Claus Birkholz

Philosophy *of* Quanta

Tensor model of varying observer positions

Inhalt

1. Historical Recollections 1
2. Classical Dead Ends in History 5
3. The 8 as the Characteristic of a Probability 9
4. Commensurability... 12
5. The Law of Great Numbers 15
6. Dynamics and Process Logic 17
7. Embedding Einstein into QG 20
8. Forces 25
9. The Tale of a Massive Big Bang....................................... 29
10. Observer Positions and Repetition 32
11. Black Holes and the Big Bang 37
12. CMS-Spacetime vs. Classical Spacetime........................ 40
13. Valence vs. Dark Matter 43
14. Unit Systems 47
15. Quasars.. 51
16. Particle Spectrum 54
17. Towards the General Mass Formula for Resonances 58
18. Philosophy of Young Tableaus....................................... 62
19. Definitions and Fundamental Principles 66
20. The Eternal Loop... 74
21. The Engine of Time 78
22. Outlook... 81
References 85

1. Historical Recollections

In ancient times already, there had been ruminations among philosophers if the divisibility of matter could not be limited. It took thousands of years until chemistry, ultimately, realised a first step into that direction by finding the atomic structure of matter (i.e. the periodic table of elements). In order to uncover the world of elementary particles, then, it just took another few centuries.

In the year of 1900, finally, Planck founded quantum theory and Einstein, shortly later, the relativity of space and time. All of a sudden, the suspicion arose if Einstein‘s spacetime could not be composed of tiny “components of dynamics“ (quanta), as well. In principle, there had been no apparent objection against it. Now, after 100 years, however, physics still is unable to prove this presumption by experiment. (If existing, those spacetime units simply are too small for contemporary measuring devices.)

In parallel, the problem of life and the ensuing problem of a human spirit has proved to be a tough nut to crack. The approach to life is laborious. Darwin‘s theory of evolution and the decoding of the DNA have been striking stages. In addition, there has been little progress in getting access to the detailed mechanism how the sensory organs of animals and humans are working.

On the field of the spirit, on the transmission of sensory impressions into the brain, and on their storage and administration, ideas are vague. According to the present understanding of things, however, some comprehensive solution to those problems still is a long way off. By then, it still will remain the battle field of immature hypotheses and dark conspiration theories. All the more, this is the situation for details of decoding brain functions, too.

As paradoxically as it might sound – the big handicap on this road just has been the technical progress of the last 3 centuries, characterised by the mechanical philosophy of nature; artificial intelligence (AI) still is applying it to-day. With everything subjected to some causal approach, people are believing to be able to extrapolate everything up to the greatest and down to the smallest scales of our universe. (Concepts: The infinitesimal calculus in mathematics, thermodynamics and the meticulous equations of motion in physics, reality and objectivity in philosophy.)

By the incompleteness of his General Theory of Relativity (GR), Einstein had supplemented a contradictory view on our universe. (Singularities!) There, cosmic expansion resulted to be independent of the processes occurring within the surface of a bubble (illustrated by the skin of an inflating balloon), and "the world we are living in" – according to his opinion (dimension = 4) – had to confine itself to that surface. Direct discrepancies from such a concept had been super-luminal velocity (in black holes and in cosmic inflation), which he, then, just had to push towards some world outside that bubble (i.e. outside its range of application), where it did not trouble anybody.

Einstein, hence, replaced that ancient ether, which meanwhile had become inopportune, by an expanding space beyond the application area of the physical laws relevant to us. Thus, he decoupled *physical* dynamics from some superimposing, unphysical, additional dynamics (cosmic expansion, cosmic inflation), into which, now, everything had to be shifted off which contradicted our laws of physics.

Rather similar incompatibilities of a related origin popped up when Feynman treated elementary particles by applying his virtual masses. Feynman's diagrams strongly are contradicting Einstein's equivalence principle. In spite of that, however, Feynman could be verified experimentally (by quantum electrodynamics and by the physical existence of particle "resonances").

Analogically, philosophers got lost with their definitions of subjectivity and objectivity. They postulated an *ideal* notion of reality colliding with the physical notion of measurability. Deliberately, they overlooked that an ideal meant some limit which is not available and, hence, neither can be definitely checked nor ultimately verified.

Briefly, their “objectivity” based on subjective statistics and arbitrary specifications of privileged individuals. Their “objectivity“, hence, resulted from gossip depending on group dynamics among selected individuals and on their subjective view of our world. Their “reality“, thus, was unreal – a situation, where subjective opinions are tried to be sold as objective reality.

But, in spite of pitifully looking down on the philosophers, theoretical physicists soon appropriated those notions the more they had to accept not to cope with the unification of Einstein’s relativity with Planck’s quanta towards some “quantum gravity” (QG) meeting the challenges of both models. For, Einstein still had puzzled in detail about how to reconcile measurability with continuous mechanics. With the discreteness of quanta, however, those ideas failed. Discrete quanta do not admit simply to be “smeared out” to some continuum. For, the signs of “neighbouring” quanta could be opposite without having a zero transit between them – because there is no “between”.

Continuous curves are enforcing their smoothness by their postulate of continuity. Einstein managed that on the mathematical base of differential geometry. But discretely distributed quanta are subject to different principles. They, predominantly, depend on combinatorics as materialised by the order of their factors. By mathematics, every quantum is represented by 1 vector of uniform, fixed dimension, and those vectors are baled to tensors (tensor = multiple vector).

In the year of 1900 already, the mathematician A. Young had arranged the index set of a tensor to some pattern of boxes in 2 dimensions (Young Tableau) submitted to certain symmetrisation prescriptions. *(Their rows are floated left and columns are pending from some upper line downwards; their lengths may vary, but without leaving gaps. Their column lengths are limited to the uniform number of vector dimensions, while row lengths are not subject to corresponding restrictions.)*

The characteristic of combinatorics is the deviation of a commuted product bxa from its original axb. In mathematics, this difference (axb – bxa) is called a “commutator“, expressed by square brackets: axb – bxa = [a,b]. *(Young‘s prescription now simply reads: Separately inside every tableau line, all labels first are to be symmetrized. Subsequently, all labels of a column are to be antisymmetrised with respect to their original order.)* Quanta, hence, are subject to quite different mathematics than the current numbers we are familiar with from school, where all commutators always are vanishing!

For people inexperienced in mathematics – but for many classical physicists, as well – those non-vanishing commutators are giving rise to serious irritations. People simply do not want to accept that quanta are no numbers but that they behave like actions. The action a = “Ask Mr. X the way“ and b = “Shoot him down“ will give a different result than the opposite order of both actions. That mathematics of pure numbers used by Einstein is not applicable to systems of quanta without drastic changes. This is the crucial fact with “New Physics“ quantum gravity [1] is based upon, and modern cosmologists, with their rigid fixation on Einstein, still do not understand nor are willing to do so until to date.

2. Classical Dead Ends in History

Our flat earth with the stars as peepholes through the heaven's curtain dividing us from the kingdom of gods bathing in light – then replaced by the geocentric model of our world (sun and stars revolving about the earth) … All that are familiar perceptions of a recent past, based on the ignorance of the intellectual honesty that blanket assertions should be backed by a reliable verification and be free of internal contradictions. Before, all that just are presumptions, entry points, hypotheses, models.

For natural sciences, therefore, we, actually, are rigorously sticking to the principle of reproducibility: Everything which – in whatsoever sense – is not reproducible neither is subject to a natural science. Religions with their multitude of unproved claims and logical contradictions, thus, are left out in the cold. Physics proved to be the "mother" of all natural sciences. History demonstrated that one natural science after the other could be subordinated as a mere branch of physics.

In order to check reproducibility, natural sciences, usually, are applying mathematical logic. Qualitative logic and quantitative mathematics are special branches of philosophy. Thus, we could call a natural science a "natural philosophy", as well. Contrary to mathematics, however, natural sciences still are adding a human aspect: Human lifetime is finite, and body size is finite, too. A human's counting range, hence, is finite as well. A physical measurement, last but not least, means reading some scale. Hence, measuring results produced by experiment are subject to this principle of finiteness, as well: Infinities, in general, are non-physical! The same will hold true for the "free will" that highly praised; it just does not exist [1, chapter 1].

Mathematical logic, in addition, teaches us how to construct limits. Such a limit, however, implies the existence of some infinity which needs some extrapolation process to satisfy some *arbitrary* ansatz. This arbitrariness, however, contradicts unambiguous reproducibility. Consequently, it is non-physical, as well. From a philosophical point of view, one highlight of the last 3 centuries has been the analysis of such limit considerations. Thus, it is not surprising that they also have found their entry – and rather successfully – into scientific thinking. The infinitesimal calculus of mathematics allows for describing mechanical procedures (solutions of equations of motions, e.g.) in a much simpler way.

With respect to mathematics, however, this obscures the logical fact that the differentials (of vanishing size) thus generated will have to satisfy continuity restrictions arbitrarily added in order to integrate their infinitely many terms (needed to *connect* 2 neighbouring points), which not necessarily can be assumed to hold true a priori, already! (Mathematicians, here, are applying the fatale logic “Zero times infinity = finite“.)

By measuring such a “continuous“ length, the application of the differential calculus, hence, implies that the contribution of every term (in the limit) will individually vanish. The application of the differential calculus, hence, automatically excludes the existence of an atomistic model the “quanta“ of which are physical carriers of some *finite* information. (Their summation always would yield infinity.)

The infinitesimal calculus, thus, can describe some smoothed approximation, at all. For a logical “understanding“ of the physics behind it, hence, it is highly inappropriate! Einstein‘s GR and the fundamental models of particle physics applying Feynman’s diagrams, by its Hamilton-Lagrange formalism, are missing the point with respect to a theory built on it. Only quantum gravity (QG), by its atomistic description and by its elimination of a free will, provides some more realistic base beyond classical physics.

For philosophy, this departure from the infinitesimal view of nature also means a departure from considering nature as the result of an abstract pattern of bits from informatics nobody can tell us how their immaterial bits might proliferate to the world of physics. In addition, that classical Hamiltonian formalism of particle physics admits only 1 temporal coordinate. (Even string-brane models are working with just 1 time but 10 space coordinates!) Einstein applied 3 real space dimensions and 1 imaginary time dimension (which he, then, optionally was able to transform into real numbers by his metric).

On its most primitive configuration level, QG [1] applies Dirac‘s 4 *complex* dimensions as the base for defining a fermion. 2 of them, however, still are time-like (“b-spin“). Additional 4 dimensions are used by QG for Dirac’s antifermion. QG is an atomistic model. Its 4+4 = 8 types of “quanta“ are the *physical* *carriers* of some *concrete,* material pattern of bits. Contrary to the above *abstract*, immaterial patterns, their transfer to real nature we are confronted with is no problem any more.

Einstein‘s dynamics only knows 3 real space dimensions and 1 imaginary time dimension. Mathematicians are characterising this geometry as an “SO(1,3)“ (SO = special-orthogonal); for physics, it provides “special relativity“. In 1916, by “crumpling“ this structure (introduction of an additional metric), Einstein succeeded in including gravity into his SO(1,3) (cf. chapter 7): By his “general theory of relativity“ (GR), he, for the first time, succeeded in interpreting some physical interaction (the force of gravity) as a purely geometrical property of his spacetime structure. His subsequent trial to extend this finding to electromagnetism (a so called “internal” force) failed, however.

The cause of his failure was that he had not bothered about the fate of his basic SO(1,3) when constructing his GR. *(Einstein‘s vague stress tensor, by far, did not reach the precision of his Ricci tensor!)* By his “Dirac algebra“, Dirac showed that this SO(1,3) extended itself towards the “conformal group“ SO(2,4), meaning that Einstein, when constructing his GR, right away had overlooked 2 dimensions (those numbered by 4 and 6 [1, chapter 14]) by setting them equal to constant! That incomplete ansatz is reflecting his equivalence principle (inertial mass = heavy mass), which, thus, became invalid; a correct application would have yielded additional terms. (In quantum gravity, by the way, the combination of both additional dimensions just will represent heavy mass as the "dilation" of the conformal group!)

For particle physics, Feynman's "virtual masses" are proving it rather obviously – and cosmologists bitterly have learnt the consequences of those additional terms ignored, which are responsible for its singularities *behind* the event horizon of a black hole. Purely quantitatively, that omission shows up again in terms of dark energy and dark matter astronomers discovered later on, which, in the experiment, just are representing the deviation of Einstein's 4-dimensional GR against QG (in its 6-dimensional version) and its variable mass [1, chapters 8, 14].

By mathematics, these 6 (pseudo)orthogonal dimensions of this "conformal" SO(2,4) just correspond to the 4 complex dimensions of a "special-unitary" SU(2,2) or its "unitary" extension to a U(2,2), respectively. It comprises equal numbers of (complex) space and time dimensions. The CPT theorem of particle physics, then, will commute both types of dimensions with each other.

This transforms the U(2,**2**) of fermions to a U(**2**,2) of antifermions (and v.v.). Thereby, the number 4 of "dynamical" fermion dimensions of a U(2,2), formally, will double to the 8 dimensions of a U(4,4) treating arbitrary particles (extension of an r-number to a c-number Lie algebra). For cosmology, then [1, chapter 19], the borderline between particles and antiparticles just corresponds to the event horizon separating a black hole from that part of our universe which is accessible to us.

3. The 8 as the Characteristic of a Probability

We could ask ourselves why dynamics just should be 8-dimensional in our universe. Here, the evolution of mankind enters. Chapter 12 will show that human perception is recognising spacetime in its "ray" representation, i.e., the division of its quanta matters. Now, number theory (mathematics, keyword "oc*tonions")* is telling us that *("irreducible") "*numbers" (quanta) capable to be divided by each other are admitted to have 8 dimensions, at most. *(Real numbers can be represented on a straight line, i.e., they are 1-dimensional; for complex numbers we need 2 coordinates (1 and i), i.e., an entire complex plane, already; 8 dimensions are some straight extension).*

Dynamics is the area of human observation. All what our senses are reporting to us is subject to the dynamics of spacetime, energy-momentum, mass, acceleration, and rotation. Out of the jumble of motions of individual gas molecules, as described by statistical mechanics, physics once created the independent field of thermodynamics: Human ingenuity concentrated the statistics of zigzagging mechanical trajectories of individual gas molecules to probability statements about the behaviour of such a gas as a whole, thus replacing the duty of bothering about that ocean of individual information. For doing so, people *applied* the structure of an 8-dimensional logic from the evolution of nature.

This concentration of an enormous amount of individual information to result in a few summary gross statements easier to handle (pressure, temperature, entropy) undoubtably belongs to the trait of a higher intelligence like that of a human. Our knowledge about our brain, however, still is in its infancy.

Actually, it still is impossible to us to detail statements on where and how a brain is collecting all those punctual events intruding from its sensory organs in order to give some summary statistics and how, then, still to compress them – at least in fact – to normalised probabilities to be prepared for our short-time memory, from where it, finally, during our sleeping period, still will extract some long-term information – provided it does not suppress that information completely.

At the moment, we only know that an intelligent brain will have continually to count events and to divide their numbers by each other (probability = favourite cases divided by all cases). It is a matter of medical research to find out how it will manage all that.

QG is applying that 8-fold bundling in terms of its dynamical, 8-component quanta. *Dynamics* is 4+4 = 8-dimensional. When respecting interactions, we observe, however, that each of its 8 dynamical dimensions individually is fanning itself out into some bundle of additional, "internal" dimensions: into 1 dimension, each, for every type of interaction (electromagnetism, strong interaction, …).

According to the 8-fold principle, this diversification, again, should consist of just 8 variants of QG, each. This presumption is confirmed by experiment, indeed: The absolute value of the fine-structure constant is reproduced in accordance with experiment only if there are exactly 8 of such "internal" types [1, chapter 34]! In standard literature, actually, only 3 of them are identified unambiguously. (Hence, there still is some tremendous need of research!)

Without this 8-fold, additional "degeneration", how physicists are calling it, of dynamics with respect to the 8 types of "internal" dimensions, we get back our old QG. Those 8 interactions are characterised by marking 1 "internal" label, at least, against the remaining labels – chemists would call it "unsaturated" (with respect to the number 8 of dimensions).

This will give rise to 8 independent "internal" forces (types of interactions) roughly resembling QG. Apart from normalisation, the "charges" of those octet forces are corresponding to the "particle number" of QG. This force octet (*without* QG itself), is known in physics under the name "GUT" (General Unified Theory). In combination *with* the original QG representing an additional "internal" singlet, all 9 forces (octet + singlet) together are called “ToE“ (Theory of Everything) [1, chapter 24].

In the “internal“ singlet of QG, the quantum number “number of quanta“ (i.e., the number of Dirac‘s fermion quanta plus that of his antifermion quanta) is positive definite (for, the number of Young’s boxes all are counted positive). In the 8 GUT octets, these numbers are corresponding to the 8 types of “charges“, however. As spin-like subquantum numbers, they may carry both types of signs, *there*. As a superordinated nonet quantum number (of a U(1) = U(4,4)/ SU(4,4)), however, it still remains present (with a positive definite value as the “number of quanta“), in addition, though.

Altogether, we are left with 8 dynamical times 8 “internal“ = 64 total dimensions of the ToE. For, due to “irreducibilty“, the original QG with its force of gravity as an “internal“, so called “trace singlet” already is contained in those 64 dimensions as a special case, indeed! It is amusing that the total ToE, like Einstein’s GR (cf. chapter 7), also admits a purely geometrical representation, again (cf. chapter 7).

From the identity $8=2^3$ we, finally, find the solution to the problem of quark confinement [1, chapter 23], which classically still is unsolved in literature, namely that Gell-Mann’s quarks, exclusively, are showing up in multiples of 3 or in quark-antiquark pairs.

4. Commensurability

For the singlet of QG, for which the double property as a subordinated octet charge (of both signs) and as a superordinated nonet quantum number (of uniformly positive sign) does not exist, this double property means that its “gravity charge“ is positive definite: There is no gravity carrying an opposite gravitational charge. Contrary to the case in the “standard“ model of particles, the number of quanta never is negative in QG. In order to understand the dynamical *background*, we need a couple of high-brow, mathematical arguments (notes 1 to 3), which, however, not necessarily are of absolute relevance for *understanding* the subsequent passages.

Note 1: Not the negative numbers of quanta are making the “standard” model of particles mathematically inconsistent – keyword: vacuum polarisation, with all its related singularities – but its application of <u>*plus*</u>*-commutators (“2nd quantisation”), which has absolutely no relevance for a Lie-algebra! On the other hand,* for n dimensions, *the transformation behaviour of a negative particle number allows for a simulation by an appropriate construction made of n–1 quanta of an SU(n) [2, appendix “Symmetries“, the yellow sketches]; for the related U(n), that “negative particle number”, in fact, is equal to +n–1. (Classical physics is used largely to ignore the difference between an SU(n) and a U(n). An SU(n) ignores singlets made of n quanta filling a Young column antisymmetrically, each. For an SU(n), hence, n–1 antisymmetric quanta are equivalent to –1 quantum!)*

Note 2: By the “ray representation” of physics (cf. chapter 12), the dimension of QG is fixed to be n=8 (cf. the preceding chapter)! Provided we denote a simple (“covariant”) quantum to represent a “creation operator”, then, the (“contragredient”) construction made of n–1=7 quanta sketched above will carry the property of a “destruction operator” (= “annihilation operator”).

Note 3: Except for the ray representation, QG and ToE are “tensor models”, i.e., their quanta just are shuffled and reshuffled by pure combinatorics without touching their contents.

(Those quanta of positive number are constituting some physical input system, while those quanta of negative number are constituting some formal, mathematical shadow system of equal structure making up an output system, i.e., they are defined for the purpose of a simpler calculation, merely: In order to check the equality of two systems, we write down one of them in terms of an input (column vector) and the other one in terms of an output (row vector) [2, Mathematical Appendix]. Provided all (oppositely variant) quanta of both (normalised) systems are equal to each other, the internal product (= row times column, in this order from left to right) of both (normalised) systems will eliminate them quantum by quantum, with the result of leaving a naked number = 1.)

The product of a quantum pair, one of its factors representing a creation operator and the other one a destruction operator (in this order from left to right), is called a "generator". With 4 (pseudo) unitary dimensions, the dynamical U(2,2) is "generated" by 4x4 = 16 generators (in the CMS = centre-of-mass system):

L_0	:	**particle number,**
L_i	:	**spin** *(3 components)*,
M_0	:	**heavy mass,**
M_i	:	**Lorentz booster** *(3 components)*,
P_0	:	**energy,**
P_i	:	**momentum** *(3 components)*,
Q_0	:	**CMS-time,**
Q_i	:	**CMS-space** *(3 components)*.

(An SU(n,n) or SU(2n) will have one generator less than a U(n,n) or U(2n), respectively – in an SU(2,2), L_0 will be missing, e.g.!) A dynamical U(4,4), then, will be constructed of 8x8 = 64 generators, an SU(4,4) of 63, the U(64,64) of the GUT of 4096, and the SU(64,64) of 4095 generators.

In physics, operators (like those generators) describe actions to be applied to "states". Hence, there are 2 ways to describe nature in physics: "Schrödinger's picture" is doing so for states, and "Heisenberg's picture" describes the actions on these states. Contrary to what a first glance possibly might pretend, however, both descript-ion ways can*not* be transferred 1:1 onto each other: For, with n (pseudo)unitary states there are nxn (pseudo)unitary generators, only n of which are "diagonal" generators which could be related 1:1 to those states and which, thus, are "commensurable" with each other.

Those additional nxn–n generators, which, in a notation by matrices, are "non-diagonal", act as "transition amplitudes" be-tween 2 distinguishable states. As such, they are "incommensurable"! Depending on the coordinate system, which can be selected arbi-trarily to represent an observer position, just the 4 generators L_0, L_3, P_0, and Q_3 of the above 4x4-table might represent some maximal quartet of "commensurable" generators, e.g. With this choice of a coordinate system, where the 3-component L_3 of spin is measurable, both remaining spin components, L_1 and L_2, are not simultaneously measurable, as well!

This might be verified rather clearly by another representation mode of this Heisenberg generator, i.e., by its representation by 2x2-dimensional Pauli matrices: L_3, there, will reproduce ("count") both components of their, here, 2-dimensional basic spinor (up and down, with opposite signs), while L_1 and L_2 will add or subtract both *com-ponents*, respectively, and, then, *exchange* them with each other. Purely by their contents, L_1 und L_2, hence, when applied to their spinors, are "redundant" to Pauli's additional two matrices.

Correspondingly, our world, according to QG, will result to be 1-dimensional, only, with respect to its spacetime behaviour Q_3; Q_1, Q_2, and Q_0 will become accessible, in addition, by their macroscopic approximations, only (cf. next chapter). The same will hold true with energy P_0, the remaining three momentum components P_1, P_2, and P_3 of which will become commensurable by the same way. *(Pauli's 0-matrix will represent the 2-dimensional singlet beside the triplet of its remaining 3 matrices: 1+3 = 4 = 2x2. With higher dimensions, the normalisations of the singlet and of the rest will depart from each other – this will become somewhat confusing.)*

5. The Law of Great Numbers

We observed already that a human cannot count up to infinity. With a sufficiently great number n, the difference between n, n+1, n–1, or n+2, … will become blurred – provided the deviation from n stays sufficiently small (metrologically “negligible“).

Example: The experimentalist selects some state Z(n), applies his experimental device D to it, and obtains the result in terms of some state – say Z(n+2) – perhaps with some factor f. For a sufficiently great n, however, he is not able to distinguish that state Z(n+2) from the state Z(n). Consequently, he *thinks* to be confronted with the original state Z(n). As a result, he, now, will erroneously *interpret* that factor f to be his “eigenvalue“ of Z(n):

D times Z(n) = f times Z(n+2), *supposedly* = f times Z(n).

In this case, by bundling “neighbouring” states, appropriate statistics will authorise him to represent an individually even *non*-diagonal state *approximately*, en bloc, as being diagonal. Provided that bundling is finer than the measuring precession applied, the experimentalist will obtain the (false) impression that the output state is the original one, and, hence, that it is diagonal.

Now, dynamic spacetime eigenvalues, usually, will be packed too densely side by side rather than we could distinguish them by our actually available measuring methods. Therefore, exactly, this *apparent* illusion will come into effect. A classical physicist will identify some bundle of neighbouring states with one individual diagonal state without being conscious of it!

In a protocol, he, then, asserts that he is able to measure all 4 components of spacetime simultaneously. The world of literature, then, will be surprised about the variety of inevitable wrong conclusions – like “Schrödinger’s cat“, e.g., where the experimentalist could not distinguish Z(n–2) from Z(n) *before* executing the experiment, and not Z(n) from Z(n+2) *afterwards*. Experiment:

1: State Z(n–2) = the cat lives, state Z(n) = it lives,
2: State Z(n) = the cat lives, state Z(n+2) = it died.

Following such misinterpretations, classical quantum physics, then, declares quantum physics “not to be understood“ instead of being “misunderstood“!

The same way, classical quantum physics, erroneously, succeeds in declaring not only all 4 spacetime generators, but even all 16 dynamical generators (of the table in the preceding chapter) to be “diagonal” in its “macroscopic“ approximation and, hence, to be simultaneously measurable (“commensurable“), as well. (As an exception, classical quantum theory only admits “canonical conjugation”.)

(This statistics coup by the law of great numbers, thus, is making possible, indeed, what the no-go theorems of the ending 1960s still had marked to be impossible: to connect the Poincaré group (i.e. the inhomogeneous Lorentz group) in some non-trivial way with the “internal“ properties of the GUT (and ToE)! Its price, however, is the “macroscopic“ approximation as indicated.) Anyhow, according to QG, only 4 of those 16 generators are “microscopically” commensurable, in fact.

6. Dynamics and Process Logic

A “unitary rotation“ is the collective title for an arbitrary unitary transformation U(n) of a Schrödinger state (“spinor“) in n dimensions by (functions of) Heisenberg generators. Its physical characteristic is the absolute conservation of probability for all states of its area of application when executing such a U(n)-transformation.

Physical reactions, hence, will have to be unitary: “Nothing comes down from heaven; nothing gets lost.“ In QG, this kind of a strongly unitary reaction, hence, is the working procedure of its “reaction channel“. All its spinor dimensions optionally either are time-like – U(n,0) – or all of them space-like – U(0,n). Its (“irreducible“) Schrödinger spinors are “entangled“.

Opposite to this reaction channel, there is the “dynamic“ channel of QG. There, we have equally many time-like and space-like dimensions. In mathematics, its (“pseudo-unitary“) transformations depend on its configuration level, which is an [S]U(2,2), an [S]U(4,4), or, for the GUT and ToE, an [S]U(32,32) with QG being its singlet with respect to the 8 “internal“ forces.

Its dynamical generators are linear combinations of its partner generators of the reaction channel. Hence, it merely will be a matter of technical utility if we better apply the dynamic or the reaction channel for some process logic. Their spinors can be mapped onto each other, and the transformation of one of their channels can be converted, i.e., mathematically “expanded” into a series of transformations of the other channel.

Invariants of all those (pseudo-)unitary transformations are given by homogeneous polynomials of fixed degrees in terms of their generators, where the labels of all of their destruction quanta are summed against those of their creation quanta. The resulting form, then, is called a “Casimir operator“ [1, chapter 6]. The “world formula“ Einstein never had found in his life, hence, simply is the Heisenberg operator

Casimir = constans.

This identity will have to be applied to some Schrödinger spinor giving a so called “eigenvalue” equation. A Casimir of 2nd degree, hence, will add all squared generators in the reaction channel of some unitary SU(2n) conserving probability; their number is (2n x 2n – 1). According to Pythagoras, this will give the surface of a sphere of the corresponding dimension having a radius equal to the square root of that “constans“. This “radius“ just is the (positive definite) “eigenvalue” of its 1^{st}-order Casimir.

For a pseudo-unitary SU(n,n) of the dynamic channel, a part of those squared generators are inverting their signs from plus to minus. By this exchange of some signs, the geometry of the sphere will commute to that of a hyperboloid. In the dynamic U(2,2)-channel, hence, its “radius“ is particle number L_0, in the reaction channel of the U(4), it is energy P_0. Thus, both channels are “sorting“ their representations according to different criteria (L_0 or P_0, respectively). For the GUT, this “radius“ just is the “internal“ singlet of the original QG.

(When illustrating cosmic expansion by stretching the skin of some inflated balloon, 2 properties happen to mix up, though:

1. *Graphically, its radius is a function of (the inflation) time. As a metaphor, it is considered to represent the radius of our universe.*
2. *By relativity, it is independent of time but coupled (by its semiaxes) to the waist size of the hyperboloid of our classical spacetime.*

Einstein distinguished between our physical spacetime as some <u>local</u> property <u>at every point</u> of the surface of a “cosmic hyper-boloid“ (cf. its sketch next chapter) and its <u>global</u> spacetime, as it had (originally) been delivered by relativity in terms of some upside-down cone with the big bang as its tip. Like in point 1, then, the cosmic radius, here, would be some time-dependent issue. Although not *understood by (the official) theory, experimental progress in cosmology (keywords: cosmic inflation, dark energy) distorted Einstein's original cone to take over a shape which qualitatively will look more and more similar to the cosmic hyperboloid of QG.*

Cosmologists, however, continued insisting on their dialectic dichotomy of dynamics between one part treating the <u>surface</u> of that structure and following the laws of physics, and another part reflecting the <u>expansion</u> of our universe claimed to be independent of it and admitting velocities surpassing that of light, which, thus, are non-physical (cosmic inflation, dark energy). Cosmologists, still actually, demand the addition of both effects.

7. Embedding Einstein into QG

Even specialists are characterising Einstein‘s GR to be rather obscure. QG will clarify that and state: It is not GR which is obscure, but its curious *derivation* by Einstein (his “ride on a light ray“) is it, together with his mixing of microscopic with macroscopic features by omitting essential details (Einstein’s mathematical *incompleteness* of his representation due to sticking to his elevator, i.e., to his equivalence principle). An additional complication arises from human imagination caught in 3 dimensions; we hardly can think beyond it. This chapter also is important for philosophers because it explains, in the language of QG, which guidelines Einstein had applied in order to describe nature.

Now, that “crumpling“ of the surface of a sphere in the reaction channel in order to transform it into a hyperboloid in the dynamic channel will proceed point by point; that number of points, however, does not vary. Classically, those quanta distributed statistically are aiming at some thermodynamic equilibrium. On the surface of a sphere, that equilibrium will be reached in the idealised case of no forces (which does not exist, of course). As a mere effect of statistics, this will yield the highest probability: Microscopically, all the other states are labile; macroscopically, this equilibrium will adjust itself automatically (in an approximation).

Contrary to a sphere, however, a hyperboloid will extend towards infinity! With a *finite* number of points, hence, their equal distribution is not possible. Consequently, their distribution will have to thin out towards its outskirts more and more, and, as a result of the limited number of its quanta, it will break off, somewhere. That means: Somewhere on our way out, we are passing its last point; behind, there will be no more quantum.

In the end, a universe described like that should stay finite in spite of its hyperbolic structure! Though in quite a different order of magnitude, the same will hold true for an elementary particle, and particle physicists agree: Their pseudo-unitary representations yield some tiny, *finite* extension for a particle, in spite of its hyperbolic structure.

On a sphere, the density gradient of an equal distribution will vanish. Quite generally, the gradient of a density distribution is called a "force" in physics. Due to the varying density from quantum to quantum on the surface of a hyperboloid, hence, the surface of a sphere free of forces in the reaction channel will face some rich pattern of forces on the surface of the hyperboloid in the dynamic channel: By its "crumpling" effect, dynamics automatically creates forces on its surface which are absent in the corresponding reaction channel. The existence of forces is some typical feature of the dynamic channel.

Now, that uniform distribution of quanta on the surface of a sphere in the reaction channel will be some idealisation. More realistically, it will be expected to be clumpier, depending on the creation history of that universe. Our sphere, then, just is some gross approximation levelling out those irregularities present on its surface, and this will propagate to the hyperboloid, as well.

By his *general*-relativistic metric, Einstein had supplemented those x-positions of our quanta on such a smoothed surface by some additional component y(x) denoting the *physical* occupation number (density) y by our quanta we observe at a location x, indeed. Hence, we can draw a sketch of that realistic value y against its idealised location x: y = y(x).

That additional component y, hence, will point into a direction perpendicular to the (multidimensional) x-surface. For a representation of that "mountain range" thus generated on top of that locally "flat" looking surface of *idealised* x-coordinates, we, hence, need 1 more dimension (upwards, perpendicular to that surface), in addition to that basic system of x-coordinates. Einstein did not add it as some mountain range upwards but as a series of dips downwards. This will cause a ball which is thrown (in an inclined way) into such a dip to rotate deeply down about the centre of that dip. Einstein‘s conclusion was: Space is bent (into the y-direction perpendicular to the ideal surface of the x-coordinates)!

In order not to become misunderstood: Einstein‘s general-relativistic “space“ is that dip, that mountain, i.e., that hilly landscape z(x) we obtain from the n-dimensional x by including that additional y-component as a function of and perpendicular to those x-components giving some structure of dimension n+1 – while the x-coordinates themselves just are representing some *idealised*, averaged location of points subdividing the surface of the sphere or of the hyperboloid!

Einstein‘s “curved space“ z(x), hence, will exist *in addition* to the distortion resulting from the transition from the sphere to the hyperboloid – on top of and below that surface. In a graphical representation, a “mount“ (positive y) will correspond to repulsion, a dip (negative y) to attraction. (Dark energy is repulsive, gravity attractive – we shall return to this point.)

Now, time-like coordinates are not represented by r-numbers like the space-like ones but by imaginary numbers. Thus, that dimension n+1 has to be assumed to be complex-valued (*complex* Lie algebra), as well. With a real and an imaginary contribution to that “mountain range“, there, effectively, will not be 1 but 2 additional y-directions above the x-coordinates originating from the above coordinate system: 1 space-like plus 1 time-like y-component. Both y-coordinates hidden in GR are extending Einstein‘s [S]O(1,3) to an [S]O(2,4): There we are with those two more dimensions QG is using beyond classical dynamics!

But Einstein did not work with the microscopic, 1-dimensional representation of space in the Schrödinger picture but with all 3 space dimensions – thus, in fact, in the macroscopic Heisenberg picture. (This distinction did not yet exist when GR had been released.) And he separated those Heisenberg parameters of our above chapter 4 into two sets: one set is given by Einstein’s Ricci tensor, the other one by his stress tensor. The Ricci tensor is limited to the 4 spacetime parameters Einstein applies in their classical non-linear form.

Those two additional components y partly are hidden in his metric [1, chapter 9], partly they should have been included in his stress tensor, where they are missing, however: Einstein had formulated his stress tensor in a rather rudimentary and rough way. Anyway, Einstein did not properly define those additional Heisenberg variables. Instead, he dropped the real part of his additional y component by applying his equivalence principle. This leaves his entire GR model incomplete.

In a subsequent step, Einstein, finally, eliminated his auxiliary point position x on the idealised, smooth surface of that hyperboloid by introducing a (new) interdependence among those 4 (hilly) spacetime generators z from the imaginary y component left ($z_a = z_a(y_2, x_1, \dots, x_n)$ with a = 1 to n).

By doing so, remember 1) that those spacetime components are redundant from each other in the Heisenberg picture, and 2) that a surface has 1 dimension less than the object itself.) While that hilly “mount”-variant with $y = y(x_1, \dots, x_n)$ of GR, by construction, still had avoided singularities, this elimination of the x out of the z, by creating novel mutual dependencies, will introduce those singularities well-known from GR, still enhanced by the ray representation (chapter 12).

Nevertheless, by this mixture of mathematically abstract distortion by the channel transition (sphere in the reaction channel, hyperboloid in the dynamic channel) together with his physical spacetime curvature of the surface of the hyperboloid, Einstein had succeeded the first time in presenting some physical force (gravity) purely by geometry.

Too deep dips are giving superluminal velocities, which, across the event horizon, are entering a black hole with its singularity. The latter, however, definitely is recoverable by that “mount “ variant of GR just described. Such a “hole“ will bend the event horizon that strongly that it will close up at its opposite side, where there are different values of the coordinates. Metaphorically, in a subsequent step, a deep funnel replacing a dip even could penetrate the black hole as a “wormhole“ coming out at the opposite side where there are different coordinates.

So far the GR model: “Time travel“ by lightyears straight across a black hole! The problem, however, is – we still shall return to this point – a black hole is “black“, and not “white“: it just is *eating* matter; but it does not release any! Technically and graphically, that non-singular mount variant in 6 dimensions is more transparent; *Einstein‘s singular z-form*, however, rather will satisfy the ideology of staying 4-dimensional, at the expense of transparency.

Both methods of general relativity – the 6- and the 4-dimensional one – are transferable to the entire ToE and to all its components without any problem: By that “mount” variant, all ToE-forces are both microscopically and macroscopically fully apt for being represented in a purely geometrical way!

Einstein, once had failed to transfer this finding to electro-dynamics, in addition, because he had not properly formulated his stress tensor: The electromagnetic 4-potential [1, chapter 31] – according to being space- or time-like – is the analogue either to spacetime or to 4-momentum, respectively. Classically (Lorentz gauge), it arbitrarily is represented to be light-like (vanishing inertial mass). But there still are different gauges!

In addition, the reaction channel still allows for including the radius of its sphere in terms of (the square root of) its constant in the 2^{nd}-order world formula. This might serve as one more coordinate perpendicular to those x-coordinates on its surface and perpendi-cular to those physical z-coordinates, as well. That radius is given by its 1^{st}-order Casimir.

8. Forces

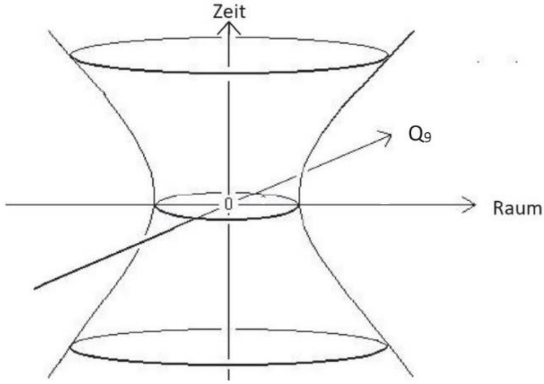
The non-constant density distribution on the surface of the dynamic hyperboloid will create “entropic“ forces. By statistics, uncorrelated quanta will try uniformly to fill their range available (diffusion effect of statistical mechanics), i.e., to fill our universe and to fill vacua in order to reach some state of equilibrium. This allows for reinterpreting “free“ quanta to follow some trend to reject each other. For charges of equal sign, hence, an entropic force will create a repulsive force proportional to its density gradient.

In QG, this repulsive force is called “dark energy“. Dark energy is an effect of the 2nd-order Casimir. Equally, we can show [1, chapter 26] that dark matter is an effect of the 3rd- and 4th-order Casimir. In QG, as elaborated already, all these dynamic effects are technically proceeding by iterating the replacing logic of the destruction and creation interpretation of its generators in the Heisenberg picture.

Einstein’s original cosmic hyperboloid still had been degenerated to some double cone (with a vanishing radius of its wasp waist at its so called “big bang“), and, due to ideological reasons (there cannot have been anything “before the big bang”), he denied the existence of negative times (“before the big bang“). Thus, his original cosmic hyperboloid showed the cosmic expansion of space for positive times only, and that, in addition, in its incomplete form.

According to QG, the below sketch of the situation distinctly shows how dark energy, for a particle at rest at the origin of time (trajectory perpendicularly upwards), will effectively vanish, there, and how that particle will become accelerated with increasing time more and more (outwards). The situation looks equal for a motion downwards. There, however, cosmic expansion turns its time arrow into the negative direction: Motion runs “backwards”, there.

ɍ$^2 \geq 0$, $Q_9{}^2 \geq 0$:



(Q_9 is the collection of all additional parameters in the dynamical world formula of an SU(2,2). The waist radius is a function of particle number L_0 in the related U(2,2).) Dark energy is repulsive. On the other hand, gravity is an attractive force reflecting a macroscopic result. In order to recognise it, we shall have to explain it in some detail.

As a Schrödinger spinor, a quantum – or let us better take an electron as some assembly of many quanta – in its *macroscopic* approximation will define some mass m at a location q. For some bigger body like our earth, this will become some mass M at the location Q in its cosmic environment. When, now, we consider that electron together with our earth, their linear parameters are adding (in the macroscopic sense) in order effectively to give M and Q, again. (For, the contribution of the electron is negligibly small.) On the other hand, however, that electron of mass m located at q within the range of our earth with its centre at Q (relative to our sun, e.g.), from its own, individual point of view, will "feel" its entropic rejection (as dark energy).

When still adding a proton, due to its opposite electric charge, we obtain a bound state with the electron building a hydrogen atom. By its momentum P, that atom proves to be "in motion" with respect to the much bigger earth. By the spherical form of the dark energy distribution created by our earth, there will exist some radial density gradient towards its inside. The atom reeling within this force field, now, will “feel“ more matter towards the centre of our earth.

Hence, it also will “feel“ some increasing space distribution (“more space“), there, than at a greater distance. By that longer distance, which the atom will have to cover nearer to the earth (with “more space“) than farther away (with “less space“), when travelling with a constant velocity, this atom, as some spatially extended structure (proton + electron), will be deflected from its straight path towards the higher entropic density, where the resistance is greater because there will have to be covered “more distance“. The atom will feel that deviation as some gravitational attraction!

Dark energy, hence, is the entropic rejection of *individual* quanta in the microcosm, and gravity is the attraction derived from it as an effect of matter “internally” *bound, extended* in the macrocosm (“prism effect“, “crossing against the wind“). As, actually, there are no quanta allowing for an experimental separation from their surrounding matter in sufficiently small portions (individually or in pairs), that direction reversal from dark energy to gravity, actually, cannot yet be checked in detail.

For the experimentalist, it would be interesting to know if stable states can be constructed *between* visible and dark matter, as well, where entropic rejection and gravitational attraction just are balancing each other (floating state), or if “internal“ multipole forces are preventing it.

Thus, we are left still to demonstrate why gravity is that much weaker than an “internal“ force like electrodynamics, i.e., why gravity is clumping matter and an “internal“ force – no matter which one – is driving (equally charged) matter apart from each other (cf. chapter 14).

Matter does not allow to be concentrated to some higher “internal“ overall charge much different from zero – otherwise, it will break apart. The reason is that a particle might be exposed as an electrically bound state to dark energy such that this, then, may evolve its macroscopic *gravitational* effect. Higher *electric* concentrations in nuclear matter, however, require neutrons in order to buffer some positively charged proton concentration, e.g. Here, strong interactions are taking over the role of the electric field within a nucleus, which the electric charge is playing for an atom in the field of dark energy.

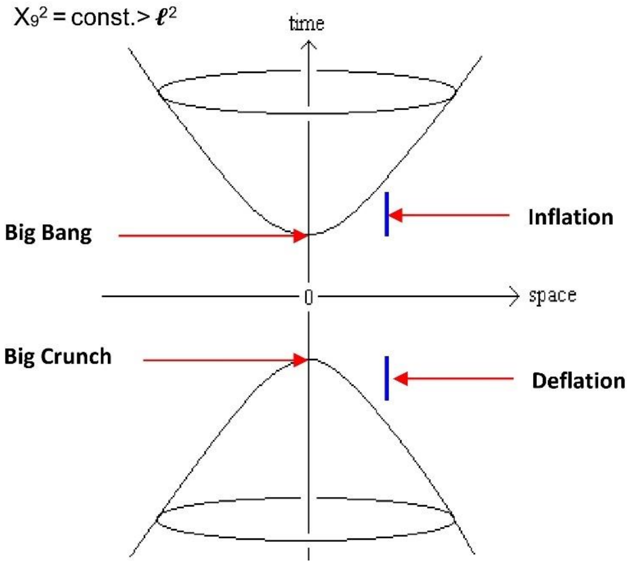
Chapter 15 will list the "internal" charges. Those (long-range) forces belonging to the charges N, L, A, and M, obviously, are their weakest ones [2, chapter 'The "Internal" Forces of Nature']. Charge N is hiding itself behind dark energy and gravity; in addition, it is the trigger of Pauli's exclusion principle [1, chapter 38]. L is lepton number (not to be confounded with the leptonic charge Λ responsible for weak interactions [1, chapter 34]). A is the charge of the force keeping the nucleons in an atomic nucleus at distance from each other such that a deuteron will not show up as a 6-quant structure but as a state combining 2 nucleons, instead.

And the charge M, together with A and the electric charge Q, is responsible for the mass split of isospin multiplets. N, L, A, and M all are missing in the "standard" model. These extremely weak long-range forces, are good candidates to be the sources of the cosmic filaments and voids on a galactic scale, as well.

By combining those different "internal" forces with each other, we enter some wide field of activity for experimental developments to come. QG is laying the theoretical cornerstone for it.

9. The Tale of a Massive Big Bang

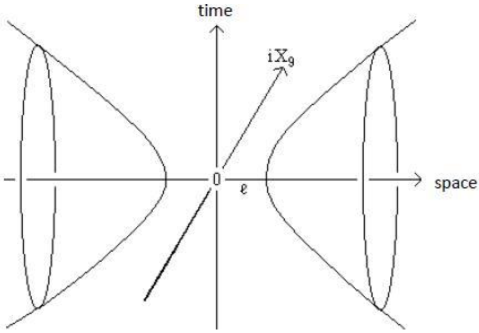
A plane cut through the cosmic hyperboloid of the preceding chapter, by keeping Q_9 constant in a certain distance from the drawing plane, there, will give a conic section:



Quotation [1, chapter 12]: 'Its upper shell is bounded downwards. That means that the upper shell of the selected Q_9-slice has a definite starting point of time called a "big bang". *Immediately* before, there is "nothing" (within this slice) – the opposite, lower shell is far away. The tangent plane annexed to that point is horizontal. That means that the temporal space-extension rate of the upper shell will formally be infinite at its start and will then gradually slow down. In literature, this behaviour is called "cosmic inflation".

On the lower shell, everything is inverted: With increasing (negative) time, space will be ending up in a deflationary collapse called a "big crunch".' In the lower shell, time formally will run backwards, however. As we still shall see, a positive absolute time (upper shell) denotes an input, and a negative one (lower shell) an output (cf. chapters 4 and 11).

The 1-shelled cosmic hyperboloid, however, only is 1 type of solution of the 2nd-order world formula, namely that for r-numbered Q_9. The other solution type, for imaginary Q_9, is a 2-shelled hyperboloid:



With the 1-shelled hyperboloid representing some boson-like space, this 2-shelled hyperboloid will trace the diverging behaviour of some fermion-antifermion pair. With varying particle number L_0, the 1-shelled U(2,2)-hyperboloid (chapter 8) will fill out the interior of the light cone (spacetime time-like), while the above 2-shelled hyperboloid does so with its exterior (spacetime space-like). (Our above low-dimensional SO(1,2)-sketch) is misleading: With higher dimensions, both separate shells will unite themselves around the outside!)

Now, humans do not notice CMS-spacetime Q by their sensory organs but ordinary spacetime $X=Q/M_0$ (cf. chapter 12). By a variable heavy mass M_0, the waist radius of the 1-shelled hyperboloid and the shell distance between the 2-shelled hyperboloid will become variable, as well. Spacetime X, hence, will decompose into a solid cone in its interior and into a solid surrounding area outside this cone.

Both areas are separated from each other by the light cone (c=1) as their causality boundary. With the passage of this causality border (chapter 11), CMS-spacetime and inertial mass will exchange each other (zero-transition of their squares), and this will happen globally with respect to our universe and locally with respect to the centre of a particle collision, as well.

The cosmic hyperboloid is the dynamic variant of a sphere in the reaction channel. When not considering all that in 8 but in 3 dimensions only, then we would have been confronted with the customary spin behaviour: The surface of the sphere of a diameter J (as the 2nd-order Casimir) would correspond to the spin J of an SO(3), and those spin-3 components belonging to it would be running through the values J_3 = –J, –J+1, –J+2, … up to +J–2, +J–1, +J in integer steps.

When embedding this spin into a structure of some higher dimension, say an SO(4), we would obtain some superposition of such spins with J = 0, 1, 2, … up to p–1 with the principle quantum number p representing a solid sphere. Now, the number of all those values J_3, when summed as points over all J, would be some point concentration around the centre of the sphere which is thinning out to some minimum towards the periphery of the sphere.

The dynamic hyperboloid belonging to an SO(3)-sphere is an SO(1,2). Its spin-3 values J_3, now, are running in integer steps from J_3 = J, J+1, J+2, … up to some maximal value and, in a second series, from –J, –J–1, –J–2 down to its negative maximum. Here, those points J_3, hence, would not concentrate any more at the centre of a sphere but at the extreme end of the asymptotes of the hyperboloid.

For our cosmic hyperboloid this means: The higher we are getting upwards for positive times, the more "spins" are steadily joining it (due to converting other quantum numbers). Conservation rules do not hold for both sides of the event horizon separately but only at a summary level! Classical statements of theoreticians about what should have happened milli-seconds after the big bang, hence, will have to be judged with utmost caution when they refer to models ignoring the physics beyond causality horizons.

10. Observer Positions and Repetition

The decomposition of a tensor into its components depends on some group G of (linear) transformations against which its Young *frame* (this is the pattern of the *boxes* of its Young tableau) will stay invariant. (Only its labels are varying, not their arrangement). For an example, let us choose the U(32,32) of the ToE for that G. As 2-step Matrioshka structures (cf. chapter 19, working hypothesis 1), its quanta are carrying 2 kinds of labels both of which are running independently of each other through 8 components, each: 8 for dynamics and another 8 for the “internal“ forces.

A mathematician would denote it as a “reduction“ of the U(32,32) according to the (Kronecker) product of a U(4,4) x SU(8) of the dynamic U(4,4) times the group SU(8) of “internal“ interactions. (It still will have to be clarified if that SU(8) should be an SU(8), indeed, or if it is an SU(4,4) like in dynamics.) This Kronecker product U(4,4) x SU(8), however, only is some *partial set* of the total U(32,32).

Mathematics is an “exact“ science. Hence, we sometimes are confronted with some cumbersome looking obsession with details repelling the non-specialist. Thus, linear groups are generated by generators, e.g. 1 such generator is the product of 1 creation and 1 destruction operator (in this order from left to right). Contrary to the generator, however, those 2 operators are no quadratic matrices but 1-dimensional column (creator) and row (destructor) matrices, respectively, in the Schrödinger picture [2, Mathematical Appendix].

The above reduction to a product is the (quadratic) “adjoint“ matrix in the Heisenberg picture. As such, the reduction – say of the “internal“ SU(8) – does not simply give 8x8 = 64 components but, more precisely, 1 octet + 1 singlet of the dynamical U(4,4). In the product U(4,4) x SU(8), this SU(8)-singlet will give the original U(4,4) of QG, and the “internal” octet the 8 GUT-forces of the U(4,4) x SU(8), both contained in the U(32,32) of the ToE [1, chapter 24]. Those U(32,32)-matrix elements not contained in the product U(4,4) x SU(8) are the transition generators among the 1+8=9 different ToE-forces. Complicated – but such is mathematics!

By physics, a quantum is some vector structure with 8 dynamical components. These 8 dimensions should admit arbitrary ("unitary") "rotations". Its 8 projections onto the 8 "dimensions", then, are the values of its "components". According to the observer position (coordinate system), as passive observers, we find different values for the 8 projections of a measurement.

This way, in the Schrödinger picture, we obtain exactly 8 (or, when respecting the "internal" forces, as well, 64) independent types of specially oriented quanta; and quanta identified in the experiment only are linear combinations of these 8 (or 64) types of quanta. (Another word for a "linear combination" also is a "superposition".)

Now, experiment shows that we cannot carry out such a "rotation" in the Schrödinger picture according to taste: In a model of quanta like that of QG, we shall have to apply (functions of) Heisenberg generators. On the level of quanta, this means, we first of all shall have formally to annihilate one quantum after the other and, then, to replace it by some equal or different one.

As explained in chapter 4 already, a destruction operator allows for a representation by creation operators, as well. The mutual destruction of a creation against a destruction operator, then, is nothing else than the creation of some column singlet according to Young, the further development of which – as one of the building bricks of dark matter (chapter 13) – then, will be widely ignored.

A measurement, then, could be considered as some scattering process where, temporarily, the measuring device will unite itself with the object to be measured and both, then, again are separating each other in some modified form: The formerly undetermined object, now, will have assumed some well-defined ("measured") state and the measuring device will report that state. A subsequent measurement, thus, will be based on a (more or less) modified state. Between 2 measurements, nothing will happen; time stands still. (For, any change of time would correspond to some additional measurement – no matter of what.)

We could identify an observer position as this combination of a measuring device with an object to be measured. Let us consider a cephalopod where each of its tentacles is equipped with its own control centre (“brain“). Thus, it might be logical to assume that „the“ human observer position could distribute itself over several partial structures, as well, reducing themselves out of the total of all quanta according to criteria still to be identified. A state of consciousness might be comparable with the “result of a measurement“. Observer positions are emerging and disappearing again.

An observer position, thus, does not just mean some physical “action“ but some logical process (cf. chapter 21): For, last but not least, we do not “*consider*“ that system of original quanta any more but some system composed of quanta the composition of which is altered slightly or even in a more complicated way (with the same or different properties). This means some change of the observer position: the “new“ quanta – at least partially – are different from the original ones)!

The set of quanta observed, now, only is subject to some changed “selection“, while the quanta themselves, however, are exactly the same as before: nothing has changed at all – quanta are individually conserved quantities! Just the *observed* content of the basket has changed. (In the language of mathematicians: The quanta had been “reduced” according to different criteria.)

This change in the observer position, however, is some purely mental process. (QG and GUT are “tensor models“: 8 or 64 <u>pre</u>defined types of immutable “components“; only their bundling to tensors is variable! If, where, and how exactly those <u>pre</u>definitions may be changed, actually, still is unclear – at least not within our universe: Quanta are parameters from some *external* interface!)

Thus, we shall have to accept: Those quanta had been generated somewhere outside our universe, and some part of them had been transmitted from some precursor structures to our universe when it had been generated. Our universe got so and so many of this sort and so and so many of that sort – all that iterated for all 64 types of quanta our universe is composed of (provided we confine ourselves to those only 2 Matrioshka levels).

This change of an observer position – which just will represent some local, partial set of our universe – seems to contradict that

1. all quanta (and, hence, an observer position, as well) should be invariant,
2. there should exist nothing besides those quanta.

How, then, can such an observer position, i.e., that "selection" of quanta "change"?

Now, that reproducibility postulate of physics will be no fancy of strange shapes but sturdy fundamental mathematics when super-ordinated sets are reduced according to subordinated partial sets: The greater their difference in cardinality, the more repetitions of partial structures will there be, in general. Mathematically, however, all those partial structures will be orthogonal to each other (real reproducibility). Up to now, there has been paid little attention to the fact that, with sufficiently great differences, there will be not only partial sets which are exactly equal but also sets which only are similar to each other such that, sometimes, the law of great numbers could become applicable, as well!

On the other hand, there still are changes of the transformation group, as well, which is a part of the definition of the (invariant, "irreducible") tensor representing nature (cf. chapter 19). "Real" reproducibility will result if the transformation just effects the transition of one component of the tensor to another one. In general, however, such transformations only will yield *admixtures* of different tensor components with each other. In case of the similarity of 2 partial sets (before/after) blurring into each other in a way to push them towards the margin of measuring accuracy, we approach a situation which we also meet with local observer positions effectively merging according to the law of great numbers (transition probability tending towards 1).

Organisms like a human are founding their existence on *similarly* repeating structures (heartbeat, respiration). Their local observer positions, approximately, are working periodically, as well; reaction times are separating differing positions from each other. But those positions are of macroscopic nature analysing the immediate surroundings by some linear statistics which will adapt to some central point x.

Now, it is the quintessence of a (hyperbolic) imbalance that the actual *linear* observer centre x of statistics does not agree with the *weighted* density centre x‘ of its centre-of-mass system. For a subsequent additional measurement *after* the reaction time, the local observer position, hence, will shift from x towards x‘: The observer position will move logically from one reaction interval to the other, without any quantum to vary physically! Only the *logical* collection defining an observer position will vary (cf. chapter 19, working hypothesis 0, and chapter 21). (But every *individual, local* observer position will stay unchanged, cf. chapter 20.)

Our problem of how an observer position, i.e., that “selection” of quanta, can change, hence, will be shifted to the problem: What kind of impact is giving rise to trigger another “measurement” (in order to (re)set our state of consciousness – or, at least, one of its subsets)? Or even to trigger some of those “measurements” at all (cf. chapter 22). This suddenly sheds quite a different light on the significance of the “repetition” of an “experiment”!

Here, again, we have to distinguish between an “exact” observer position in the Schrödinger picture and an “approximate” observer position given by the Heisenberg picture. Heisenberg does not only provide some spatial, but a temporal overlay, as well. (The latter one somehow is darkened by the factor $3x10^{10}$ of the speed of light relating sec to cm (chapter 14).)

11. Black Holes and the Big Bang

Heisenberg's picture describes actions on a Schrödinger state. On Dirac's basic spinor comprising 4 components, these are Dirac's typical 4x4 γ-matrices; on the 8-dimensional collection of Dirac's spinors with Dirac's antispinor, these would be 8x8 matrices. Such an 8x8 matrix, hence, will be split into precisely 2x2 = 4 quadrants made of classical Dirac matrices (4x(4x4)) = 8x8). In the 8x8 range of Heisenberg matrices of QG, thus, right 2 of such breaks will cross each other.

From cosmology, both breaks are well-known. One of it is splitting the range of a black hole beyond an event horizon from our own range on this side of it, and the other horizon will split our habitat "after" the big bang from that legendary range "*before* the big bang". (In Schrödinger's 8-dimensional spinor, both horizons coincide.)

Contrary to the situation in Einstein's world boarded up by his singularities behind his event horizon, in QG all 4 quadrants of our universe are fully open to mathematical inspection by its non-singular "mount " variant of GR. Just by experiment, those ranges behind the event horizon belonging to a black hole and those before the big bang still are left inaccessible, though. At least, classical physicists are thinking like that. We shall relativise this immediately.

For, there still is a 3rd horizon separating input from output structures, defined by the simultaneous sign change of *all* additive quantum numbers. This amounts to a double occupancy of the above 4 quadrants. Dirac once had managed that by exchanging his a-spin against his b-spin in this case. (His criterion for this general sign change had been the energy sign.)

These 3 horizons define 3 different observer positions (coordinate systems) overlapping each other, the general-relativistic metric of which, however, will distort its respective coordinates against each other (due to their "ray representation", see next chapter). For that reason, that 1 big black hole of our universe, from our view after the big bang from our side of that 1 event horizon, will represent an assembly of many “islands“ scattered around in our world. From the view from inside that 1 coherent black hole, *our* 1 partial world would appear to resolve itself into many “lumps“, as well. But all 3 coordinate systems are valid for all 3 domains.

Thus, from our point of view in front of the event horizon, those “lumps“ of the black hole do well show up that gravity behaviour owed to them, while they will become mathematically singular in its interior (behind the event horizon) – from Einstein’s 4-dimensional view, at least. Unless we accept those 4 U(2,2)-dimensions of that time-like energy-momentum together with those of the space-like spacetime to represent an 8-dimensional phase space with uniform, “superregional“ U(4,4)-transformations (or we accept that “mount“ variant of GR)!

According to the dynamic 2nd-order world formula, the event horizon denotes the zero passage of squared *heavy* mass (real square root of its positive square = domain on this side of the event horizon, imaginary square root of the negative square = domain of the black hole beyond of it), and the “big bang“ denotes the corresponding zero passage of squared CMS-time in a domain (real square root) after and another one (imaginary square root) “before“ the “big bang“. Those breaks by the event horizon and by the big bang, hence, do not simply separate negative from positive heavy masses or times from each other, respectively, but their respective squares: Both U(8,8)-horizons do not just change signs but exchange the real axis against the imaginary axis in the respective complex plane!

The product of (CMS-)time times heavy mass yields 2 “real quadrants“ and 2 “imaginary quadrants“. Crosswise to the cosmic scenario of event horizon and big bang, now, particle physics is collecting parts of both “real“ quadrants to be its basic fermion and parts of the 2 imaginary quadrants to be its conjugate antifermion. As humans, we, obviously, are located in that domain combining real (CMS-)times with real heavy masses. According to the upper definition, this is one of the domains of the 2 “real quadrants“.

Now, the combination of imaginary (CMS-)times with imaginary heavy masses, however, will be part of the other “real quadrant“ – only that, now, Dirac’s a- and b-spins just are commuted with each other. As a summary, we, hence, must conclude according to Dirac: Antiparticles running backwards in a black hole “before“ the big bang (Dirac‘s time reversal) are coexisting (Dirac had overlooked that) with particles running forwards after the big bang on our side of the event horizon within the same (macroscopic) “phase space“ of spacetime and energy-momentum! (Dirac did not bother about the logic of black holes.)

In order not to annihilate each other, hence, those particles and antiparticles left will “avoid each other“ to the greatest possible extent. Hence, there should be areas in our universe which predominantly will host particles (with just a few antiparticles) and, separated by horizons, others where antiparticles are dominating (with just a few particles scattered in). In QG, now, leptons are identified as antiparticles – provided baryons are particles. Consequently, the valence parts (cf. chapter 13) of baryons and positrons (as anti-electrons) should be composed of quantum types having no type in common.

Provided they are creating stable atoms. (By the shell model [1, chapters 35, 36], however, their valence parts are not strictly separated from their non-valence parts. Those “forbidden” pairs, hence, might create exited states. But this would be some chapter of its own, where the Pauli principle would have to be derived from the shell model, as well [1, chapters 36, 38].)

For mesons, the situation is different. For this reason, most of them are instable. (All this will put the philosophical problem why we do not observe antimatter within the closer vicinity of our universe on quite another footing!) As mesonic end products, only the photon and the graviton are left stable as mesons carrying a minimum of *inertial* mass.

12. CMS-Spacetime vs. Classical Spacetime

Einstein‘s classical spacetime just is the quotient (“ray representation“ [1, chapters 15 and 20]) of CMS-spacetime divided by heavy mass:

(CMS-spacetime) : (heavy mass) = (classical spacetime).

For velocity, this constellation still has been well-known a longer time:

(4-momentum) : (heavy mass) = (4-velocity).

Now, with accelerations, special relativity will add more and more admixtures of b-spin (*from the U(8,8)-quadrant combining negative heavy mass with negative CMS-time*) to the a-spin (*of the quadrant combining positive heavy mass with positive CMS-time*). In Einstein‘s classical time, both negative signs just are eliminating each other, and special relativity will mix both quadrants correspondingly.

As mentioned already, dimension doubling from Dirac‘s 4-dimensional U(2,2) to the 8-dimensional U(4,4) of QG is a consequence of applying the CPT-theorem of particle physics to the Dirac algebra U(2,2). Classical continuum physicists always have been conscious of the problem that classical spacetime does not behave additively (i.e., linearly). Last but not least, even deSitter once had failed because, in those 1920/1930s, he had not succeeded in extending his 5-dimensional SO(1,4) and SO(2,3) to that embracing SO(2,4) of QG in a way making sense. In spite of the fact that the “trick“ making it possible, i.e., to replace classical spacetime by CMS-spacetime, at those times, had been known long since.

From this perspective, it is that property identified to be special relativity we are attributing to our universe which, in daily life, is making us not to work with CMS-time but with the *classical* notion of time. For, *only this* specification will authorise us to experience those transitions among the various Lorentz-frames of special relativity without complications.

Furthermore, we can show [1, chapter 20] that, in its application as a generator, heavy mass will exchange those 4 components of (the space-like) (CMS-)spacetime and those of (the time-like) energy-momentum against each other. (Both together could as well be denoted as some 8-dimensional “phase vector“.) By this exchange, however, heavy mass will stay totally commensurable with all generators (L_i and M_i) of *special* relativity. Up to some substitutions, hence, physics inside a black hole is the same as outside of it. And the same will hold true for the domain “before“ the big bang.

Now, for Einstein‘s incomplete mathematics, his terra incognita will start right at both horizons. There is much interpretation with his big bang and with his black holes which is not justified. In particular, Einstein‘s classical continuum physics is treating the big bang as some purely *temporal* phenomenon: For him, his notions “before“ and “after“ the big bang are delimiting different *sign*-ranges of time against each other.

Dynamics, however, only is generated by quanta! A new universe, hence, will have to *collect* its quanta, first of all, before arranging them to define dynamics (like time, e.g.) and horizons. The creation of a universe, thus, cannot be some temporal act – the entire universe must be created at one fell swoop, for all times at once!

QG, then, will consider horizons from its discrete point of view as varying observer positions. (Just remember: By QG, “motion“ is described by a discrete sequence of applying Heisenberg generators. As a mathematical tool, the input-output formalism can help, as well.) Discrete QG, then, will consider a state “before“ the big bang as its input to this horizon, and a state “after” it (no matter how created) as its output from there. This logical sequence input -> output is not necessarily a temporal one!

However, dynamics is some logical consequence of the existence of quanta, only. Without these quanta, there is no dynamics! Dynamics depends on our point of consideration (= selection and bundling) of certain quanta to serve as our observer position. Technically, we have to distinguish: By considering a quantum *microscopically*, we are confronted with 4 exactly commensurable Schrödinger components, *macroscopically,* however, with those 4x4 = 16 components of macroscopic Heisenberg superpositions, which only are appearing to us to be *approximately* commensurable by applying the law of great numbers. The cosmic hyperboloid is representing those 15 to 16 *macroscopic* components of the [S]U(2,2) of the Heisenberg picture.

The notion "macroscopic", however, is ambiguous! With respect to linear quanta, we know it, already. Thus, elementary particles, atoms, and molecules are macroscopic representations with respect to CMS-spacetime and energy-momentum in the elementary sense. In its classical application, however, ray-representations are overlapping to represent objects, bodies, … , stars, galaxies, … , the dividends and divisors of which still are macroscopic in the elementary sense. This double-macroscopic treatment of classical physics will distort our view of the universe.

(*CMS-distances a and b with masses A and B will be overlapping each other, whenever just a/A=x and b/B=y are sufficiently close to each other. This way, a and b may overlap provided B=1000A if b=1000a. On the other hand, that simple superposition of a with b will give physically non-plausible results.)* Only that classically human ray-representation [1, chapter 20] will bundle matter to such different "objects" a human typically will notice. (Spacetime and velocity, generally, will be subject to a different weighting, however.)

When passing the event horizon, where spacetime and velocity are exchanging each other, those "objects" of a human observer position inevitably will get broken. Human evolution, thus, is well taking special relativity into account (light!), but not GR!

13. Valence vs. Dark Matter

With the “internal“ *and* dynamical properties taken together, every quantum will have 8x8 = 64 components. A Young tableau of quanta, hence, will consist of maximally 64 rows. And, in a *full* column, *all additive* quantum numbers will neutralise each other; mathematics will denote them to be some (64-dimensional) singlet representation.

If we meet 2 Young columns with 64 labels, each, in neighbouring columns upside down to each other, then, *in every row* 2 components will oppose each other with their 2 *linear* quantum numbers neutralising each other in a pair, already; just the *number* of quanta still will be adding up (to dark energy). Such a neutral pair, however, does not yet represent a singlet but still is (a meson-type) part of some higher Young representation.

With respect to the charge signs of our quanta, probability will be maximal if these quanta primarily will find together within our universe in order to create those above “*internally*“ neutral pairs – different aggregations rather should remain the rare exception. Like noble gases in chemistry, the majority of those “internally“ neutral quantum pairs will unite each other in a second step to build up “internal“ singlets; astronomers are observing them in terms of dark matter which almost exclusively is characterised by its gravity.

For, those microscopic properties of *dynamics* left over unsaturated do *not* admit the application of the law of great numbers necessary for the identification of its dynamical properties with such a small number of quanta an “internal“ singlet is composed of and with that dynamical complete disorder of those singlets among each other.

Dark matter, hence, fully confirmed by the astronomers, is characterised by

1. executing dark energy and gravity,
2. not being localisable,

3. but being polarisable. This, sometimes, also will give macroscopic agglomerations with
4. a correspondingly rough localisability.

Now, dark matter is combining its 8 “internal“ states right from quantum pairs representing an anti-fermion times a fermion and of a fermion times an anti-fermion. Thus, every “internal“ pair is present twice, only in an inverted order. Hence, there are not 8 but just 4 of such “internal“ pairs – with Dirac’s a- and b-spins left open in an up- and a down-version, each. These are 4 “internal“ pairs times 4 spin directions, i.e., 16 pairs, altogether [1, chapters 36 and 38]:

$$a^{+}_{i'}b^{+}_{i''}\,,\ a^{+}_{i'}a^{-}_{i''}\,,\ b^{-}_{i'}b^{+}_{i''}\,,\ b^{-}_{i'}a^{-}_{i''}\ .$$

This creation of dark matter will end automatically when the first of these 4 “internal“ pairs of quanta cannot be created any more, i.e., when in every one of these 4 pairs there is no more Dirac label available at one of its sides, i.e., when 4 of the original 64 types of quanta are exhausted. There are exactly 16 different types of dark-matter states. Beyond dark matter, hence, there still are 60 of the original 64 types of quanta left, only.

As not all of the 8 original types of “internal“ charges are left for pairing, they cannot build an “internal“ singlet either. Like in chemistry, those neutral pairs left will bind as Van-der-Waals bonds to those remaining aggregations not yet treated. Those “remaining aggregations“ are the “valence parts“ of an elementary particle, and those Van-der-Waals bonds are their “non-valence part“.

According to the Young formalism, only a valence part and a non-valence part together are forming an elementary particle. (Those dark-matter bricks are no elementary particles because they have no non-valence part!) *(That argumentation by physical forces deriving from the Young formalism only had been serving for making the construction more plausible.)*

For a particle, macroscopic dynamics derives from its non-valence part. Statistics with its application of the law of great numbers will find its macroscopic application field with that non-valence part, only; that tiny number of valence quanta is negligible with respect to it. The valence quanta, essentially, are of importance for the “internal“ structure governed by a few quanta, only, the additive parameters of which are not neutralised by the non-valence part and left open by statistics. Subsequently, hence, the spin component of the valence of a particle will have to be respected, as well.

This type of argumentation by forces rather is looking to be of experimental origin; it is that of particle physics. Particle physics is especially interested in those quanta serving as bricks of physics. For field-theoreticians, a representation by the invariants of the world formula (completing Einstein’s formulas) is more instructive; this also is the method favoured by cosmologists. Particle physics and cosmology are working on the same problems – in a different form, however. QG will unite both methods.

For particle physicists, dark energy is an entropy result of quanta rejecting each other, for field-theoreticians a property of the cosmic hyperboloid (2^{nd}-order world formula). Correspondingly, for particle physicists, dark matter denotes the properties of special quantum structures, for field-theoreticians, however, the results of the 3^{rd}- and 4^{th}-order world formulas [2, chapter Casimirs]. The Higgs formalism invented for replacing non-valence structures (which do not exist in continuum physics), just scratches some symptoms without examining their background. This way, classical physics never will get anywhere.

Graphically, let us generalise the above results as follows: In a developing universe, “ordinary“ matter will rain drop by drop out of dark matter when those quanta freshly transferred from outside are formatting to some new dynamics carrying “internal“ structures. The development of a universe is no *temporally* proceeding process. Those different numbers of quanta and types of quanta are the result of a mathematical “reduction“ series of colliding or decaying pre-universes. In a universe parallel to ours, these numbers will be different and, hence, will give rise to different dynamics and different “internal“ structures (of forces). Thus, even the roles played by CMS-time and heavy mass could be exchanged, e.g.

However, everything will proceed its controlled way according to meanwhile more and more identified rules of mathematics and physics. The thesis propagated and repeated in pop-literature and in the public media warning us that any change of just *one* of its well-tuned constants of nature would yield a physical disaster, that the concrete set of constants “hence“ should be sacrosanct and should not be varied – clearly is missing the point; it is mixing up “sufficient“ and “necessary“.

By reducing fundamental physics to counting the *numbers* of special quanta (see chapter 16), we achieved a level permitting us also to derive the properties of competing universes proving to be as diverse as ours – just with different constants of nature but tuned in an equally fine way.

As usual in philosophy, the solution to one problem will give rise to another problem, e.g.: “How many Matrioshka levels will there be?“ or “By what will it be replaced at its ends?“ The eternal question of the origin of all being still remains open, of course.

14. Unit Systems

Formally, the 2nd-order world formula of the reaction channel will yield a sphere. Physically, however, coordinates just will count the quanta of their respective types present in the application area of their dimension in their macroscopic, redundant form. A sphere, thus, will deform to an ellipsoid (centred at the origin of the coordinate system). In the dynamic channel, its coordinates will "crumple" to the corresponding hyperboloid, as we had observed.

With differing changes of the measuring systems (km to miles, e.g.) on those particular coordinates, our ellipsoid still will continue to deform, and those individual points (quanta) will distribute on the ellipsoid still more unequally. Such alterations of the "natural" measuring unit 1 to cm or to seconds or to whatsoever also will yield modified density gradients on the ellipsoid and, hence, give rise to shear forces not present on a sphere. The same will hold true on the hyperboloid, where these shear forces will enhance or weaken those forces still present, there.

From the hyperbolic coupling between space (sinh) and time (cosh) we learn that there will be some asymptotic top speed (sinh/cosh = 1) in dynamics; in cgs-units, this is the speed c of light. In fundamental physics, it often will be normalised to c=1. The fact that it cannot be overridden in the dynamic channel, is known as "causality" in physics. For the reaction channel, this limit does not exist. "Entanglement", hence, is a property of the reaction channel; its characteristic is the absolute conservation of probability.

In QG, both channels can be converted into each other. Hence, both effects do exist side by side – only, (like 2 spin components) they are not commensurable with each other. (In spite of its experimental verification, classical physicists had tried theoretically to disprove this coexistence by applying (Bell's *original*) no-go theorems [1, chapter 1]. In that case, however, they would have needed to accept the existence of a free will, which does not exist in

QG – a strong, additional indication in favour of QG, against that classical postulate of a free will!

Such alternative measuring units could be, there, provided we do not measure time any more by the speed of light ($c = 3x10^{10}$ cm/sec = 1) in cm but in seconds (1 sec = $3x10^{10}$ cm.) However, we immediately observe that those 3 measuring units of the 3 redundant *space* coordinates of the macrocosm will *not* be changed! From those 4 dimensions of microscopic dynamics (within just 1 of its 4 quadrants of QG) we derive that, apart from that natural measuring unit for the 1st-order Casimir, L_0, only 3 additional measuring units are needed. In fundamental physics, these are cm, g, and sec (cgs-system), e.g.

(In its SO(2,4)-variant, QG defines 6 <u>orthogonal</u> dimensions. This separation of 2 additional dimensions on top of the 4 commensurable SU(2,2)-parameters will require 2 more measuring units which, however, are of importance only macroscopically [1, chapter 28]*.)*

With those quanta and their types as external inputs, their numbers will have been inserted from outside, as well; from inside our universe, we have no influence on them. With a size R of our universe and some number A of quanta, microscopically, there will be a (linear) space of the extension R/A at our disposal in QG, on the average. When characterising those quanta of QG by their GUT-type g, however, we shall have to manage 8 different numbers A_g.

Such a quantum, then, will distribute itself over a space R/A_g, thereby just “filling“ the space R/A, however. Densely packed, hence, they will need the space $R_g = A_g x(R/A)$. R_g is called the “*range* of the GUT-force g“. (Microscopically, space is 1-dimensional only! The macroscopic extension will serve redundant domains only.) The other way round, this smaller number A_g of quanta of type g will enhance the averaged gradient and, thus, the strength of the force by a factor R/R_g. $R/R_g = A/A_g$ is the “coupling constant of the GUT-force g“.

For a comparison: In these measuring units, the range R of gravity and its coupling constant would be 1. If we assume that the values of A_g are lying somewhere around A/8, then, those ranges and the coupling constant of the GUT-force g would not be rather different from the values given for gravity.

This is all well and good. However, when, as usual, considering those ranges only where dark matter does not interfere, then we should subtract that number A' of quanta from the numbers A_g everywhere, which has been trapped by dark matter, already. Outside dark matter, then, for the GUT-force g, there will be left only:

coupling constant: $A/(A_g – A')$,
range: $R/(A/(A_g – A'))$.

With an A' in the order of magnitude of A, in both above formulas, the differences $A_g – A'$ would always be small, tending towards zero! By the separation of dark matter, hence, those coupling constants of the GUT-forces are "blowing up", and their ranges are dropping. Particle physicists are used to normalise the coupling constant of their strong interaction about 1. With such a normalisation, the coupling strength of gravity almost will vanish – in good agreement with experiment. The coupling strength, then, is the product of the coupling constant times the transition probability.

The other way round, the range of gravity could be used in order to determine the diameter of our universe. Then, those ranges of the GUT-forces would come to lie somewhere in a human order of magnitude, indeed – or even in a (much) smaller one (particle physics) or in a much larger one (filaments and voids in cosmology). This is in accord with experiment, too. It would be useful experimentally to delimit those values even in more detail. Due to the unknown A and R, and with the uncertainty of A', those values do not yet allow to be measured precisely. On the other hand, we could try to calculate in the inverse direction.

We just observed that, in QG, the coupling constant of a GUT-force g exceeds 1. Probability, however, can be = 1, *at most*. But, according to QG, an elementary particle will have to be described macroscopically. Due to the law of great numbers, then, it will represent a superposition.

Now, a stable particle is characterised by some rather narrow superposition range where its energy-momentum appears diagonal within the actual measuring precision. Contrary to that, the range of an instable particle, a so called “resonance“, will show a form according to a bell shape with a measurable halfwidth. Its peak value denotes the position of its mass, and its halfwidth the averaged lifetime of the particle before decaying.

Nature resolves that contradiction by broadening the macroscopic superposition structure (“halfwidth“) corresponding to the reciprocal coupling constant according to Einstein’s “cosmological constant“ (which is not constant at all) [1, chapter 10]. In particle physics, this is Feynman‘s (reciprocal) “propagator“ [1, chapter 10] to drag the above superposition range into the desired width, such that the maximal probability 1 per superposition component will not be overrun. According to Yukawa and Feynman, that halfwidth is inversely proportional to the resonance mass.

Thus, we observe again and again that the model of QG is tending into the correct direction. It should be able not only to explain “our world“ qualitatively but also quantitatively! Classical physics, however, until to-day does not succeed in presenting any model of an even approximately comparable depth of information.

15. Quasars

In the dynamic channel, there are 3 horizons. For states to pass them "unplucked", special care must be taken. In order to pass the border between input and output, all "internal" charges must vanish, e.g. As subjects to some observer position, however, they did not yet fix their linear combinations exactly; they only will have to be orthogonal to each other. This might be achieved by the following attribution of charges, for example [3]:

	N	Q	T	L	Λ	E	A	M
a^{+}_{i211}	+⅓	+⅔	–⅓	0	0	0	0	0
a^{+}_{i111}	+⅓	–⅓	–⅓	0	0	0	0	0
a^{+}_{i222}	+⅓	+⅔	+⅔	0	0	0	+½	+½
a^{+}_{i122}	+⅓	–⅓	+⅔	0	0	0	+½	–½
a^{+}_{i212}	+⅓	+⅔	–⅓	–½	–½	0	0	0
a^{+}_{i112}	+⅓	–⅓	–⅓	–½	+½	0	0	0
a^{+}_{i221}	+⅓	+⅔	+⅔	+½	0	+½	–½	0
a^{+}_{i121}	+⅓	–⅓	+⅔	+½	0	–½	–½	0

At the upper rim, the abbreviations of those 8 "internal" charges are denoted, and at the left-hand rim those of their 8 "internal" variants for the i-component (i = 1 or 2 corresponding to up or down) of Dirac's a-spin for positive energy (upper label = +), arbitrarily numbered according to their 3 nesting levels ($8 = 2^3$) [1, chapter 30]. (Their first label denotes the component of isospin, e.g.) The 4 colours are characterising 4 isospin "generations", as the "standard" model of particle physics would call it, which, however, only knows 3 generations (defined differently) for its quarks plus another one for its leptons. (For b-spin, all 8x8 signs are reversed. For negative energy, another sign change will take place.)

In order to pass the horizon between input and output, as said already, all 8 charges of a physical state will have to sum up to zero, each. The same holds true for their dynamical quantum numbers. This will fulfil the conditions for the other 2 horizons (event horizon and big bang), as well. In order to satisfy those dynamical restrictions, in addition, we should have to move from the Schrödinger to the Heisenberg picture and apply the law of great numbers.

In this sense of a statistical approximation, this could approximately meet the conditions of the uncorrelated set of *unpolarised* dark matter as a whole. For real elementary particles carrying a non-valence part, this restriction, analogously, would require macroscopically vanishing masses (M_0) combined with lacking extension (Q_3) and energy (P_0). For Q_3 and P_0, however, these conditions are contradicting the behaviour of an object close to an event horizon, where objects are travelling almost at the speed of light.

Particles equipped with a non-valence part, hence, cannot pass those horizons without being torn to pieces. Now, it is our turn as humans to enter. For us, CMS-spacetime Q and energy-momentum P are secondary, derived quantities. Our primary entries are the corresponding non-additive ray-representations [1, chapters 15 and 20] dividing those entries by heavy mass M_0, like $X = Q/M_0$ (classical spacetime) and $V = P/M_0$ (4-velocity). For heavy mass M_0 tending to zero, Q and P must converge towards zero, as well.

At the event horizon, thus, an object, and even an elementary particle, will be torn to pieces. That debris of matter caught by the attraction of a black hole will develop an extended accretion disk outside the event horizon, where matter is rotating close to the speed of light. At the intersection of the event horizon with that disk, matter will be absorbed by the black hole, and additional debris will accumulate to some bulge below and above the accretion disk all around the remaining parts of the event horizon.

Close enough to the intersection of the event horizon with the rotation axis (perpendicular to the accretion disk), depending on the mass of the local black hole, there is the polar location where that linear speed of light will transform to a chaotic motion. There, for the super-heavy dark holes in a galaxy centre, that debris might be torn to pieces small enough that the dark energy of individual quanta starts dominating the gravity of extended, bound matter. By this reversal of the force direction from pointing inwards (gravity) to pointing outwards (dark energy), a flow of debris strongly pointed outwards will result in terms of agglomerations each of which is consisting of a few quanta only.

From this astronomical observation we conclude that those super-heavy local black holes are strong enough to decompose matter – if baryonic or dark – into bricks of quanta small enough that the gravitational attraction of bound matter will pass over to the repulsion of separate quanta. Numerical simulations should find out how many quanta of what types are necessary for that transition. As another conclusion, that observation shows that dark matter might not consist of those pairs of quanta indicated in chapter 13, only, but that compounds of those dark-matter bricks a little bit more massive are needed, in addition.

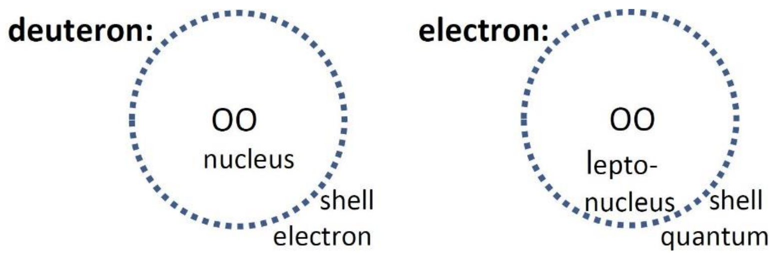
On their long way to our earth, those small numbers of quanta will accumulate more quanta from the non-valence parts of matter sparsely populating the interstellar space of our universe. The yellow and green quanta will grow to nucleons, additional blue pairs to leptons (predominantly electrons and their neutrinos), and the exonuclei will couple to those simulations of destruction operators mentioned, already – among other compounds. On earth, we, then, identify that galactic black hole as some quickly rotating quasar equipped with 2 high-energetic jets parallel to its rotation axis.

“Passing a horizon“, here, means tracking some state across the horizon according to the criteria of its *source* area. The criteria of the area beyond may be totally different (time reversal, charge conjugation). In this context with an event horizon, it would be interesting to find out the limiting condition where the effects of dark energy and gravity are cancelling each other. This would be especially interesting for the charges N, L, A, and M, as well (cf. chapter 8).

16. Particle Spectrum

For the “standard“ model of particles, leptons are states without any substructure (“point particles“). In the GUT, they are antibaryons carrying lepton number L=+1 (cf. the two blue entries in the table of the preceding chapter) which have to couple each other to an additional green quantum in order to saturate their triality charge T (of strong interactions) to T=0.

We call the combination of both blue quanta with each other to give a positive lepton number L=+1 a “leptonucleus“. The combination of this leptonucleus with the green quantum looks similar to the structure of a deuteron made of a nucleus and a shell electron – only, in a lepton, the shell is bound to its leptonucleus by the strong nuclear force T, while, in a deuteron, the electron is bound to its atomic nucleus by the electromagnetic force. And the atomic nucleus itself will bind its two nucleons (proton and neutron) by the strong nuclear force T, while the leptonucleus will bind its two blue quanta by the “leptonic force“ Λ.



By considering a lepton as a point particle, we observe that the coupling strength of the Λ-force (as a monopole) will have to be much stronger than the strong force T; otherwise, we would have been able experimentally to resolve a lepton into its constituents, long since. A weak interaction, hence, does not apply the leptonic force Λ in terms of a monopole force but in terms of a dipole force transmitted by its leptonucleus. From similar considerations we observe straight forward that the “exotic force” E even should be much stronger by powers.

For one of the two green quanta bound to a leptonucleus, this will give an electric total charge Q=–1; for the other green quantum, it will give Q=0. According to the special Young symmetry of those 3 quanta, we, thus, obtain an electron, muon, or tauon for Q=–1, and the respective neutrino for Q=0 [1, chapter 34]. *(In QG, the 3 classical neutrino types are converted into each other by collisions with dark matter; in the "standard" model, the same is achieved by its sophisticated "neutrino oscillation".)*

From this composition of a lepton by quanta, QG calculated the absolute value of the "fine-structure constant" (electromagnetic coupling strength) in a first approximation by a precision of 8 per mil, already [1, chapter 34], while the "standard" model does not see any way to calculate it by theory.

We could imagine that a similar construction would arise for a "sterile neutrino" from those quanta represented in red in the table – with the difference that, here, either the distinction between a symmetric and an antisymmetric coupling of both red quanta (with L=+1) is absent because that 2nd component necessary for the distinction has been snatched away by dark matter, already, or that the anti-partners are missing completely. (Here, we assume that those 4 of the 64 types of quanta snatched away just have been taken from the isospin generation represented in red.)

Anyway. This construction cannot work symmetrically with respect to a matter-antimatter replacement. For, in this case, the exonucleus would sum its quantum numbers to T=+**4**/3 (with L=+1, Λ=0, E=0), while our leptonucleus is summing them to T=+**2**/3 (with L=+1, Λ=0, E=0). Strong charge T makes the difference! Thus, we would need 2 green quanta instead of 1 for compensation. This, however, would give a meson – and not a fermion. As an alternative, we could replace 1 of these (anti)green quanta by 2 blue quanta. The inequivalence between red and anti-red quanta, thus, would step by step trigger the experimentally observed inequivalence between matter and antimatter.

Now, for an *approximately* massless fermion, according to the 3rd-order world formula, the sign change of a spin component (helicity) inevitably will be coupled to its nature of being a particle or an antiparticle [1, chapter 40]. The spin flip of a neutrino, hence, will mean a flip of particle number, as well. The imbalance of matter to antimatter, hence, is an immediate result of dark matter having split off by partially exhausting exotic matter.

From the number 64 of types of quanta (8 dynamical times 8 “internal“ ones), we deduce for the present models of QG and ToE that, within our universe, there should be exactly 64 absolutely stable types of states. Together with the above knowledge, we conclude that those 16 dark-matter states will belong to them, which have no non-valence parts. The remaining 64–16 = 48 states will have to belong to elementary particles, which do have some non-valence parts.

As heavier particles will decay into lighter ones (and not the opposite way), first of all, those particles which experimentally are identified to be massless will belong to them: neutrinos, the photon, and the graviton. A massless particle with spin will have to move by the speed of light. Hence, it will keep its extreme spin values in the travelling direction as helicities, only, dropping its middle spin components; these are 2 helicities, each. By multiplying with the 2 energy signs, we will be left with 4 states per neutrino type. These are 3x4 = 12 states.

Another 4 states will belong to the photon and to the graviton, each. Finally, we still shall have to add those 8 stable states of the proton-antiproton and of the electron-positron pairs, each. As a summary result, we, so far, obtain for the stable states:

16 states of dark matter
12 states of 3 neutrinos
4 states of the photon
4 states of the graviton
8 states proton/antiproton
8 states electron/positron

52 states

There still are missing 12 more particle states. If we consider the composition of the above particles out of quanta, then, we should assume that those missing states should be states in which the blue and/or red quanta are playing some special role. Now, in that colourful table, those 4 generations, from yellow to red, obviously, will have been ordered according to those numbers of quanta per quantum type as taken over by our universe from its external interface. Particles with red quanta which are not saturated in antisymmetrical pairs should be the heaviest, followed by those with corresponding blue quanta. For their experimental detection, hence, there still should be needed much higher energy than actually available.

The wealth of yellow and of green quanta, as well, indicates that those non-valence parts of particles predominantly will consist of these two types of quanta. Here, numerical computer confirmations are asked for. In addition, they are the source of states excited by photons well known from the shell models of atomic and nuclear physics.

For the valence parts of particles, this abundance of yellow and green types means the creation of hadronic flavours [1, chapter 37] and hadronic S-, P-, D-, F-, and higher spin excitations [1, chapters 35 and 36] by appending suitable "rucksacks" out of quantum pairs saturating each other "internally" (green-antigreen or yellow-antiyellow) [1, chapters 35 and 37]. (Note: Quantum pairs are no quark pairs; quarks have a non-valence part!)

The valence of such a hadronically flavoured quark, hence, will consist of 3 quanta, each, which, by having been reduced as some compound, will have taken over the dynamical spin of the original, simple quantum. Contrary to that, a leptonic flavour will conserve its composition of quanta unchanged; it just will reorder its representation by Young boxes, instead [2, chapter "The System of Leptons"].

17. Towards the General Mass Formula for Resonances

Chapter 14 demonstrates how we apparently could create a probability (coupling constant) greater than 1 by a superposition of microscopic states. The point is the discrepancy between (microscopically) irreducible and (macroscopically) reducible facts. Microscopically, we might keep all 4 commensurable quantum numbers L_0, L_3, Q_3, P_0 diagonal simultaneously depending on their observer position (coordinate system). U(2,2)-“rotations“, however, also could make different 4-combinations diagonal *without* applying the law of great numbers.

According to chapter 4, this will separate the set of these 4 diagonal U(2,2)-generators from the 12 non-diagonal ones left. This is the difference between the 4-dimensional view on a Schrödinger spinor and the adjoint view on Heisenberg’s 4x4=16 generators: By applying them to Schrödinger’s spinor, 12 of those 16 Heisenberg generators will become redundant to each other.

Those 12 redundant generators, hence, are not commensurable with the 4-set of diagonal generators. In order to make them commensurable in spite of that at least approximately, we need the law of great numbers. From the mathematical view, however, this kind of superposition, then, is not any more *irreducible* but *reducible*.

While an irreducible representation transforms as an entity, a reducible one will diverge (i.e., have some decay width). The latter also will hold true in case of those so called “resonances“ of elementary particles. However, there is the experimental conflict that a resonance is no entity, but that, on the other hand, a unitary (irreducible) partial state is not diagonal (commensurable). Exactly by this reason – from a formal perspective, if you try to treat it as an entity, which it isn’t – a resonance may have a coupling constant exceeding the maximal value 1 of a probability (chapter 14).

If, in a frame of *classical* particle physics, i.e., from the *special*-relativistic perspective, we treat the mass M_0 as the lowest limit of energy P_0, then, for the resonance type in consideration, a collision experiment of 2 particles will yield a curve (probability vs. energy) resembling a bell or a superposition of bells (unitarity behaviour).

Here, in the context of QG or ToE, the discrete quantum structure of the non-valence part of a particle will hit, already (in terms of some “Regge-trajectory“): “Internally“ neutral quantum pairs from the non-valence parts of *both* collision partners in common are changing their state from a non-valence type to attach themselves to the new gross valence part of the resonance type considered to be an extended valence part of the new resonance. (As, in parallel, additional processes, like virtual photons splitting off, might take place, as well, the probability of such a microscopically proceeding collision process will stay *below* its maximal value 1.)

Technically, such a collision can be calculated on a numerical base. However, for an experimental comparison, not just 1 such collision process will have to be calculated but a whole bundle. For, the experiment assumes states the quantum numbers of which all are commensurable with each other.

This, however, requires a certain (reducible) superposition width of the (dynamical) quantum numbers of all collision partners – even if these superpositions will stay below the measuring precision. The collision processes themselves, of course, will proceed separately (on an irreducible base). The published tables, however, will contain the summary results of all (reducible, collected) individual measurements.

First of all, pure non-valence parts should be constructed. (Their valence parts are negligible in the first instance.) Such a calculation program, hence, will consist of several separate parts:

1. For every input partner independently of each other, an appropriate (reducible) ansatz for some dynamical starting superposition of irreducible states will have to be made.
2. The same is true for every required output type.
3. All (irreducible) individual normalisations are to be calculated.
4. For every transition of interest separately, the probability is to be calculated.

Point 1 and 2 are the most elaborate ones because they, first of all, will have to identify consistent assumptions for the exact structures of the respective non-valence parts by some experimental trial-and-error procedure, which the “standard“ models are leaving aside completely.

(It is the great advantage of QG and ToE that they do not ad hoc graft Feynman‘s propagators as a simple pole-model with an unknown imaginary component to create an equally rough decay width onto some Lagrangian formalism, but that they allow for an explicit calculation of mass and width.)

(Point 1 could be limited, at first, to Dirac‘s a-spin (of both energy signs) belonging to the yellow and green quanta. They should be multiplied in pairs to give isospin components with $I_3=0$, particle number N=0, triality T=0, and charge Q=0; then, they should be summed to isospin I=0. Similarly, we could handle the 4 dynamic components L_0, L_3, Q_3, P_0.

The construction of the dark-matter states (chapter 13) could serve as a model. Their representations [1, chapter 9] provide the respective inputs. The proper construction, then, will start by applying the law of great numbers to superpositions approximately giving $Q_1=Q_2=0$ and heavy mass M_0. Here, Dirac‘s b-spin will enter, in addition. On the other hand, however, 3-momentum P_1, P_2, P_3 will be left aside.)

Such a computer program could start with calculating the pion masses by the collision of an electron with its antineutrino (π^-) or by the collision of 2 photons (π^0). The next option could be the diverse decay channels of K-mesons and the creation of a neutron from a proton. The magnetic moment of the nucleons could serve as a cross check. This way, by trial and error, the exact valence structure of the weak bosons W and Z could be identified.

In principle, the calculation of the entire spectrum of masses and widths is a mere consistency problem depending on the occupation numbers of all 8x8=64 types of quanta (number of quanta per quantum type) in our universe. The required information is largely available to us. As long as the related mass formulas for a *theoretical* description still are not available in detail, however, we still shall have to resort to numerical methods, in the time being.

Thus, by QG and ToE, the first time, all information to derive masses and half-lives of all particle states as functions of the numbers of quanta per quantum type present in our universe is available (except those numbers themselves). The “standard“ models, are far away from this situation, and the string-brane models even further.

As a side note, models like that of “loop quantum gravity“ and related ones only share the name with our QG; in fact, they are purely classical models. A <u>real</u> quantum gravity is characterised by consequently applying *Young’s tableaux* and deriving dynamical *non-valence structures.*

18. Philosophy of Young Tableaus

Elements of totally symmetric structures, usually, are denoted to be “indistinguishable“. The characteristic of individuality, thus, will be antisymmetry. When considering nature to be represented by just 1 (“irreducible“) tensor made of quanta and its quanta all to be individual, then, we should expect its Young tableau to consist of 1 column only, and its dimension would be equal to the number of its quanta.

Its “reduction“ according to those various steps of some Matrioshka nesting (cf. chapter 10), then, would yield a wealth of equal, parallel substructures. For reproducibility, hence, there are sufficiently many options.

However, there still are different reduction processes, which do not produce identical results but merely are similar or even will largely overlap each other. Especially, consider the locomotion of a car, e.g.: Continuously, fuel is burnt and removed; air is sucked in. And the car itself is changing its local position with respect to its surrounding. In spite of all that, it still is the same car – although many quanta will have been exchanged, incorporated, or emitted.

The addition of just 1 quantum to the actual time means a leap to the global observer position belonging to the next time-slice. (Our entire universe may be considered as being sliced according to time! Thus, local observer positions will be densely packed side by side, as well.) Probability maximation among them, hence, hardly will meet serious difficulties. Even more sophisticated – though proceeding along to the same principles – are the procedures of life.

Now, a human, as a subject of nature, will underlie such a nesting of quanta he is composed of, too. Compared with our universe, a human is some relatively small (thermodynamically open) unit. As a biological species, he will underly the laws of reproduction. His base will be laid by his conception.

There, his DNA is generated, the fundament out of which his structures, essentially, will derive of. External influences (like mutation and experiences) are playing a subordinate role. His brain will serve as the control centre of what we denote to be the senses of a human. (Even the extended surface of our skin will transfer its impressions, there.)

In the sense of informatics, quanta are mathematical, abstract bit or byte carriers, arranged in terms of some square pattern called the Young tableau of some higher Matrioschka level. Physically, however, these quanta quite certainly are of some material significance, interpretatively equipped with properties like dynamics and forces.

The brain of a human consists of quanta, as well. By evolution, the differing individuals of the same species, like those of a human, are similar to each other. Every individual will have his own quanta, however – and they are subject to an evolution we are calling life. This way, quanta starting from quite similar positions may individually develop rather different structures, reproducing quite similar Young sections in parallel components of an appropriate reduction.

Now, an observer position is some partial set of the quanta of a brain having certain properties. Hence, that position is individual and subjective. On a hyperboloid (dynamic channel), such a local selection of quanta to serve as an observer position is labile; there is no equilibrium. Permanently, forces are at work.

Its specification is subject to statistical comparisons among closely related constellations of quanta with each other. The winner will be the one showing the (locally) highest probability. With a lacking equilibrium, this will not just be the actual position. For, by occupying a position, the observer centre, even if minimally, will shift towards some locally new position.

Comparison means repetition. But repetition is physics. (Repetition not necessarily is a *temporal* aspect!) The determination of an observer position (by maximising some local probability) means resetting it. This resetting, however, will mean some quantum leap –

not physically but purely logically. Such a purely logical change of the observer position will be interpreted as “motion“ – even if it simply might be (the special case of) the change caused by the cosmic expansion of space we locally are feeling (as the current of time).

“Life“, hence, will be some progressive chain of local probability maximations, like those possible on a (thermodynamically “open“) hyperboloid – i.e., in the dynamic channel – but not on the surface of a sphere (like in the reaction channel). (This kind of maximation, however, is not to be understood statistically but without fluctuation.)

As a hyperbolic parameter, time neither will adopt an equilibrium (outside its origin): It just is running. But we know well that we have some feeling of time in our brain, indeed. Thus, depending on time, a brain will carry along some address pointer announcing where nature deposited his actual observer position. (Nature is static: All times are present simultaneously.)

For, remember: An observer position depends on time; its pointer will not only provide the presence but – in terms of recollections – also parts of the past to our brain. In principle, future might be available in a comparable form, but – due to whatever practical reasons – evolution had considered it to be more useful to reflect volatile recollections of the past, only, and not to overload its storage capacities with possibly psychologically stressful fortune telling (with details how we will be eaten, e.g.!).

Our brain will accumulate extracts of sensory impressions intruding from various sensory centres to some total observer position. These processing algorithms partly are inherited, partly acquired later. *(Contradicting impressions from differing sources – from the balance sense in the ear vs. the optical impression by the eye, e.g. – will quickly give rise to “error messages“ in terms of a malaise or vomiting.)* Hence, in our brain, there must be installed some coordination centre for observer positions. Accelerations overstraining the perceptive skills of our senses are leading to similar phenomena.

Briefly: While tensors are pure, abstract mathematics moving nothing, their physical materialisation in terms of quanta will do so! Quanta are the natural, physical carriers of those abstract mathematical structures. But what do the quanta have in addition to Young's boxes? The ontological, basic problem of philosophy will stay: What is the origin of everything existing, where do those quanta come from?

19. Definitions and Fundamental Principles

This chapter will serve to unify some notions. The majority of these notions will be clear from the beginning. But a few of them – like Young's "**reduction**", e.g. – are too sophisticated for the layman. There, however, he will be in good company: Even the majority of classical physicists do not really understand that formalism thoroughly. For a few of these explanations, we need the recourse to preceding chapters, in addition. Hence, the actual chapter hardly can be moved to the front in order to start the book with it.

Real physics will start with definition 3. Those "ansatzes" before it are more general and rather related to philosophy (nature) or to mathematics in general.

Definition 1:
The set of all what mankind is able to record by its senses and logically derive from it will be called "**nature**". The elements of this set are "**quanta**".

Ansatz 1:
All **quanta** are disjunct and **distinguishable**. Their dimensions are uniform. Their properties are global, finite, quantitative measuring values.

Ansatz 2:
Principle of finiteness: The **number of quanta** is **finite**; there is **no free will**.

Ansatz 3:
Nature behaves like an ("irreducible") **tensor** of its quanta.

Mathematics:
A **tensor** is some multiple vector. Its components are characterised by Young tableaus. The path from one component to another one is given by applying an appropriate group of linear transformations. The representation of the quanta of a tensor depend on the linear transformation selected (i.e., on the coordinate system chosen).

Definition 2:

An **observer position** is based on partial sets of tensor components of nature supplemented by (not necessarily logical) derivations of them. (What another observer would consider as "non-logical" simply could be the result of insufficient information of his partner triggering false conclusions.)

Ansatz 4:

A **human** is some partial set of nature, as well. Hence, he will consist of quanta, too – "tertium non datur" = "there is nothing else" (materialist conception of the world).

Ansatz 5:

By appropriate criteria (choice of the transformation group), nature will admit its mathematical "reduction" (decomposition) into a set of disjunct **universes**. Universes are assemblies of quanta.

Definition 3:

Physics will exclusively deal with (however) **repeatable structures** – i.e., not with nature as such (this will be handled by **philosophy**) but with structures below it until down to the level of quanta. For doing so, (within its respective precision frame) physics also will use the law of great numbers. Provided this frame is "insignificantly" broken at its local repetition by some observer position, we are speaking of some "**change of** this local **observer position**".

Working hypothesis 0:

The **change of** a local **observer position** is not physical but happens purely on a **logical** base.

Definition 4:

A universe reduced according to identical criteria is some **parallel universe**, a selected partial set of parallel universes is a **multiverse** ("horizontal" collection). The smallest universe containing mankind completely is **our universe**.

(Note: In this sense, quanta are parallel universes among each other.)

Working hypothesis 1:

By extension or cutback of the above list of criteria, we obtain a nesting ("vertical" collection) of universes according to the **principle** of Russian **Matrioshka** dolls.

Mathematics:

The **dimension** of a quantum is that of its Matrioshka level. This number of dimensions will determine the number of its commensurable measuring values and eigenvectors on this level.

Definition 5:

An eigenvector will fix its **quantum type**.

Working hypothesis 2:

QG and its GUT and ToE extensions all are "**tensor models**": Their quanta of any type only are shifted to and fro by combinatorics (tableau creation of its components according to Young); their contents are considered as frozen.

(Remark: The string-brane models are no tensor models.)

Definition 6:

The quanta of our universe primarily are defining **dynamics**, in a second step the **charges** of their so called **"internal" forces** as their next-*deeper* Matrioshka level.

Working hypothesis 3:

Human beings perceive dynamics in its *ray representation*. The eigenvalue spectrum of the quantum types of our universe is given by some external **interface structure**. For its "internal" forces, the same structure is assumed.

Mathematics:

A ray representation is dividing numbers by each other; probabilities do so as well. Provided they are irreducible, according to number theory, their maximal basic **dimension** is **8**. The total dimension of our dynamic universe including its "internal" forces, hence, is 8x8 = 64.

Definition 7:

The 3 parity matings of particle physics (**C** = charge conjugation**, P** = classical parity of space, **and T** = classical time reversal) are proliferating to the dynamics of our universe in terms of an **event horizon**, a **big bang**, and (the sign of) **particle number**, as well. The product of all 3 matings (**CPT theorem**) transfers Einstein's and Dirac's 4 classical dimensions into the 8 dimensions of QG.

Mathematics:

A “spinor“ (vector) of dimension n denotes a representation space in the **Schrödinger picture** of physics; a square matrix of dimension nxn, then, will represent an action on this spinor in the **Heisenberg picture**. The Heisenberg picture is the “**adjoint representation**“ to the Schrödinger picture. In its basic dimension, the components of a mathematically adjoint representation are called its “**generators**“. The n generators on the diagonal of the nxn-matrix all are **commensurable** with each other.

Definition 8:

The Schrödinger picture is a **microscopic representation**, the Heisenberg picture a **macroscopic representation** of our universe.

Mathematics:

The macroscopic representation will contain redundant, **incommensurable generators**, in addition to the commensurable ones of its microscopic representations. In its statistical extension, the Heisenberg picture, hence, often is applied by the **law of great numbers** in order to make the incommensurable generators commensurable at least **approximately**, as well.

Working hypothesis 4:

Equal **quantum types** might be **indistinguishable** copies of each other, but they admit an **individuality** by their unique copy characteristic *(from the nested chain of their reductions)*. Humans, however, will consider quanta from their various **observer positions**.

Working hypothesis 5:

The 8 = 4+4 basic dimensions of our quanta are composed of 4 “**unitary**“ dimensions of an **SU(4)**, while the additional 4 dimensions are subject to the extension of their r-number Lie-algebra to a **c-number Lie-algebra**; hence, they are *imaginary*.

Mathematics:

All 8 basic dimensions together create some **SU(4,4)**

Definition 9:

By resorting its 8 dimensions, this SU(4,4) is separable into 4 quadrants of an SU(2,2) according to chapter 4, as well. The separator could be the **event horizon**. The domain beyond the event horizon is a **black hole**. Within a black hole, all generators will have to be

divided by the imaginary unit "*i*". Provided the energy is imaginary after it, then, all 4 components of energy-momentum will have to be exchanged with those of CMS-spacetime. The **big-bang horizon** will serve as another separator.
Note: Observe that, here, that notion "before" the big bang does not denote negative but imaginary times!

The reduction of this SU(4,4) to the subgroups SU(2,2) applied by Dirac for a fermion or an antifermion, now, will not give a total of 2 but ***4 quadrants*** *of such SU(2,2)s, 2 of which are lying on the same side of a fixed horizon, always. The sketch of the cosmic hyperboloid of chapter 6 demonstrates that* a mere sign change of time across the big bang will change entropy and, hence, the direction of the **time arrow**, as well: time is running backwards, there; **input** and **output** will exchange each other!

Definition 10:

Inertial mass provides a 3rd horizon for the SU(4,4), still separating inputs and outputs from each other in all 4 SU(2,2)-quadrants. **Input**s will give **ket-vector**s, **output**s **bra-vector**s.

Definition 11:

By dividing all generators of the above SU(4,4) which had been added by the extension of its original SU(4) to a c-number Lie algebra by the imaginary unit *i,* we obtain an SU(8). U(8)-states are part of the "**reaction channel**". U(4,4)-states are part of the "**dynamic channel**".

Mathematics:

The reaction channel conserves **probability**, the dynamic channel **causality**.

Working hypothesis 6:

Quanta are absolutely conserved quantities. In both channels, there is no **symmetry breaking**.

Definition 12, Mathematics:

The generator the squared eigenvalue of which is representing the constant (i.e., the "**radius**") in a 2nd-order world formula is the same which extends an SU(n) to a U(n) or an SU(n,n) to a U(n,n). For a U(n), (by some appropriate normalisation) it just will count the boxes of a Young tableau. In all these cases, it is the respective **1st-order Casimir**.

Definition 13:

The **ToE** will unite the Matrioshka level of dynamics with that of the "internal" forces. Its dimension, hence is 8x8 = 64. Its partial set excluding **QG as its "internal" singlet** is the **GUT**.

Geometric statement of our QG:

QG and ToE may be represented by Cartesian coordinates by optionally drawing the microscopic or macroscopic number of its respective quantum types in terms of a (multi-dimensional) "mountain range" against their respective coordinates. However, if we use these numbers as stretching or compression factors of their respective coordinate points, instead, then (thus applied by Einstein in his GR), we obtain some (multi-dimensional) **geometrically distorted picture** of the basic Cartesian coordinates, which, due to those distortions by the horizon, (depending on the numbers sketched) even might contain (black) holes, here and there. Those ("recoverable" pseudo-singularities) might compel us technically to represent those 4 quadrants of QG separately from each other.

Working hypothesis 7:

The restriction of our universe to substructures of Young tableaus which, summarily, do not execute any "internal" forces on their neighbourhood, are separating quantum structures into 3 types: **dark matter**, **non-valence** structures, **valence** structures. The latter two (by "irreducibility") only will appear together.

Working hypothesis 8:

Range and **strength of a force** are mere functions of the numbers of their quantum types.

Working hypothesis 9:

Hadronic flavours are 3-quant constructions, **leptonic flavours** symmetry variants.

Working hypothesis 10:

As an extension of QG, ToE, first of all, will try to reduce all properties of a universe to its external interface parameters (especially to the numbers of quanta per quantum type).

Working hypothesis 11:

Entire nature is **static** and **invariable**. “**Change**“ means some purely logical action, triggered by the **change** of an **observer position**. This logical change will define **motion**.

Working hypothesis 12:

The *global* change of an observer position will result from our **universe spinning against its embedding** multiverse.

Mathematics:

A **spin** denotes an *internal* rotation which does not make itself observable as such but only as some linearly conserved quantity (**logical rotation**) within the system observed.

Working hypothesis 13:

From the perspective of the multiverse, *our* ***global*** **observer position** is the result of that spin of our universe about its energy axis $P_0=L_{56}$.

Mathematics:

This logical rotation in terms of an energy spin $P_0=L_{56}$ commutes with ordinary rotations L_i and space $Q_i=L_{i4}$ but not with the Lorentz booster $M_i=L_{i5}$, momentum $P_i=L_{i6}$ and heavy mass $M_0=L_{46}$. Especially, it provides a **permanent progression of global time** $Q_0=L_{54}$. Time (sin) and heavy mass (cos) are supplementing each other. (In daily life, this is not noticed because of the relative “rigidity“ of mass – in a closer neighbourhood of the event horizon, however, it will be felt rapidly.)

Working hypothesis 14:

A changing **local observer position** is an act of **probability maximation** based on the **imbalance** of quanta on the surface of our cosmic hyperboloid. With respect to *our* universe, all *local* observer positions are invariant.

Note: By the local procession of time, these invariant ***local*** **observer positions** will chain to time-dependent series with respect to the superordinate multiverse, as well.

Working hypothesis 15:

The **logical change** (logical quantum leap) **of an observer position** is the result of the **mental uncertainty** of overlapping observer positions in the Heisenberg picture following the probability maximation on the surface of our cosmic hyperboloid due to its steady imbalance.

Note: Without this mental uncertainty, time would stand still for us.

Working fields:

Philosophy (in its strict sense) embraces problems of **logic** which are

1. critically scrutinising the working hypotheses of **natural sciences**,
2. concerning nature as a whole, or
3. making neighbouring working fields to a subject.

The latter will especially concern still unresolved issues of **medicine** and **mind**.

Additional special regulations from other chapters need not to be repeated, here.

20. The Eternal Loop

On this side of the event horizon, in the course of time, matter will be thinning out systematically by its transition into the black hole. At the “end of times“, finally, there will left just some minimum of matter on our side; most of the matter will have accumulated inside the black hole. There, however, time is running into the opposite direction. For the black hole, hence, this is not the end of times but the beginning of *its* chronology.

From the perspective of an observer sitting inside the black hole, now, in the course of *his* time, due to its opposite course, *his* matter will start systematically to diffuse into *our* domain. Inside the black hole, hence, matter will be thinning out until, at the end of its time (by the perspective of the black hole), there will not be left much matter because it has essentially gone into *our* domain.

But (heavy) mass is an absolutely conserved quantity in QG and in ToE – when summed over *both* sides of a horizon. What is disappearing on one of its sides, necessarily, must resurface on the other side. The logic at an event horizon is conclusive by the inverted time arrow (time reversal), there. The end of times on one of its sides, thus, corresponds to the start of time on its other side. By respecting the direction of its time arrow, hence, time will start with its maximal (heavy) mass and run up to *its* maximum of time until the majority of mass will have disappeared across the horizon. (This does not contradict chapter 9, cf. below!)

This maximum (of time), now again, will correspond to the minimum of time by the perspective of the opposite side of the horizon, where, in the meantime, the majority of (heavy) mass will have assembled. This way, mass (cos) and time (sin) will run in circles around, always into opposite directions with respect to each other. Endlessly.

Provided there are no additional universes. Collisions will put an abrupt end to this eternal cycle to and fro across the event horizon.

Like in the situation of colliding elementary particles – it is the same mathematics! – a collision of two universes will trigger another reduction according to the mathematical rules of group theory. With the former universes disappearing, new universes will be created as a reduction result, instead.

The individual quanta of those universes, there, will show the behaviour of a burst bag full of fleas: All are jumping in disorder until they are recaptured by the new, differing end products in order to start new cycles with new distributions of the numbers of quanta per quantum type in each of the newly emerged universes. For doing so, those new universes, first of all, will have to have been created as end products of such a reduction series, of course.

Dynamics and forces, however, are *secondary* properties of universes: Before the creation of a universe, neither dynamics nor forces are existing *locally*! If we want to describe a collision process dynamically and as a function of effective forces in spite of that, we necessarily have to subordinate the entire collision (or decay) process to some more embracing, *global* structure. This way, we are subordinating elementary particles until up to galaxy clusters to the system of our universe, while for universes, just *their* superordinate structure will have to be determined. This collision, however, again just is an aspect of changing the (global) observer position.

(So far, a schematic review of what is happening at a horizon. Practically, however, in a universe, we shall have to handle not only heavy mass and time but – in Heisenberg's picture – all 16 components of dynamics (chapter 4). On our side of the horizon, heavy mass and time both are time-like and, thus, should behave towards each other like cos and sin in the ideal case. Additional components, however, are not attached in a time-like but in a space-like way (like cosh and sinh).

For our side of the cosmic hyperboloid, the (upper) sketch of chapter 9 demonstrates how, with increasing time-like accretions, ever new space-like accretions are generated in terms of additional Q_9-

slices the values of which are concentrating each other asymptotically until up to some maximal value (chapter 9). The eternal cycle of matter across a horizon, as described, thus, will proceed in many Q_9-slices with always differing starting times – i.e., in terms of a multitude of overlapping structures. A maximal starting mass of our section in front of an event horizon, thus, is some relative notion!)

Altogether, by definition, such a universe will behave invariable, static, fixed as whole. Now, in some of the universes, there, locally still will be partial substructures of its quanta which we could interpret as observer positions. Around them, there might be entire supply networks of processing and reproduction. (Animals would use their brains supplied by organs in order to manage all that.) Those networks should be invariable, static, and fixed, too – but in some dynamical, hyperbolic imbalance.

According to chapter 18, such an imbalance might leave the entire universe invariant; but its logical probability maximation will lead to logical quantum leaps from one fixed observer position to another one. The living being attached to this bundle of observer positions will register such a quantum leap as motion.

Here, the model character of a mathematical theory is showing up. By physics, the technical implementation of such a *logical quantum leap* by the forces represented by Heisenberg's generators it is based upon, consisting of pairs of 1 destruction and 1 creation operator, each, is no problem. The problem left open, hence, reads: Is there any formalism on a logically abstract level to allow for those *logical* quantum leaps, too, without changing any *static*, invariant quantum structure?

Thus, wanted is some *purely logical implementation* of a probability maximation by some purely *logical* quantum leap. Here again, we have to distinguish between Schrödinger's and Heisenberg's view. For Heisenberg, not only space but also time parameters are overlapping. (By the factor 3×10^{10} from the speed of light, which is connecting sec with cm (cf. chapter 14), the temporal variation might be small with respect to the spatial variation, but it is not absent.)

This technical uncertainty with respect to time will allow 2 observer positions (*repetition* of an “experiment”), the time difference of which only is marginal, for fixing the causality order of both events against each other. Human subconsciousness, then, will construct a quantitative time difference, and their technically overlapping uncertainties will formally translate this time difference into some “logical” quantum leap by formally adapting the observation centre to this logical probability maximation.

Observe that an “uncertainty” means some mental, *logical* statement: Without this uncertainty, “nature” would not vary spacetime and all the other parameters within its universes – nature is static, immovable! Is motion, thus, an effect of self-illusion of life? Last but not least, this probability consideration still does not give the answer to what is the *trigger* of a measurement! Some little (?) detail still is missing in our model.

21. The Engine of Time

It might sound somewhat strange. The loop just described between heavy mass $M_0=L_{46}$, the zero-transition of which characterises the event horizon, and CMS-time $Q_0=L_{45}$, the zero-transition of which does it for the big bang (the double label refers to the 6-dimensional SO(2,4)-variant of QG [1, chapter 14 and 9]), however, figuratively means some non-ending rotation of our entire universe within its 56-plane, i.e., by the generator $L_{56}=P_0$ of energy as its rotation axis.

This (formal) rotation of our total universe is comparable (identical mathematics) with the spin of an elementary particle – only that an elementary particle does not use energy L_{56} but the 3-component $L_3=L_{12}$ of spin as its rotation axis!

(From quantum mechanics we know that such a spin might be some *static* state. In fact, nothing moves – with respect to the superordinated system. On the other hand, however, there still is its logical *analogy* to an angular momentum (having the same commutator properties; cf. [2, chapter "Spin and Angular Momentum"])!) This intrinsic, spin-like L_{56}-rotation of our entire universe will systematically commute heavy mass M_0 (cos) with CMS-time Q_0 (sin) in the course of billions of years (or even more time). Spin, hence, should be interpreted as the source of some pseudo-forces on the same level as a centrifugal or Coriolis force in the subordinate system.

To put it another way, this apparently non-vanishing "spin" might be considered as the engine of time progression for *our* universe. It is (formally) "rotating" the *coordinate system* of our *global* observer position in terms of "logical" quantum leaps from time slice to time slice, without any physics moving in *our* universe: Our universe stays fully at rest. Just the coordinate system, i.e., the global observer position, pretends formally to proceed in time *within* our universe, and it is L_{56}-spin, i.e., the energy generator, which formally keeps time running by pretending to convert an *abstract* probability maximation of theory into some concrete effect of entropic forces when an experiment is *repeated*! This way, the postulate of physics that an experiment should be repeatable still acquires quite another significance!

Without this intrinsic rotation about the axis of energy $P_0=L_{56}$, forces would remain abstract and could not be observed in practice. This *apparent* progression of global time also makes our *local* observer position formally jump from time slice to time slice such that – purely from the logical perspective – the *local* observer position will be subject to a permanent change, as well. (On the other hand, however, this global rotation will be the averaged result of summing up local motions. Thus, local and global motions, last but not least, are different sides of the same coin.) This permanent change of individually chained, subjective, local observer positions by the course of time also is called “life“.

Such an energy-“spin“ of our total universe, automatically, will give rise to the problem: A rotation with respect to what? And we know the answer, already: There still must be something outside our universe: Our universe cannot be all!

Within our universe, we are applying the allocations of our generators as given in the table of our chapter 4. *Outside* our universe, however, there, obviously, are differing allocations representing our universe as some kind of “super-quantum” of some super-universe (multiverse) on a superior level, where energy is replacing and taking over the role of a spin-3-generator. From the perspective of that multiverse, our universe, officially, is at rest, and that “spin” just is one of its various conserved quantities.

But our energy, there, is serving as the 3-component of its super-spin (which, from the perspective of our universe, is given by $L_{56}=P_0$, $L_{45}=Q_0$, $L_{46}=P_0$ [1, chapter 14] rotating about our energy axis $L_{56}=P_0$). With respect to that multiverse, that super-spin (456) is local and invariant, there. From the perspective of our universe, however, that super-spin also is noticed as a set of generators belonging to the coordinate system of that *global observer*-position. Hence, *our* universe will be noticed to rotate with respect to the coordinate system of that multiverse.

This apparent, *global* rotation of *our* universe, nevertheless, will formally limit the size of *our* universe by the fact that the most distant part of our universe (on *our* side of the event horizon) cannot exceed the speed of light (with respect to the embracing universe) by its rotation. (Otherwise, it would enter the black-hole domain with its time reversal, where spacetime and inertial mass are exchanged against each other.)

22. Outlook

QG and its ToE-extension are axiomatic models. And a “model” itself means an idealisation of some more sophisticated problem, already, which is neglecting certain details. The main problems to be solved by QG/ToE were

1. the reduction of all items handled purely to manage occupation numbers of quantum types and
2. the identification of the engine of time.

The rest is mathematics and defining interpretations. The main problems not yet solved are the numerical computer calculations of details. The next open problems, of course, are the embedment of ToE into the Matrioshka chain and the problem of what comes next to Matrioshka: Where do all those quanta come from and where are their components frozen up to those states we are meeting in our universe?

In addition, the type of representation applied by QG/ToE – some static system of invariant quanta observed by varying observer positions – is predestined to living systems, which, by thermodynamics, are open systems. They are not only subject to metabolism and breathing but also lose dead skin flakes, get their hair and finger nails cut, and, last but not least, are growing and dying. Nerve cells, especially those in the brain, are partially controlling that and, by selecting an adapted observer position, are telling that person what is a part of him, and what not.

Actually, QG still is far from being prepared to describe living systems. At least, however, QG will inspire progress into that direction by revitalising age-old ideas and supplementing novel, unprecedented, radical impacts without losing sight of the experimental situation. Its antagonism reads: Abstract, objective logic (mathematics) vs. concrete, subjective “experience“ – like that physics is up to mediate. By the ansatz of an invariant, static nature in terms of a tensor, Young's box pattern will be abstract, too, and, thus, an observer position as some of their partial sets, as well.

As a metaphor of physical quanta, those boxes (or subsets of them) will take over physical properties (like forces, e.g.). They neither will "move" anything; but, within a hyperbolic system of imbalance, they will build up potentials controlling the (abstract) fabric of probability. According to definition 3 (cf. chapter 19), physics will manage repeatable issues, only. Noticing an imbalance, however, means that a certain state composed slightly differently will be equipped with a different probability.

Now, a local change of an observer position to some "neighbouring" one under the aspect of probability maximation is a "quantum leap", too (cf. chapter 18). Depending on its embedment (level of education), even conspiracy theories might obtain a maximal (local) probability!

But let us proceed to a technical realisation. With entire nature as 1 single tensor, we obtain a wealth of structure carrying quite similar properties – too big to keep a survey over all its facets. We (i.e., our local observer positions) are familiar to cut small slices out of this "cake" in order to swallow them easier. At least at the interface, however, this interference means some change (some local idealisation) by our view of nature, which still extends beyond this slice. Like this, however, we obtain better manageable "parts" less overstressing us.

We have to interpret the hyperboloid of our universe this way, too: As an idealised collection of an enormous amount of individual elementary structures the relations of which towards exterior parts of our universe have been "cut away" (neglected) for an easier handling. This, however, does not mean that such external relations do not exist!

"Divide and rule" – this is the key to understanding. Mathematicians, thus, (classically) arrived at series expansions and (according to Young) at reductions with respect to irreducible representations.

This way, the data of observer positions could spread over our brain according to competence, as well. As abstract mathematical boxes, Young tableaus will have no effect to physics, at all.

As the carriers of physical forces, however, quanta will guide us (locally) from observer position to position – always following probability maximation. And this will be the result of a global rotation of our total universe within its energy plane L_{56} perpendicular to its formal “spin”-axis within a multiverse at rest. From the perspective of this multiverse, a spin of one of *its* “quanta“ (= our universe) would correspond to some rotation on *our* level, induced by conservation rules. But it is no “motion“ on *its* level. Both *coordinate systems* (i.e., observer positions) are rotating against each other.

Schrödinger states only are able to describe statics; for dynamics, we need (functions of) Heisenberg generators, in addition. By the observer positions, thus, annihilation operators will enter by the back door, as well – besides the creation operators. For the Schrödinger picture, where they are not provided for, this requires their new definition [2, appendix “Symmetries“, the yellow sketches]. According to that, a destruction operator (as a negative Young box) in n dimensions is the result of n–1 creators (positive Young boxes) divided by an n-dimensional (column) singlet. The latter one just will represent one of the 16 dark-matter bricks.

The creation of “one” quantum out of a dark-matter brick to be identified as an annihilation operator, hence, again will have to result from a probability maximation at a collision or decay process. This means a quantum leap – or even more than one. Like a radioactive half-life width depending on its decay period (chapter 14), “the” quantum leap treated here will statistically extend over some time period, as well.

This way, an observer position is expected to follow the same principles as a particle resonance. An “idea”, a “thought”, somehow, will be the low-energy analogue of the solid-state physics of organic proteins (sets of neurons) with respect to the high-energy Feynman diagrams of particle physics, i.e., to chains of virtual transitions (quantum leaps) between fixed boundary states (observer positions). “Life“, then, is the collective notion of all these chains belonging to the same individual. The interruption of those chains means the end of its life.

However, the philosophical (or rather medical) problem still remains open: According to what criterion do quanta combine to observer positions? What evolutionary steps are there behind? To put it short: QG and ToE are models with the option to solve problems of physics with*in our* universe by just counting quanta. With the “engine of time” (chapter 21), QG even recognised and handled a first structure beyond our own universe concerning its embedment into a next-superior multiverse.

With the reduction of change (“motion”) to be managed purely by observer positions, even a first step towards the inclusion of life beyond traditional chemistry and electro-magnetic potentials into physical considerations has been identified.

References

Citations of standard school knowledge are omitted. The same holds true for a vocabulary easily to be looked up in the internet. QG is subject to some temporal development. Its actual version, thus, always is found in its latest publication; older publications might be punctually obsolete. The titles quoted below also can be looked up in the internet under www.q-grav.com . All these books are available in an English translation as well. [1] is an extended update and, at the same time, an abbreviated extract of [2].

[1] C. Birkholz, “Young and Dirac – The Prophets of New Physics“ (2019), tredition/Hamburg, ISBN 978-3-7497-2473-4 (Paperback), 978-3-7497-2474-1 (Hardcover), 978-3-7497-2475-8 (e-book).

[2] C. Birkholz, “ToE; New Physics; explaining our world by Quantum Gravity – World’s 1st textbook on QG“ (2016), bookrix/Munich, ISBN 978-3-7396-3009-0 (e-book).

[3] C. Birkholz, lecture AGPhil 10.3 “Successfully Unravelling the Structure of Our Universe by First Principles“, DPG Spring Conf. on Grav., Jena/Germany (2013), see www.q-grav.com .

Impressum

This is the English translation of the German e-book “Philosophie der Quanten, Tensor-Modell variierender Beobachterstandpunkte“, bookRix, Munich (2021), serving as the original, edited by the same publisher the same year.