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*Where* **Einstein**  
*had* **failed**

A compendium of New Physics

# Table of Contents

- Historical Facts ..... 1
- Failures ..... 4
- Hidden Parameters and Free Will ..... 7
- Dimensions and Statistics..... 10
- Channels ..... 15
- Quantum Gravity ..... 20
- The “World Formula“ ..... 24
- Cosmology ..... 28
- Cosmic Inflation..... 32
- Event Horizon ..... 35
- Black Holes ..... 40
- Motion as an Illusion ..... 43
- How Fast Does Time Run? ..... 47
- The “Conformal“ Version of General Relativity..... 49
- “Force“ as a Dynamical Effect of Statistics ..... 54
- Quark Confinement..... 57
- The System of “Internal“ Forces ..... 61
- Leptons ..... 63
- Hadrons ..... 66
- How Does a Particle Materialise, and how a Universe? ..... 69
- Chimeras ..... 76
- Logic and Checks of New Physics ..... 80
- Retrospective ..... 86
- Promising Outlook..... 90
- The Author ..... 93
- References..... 95

## Historical Facts

Once upon a time there was a little student; his name was Einstein. He dreamt of riding on a light ray. His result, then, became known as the “**Special Theory of Relativity**”. At that time, in Europe, where he lived, the first fully operational elevators, as we know them to-day, had launched their service. Einstein’s interpretation is known as his “**General Theory of Relativity**”.

Only, he had had problems with mathematics. Therefore, he consulted a friend from university; Grossmann introduced him into differential geometry. But alas: This led Einstein to absorb the classical continuum physics that tightly that it unilaterally blocked his further imagination until his death.

Although Einstein correctly had recognised the photon as a quantum object, his mathematical lack of awareness concerning the methods of “group theory” reduced his combinatorial strategy to purely symmetrical and antisymmetrical representations (Bose-Einstein and Fermi-Dirac statistics, respectively). Important notions like that of “**irreducibility**” (inseparability), thus, passed beyond him. His own idea of a “background independence” just is some poor version of it.

During the 1920’s, quantum mechanics had been founded on Planck’s discrete quanta. Again, however, people just retranslated it into some continuous description by functional analysis (“Schrödinger’s view”), according to which “**quantisation**” merely meant some curious “cooking recipe” nobody really took seriously. In spite of its use for *calculation*, physical *argumentation* still followed the old, beaten track of classical physics, thus minimising the chance of finding novel features.

Planck's revolutionary ansatz of **discrete quanta**, thus, got lost again – both in Einstein's works and in those half-hearted formulations of "**Quantum Mechanics**".

That classical refusal of trying to understand the most primitive rules of combinatorial analysis on an atomistic level, as it is mediated by "group theory", converted to an essential characteristic of an entire century: corresponding mathematics (Young tableaux) had been well known – only, people did not care about it because schools preferred to teach the infinitesimal methods of the 18<sup>th</sup> century, but no combinatorial analysis.

In Austria, Schrödinger and Pauli even came up with a critique stigmatising this type of mathematics, which once should have a good chance of unifying Einstein's General Relativity with Quantum Mechanics to a common "**Quantum Gravity**", as "group pestilence".

From the perspective of a particle theorist or of a theoretical cosmologist, hence, the last 100 years will have to be ticked off as a lost century where the theory of fundamental physics just lived on its substance. In those times, theory did not really process the experimental findings. Their "Standard" Models just are busy with fitting – they do not explain anything, however.

With **General Relativity** as a one-man-project on the one hand and with **Quantum Mechanics** (including its extensions by Dirac and some half-baked contributions by deSitter) as a common project of several people on the other hand, a glorious epoch of physics dried up, whose glamour shortly flared up just another time with Gell-Mann's quark model – in order to be destroyed at birth again by the continuum theoreticians.

The relativity of space and time had shaken the fundamentals of classical philosophy, and so did it – even more abstractly – the concept of a world of quanta. Einstein’s quasi idolisation widely accepted still to-day has its roots in the fact that he had proved to be one of the last advocates of a *serious* theory of fundamental physics which still based on **cognition** – and not purely on administration.

## Failures

The measuring process had been interpreted completely wrong. Its Copenhagen misinterpretation became the start of a centenary drama of theoretical physics which did not any more “de-  
tect” a **law of nature** according to the proper methods of natural sciences, but just “passed” it along juristic lines in accordance with the “quick and dirty” acclamation of an accidental voting by a few opinion leaders relying on an ill-defined “mainstream” defined by the economic sales figures of leading journals.

By virtue of authority, those “team” decisions of just a few persons, then, usually became foisted as the “answer to everything” on those colleagues still otherwise engaged, who previously have had neither time nor leisure in order promptly to have reproduced all that overnight.

Thus, the power-political hedging of such dubious regulations by self-appointed elite groups went succeeding in one fell swoop. From this time on, their key working instruments were consisting of conceiving bureaucratic formalisms in a way that subsequent “infidels” are kept away from the feeding troughs of **authorities** having their heads in the clouds.

By Copenhagen and by that dirty word of “group pestilence”, the base had been laid for to-day’s omnipresent arrogance of prevalent, established circles. Their segregation in ivory towers far from reality, living in epistemological incest, and suffering from their tunnel vision still enjoyed their best-known comeback with the string and brane models.

On this line, then, one monstrosity followed the other: just think of the so-called “2<sup>nd</sup> quantisation” in quantum *field* theories, which crudely is violating the principle of irreducibility in the tensor calculus, such that a vacuum suddenly is not any more empty (“vacuum polarisation”), and probability conservation is lost (“renormalisation”: infinite minus infinite is set equal to finite). Those and similar absurdities (as typical for the “2<sup>nd</sup> quantisation”) became presentable. In parallel with its mathematical inconsistency, fundamental theory rapidly lost its integrity and informative value.

It did not help that Einstein permanently intervened. Due to his own unfamiliarity with **group theory** his own approaches, based on group-theoretically immature counterarguments, did not convince: “Close by is off the target, too”. Einstein suspected already that something should be wrong with the current interpretation of quantum theory without, however, due to his own poor mathematical knowledge of group theory, being able to substantiate it.

In his eyes, quantum theory should be some kind of a “thermodynamic description” whose more fundamental level of “statistical mechanics” (“hidden parameters”) still had not yet been uncovered. On the other hand, he himself had developed General Relativity on the base of his **equivalence principle** (“inertial = heavy mass”) according to which no effect should spread faster than light in a vacuum (“causality”).

His “spooky action at a distance” (“entanglement”), thus, fueled his suspicion that there still should exist “**hidden parameters**” below the level of an elementary particle – actually, we would formulate: below the level of quarks and leptons.

In the 1960's – i.e., only *after* Einstein's death – Bell had been able to found the non-existence of those “hidden parameters” on the theoretically clean base of his no-go theorems. Experiment, then, confirmed Bell's inequalities in all details. By them, the existence of “hidden parameters” in quantum mechanics seemed to be disproved once and for all: a “true” theory to link Planck's quanta to Einstein's relativity should look different, (keyword:) “non-local”.

By this way, however, another misleading trail had been laid out, which, after the flop with “2<sup>nd</sup> quantisation”, went massively obstructing progress on fundamental theory for at least another half century. Empty slogans stepped up dominating any deeper search for relations. Consequently, the rules of quantum theory became more and more enigmatic.

Like every mathematic theorem, however, Bell's no-go theorems, too, are based on certain conditions whose substance fatally had been swept under the carpet before having become mature: In his proof, Bell tacitly had assumed the existence of a “free will”. The big failure of his contemporaries in den 1960's until to-day, hence, consisted in the unaudited acceptance of a “free will” as another, sacrosanct dogma out of the historical development of the “Christian Occident”.

(Classically, those above “non-localities” are nothing else than powers of space-time, which – in their abstraction as overlapping exponential functions – are giving rise to the existence of dynamic “**half-life periods**” for decay processes in the course of “cosmic expansion“.)

## Hidden Parameters and Free Will

A “**free will**” means the existence of not fully deterministic processes in nature. On the other hand, physics always is asking for their „**reproducibility**“: Non-reproducible processes simply are not subject to physics; they are belonging to the metaphysical domains of “religious faith”.

When persisting in the limits of physics, then we arrive at the philosophically as well as, especially, in religions controversial result that there should exist **no really “free will”**! In brain research, meanwhile, similar experimentally comparable results are emerging.

Insofar, the indistinguishability that significant between good and evil in religion and in jurisdiction mutated into a matter of random interpretation – a disaster for our culture as grown historically! Therefore that tough resistance against models of that kind on the part of our society, which hardly had swallowed Einstein’s relativity of space and time. Planck’s quanta, now, meant overstraining it.

As a viable alternative to his no-go theorems, even Bell himself had already mentioned an “**absolute determinism**” in a BBC interview (1985): his “**super-determinism**”. This, at a single blow, swept from the table all counterarguments against Einstein’s objections with respect to “hidden parameters”.

But nobody, then, wanted to renew that old discussion considered as checked off already; the strong degree of persistence on once “**beaten tracks**” was overwhelming, even if it obviously was going astray – a crux continuing throughout the entire 20<sup>th</sup> century till far into the new millennium.

Bell's way out by his super-determinism meant that all imaginable measuring values characteristic of our world for all times and locations should already be fixed unambiguously *in advance*. Vividly spoken, they are representing points on an all-embracing (multi-dimensional) "wall paper" whose pattern is uniquely dictated from outside; purely from *inside*, it is **unchangeable!** Mathematicians would call it an "initial condition" of our world.

However, as time, as one of its parameters, will belong to it, too, these "initial conditions" are *no temporary* properties in the sense of a time interval: more generally, they must be *boundary* conditions (i.e. "**interfaces**") of an even bigger, more comprehensive system our world just is a partial structure of ("multi-universe" models).

Again, we, here, will have to abandon some historically grown centralistic position and have to restart with some new idea. In historical epochs, we experienced that several times, already – most recently when proceeding from the geocentric picture (the earth as the centre of our world) towards the Copernican system (with the earth revolving around the sun), and later on, when we recognised that even our solar system is just one among many ones (in the "Milky Way"), which is spirally rotating about some giant central "black hole", and, finally, that even our Milky Way just is one of many galaxies in "space".

Actually, the embedding of our universe itself is on the agenda. This time, it will be the battle with the "sensationalists" to be fought out, who only are accepting what they themselves can touch with their fingers. By doing so, they are categorically calling the legitimacy of *logic* relations into question: concrete facts (the old mechanistic view) vs. abstract reasoning (transitivity).

But not enough with the macrocosm: In the microcosm, this revolution shows up its effects, too. Einstein's hidden parameters – let us call them “**quanta**” – automatically are leading us towards a level of “states” still far beneath the level of the “Standard” Model of elementary particles (quarks and leptons), i.e., towards that level of “quanta” which had been “hidden” up to now – similarly as the level of atoms once had been “hidden” under the level of a “chemical substance”.

Instead of trying to found physics on an abstract, continuous, mathematical argumentation on some postulated symmetry behaviour, physics will be shown to result from solid sets of discrete, finite numbers of individual “quanta”.

## Dimensions and Statistics

A parametrisation of the above “wall paper” as a pattern of points fixed *from outside* inevitably will lead us to introduce more or less abstract parameters characterising those points more specifically, more rationally. The minimal number of “com-measurable” linear (i.e.: additive) parameters needed for it is the “dimension” of its points: Each of those points, then, allows for a representation by components of a vector – or, more generally, by components of *products* of “vectors” which mathematicians are calling “tensors” (tensor = multiple vector with components carrying *more than one* label).

Now, thermodynamics, as abstracted “statistical mechanics”, will result from its basic point mechanics by just that additional imposition of **statistics**. “Statistics”, however, will generate additional, “**emergent parameters**” which, often, are not even definable for a *single* “point” on the “wall paper”: What point “**density**” might belong to some isolated, individual point, e.g.??

Statistics over individual momenta of individual particles will give rise to a resulting “pressure” of a set of particles onto a confining plane, e.g. And the mutually averaging components of their momenta (their “disorder”) will give rise to purely thermodynamic notions like “temperature” or “entropy”. At the same time, this statistical averaging also will be blurring some of the individual parameters.

*(In special cases, the transition of individual parameters towards emergent parameters also might proceed smoothly; often enough, however, this is not the case.)*

Now, statistics admitting a “normalisation” will merge in considering probabilities. “**Probability**” is one of the basic concepts of physics. Every measurement is associated with a probability (“**measuring precision**”). The reproducibility of a measurement also is based on its measuring precision. Last but not least, this is culminating in the fundamental conservation rule: “**Nothing is coming from nothing, nothing gets lost**” – a principle known in physics as “**probability conservation**”. (A “free will” would violate it.)

Normalising a probability needs a division (“considered number divided by the total number”). Now, number theory is definitely telling us: A system of numbers admitting a division is either 1-dimensional (real numbers), 2-dimensional (complex numbers having 1 imaginary unit), 4-dimensional (“quaternions” having 3 distinguishable imaginary units), or 8-dimensional (“**octonions**” having 7 distinguishable imaginary units).

The highest dimension of a closed system of numbers (here: vector components) still admitting a division (a “division algebra”), thus, is 8 (the above “octonions”).

A physical system, however, also might be composed of several “division algebras”. According to our actual experimental state of the art on fundamental physics, just a product of 2 such distinguishable **8-dimensional** vectors to a double vector is sufficient for describing nature: effects needing some 3<sup>rd</sup> or even a still higher power, actually, are not known.

The world we, *actually*, are observing, thus, proves to be  $8 \times 8 = 64$ -dimensional. The points on our above “wall paper” to map our world, hence, will consist of (components of) “tensors”, i.e., of multiple products of those double vectors.

The onward discussion will demonstrate that the first factor 8 of its dimension is generating “**Quantum Gravity**” (i.e., the consistent unification that long sought for in vain of Einstein’s General Relativity in its curvilinear spacetime with quantum theory), while the remaining 8 dimensions are supplementing the “**internal**” structure (like electromagnetism, the “strong”, or the “weak” nuclear forces). Altogether, we actually are distinguishing the following partial structures (where “9” means “8+1”):

1x1 : **particle number**,  
 8x1 : **Quantum Gravity** (= dynamics + gravity),  
 1x8 : “**internal**” **structure** (electromagnetism, etc.)  
 8x8 : **Grand Unified Theory (GUT)** of all “internal” forces,  
 9x9 : „**Theory of Everything**” (**ToE**).

While this GUT still is denoting the unification of the “*internal*” forces of nature excluding gravity, the ToE (as a notion from the string/brane models) is to represent the **unification of all forces of nature *including* gravity**.

(Remark: The difference between a GUT and a ToE often is ignored.) In my textbook [1], I am deducing all those models, which, in the official literature, pompously are denoted as “theories” – provided they are represented, there, at all – in their old, classical, top-down way of a representation based on **cognition**, before struggling from there on towards its details in order to confront them with the experimental findings.

Compared with this, the “Standard” methods of to-day’s official literature in its obsession with infinitesimal continuum mathematics, v.v., are preferring the neoclassical bottom-up representation, which – aimlessly, on tortuous, chaotic paths – is

guided by super-specific, accidental, singular approaches; different ones arbitrarily are ignored. Finally, they are used to end up by arbitrarily trying to reconstruct superordinate structures *from there* (“backwards from behind through the chest into the eye”). Official literature, then, drastically proves how this way, usually, means the sad end of all attempts.

In the absence of presentable physical results from those bottom-up trials (strikingly cf. the string models, e.g.), people are nevertheless attempting to sell those failed ideas by expensive promotion to the unexperienced public, whose tax money is spend for such things as if there is no to-morrow. Economic puffery is to obscure the failure of projects due to their physical facts (strings), and unexplained fits of details by the inconsistent use of mathematics are to hide their failure by construction (quantum *field* theories).

Another basic evil of almost all of those models is the suppression of 1-dimensional structures like particle number or the number of quanta. It had taken a long time until people have become aware by the “gauge theories” that those quantum-mechanical “phases” readily thrown away might have some physical background, indeed. For, the analogue of particle number, in the “internal” structures, just is “**charge**”!

Only that “number of quanta” will open the road towards a physical understanding of the non-valence structure of an elementary particle – which, on the other hand, is the mandatory requirement for understanding physical notions like “mass”, “energy”, “location”, and “time” at all!

This “number of quanta“, as well, is showing its place to the Higgs model, namely to be a mere term of some sort of thermodynamics expressing the much simpler net notion of a mass in Quantum Gravity by some (obscure) gross function.

On the other hand, *outside* Quantum Gravity, the physical existence of a “mass“ had become a severe puzzle to the continuum physicists – like many other notions before, too. In the following chapters, I shall present some of those details still more precisely; the interested reader will find additional ones in my textbook [1].

In order to avoid misinterpretations: Though we had used “octonions“ in order to *deduce* a dimension, nobody may compel us to *continue* treating its components to be octonions!

## Channels

The most transparent representation of the *coefficients* of the 8 components of an “octonion” would be that by real numbers. With 7 imaginary units, however, the “norm” (= “length”) of a vector will not be calculated by the customary Pythagorean *sum* of its 8 squared components: 7 of those components will reverse their signs into a minus (metric = (+,-,-,-,-,-,-)).

Hence, the principle of “**probability conservation**” (metric = (+,+,+,+,+,+,+)) means that the 8 dimensions of Quantum Gravity will not be given by r-numbers but will have to be noticed in terms of complex numbers, somehow. To physicists, this ansatz still is well-known from quantum mechanics (keyword: “Pauli’s 4 matrices“, which are relating 2 spin-like unitary components “up” and “down” with each other in 2 dimensions. Actually, we are denoting such a representation as a “**U(2)**“.)

*(Especially, the two “diagonal” Pauli matrices #0 and #3 are “measuring” the two values of its components on its “**quantisation axis**” by (half) its sum and difference, respectively. The other two “non-diagonal” Pauli matrices #1 and #2, then, are mixing both components with each other. That mixing, then, is interpreted as a physical “rotation of the quantisation axis”.*

*The so-called “collapse” of Schrödinger’s wave function by a “**measuring process**”, then, simply explains itself by a rotation of the frame of reference by that measuring device, whose influence on the measuring process, however, officially is denied by its “**Copenhagen interpretation**”: Copenhagen, thus, is practicing purely dogmatic mathematics instead of taking care of the concrete problems of physics!)*

Due to  $8 = 2 \times 2 \times 2$ , an 8-vector may be expressed by a 3-fold 2-vector; its 8 components, then, are its "diagonal" coefficients in an expansion into a 3-fold product of Pauli matrices. Mathematicians are denoting this special form, which includes "probability conservation", as a "**unitary representation** in 8 dimensions", briefly as a "**U(8)**".

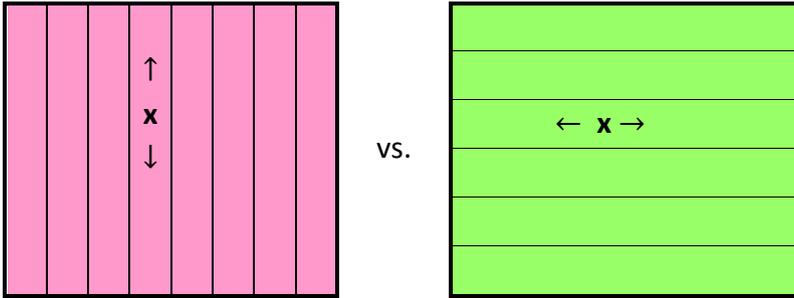
Pauli's matrix #2, however, is imaginary, the other 3 real. As classical point mechanics, usually, is working with real numbers, we shall have to cancel the imaginary unit as a factor in that matrix #2 if we want to establish a relation.

As a result, we obtain some "pseudo-unitary" metric (+,+,+,-,-,-) carrying 4 plus and 4 minus signs. Mathematicians are denoting this "**pseudo-unitary**" form as a "**U(4,4)**". It is *allowing* for a representation by real coefficients, but it does not conserve probability any more.

Half of its 8 dimensions, then, are "space-like" components, the other half "time-like" ones. A (truly) unitary U(8) does not need this distinction between "**space**" and "**time**". That distinction between "space-like" and "time-like" parameters, hence, just is the consequence of a purely classical, dynamic approach! In complete analogy, we obtain a "**unitary U(64)**" and a "**pseudo-unitary U(32,32)**", respectively, on the GUT and ToE level.

By thermodynamics, a unitary representation is characterising some "**closed system**" ("elliptic channel"), and a pseudo-unitary one some "**open system**" ("hyperbolic channel"). Probability conservation only is a matter of a closed system. In our ToE notation, the closed system also will be called its "**reaction channel**" and the open system its "**dynamic channel**".

Both channels can be converted into each other (“coordinate transformation“ in the *total system*) (*Please zoom if PDF is suppressing the internal structure below!*):



Mathematicians are formulating it more precisely: the “states“ (= components) of one channel allow for an “expansion“ into the states of the other channel. The differing structures of both channels due to their metric, usually, will produce differing “neighbourhoods“ of one and the same point “x“ with respect to both structures: The identical (“reducible“) “multiverse“ will subdivide into differing “**universes**“ (the “red“ columns or “green“ rows, respectively; ideally, each of them will result in an “irreducible“ way).

The “red“ and “green“ “multiverses“ are identical. Only their splitting (“expansion“) into (“irreducible“) parts (“universes“) might differ according to the way of collecting their points (i.e., according to the types of channels: “green“ or “red“). And the expansion of a “green“ universe, in general, will distribute its points over *several* of the “red“ universes – and v.v. The boundary of one “universe“, thus, will depend on the channel type, too!

For the 8-dimensional version of Quantum Gravity, its dynamic channel of a  $U(4,4)$  is reproducing its dynamics, as we are familiar with from a mechanical system. Now, **causality** is a property of the *dynamic* channel only, and not of the reaction channel. “Entanglement” (i.e., Einstein’s “spooky action at a distance”), hence, as a property of the *reaction* channel, is *no* violation of causality, which only is defined for the other channel!

As quantum *field* theories, as well as Einstein’s relativity, unscrupulously are identifying both channels with each other, we immediately are recognising those inadmissible identifications (of a “red column” with a “green row”) as another source of **inconsistence** inherent in modern models of fundamental physics. It will remain to be seen how long it still will take until this fact will have gotten about into the ivory towers.

Always again, it is that accumulation of inconsistent fusions of incompatible representation forms with each other which – together with arbitrary truncations – have given rise to the actual chaos prevailing in fundamental physics and having thwarted the unification of quantum theory with General Relativity in the framework of the official literature.

Current theoreticians of fundamental physics are under the continuous stress of hardly controllable torrents of irrelevant papers. “Officials” are publishing come hell or high water, often enough just for the sake of counting titles – with contents having no relevance. Theoreticians feel to be driven by the blind fury of a mainstream acting behind blinkers, which just is accepting *statistically* deduced figures counting the *number* of publications per institute, but considering themselves to be totally overtaxed when having to judge the *physical* significance of a paper.

The dogmatising politics out of misty windows of isolated ivory towers gives little hope for anything good even to foreseeable generations. (Remember those admission restrictions according to *formal* criteria of unspecific statistics which are not oriented towards the topical subject.) Their rigorous measures of censorship towards everybody having different suggestions strictly is suppressing contributions which really could push physics forward.

*(Remark: In the 4x4-dimensional representation of generators of his "Dirac algebra"  $U(2,2)$ , Dirac applied his 16 " $\gamma$ -matrices". These are ("Kronecker") products each of which is consisting of 2 of the 4 Pauli matrices ( $4 \times 4 = 16$ ). For the 4 components carrying the "spin" label "2", Dirac, by his formalism, redirected the special characteristic of Pauli's matrix #2 to the label #0:*

$$\psi^+ \rightarrow \bar{\psi} = \psi^+ \gamma_0 \quad \text{with} \quad \gamma_0 \propto \sigma_2 \times \sigma_0 .$$

*The other 4 components carrying the other Pauli label #2 are the 3 Lorentz-boosters and heavy mass – the latter of which, however, had not been identified by Dirac as a generator; he treated it as a scalar number.)*

## Quantum Gravity

One of the linear (= additive) quantum numbers of the above  $U(4,4)$  is particle number. It is separating the 8 dimensions of that  $U(4,4)$  additively into 2 equal parts of 4 dimensions each of which separately is representing a  $U(2,2)$ . Current models are used only to group states of matching particle numbers to higher units (“multiplets”) only. The four basic components of a  $U(2,2)$  vector of positive particle number, thus, are representing a “**Dirac spinor**”, and those of negative particle number some “antispinor”.

Now, in an (“elastic”) scattering process, a “transformation” of the  $2+2 = 4$  *input* components towards its  $2+2 = 4$  *output* components yields  $4 \times 4 = 16$  transition components. They can be composed of 16 standard components – however they might be defined. These current standards are what we call “**generators**” of the  $U(2,2)$ . (According to current continuum physics, they are the 16 matrices of the “Dirac algebra“.) In my textbook on Quantum Gravity [1], they are deduced in all details. Briefly, they are:

<b><math>L_0</math></b>	: <b>particle number,</b>
<b><math>L_i</math></b>	: <b>spin</b> ( <i>3 components</i> ),
<b><math>M_0</math></b>	: <b>heavy mass,</b>
<b><math>M_i</math></b>	: <b>Lorentz booster</b> ( <i>3 components</i> ),
<b><math>P_0</math></b>	: <b>energy,</b>
<b><math>P_i</math></b>	: <b>momentum</b> ( <i>3 components</i> ),
<b><math>Q_0</math></b>	: <b>(CMS-)time,</b>
<b><math>Q_i</math></b>	: <b>space</b> ( <i>3 components, in the CMS</i> ).

(Label  $i = 1,2,3$ . CMS = centre-of-mass system.)

For “space“ we, here, get 3 components, for „time“, however, just 1. Both Dirac spinors taken together are making up our dynamic  $U(4,4)$  spinor in the 8 fundamental dimensions of Quantum Gravity.

The above 16 generators might be represented by a 4x4-block, as well:

$L_0$	$M_0$	$P'_0$	$Q'_0$
$L_1$	$M_1$	$P'_1$	$Q'_1$
$L_2$	$M_2$	$P'_2$	$Q'_2$
$L_3$	$M_3$	$P'_3$	$Q'_3$

For Quantum Gravity, hence, spacetime is no external *input* of some unknown dimension any more but an immediate *output* of theory itself! And, in contrast to the string/brane models, **spacetime** (the above  $Q$ 's in blue) automatically are resulting in **1+3 = 4 dimensions!**

The “yellow“ 3+3 = 6 components of “spin“ (L) and “Lorentz booster“ (M), when separated off the rest, are generating Einstein’s **Special Relativity** (the “Lorentz group“), all 16 generators together his **General Relativity** (a “conformal group“).

*(In its representation as a product of two Pauli matrices, the top-most line with its four 0-components (according to Dirac’s formalism) will correspond to the first Pauli factor of his matrices labelled by “2” (and converted to “0”), while the second column from the left (the 4 “M”-s) are corresponding to the second Pauli factor labelled by “2”. In heavy mass (in brown), both (original) Pauli matrices #2 are matching.)*

Beware, however, of confounding the above 4 “pseudo-orthogonal“ (r-number) dimensions of spacetime with Dirac’s 4 pseudo-unitary (c-number) dimensions of his spinors!

*(Mathematical remark: Apart from topological properties (integer “orbital angular momentum” vs. half-integer “spin”), a “special-orthogonal” representation  $SO(n)$  formally will result from a “unitary”  $U(n)$  by omitting all its symmetrical generators. While a  $U(3)$  still is fitted with  $3 \times 3 = 9$  generators, an  $SO(3)$ , hence, will dispose on 6 less: An  $SO(3)$  only has 3 generators (generating the 3 „rotations“ in space, e.g., which are orthogonal to each other); an  $SO(1,3)$  has 6 (generating the “Lorentz group”).)*

Only, his fragmentary knowledge of group theory misled Einstein to formulate a General Relativity full of gaps. Especially, those insufficiencies prevented him from identifying the **invariants underlying his theory of General Relativity**. Thus, he just described its spacetime properties extensively (by explicit functions of the above Q-terms giving his curvature tensor), but leaving the explicit structure of his energy-momentum tensor open to speculation (as an unprecise function of P- and additional terms above – provided we stay with mechanics only).

He tried to subsume the rest of physics under his cosmological constant. Thus, spin is a property exterior to it. Even Einstein himself had felt the unpleasant mismatch in a precision that different in his various terms. (For Einstein heavy mass and his cosmological constant had been 2 invariants; he never had found the “true” invariants of nature.)

It is Quantum Gravity only which is treating all terms with equal precision. In the framework of Einstein’s continuous formulation by differential geometry, many people resigned by expressing their opinion that there even might be *no* invariants. Now, Quantum Gravity and GUT are systematically writing down the complete set of all those invariants explicitly (see [1]).

Thereby, it turned out that more than just *one* such invariant will exist, there. Einstein, hence, had missed a couple of these invariants completely!

Einstein's theory only covers a small part of the quadratic invariant of General Relativity. By neglecting its major part and treating his "cosmological constant" as a constant, he did not really recognise the nature of **Dark Energy**. And by ignoring the 3<sup>rd</sup>- and 4<sup>th</sup>-order invariants of General Relativity, he missed the correction terms to be added to his formulas which, actually, are giving rise to the **Dark-Matter** effect.

The basic equation he had published in 1915, hence, just is reflecting parts of the *quadratic* invariant. That is why we are confronted with the well-known dilemma to identify the invariants *at all* by such incomplete bottom-up methods. And owed to that mess of omitted contributions, it is no surprise that nobody had been able really to quantise Einstein's curvilinear spacetime, yet. By Quantum Gravity, however, which is respecting all those terms neglected by Einstein, its details are no problem at all.

Before detailing this further, however, we are quick to write down the "world formula" Einstein, because of his ignorance towards group theory, had sought for in vain during all his life.

## The “World Formula“

A  $U(2,2)$  has 4 invariants characterising it as a whole. By the jargon of mathematicians, they are called “**Casimir operators**“ of 1<sup>st</sup> to 4<sup>th</sup> order. (The same holds true for the  $U(4)$  belonging to the related reaction channel – only, their generators are marginally different. A corresponding statement will hold for the 64-dimensional  $U(32,32)$  and for the  $U(64)$  of our Grand Unification GUT with respect to their 64 invariants.

Einstein never had found the “**world formula**“, from which he had hoped once to deduce all physics. It reads

“World formula“:

$$\text{Casimir} = \text{const.}$$

The dynamic Casimir of 1<sup>st</sup> order is the linear particle number. The additional Casimirs are non-linear. By his elevator model (his “equivalence principle“, by the mathematicians called “**Klein-Gordon equation**“), Einstein had found a part of the 2<sup>nd</sup>-order Casimir only. Later on, he condensed the remaining terms to his “**cosmological constant**“ – however, without knowing its composition. This “constant“, now, by no way, is “constant“ at all! There, the bulk of *apparent* contradictions in cosmological statements has its origin.

Its dependence on the additional variables is giving rise to the existence of those “**virtual states**“ in quantum *field* theories, in addition. They do *not* any more satisfy the equations of a “free“ particle (Einstein’s equivalence principle) *without* these

additional variables. Still here, let me remind you that in quantum *field* theories – contrary to Einstein’s theory – *squared* masses are successfully allowed to assume *negative* values, as well. Thus, they are giving rise to those unstable, intermediate “tachion“ states moving “**faster than light**”!

Now, a **non-linear** Casimir of 2<sup>nd</sup> order, when inserted into the world formula, will provide some curvilinear structure as locus of its solutions. Einstein had described those curvilinear “hyperplanes“ by means of differential geometry and by applying his rather cumbersome “**metric**“ following his Special Relativity derived before.

Quantum Gravity is waiving those detours via classical physics by directly applying the generators and their group-theoretical “**commutators**“ Einstein had ignored completely. Hence, his General Relativity does not know spin, either, but, at best, some *orbital* angular momentum.

This way, Einstein, then, generated his theory in terms of a purely classical field theory, while Quantum Gravity is yielding some **fully quantised** and more comprehensive theory from the beginning: even its *spacetime* generators are quantised from the start! By Quantum Gravity and GUT, Einstein’s vague formulation of his energy-momentum tensor is precisely elaborated. As told already, Einstein still himself had recognised his own ansatz as less satisfactory in regards to the totally different quality of his curvature tensor. But he had not found any better form.

The fine granularity of our world, by the way, is based on its high number of participating quanta.

However, where Einstein's relativity – like all those quantum field theories, too – had failed that clearly, that is the aspect of completeness of a model, which group theory automatically includes in its top-down form of a representation (by its "Young" formalism). Einstein had had no idea of the existence of those Casimirs of 3<sup>rd</sup> and 4<sup>th</sup> order in a U(2,2), which, among other things, are responsible for the coupling of spin and orbital angular momentum to **total angular momentum** (and analogously with the Lorentz boosts).

Just as a quick reminder: In classical mechanics, those *total* units are treated as conserved quantities only by *experiment* – a *theoretical* justification for them is missing! (*For Noether's theorem, the respective match is missing!*) However, it is not total angular momentum which is making up the conserved quantity but these are certain expressions [1] in which powers of total angular momentum are multiplied with powers of masses.

This reciprocity of mass and angular momentum in those higher Casimirs of the open channel of dynamics, will give rise to some rapid *growth of mass* in the system as soon as *angular momentum* (in a rotating system) will *decrease*. This shrinking of angular momentum had already been described by Einstein's metric in the case if 2 bodies do not simply orbit one another but if, in doing so, they are approaching each other in a spiral. However, Einstein had overlooked the related part of mass growth which is due to the *higher invariants*. (In Quantum Gravity, *mass* is not a constant but a variable, too!)

Astronomers tried to save Einstein's original equation by attributing that mass effect – which they *did* observe, indeed, but which Einstein was not able to explain – to the additional pres-

ence of an optically not directly observed “**Dark Matter**“. They had to throw in the towel, however, when asked to explain what it could be made of.

In Quantum Gravity, this special mass growth in the open system of the dynamic channel, as told already, is nothing else than an effect by the 3<sup>rd</sup>- and 4<sup>th</sup>-order Casimir. The movement of spiral arms in the Milky Way and of stars in its centre, which all are deviating from Einstein’s reduced relativity, thus, are explaining themselves pretty trivially.

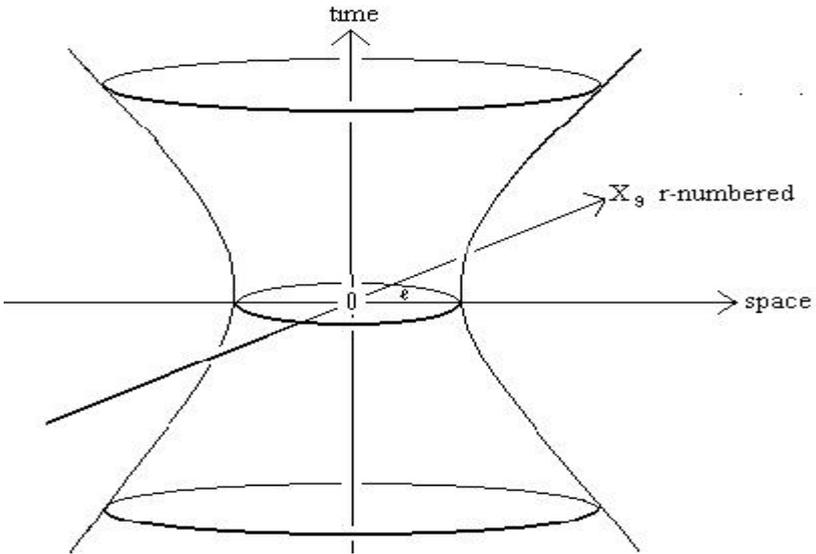
Einstein’s relativity only provides some approximate description of nature, i.e., one for the special case of *low* gravity. (He had not been aware that, besides energy, heavy mass, too, is a variable in a *complete* theory of relativity!)

In addition, Einstein’s “overlooking“ of spin in his theories of relativity has consequences down to the present day. Physicists and astronomers might often *calculate* with spin; then, however, instead of, correctly, involving the 3<sup>rd</sup>- and 4<sup>th</sup>-order U(2,2) Casimirs, they are experimentally applying their results to an orbital or total angular momentum – especially when Lorentz boosts are involved!

The explicit significance of “Dark Matter“ on the microscopic level still will become a topic of the following chapters.

# Cosmology

Einstein's incomplete basic equation of General Relativity derives from the 2<sup>nd</sup>-order invariant of the "world formula". Its completion will deliver the following representation of a "1-shelled elliptic hyperboloid". In this "cosmic hyperboloid", all parameters beyond space and time are collectively included in the variable  $X_9$ :



As the invariant presented here is the quadratic "Casimir" (operator),  $X_9$  is some square root, which also might come out imaginary. Above, only its r-numbered case is presented for the moment. Now, on a sheet of paper (with the aid of perspective), only 3 dimensions can be sketched. Hence, 2 of the 3 space directions are dropped. Correctly, the sketch would have to be read in 5 dimensions.

In Einstein's original version, the waist radius is vanishing; in his General Relativity, the hyperboloid, hence, will degenerate to a double cone having its tip at zero time. Its "**singularity**" (that "tip") is the "**big bang**". When corrected by Quantum Gravity, the big bang will "smear out" to some kind of wide wasp waist: as a "singularity", it is vanishing: **There is no "big bang" representing an "outset of space and time"!**

Beyond that waist range, without further ado, we are reaching those ranges "before the big bang". In order to be correct, hence, causality arguments like those of a "cosmic inflation", will not have to end with that "big bang" but (from a *classical* point of view) it should include ranges before the big bang, in addition.

This will lead towards a considerable *magnification* of the sphere of influence relevant for causality and, thus, of its statistical effect of spreading out! (*By quantum theory and mathematics, the starting point of causality will be fixed by (the symmetry point of) "Young tableaux".*)

Einstein's double cone is representing our cosmic hyperboloid in an asymptotic way. its spatial spread with increasing time is its "**cosmic expansion**" of space. According to the sketch, above, our cosmic hyperboloid will approach this double cone *from outside*.

Now, a particle sitting on the periphery of that double cone, actually, should move constantly by the speed of light away from its centre. Strictly according to Einstein, this velocity of light, however, would mean that the particle should be **massless!** There we are with the old dilemma of particle physics, which had to invent that artificial "**Higgs formalism**" in order to attribute some non-vanishing mass to a particle.

Only dogmatism will prevent this matter-of-fact awareness of a general lack of mass, which, however, on different, less transparent ways, is pushing itself forward into particle physics, all the same.

Experimentally, in accordance with Quantum Gravity, this cosmic expansion is proceeding with a speed *less* than that of light, indeed. Without being aware of the existence of Quantum Gravity, cosmologists, actually, felt themselves obliged to misunderstand that expansion as being some autonomous effect of nature *exterior* to Einstein's ordinary spacetime!

(From there, the most funny competitions between the expansion of space and particle speed with respect to that space had their origin, where cosmologists, according to the best Marxist dialectics, tried to worm their way out of overriding the speed of light close to that unphysical singularity of a black hole.

In their opinion, the particle still is moving below the speed of light. It just is space to expand faster than light, there – the particle only is "swept away" together with it! And matter cannot escape a black hole because its maximal velocity, *with respect to that space* (!), according to Einstein's equivalence principle, is that of light; but space itself is expanding *faster* than light beyond the event horizon. The particle cannot keep pace, there; it just is too slow – in their opinion, that's bad luck!

For Quantum Gravity, the Higgs formalism is superfluous: For, on the hyperboloid, the particle is starting at time zero by zero velocity, as well. Only with increasing time it is accelerating stronger and stronger (the "Dark Energy" effect!), until it is *asymptotically* approaching the speed of light as its maximum,

without, however, (when restricting itself to a real  $X_9$ ) ever reaching it, indeed.

Hence, "**Dark Energy**", too, is a trivial effect of General Relativity, as far as Einstein's equation is not arbitrarily cut off – as done by himself – but is completely and correctly written out with *all* its terms. By group theory, this effect will follow directly out of the "commutators" of Quantum Gravity (among space, time, and mass). Hence, we may formulate: *Dark Energy is some quantum effect of cosmic magnitude!*

In our part of the universe, an elementary particle, for positive times, essentially is equipped with positive energy. For, states of negative energy cannot survive in a surrounding of positive energy: it will immediately be annihilated by the neighbouring matter, and, thus, appear only "virtually", here (but with positive squared mass!). According to "**time reversal**", then, beyond that wasp waist of the cosmic hyperboloid ("**beyond the big bang**"), states of predominantly negative energy should dominate (Dirac's "holes").

Accordingly, that threshold area around the waist itself should be characterised by some giant "**big-bang explosion**" due to the mutual reactions of states carrying positive energies with Dirac's "holes" carrying negative energies.

Furthermore, that time reversal, in addition, means that the "**arrow of time**", i.e., the direction into which time is running (forward or backward), will be reverted for negative times, as well; the temporal development, there, will point towards negative times. Thus, our own partial world of positive energies – including those Dark Energy effects – will mirror itself "downwards" at its waist.

## Cosmic Inflation

Among cosmologists, it is controversial if there is a “cosmic inflation”, indeed. Their majority is tending to agree. It might be some purely theoretical construction; but it would help rather simply to underpin the approximate isotropy of the 3°K cosmic background radiation measured by experiment and usually attributed to the big bang.

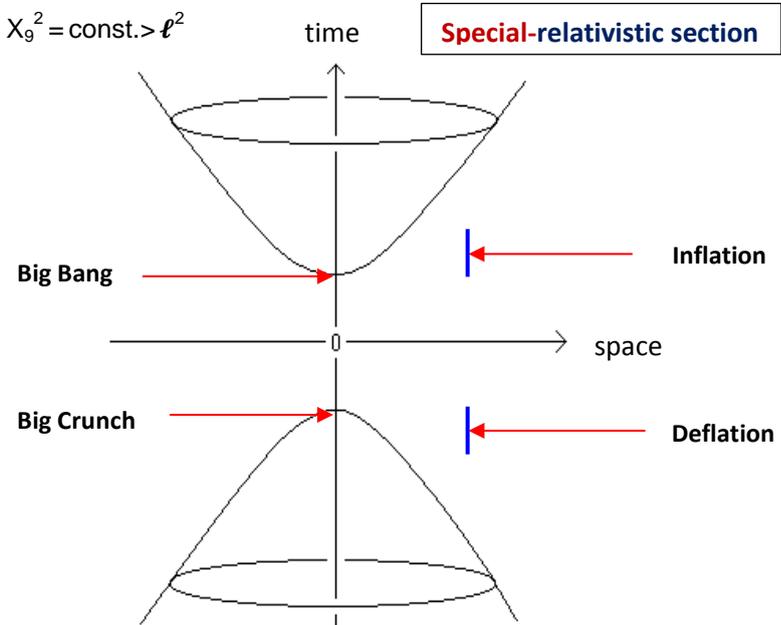
Now, we just had observed that such a “big bang” does not really exist in terms of a “singularity” and that, in a classical argumentation, a backtracking of isotropy will not stop at the cosmic time zero but continue into negative times. This, however, is only one of the shortcomings in the argumentation in favour of cosmic inflation.

Like with the related pair of spin and angular momentum, in official physics, the arguments from Special and General Relativity are mixing up, too (particle physics vs. cosmology). Let us make it clear: Special Relativity is obtained from the more comprehensive Quantum Gravity (in its representation by the 5-dimensional cosmic hyperboloid of the sketch in the previous chapter) as a 4-dimensional conic section defined by a constant  $X_9$ .  $X_9=0$  directly provides the drawing plane of that sketch, there.

By an increasing  $X_9$ , this plane will be shifting in parallel to the drawing plane behind it, and both branches of the hyperbola are approaching more and more, until, at the distance of its waist width from the drawing plane, it will degenerate to a double cone.

This limiting case is Einstein's original form of General Relativity. Remember that he did not specify his energy-momentum tensor and his "cosmological constant" further (which both together are giving  $X_9$ ).

By, then, increasing  $X_9$  even more, Einstein's double cone again will open, this time on the time axis:



Remarkable is that both new vertices generated here – in literature called "Big Bang" and "Big Crunch", respectively – are giving rise to tangential planes each of which is exactly perpendicular to the time axis. The smallest increase in time on this time axis, hence, will (formally) give rise to a spatial expansion by an initially infinite local expansion speed at that "big bang"! This is the so-called "cosmic inflation".

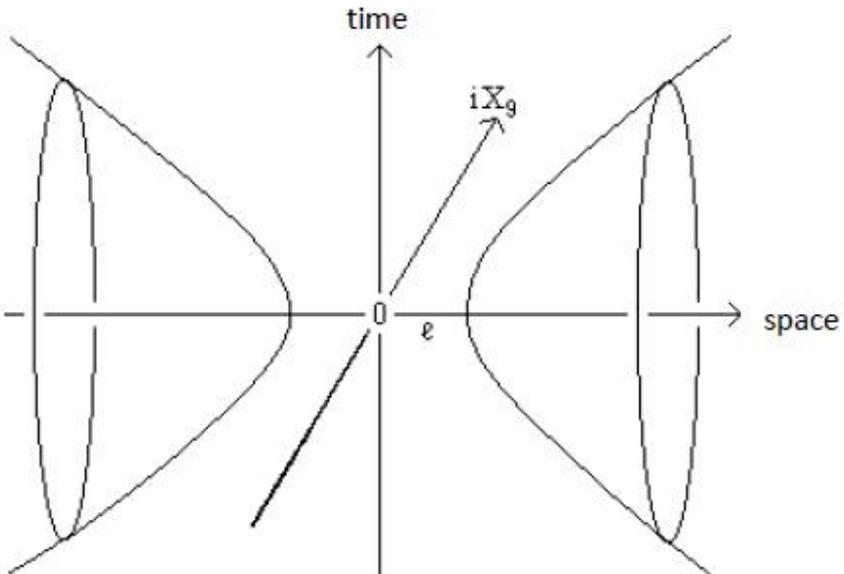
When things are developing, this infinite expansion speed will asymptotically decelerate towards the speed of light (a reciprocal behaviour with respect to Dark Energy, which is accelerating). But observe well: This is a *special*-relativistic argumentation! In full Quantum Gravity, there are no “bigs”; it is free of singularities.

## Event Horizon

In Quantum Gravity, an elementary particle, by mathematics, is represented the same way as our universe – only, its parameters are different (smaller): While a “particle” is observed from outside, our universe is it from inside.

This enables us to show cosmic processes, which, from our human perspective, are proceeding extremely slowly, in a speeded-up way on the level of elementary particles. Analogously, extremely fast-running processes of particle physics, on the other hand, can be mapped by astronomers onto slow motion – provided that related sequences always might be identified as such, indeed. Corresponding research, however, still finds itself at the very beginning.

When letting  $X_9$  become imaginary in the 1-shelled cosmic hyperboloid, then it transforms to a 2-shelled hyperboloid:



For positive time, particle physics would allow an asymptotic interpretation of its upper half in terms of a “pair-creation” process (both branches of the hyperbola are running *apart* from each other), and for negative time, the lower half would do so in terms of a “pair-destruction” process (both branches are running *towards* each other). **Feynman’s** asymptotic technique, at least, is describing it this way by his **diagrams**.

This analogy, however, is not yet totally correct like that. For, both branches together (on the right and on the left), here, are describing an “**elastic scattering**” of both parts on each other; for, they are not touching each other anywhere. This, however, does not trouble Feynman’s asymptotic method.

The true analogue is encountered in the preceding chapter. There, from Special Relativity, we had become acquainted with a 2-shelled hyperboloid, whose rotation axis is the *time* axis. In asymptotic particle physics, this is a better correspondence to be interpreted as a “**pair creation**” at a “big bang” coupled with a “**pair destruction**” at a “big crunch”.

Classical continuum mathematics, by its asymptotic treatment, is mixing up both differing processes (scattering and creation/destruction). Feynman, thus, is decomposing all processes of particle physics into his “3-vertices”:



For doing so, he is picking out one point on each of both (black) branches, in which he is considering the entire particle to be concentrated locally (in space and time). Then, he is con-

structuring the resultant of all quantum numbers (here in red). (The lines drawn might be considered as the abstraction of energy-momentum vectors, e.g.)

Feynman's technique, now, is it to connect those asymptotic "Mercedes stars" to some network of "Feynman diagrams" by always identifying one "leg" out of 2 stars with each other. Quantum numbers identified this way, thus, will have to agree exactly.

(For non-additive quantum numbers like the absolute value of spin, there are consistency problems. Feynman "resolved" them by adding arbitrary derivatives from functional analysis as "non-local factors" at a vertex.) Those matching identifiers connecting 2 vertices with each other are called "**propagators**".

Towards its outside, such a diagram is confined by lines corresponding to quantum numbers of particles well-known from experiment (and having sufficiently long half-lives). This, especially, also holds true for the value of their masses. In their property as propagators, however, those "**intermediate states**" are carrying "**virtual masses**" not matching those of their "real" representatives.

The "**Standard Model** of elementary particles" tries to get a grip on that high degree of arbitrariness in the context of Feynman's diagrams by introducing equally arbitrary "Lagrange" functions adjusted according to demand. Due to lacking "better" ideas in order to catalogue experimental data according to any scheme, those data fits, already, are officially sold to the public as "models" or even as "theories".

This, however, does not “**explain**” anything! In the classical sense – what even Einstein still would have accepted as a “theory” – those actual “Standard” Models merely have the significance of some annual abstract of statistics, or of some kind of “telephone books” of experimental physics on that partial subdomain.

The main evil with Feynman’s diagrams is that they are treating particle “reactions” by the dynamic channel instead of applying the reaction channel. Due to the resulting violation of probability, then, a “renormalisation” will be needed, of course.

But all this is coming as a “surprise” to them. Even “coupling constants”, then, cannot be traced back to theory; they will have to be “*adapted*” to experiment! On the other hand, it is remarkable that Feynman has taken it for granted that he is allowed to juggle *imaginary* masses around.

An imaginary mass, however, means that (squared) energy is *smaller* than (squared) momentum. Such a “**tachion**” state, hence, is moving **faster than light** – which, according to Einstein, is strictly forbidden. In particle physics, however, this is current use! In the *dynamic* channel, thus, the application of relativistic dynamics will automatically segment our world into 2 equivalent partial domains, which in the reaction channel are “continuously” merging into each other. Real mass is describing some “time-like” energy-momentum (i.e., a “particle”), and imaginary mass some “space-like” one (a “tachion”).

In Quantum Gravity, we define the plane separating states of real from those of imaginary masses to be its “**event horizon**”. Due to the incompleteness of Einstein’s General Relativity, his own definition reads a little bit differently.

Thus, the 2-shelled hyperboloids, above, are describing 2 mirrored partial worlds. In the dynamic channel of the partial representation chosen, they are not merging each other. For the basic 8-dimensional  $U(4,4)$  spinor all additional tensors are constructed of, the 2 branches are denoting a ***pair of fermions*** conjugate to each other.

According to Quantum Gravity, hence, fermions originally are arising in pairs always. By asymmetrical interactions with additional particles, however, their individual partners, during the course of evolution, will develop totally differently.

## Black Holes

In a universe, on principle, an event horizon will separate 2 *equivalent* domains of our world from each other (exchange of the 2 "time-like" U(2,2)-dimensions against its 2 "space-like" ones). From a perspective of this side, we are denoting the opposite side as a "**black hole**". But why, then, are both domains that obviously showing up *not* to be equivalent to each other? (One world, but a huge number of black holes!)

Now, in Quantum Gravity, spacetime is resulting in its linear **centre-of-mass** version "Q". Einstein's non-linear spacetime "X", on the other hand, is the ordinary spacetime of classical mechanics. Both are functions of each other:

$$X_{\mu} \equiv \frac{Q_{\mu}}{M_0} \quad (\mu = 0,1,2,3).$$

In relativity, a similar representation holds true for velocity and momentum:

$$V_{\mu} \equiv \frac{P_{\mu}}{M_0} \quad (\mu = 0,1,2,3).$$

The equivalence of both domains on either side of an event horizon, now, is demonstrated most simply by applying an adequate (unitary) U(4)-transformation with **imaginary mass**. Apart from a sign change, this transformation will exchange CMS-spacetime Q against energy-momentum P, and ordinary spacetime X against velocity V; up to a possible sign change, heavy mass, spin, and the Lorentz booster are remaining untouched. *Special* Relativity, thus, will survive effectively untouched, too.

In the centre-of-mass system, this equivalence is obvious. In Einstein's classical, non-linear spacetime, however, states differing in the values of  $Q$  and heavy mass are lumping together, provided only that their quotients  $Q/M$  are matching ("**ray representation**").

From the point of view beyond the event horizon, those agglomerations of points are resolving into individual states; instead, states are lumping together whose quotients  $V$  replacing those of  $X$  are matching on our side. From our point of view, thus, black holes still separated with respect to  $X$  are uniting to common  $V$ -ranges and, v.v., our own world, from the point of view of a black hole, will be left in tatters representing some multitude of separated  $V$ -ranges.

Here, the "CPT theorem" of particle physics still will become active. Last but not least, it will lead to a reversal of the time axis at the event horizon, in addition [1]. This will transform a particle which, by our point of view, is *entering* there to an antiparticle which, by that view, is leaving that black-hole domain behind the event horizon.

This way, the apparent contradiction resolves that, from our point of view from this side, a black hole is "swallowing" all matter and radiation without returning anything, while, from a point of view from inside that black hole, matter and radiation, v.v., only should be entering, there: Only by **time reversal**, our side will behave like a big Moloch, too, which is swallowing everything from the point of view from *inside* a black hole – and not like a "white hole" releasing matter.

Formally, hence, an event horizon could be interpreted as some thin layer gathering matter and radiation coming in from

everywhere. Even Hawking and others, apparently, anyhow have smelled the rat, meanwhile, without, however, being able to formulate it properly; for, they do not apply Quantum Gravity. Thus, their rather mysterious and nebulous assumption is the existence of some "firewall" at the event horizon, where all structure will "resolve" and "information" reputedly gets lost.

It is not worth seriously to engage for their conclusive speculations on an abstruse information behaviour bordering a black hole, nor to respond to the "holographic principle" resulting from it. *(To tell the truth, by mathematics, the holographic principle is nothing else than a "pseudonym" for the "local isomorphism" well-known from particle physics to relate the groups  $SU(2)$  and  $SO(3)$ , or  $SL(2,c)$  and  $SO(1,3)$  to each other, which are the  $c$ -number representations of some minor dimensions reformulating some  $r$ -number representations of correspondingly higher dimensions.)*

From the point of view of Quantum Gravity, nature behaves quite "normally" even at an event horizon. Those speculations just are demonstrating a lack of knowledge with respect to the appropriate physics. In the end, that apparently wild "concentration effect" at the event horizon only is triggering some gradual thinning-out of our universe by matter towards its "boundary": What (by this point of view) is remaining stuck to the event horizon (i.e., what there is "falling into the black hole"), that will, henceforth, be missing in the remaining universe. (And, from the point of view from inside a black hole, due to time reversal, the same will hold true, there.)

On the level of particles, this effective thinning will mark the finite outer boundary of a particle in space and time.

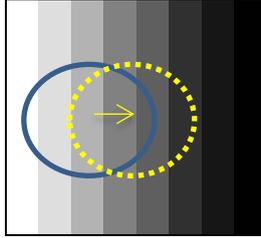
## Motion as an Illusion

**Physics is mapping nature into mathematics** (better: selected parts of it). The hypothesis (“HMU”) “physics is mathematics” should be considered as a malicious allegation! Purely on a mathematical base, we had observed that physics is a game among points of an invariant, fixed arrangement on some kind of (a multi-dimensional) “wallpaper”.

If we consider this “wallpaper” to be replaced by some rubber membrane and crumple, stretch, compress, rotate, or rip it to pieces, then we are “disrupting” the original arrangements of points in some definite way. (In mathematics, this means some “transformation“.) The point pattern, which originally had been uniform, afterwards, will show up an uneven **density** distribution and **ruptures!**

Our (“unitary“) “**reaction channel**“, then, by definition, will be given by the undistorted pattern of the uniform distribution of points without that density gradient, while our (“pseudo-unitary“) “**dynamic channel**“ is collecting those specifically distorted, hyperbolic states with a non-vanishing density gradient. The components of such a density gradient, hence, are automatically creating additional, new, “**emergent parameters**“ not present in the reaction channel, before. These new, purely dynamic parameters are called “**forces**“ (or their components).

Forces are generating “**motion**“. But how can that work on an invariant, fixed structure of points (on that above “wallpaper“)? In order to understand it, let us, in a 2-dimensional visualisation, consider the density gradient within the subsequent blue circle:



By “weighing” those points by their respective (“scalar”) density as a factor, the *weighted* centre of the unweighted blue circle will be shifted by some distance (see the yellow arrow). If drawing another circle about this new point (this time a yellow one) and by repeating this procedure several times, we *apparently* observe that initially selected starting point to migrate following exactly the density gradient.

In classical mechanics, we only had density, mass, and energy at our disposal, and for the gradient only the 3 *directions* of space (or momentum, or angular momentum). The “time” parameter, then, was a measure of the *distance* covered. (In electrodynamics, there still will exist quite different, “internal” constellations I do not discuss, here.)

The “magic” word “motion”, thus, can be traced back to a notion from **statistics**, i.e., to “**probability**”. Hence, our entire actual physics, by the dynamical channel of Quantum Gravity, GUT, and ToE, is based on the application of specific statistics: physicists, hence, are actually practicing just some kind of thermodynamics!

By applying the reaction channel, “entanglement”, now, hesitantly, is opening a way out of that type of thermodynamics – a way that had been activated already by particle reactions, pro-

vided their temporal advancement had been dropped due to being some effect of mere statistics.

In Einstein's dynamics, the "time" parameter still is replaced by the invariant "path" element "ds" connecting time and space with each other. In "**New Physics**", this path element still will have to be extended further. Its extension by the "heavy-mass" parameter already is pointing the way to design experiments, which even could blow up the barrier of an event horizon.

*(By mathematics, a transformation  $T$  is the exponential function  $\exp[iaG]$  of its generator  $G$  together with the "angle"  $a$  (elliptically) or  $ia$  (hyperbolically). A minus inside the metric of a generator, for the dynamic channel, hence, will mean the reversal of its transformation from  $T$  into  $1/T$ .)*

*The density of points in the dynamic channel of our cosmic hyperboloid, hence, is calculated out of that of the reaction channel (the ellipsoid) most simply by an appropriate inversion of expressions like "A" to "1/A" on its orthogonal axes – or, more precisely, by their sums and differences (corresponding to  $\cosh/\sinh$  replacing those pure exponential functions).*

*As a  $U(4)$  will be generated by the 2-fold product of Pauli's matrices (cf. the chapters "Channels" and "Quantum Gravity"), this is splitting the "elliptic" range of values of the unitary reaction channel of a  $U(4)$  into the  $2 \times 2 = 4$  "hyperbolic" branches of the dynamic channel of a  $U(2,2)$  (2 r-number branches) in addition to those in front of and behind the event horizon (2 additional, imaginary branches). The full  $4 \times 4 = 16$  generators, then, still are supplementing the partition on the 4 diagonal axes by the  $16 - 4 = 12$  non-diagonal coefficients, which, in the macrocosm will be treated as "emergent" parameters, like*

$$r^2 \rightarrow z^2 \rightarrow z^2 + (x^2 + y^2).$$

*(z diagonal and directly measurable; x, y microscopically non-diagonal, macroscopically, however, accessible only by statistics, i.e., as "emergent" parameters.) As the "true" direction of the "diagonalisation axis" is unknown by experiment, it still must be positioned by chance.)*

In the end, all actions of the open, dynamic channel are reduced to mere statistics on particle reactions, averaged by "dynamics". "**Transformations**" (like a rotation, e.g.) merely are *abstracting* expressions of mathematics: by basic physics, the reaction channel is primary; the dynamic channel merely is some smoothed, secondary "matter of interpretation". The reason why our senses are used preferably to interpret the dynamic channel instead of the reaction channel will have to be attributed to the special way our evolution has pursued.

Einstein's dynamic access to his relativistic measuring process by clocks and measuring rods is running along the lines of a statistical bottom-up method, which sensationalists are recognising as the only "true" method. This purely verifying method is preventing extrapolations ranging beyond the just actual special case treated, however. Thus, it might be interpreted as another trade mark for Einstein's incompleteness in his General Relativity.

With respect to the top-down frame of Quantum Gravity and Bell's superdeterminism, all parameters of the reaction channel should be definable uniquely. By neglecting the overall aspect, however, the implication of Einstein's organisation in terms of the dynamic channel is an individual split. Compare his problem of travelling twins, e.g., where he is assembling their parameters *independently* of each other. This amounts to differing ages of those "partial systems".

## How Fast Does Time Run?

Within our static, fixed "wallpaper", we had identified "motion" as an illusion by statistics. This illusion is based on considering some density of points (a "potential"). And "force", as the motor of motion, had become the synonym for a density gradient. This denies the *classical* interpretation of a force to be a function of some *temporal* phenomenon of nature:

Time (infinitesimally: "dt", in relativity dominating the "ds") does not any more *dominate* nature; time itself is *depending* on it! Its strongest competitor is (heavy) mass. Quantum Gravity is allowing their mutual (elliptical) conversion into each other. More definitely: **Time even might be stopping!**

We are meeting this asymptotically in the channel transition of a transformation "A" to its inverse "1/A" in the case of sufficiently "great" values of A (cf. the preceding chapter). There, its asymptotic value might vary to whatever extent in the dynamic channel – in the reaction channel, "1/A" (when sufficiently close to zero) will effectively be stationary.

Consider it as an alternative to that non-Einsteinian "expansion of space" which, in cosmology, unscrupulously is considered to be able to overtake the speed of light (in „cosmic inflation“, e.g., or inside a black hole) – contrary to Einstein's relativity.

This "speed" – as a representative of a statistically non-uniform density distribution triggering time to go by – obviously, is representing some concrete alternative to "explanations" based on that non-Einsteinian "expansion of space" and to its implications towards the redshift measured by experiment.

In a similar way as, for the “Standard” Modell of particle physics, the dogmas with respect to “2<sup>nd</sup> quantisation” once have rung in the beginning shutdown of every productive evolution of *theory*, Einstein’s dogmas (his equivalence principle and differential geometry) equally have been providing the same effect for the “Standard” Model of cosmology.

In Quantum Gravity, the event horizon just means some formal break depending on the system of reference (dynamic channel). In a different system (reaction channel), it will not be felt comparably any more. And this is in accordance with experiment: there, “virtual”, tachionic intermediate states do exist, indeed!

This special, *asymptotic* transition of our “real” world into the world of “tachions” beyond the event horizon would mean leaving our world at “great” positive times – and, simultaneously (by time reversal) restarting it again beyond that horizon at strongly negative times. This will correspond to some continuous cycle from the end of one world smoothly towards the start of another one.

In Quantum Gravity, however, this transition is not restricted to the asymptotic case in the sense of infinite times, only. That phenomenon of a momentarily stopping time followed by a time-reversal will happen at every point of the event horizon, as well. Matter crossing there will be thinning out the concentration at its area of departure in favour of its target area. A continuous exchange of matter between both semi-universes will be the result, where the arrow of time always is switching between its run forward and backward: this will provide a steadily recycling universe with respect to the dynamic channel, opposed to rigidly fixed universes in the reaction channel.

## The “Conformal” Version of General Relativity

From particle physics, physicists are well familiar with the properties of Pauli’s 4 matrices: they are generating a “ $U(2)$ ”. After taking off Pauli’s matrix #0 as the “unity” generator (it is generating what quantum mechanics is used to drop as a “phase”), only Pauli’s 3 matrices #1, 2, and 3 of an “ $SU(2)$ ” are left as their “spin” representation.

The ordinary rotations of an “ $SO(3)$ ” (“special-orthogonal” representation in 3 dimensions) are showing up quite similar properties. Each of them is generated by the 3 combinations of “Kronecker” products made of two Pauli matrices whose labels are identical:

$$\sigma_i \times \sigma_i \quad \text{with } i \in \{1,2,3\}.$$

As Pauli’s matrix #2 is imaginary, this product representation directly is demonstrating that, in an ordinary  $SO(3)$  rotation, contrary to the “spin rotation” by a simple  $SU(2)$ , its imaginary unit just is squared. Ordinary rotations, hence, are resulting as  $r$ -number functions! The spin representation  $SU(2)$  is denoted as (“topologically”) **simple-connected** and its  $SO(3)$  counterpart as **double-connected**. The physical result is that an  $SO(3)$ -“spin” basically is an integer (sum of both individual  $SU(2)$ -spins), while an  $SU(2)$ -spin might be a half-integer, in addition.

With the “internal” forces we shall be confronted with the fact that they (partially) even are **triple-connected**. Their quantum numbers, thus, are showing up to be multiples of  $1/3$ . In addition, they will have to “saturate” each other. By doing so, their “quanta” will show up either in pairs or in 3-packs each of

which being packed to a total value of zero: this is the notorious "quark confinement". –

Einstein had been more interested in the field of cognition. With respect to mathematics, as mentioned already, he showed himself to be less interested – especially what concerned group theory. What he – neither at that time nor later – had observed, this was the fact that the above spin acrobatics are admitting a repetition a step higher, in addition, in 4 dimensions – not in a completely identical way but rather similarly. And  $4 \times 4 = 16$  just is the dimension of Dirac's algebra of the  $U(2,2)$ !

Provided he had been aware of this, he presumably had put on paper his General Relativity in terms of Quantum Gravity from the beginning, thus simultaneously managing to enter the GUT as well.

Let us observe the colourful 2<sup>nd</sup> table of chapter "Quantum Gravity" for another time. After splitting off its supersinglet (the "red" particle number), we are left with the generators of an  $SU(2,2)$ ; they might be re-sorted the following way:

**SU(2,2):**

0	$-P'_0$	$-M_0$	$-P'_3$	$-P'_2$	$-P'_1$
$+P'_0$	0	$+Q'_0$	$-M_3$	$-M_2$	$-M_1$
$+M_0$	$-Q'_0$	0	$-Q'_3$	$-Q'_2$	$-Q'_1$
$+P'_3$	$+M_3$	$+Q'_3$	0	$+L_1$	$-L_2$
$+P'_2$	$+M_2$	$+Q'_2$	$-L_1$	0	$+L_3$
$+P'_1$	$+M_1$	$+Q'_1$	$+L_2$	$-L_3$	0

Their block framed in bold on the lower left-hand side, here, is mirrored towards the upper right-hand side with reversed

signs. By renaming its simple labels running from 0 to 3 into double labels which, independently of each other, are running from 1 to 6, we obtain its “conformal” variant:

**SO(2,4):**

0	+L <sub>65</sub>	+L <sub>64</sub>	+L <sub>63</sub>	+L <sub>62</sub>	+L <sub>61</sub>
+L <sub>56</sub>	0	+L <sub>54</sub>	+L <sub>53</sub>	+L <sub>52</sub>	+L <sub>51</sub>
+L <sub>46</sub>	+L <sub>45</sub>	0	+L <sub>43</sub>	+L <sub>42</sub>	+L <sub>41</sub>
+L <sub>36</sub>	+L <sub>35</sub>	+L <sub>34</sub>	0	+L <sub>32</sub>	+L <sub>31</sub>
+L <sub>26</sub>	+L <sub>25</sub>	+L <sub>24</sub>	+L <sub>23</sub>	0	+L <sub>21</sub>
+L <sub>16</sub>	+L <sub>15</sub>	+L <sub>14</sub>	+L <sub>13</sub>	+L <sub>12</sub>	0

From comparing both tables we find that those double labels of the SO(2,4) variant, obviously, will have to be antisymmetrical.

Now, unitary groups, with respect to topology, are simple-connected, while orthogonal groups, usually, will be double-connected. The notion of a “conformal group” SO(2,4), thus, will become somewhat ambivalent. Historically, it had been introduced into field theory (in its early years, already) in its double-connected, geometric variant.

On the other hand, it would make sense to use it as some distinctive feature opposed to the (“locally isomorphic”) SU(2,2) without always referring to topology. This will be *my way*. By experiment, nature is materialising in its simple-connected “spin variant”.

At deSitter’s times (immediately after Einstein’s discoveries), the SO(2,4), historically, on the one hand, had been used for directly embedding a “Poincaré group” as some subgroup. (This case is not treated, here.) On the other hand, it also had been used for handling the “group contraction” of a 5-dimensional pseudo-orthogonal “deSitter group” SO(1,4) or SO(2,3), respec-

tively, giving a **Poincaré group** (an "ISO(1,3)", where the "1" stands for "inhomogeneous").

This is almost approaching its handling by Quantum Gravity, already: There, those labels 1, 2, 3 are denoting the three spatial directions of space and 5 its temporal direction.

At that time, deSitter could not distinguish *which* of his two 5-dimensional alternatives he should supplement: the spatial label 4 or the temporal label 6 ?! Anyway, by "group **contraction**" (= limit of the sphere radius tending towards infinity), he identified the result as his 4-dimensional linear energy-momentum within the tangent plane ("locally") generated this way.

In New Physics, it unambiguously must be the label #6. Only, that "limit" will not really be performed because everything has to stay finite, here! The deviation of the tangent plane (limit executed) from the curvilinear surface (no limit) just is providing the effect of a metric, which Einstein, by his differential geometry, is describing that laboriously by his bottom-up procedures.

For this reason, spin is missing in his theory, as well! (The top-down description of the same process by group theory applying its "commutators" is, mathematically, much more transparent and even more general.)

Einstein's metric, however, does not apply to 4-momentum (label #6) but to *spacetime* (label #4). DeSitter's special focus, on the other hand, had been more on *4-momentum* in his Poincaré treatment. When trying to include spacetime into his contraction model, in addition, his geometric imagination, however, had abandoned him in the last minute.

When noticing how close deSitter, in those times, already had come to the discovery of Quantum Gravity, ... But: “close by is off the target, too”.

What once had prevented Einstein and, then, deSitter from their ultimate breakthrough from 5-dimensional sub-patterns towards a (conformal) 6-dimensional Quantum Gravity – when considered in hindsight – that had been the miserably simple step from the classically *non-linear* spacetime “X” towards the *linear* CMS-spacetime “Q”. Result: 100 years of time lost. As fate had it!

## “Force“ as a Dynamical Effect of Statistics

In physics, a force, usually, is deduced as a **density gradient** from some “**potential**“ (= density). Its different components are corresponding to different parameters; we are inspecting their densities.

At the periphery of physics, hardly anything is enclosed that strongly in conspiracy theories as that notion of a “force“. In mathematics, its potential simply is described by some tensor – i.e., an “**n-point force**“ by a tensor carrying  $n$  (“unitary“) label pairs; it, thus, is able to access  $n$  quanta in one swoop: one of the labels in a pair is acting on the quant to be canceled, and the other one on the quant to replace it. The “mystery“ rather is the *origin* of those tensors!

Now, by mathematics, a force automatically will follow from an invariant (i.e., from a “Casimir“) made of particle spinors. In the sense of the 4-dimensional version of Quantum Gravity, we can select those  $4 \times 4 = 16$  “generators“ of a 1-point force (from “particle number“ passing “heavy mass“ until down to “time“ and “space“) out of the table given in the chapter “Quantum Gravity“. Only, this denotation of a “1-point force“ for generators is historically unusual.

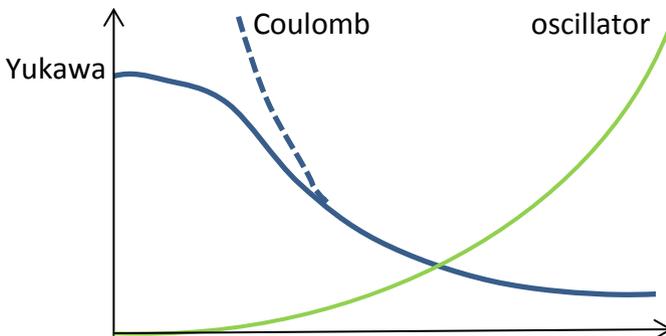
A 2-point force will be drawn out of the Casimir of 2<sup>nd</sup> order by applying it to 2 particles. Their most current types are the “Yukawa force“ (becoming a “Coulomb force“ in the case of vanishing rest mass). This 2-point force will permit a decomposition into 2 terms each of which is taking access only to *one* of the 2

particles. The remaining terms, which do not permit such a split, then, are the “interaction terms”.

In Quantum Gravity, this separation of terms will yield *unique* results. In the reaction channel, we, thus, obtain the “coupling constants” of particle physics in terms of simple “Clebsch-Gordon coefficients” purely from group theory, e.g.

*(In particle physics, those exceedingly arbitrary “Lagrange models” of an obsolete “variation calculus” still are dominating, actually. Due to not knowing the invariants of our “world formula”, people, by means of totally arbitrary “Lagrangians”, put together artificial constructions in the dynamic channel in order to simulate interactions by applying series of mathematical mechanisms whose physics is not understood (like “gauge invariance”, “Higgs”, and additional formalisms). Their ad-hoc parameters, then, had been optimized by experiment. The results are catalogued like a telephone book and named “Standard” model.)*

Classically, interaction terms are represented by powers of the distance of both particles from each other in space and time. Positive powers in the denominator are giving a “**Yukawa force**” (in special cases this might be a “**Coulomb force**”), while negative ones are giving those less familiar “**oscillator forces**”. A Yukawa force is strong in its centre and vanishing asymptotically – oscillator forces, on the other hand, are strong asymptotically and vanishing in their centre:



In Quantum Gravity, both force types automatically are coupled to pairs. Their mutual distribution of strengths ensures matter to be kept tight in the minimum of their potential. In a universe, this precisely is the surface of our cosmic hyperboloid; on the level of particles, this is the effective extension of an elementary particle (more exactly: the "range" of its forces – depending on the type of force: gravity, electromagnetism, the "strong" nuclear force, etc., thus, all will be giving differing "extensions").

## Quark Confinement

The extension of Quantum Gravity by the 8 (multiplicative) dimensions of the “internal” forces towards that so-called “Theory of Everything” (ToE) still will yield 8 more, “chiral” force types belonging to the Grand Unification (GUT) beyond gravity as its “internal” singlet. Contrary to the opinion defended officially, namely that they should be confined to just 3 nuclear forces (the electromagnetic, “strong”, and “weak” forces), let us point to that incompleteness present in the official argumentation with respect to particle physics.

It is completely ignoring such significant force types like those of nuclear physics which are caring for the deuteron not to show up in experiment in terms of a 6-quant structure but in terms of two nucleons, e.g.! That force keeping the 2 nucleons at a distance from each other in the nucleus, simply, is missing in the count made by particle physics! Additional forces are needed for correctly splitting an iso-multiplet into its components. Etc. Altogether, the number of “internal” forces in our GUT is 8.

Now, 8 is equal to  $2^{**}3$ . Hence, one 8-dimensional state vector will allow for being represented by a tensor made of three 2-dimensional vectors. Official particle physics, actually, is pretending only to know those 3 “internal” forces listed above and corresponding to 3 types of potentials, only. This is pretending that all 3 of them are independent of each other; particle physics simply is ignoring their tensor character according to which those 3 labels, each of which is running from 1 to 2, might be ordered the following way:

(111), (112), (121), (122), (211), (212), (221), (222).

Instead, particle physics, actually, is arguing in a symmetric way where all 3 labels are commuting with each other. When still adding gravity, we, thus, obtain

$$V_1=(111), V_2=(112), V_3(122), V_4(222) .$$

This is the reason why that “quark confinement”, actually, still is enigmatic to current theory. (“Quark confinement” is denoting the property of strong interactions to accept their “quarks” only in multiples of 3.) Quantum Gravity (see the first line, above) does not start with 4 labels and 4 potentials  $V$  but *permutes* the 3 *positions* of its three double labels (cf. above). This permutation of 3 labels – rather abstractly – will yield a 3-dimensional representation  $U(3)$ .

In his “8-fold way”, Gell-Mann, originally, had described his quark model in terms of a  $U(3)$ , too. In his historical representation, he had to extract a 3-dimensional “trace singlet” out of his “octet” in order to obtain its “irreducible” rest. For New Physics [1], the situation is similar. That “internal” singlet, here, is Quantum Gravity, and the remaining “internal” octet is characterising the 8 force types of our GUT.

Purely by mathematics, that 3-dimensional trace singlet implicates that the value  $1/3$  will have to be subtracted from a couple of linear quantum numbers of that “internal”  $U(8)$ . This is the well-known **three-way split of “internal” quantum numbers** we observe in nature. By those subtractions (of  $1/2$  times  $1/3 = 1/6$ ), the isospin values  $(+1/2, -1/2)$  of the nucleons, thus, are transformed to the charge values  $(+1/3, -2/3)$  of (anti-)quarks.

Now, the expansion of our universe is manifesting itself by the value of the radius of its cosmic hyperboloid, measured from its time axis. The same way, the radius (“**horizon**”) of a particle is defined by the equilibrium condition between Yukawa and oscillator forces; this will define the effective range (“**horizon**”) of such a force pair.

Depending on the type of a force considered (strong, weak, electromagnetic, etc.), we obtain some differentiation into various horizons by force types differing in their ranges. 2 *equal* quanta will be catapulted apart from each other, especially by the repulsion of their oscillator force components. The related charges of the individual quanta of a particle which are doomed to stick together will have mutually to “saturate” each other. For, the total charge (of a type considered), in order to eliminate the point of attack for a force, will have to be neutralised.

However, as individual *electric* charges can be isolated in nature, indeed, we have to conclude that we are sitting *inside* the electromagnetic horizon! Or v.v.: the electromagnetic horizon – like that of gravity – will have to be of the unimaginable order of magnitude of our universe. Its Yukawa potential, hence, will effectively transform into a Coulomb potential.

On the other side, a nucleon looks to be narrowly confined. Hence, we are observing its “strong” oscillator horizon from outside; it should be of some microscopic order of magnitude. Therefore, those “strong” interactions of all quanta should saturate each other to zero inside a nucleon.

This, exactly, is the statement made by the “**quark confinement**”, whose origin, for particle physicists, is one of the great mysteries of official present-day physics, because their bible,

that "Standard" Model, neither is able to explain the three-way split of quantum numbers nor the existence of oscillator forces.

These oscillator forces are giving rise to the **shell model of nuclear physics**, in addition, whose origin, there, is one of the mysteries of physics, as well. The "Standard" Model of elementary particles, again, does not contribute anything to its clarification.

Quantum Gravity is controlling all these problems once and for all. The differing sizes of elementary particles are due to their different compositions together with the property of physics that everything which makes sense, as a matter of principle, has to stay *finite*: **Infinities are not measurable!** Nobody can count up to infinity.

## The System of “Internal” Forces

By appropriate linear combinations, the subsequent “linear” (i.e., additive) quantum numbers may be defined (see the top line in bold print). An individual quant “a” (see on the left-hand border side) of positive energy (the upper “plus”, there), its spin component “i”, and the three 2-dimensional “internal” labels (behind it), then, will carry the values listed in a row:

	<b>N</b>	<b>Q</b>	<b>T</b>	<b>L</b>	<b><math>\Lambda</math></b>	<b>E</b>	<b>A</b>	<b>M</b>
<b><math>a^+_{i211}</math></b>	$+\frac{1}{3}$	$+\frac{2}{3}$	$-\frac{1}{3}$	0	0	0	0	0
<b><math>a^+_{i111}</math></b>	$+\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$	0	0	0	0	0
<b><math>a^+_{i222}</math></b>	$+\frac{1}{3}$	$+\frac{2}{3}$	$+\frac{2}{3}$	0	0	0	$+\frac{1}{2}$	$+\frac{1}{2}$
<b><math>a^+_{i122}</math></b>	$+\frac{1}{3}$	$-\frac{1}{3}$	$+\frac{2}{3}$	0	0	0	$+\frac{1}{2}$	$-\frac{1}{2}$
<b><math>a^+_{i212}</math></b>	$+\frac{1}{3}$	$+\frac{2}{3}$	$-\frac{1}{3}$	$-\frac{1}{2}$	$-\frac{1}{2}$	0	0	0
<b><math>a^+_{i112}</math></b>	$+\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{2}$	$+\frac{1}{2}$	0	0	0
<b><math>a^+_{i221}</math></b>	$+\frac{1}{3}$	$+\frac{2}{3}$	$+\frac{2}{3}$	$+\frac{1}{2}$	0	$+\frac{1}{2}$	$-\frac{1}{2}$	0
<b><math>a^+_{i121}</math></b>	$+\frac{1}{3}$	$-\frac{1}{3}$	$+\frac{2}{3}$	$+\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{2}$	0

Its 4 quantum numbers on the left-hand side are denoting the traditional set of the “Standard” Model:

<b>N</b>	: particle number,
<b>Q</b>	: electric charge,
<b>T</b>	: triality ( $1^{st}$ strong component),
<b>L</b>	: lepton number.

The remaining 4 linear quantum numbers are the additional ones from the GUT:

<b><math>\Lambda</math></b>	: leptonic charge,
<b>E</b>	: exotic charge,
<b>A</b>	: strong charge ( $2^{nd}$ component),
<b>M</b>	: strong charge ( $3^{rd}$ component).

Contrary to the range (= horizon) of Q, which has some cosmic order of magnitude, and contrary to that of T, which has a microscopic one, the horizons of A, M, N, and L should be of some intermediate order. Their measurement is a task for experimentalists and/or astrophysicists.

The "Standard" Model is replacing T, A, and M by 3 quantum numbers "colour" of an entirely different approach. To them, no *individual* properties are assigned. They are deducing their existence purely from the dogma of Fermi-Dirac statistics: People are arbitrarily claiming that it might have any relevance for quarks, too – end of discussion! (On the other hand, our own quantum numbers, above, are directly from theory itself!)

The remaining two quantum numbers,  $\Lambda$  and E, should have ultra-short ranges still by orders of magnitude below that of T – with that of  $\Lambda$  lying between those of T and E.

## Leptons

From the colourful table in the beginning of the previous chapter we learn that its two “blue” quanta are the only ones carrying a non-vanishing “leptonic” charge  $\Lambda$ . In order to neutralise its ultra-strong oscillator potential when constructing a particle, we have to couple both “blue” quanta with each other. This yields “nuclei” specific for leptons:

**anti-leptonucleus:**  $a_{i,212}^+ a_{i,112}^+$

**leptonucleus:**  $b_{i,212}^+ b_{i,112}^+$

Like in the case of the two “yellow” quanta of baryons, some third quant of the “green” type still will have to be added in order to saturate the quantum number T (“triality”). For doing so, just 2 types are at our disposal. In the baryon case, this will result in a pair of nucleons (proton, neutron). In the lepton case, some corresponding pair will result (an electron and its neutrino, e.g.).

**Leptons**, hence, **are anti-baryons** with a non-vanishing lepton number  $L$ , and antileptons are turning out to be baryons with an opposite  $L$ . In the baryon case, beside the nucleons, there still are “resonances” of a similar construction, in addition (those “ $\Delta$ -resonances”, e.g.); they only are differing by the symmetry of their tensor labels. Analogously, there are resulting several different, parallel forms in the lepton case, too.

Now, in the “Standard” Model, the doctrine is that a lepton will have to be point-like, i.e., without any “internal” substructure. In order to distinguish an electron from a muon and tauon,

there, the existence of three "**generations**", hence, must be postulated artificially. For our GUT, that necessity is absent: an electron, muon, and tauon, together with their neutrinos, all are members of just *one* generation of leptons.

Our classification of a lepton as an "antibaryon" could perfectly fit the experimental finding that, apparently, there is exactly one lepton of opposite charge to every proton in our universe. The comparable ansatz for a neutron-neutrino pair could indicate that particle number  $N$ , which is separating (baryonic) matter from antimatter just is balanced in our universe. This is opposite to what the "Standard" Models are telling us. Only in order to balance the associated mass values, in addition, the part assigned to negative times in our universe still will have to be supplemented, i.e., those areas "before the big bang".

But why, then, does an electron, when its spatial structure is checked by the actual technique, still appear to be point-like in experiment? For this, let me remind you of a deuteron, in which a lonesome electron is making up a shell around its nucleus. There, in the atomic nucleus, both nucleons are bound together by the "strong" interaction, while the electron is bound to it by the considerably weaker electromagnetic force.

Now, an electron might be considered to be constructed by complete analogy: Its two "blue" quanta are bound to a "leptonucleus" by the much stronger "leptonic" force, while that "green" quant, according to its weaker "strong" interaction just is docking "more loosely" with the "leptonucleus".

By the smallness of the "leptonucleus" with respect to the total system making up an "electron", however, the energies actually available in scattering processes do not suffice in order

to hit the lepton*nucleus* in a significant way. Compare it with the failure of scattering experiments with the *atomic* nucleus before Rutherford.

The weakness observed experimentally with the “weak” interaction is based on the fact that we do not observe the super-strong *monopole* charge  $\Lambda$  of an individual “blue” quant, which is saturating that of the other blue quant. Hence, we just are feeling its higher *multipoles* (“Van-der-Waals forces”).

Here, again, the definite supremacy of a top-down model like ours is showing up, which is predicting this substructure to be checked by experiment, against a bottom-up model like the “Standard” Model, which is obscuring those substructures.

## Hadrons

Corresponding ideas will hold true for hadronic resonances, as well. An analogous transfer from the “Standard” Model to the GUT will define a “**hadron**” as some state (whose valence part is) composed exclusively of the above “yellow” and “green” quanta, i.e., which neither contains any “blue” nor “red” quanta. Like in the case of leptons, the “Standard” Model, here, again, is introducing “generations” not needed for its hadrons. Again, it is a *doctrine* stating: (Valence parts of) Hadrons are not “permitted” to be composed of more than 3 quanta.

This dogma, then, turned to grow to the main obstacle preventing a particle from being equipped with a non-valence structure. This way, the structure of Quantum Gravity could not be discovered! This directly led to such a “washout” like that totally superfluous “Higgs model”, which only raised additional problems instead of solving the old ones.

It can be shown that such **apparent quantum numbers**, which, then, will have to be “**broken**” afterwards, much simpler might be replaced by many-quant systems. Here some examples for a demonstration:

$$\mathbf{a^+ \cdot_{.222} (a^+ \cdot_{.222} b^+ \cdot_{.222})} \text{ or } \mathbf{a^+ \cdot_{.122} (a^+ \cdot_{.222} b^+ \cdot_{.222})}.$$

Those bold-print points as labels are inserted to indicate the spin compositions needed in order to couple to a total complex which should carry total spin 1/2. For, then, the total linear quantum numbers of such a complex just are reproducing those of the single quant in front of the parentheses: the *linear* quantum numbers inside the parentheses are neutralising each other.

That total complex, hence, will differ from the single quant on the left-hand side only by its *non*-linear quantum numbers, and this just is the difference the "Standard" Model is ascribing to the generations ("up" vs. "charm" vs. "top", or "down" vs. "strangeness" vs. "bottom"). Examples:

$\Delta^{++}$	$(+2/3,+2/3,+2/3)$	$aaa \rightarrow -$	$-$
$\Delta^+,p$	$(+2/3,+2/3,-1/3)$	$aaa \rightarrow a a a(ab)$	$\Sigma^+$
$\Delta^0,n$	$(+2/3,-1/3,-1/3)$	$aaa \rightarrow a a a(ab)$	$\Sigma^0$
$\Delta^-$	$(-1/3,-1/3,-1/3)$	$aaa \rightarrow a a a(ab)$	$\Sigma^-$

$\Delta^{++}$	$(+2/3,+2/3,+2/3)$	$aaa \rightarrow a(ab) a a$	$\Sigma_c^{++}$
$\Delta^+,p$	$(+2/3,+2/3,-1/3)$	$aaa \rightarrow a(ab) a a$	$\Sigma_c^+$
$\Delta^0,n$	$(+2/3,-1/3,-1/3)$	$aaa \rightarrow a(ab) a a$	$\Sigma_c^0$
$\Delta^-$	$(-1/3,-1/3,-1/3)$	$aaa \rightarrow -$	$-$

(The two charge types "++" and "--" of a  $\Delta$ -resonance only are containing quanta of the types "up" or "down", respectively.) Multiple substitutions could be the following ones:

$\Delta^0,n$	$(+2/3,-1/3,-1/3)$	$aaa \rightarrow a a(ab) a(ab)$	$\Xi^0$
$\Delta^-$	$(-1/3,-1/3,-1/3)$	$aaa \rightarrow a a(ab) a(ab)$	$\Xi^-$
$\Delta^-$	$(-1/3,-1/3,-1/3)$	$aaa \rightarrow a(ab) a(ab) a(ab)$	$\Omega^-$

This GUT notation getting along without generations will satisfy the same situation the "Standard" Model is trying to overcome by "symmetry braking" applied to its "flavours". Thus, the "Standard" Model is continuously busy with its quarrel against symmetries which are none. It is unnecessarily wasting its power with sophisticated philosophies on a house of cards.

On the other hand, it is our GUT which is concentrating on real physics, indeed. **Quantum Gravity, GUT, and ToE do not know *any* “broken” quantum numbers!** Their mathematics, contrary to that of the „Standard“ Model, is thoroughly coherent and consistent.

## How Does a Particle Materialise, and how a Universe?

You could ask to what extent all those “*internal*” properties of the “Standard” Model of *elementary particles* might be involved in Einstein’s relativity? Now, its direct interface is “Dark Matter”.

We observed already that, *quantitatively*, its existence will automatically arise by including those higher invariants (“Casimirs”) into Einstein’s General Relativity; he himself had failed to notice them (*total* angular momentum composed of orbit *and* spin, e.g.). However, we did not yet arrive at the *qualitative* composition of Dark Matter. Now, finally, we collected all the basic facts needed to clarify it.

First of all, it is a matter of embedment. A universe is composed of particles, and a particle is made of quanta. Independently of each other, we had treated both, a universe and a particle, as an “irreducible” state. On the other hand, however, irreducible states cannot be nested – this would be a mathematical nonsense: Within an irreducible universe, hence, a particle will have to be reinterpreted as a superposition of components of that universe, which, locally, are giving rise to constructive interferences. But nobody can prevent us from *approximating* those interference nodes by irreducible structures when they are considered as isolated from each other.

The embedding of those particle states into some universe does not describe an „*act of creation*“ proceeding in time, but it is quite an ordinary *interface* between some superstructure and its (idealised) substructures. And those (idealised) “interfaces” do allow for nesting each other.

It would be impudent to assume that we, as a part of nature, ever might register total nature. This is suggesting the working hypothesis that neither our universe will be subject to an upper bound of nature as laid down in terms of our “universe” nor that its quanta will be subject to a lower bound as laid down in our “microcosm”: nature still will stay far from being completed by them, already.

The extension of our universe “towards its outside” will give way to multiverse models and the extension of our quanta “towards their insides” will give way to their even deeper atomisation. In a similar way as we, meanwhile, are interpreting a “particle” to represent some constructive superposition of states of our universe, future models, presumably, will recognise our universe as an object of interference of states of some multiverse.

By this, that holistic illusion of sensationalists will have to be dropped, who are postulating that our isolated description of nature, once, might become complete inside our universe and that properties outside our universe, as a matter of principle, are inaccessible to us, i.e., that multiverse models are unphysical nonsense.

Those sensationalists simply have not understood the method of how a physical theory is developing by starting from an approximation deliberately idealising nature! They only want to see black and white; physics, however, is colourful – shining in many shades. No, it is *no* nonsense at all to argue beyond the (actual) limits of our universe; those “limits” just are to be considered as idealised “interfaces”! And its parameters are interchanged *across* their boundaries!

In the ToE, e.g., the partial numbers of the 8x8 types of quanta of our U(64) or U(32,32) will belong to those interface parameters: How many of their quanta will be “yellow and up”, how many “blue and down”, etc. Then, there, obviously, still is an additional, subordinate interface setting the symmetry of the tensor labels by which our universe is made irreducible. They all are **external parameters**. Only that always repeated postulate of a system *free* of parameters, from this point of view, is physical nonsense.

Thus, we are back to our subject. It is the set of *external* parameters which, by the differing numbers of their 64 types of quanta, are fixing the forms of their *internal* interactions. For an example: Quantum Gravity, as an “internal” singlet representation, will touch *all* quanta of a particle, while the “internal” octet forces are effectively confining their access to its “*valence* part”, only. Now, the non-valence part of a particle is much more extensive than its valence part. Hence, we observe the inverse effect that the gravitational constant, when compared with those “internal” coupling constants, will have to result as much weaker:

$$G_{(\text{gravity})} \ll g_{(\text{"internal"})}$$

Among those individual quanta, some confusing network of “internal” forces will be present, in addition. Now, by applying some (“hyperbolic”) generator of the dynamic, “open” channel (like time or heavy mass), the number of quanta will change by one *pair*. In a summary representation according to thermodynamics, hence, from the point of view of Quantum Gravity, the least sophisticated way of coupling quanta would consist of that

yielding some "internal" singlet (by neutralising its "internal" octet labels to give a singlet). The  $4 \times 4 = 16$  pair combinations of the 4 components of 2 Dirac spinors whose "internal" quantum numbers are saturating each other, then, are:

$$\mathbf{a^+{}_i b^+{}_i}, \mathbf{a^+{}_i a^-{}_i}, \mathbf{b^-{}_i b^+{}_i}, \mathbf{b^-{}_i a^-{}_i} .$$

As their labels "i" are running from 1 to 2, these are the  $4 \times 4 =$

**16 variants of Dark Matter.**

Due to the non-vanishing energy content of the above outer two blocks, Dark Matter will be gravitationally active. On the other hand, the number 2 of quanta such a brick of Dark Matter is consisting of is much too small in order that the law of great numbers could be applied to it. Hence, momentum and Einstein's non-linear spacetime X still are staying indefinite. These bricks, thus, are satisfying all criteria according to which cosmologists are characterising Dark Matter.

By the differing numbers of the 64 types of quanta in our universe, the creation of Dark Matter already will have exhausted its resources *of the least abundant type* of its quanta necessary for doing so. A great number of the *remaining* types of quanta still will succeed in mutually "saturating" their *linear* quantum numbers; but they do not make up overall *singlets* any more. In a 3rd step, even this way of a mutual saturation, then, will dry up, too. Those quanta still left over, finally, are representing the "condensation germs" for elementary particles.

We know this phenomenon from our weather, already: By Van-der-Vaals forces (“dipoles”), water molecules are adhering to the condensation germs present in the air – as long as the complex will not become too heavy and precipitate out of a cloud in terms of a rain drop:

**Elementary particles are  
condensing out of Dark Matter.**

Their assembly of **neutralised,  
incomplete bricks, then, are representing  
the non-valence part of a particle.**

And,

**Ordinary matter will be sweeping  
those incomplete bricks  
out of Dark Matter.**

Dark Matter, hence, will roughly correspond to the above pair quanta, while “ordinary” matter will be composed of some long non-valence part adding to some short valence part. While the “internal” octet forces and potentials just are acting on the valence parts, Quantum Gravity is acting on the entire set of quanta – with the valence parts, however, being negligibly small for it.

Now, in its running direction, the dynamic density gradient will not only act by its *inertial* mass on the energy-momentum vector (as a part of the 2<sup>nd</sup>-order Casimir, in terms of Einstein’s truncated variability), but also by its *heavy* mass on its *scalar* mass *concentration* (whose variation is given by the 3<sup>rd</sup>- and 4<sup>th</sup>-order Casimir).

Einstein never had noticed this (“conformal”) *5-dimensionality of his energy-momentum* (by “Dark Matter”).

In the “open”, dynamic channel, both effects are described in terms of a common property of the non-valence part. In the “closed” reaction channel, however, they will lead to some re-diagonalisation to be interpreted as some “continuous” absorption of free pair quanta (plus a subsequent overall “reduction”).

In group theory, “**Young’s formalism**” allows for detailed calculations. There, the label pairs ( $i', i''$ ) at particle vertices are providing the multipole series of higher orbital angular momenta. Those calculations are simplified by the fact that, in New Physics, everything is staying finite; hence, it might comfortably be outsourced to a computer.

**Quantum field theories**, on the other hand, are hoping to get along with the naked valence parts solely; they are ignoring the non-valence parts completely. Their “partons”, however, are no compensation! The result of such a misguided, blinkered policy can be reviewed since a century in terms of the current journals.

Another such blinkered way of arguing is that unending hunt of “wimps”, i.e., of “weakly interacting massive particles” Dark Matter is assumed to be composed of in quantum field theories. Lacking success did not deter people from continuing their mad rush for them since decades. “And they all lived happily ever after.”

Einstein, as a physicist of the old school, still was trying to argue in a top-down way; but he pitifully failed due to his mathematical incompetence with regard to Young’s top-down method of group theory. Therefore, it was easy for the continuum physicists of his time to bamboozle him by dubious bottom-up

methods. His unsuccessful trial of finding the “world formula”, henceforth, just has been mocked at.

On the other hand, Einstein had been on the right track, all the same – only, his workmanship still had been doomed to fail by the spirit prevailing in the monoculture of the mainstream, which only is rewarding the “quick and dirty” apparent success.

By their immature, quick-to-print publications, those almighty institutions are used from the beginning to direct the public attention straight away from solid physics into their customary dead ends leaving no way out, blocking it. Meanwhile, fundamental theory has lost its way completely. Actually, in the field of theory, fundamental research is controlled by the hectic bustle of a total chaos. But experimental evidence unquestionably is in favour of our reinterpretation of physics as resulting from Quantum Gravity, GUT, and ToE in its description presented here.

## Chimeras

Einstein's ancient idea to include electrodynamics into his geometrical model of General Relativity was based on the work of **Kaluza and Klein**. Translated into our ToE, this means to extend the generators of Quantum Gravity as "internal" singlets by *one* component of the "internal" octet. Both together, then, will correspond to Quantum Gravity multiplied by some 2-dimensional spinor: its component "up" *plus* "down" will reproduce Quantum Gravity itself, while "up" *minus* "down" will provide electrodynamics. Both components, "up" and "down", separately, then, will provide the "**minimal coupling**" of electrodynamics.

The **String Models** and their extension to "**M-theory**" are based on the 8-dimensionality of the division algebra of octonions, by which those M(embrane) models are justifying their "supersymmetry". Contrary to our model of "Quantum Gravity", however, they do not recognise the scope of this construction, which already is including the fully quantised extension of Einstein's General Relativity!

Instead of multiplying the "internal" properties of matter as an *additional* division algebra still to be qualified further, they are adding additional dimensions according to the way Kaluza and Klein once had managed it: one dimension as a representative of the spatial part of their strings and another one for its "brane" extension: the 8 components of their octonions, thus, are giving rise to 10 dimensions. Arbitrarily, they are postulating all 10 of them to be space-like. Their reason is that the old variation calculus they do not want to give up, in its standard form is admitting 1 time-like dimension, only.

Somewhat unsystematically, then, time is added as a dimension #11. “String theories”, thus, are resulting in  $(9+1) = 10$  dimensions, “M-theory” in  $(10+1) = 11$  dimensions. They did not check their double-counting of space-time dimensions!

Their special way of separating time from space is setting the frame where the string-brane models, due to their ill-conceived takeover of the classical principles of a decrepit variation calculus, right at the start of their construction, irretrievably got lost offside, drifting into a physical dead end. All those models are lacking the awareness that it is not a continuous time but the density distribution of discrete quantum points, which, in dynamics, is initialising motion.

When starting from Quantum Gravity, however, and breaking it down to its 4-dimensional  $U(2,2)$  variant, then, we obtain the  $4 \times 4 = 16$ -dimensional Dirac algebra  $U(2,2)$  as the set of generators of Einstein’s General Relativity. By similarly treating the “internal” structure, we obtain some  $4 \times 4 = 16$ -dimensional “brane-GUT” as a brane analogue of our  $8 \times 8 = 64$ -dimensional GUT.

Its 16-dimensional (“special”) orthogonal subgroup  $SO(16)$  allows for a (local) mapping onto an  $SU(11)$ , which, on its part, is containing an  $SO(11)$  subgroup. When reserving one dimension for representing “time”, the 10 spatial dimensions left are giving M-theory. On the other hand, if considering those  $10 \times 10$  (squared) space-like dimensions as the basic representation of a meson, we are left with two representations of  $1 \times 10$  and  $10 \times 1$  dimensions of a fermion-antifermion pair (beside a  $1 \times 1$ -dimensional representation of time with itself). This combination of a meson with a fermion state is called “**supersymmetry**”.

But that isn't the only way of doing it. Just those string models are characterised by their incredible number of subversions. If using the 16 generators of Dirac's algebra as a tensor base, then we might analyse it according to its 10 symmetrical plus its 6 antisymmetrical tensor components formed by pairs of Dirac-spinors.

By an arbitrary interpretation of the symmetrical components to be space-like and the antisymmetrical ones to be time-like, the application of the variation calculus is demanding us to cut down its 6 time-like components to a 1-dimensional singlet (like Pythagoras, who is compressing the 3 directions of space to their 1-dimensional radius). As a result, we obtain the  $(10+1) = 11$  dimensions of "M-theory".

No matter, hence, which derivation we are preferring: There will always be reasons why "M-theory" will become mathematically consistent just with 10 space-like dimensions. Physics, however, is quite a different story!

When, now, constructing tensors of "M-theory" for the latter case and interpreting them to represent "particles", then, their next-simple form (made of 2 M-spinors) just is providing  $11 \times 11 = (10+1) \times (10+1) = 10 \times 10 + 1 \times 1 + 10 \times 1 + 1 \times 10$ , i.e., some  $10 \times 10$ -dimensional sub-block representing a boson, another pair of sub-blocks interpreted as a fermion-antifermion pair conjugate to each other, and a 1-dimensional super-boson. When reserving that "super-boson" for special purposes, we are left, again, with a variant where 1 boson is corresponding to 1 fermion-antifermion pair, i.e., just with that ill-reputed "supersymmetry" not found in nature.

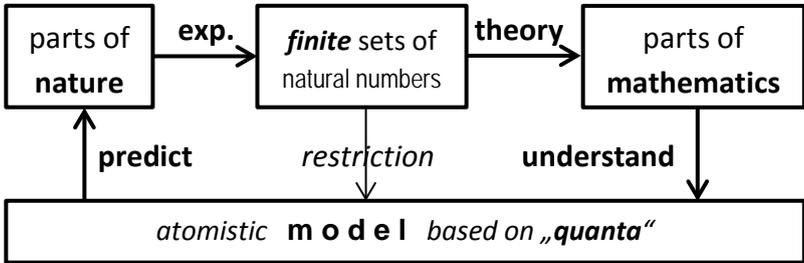
Let me resume: According to whatever variant, the number of its time-like components, usually, will be compressed to 1 – just in order to satisfy the aged variation principle.

It should be clear that for such an artificial construction, there will be no place in nature. Such an anticipatory mathematical obedience towards the dubious variation calculus of continuum physics will not pay off in modern physics.

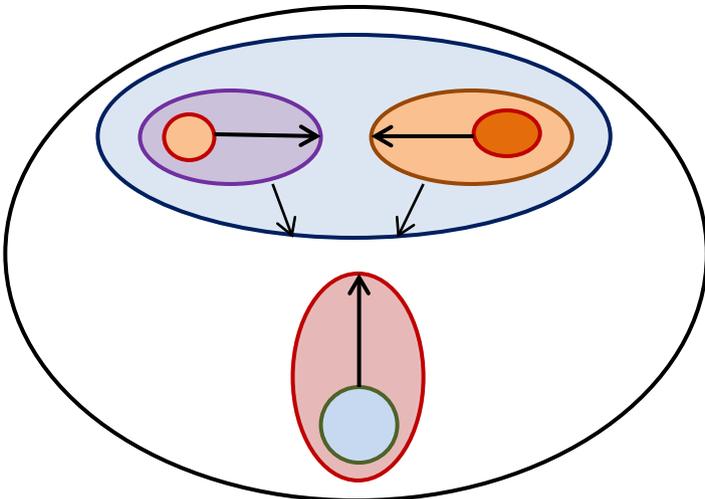
Even if they are denoting themselves as “theories”, it is a pity that those models, for 50 long years, had been allowed to block the official journals **without being able to register *any physical result of relevance***: This is a warning example for demonstrating what a serious theoretician should avoid in *any* case!

# Logic and Checks of New Physics

Generally, the subject of physics is **nature**, and its description is by **mathematics**. As we ourselves are **parts of nature**, our senses merely are recognising rough sections of it:

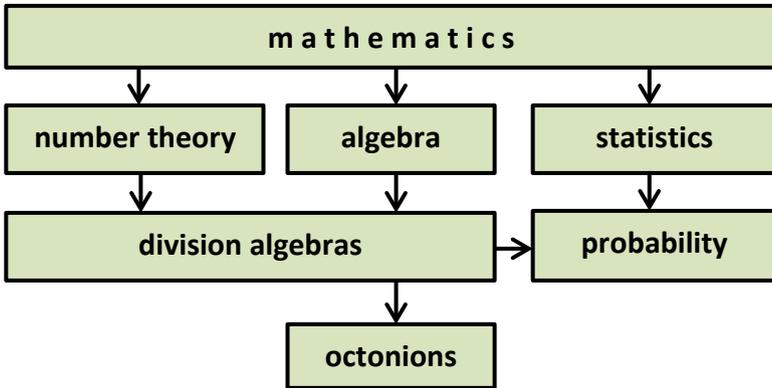


Our description is working **inside out**. Its scope always is a matter of the actual development, then:



Its scope will never include the whole story of nature because our technical resources are limited. *(The latter, however, might be a matter of philosophical dispute.)*

Mathematics, here, will need some more details:



According to the **finiteness** required for any fundamental model of physics (see the first sketch above), its “quanta” are countable. Due to probability, a division algebra will have to exist; its highest dimension is 8 (“octonions”). Every “quant”  $q$ , hence, should be analysable according to those 8 dimensions  $a$ , with  $r$  denoting its individual rest:

$$q_n = q_{a,r} \quad (n=\{1,\dots,N\}, a=\{1,\dots,8\}).$$

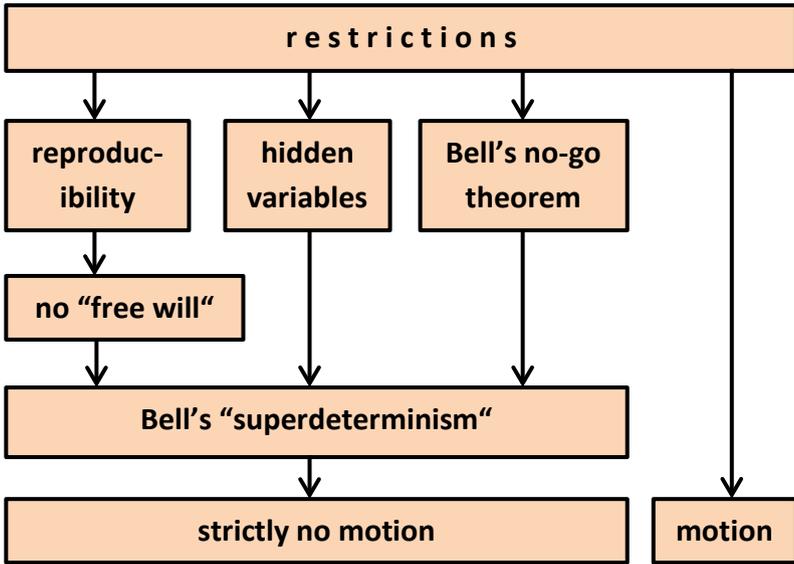
This split, however, is repeatable:

$$q_n = q_{a,r} = q_{a,b; s} = q_{a,b,c; t} = \dots$$

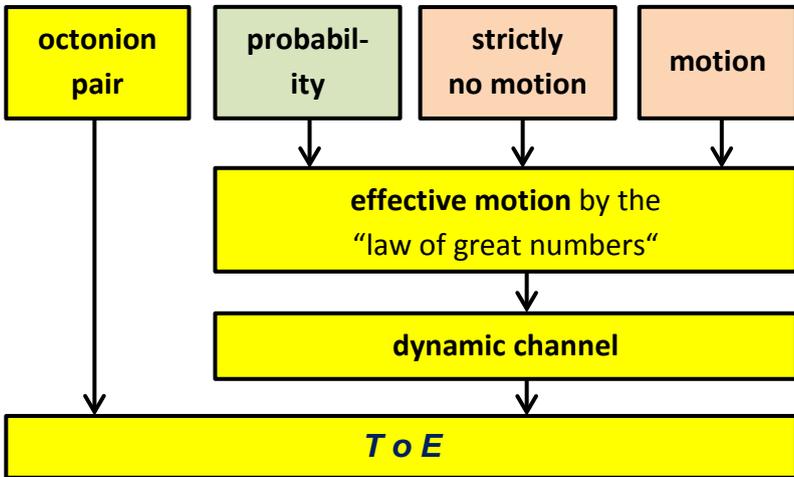
Its effective dimension, hence, will be some (natural) power of 8.

Now, experiment shows us that, by our actual experimental state of the art, a power higher than 2 is not needed. Hence, the **dimension** of a “quant”, actually, will be fixed to be **8x8 = 64**.

Another set of details will result from the restrictions we have to impose on fundamental physics:

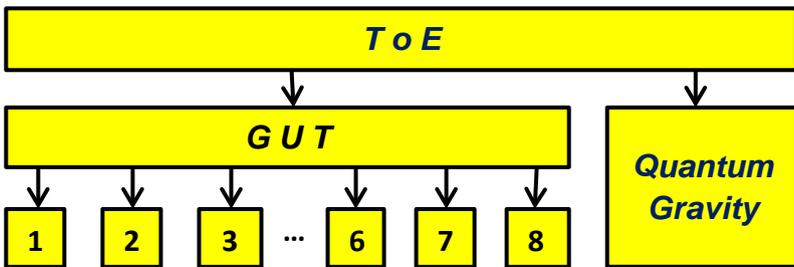


Bell's superdeterminism will give rise to our reaction channel, while the two opposing statements of the last line, above, are reconciled by adding the statistical effect of probability. The extension of probability to the above *pair* of octonions, then, yields the ToE:

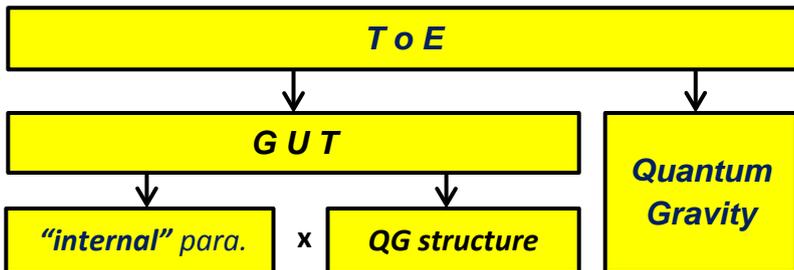


Now, the ToE contains Quantum Gravity as an “internal” singlet and the 8 “internal” structures (including their forces) as an “internal” octet. The sum of all 9 structures, hence, is contained in the ToE, too. The ToE, however, still will supplement the intermediate structure to connect all those independent 9 sub-structures with each other, i.e., the ToE is *more* than that sum!

The same holds true with respect to the 8 individual (“chiral”) “internal” structures contained in a GUT = “Grand Unified Theory” (of its “internal” components):



While the GUT is the *additive sum* of all “internal” forces ( $8+8+8+8+8+8+8+8 = 64$ ) contained in the ToE, the *product* of (a copy of) Quantum Gravity with the set of “internal” parameters is some *multiplicative* subset of ToE ( $8 \times 8 = 64$ ):



Those “internal” parameters, hence, will not be *generally* commensurable with an “internal” force! Only their *diagonal*

subset representing the *quantum numbers* of physics does so! (Example: The 3-component of isospin is commensurable with the state of a proton. Its 1- or 2-component, however, which will transform it into a neutron, is not! But it still is commensurable with Quantum Gravity.)

In the late 1960s, this non-commensurability, once, had been a big problem preventing people from successfully uniting “Poincaré dynamics” with the “internal” structure (to our GUT). And this problem still nowadays is preventing them from understanding the background of that ill-reputed “quark confinement”.

Now, ToE and GUT are transforming their  $8 \times 8 = 64$  basic dimensions by 6-fold (“Kronecker”) products of Pauli’s matrices ( $2 \times 2 = 4$ ). Its first two matrices, below, are reproducing Dirac’s 16  $\gamma$ -matrices; together with its third matrix we get Quantum Gravity, and the remaining 3-set yields the “internal” transformations:

$$S \equiv \left( (\sigma_\mu \times \sigma_\nu) \times \sigma_\kappa \right) \times (\sigma_\lambda \times \sigma_\rho \times \sigma_\tau)$$

Their “commutators” are the source of quantisation and of **Dark Energy**. The permutation group of the “internal” 3 labels (in the right-hand bracket) are giving rise to the **quark confinement**.

Appropriate exponential functions  $\exp[iaS]$  of  $S$  will provide a unitary group  $U(64)$ . Those Pauli matrices carrying the label “2”, however, are imaginary. When cancelling their imaginary unit factor “ $i$ ”, the resulting group will become a pseudo-unitary  $U(32,32)$  with their higher invariants giving **Dark Matter**. This yields our two “channels”; for Dirac, QG, and GUT/ToE, these are the

- reaction channels: **U(4), U(8), U(64);**
- dynamic channels: **U(2,2), U(4,4), U(32,32).**

The closed reaction channel is describing the **atomistic view** and the open dynamic channel a **statistical view**. Both views are not commensurable; but states of both views can be converted (“expanded”) into each other. Einstein’s “spooky action at a distance” (**entanglement**) is a property of the reaction channel, and **causality** a property of the dynamic channel. Entanglement, hence, does not contradict causality!

By reversing the roles of time-like and space-like dimensions,  $U(n,m)$  vs.  $U(m,n)$ , the equality  $m=n$  will provide an effective boundary between both situations which we may identify with the **event horizon** of a **black hole**. The **time reversal** at this boundary is initialising some perpetual transition from a partial universe on this side of the event horizon towards another, time-reversed partial universe behind that horizon – and v.v.

Most of the above results are dealing with the dynamic channel. Hence, let us, finally, add a striking result based on a rough calculation applying the reaction channel, instead. By theory, the **fine-structure constant** is (the “Clebsch-Gordon coefficient”)

$$\alpha_{theory} \approx \left(\frac{2}{3}\right)^2 \left(1 - \frac{1}{64}\right) \frac{1}{64 - 4} = \frac{1}{137.143 \dots}$$

According to this approximation, its deviation from the experimental value is  $\frac{\alpha_{theory}}{\alpha_{exp}} - 1 \approx 0.08\%$ .

The squared quotient, above, is proving **leptons to be composed particles**, the central bracket is confirming that nature is 64-dimensional, and the projection term  $4 = 8/2$ , behind, is pointing to the 8-dimensionality of QG and to the fact that, in our universe, the separation process of ordinary from dark matter has come to an end, already.

## Retrospective

Until his last breath, Einstein's endeavour stood for finding his "world formula". His hope had been that it should unite all basic rules of nature. As told, already, that search (*for a "Theory of Everything" – actually, we would formulate: for the **invariants** of an extended Quantum Gravity*) ultimately failed due to his unawareness of the criteria of mathematical integrity; **Young's tableau** management of assemblies of discrete "quanta" is offering it automatically. Grossmann's continuous, classical treatment by differential geometry had deprived him of it.

I substantiated how his contemporaries and successors had preferred to follow the comfortable track beaten by the **mainstream**. By the power of persuasion, misused authority, and censorship they had tried to achieve what their power of conviction and lack of fresh ideas had not succeeded in. A hundred years of stagnation in fundamental theory, now, is embedding into concrete the chaotic nowhere of institutions merely reasoning on an eloquent, short-term basis instead of presenting physical arguments.

Everybody thinks to be able to outmanoeuvre nature by cheap tricks – the requirement of **discrete quanta** fell by the wayside. Sophisticated ad-hoc "philosophies" had been replacing definite solution ideas. Instead of pragmatically constructing Young tableaux in order to represent particles by discrete quanta, people invented "theories" ("models" had been too profane for them) driving weird philosophies (including their strange pitfalls) deeper and deeper into their dead ends beyond the realm of physics.

Even the logic of mathematics had been jettisoned – just in order to be faster than the neighbour at making poor decisions. Economic practice replaced serious research; populist illusions conquered their predominance over more reflectiveness.

In addition, there is that autocratic insistence on unqualified doctrines having decisively thwarted institutions detached from reality to make progress in fundamental theory for almost a century. And this still actually is their maxim.

Pretentiously, the need for non-valence structures had been ignored – just in order again to complain that all those emergent parameters of nature – like a *coherent* quantisation of Einstein's curvilinear spacetime, mass, and energy-momentum – does not fit into a unified concept of *that* brand.

Briefly: The know-how necessary for constructing New Physics definitely has been available – lacking *will* has been the problem! “Political correctness” has been the censor to tell science what has to be true or wrong. Amen!

After this harsh criticism of the actual state of the art on fundamental physics on its subfield of *theory*, let me still point especially to how to conquer all those mathematical **inconsistencies** accumulated in the course of a century down to the present day, which is hedged in the ivory towers of monoculture, and promoted by the official mainstream. Nothing ever will become more durable than the temporary!

This article is meant to help to overcome that speechlessness in the theory of fundamental physics, which had lasted much too long, already. There has been sufficient talk, but its output scope is poor. The purpose of those vast amounts of official “publica-

tions for the trash“ just had been to pep up the statistics of official institutions quoting themselves mutually: “Hey, look here; we are active, too; please, distribute alms (third-party assets) towards us, too!”

As mentioned, an essential insight from Quantum Gravity and its GUT extension has been that the structure of the **non-valence** part of an elementary particle, as matters stand, now, is explicitly calculable from its individual “quanta“ according to the top-down method of Young tableaux replacing that pro-forma whispering in the range of Lagrange and Higgs models.

*(The physical quality of Lagrange models has been criticised sufficiently, already. They just administer their mess of parameters, which only allow for being fitted but not for being derived.*

*In order to camouflage their enormous number of actually still open parameters, people went hiding them in terms of “functions“. Every student of mathematics is learning in his first semesters that one function, by its Taylor expansion, is a collection of an infinite number of parameters, already. And how many “functions“ are there directly or indirectly buried in the “Standard“ Model!)*

Only those non-valence parts are allowing for an *explicit* assignment of the dynamical parameters of a physical “state“ to the emergent entities of thermodynamic statistics based on the “law of great numbers“. Without their *explicit* representation by individual quanta, they never will get beyond those vague “arguments“ given by poorly defined “functions“.

By New Physics, (CMS-) **space is nothing else than a count** of specifically oriented quanta, i.e., of 3 statistically averaged components of emergent quantum numbers. On the other hand, (CMS-) **time** and **mass** are the result of counting **special quantum leaps** between

neighbouring quantum levels. Only the *atomistic way of applying discrete quanta* to replace the continuous method of functional analysis allows for this "count".

The signs of time and mass are dividing spacetime into its 4 sections, those before and after the "big bang" and those in front and behind the event horizon, respectively. Experiment, now, demonstrates that "virtual" states are present in all 4 domains.

As we basically have to do it with finite sets in New Physics, even our universe, by its **finite number** of quanta, can yield just finite results in New Physics when counting partial sets or "leaps" among them (in order to determine their spacetime or mass, e.g.): **The extension of a universe is finite!**

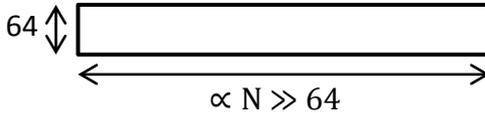
On the other hand, we recognised an elementary particle as some constructive interference knot of states of our universe. From the mathematically identical description of an elementary particle and a universe, hence, we conclude: Even our universe, one day, might out itself as a mere superposition of interfering universes inside some multiverse one order higher.

Contrary to the opinion of sensationalists, it is not senseless at all to consider experimental ways of an **inter-universal communication** on this base – just as little as it is their further "argument" that information from the **interior of a black hole** across its event horizon is basically inaccessible.

Just give access to the experts; by regarding the time reversal, there, they, one day, might puzzle out some method in order to tackle the problem in the long run: the transition from the dynamic to the reaction channel is open to everybody! And military administrations, often enough, are standing by in order to fund the most incredible projects. Only: The technical starting **idea**, usually, will have to come from outside.

## Promising Outlook

What still is missing, these are the explicit details of the non-valence part of an elementary particle. Here, a minute number of just 64 dimensions is opposed to a huge number of quanta. In terms of superposition statistics and according to the “law of great numbers”, its dynamic structure will lead us to state that, beside complete singlet columns, the dominant property of their Young tableaux will be that of a *symmetric* representation (*symmetrical lines vs. antisymmetrical columns*):



Young’s formalism does not admit long chains of *antisymmetrical* structures – though the length of a *symmetrical* structure is unlimited: the maximal *column* length is 64. Opposed to the total number of quanta, this is (almost) negligible. This even will make it small compared to the lowest approximation of a sample calculation. It is tremendously facilitating the explicit construction of **superposition states** like those we are needing for creating emergent quantum numbers (like spacetime, e.g.), provided they should appear to us quasi-diagonal – in whatever approximation.

On the other hand, those still surviving few antisymmetries will give rise to typical “class” characteristics, and our task is it to uncover and analyse them step by step. (*Compare its effort needed with that once necessary and having been made available in order to calculate some variant of a string model.*)

Chemistry once proved to be just a partial feature of physics (essentially of quantum mechanics + thermodynamics). The same way, those relatively “simple” states making up the reaction channel gradually will be extended to the more interesting statistical forms of the dynamic channel.

Its classical analogue could be the transition from an atom towards a molecule and further on towards solid-states physics. There, material characteristics became more and more important (in the electronics industry, e.g.) revolutionising our information behaviour. Similarly, here again, unexpected challenges are waiting for us to turn everything upside down.

When considering just the *theoretical* aspect of fundamental physics, the 21<sup>st</sup> century has been starting that sluggish and dozy. But it promises to bring about an explosion of new insights, provided we are redirecting our focus on improving and expanding Quantum Gravity, which still is at its dawning. But we are holding all its aces, already. Compare it with the transition from Planck’s quanta, a hundred years ago, towards Schrödinger’s quantum mechanics in the 1920s.

Remember how his professor had tried to discourage Planck from studying physics in 1874. His argument, at that time, read: In physics, long since, everything of importance is already discovered – up to a few gaps of no significance. Now, look at them: Let us finally fill those gaps instead of remorselessly chasing after chimeras like those strings, which are not good for anything – just in order to pretend a hectic bustle!

When seriously delving into these non-valence structures of particles, substructures made of quanta (partial “lumps” of matter) inevitably will evolve to remind of structures we are familiar

with from astronomy: quarks, fermions, and bosons, substructured like galaxies, clusters of galaxies, voids, and filaments in a universe – and all that on the level of quanta within the framework of Young tableaux!

After having elaborated the rough concept of Quantum Gravity, GUT, and ToE the next important ansatz, now, would be to find out those properties worth to be neglected or slightly to be altered in order to adapt Young's top-down method to a management still more efficient for *special* cases.

Simulations of that quality could start the next development steps needing a greater investment of manpower like that available by working groups at universities and comparable institutions, which, however, cannot be afforded by individuals, at least not within a reasonable time. Just think of those 10.000s of eager physicists having worked on the string and brane models for half a century, year by year, without, however, having achieved *any* success as regards physics. All that had been a huge waste of time, only!

Let us, hence, be busy with activities making more sense; New Physics is ready. Don't permanently pussyfoot around – let's tackle it!

## The Author

Born in 1939 in Berlin/Germany. Sports, gossip, small talk, discos, and game-apps always had been a horror to me. Thus, there had been sufficient time left for veritable challenges.

During my school time already, I had followed first problems on the field of comparative linguistics, which, during my subsequent study of physics (*theory of elementary particles*), focused on problems about a common ancestor language of the Indo-European and the Chinese languages. (*Examples and the sound-shift rules are published as an e-book in 2015.*)



*Up to new horizons!*

The challenge of fundamental physics consisted in the Faustian demand “to find out what is keeping our world together in its interior”, briefly: in the unification of Einstein’s *General Relativity* with Planck’s world of quanta (“*Quantum Gravity*”).

It is obvious that a simple diploma thesis could *not* cover all that. Nor did I accomplish this sophisticated target during my long-term activity as a scientific assistant after that graduation. In those times, however, I had come rather close to it, already.

After the “golden” 1960s with their enthusiastic consolidation of the quark model, the “Standard” Model with its inconsistencies and string models had been ringing in the creeping descent of the theory section of fundamental physics still lasting until nowadays. I myself had been personally condemned to experience that depressing fate in the situation of a university assistant.

Still as a student, I had got furious about that wobbly house of cards theoretical physics seemed to be founded upon, the way it had been presented in lectures and seminars. Especially with quantum theory, it was shocking how badly even professors appeared to have got behind its physical base when the students were kept diverted from the real problems of *physics* by long-winded *mathematical* formalisms.

After the expiration of my last contract at university, I went to industry. In the branch of software development (*main frame*), I acquired knowledge in project management. That software, however, was boring me to death. When approaching to my state of retirement, I seized the opportunity gradually to return to my old ideas. My breakthrough succeeded.

My visits at conferences on particle physics attested me again: In my field of interest, the state still was the same as at the end of my time as an assistant many decades ago, I had not missed anything – only, at that turn of the millennium, string-brane fans were occupying and blocking (*almost*) all resources of particle physics. *Novel* insights: negative. During the boom at the experimental side of fundamental physics and astronomy, theory had been rotating at full speed, too – since half a century, however, just by idling about in a non-ending loop.

C. Birkholz.

## References

In literature, there is much talk about **Quantum Gravity** and **New Physics**; though, in fact, it does not really exist, there – not even in a starting position. That “Loop Quantum Gravity”, there, just is borrowing its name – without, however, having to do anything with a real “Quantum Gravity”.

The only texts which do not just beat about the bush but do address Quantum Gravity, GUT, ToE, and/or the New Physics resulting from them, indeed, actually is available in a chronological order in the internet at [www.q-grav.com](http://www.q-grav.com); in their form of e-books, they are available from the customary distributors. (Sales figures of these **e-books**: more than 30.000 within the first 3 years only.)

The present text, here, dated from 2017, is slightly more actual than the “textbook” of 2016 quoted there:

[1] “ToE; New Physics explaining our world by Quantum Gravity. World’s first textbook on QG” (2016). e-book. ISBN 978-3-7396-3010-6.

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