ of the Hermetry form x causes a condensation state $\lambda_{kl(\mu\nu)}^{(\kappa\lambda)} \equiv \lambda_{kl}$ which, following (4.26) is an inertial characteristic, accordingly $\lambda_{kl} \perp \mathbf{Y}$. Each $(\pm\mathrm{p})_x$ therefore becomes an inertial effect with a mass assigned, if $(\pm\mathrm{p})_x$ is inserted by conjunctive fluctuations into the internal structure of the mass term. The different values of the inertia (±p) of an x refers to the orthogonality of λ_{kl} to the world velocity vector and is an integral multiple $N \equiv N_{(\mu\nu)}^{(\kappa\lambda)}$ of a minimum unit condensation $\lambda_{kl\,(0),}$ corresponding to a unitary protosimplex:

$$\lambda_{kl}\,[(\pm\mathrm{p})_x)] = \mathrm{N}\,\lambda_{kl\,(0)}. \qquad (7.1)$$

The whole number N, which describes the multiples of the elementary configuration sample $\lambda_{kl\ (0)}$ are called *Protosimplex charges*. Here λ_{kl} represents a curvature measure of the metric configuration stages. They define a radius of curvature $\varepsilon_{kl} = 1/\lambda_{kl}$. Then the radii of the condensation stages is $\rho_n = \mathrm{n}\,\varepsilon_{kl}$. If $k > 0$ the configuration index is $\lambda_{kl\,(0)} = \lambda_{kl\,(0)}\,(\mathrm{k})$. This indicates which number of possible basic flux processes in the c and d-terms that unit structure indicates. The lowest barriers for the partial structures c and d were indicated in (2.62) to (2.65) as m_1, m_0 and $m_{(0)}$. The Protosimplex $(\pm\mathrm{p})_{\mathrm{c,d}}$ must therefore have these minimum masses for the Protosimplex charge $N = 1$.

The deviations of the measured electron mass to the theoretical value (2.63) make necessary a correction within ranges of low metron number. The difference $m_1 - m_0 > 0$ is the characteristic of the two common protosimplexes $(\pm4)_{\mathrm{c,d}}$ and $(+(1,7))_{\mathrm{c,d}}$. The characteristics of m_0 are $(\pm1)_{\mathrm{c}}$ and (+7)c. The deviation between coupling structures m_1 and m_0 is given by $(\pm\,(3,5))_{\mathrm{d}}$, $(+2)_{\mathrm{d}}$ and $(-6)_{\mathrm{d}}$. If two conjunctions in (±p) are set, they are to be written symbolically as: = (±p)−.

In the hermetry form d, (±5) and (−6) have charge characteristics (±4) and (+7) and are connected through the following conjunctions:

−(2) − (±5) −(3)− (+7) −(3)− (±4) −(1) − and

=(1,3)= (−6) −(2)− (+2) −(2)− (±5) −(3)−

and/or. =(1,2)= (−6) −(3)− (+7) −(3)− (±4) −(2)−.

Because of the conjunctor's spin there remains a latent charge component from (2.43) and this reduces $\varepsilon_{0\pm}$ to $e_R < \varepsilon_0\pm$. The lower barrier of the c-spectrum of m_0 can be accepted as accurate. On the other hand m_1 is only an approximate value. The correction can determined from that inertial contributions of the protosimplex of the elementary configuration sample. The elementary configuration sample $N = 1$ for an electron for the d-term is

$$(+(1,2,7)),\ (\pm\,(3,5)),\ (-6),\ (\pm4).$$

m_1 is therefore reduced by the factor $u = (m_1 - m_e)\,/m_1 > 0$, which is due to internal structure, and this contributes to the value of the total inertia because $\lambda_{kl\,(0)} \perp \mathbf{Y}$.

Because of the R_3-cell distribution one can define a *v* Metron surface of the source of the charge field, F(v), between $v = z$ and $v = z - 1$. These are metrons which lie between the inner and outer areas of the charge field. The cyclic Partial conjunctor P_j, which corresponds to the conjunctor −(j)− (with j = 1, 2, 3), changes (+ (1,2)) to the R_3-Structure field (+7) and by (4.24) within the range *F* by Potential W_j in the sense of the metronic change taking place within the range of low Metron number.

So far Heim theory without the Metron calculus was presented. This is now no longer possible, because for the correction calculations in the range relatively small metrons a continuous calculation is no longer possible.

The metron differential is characterized by Δ, where Δ is a variation of the order of magnitude describing $\sqrt{\tau}$. Then the following starting equation can be made:

$$\Delta u / u = \Delta F / F + \sum_{j=1}^{3} \Delta F_j / F_j \,. \tag{7.2}$$

F indicates the increase of the Metron values within the range of the metaphorical surface of the d-term. For *F* this can be set using (4.24):

$$F \sim 1/\varphi(r) \sim e^{\alpha r(v)} \,. \tag{7.3}$$

To the three cyclic partial conjunctures (contact conjunctures) these equations apply:

$$\text{P (1)} \triangleq (\pm 3) -(1)- (\pm 4) -(1)- (-6) -(1)- (\pm 3) \tag{7.4}$$
$$\text{P (2)} \triangleq (\pm 3) -(2)- (\pm 5) -(2)- (-6) -(2)- (\pm 3) \tag{7.5}$$
$$\text{P (3)} \triangleq (\pm 4) -(3)- (\pm 5) -(3)- (-6) -(3)- (\pm 4). \tag{7.6}$$

P (1) and P (2) are complementary related to the imaginary structure units (1) and (2), and thus $W_1 = W_2 = W$. With $W_3 = U$, (7.2) becomes:

$$\Delta u/u - \Delta F/F = 2\Delta W/W + \Delta U/U. \tag{7.7}$$

During the metronic integration of (7.4) it is to be noted that *F* takes on values from $v = z - 1$ to $v = z$, *u* from 0 to a fixed value u_0, and *W* between the potentials $V_{\varepsilon,\varepsilon}$ and $V_{r,\,r}$ (after (2.52)) and *U* between $V_{\varepsilon,\varepsilon}$ and $V_{D,\varepsilon}$ (with $e_D = \varepsilon_{0\pm} - e_R$). Then the integration of (7.4) is:

$$\ln(u/u_0) - \ln [F(z)/F(z-1)] = 2 \overset{(RR)}{\underset{(\varepsilon\varepsilon)}{S}} \Delta \ln W + \overset{(D\varepsilon)}{\underset{(\varepsilon\varepsilon)}{S}} \Delta \ln U$$
$$= 2 \ln (V_{RR}/V_{\varepsilon\varepsilon}) + \ln (V_{D\varepsilon}/V_{\varepsilon\varepsilon}) \tag{7.8}$$

The m_1 correction factor, using (2.52) to (2.54) is given by:

$$u = [F(z)/F(z-1)]\, u_0\, \eta^2(1 - \eta) \tag{7.9}$$

Therefore the function $F(z)$ we can see must be determined metronically[x]

Because of (A.5) and (A.11), $F(z)/F(z-1)$ in (7.9) can be set to:

$$u = u_0\, \xi\, \eta^2\, (1 - \eta). \tag{7.10}$$

The constant u_0 must be understood as the arithmetic mean of the coupling constants α_j, which refer to the partial structures P_j of the electron. Because of the correlation of P_j with P_i ($i \neq j$) the same correlation on Pj gives the following double sum:

$$u_0 = 2/3 \sum_{j=1}^{3} \alpha_j$$

Since $W_1 - W_2 = W$ this also gives $\alpha_1 = \alpha_2 = a < \alpha$, if α is the correct value of the fine structure constant as approximated by (2.60). P1 and P2 are caused by the imaginary structure units $\kappa_{(1)}$ and $\kappa_{(2)}$. They are more weakly coupled than the b hermetry to the charge field. The constant α_3 has the strongest coupling, a value of $\beta \approx 1$. Therefore,

$$u_0 = 2/3\ (\beta + 2a) \tag{7.11}$$

and with $a = \alpha/16\pi e$ and the substitution

$$f = \beta + \alpha/(8\pi e) \tag{7.12}$$

as well as $m_1 - m_e = u_0 m_1$ we get from (2.63) the **corrected mass of the electron**:

$$m_e = m_1(1 - u_0) \tag{7.13}$$

$$m_0 = \frac{4}{cs_0}\sqrt[4]{\pi}\sqrt[3]{3\pi s_0 \gamma \hbar}\sqrt{\frac{c\hbar}{3\gamma}} \tag{7.14}$$

$$m_e = \frac{m_0}{\eta\sqrt[3]{\eta}}[1 - 2/3(f\xi\eta^2(1-\sqrt{\eta})] \tag{7.15}$$

using (7.10), (7.11) and (7.12), which agrees with the empirical value.

The mass m_0 could possibly be interpreted as the mass of a Lepton neutrino ν_L and $m_{(0)}$ as that of a Baryon Neutrino.

For $N = 1$ the protosimplex combination, which forms the masses of the unit structures m_e, m_0 and $m_{(0)}$, by the combination of the ponderable inertia becomes:

$$(\pm(1,4))_x\ ,\ (+7)_x \mathrel{\hat{=}} \mu_+ = m_{(0)} - m_0 \tag{7.16}$$

and in the case of the d-hermetry by the condensations for the charge field gives:

$$(\pm(2,3,5))_d\ ,\ (-6)_d \mathrel{\hat{=}} \mu_- = m_e - m_0 \tag{7.17}$$

The mass μ_S the straton spin, which is defined by the conjunctor field, reads:

$$\mu_S = m_{(0)} - m_e, \tag{7.18}$$

where $m_{(0)} = m_e/\eta$ is a neutral complement to m_e. Thus the Partial masses are:

$$\begin{aligned} \mu_+ &= 4\,\mu\,\alpha_+ \\ \mu_- &= 4\,\mu\,\alpha_- \\ \mu_S &= (1 - \alpha_-/\alpha_+)\,\mu_+ \\ \mu &= m_0/4 \end{aligned} \qquad \}(7.19)$$

With (7.19) and (7.14) the conditional equations for $\alpha_\pm$ become:

$$\eta^2(1+\alpha_+) = \eta(1+\alpha_-) = \frac{1}{\sqrt[3]{\eta}}\{1 - 2/3[\xi\eta^2(1-\sqrt{\eta})]\} \qquad (7.20)$$

The elementary masses M (c,d) are derived from the components (±p) and from that portion of the conjunctor m_S as well as – in the case of the d-Hermetry – together with a charge portion M_q :

$$M\,(\mathrm{c,d}) = M_P + M_S + M_\mathrm{q}. \qquad (7.21)$$

In the derivation of the field equation (6.6), the matrix spectrum is proportional to the energy density tensor $W_{ik}{}^{(\kappa\lambda)}{}_{(\mu\nu)}$, corresponding to the matter tensor $M_{ik}{}^{(\kappa\lambda)}{}_{(\mu\nu)}$:

$$W_{ik(\mu\nu)}^{(\kappa\lambda)} \sim \Delta V\, M_{ik(\mu\nu)}^{(\kappa\lambda)} \qquad (7.22)$$

The metronic volume element ΔV_s in R_3 is not defined, because for $0 \le s \le 3$ there can be metronic constant coordinates. There are therefore 4 possible volume elements, with $\Delta_V = \Delta/\Delta V_s$ and $\Delta Vs = \beta_s \prod_{k=1}^{3-s} \Delta_k()$ and β_s = const.

This is $$\Delta_V M_{ik(\mu\nu)}^{(\kappa\lambda)} \sim \lambda_{ik(\mu\nu)}^{(\kappa\lambda)} \left[\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right]_+$$

The right side is a tensor of the spacetime-like effective density and describes the condensation state as well because $\lambda_{ik(\mu\nu)}^{(\kappa\lambda)} \perp \mathbf{Y}$, the inertial state of the coupling group $(\pm p)_{(\mu\nu)}^{(\kappa\lambda)}$. The metron differential $\Delta_V(\lambda_{ik(\mu\nu)}^{(\kappa\lambda)} \left[\begin{smallmatrix}\kappa\lambda\\ \mu\nu\end{smallmatrix}\right]_+) \sim \mu_+ P_{ik(\mu\nu)}^{(\kappa\lambda)}$ is a fluctuation tensor which is proportional to the protosimplex charge $P_{ik(\mu\nu)}^{(\kappa\lambda)}$. The protosimplex charge can fluctuate around a constant value. The change tensor and/or -selector, based on the whole number N, consists of an imaginary and a real part:

$$\mathrm{P_{ik}}_{(\mu\nu)}^{(\kappa\lambda)}\,;\mathrm{N} = \mathrm{G_{ik}}_{(\mu\nu)}^{(\kappa\lambda)} + \mathrm{i}\,\mathrm{F_{ik}}_{(\mu\nu)}^{(\kappa\lambda)}. \qquad (7.24)$$

For determining the ponderable terms only the real part of the selector is needed, depending on the dynamic state of the internal correlative coupling structure. In the state of an undistorted dynamic equilibrium the real part is:

$$\Re e P_{jk(\mu\nu)}^{(\kappa\lambda)}; N = A_{ik(\mu\nu)}^{(\kappa\lambda)} = const.\ . \qquad (7.25)$$

With the basic dynamics of an exchange effect or with the decay of a term into lower states the imaginary part $i F_{ik(\mu\nu)}^{(\kappa\lambda)}$ changes the energetic levels. F_{ik} implies the energetic range of all ponderable terms. These terms are a measure of the life time of the c and d-terms.

That real part of (7.23) is

$$\Delta_V M_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} \sim \Re e\, \Delta(\lambda_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} [{}_{\mu\nu}^{\kappa\lambda}]_+) \sim \Re e\, \mu_+ P_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} = \text{const.} . \tag{7.26}$$

and a trace calculation leads to the following expression:

$$\Delta\Delta_V \, spM_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} \sim \mu_+ \, spP_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} . \tag{7.27}$$

For the R_3-volume element ΔV_s, four configurations exist because of the four existence zones $0 \le s \le 3$ of the correlating condenser fluxes (i.e. protosimplexes) in this space. Therefore in each case within a configuration where the condenser's signature range is defined in it, $\varepsilon = \varepsilon(s)$ are to be summed up. With natural whole numbers $N \ge 0$ this becomes changed over from tensors to metaphorical quantities in the zones s, accordingly

$$\sum_{\varepsilon} M_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} ; N = M_{s+1} \quad \text{und} \quad \sum_{\varepsilon} P_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} ; N = P_{s+1} = \text{const} \tag{7.28}$$

a calculation of the trace gives:

$$\Delta\Delta_V \, spM_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} \sim \mu_- \, spP_{ik}{}_{(\mu\nu)}^{(\kappa\lambda)} . \tag{7.27}$$

For this R_3 volume element ΔV_s there exist four configuration existence zones $0 \le s \le 3$ because of the correlation of condenser flux zones (ie protosimplexes) in space. Therefore in each configuration zone its summed condenser signature $\varepsilon = \varepsilon(s)$ will be defined with s being summed. With natural integers $N \ge 0$ tensors in zone s transform to metaphorical quantities, according to

$$\Delta\Delta_V M_{s+1} = (\Delta^2/\Delta V_s) M_{s+1} = B_{s+1} \mu_+ , \tag{7.29}$$

or:

$$\Delta^2 M_{s+1} = \mu_+ \alpha_{s+1} \prod_{k=1}^{3-s} \Delta_k \nu_k , \tag{7.30}$$

with $\alpha_{s+1} = B_{s+1}\beta$. The integration yields:

$$\Delta M_{s+1} = \mu_+ \alpha_{s+1} \prod_{k=1}^{3-s} \nu_k \tag{7.31}$$

(for s = 3 this is $\prod_{k=1}^{3-s} \nu_k = 1$). If spherical symmetry exists in $R_{,3,}$ then $\nu_k = \nu_{k+1} = \nu$ and after metronic integration,

$$M_{s+1} = \mu_+ \alpha_{s+1} S v^{3-s} \qquad (7.32)$$

After carrying out the metronic integration it follows for

$$s = 0: \quad M_1 = \mu_+ \alpha_1 \tfrac{1}{4} N_{(1)}^2 (N_{(1)} + 1)^2, \qquad (7.33)$$
$$s = 1: \quad M_2 = \mu_+ \alpha_2 \tfrac{1}{6} N_{(2)} (2N_{(2)}^2 + 3N_{(2)} + 1), \qquad (7.34)$$
$$s = 2: \quad M_3 = \mu_+ \alpha_3 \tfrac{1}{2} N_{(3)} (N_{(3)} + 1), \qquad (7.35)$$
$$s = 3: \quad M_4 = \mu_+ \alpha_4 N_{(4)}. \qquad (7.36)$$

The inertial part of the protosimplex M_p is determined from M by:

$$M_p = \sum_{j=1}^{4} M_j$$

This fourfold summation is a fundamental property of all straton-like elementary structures (i.e., c and d-hermetry forms).

The straton mass Ms(c,d) must be proportional to the standard factor μ_s from (7.19), and a function F_s that depends, because of (6.19), on the quantum numbers P and Q, on the baryon number k and on the quantum number q of the charge field. Therefore it follows (in summing up the j number):

$$M_s = M_5 = \mu_s F_s(k, P, Q, q) \qquad (7.38)$$

and using (6.19):

$$M_5 = \mu_+ (1 - \frac{\alpha_-}{\alpha_+}) F_s \qquad (7.39)$$

(F_s is independent of q). The mass part of the charge field is

$$M_q = M_6 = \mu . q = \mu_+ q \frac{\alpha_-}{\alpha_+} \qquad (7.40)$$

Therefore the complete mass expression is:

$$M(c,d) = \sum_{i=1}^{6} M_i := \mu_+ [\tfrac{1}{4} \alpha_1 N_{(1)}^2 (N_{(1)} + 1)^2 + 1/6 \ \alpha_2 N_{(2)} (2N_{(2)}^2 + 3N_{(2)} + 1) + \tfrac{1}{2} \alpha_3 N_{(3)} (N_{(3)} + 1) + \alpha_4 N_{(4)} + (1 - \frac{\alpha_-}{\alpha_+}) F_S + q \frac{\alpha_-}{\alpha_+}] \qquad (7.41)$$

In this equation, the numerical quantities $N_{(j)}$, α_j , and the spin function F_s must be determined. $N_{(j)}$ are integral time functions, that are composed of the whole computation time parameters $n_{(j)}(t)$ and constant quantum numbers Q_j : $N_j(t) = n_j(t) + Q_j$. The consequences $1 \leq j \leq 4$ are symbolized alternatively with 1, 2, 3, 4 or n, m, p, σ, because with these states the Protosimplex set up in the R_3-domain can be described. If $n = m = p = \sigma = 0$, then it concerns the ground state described by Qj. There those protosimplex charges N with condensation stages $\lambda_{ik(\mu\nu)}^{(\kappa\lambda)} = N \lambda_{0(\mu\nu)}^{(\kappa\lambda)} \perp \mathbf{Y}$ (with $N \equiv N_{(\mu\nu)}^{(\kappa\lambda)}$, as given before) are always

identically normal to the corresponding fluxions $(-p)^{(\kappa\lambda)}_{(\mu\nu)}$ and /or the fluxion spin σ, giving for ($\pm$ p) two possibilities $(-1)^r = \pm 1$, where r is the metric-combinatorial characteristic structure quantum number.

The number of condensation stages and/or the basic fluxes in a specific $(\pm p)_\kappa$ is κ. Each basic flux L has a flux spin $\sigma^{(\kappa\lambda)}_{L(\mu\nu)}$ with $1 \le L \le \kappa$. For all fluxions we have $\sigma^{(\kappa\lambda)}_{L(\mu\nu)} \parallel \lambda^{(\kappa\lambda)}_{0(\mu\nu)}$, i.e. $\cos(\lambda_0, \sigma_L) = (-1)^L$. The number of alternating σ_L representations, $(-1)^L$, in the case of $\lambda^{(\kappa\lambda)}_{0(\mu\nu)}$ is $Z^{(\kappa\lambda)}_{(\mu\nu)\kappa} \equiv Z_\kappa$. With $N = 1$ the metron differential of order κ is formed, that in the direction $(-1)^L$ can be written:

$$Z_\kappa = |\Delta^k(\text{-}1)^L| = 2^\kappa |(\text{-}1)^L| = 2^\kappa. \qquad (7.42)$$

and for the complete set of alternating representations: $Z = 2\,Z_\kappa$. Z_κ can also be regarded as density of one distribution of Z_V in accordance with $Z\kappa = \Delta_\kappa Z_V$ or $\Delta Z_V = Z_\kappa\,\Delta\kappa$. The metronic integral is:

$$Z_V = \sum_\kappa \left|\Delta^\kappa (-1)^L\right| \Delta\kappa = \left|\Delta^{\kappa-1}(-1)^L\right| = \tfrac{1}{2}\, Z_\kappa |(\text{-}1)^L|. \qquad (7.43)$$

The occupation of the ground state Q_j with the digit κ is given by: $Z_\kappa = 2^\kappa$, $Z = 2Z_\kappa$ and $Z_V = 1/2Z_\kappa$.

The R_3 contouring of the straton-like terms is given by the occupation with protosimplex number $N_{(j)}$ in (7.33) to (7.36) as:

$$\begin{aligned} G_1 &= \tfrac{1}{4}\, N_{(1)}^2(N_{(1)} + 1)^2, & G_2 &= 1/6\; N_{(2)}(2N_{(2)}^2 + 3N_{(2)} + 1), \\ G_3 &= \tfrac{1}{2}\, N_{(3)}(N_{(3)} + 1), & G_4 &= N_{(4)}. \end{aligned} \qquad (7.44)$$

The protosimplex occupation increases as $j = 1$ for cubic, $j = 2$ for quadratic and $j = 3$ for linear. Therefore inertial density ηj can be defined as: $\eta_j = G_j/N_j$. and $\eta_1 \ge \eta_2 \ge \eta_3 \ge \eta_4 = 1$.

The occupation with $j = 4$ is to be understood as an **external zone (σ)**, in which exchange effects can be affected by external potentials. $j = 1$ identifies the **central zone** of the *n*-occupation. $j = 2$ is the **internal zone** of the *m*-structure, and $j = 3$ defines the **mesozone** of the *p*-Structure.

A ponderable elementary structure in this picture consists of a very tightly bound impenetrable core, which is surrounded by a field structure, which exhibits different exchange effects. The mesozone becomes an outer source that strongly interacts with fields in the external zone.

The **configuration number** k is the condenser number of possible elementary protosimplexes in the corresponding hermetric subspace. $r^{(\kappa\lambda)}_{(\mu\nu)}$ is the radius of the fluxion $(-p)^{(\kappa\lambda)}_{x(\mu\nu)}$ in R_3 that the curvature measure $\left|\lambda^{(\kappa\lambda)}_{0(\mu\nu)}\right| = k / \varepsilon^{(\kappa\lambda)}_{(\mu\nu)}$ increases by an integral amount k. It is also equal to $\left|\lambda^{(\kappa\lambda)}_{0(\mu\nu)}\right| = \kappa / r^{(\kappa\lambda)}_{(\mu\nu)}$, from which $\kappa = r^{(\kappa\lambda)}_{(\mu\nu)} k / \varepsilon^{(\kappa\lambda)}_{(\mu\nu)}$ follows and with $r = k\varepsilon$ then $\kappa = k^2$.

This indicates: $Z_\kappa = Z_k = 2k^2$. (7.45)

Thus from the steady state protosimplex occupation numbers in the configuration zones, $j = n, m, p, \sigma$ a straton-like term from Z_k can be derived. The difference between Q_p and Z must have the value 2. From this it follows that:

$$\begin{aligned} Q_n &= Z - Z_V, \\ Q_m &= Z - 1, \\ Q_p &= Z + 2(-1)^k, \\ Q_\sigma &= Z_k - 1. \end{aligned} \tag{7.46}$$

The yet to be determined factor αj, which in $\mu_j = \mu_+ \alpha_j$ express occupations in configuration zones by inertia measurement, leads back to the conjugate Protosimplex structure.

From (2.61) the following relationship can be deduced:

$$\left(\frac{\mu f}{M}\right)^4 = \eta_q^4 = 1 + q^4\left(\frac{a'\varepsilon_{o\pm}R_-}{2\pi h}\right)\sin^2\left(\frac{2Nh}{a'q^2\varepsilon_{o\pm}^2 R_-}\right) \tag{7.47}$$

using the substitutions: $f = \sqrt[4]{2n}/\sqrt{2n-1}, \mu = \sqrt{\frac{ch}{\gamma}}$ *and* $a' = (2/3\pi^2 a)^2$.

Therefore $\varepsilon_{0\pm}$ is found using (2.43), which however is smaller than the difference $\Delta\varepsilon_{0\pm} = \varepsilon'_{0\pm} - \varepsilon_{0\pm} > 0$ as the yet to be determined outer charge field $\varepsilon'_{0\pm}$. Because of the fourth power in the mass ratio, (7.47) effectively becomes the charge field to the fourth power. Also $\Delta(\varepsilon_{0\pm}{}^4)$ is given by $\Delta(\varepsilon_\pm{}^4) = (\varepsilon_{0\pm}{}'/\varepsilon_{0\pm})^4 - 1$. If $L = L(R_3)$ is a more effective condensing process than the number of dimensions, then the basis quantum number $k = L$ $\Delta\varepsilon_{0\pm}{}^4 = 4\ \Delta_{\varepsilon 0\pm}{}^4$ and:

$$\varepsilon_{0\pm}' = \varepsilon_{0\pm}\sqrt[4]{1+k/4} = \pm\frac{3}{\pi^2}\sqrt{\frac{\hbar}{R_-}}\sqrt[4]{1+k/4}\,. \tag{7.48}$$

When this relationship is used in (7.47) and this results in the case of a demand for an extremal, setting $\sin^2(\ ) = 1$ we have:

$$\begin{aligned} \left(\frac{\mu f}{M}\right)^4 &= 1 + q^4\left(\frac{a'\varepsilon_{o\pm}^2 R_-}{2\pi h}\sqrt{1+k/4}\right)^2 = \\ &= 1 + q^4\left(\frac{a^2}{\pi^2}\sqrt[4]{1+k/4}\right)^2 = 1 + \left(\frac{q}{4}\right)^4(4+k), \end{aligned} \tag{7.49}$$

Where $a = \sqrt{2}$ is used. For a protosimplex mass M containing the internal structure of a charged field:

$$M = \mu\,\pi\,f\,[\pi^4 + q^4(4+k)]^{-1/4} \tag{7.50}$$

and introducing the coefficients η_{kq},

$$\eta_{kq} = \sqrt[4]{\frac{\pi^4}{\pi^4 + q^4(4+k)}} \tag{7.51}$$

this becomes $M = \mu f \eta_{kq}$ (7.52)

For $q = 0$, η_{0k} is 1. With $k = 0$ $\eta_{q0} = \eta_q$ goes over into the factor describing the external charge field, (2.48).
η_{kq} determines the metric interior structure configuration of the concerned straton-like hermetry form. Similar to the derivation of (2.59) the internal charge field components for the reduced field can be calculated using:

$$e_\rho = \varepsilon_{0\pm}\sqrt{\eta_{kq}}, \tag{7.53}$$
$$\varepsilon_\omega = \tfrac{1}{2}(\varepsilon_{0\pm} + e_\rho) = \tfrac{1}{2}\varepsilon_{0\pm}(1 + \sqrt{\eta_{kq}}), \tag{7.54}$$
$$\varepsilon_\delta = \varepsilon_{0\pm} - e_\rho = \varepsilon_{0\pm}(1 - \sqrt{\eta_{kq}}). \tag{7.55}$$

Similarly to measurable external fields $e_\pm$ the correlation center of a field e_C must appear as:

$$e_C = \varepsilon_{0\pm}\sqrt{\eta_{qk}/8}$$

with:

$$\vartheta_{qk} = 5\eta_{qk} + 2\sqrt{\eta_{qk}} + 1 \tag{7.57}$$

8. Fine structure constant and the electromagnetic field

So far we have examined the features of the world principally coming from the dynamics of metron geometry. Due to the existence of three real coordinates of R_6, static fields are developed, which are coupled to particles. Particles come from systems by dynamic structure processes, which are due to the three imaginary coordinates of R_6, where the imaginary periodic exchange processes of maxima and minima of the deformation of the local metronic lattices in the subspace of R_6 form structural fluxes and let flux systems accumulate.

Such exchange processes take place everywhere in the matter-free continuum, since those metron quantities were small before some 10^{18} years ago, large enough in size to correspond to deviations from the pseudo Euclidean lattice and „Vacuum fluctuations". (By the evolution of the metron number the cosmological principle becomes disturbed). In complex systems which, after different correlative exchange procedures the initial situation is always modified, there may remain at least one structural flux systems with a long time stability and possessing a spin, which tries to adjust so its spin is orthogonal to the cosmological expansion and therefore shows Inertia. With flux systems, those not taking defined initial conditions, are formed due to the short existence of the partial flux having no inertia. These structure dynamics correspond to virtual energies, which are not observable. They exist in only few flux systems (protosimplexes), as coupled structures over conjunctions and proceed to observable features by joining to temporally stable features.

All such structure complexes possess inertial structures and also masses, and can be understood as exchange geometrical effects between them. As the simplest case Heim first treats the hydrogen atom consisting of an electron and proton and deduces from it the fine structure constant. The geometrical causes for the electromagnetic field in the micro realm can be deduced from approximations of macro range field equations.

1. In (2.59) the interior structure of the d-terms in the derivation of the charge was not considered, and there arose a deviation for $\left(e^{-}\right)^2 \sim \alpha'$ from the empirical value for α. One assumed there that the interior structures of the electron and the proton in hydrogen atom do not change, if the electron e^- becomes bound as a consequence of the electromagnetic exchange effects and/or correspondence in the K-shell of the proton field as an s-term. This correspondence does not change the protosimplex occupation of the internal zones of e^- and p. But the R_3 -structure of the occupations of the respective stratons of e^- and p obviously change in a way such that $\alpha' \neq \alpha$.

The charge e^- is referred to $\varepsilon = +1$. The state of charge of the proton e^+ is interpreted as $\varepsilon = -1$. Therefore it is assumed that the charges e^- in the electron and e+ in the proton behave like $\varepsilon = +1$ and $\varepsilon = -1$ in determining protosimplex correlations. The electron and the proton have the basic patterns (+(127))(± (345))(− 6) and remain time invariant. The Partial structure of the electron is described by

$$(+(127))_e^+ \ (\pm(34))_e^+ \qquad \text{and} \qquad (\pm(5)_e^+(-6)_e^+$$

and that of the proton (with an anti-electron charge) and its charge field by:

$$(+(127))_p^+ \ (\pm(34))_p^+ \qquad \text{and} \qquad (\pm(5)_e^-(-6)_e^-$$

The exchange effect is made time-like by (±3), because (±5) over (−6) is the source structure of (±3). Except for H-Atoms with the volume $4/3\ \pi r H^3$ the structures (±5) (−6) (±3) are irrelevant. Therefore the mutual correspondence between e^- and p is the dynamically stable correspondence structure:

$$[+ (127))_e \ (\pm4))_e] - (2) - [(\pm4))_p \ (+ (127))_p].$$

The correspondences can be understood from the potential internal charge field components ε_ρ, ε_ω, ε_δ and the non-reduced charge field $\varepsilon_{0\pm}$.

If the index y stands for ρ, ω and δ, $V'(y, \varepsilon)$ indicates the internal potential between e_y and $\varepsilon_{0\pm}$ for $k = 1$. $V''(y, \varepsilon)$ is the potential of p for $k = 2$. Then the part of the internal potential $\varphi(y)$ opposing the unchanging of the H-system (e^-, p), if ΔV indicates the metronic differential of V, is described by[xi]

$$\varphi(y) = \frac{\Delta V'(y,\varepsilon)}{V'(y,\varepsilon)} + \frac{\Delta V''(y,\varepsilon)}{V''(y,\varepsilon)}, \qquad \mathrm{f}\,\varphi(\rho) + \varphi(\omega) = \varphi(\delta) \tag{8.1}$$

The factor f in first term of (8.1) is justified as follows: By the external reduced charge field $e_r = \varepsilon_\pm \sqrt{n}$ the deformation of the metronic cell structure of space is caused by the proton and electron in the hydrogen atom, which is described by a vectorial function $\varphi(n)$ of the metron number n. If **p** projected onto $\Delta\varphi$ is the changed field vector $\mathbf{p} \,||\, \varphi : \mathbf{p} = \varphi - \Delta\varphi$, then it can be accepted that two further vector fields **f** and **X** exist, such that $\mathbf{O}(\mathbf{f}, \varphi) = \gamma$, $\mathbf{O}(\mathbf{X}, \mathbf{f}) = \pi/2 - \gamma$ and $\mathbf{X} \perp \mathbf{p}$ applies. γ is an elevation angle describing the new surface of the field structure of the distorted cell area. **f** and φ are constant with regard to γ. Then the metronic-like Differentials are $\Delta_\gamma \mathbf{f} = 0$ and $\Delta_\gamma \varphi = 0$, however $\Delta\gamma \mathbf{X} \neq 0$. Now the connection

$$\mathbf{p} \times \Delta_\gamma \mathbf{X} = \mathbf{f} \times \varphi \tag{8.2}$$

can be found. On the other hand there must be a function Z, with the Potential V, that lies between the reduced outer potential $V_{\varepsilon\varepsilon}$ and the potential V_{rr} (between electron and proton) which exists at the distance r, in the connection $V\Delta Z = Z\Delta V$. An Integration is made over the region $X_0 < X < X$, $Z_0 < Z < Z_1$ and $V_{\varepsilon\varepsilon} < V < V_{rr}$. From (8.2) we have the sum:

$$\mathrm{p}\,\Delta_\gamma \mathrm{X} = \mathrm{f}\,\varphi(\mathrm{n}) \sin\gamma, \tag{8.3}$$

or with the simplification $p = \varphi - \Delta\varphi = \varphi(n - 1)$:

$$\Delta_\gamma \mathrm{X} = \mathrm{f}\,\frac{\varphi(n)}{\varphi(n-1)} \sin\gamma. \tag{8.4}$$

The support for large metron numbers, $n \to \infty$ gives a limiting value of:

$$\lim_{n\to\infty} \frac{\varphi(n)}{\varphi(n-1)} = \xi \tag{8.5}$$

with $\xi = \frac{1}{2}(1+\sqrt{5})$ from A5 to A11, and it follows for (8.4):

$$\lim_{n\to\infty} \Delta_\gamma X = dX/dy = f\xi \sin y. \tag{8.6}$$

The integral is:

$$X_1 = f\xi \int_0^\pi \sin\gamma d\gamma = 2f\xi. \tag{8.7}$$

The limit process gives: $\lim_{n\to\infty} \Delta Z / \Delta V = Z / V$ and using:

$$\int_{Z_0}^{Z_1} d \ln Z = \int_{V_{\varepsilon\varepsilon}}^{V_{rr}} d \ln V \qquad (8.8)$$

gives: $Z_1 / Z_0 = V_{rr} / V_{\varepsilon\varepsilon}$.

At the distance *y*, $V_{\varepsilon\varepsilon} = \left(\frac{1}{4}\pi\varepsilon_0\right)\left(\frac{1}{y}\right)\varepsilon_{\pm}^{\,2}$ and $V_{rr} = \left(\frac{1}{4}\pi\varepsilon_0\right)\left(\frac{1}{y}\right)e_r' e_r''$, with $e_r' = \varepsilon_- \sqrt{\eta}$ for an electron and $e_r'' = \varepsilon_+ \sqrt{\eta}$ for a proton. Since $Z_0 = 1$ can always be set this becomes:

$$\frac{Z_1}{Z_0} = \frac{e_r' e_r''}{\varepsilon_{\pm}^{\,2}} = -\eta = Z_1 \qquad (8.9)$$

Then it can be assumed that Z_1 is the phenomological analog of working out of X_1, and $X_1 = Z_1$. Therefore, $2\xi f = -\eta$. The heuristic expression in the formula (8.1) can be written:

$$-f\varphi(\rho) = \varphi(\delta) - \varphi(\omega),$$

which becomes with a variation of potential relations can be written:

$$-f\left(\frac{\partial V'(\varepsilon\rho)}{V'(\varepsilon\rho)} + \frac{\partial V''(\varepsilon\rho)}{V''(\varepsilon\rho)}\right) = \frac{\partial V'(\delta)}{V'(\delta)} - \frac{\partial V''(\omega)}{V''(\omega)} + \frac{\partial V''(\delta)}{V''(\delta)} - \frac{\partial V'(\omega)}{V'(\omega)}. \qquad (8.10)$$

This leads to metronic integration with the integration constant ln A = const in:

$$- f \ln V'_{p} - f \ln V''_{\rho} + 2 \ln V_{\varepsilon\varepsilon} + \ln A = \ln V'_{\varepsilon\delta} - \ln V''_{\varepsilon\omega} + \ln V''_{\varepsilon\varepsilon} - \ln V'_{\varepsilon\omega} \qquad (8.12)$$

Using for f(r) $V_{(\,)(\,)} \approx e_{(\,)}\, e_{(\,)}$ with the inner charge field components from (7.35) to (7.55) gives the potential for $k = 1$ or 2 as:

$$A = 4 \sqrt{\eta_{11}}^{\,f} \sqrt{\eta_{12}}^{\,f} \left(\frac{1-\sqrt{\eta_{11}}}{1+\sqrt{\eta_{12}}}\right)\left(\frac{1-\sqrt{\eta_{12}}}{1+\sqrt{\eta_{11}}}\right) \qquad (8.13)$$

or with $s = f/2$ and $k = 1,2$:

$$A = 4 A_1 A_2 , \qquad A_k = \left(\frac{1-\sqrt{\eta_{1k}}}{1+\sqrt{\eta_{1k}}}\right)\eta_{1k}^{s} , \qquad s = -\tfrac{1}{4}\,\eta/\xi \qquad (8.14)$$

The inner structure of the d-terms denoted by η_{11} or η_{12} with $q = 1$ are linked with the external field by exchange effects:

$$V\, f(y)\, 4\pi\varepsilon_0 = e_+ e_- = -e_-^{\,2} \qquad (8.15)$$

The kinetic energy of the (e_-, p) system is E, and its potential energy is X. Because of energy conservation the expression:

$$d(E + X) = 0 \tag{8.16}$$

is true. The potential energy X must lie between the exchange effects of the charge fields producing energy in the range from W and a maximum of V. For $W \sim A_1 A_2 V$ or $W = C\,V$ with $C = C(\eta_{11},\eta_{12})$ it follows from (8.6):

$$-E_k = \int_W^V dX = V - W = V(1 - C). \tag{8.17}$$

For the distance between e^- and p the equation $f(y) = y$ can be written. With (8.15) this gives:

$$e_-^2(1-C) = 4\pi\varepsilon_0 y\,E_k \tag{8.18}$$

If the velocity with $v = v_H < c$ is non-negligible on the K-shell of the p-field of the moving electron, which is understood to be a particle, this determines $v_H = c\,\alpha$, the desired constant of coupling. $s_H = 2\pi\,r_H$ is the length of a screening meridian, that appears shortened by the relativistic movement on $s = 2\pi y < s_H$, so that $s = s_H\sqrt{1-\alpha^2}$ or $y = r_H\sqrt{1-\alpha^2}$

With momentum mv_H the electron's energy is $E_k = mv_H c = \alpha mc^2$. Placing this quantity in (8.18) results in:

$$e_-^2(1-C) = 4\pi\varepsilon_0 r_H \alpha\sqrt{1-\alpha^2}\,mc^2 \tag{8.19}$$

and with $m\,c^2 = hv_H = ch/\lambda_H = ch/(2\,\pi\,r_H)$ and $R_- = 1/\varepsilon_0$ it follows:

$$e_-^2(1-C) = 4\pi\,\alpha\sqrt{1-\alpha^2}\,\hbar / R_- \tag{8.20}$$

Substitution of (2.59) gives:

$$\alpha\sqrt{1-\alpha^2} = \frac{9\vartheta}{(2\pi)^5}(1-C) \tag{8.21}$$

Opposite to (2.60), C is the correlation contribution. When $A_1A_2 << 1$ the structural variation of the charge field of e^- and p in the case corresponding to H-Atoms is described by internal charge field composition, permitted by the approximation being used, $C \approx A_1A_2$. The **Sommerfeld fine-structure constant** $\alpha^2_{\pm}$ is found, using (8.14) to be:

$$\alpha_\pm^{-2} = B\,(1 \pm \sqrt{1 - 2/B})$$
$$\text{mit}\quad B = \tfrac{1}{2}\left[\frac{(2\pi)^5}{9\vartheta}\right]^2 (1 - A_1A_2)^{-2} \tag{8.22}$$

Numerically this gives for the two values which are the positive and negative parts of the reciprocals:

$$\alpha_{(+)}^{-1} = 137{,}0359895$$
$$\alpha_{(-)}^{-1} = 1{,}000026627 \qquad (8.23)$$

The empirical value for $\alpha_{(+)}^{-1}$ from the Particle Data Group at CERN 2002 is given as 137.0359976(50). The negative second value is a very strong coupling constant, which probably represents the internal correlation between the internal quasiparticles. (Heim gave a far more correct formula for the fine structure constant in his mass formula of 1989, for which the theoretical development can no longer be given and can no longer be found in the documents.)

2. At high density and temperature the (p,e^-) correspondence in the hydrogen atom inside the radius r_H can employ the k-shell, so that p and e_- which involve the exponential proximity fields (−7) (after 4.24), so that the exchange effect also extends over (±4). It becomes a stronger effect than the electromagnetic exchange effect, which appears as a *charge field correspondence*. Because of the enantio stereo isomeric partial structures (±5) and (−6), the charge fields e_+(p) and e_- (e^-) with their (±3) electromagnetic exchange of two b-hermetry forms are compensated, while the correspondences through $-(\hat{1},\hat{2},\hat{3})-$ become primary. The amount of energy which can be spent is *E*. Then the transition from the electromagnetic correspondence to the charge field correspondence can be described by:

$$[(+(127))_p(\pm4)_p](\pm5)_e{}^-(-6)_e{}^-(\pm3)-(\hat{2})-(\pm3)(-6)_e{}^+(\pm5)_e{}^+[(\pm4)_e(+(127))_e] + E \rightarrow$$
$$[(+(127))_p](\pm4)_p-(\hat{1},\hat{2},\hat{3})-(\pm4)_e[(+(127))_e]. \qquad (8.24)$$

This relationship corresponds to the transition for the neutron (p, e^-) → n. There the quantum numbers remain invariant while a "field catalyst" must still be involved, which guarantees this invariance. The charge field correspondence corresponds to the structure of the neutron; while the hydrogen atom is held together by the electromagnetic correspondence (p, e^-).

Because of the gauge invariance in correlation flux aggregates (−p) and their absence in screening fields, there occurs with neutrons and with the H-atom only (+(127)) in the R_3 region. The electromagnetic correspondence that a Z-fold negative electron shell Ze^- with a charge Ze^+ of the nuclide of any atom structured from Z protons, lets the superposition of sub nuclear screening field triads (+(127)) appear only in the external area. The R_3 region corresponding to an R_6 structure is determined by (+1) in x_5 and x_6, as well as (+7) in R_3 and in the time field x_4. The projection of (+1) on (+7) appears in R_3 as a gravitational field, which, using the strong approximation, turns into an exponentially increasing proximity effect field of (+7).

Electromagnetic processes are determined by the b-hermetry. The electrical field can only be one screening field, i.e. the basis and the contra signature of these condensers are equal. The screening fields are represented by $\left[\begin{smallmatrix}\cap\\ ab\\ ab\end{smallmatrix}\right] \equiv [ab]$. (+(127)) corresponds to $(+1) \equiv [1]$ and $(+7) \equiv [3]$, for example, $[1] \equiv \left[\begin{smallmatrix}\cap\\ 11\\ 11\end{smallmatrix}\right]$. The composition law for (+(127)) reads: $\left[\begin{smallmatrix}\cap\\ \end{smallmatrix}\right] = [1]+[2]+[3]$, because in the case of the screening fields we always have $Q_k{}^{i}{}_{(bb)}$.

If the material structure is not at rest in a reference system C_0, but has velocity v = const relative to C_0, then this movement can be understood as imaginary rotation around x_4 referred to a new reference system C_V. If this is assumed to be $\left[\begin{smallmatrix}\cap\\ \end{smallmatrix}\right]$ then an imaginary rotation of the partial structure [1], [3] , referenced to the structure[2], and a pseudo structure $(+\bar{3})$ must appear in the R_3 related to C_0, however this is not related to the rest system of the relatively moving matter. Compared to the subject being accelerated, then we must have $(+\bar{3}) \rightarrow (3)$ as real matter also in the field structure of the accelerated system. In this the

field screening component (+3) ≡ [1 2] may be just a type of static field b-hermetry action, which can transfer no energy. The complete composited field is of the form:

$$[\overset{\frown}{\ }] = [1] + [2] + [3] + [1\ 2], \tag{8.25}$$

Where [1 2] ≡ (+3) must be understood as the sum of the two possible fields: $\left[\begin{smallmatrix}\overset{\frown}{12}\\12\end{smallmatrix}\right]_+ + \left[\begin{smallmatrix}\overset{\frown}{21}\\21\end{smallmatrix}\right] \equiv [1\ 2]$ (due to the correlation (+3)).

To investigate the $\dot{v} \neq 0$ induced structure [1 2], the Fundamental relationship (3.20) must be employed. Since for screening fields no Correlation tensors $Q^{(\kappa\lambda)}_{(\mu\nu)}$ exist, (3.20) is simplified. If, in addition, the indexing, which indicates the components in [1 2] are labeled uniformly with ($ab \equiv (12)$ or $(ab) \equiv (21)$, shall be taken to be correct in the first region (with a small metron number n) (3.20):

$$K^{(ab)}_{(ab)} + D^{(ab)}_{(ab)} ; \left[\begin{smallmatrix}\overset{\frown}{ab}\\ \overset{\rightarrow}{ab}\end{smallmatrix}\right]_+ = \overline{\lambda}^{(ab)}_{(ab)} \times \left[\begin{smallmatrix}\overset{\frown}{ab}\\ \overset{\rightarrow}{ab}\end{smallmatrix}\right]_+ . \tag{8.26}$$

For the components of the condenser action in (+3) we have the following metronic functions:

$$\left[\begin{smallmatrix}i\\km\end{smallmatrix}\right]^{(12)}_{(12)} ; n = G^i_{km} \quad \text{und} \quad \left[\begin{smallmatrix}i\\km\end{smallmatrix}\right]^{(21)}_{(21)} ; n = H^i_{km},$$

with

$$\overline{\lambda}^{(12)}_{(12)} = \overline{\lambda}^{(1)}\ , \qquad \overline{\lambda}^{(21)}_{(21)} = \overline{\lambda}^{(2)}\ , \qquad D^{(12)}_{(12)} = D^{(1)} \ \text{und} \ D^{(21)}_{(21)} = D^{(2)} . \tag{8.27}$$

If, in the second applicable region, instead of the Metronic Differentiation Δ_m, the usual differentiation with $\partial_m = \partial / \partial_{xm}$, is used, then the component representation of (8.26) is:

$$\partial_m G^i_{kp} - \partial_p G^i_{sm} + G^i_{sm}\, G^s_{kp} - G^i_{sp}\, G^s_{km} + D_p^{(1)}\, G^i_{km} = \lambda_p^{(1)}\, G^i_{km} \tag{8.28}$$

$$\partial_m H^i_{kp} - \partial_p H^i_{sm} + H^i_{sm}\, H^s_{kp} - H^i_{sp}\, H^s_{km} + D_p^{(2)}\, H^i_{km} = \lambda_p^{(2)}\, H^i_{km}. \tag{8.29}$$

Forming the matrix trace, $i = k$ and using the vector field equations:

$$\varphi_m^{(1)} = G^k_{km} \qquad \text{und} \quad \varphi_m^{(2)} = H^k_{km} \tag{8.30}$$

gives:

$$G^k_{sm}\, G^s_{kp} - G^k_{sp}\, G^s_{km} = H^k_{sm}\, H^s_{kp} - H^k_{sp}\, H^s_{km} = 0 \tag{8.31}$$

after the summing we obtain for $b = 1$ or $b = 2$:

$$\partial_m \varphi_p^{(b)} - \partial_p \varphi_m^{(b)} = \lambda_p^{(b)}\, \varphi_m^{(b)} - D_p^{(b)}\, \varphi_m^{(b)}. \tag{8.32}$$

The sum $\varphi_m = \varphi_m^{(1)} + \varphi_m^{(2)}$ corresponds to the induced combination [1 2], or (+3). With the influence of the triad (+(127)), therefore [1], [2] and [3] are contained in the tensor $D_m^{(b)}$. The summation of the two differentials for $b = 1$ and $b = 2$ leads to:

$$\partial_m\varphi_p - \partial_p\varphi_m = \lambda_p^{(1)}\varphi_m^{(1)} - \lambda_p^{(2)}\varphi_m^{(2)} - D_p^{(1)}\varphi_m^{(1)} - D_p^{(2)}\varphi_m^{(2)}. \quad (8.33)$$

Because of the required time independent properties of the examined system (+(127)) and the (+3)-induction when [1 2] is present, φ_m must be a function only in R_3, so that for all $p \geq 4$ we have: $\partial_m\varphi_p = 0$, $\varphi_p = \text{const}$ (R_3) and $\partial_k\varphi_p = 0$ for $k \leq 3$. Thus, $\partial_i\varphi_k - \partial_k\varphi_i$ R_3-coordinates become the curl-components of an R3-field φ while

$$D_i^{(1)}\varphi_m^{(1)} + D_i^{(2)}\varphi_m^{(2)} = F_{ik} = -F_{ki} \quad (8.34)$$

form an antisymmetric R_3 tensor. This corresponds to:

$$\lambda_i^{(b)}\varphi_k^{(b)} = (\lambda^{(b)} \times \varphi^{(b)}) \quad (8.35)$$

The third range of validity is $n \to \infty$ and the discrete levels $\lambda^{(b)}$ of [1 2] go in this range to a continuous vector field $\mathbf{\Lambda}$. $\mathbf{F}$ goes to a vector product of $\mathbf{f}$ and $\mathbf{w}$ with $f_i = e_i\partial / \partial x_i$ and $w_k = A_k$:

$$\lambda^{(1)} \times \varphi^{(1)} + \lambda^{(2)} \times \varphi^{(2)} - \mathbf{F} \rightarrow \mathbf{\Lambda} \times \mathbf{u} - \mathbf{f} \times \mathbf{w}, \quad (8.37)$$

Then in the fourth range of validity the corresponding principle field goes to an effective continuum, where the polar macroscopic vector field is represented by the single equation:

$$\mathbf{\Lambda} \times \mathbf{u} - \mathbf{f} \times \mathbf{w} \rightarrow \mathbf{x} \times \mathbf{y}, \quad (8.38)$$

in which only a simplified vector product appears:

$$\mathbf{x} \times \mathbf{y} = \lim_{n\to\infty} rot\,\varphi = \text{rot} \lim_{n\to\infty} \varphi. \quad (8.39)$$

Translator's note: The German notation rot a indicates the Curl(a) operation or ∇ X (a)

$\varphi = \varphi^{(1)} + \varphi^{(2)}$ can also be represented by (+2), ((17)) of the Triad (+(127)) because in the R_3 projection the (+1) in the straton like near field goes over to (+7). This means that in (8.39) both limits of the vector fields in R_3 in the formulas become:

$$\lim_{n\to\infty} \varphi^{(1)} = \mathbf{C} \quad \text{und} \quad \lim_{n\to\infty} \varphi^{(2)} = \mathbf{g} \quad (8.40)$$

such components are a- and b- hermetries that cannot transfer energy. From (8.39) and (8.40) we have:

$$\text{rot}\,(\mathbf{C} + \mathbf{g}) = \mathbf{x} \times \mathbf{y}. \quad (8.41)$$

From the empirical result, the **C** component is proportional to the magnetic field strength **H**. **g** should correspond to an orthogonal trajectory field of gravitational field strength **G**, and is designated by Heim as being proportional to a Mesofield μ. For the Magnetic field the relationship is:

$$\text{rot } \mathbf{C} \sim \varepsilon_0 \partial/\partial t\, \mathbf{E} + \rho \mathbf{v}, \tag{8.42}$$

where ε_0 is the dielectric constant, **E** is the electric field strength, **v** is the velocity of the moving charge and ρ the electric charge density. Under the assumption that μ and **H** are not related, Heim formally identifies μ with the mass density and **G** as the gravitational field strength in the equation:

$$\text{rot } \mu \sim \alpha\ \partial/\partial t\, \mathbf{G} + \sigma \mathbf{v}. \tag{8.43}$$

α is a new constant of nature, which must be determined.

In the case of time-independence, $\partial / \partial t\, \mathbf{E} = \partial / \partial t\, \mathbf{G} = 0$, while $|\mathbf{v}| = \text{const}$ with respect to t since only its direction can change. As in (8.41), the vector fields must have equal dimensionalities because of the proportionalities: $\mathbf{C} = \mathbf{H}\sqrt{\mu_0}$ and $\mathbf{g} = \mu\sqrt{ß}$, with ß a still to be determined natural constant that occurs in the law for propagation of Gravitational disturbances:

$$\text{div grad } \mathbf{p} + \alpha ß\, \partial^2/\partial t^2\, \mathbf{p} = 0 \tag{8.44}$$

comparing to (8.41):

$$\text{rot } (\mathbf{C} + \mathbf{g}) = \mathbf{v}\,(\rho\sqrt{\mu_0} + \sigma\sqrt{ß}) = \mathbf{x} \times \mathbf{y}. \tag{8.45}$$

v appears as the vector product of two polar vectors which characterizes the circular motion. When **r** is the radius vector of the motion and **ω'** its angular velocity, then $\mathbf{v} = \mathbf{r} \times \boldsymbol{\omega}'$. If, supposing that in the mass distribution σ there are no free uncompensated charges, and that they are not movable, so that $\rho = 0$, then this results in the simple relation:

$$\text{rot } (\mathbf{H}\sqrt{\mu_0} + \mu\sqrt{ß}) \ = \ (\mathbf{r} \times \boldsymbol{\omega}')\, \sigma\sqrt{ß} \tag{8.46}$$

concerning ß it is only known that $ß \neq 0$

a) Assumption: <u>β < 0:</u> In this case the equation is for propagation of gravitational field disturbances,

$$\text{div grad } \mathbf{p} - \alpha ß'\, \partial^2/\partial t^2\, \mathbf{p} = 0$$

which is a transverse wave equation. However since $\sqrt{ß} = i\sqrt{ß'}$ the rotor has a complex value with the real part Curl **H** = 0 and the imaginary part Curl $\boldsymbol{\mu} = \boldsymbol{\sigma}\, \mathbf{r} \times \boldsymbol{\omega}$, which for $\partial / \partial t\, G = 0$, $\partial / \partial t\, E = 0$ and $\rho = 0$ gives the electromagnetic law. The timelike coordinate is $x_4 = ict$, and R_4 would be a Minkowski space.

b) Assumption: <u>ß> 0</u>: In this case, (8.44) is not a wave equation, but a potential equation with velocity ω of potential propagation. The rotor relationship remains real. One representation is a rotating mass density σ with ω' = const which should generate a field **H**, and it produces $x_4 = \omega t$, which gives a second principle of relativity. The transformation matrix $\hat{A}'$ in R_{+4} remains real, as opposed to the electromagnetic Principle of Relativity $\hat{A}$ in R_{-4}. Instead of the matrix elements with $\gamma = \dfrac{1}{\sqrt{1 - v^2/c^2}}$, the matrix elements become $\dfrac{1}{\sqrt{1 + v^2/c^2}}$. These relativity principle gravitational field disturbances have a regular and orthogonal transformation matrix defined over the real algebraic field. It would then demand invariance over $G = \hat{A}\hat{A}'$. This overlooked feature in the principle of relativity would not significantly affect the

Lorentz-Matrix because the Matrix elements $\gamma\gamma'$ in *G* are only multiplied with a factor differing little from unity.

Because **H** and μ are mutually dependent, Heim sets:

$$\mathbf{B} = \tfrac{1}{2}\,(\mu_0\mathbf{H} + \sqrt{\mu_0\beta}\;\mu). \tag{8.47}$$

Then the magnetometric relevant energy flux density in Tesla or Gauss is given by:

$$\text{rot}\,\mathbf{B} = \tfrac{1}{2}\,(\mathbf{r}\times\omega')\,\sigma\sqrt{\mu_0\beta} \tag{8.49}$$

Or with **w,** the number of revolutions per unit time, and with $\omega' = 2\pi\,\mathbf{w}$:

$$\text{rot}\,\mathbf{B} = \pi\sqrt{\mu_0\beta}\,\sigma\;\;(\mathbf{r}\times\mathbf{w}). \tag{8.50}$$

ß is from (8:44) and is yet to be determined.

c) Assumption: $\omega \neq c$ From Heim's initial calculation of the density operator follows from the constant $\alpha = 3/(64\,\pi\gamma)$, which gives the propagation speed of gravitational field disturbances. With $\omega = 4 / 3c$ the constant's value for $ß = 12\,\pi\gamma / c^2$ is obtained.

d) Assumption: $\omega = c$, this gives $\alpha' = 1 / (4\,\pi\gamma)$ and $ß' = 4\,\pi\gamma / c^2$ or $ß' = 2ß / 3$.

With c) and d) there are the two alternative values for the fundamental constants A and A ':

$$A = (\pi\sqrt{3\pi\gamma\mu_0})/c^2 \qquad \text{und} \quad A' = (\pi\sqrt{2\pi\gamma\mu_0})/c^2 \tag{8.51}$$

This gives for the integral value with the constant A:

$$\text{rot}\,\mathbf{B} = 2A\sigma\;\;(\mathbf{r}\times\mathbf{w}) \tag{8.52}$$

The decision to use $\omega \neq c$, which could have been determined by the measurements of the time delay in the arrival of Radio signals from the quasar JO842 +1835 at a Jupiter-Passage on 8 Sept. 2002 was not done. In the view of *E.B. FOMALONT* and *SERGEI KOPEIKIN* (2003) $\omega = c$ was determined to be correct up to a factor of 1:06 ± 0:21. *J.A. FABER* (2003) and *C.M. WILL* (2003) showed however that ω can not be measured from a determination of the time delay in the arrival of the signals. The effects on the propagation speed of gravity become retarded, taking on values higher than those measured in terms of its influence. But, the accuracy of the experiment has not yet been determined. The interpretation of the measurements may be based on incorrect assumptions, see Kopeikins (2003).

Even a decision for a): ß < 0 or b): ß > 0 is still pending. Case b) is not completely probable. Since (8.45) results in neglect of Curl(**g**) as a solution for a rotating sphere in the absence of electrical currents for the radial component of the magnetic field B_r on the surface (with radius r_0 and geographical latitude θ):

$$B_r(r_0,\theta) = 3/10\pi\;\sqrt{\mu_0\beta'}\;/(1+2\mu_0)\;\omega\;\mathrm{m}\;\sin\theta/r_0\,, \tag{8.53}$$

and for the tangential component B_t :

$$B_t(r_0,\theta) = 3/20\pi \sqrt{\mu_0 \beta'} /(1+2\mu_0)\, \omega\, m \cos\theta/r_0. \qquad (8.54)$$

However, equation (8.53) has exactly the same form as that derived by those who have made purely empirical observations of the magnetic fields of rotating stars as found by *BLACKETT* (1947) and confirmed by von *SIRAG* (1979).

If instead of stellar masses a cylinder of diameter of 5 cm with a high permeability and angular velocity of $w = 300$ revolutions per second (in a vacuum on a Helium bath) is rotated, it will have very weak magnetic fields (about 10^{-11} Tesla). But if a Squid-Magnetometer with a sensitivity of 10^{-13} Tesla could be used for experimental evidence, if disruptive effects can be compensated. (Harasim, LOUIS, and Auerbach 1985).[xii]

9. Ground States of Elementary Particles and "Quarks"

1. First to estimate the maximum values of the quantum numbers q_{max} and k_{max} we derive this inequality:

$$k < u_q = (\pi/q)^4 \{[(1 + \sqrt{\eta_q})^2/4\eta\eta_q + (1 - \eta_q/\eta)\sqrt{\eta}\,]^4 - 1\} - 4 \qquad (9.1)$$

and numerically evaluate it. We obtain:

q = 1 and 2:	$2 < u_q < 3$
q = 3:	$1 < u_3 < 2$
q = 4:	$0 < u_4 < 1$
q > 4:	$u_q < 0$

and k would only be valid for values 1 and 2 and q for values 1 to 3. Therefore $k_{max} = 2$ and $q_{max} = 3$.

Through an analysis of the internal charge potential $V_{xy,}$ α_j can be determined. μ_+ $\alpha_j = \mu_j$ are elementary mass units in the zone j for $n\,Q_n = m + Q_m = p + Q_p = \sigma + Q_\sigma$, so that μ_5 and μ_6 act as units of mass $F_S = 1$ and $q = 1$ in the mass spectrum represented by (7:39). For the central region $j = 1$ is the same as was derived in chapter 2, with $E_+ = ß_+ w^2$ in the R_3-Region with the relationship:

$$E_1/E_+ = V_{\varepsilon\omega}/V_\varepsilon = ½\,(1 - \sqrt{\eta_{qk}}) \qquad (9.2)$$

and for j = 2: $E_2/E_+ = V_\varepsilon/V_{RR} = 1/\eta_{qk}$ (9.3)

or $\mu_1 = (1 + \sqrt{\eta_{qk}})\,(1/2)\,\mu_+$ (9.4)

$$\mu_2 = \mu_+/\eta_{qk} \qquad (9.5)$$

and, since $\mu_{1,2} = \alpha_{1,2}$,

$$\alpha_1 = ½\,(1 + \sqrt{\eta_{qk}})$$
$$\alpha_2 = 1/\eta_{qk} \qquad (9.6)$$

In the external zone:

$$\alpha_4 = 1$$

μ_3 is a function determined by μ_+ f (k), that reduces the configuration Protosimplex structure, and is a function of μ_+ qF (k, q) that the charge field through deformation reduces f by F according to:

$$\mu_3 = \mu_+\,(f - q\,F) \qquad (9.7)$$

and because $\mu_3 = \mu_+ \alpha_3$:

$$\alpha_3(k,q) = f(k) - q\,F(k,q). \tag{9.8}$$

A metronic calculation leads to the expressions:

$$\begin{aligned} \alpha_3 &= 1/k\, e^{k-1} - q\,F, \\ F &= H + G, \\ H &= \alpha/3\,(1 + \sqrt{\eta_{qk}}\,)(\xi/\eta_{qk^2})^{2k+1}\,\eta_{qk}{}^3, \\ G &= \eta_{11}/e\eta_{qk}\,(2\xi\eta_{qk})^k\,[(1 - \sqrt{\eta_{qk}}\,)(1 + \sqrt{\eta_{qk}}\,)]^2. \end{aligned} \tag{9.9}$$

where α is the fine structure constant. For time constant structural states with $(j \leq 4) \mathrel{\hat{=}} (n, m, p, \sigma)$ the protosimplex numbers $N_{(j)}$ in (7.41) become:

$$N_{(j)}(t) = n_j(t) + Q_j \tag{9.10}$$

with

$$\begin{aligned} Q_n &= 3 * 2^{s-2} \\ Qm &= 2^s - 1 \\ Q_p &= 2^s + 2(-1)^k \\ Q_\sigma &= 2^{s-1} - 1, \quad \text{where } s = k^2 + 1 \text{ is a constant} \end{aligned}$$

This results in a provisional mass formula:

$$M(c,d) = \mu_+ \left[\sum_{j=1}^{4} \alpha_j G_j + (1 - \alpha_- / \alpha_+) F_S + q\alpha_- / \alpha_+ \right] \tag{9.11}$$

Now we must find a selection rule for the occupation of the configuration zones (n, m, p, σ) for the ground states $N = 1$ and the higher resonant states.

2. The spectrum of c-and d-hermetries are divided into the spectral segments $k = 1$, and $k = 2$. The possible invariant P-values (because of the interval requirement $0 \leq P \leq G = k + 1$) are limited by k. There are therefore for $k = 1$ three, and $k = 2$, four multiplets, each with $I = P + 1$ components.

There must be basic structural ground states, whose occupation zones (n, m, p, σ) determine the invariant properties of the c-and d-Terms. The invariant properties are determined by sets of quantum numbers, such as k, P and Q and describe the spin isomeric multiplets according to (6.19), and due to $q = 0$ or $q \neq 0$ cause a separation of the spectrum of c- and d- Terms. Furthermore, the structure of flux in terms R_4^+ and R_4^- can be distinguished by the time helicity ε (after (6.20)). If there are v charge components of the field, the set of conservation principles are symbolically summarized as $(kPQ)_\varepsilon\ q_v$. This conservation principle does not apply to the parameter n_j $(1 \leq j \leq 4)$ structural configuration zones (n, m, p, σ).

In analogy to space spin isomorphisms with $I_{max} = G + 1 = k + 2$ there can also be a multiplet of the integral component of the integral space spin components of the Straton spins (6.19) and in terms of Tensor- Spinor terms is defined as:

$$I_R = 2J + 1 = Q + 1 \tag{9.12}$$

This can change J so that tensor- and spinor terms alternate, so that ΔJ '= ½, or the spinor- and tensor character remains unchanged: $\Delta J = 1$. Then $\Delta Q' = 1$ and $\Delta Q = G - Q = 2$, i.e., $Q(P) = G - 2 = k - 1$.

$Q = k - 1$ applies to a P-interval, but there are also places in P ', where the multiplet $P = P$ ' is doubled, so that the spin isomorphism's second multiplet on Q '(P') = $2k - 1$.

The analysis of the location of P' in the P-interval gives two solutions:

$$P'_1 = P_+ = 2k - 1 \quad \text{and} \quad P'_2 = P_- = 2 - k.$$

Both solutions are in the P-interval and double the corresponding multiplets, and with

$$Q(P) = k - 1, \qquad Q'(P_\pm) = 2k - 1, \qquad 0 \le P \le k + 1 \tag{9.13}$$

representing different ground state multiplets. We also have $Q' = Q + k$.

For $k = 2$ we have $G = 3$, $Q = k - 1 = 1$, $Q' = 3$, which appear as the singlet $P_- = 2 - k = 0$ and quartet

$P_+ = 2k + 1 = 3$.

For $k = 1$ we have $G = 2$, $Q = 0$, $Q' = 1$ and $P_+ = P_- = 1$, which leads to three doublets $(kPQ) = (110)_A$ and two spinor doublets $(111)_B$ and $(111)_C$. The scalar doublet A is different from the spinor doublets B and C, but B = C is contrary to the requirement that the basic patterns must be different in their invariants. If the principle of multiplet invariance is extended by an additional property κ, then the problem will disappear. For all $P \neq 1$ define $\kappa = 0$, and $P = 1$ define $\kappa = 1$. For λ doublets in the interval $1 \le \lambda \le \lambda_k \equiv 4 - k$ we obtain the **doublet quantum number**:

$$\kappa(\lambda) = (1 - \delta_{I\lambda})\delta_{IP} \qquad (\delta_{I\lambda} = 1 \text{ for } \lambda = 1, \text{ otherwise} = 0). \tag{9.14}$$

The quantum number condition of the multiplet invariance can thus be written:

$$(kPQ\,\kappa)_\varepsilon. \tag{9.15}$$

For the doublets we have, for $k = 1$, (1110) and (1111) for the spinors and (1101) for the scalar product.

Now we must investigate how the c-and d-structures are distributed over the individual components of multiplets. These can be seen as R_3-projections of (± (35)) and (−6). The component x (with $0 \le x \le P$) of a multiplet appears to be a characteristic illustration and is represented by the imaginary part of σ, so $s_x = P_x/2$ in the x component.

The multiplet components are degenerately isomorphic to a stratonlike space spin structure J of the R_6 condensation caused by the projection in space. We can therefore consider how various states of the R_3 projection of the polymetric R_6 structure are interpreted, so that in each of these R_3-projections the property $q_x \neq 0$, appears as the d-structure or $q_x = 0$, appears as the c-structure. In this picture, the multiplet components must transform into each other. In multiplets there is therefore a further invariant feature, the transfer characteristic of the various R_3-states x appearing in the distributions $q_x \neq 0$ and $q_x = 0$ in multiplets act as a **structure distributor**.

This feature is due to an invariant quantum number C. C depends on the time helicity ε according to (6.20): $C_\pm(R_4^\pm) = -C_\mp$. ε allows for mirror symmetric representations of σ. Since σ is formed from the components σ_P and σ_Q, this is a superimposed concept for ε as generic term components of **iso** and **space helicity** ε_P and ε_Q, given by $\varepsilon_P = \varepsilon \cos \alpha_P$ and $\varepsilon_Q = \varepsilon \cos \alpha_Q$ Q (with the projection angles $\alpha_{P,Q} = \pi\, x_{P,Q}$). The x are identical to terms in Q to the number N' of doublet combinations $s_x = s - x$ for $x \neq 0$, and in case of Q with the added product QQ_{min} this becomes:

$$X_{P,Q} / Q = N' + (\kappa\, QQ_{min}) \tag{9.16}$$

In the interval $1 \leq x \leq P$, N' is expressed as the two combinations of Class P, i.e. $N' = \binom{P}{2}$, $Q_{min} = k - 1$. It follows for the iso and space helicity:

$$\alpha_P = \pi Q (\kappa + \binom{P}{2}) \qquad \text{und} \qquad \alpha_Q = \pi Q [Q(k-1) + \binom{P}{2}] \qquad (9.17)$$

The relation of the maximum values of quantum numbers k and κ to their minima are represented by the following equations in V_κ and V_k:

$$V_\kappa = (\kappa_{max} + \kappa)/(Q_{min} + \kappa), \quad V_k = k_{max}/k.$$

These numbers behave like the sum of helicity components of the straton spins $P\varepsilon_P + Q\varepsilon_Q$ to the structure distributor C. For $\kappa_{max} = 1$, $k_{max} = 2$ and $Q_{min} = k - 1$ it follows for the structure distributor:

$$C = 2 (P\varepsilon_P + Q\varepsilon_Q)(k - 1 + \kappa)/ (k + k\kappa) \qquad (9.18)$$

The analysis of charge quantum number q_x gives a relationship which returns to the multiplet invariants $(kPQ\,\kappa)_\varepsilon$ and C :

$$q_x = \tfrac{1}{2} (P - 2x)[1 - \kappa Q(2 - k)] + \varepsilon[k - 1 - (1 + \kappa) Q(2 - k)] + C \qquad (9.19)$$

with $|\, q_x \,| = q_x$ and $0 \leq x \leq P$.

3. It follows that the multiplets $(kPQ\kappa)$ are symbolized by (v). The number of quasi corpuscular internal zones are $G_k = k + 1$ up to the upper limit of the P-interval. For $\underline{k = 1}$ we obtain the multiplet series of singlets up to triplets $G_1 = 2$. Because $Q = k - 1 = 0$ this is a scalar term. Since $P_+ = P_- = 1$ and $\lambda_1 = 4 - k = 3$, there will be next the scalar doublet and two spinor doublets $Q' = 2k - 1 = 1$. These are:

Singlet: $(v)(kPQ\kappa) =$	(1)(1000),	
Spinor doublets:	(2)(1110)	and (3)(1111),
Scaler doublet:	(4)(1101)	
Triplet (P limited)	(5)(1201)	

For $(v) = (4)$ there is the doublet value $\varepsilon C = +1$; for the remainder (for $k = 1$) $\varepsilon C = 0$.

In the spectral segment $\underline{k = 2}$, the P-interval is limited by the quartet, because $G_2 = k + 1 = 3$. Because $P_+ = 2k - 1 = 3$, there also appears besides this quartet $P_- = 2 - k = 0$ the doubled singlet. When $\lambda_2 = 4 - k = 2$ a doublet appears because $\kappa(1) = 0$ and $\kappa(2) = 1$ twice. For the multiplet invariance we obtain:

Singlets:	(6)(2019) and (7)(2030),
Doublets:	(8)(2110) and (9)(2111),
Triplet:	(10)(2210),
Quartet	(11)(2310) and (12)(2330)

The interval of possible ground state multiplets is:

$$\boxed{(v)(kPQ\kappa)\ \varepsilon C(\varepsilon q_x)0^P} \qquad (9.20)$$

Therefore the quantum numbers are given by the following list:

$$
\begin{array}{l}
(1)\ (1000)\ \ 0(\ \ 0) \\
(2)\ (1110)\ \ 0(\ \ 0,-1) \\
(3)\ (1111)\ \ 0(-1) \\
(4)\ (1101)+1(+1,\ \ 0) \\
(5)\ (1200)\ \ 0(+1,\ \ 0,-1) \\
(6)\ (2010)-1(\ \ 0) \\
(7)\ (2030)-3\ (-1) \\
(8)\ (2110)\ \ 0(+1,\ 0) \\
(9)\ (2111)-2(\ \ 0,-1) \\
(10)(2210)-1(+1,\ 0,-1) \\
(11)(2310)-2(+1,\ 0,-1,-2) \\
(12)(2330)\ \ 0(+2,+1,0,-1)
\end{array}
\qquad (9.21)
$$

If these theoretical ground states are compared with empirically determined quantum numbers of stable or metastable particles, it will be seen that the well-known basic conditions of elementary particle spectra are:

The **baryon number** B is given by the configuration number k as $k = B + 1$. $k = 1$ designates mesons, and $k = 2$ baryons.

The number $P = 2s$, which indicates the spin isomorphism in multiplets, $I = P + 1$, is equal to twice the empirical **isospin**.

$Q = 2J$ is twice the quantum number of angular momentum or **spin** (as in spin quantum number J of the angular momentum $J\sigma_r$).

The **strangeness** S is identical to the structure distributor C.

The interpretation of isospin multiplets (v), which is confirmed by the calculation of the masses, provides the following correlations to elementary particles:

$$
\begin{array}{lll}
(1) \mathrel{\hat{=}} (\eta), & (2) \mathrel{\hat{=}} (e_0,\ e^-) & (3) \mathrel{\hat{=}} (\mu -) \\
(4) \mathrel{\hat{=}} (K^+, K^0) & (5) \mathrel{\hat{=}} (\pi^+, \pi^0, \pi^-) = (\pi^{\pm}, \pi^0) & \\
(6) \mathrel{\hat{=}} (\Lambda) & (7) \mathrel{\hat{=}} (\Omega^-) & (8) \mathrel{\hat{=}} (p, n) \\
(9) \mathrel{\hat{=}} (\Xi 0, \Xi -) & (10) \mathrel{\hat{=}} (\Sigma^+, \Sigma^0, \Sigma^-) & (11) \mathrel{\hat{=}} (o^+, o^0, o^-, o^{--}) \\
(12) \mathrel{\hat{=}} (\Delta^{++},\ \Delta^+, \Delta^0,\ \Delta^-) & & k = B + 1
\end{array}
\qquad (9.22)
$$

(2) and (3) correspond to the empirical leptons (e^- and μ). For these, $P = 1$. Electrons and μ -Mesons should also possess an inner structure, but it is so weak that only point particles are observed. For the b-hermetry, P is not defined. But through the transition $b \rightarrow d + \overline{d}$ (pair production), due to the stratonlike properties of d-Hermetry forms for e− and μ, a P-value in this manner appears, so that εP with $\varepsilon = +1$ on d and $\varepsilon = -1$ on the anti structure $\overline{d}$, and their sum disappears. With $P = 1$ for (2) and (3) there must be a negatively charged pseudo singlet (3) and another particle with a complementary neutral component (e_0). If there is a time-stable **neutral electron** e_0 that actually exists, its mass can deviate only slightly from e^- and it would have an effective cross-section of nearly $q = 0$, so that for this particle experimental evidence would be difficult to obtain.

(3) is identified along with the electron doublet e_0 and e^- or e_0 and e^+ (in the case of $\varepsilon = -1$). Regarding ε, C and q_x behave as mirror symmetries, so that through εC and εq_x this anti-symmetry is compensated. The π- triplett is the antitriplet to itself, so it is possible to use the short form of (5), $(5) \mathrel{\hat{=}} (\pi^{\pm}, \pi^0) = (\overline{5})$.

In the case $k = 2$ there occurs the transitory hermetry forms b → d + $\overline{d}$ or b → c + $\overline{c}$ since $B = 1$ and (ν) and ($\overline{\nu}$) are always paired. Because q_x and C reduce to the multiplet invariance (9.15), (9.20) can be written as follows

$$(\nu)\,(\varepsilon)\,(\varepsilon B, \varepsilon P, \varepsilon Q, \varepsilon\kappa)\,C\,(q_x)_0^P \tag{9.23}$$

with $(\nu)\,(\varepsilon = +1) \equiv (\nu)$ and $(\nu)\,(\varepsilon = -1) \equiv (\overline{\nu})$

k and P are fundamental quantum numbers (invariants). Q, κ, C and q_x are derived quantum numbers and ε depends on the time helicity. Heim therefore gives to invariant properties of the basic ground states the form

$$\boxed{\hat{I} \equiv kP\left(\frac{Q\kappa}{Cq_x}\right)_\varepsilon} \tag{9.24}$$

4. $G = k + 1$ indicates the number of internal quasi corpuscular zones. In the structures of mesons this is $G = 2$, and for baryons $G = 3$ such zones.

In the $1 \le j \le 4$ configuration zones of a c or d-hermetry b_λ is the number of quasi corpuscular zones $1 \le \lambda \le G$. For the timelike constant framing structure $n_j = 0$ and $G_j\,(Q_j) = \text{const}\,(t)$ are consistent. In this case, for the protosimplex occupation is given by (7.44):

$$\begin{aligned} G_1 &= ¼\,Q_1^2(1 + Q_1)^2, \\ G_2 &= 1/6\,Q_2(2Q_2^2 + 3Q_2 + 1), \\ G_3 &= ½\,Q_3(Q_3 + 1), \\ G_4 &= Q4. \end{aligned} \tag{9.25}$$

For $\underline{k = 1}$ $\quad Q_1 = 3,\ Q_2 = 3,\ Q_3 = 2,\ Q_4 = 1$ and therefore,

$$G_1 = 36,\ G_2 = 14,\ G_3 = 3,\ G_4 = 1,$$

and because $G = k + 1 = 2$ there exists for these mesons two quasi corpuscular zones. Identify $Z\,(n)$, $Z\,(m)$, $Z\,(p)$, and $Z\,(\sigma)$,as the occupation numbers of the 4 configuration zones. Then two meson regions would appear together in the forms $b_1 = Z\,(n)$ and $b_2 = Z\,(m) + Z\,(p) + Z\,(\sigma)$, because only for G_1 the condition $Z_\lambda\,(b_\lambda) \ge 16$, an invariant basis can be found is satisfied.

For $\underline{k = 2}$, $Q_1 = 24$, $Q_2 = 31$, $Q_3 = 33$, $Q_4 = 15$. The occupations of G_1, G_2, and G_3 satisfy the condition $Z_\lambda\,(b_\lambda) \ge 16$, with the exception of Q_4. Because $G = 3$ applies to the baryon distributions of quasi corpuscular zones, $b_1 = Z(n)$, $b_2 = Z(m)$, and $b_3 = Z(p) + Z\,(\sigma)$. It is assumed that because of (2.43), the three partial elementary charges $C_{e\pm}$ define $e_\pm = 3\,C_{e\pm}$ in the G region b_λ with the state $C_{e\pm}$ or $2\,C_{e\pm}$ a d-term with $q = 1$ or $q = 2$. This gives the experimental discovery of **"quarks"** another theoretical interpretation. Because the empirical quarks are in Heim's theory not subparticles which are bound by gluons, but are extremely high density fields, which cannot be separated by scattering experiments.

The constant time "frame condition" ($n_j = 0$) can be used for $k = 1$ and $k = 2$ and with (7.41) can be written:

$$\boxed{\begin{aligned} m_0(k,q) - \mu_S F_S = \mu_- [&\alpha_1/4\,Q_1^2(1 + Q_1)^2 + \alpha_2/6\,Q_2(2Q_2^2 + 3Q_2 + 1) + \\ &+ \alpha_3/2\,Q_3(1 + Q_3) + Q_4 + q\,\alpha_-/\alpha_-] = \text{const}(t) \end{aligned}} \tag{9.26}$$

With the quantum numbers (9.20), component wise for $k = 1$ and $q = 1$, when the unknown function value $F_S \approx 1$ is substituted, the following mass values are found:

$$m_0(1,1) - \mu_S F_S = 0.50562729 \quad \text{[MeV] or}$$

$$m_0(2,1) - \mu_S F_S = 938.2497 \quad \text{[MeV]}$$

Since the spin function F_S has not yet been considered, the results for the masses of the electron, $m_e \approx m_0(1,1)$ and for the proton $m_P \approx m_0\ (2,1)$ now can only be approximated. For the neutral electron the mass value is $m_0\ (1,0) - \mu_S F_S = 0.501507$ [MeV].

10. Excitation Limits of Resonances and Masses of Neutrino States

Because of time independence the occupation numbers n_j (t) of the $j = 4$ configuration zone for $n_j = 0$ and $P = 1$, a time stable structure is guaranteed for the $k = 1$ and 2 elementary particles. e^- and p. The time independence of nj (t) would have to have a single relationship, as the selection rules allow all n_j multiplet components $(v)_x$ from the possible integer quadruple selections. A change to the level of $N(j)$ in (7.44) to $\Delta jGj > G_{j+1}$ ($J = 1$ to 3) with $\Delta jGj \geq \Delta_{j+1} G_{j+1}$ means that occupation of the j-Zone is determined by additional Protosimplex elements through the central Zone with $j = 1$.

Heim conceives the multiplet components $(v)_x$ as abstract lattice points in a six dimensional grid V_6 (k, P, Q, κ, Cq_x). Each pattern in (9.15) denotes such a point. If this pattern refers to the non-existent expression $\hat{I}(0) = 00\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{\varepsilon}$ with $\varepsilon = \pm 1$ however, it should be represented by the transition $\hat{I}(0) \rightarrow \hat{I}(\nu x)$ represented by a function of $(v)_x$, and in the transition to the new grid point, the occupation is one of the 4 zones described by n_j when, as a reference point, the lowest value of N_j is taken. $n_j(t)$ values less than 0 are possible. Since $N_{(j)} = n_j + Q_j \geq 0$ must remain true, there is a lower bound $(n_j)_{min} = -Q_j$, so that $_{(j)} = 0$ for empty space. Since $\Delta_4 N_{(4)} = 1$, consists of a total transition from ΔjM (c, d) + Δ_4. In empty R_3, $\Delta_4 = 0$. This applies to the external zone $J = 4$ of the expression $\mu_+ \exp(-AN_{(4)})$, and $N(4) = 0$ in the V_6 reference point μ_+. Therefore:

$$\Delta_4 = \mu_+ \exp(-AN_{(4)}) - \mu_+ = \mu_+ [\exp(-AN_{(4)}) - 1]. \qquad (10.1)$$

There must be a function $W(xv)$ which is a function of the V_6 lattice point invariant ground state, which in the transition $\hat{I}(0) \rightarrow \hat{I}(\nu x)$ returns $N(j)$ (vx) to the state $(v)_x$ of the grid point with the masses ΔjM (c, d) + $\Delta_4 \sim W(x\,v)$.

If the indexing (vx) is omitted,

$$\mu_+ W = \Delta M + \Delta_4 \qquad (10.2)$$

or with $\Delta_j N_{(k)} = \delta_{jk}$ and (7.41) with (7.44):

$$W = \sum_{j=1}^{4} \alpha_j \Delta_j G_j + \Delta[(1 - \alpha_- / \alpha_+) F_S + q\alpha_- / \alpha_+] + \exp(-AN_{(4)}) - 1 \qquad (10.3)$$

The unknown function F_S depends only on $(v)_x$. Therefore we have:

$$\Delta F_S = \Delta q = 0,$$
$$\Delta_1 G_1 = N^3_{(1)},$$
$$\Delta_2 G_2 = N^2_{(2)},$$
$$\Delta_3 G_3 = N_{(3)}$$
$$\Delta_4 G_4 = N_{(4)}\,.$$

This gives, with $\alpha_4 = 1$ substituted in (10.3),

$$\alpha_1 (n_1 + Q_1) + \alpha_2 (n_2 + Q_2) + \alpha_3 (n_3 + Q_3) + \exp[-A(n_q + Q_4)] = W \qquad (10.5)$$

$W \equiv W(vx)$ is considered as a **protosimplex generator** of the ground state $(v)_x$. The decay constant A depends only on k: A = A (k). This results in the relationship (with $Q_4 = 1$):

$$A(k) = 1/(3Q_4)(2k - 1). \tag{10.6}$$

From (10.5) therefore:

$$W(vx) = \alpha_1 N_{(1)}^3 + \alpha_2 N_{(2)}^2 + \alpha_3 N_{(3)} + \exp[-(2k - 1)N_{(4)}/ 3Q_4] \tag{10.7}$$

For both k values the timelike constant lattice structure described by $n_j = 0$ is given by:

$$\alpha_1 Q_1^3 + \alpha_2 Q_2^2 + \alpha_3 Q_3 + \exp[-(2k - 1)/3] = g(k,q) = \text{constant(t)} \tag{10.8}$$

$g(k,q)$ is the **basis increase** of $n_j = -Q_j$ after $n_j = 0$ in the V_6-lattice complementary P_4-Raster, because each point in V_6 is assigned $j = 4$. The ratio $W / g = w \neq 0$, is defined as the **structure potential** of the ground state $(v)_x$. For $n_j = 0$, $w = 1$. In this case the basis increase is identical to the Protosimplex generator. Correspondingly the two k values combine with two coefficients w_1' and w_2' as:

$$w = 1 + (2 - k))w_1' + (k - 1)w_2' \tag{10.9}$$

which can be written with $w_1 = w_1' + k - 1$ and $w_2 = w_2' + 2 - k$ as:

$$w = w_1^{(2-k)} + w_2^{(k-1)} \tag{10.10}$$

According to the cubic equation of Protosimplex generators each V_6 point is assigned a quadruple N_j in the P_4-Raster, corresponding to a mass term (7.41), so that a whole spectrum of excitations becomes possible.

For $N = 0$, the 26 points of V_6 once again lead to complements n_j in P_4 through a Protosimplex generator. For $N > 0$ the V_6-lattice is replaced by a V_7 lattice. W is complemented by an additional factor n_j (N) on values above each grid point $n_j(0)$ that the ground state specifies, leading to a basic pattern $(v)_x$. Because $V_6 \rightarrow V_7$ with $N > 0$ adds a factor F (N) ≥ 1, the Protosimplex generator W becomes W ($v\,x$) F (N), as given in (10.7).

F (N) is represented through an excitation function f (N) as: F (N) = 1 + f (N). f (N) and w are ambiguous but can be found using empirical data (Heim used the particle Data from "Review of Particle Properties, CERN, 1974 in the course of this study).

Designating $ß_j = \Delta_{j-1} G_{j-1} - G_j$, as the possible number of excitation levels in j, an increase in f will reset the bandwidth $ßj > 0$ to $ßj = 1$. The specific excitation with multiples of the energy $\mu_+ c^2$ in the first external zone $j = 4$ can go over to $j = 3$, $j = 2$, and the central Zone $j = 1$. The range of excitation in the external zone is:

$$ß_4 = \Delta_3 G_3 - (n_4 Q_4) = \alpha N_{(3)} - N_{(4)} > 0 \tag{10.11}$$

The transition from $N = 0$ to $N > 0$ is a resonant process. As a consequence of $M(N)$ a V_6 lattice point in P_4-space becomes a **resonance** of the ground state $(\upsilon)_x$ and the whole number $0 \leq N \leq N_{max} < \infty$ designates its **resonance order**.

In (10.10) w_1 is the sum of a scalar part S_C and a spinor part S_P and is written as:

$$w_1 = (1 - Q)\, S_C + Q\, S_P . \tag{10.12}$$

This gives, for $k = 1$ with $S_C = \sum_{i=1}^{5} X_i$ and $S_P = X_6$ the expression:

$$w_1 = (1 - Q) \sum_{i=1}^{5} X_i + QX_6 , \tag{10.13}$$

with:

$$\begin{aligned}
X_1 &= F_{11}, \\
X_2 &= - p\, F_{12} \\
X_3 &= - p\, (\kappa q/\eta_{qx})\, F_{23}, \\
X_4 &= - \binom{P}{2} \frac{\kappa q}{\eta_{qx}}\, F_{14}, \\
X_5 &= \binom{P}{2} \frac{q}{\eta_{qx}}\, F_{15} \\
X_6 &= \kappa\, \eta_{qx}\, F_{16},
\end{aligned} \tag{10.14}$$

where the F_{ik} are metronic functions that must be determined. For $k = 2$ this gives neither the scalar or tensor terms, but only two spinor terms $Q = 1$ and $Q = 3$.

In $$w_2 = \sum_{r=1}^{10} Z_r \tag{10.15}$$

the sum terms Z_r depend on q, P, κ and $\binom{P}{2}$ as well as $\binom{P}{3}$. The summations of w_2 according to Heim are:

$$\begin{aligned}
Z_1 &= - (1 - q)\, F_{21} \\
Z_2 &= (1 - P)\, F_{22} \\
Z_3 &= \binom{P}{2} F_{23} \\
Z_4 &= \varepsilon\, q_1\, \eta_{qx} \binom{P}{2} [1 + (1 + \varepsilon q_x)\, F_{24}]^{-1}\, F_{25} \\
Z_5 &= \kappa\, F_{26} \\
Z_6 &= \kappa\, q\, \eta_{11}^{2}\, F_{31} \\
Z_7 &= \binom{Q}{3}\, \eta_{qk}\, F_{32} \\
Z_8 &= \binom{P}{3} q^2 [\varepsilon\, q_x - (-1)^q]\, F_{33} \\
Z_9 &= e(P\text{-}Q) \exp[(q \ln\eta)(q\text{-}1)/4][1\text{-}(q/\eta_{kk})(2\text{-}q)\; F_{34}^{(j-sq_x)}\, F_{35}]\, \eta_{qk} \eta^{-2} [8 - (q\text{-}1)qF]^{-1} \\
Z_{10} &= - \binom{P}{3} F_{36}.
\end{aligned} \tag{10.16}$$

The unknown functions F_{ik} and F converge with increasing metron numbers to give real limiting values Aik and A. (A indicates the matrix A_{66}). These limiting values for F_{ik} and F in (10.12), (10.13) and (10.15)

finally become fully determined after long calculations as we see in chapter E in equations XVI, XVII and XVIII.

The Aik were found by Heim by comparing the empirical mass ratios of the Ground states with number theoretical values for the parameters are compared and numerically calculated and are based solely on the parameters π, e and ξ and the coupling constants α_+ and α_- from (8.12) (they are listed in Formula XXIV, Section E).

From an analysis of the empirical resonances we see that the unknown function f (*N*) consists of two parts:

$$f(N) = X_B(N) + X_R(N), \tag{10.17}$$

where $X_B(N)$ is that part of *N* essentially unchanged, however X_R is monotonically increasing. We have for the summation of the limiting values:

$$\lim_{x\to\infty} X_B = a(vx) = const(N) < \infty \; and \; \lim_{x\to\infty} X_R = b(vx) = const(N) < \infty$$

then the family of curves is defined in the following manner:

$$f(N) = [1 - Q(1-\kappa)(2-k)[aN/(N+2) + b\sqrt{N(N-2)} - ib\delta_{1N} \tag{10.18}$$

$$(\delta_{1N} = 0 \;\; for \;\; N \neq 1, \; \delta_{11} = 1)$$

$a(vx)$ indicates the **basis of resonance** states; $b(vx)$ indicates the **resonance spectrum** which is decreasing in value on the resonance surface. The resonance basis is determined by:

$$a(vx) \equiv a = 1/k(1 + a_n a_q)A_4 \tag{10.19}$$

with a_n and a_q given in equations XXI and XXII of Chapter E. The resonance spectrum $b(vx)$ is given in Chapter E, equation XXIII.

With these expressions the values for *W*, *a* and *b* for each V_6 point $(v)_X$ can now be determined numerically. With $W = W(1 + f)$ (9.7) becomes:

$$\alpha_1 N_{(1)^3} + \alpha_2 N_{(2)^2} + \alpha_3 N_{(3)} + \exp[-(2k-1)N_{(4)}/3Q_4] = W_1 \tag{10.20}$$

The determination of $N_{(1)}$ to $N_{(3)}$ are computed by an exhaustion process: The positive whole number is set to 1 and increased up to the maximum value of $N_{(1)}$ for which $\alpha_1 N_{(1)}{}^3 \leq W_1$ and $\alpha_1(N_{(1)}+1)^3 > W_1$. Then W_2 is formed from the expression $W_2 = W_1 - \alpha_1 N_{(1)}{}^3$, and the procedure for $J = 2$ is $\alpha_2 N_{(2)}{}^2 \leq W_2$ and with this value, $W_3 = W_2 - \underline{\alpha} N_{(2)}{}^2$ can be found. Then with $\alpha_3 N_{(3)} \leq W_3$ the value of $N_{(3)}$ can be found by the exhaustion process. W_4 is then given by $W_4 = W_3 - \alpha_3 N_{(3)}$.

Next the contribution $\mu_S F_S$ can be found from the empirical mass data M_{emp}. It is given by:

$$\mu_S F_S = M_{emp} - \mu_+ \left(\sum_j \alpha_j G_j + q\frac{\alpha_-}{\alpha_-}\right) \tag{10.21}$$

with $\mu_S = \mu_+(1 - \alpha_- / \alpha_+)$ and $\mu_+ = 4\,\mu\,\alpha_-$. F_S has the expression:

$$F_S = [A_v F_1 F_q F_w / F_2 + B_v(P+Q)]\,[4(1 - \alpha_-/\alpha_+)]^{-1} \tag{10.22}$$

where F_1 and F_2 are functions of P, Q, and k; and F_k and F_κ are functions that depend on q and k or on κ and k. A_v and B_v are constants which depend on α, α_- and α_+.

In (10.22) a summary of the uniform part with charge value q which α_- / α_+ allows is given by:

$$F_S = [4(1 - \alpha_- / \alpha_+)]^{-1} [\Phi - 4 q \alpha_- / \alpha_+] \qquad (10.23)$$

with

$$\Phi = A_v F_1 F_Q F_\kappa / F_2 + B_v (P + Q) + 4q\alpha_- / \alpha_+ . \qquad (10.24)$$

Leading to the new factors:

$$\begin{aligned} N_1 &= \alpha_1, \\ N_2 &= (2/3)\, \alpha_3, \\ N_3 &= 2\, \alpha_3, \end{aligned} \qquad (10.25)$$

with G_j composed of components in which K is a timelike constant part of the framework structure and a part F that only depends on n_j and a mixed part H:

$$G_j = \tfrac{1}{4} \sum_{j=1}^{4} 1 / \alpha_j \, [K(Q_j) + H(n_j Q_j) + F(n_j)] , \qquad (10.26)$$

this results in a unified spectral function of all mass terms:

$$\boxed{M(N) = \mu \alpha_- (K + F + H + \Phi) ,} \qquad (10.27)$$

with K, H, Φ and $F \triangleq \underline{G}$ as given in chapter E, equation (XI) (with $Q_i = n_i$).

The maximum possible mass M_{max} is determined by the limit of the central zone $j = 1$ through an increase of $\alpha_1 (L_1 + Q_1)^3$, with $L_1 = (n_1)_{max}$ fixed, in multiple forms of the invariant S and Mx at the point $(v)_x$ in the V_6 lattice with $N = 0$: $\mu_+ \alpha_1 (L_1 + Q_1)^3 = SM_x$. This gives, for $k = 1$: $S = s\,(1) = 2\,(P + 1)\, M_x$, and for $k = 2$: $S = s\,(2) = 3\,(P + 1)\, M_x$, because $G\,(1) = 2$ and $G\,(2) = 3$. This allows the equation:

$$S(k,P) = 2/k \; G(P + 1)^{2/k} \, M_x \qquad (10.28)$$

using the values given by (7.44) for the numerical quantities to give this equation:

$$\mu_- \alpha_1 = 2/k \; (k + 1)(P + 1)^{2/k} \, M_x \qquad (10.29)$$

For the remaining $J > 1$ values the maximum occupations are given in Chapter E, equation (XXXIV) (when the terms in the equation are known, and the equation for L_j (XXXV) is assumed to be correct).

For the resonances $0 \leq N \leq L_N$, when $M(N) > M_X$ an energy excitation is reached so that $M(N) - M_X > 0$ requires an increase in n_j.

The integer pseudomatrix $\hat{S}$ which replaces (9.15) is, with the value $N > 0$:

$$\hat{S} = \mathrm{k\,P}\left(\begin{smallmatrix} n & m \\ p & \sigma \end{smallmatrix}\middle\| \begin{smallmatrix} Q & \kappa \\ C & q_x \end{smallmatrix}\right]_e^N . \qquad (10.30)$$

This will be designated as a **Stratonmatrix.** $X(vx)$ gives the name of the corresponding N-Resonance of $(\nu)_x$ and is placed behind the Stratonmatrix:

$$\boxed{\hat{S} = \mathrm{k\,P}\left(\begin{smallmatrix} n & m \\ p & \sigma \end{smallmatrix}\middle\| \begin{smallmatrix} Q & \kappa \\ C & q_x \end{smallmatrix}\right]_e^N \mathrm{X(vx)}} \qquad (10.31)$$

Examples:

1. Electron:

$$11\left(\begin{smallmatrix} 0 & 0 \\ 0 & 0 \end{smallmatrix}\middle\| \begin{smallmatrix} 1 & 0 \\ 0 & -1 \end{smallmatrix}\right]_+^0 e^- \qquad (10.32)$$

2. Nuclear doublets p and n:

$$21\left(\begin{smallmatrix} 0 & 0 \\ 0 & 0 \end{smallmatrix}\middle\| \begin{smallmatrix} 1 & 0 \\ 0 & 1 \end{smallmatrix}\right]_+^0 p \quad \text{und} \quad 21\left(\begin{smallmatrix} 0 & 0 \\ -2 & 17 \end{smallmatrix}\middle\| \begin{smallmatrix} 1 & 0 \\ 0 & 0 \end{smallmatrix}\right]_+^0 n \qquad (10.33)$$

The invariant ground states of terms $(\nu)_x$ of the masses M_x describe the stationary states of dynamic equilibrium of the inner correlations of condenser fluxes of (±p) which center around an integral cyclical flux aggregate. It has a definite period $\Theta_x > 0$, after which time the initial state is again reached. T is the duration of this resonant process which, if it occurs during $M(N)$, $T > \Theta_x$. The condition for such a resonance is $\hbar\omega R > (M(N) - M_x)\,c^2$. If $T < \Theta_x$ the amount of energy $E_x = \hbar\omega R >> (M_L - M_x)\,c^2$ and no structure is possible. In the case of deep inelastic collisions, energy is emitted that depends on both the structure of the excited term as well as the resonance energy E_r. This energy is radiated in the form of jets.

In (10.31) when the restriction to empty space with $n_i = -Q_i$ is introduced, because $(\nu)_x$ in spite of the fact that $\begin{pmatrix} -Q_1 & -Q_2 \\ -Q_3 & -Q_4 \end{pmatrix} \equiv 0$ in (9.27), $\mu\alpha_+ \Phi \neq 0$ (with the exception of neutrino states). If $M_\nu = M(\nu_x) = \mu\alpha_+ \Phi$ is true, proving $M_\nu << M(e_0)$ so that (7.14) is not a neutrino mass, then $q = 0$ is true.

For (0] the empty R_3 space in (10.27) in case $n_i = -Q_i$, the part $K + H + F = 0$, however $\Phi \neq 0$. Therefore, despite the restriction to an empty space there can be a neutrino mass:

$$m(\nu_x) = \mu\alpha_- \Phi_{q=0} \neq 0 \qquad (10.34)$$

There are only neutrino state ν_x masses for which $P + Q$ is an even number:

$$\hat{S}\,(\nu)_x = \mathrm{k\,P}\,(0\left|\begin{smallmatrix} Q & \kappa \\ C & 0 \end{smallmatrix}\right]_e \nu_x \qquad (10.35)$$

The protosimplex free R_3 states characterized by (0] can be identified as neutrinos. Due to (0] they are not ponderable, but because of $\Phi \neq 0$ are not imponderable.

For $k = 2$ neutrino states do not exist. (10.27) gives the following selections for neutrino states that do exist:

$$\Phi_e = 4 A_\nu (3 - \alpha) \sqrt{\eta_{11}} + 2 B_\nu$$
$$\Phi_\mu = 4 A_\nu (1 + 2\xi/3\eta^2)(3 - \alpha) \sqrt{\eta_{11}} + 2 B_\nu \qquad (10.38)$$
$$\Phi_\pi = 4 A_\nu (3 - \alpha)(1 + 4\xi)^{-1} \sqrt{\eta_{11}} + 2 B_\nu$$
$$\Phi_R = \Phi_p = B_\nu$$

According to Heim, neutrinos are not metrical states of empty metronic spaces, but are “field catalysts”; when ν_x -radiation transfers invariance properties and this makes possible ponderable matter field quanta reactions that otherwise could not take place.

11. Experimental Verification of Heim's Structure Theory

The mass formula (10.27) was programmed (see chapter E) in 1982 by members of DESY (Schulz and Ribgen) and the values of the masses of the ground states and resonances consisting of hundreds of pages were printed. The deviations from the theoretical measured values are so small (the deviation of the Electron mass is approximately 10^{-6}, and the proton mass approximately 10^{-7}) that the accuracy of Heim theory was confirmed by the elementary particle experimental values. Since there are no selection rules for the resonance masses reproduced by the mass formula, too many are predicted. The values are very numerous in the intervals down to 20 MeV. The theory predicted new Omicron-particles o_+, o_0, o_- and o_{--}. The mass of o_+ is predicted to be 1540 MeV / c ². One of the resonances of this particle is at 2317.4 MeV/c², which is exactly the value of the particle D_{SJ}* (2317) that has been recently discovered in the experiment by Barbar at SLAC in (2003). The existence of a neutral electron is not excluded by CERN physicists. The proof is difficult due to the small cross section, but these neutral electrons may be found in cosmic ray particles that have traveled from astronomical distances, and are not distorted by interstellar magnetic fields. Also a proof is necessary about the lifetime of the short lived excitations so that it can be predicted which resonances are measurable in general.

The neutrino masses were not calculated at DESY in their program. However the company MBB / DASA derived another formula in 1989 to find the masses and lifetimes of the ground state levels and the neutrino masses.

After the death Heim in 2001, the working group "Heim Theory Group" was formed to reconstruct the work of Heim. In 1989, after re-programming they could account for the values given by Heim for masses of the neutrinos. These are consistent with the empirical estimates. (Because of the considerable effort which the checking of the formulas for calculating particle lifetimes will require, this part was not reprogrammed. The values derived by Heim will be presented).

Since in the equations, except for the mathematical constants π, e and ξ, only physical constants h, c and *G* are used, the results of the calculations depend on the exact values of these constants, especially the gravitational constant *G* (relative Uncertainty of $5.1 \cdot 10^{-3}$). The masses for the ground states of elementary particles were computed using the minimum and maximum value for *G*, as given in the CODATA / CERN data. In both cases the numerical mass values were outside the measuring tolerances. The most probable value obtained from experiments currently is assumed to be $G = 6.67407 \times 10^{-11}$ m³ kg^{-1} s^{-2}. (Gundlach and Merkowitz 2000 Kündig et al. 2002/03). With this value, the majority of the theoretical Mass values are inside the measuring tolerances.

Heim had calculated *G* (6.6732×10^{-11} m³ kg^{-1} s^{-2}) from the mass formula by using the empirical value of the proton mass, which is the most accurately known mass value of the long-lived particles (see chart, Chapter G). For the calculated masses of 16 different elementary particles, five are within the measured limits of error, and the deviation of the others is not more than one order of magnitude. With a slight increase in the value that Heim had previously chosen for the gravitational constant ($G = 6.6733082 \times 10^{-11}$ m³ kg^{-1} s^{-2}) we obtain the result that eight are within the error limits, with minimum relative differences in the numerical values for the masses of the electron, proton and neutron.

A further development of Heim's theory was made by Dröscher (2003). In his extension of the theory to 8 dimensions this new polymetric structure can calculate the value of the Gravitational constant. This theoretically determined value of *G* is $6.6733198 \times 10^{-11}$. Eight of the theoretically derived masses using this value of *G* also lie within the error limits.

Of the calculated particle lifetimes 12 out of 14 particles are within the empirical error limits (cf. Chapter G chart). Heim's structure theory is therefore well proven here also.

Since both the Dirac equation and the Einstein Field equations can be derived from Heim's equation, along with an elementary particle mass spectrum , the quantum of action constant as well as a numerical value for the gravitational constant, this theory has proved superior in comparison to other theories.

Heim's semi-classical structure theory only describes free particles. Those wishing to study interactions between those particles should consider Heim's theory as the next logical step.

Heim worked until his illness in 1999 on the calculation of the lifetimes of the resonances in order to derive a selection rule. At the same time, he calculated the magnetic moments of elementary particles. However these documents are not available to us.

B. Heim and W. Dröscher made a proposal to unite the probability aspects of quantum theory with the structure theory (Heim and Dröscher 1996). How interactions are treated has not been defined. The transformations of the particles would be defined in the geometric theory by production and annihilation operators carried out in Heim theory by the sieve selector S (x) (see Paragraph 3.10 to 3.12), in which each of the fields of probability hermetry act. For example, they make the electron / positron pair production in the Euclidean R_3 -components of the electron and positron. In the 8-dimensional extension of Heim's theory by Dröscher sieve selectors are caused by projection from a possible R_{12}. These investigations are still incomplete at this time.

As long as no better description of the properties of noninteracting particles is presented, Heim theory deserves to be given more attention and studied intensively.

Changelog

Version 1.01g, 2010-08-04
formatting adapted to German version
a lot of typographical changes and corrections
Kondensor → condenser
Konjunktiv → conjunktion
Konjunktor → conjunctor
Hermetrieform → hermetry form

If you have corrections please contact Olaf Posdzech (op@engon.de)

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[i] this theory was communicated by B. Heim to Einstein, but at that time he could not answer and the letter was answered by his coworker in unified field theory, Vaclav Hlávaty.

[ii] from the unified field strength tensor for example, relations can be derived between gravitation and Magnetism, which can be examined experimentally. In the 60's Heim wanted to accomplish such experiments with P. Jordan at Hamburg and in the 70's with the company MBB, Ottobrunn,. But the costs of these experiments were estimated at more than 2 million DM (about 1.5 Mill $). Heim also developed a relationship between the contravariant electromagnetic Radiation vector and acceleration effects that should be noticeable. Heim tried to verify this effect experimentally in the 50's in its Institute, but did not succeed because of the limited money available for financing of coworkers. The discovery of this effect would make new field drives possible for space travel. B. Heim did not publish the derivation of this contravariant equation. After examining its deduction these considerations are to be examined in the fiber bundle Heim theory and published if necessary.

[iii] These equations are nonlinear. The square of the wave amplitude or the wave function $|\psi n|^2$ indicates the probability to find the particle as the energy E_N at a certain place in the area. The Copenhagen interpretation of the probability interpretation, with which wave particle dualism is described, was rejected by some physicists (e.g. Einstein, deBroglie, Bohm), because the character of an observable is defined by Experiments and not given by nature. The Schrödinger equation is based on experience. Indeterminism could be only pretended however through “hidden variables”, it was assumed. The dualism of the particle characteristics, could be explainable also by the fact that the objects would be structures in higher-dimensional areas, which project themselves only by different exchange actions with measurable effects into the area and presented there – depending upon equipment – its wave or particle character. This interpretation, which could save determinism, was not considered seriously by John v. Neumann in 1932.

[iv] iv The nonlinear eigenvalue equations (1.3) correspond to those in the causal and continuous description of the deBroglie Bohm version of the quantum theory, in which a particle is understood to consist of nonlinear and linear wave components (Gueret and Vigier 1982). In it the wave function φ is a soliton solution of the nonlinear kind, which acts as a guide wave with the particle and in the form of waves interacts with its environment. Particle and Environment form a unit, consisting however of differently curved space-time structures. After that Quantum field cybernetics points to a particle as a nonlinear completely geometrical structure. (Grössing 2000).

[v] The either/or statements of Aristotle logic do not apply any longer to the coordinates x_5 and x_6 around the qualitative values which are used there. An aspect logic was developed by B. Heim in order to be able to describe the qualitative and quantitative features of physics uniformly. Whereupon this will not be discussed further here.

[vi] B. Heim had calculated a value of 4/3c for the propagation speed of gravitational field disturbances in his first publication (1980), which was due to the use of a wrong operator expression. In the following, c is the propagation speed of gravitational field disturbances and has a value of one. Publications of other authors, who – like Heim in former times – use 4/3c, are not supported by us.

Note that in the discussion between equations (8.50) and (8.51) (part c), the velocity of a gravitational disturbance is said to be 4/3 c (J. Reed).

[vii] if the real part has the value +1, then $\psi_{kl}(\pm\infty)$ becomes singular. Heim excludes singular values.

[viii] Another explanation for inertia was found by Dröscher (2003) in his extension of Heim theory to 8 dimensions. Starting from (4.25) leads to the expression $\lambda_{kl}\,\mathbf{Y} = \text{const}$. That means that the λ_{kl}-vectors are aligned parallel or antiparallel to **Y**, which is caused by a probability field. Since λ_{kl} possesses the dimensions of a exchange length or mass, $\lambda_{kl}\,\mathbf{Y} = \text{const}$ can be interpreted as momentum conservation.

[ix] For example, $(+(127) \mathrel{\hat{=}} [1] + [2] + [3]$ with $(+1) \mathrel{\hat{=}} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \equiv [1]$, $(+2) \mathrel{\hat{=}} \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} \equiv [2]$ etc…

[x] In order to give to the reader an impression of what is meant by this, the derivation is briefly discussed. According to the rules of Metronic calculations each cell sequence $a_n = \varphi(n)$ can be understood as a metronic function, which is defined as follows:

$$\varphi(n) = \varphi(n-1) + \varphi(n-2). \tag{A.1}$$

From this it follows: $\varphi(n-2) = \varphi(n) - \varphi(n-1) = \Delta\varphi(n) = \Delta\varphi(n)/\Delta n$ (A.2)

and with $\varphi = \varphi(n)$: $\Delta^2\varphi = \Delta[\varphi - \varphi(n-1)]$

$$= \Delta\varphi - \Delta\varphi(n-1) = = \Delta\varphi - \varphi(n-1) + \varphi(n-2) \tag{A.3}$$

With the substitution of (A.2) in (A.3) we have

$$\Delta^2\varphi = 3\,\Delta\varphi - \varphi \tag{A.4}$$

or as a *selector equation*: $\Delta^2(\ ) - 3\,\Delta(\ ) + (\ ) = 0$.

For $\varphi(n)/\varphi(n-1) > 1$ a limiting value $\xi > 1$ exists:

$$\lim_{n\to\infty} \phi(n)/\phi(n-1) = \lim_{n\to\infty} \phi(n-1)/\phi(n-2) = \xi \tag{A.5}$$

Equation (A.1) divided through by $\varphi(n-1)$ leads in the limit to the value

$$\xi = \lim_{n\to\infty} \phi(n)/\phi(n-1) = 1 + \lim_{n\to\infty} \phi(n-2)/\phi(n-1) =$$

$$= 1 + \left[\lim_{n\to\infty} \phi(n-1)/\phi(n-2)\right]^{-1} = 1 + 1/\xi \tag{A.10}$$

or $\xi^2 - \xi = 1$, and with the condition $\xi > 1$

$$\boxed{\xi = \tfrac{1}{2}(1 + \sqrt{5})}$$

is a constant, which describes the Fibonacci series.

(Also known as the Golden Ratio)

[xi] In volume 2 (Heim 1984) the metronic cell structure of the R_3 distorted by the fields was not considered; i.e. the factor f is missing in the product $f\varphi(\rho)$ in (8.1). The correct representation above is given in the Appendix of the second Edition of volume 1 (Heim, 1989).

[xii] This rotation experiment has not been carried out because of cost reasons. The company DASA, Ottobrunn, did preparatory work in the year 1980. Preliminary results of the planned experiment were presented in the 1985 conference "SQUID and their Applications" in Berlin.