The Lightness of Being

Physics Opens a Door to a Theory of Consciousness

Dr. Joachim Keppler, January 2012

Definition of Consciousness

Conscious experiences are associated with qualitative feels, i.e., consciousness is connected with phenomenal qualities (qualia):

- Sight
- Smell
- Touch
- Taste
- Hearing
- Emotions








first-person aspects
of the mind = inner world

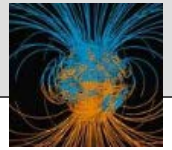
The Hard Problem of Consciousness

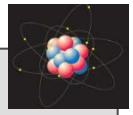
- Fundamental questions
  - How can a physical system give rise to conscious experience?
  - How can a physical theory incorporate the existence of consciousness?
- In “western thinking” these problems are hard to solve because we believe that ...
  - a physical system “produces” consciousness,
  - the functioning of our bodies would be possible without conscious experience.
- Do robots have conscious experience?



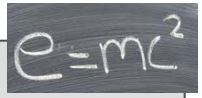
The Floor Plan of Physics

Classical physics
Mechanics — Newton laws
Electrodynamics — Maxwell equations



Quantum mechanics
Dirac / Schrödinger equation
(wave functions, probabilities)



Special relativity
Lorentz transformation
Energy-mass relation

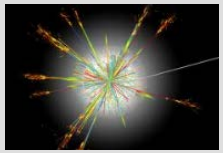
General relativity
Einstein equations
(curved space-time)

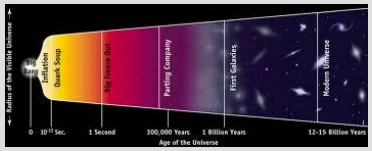
Quantum field theory
QCD

GSW
QED

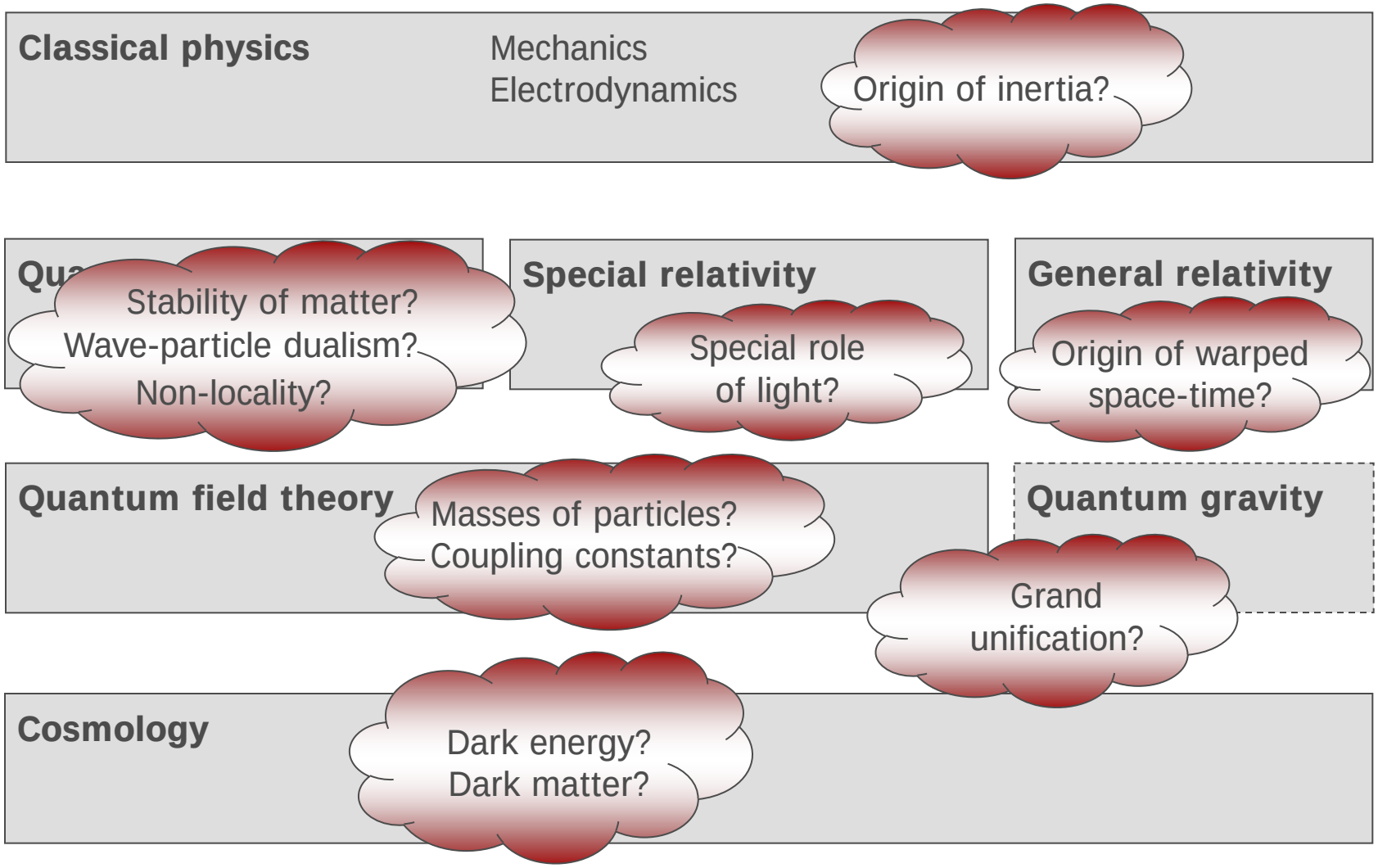
Quantum gravity

Cosmology
Big bang theory
Inflationary universe

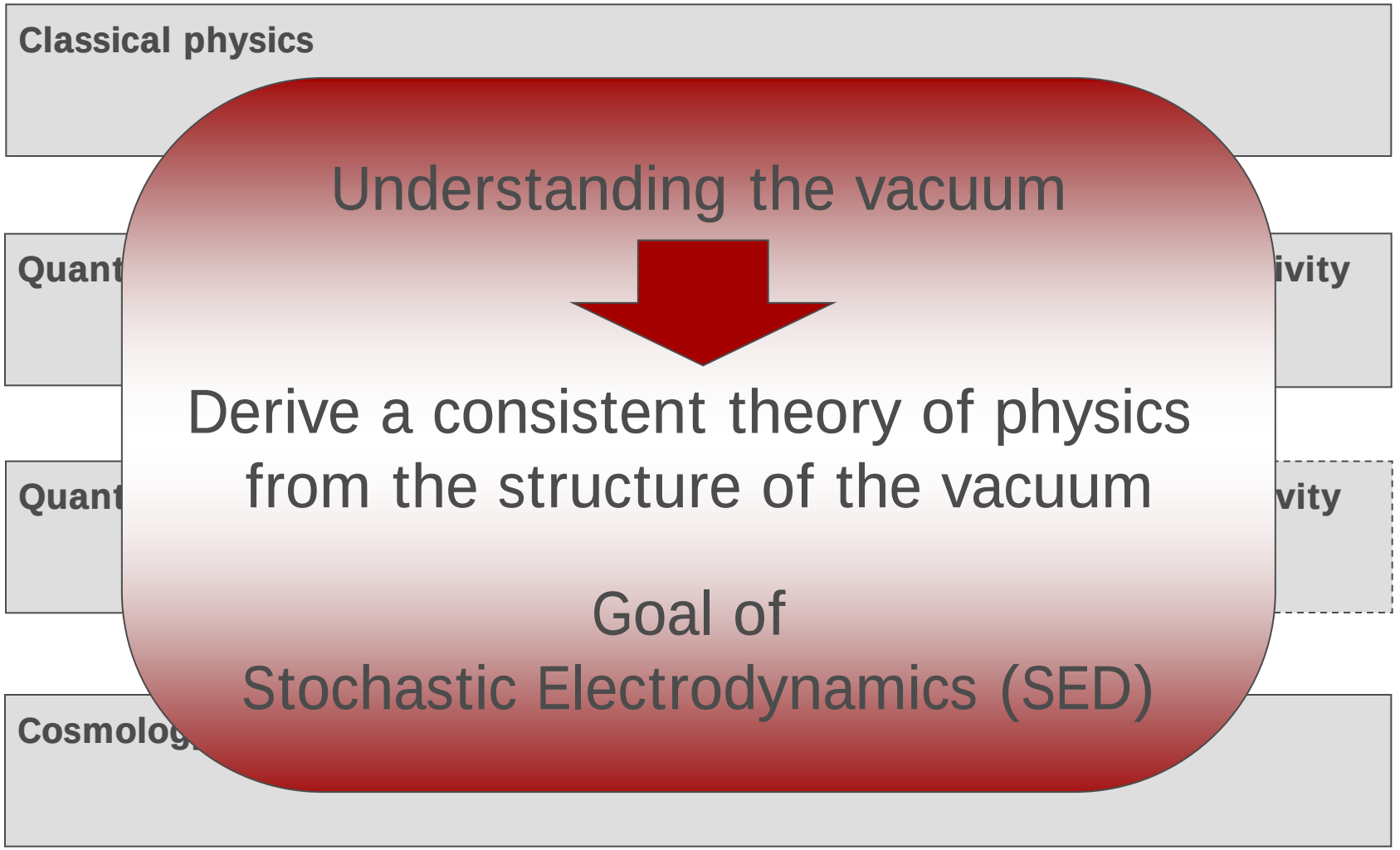




Unsolved Problems and Open Questions of Physics



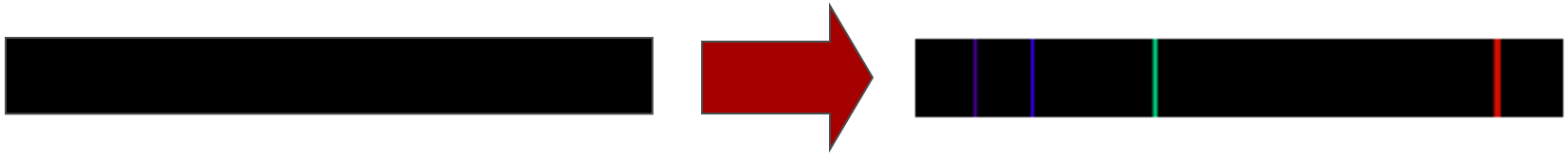
The Key to Solving the Problems and Inconsistencies



Two Different Philosophies of Creation

- Creation = generation of phenomena out of nothing

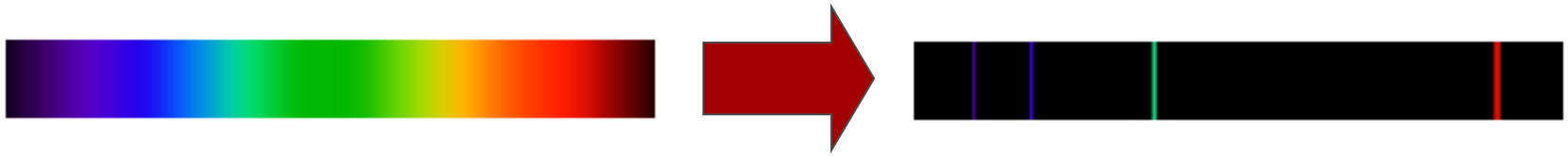
  selective population of the vacuum (void)



Generation

- Creation = filtering of phenomena out of an infinite potential

  selective restriction of the plenum



Filtering

Our world is based on the second philosophy of creation!

Genesis – The Absolute

Plenum

Pure potential / energy / dynamics

$$\mathbf{E}_{ZP}(\mathbf{r},t) = \sum_{\lambda=1}^{2} \int d^3\mathbf{k} \left(\frac{\hbar\,\omega}{2\,\pi^2}\right)^{1/2} \boldsymbol{\varepsilon}(\mathbf{k},\lambda)\, \cos\left(\mathbf{k}^*\mathbf{r} - \omega\, t + \theta(\mathbf{k},\lambda)\right)$$

$$\mathbf{B}_{ZP}(\mathbf{r},t) = \sum_{\lambda=1}^{2} \int d^3\mathbf{k} \left(\frac{\hbar\,\omega}{2\,\pi^2}\right)^{1/2} \left(\mathbf{k} \times \boldsymbol{\varepsilon}(\mathbf{k},\lambda)\right) \cos\left(\mathbf{k}^*\mathbf{r} - \omega\, t + \theta(\mathbf{k},\lambda)\right)$$

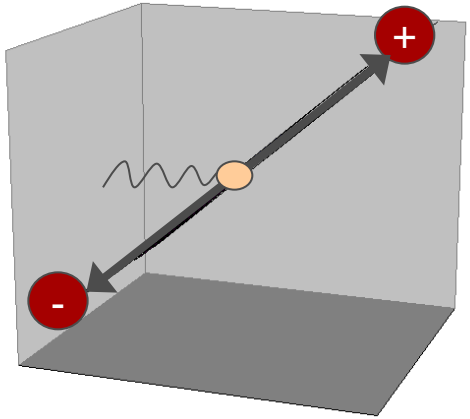
Infinite sea of light / all-pervasive radiation field (ZPF)

Perfect symmetry: homogeneity, isotropy, Lorentz invariance, scale invariance

Genesis – Polarization of the Absolute

Polarization of the plenum

Creation of the relative



Creation of space-time and charges (vortices of light)

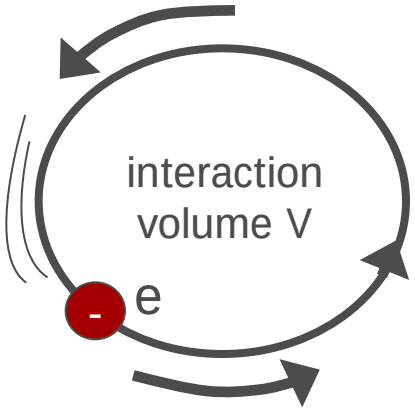
Process not well understood yet (charge quantization, pre-elementary particles)

Genesis – Selective Restriction of the Absolute (1)

Selective restriction of the plenum

Level 1: elementary particles → creation of mass

Localized energy associated with charge oscillation driven by the ZPF



$$E = V \int \eta(\omega)\, \rho_{ZP}(\omega)\, d\omega$$

$$m_0 = \frac{V}{c^2} \int \eta(\omega)\, \rho_{ZP}(\omega)\, d\omega$$

Filter function: $\eta(\omega)$ with resonance at $\omega = \omega_c$

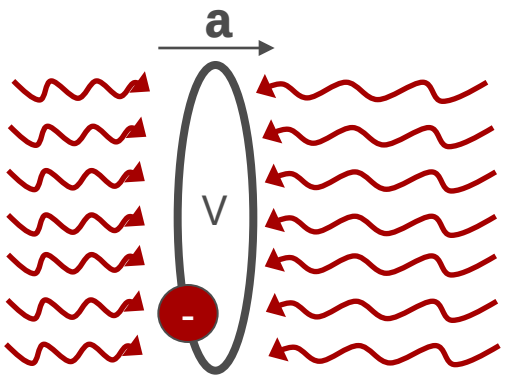
Energy density: $\rho_{ZP}(\omega) = \dfrac{\hbar\, \omega^3}{2\, \pi^2\, c^3}$

Genesis – Selective Restriction of the Absolute (2)

Selective restriction of the plenum

Level 1: elementary particles → creation of inertia

Particle feels asymmetry of the ZPF → non-zero radiation pressure

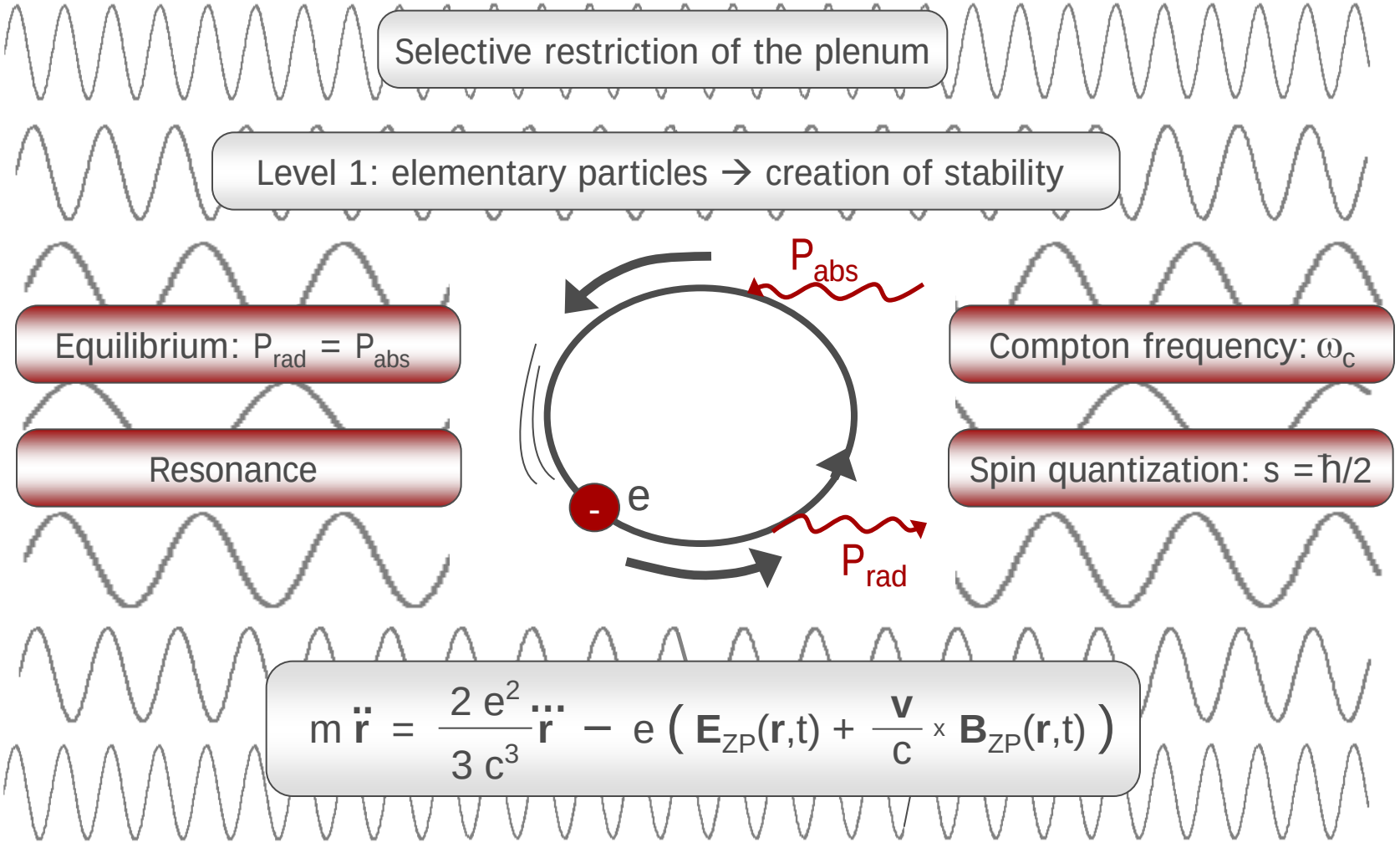


$$\mathbf{F} = -\left[\frac{V}{c^2}\int \eta(\omega)\,\rho_{ZP}(\omega)\,d\omega\right]\mathbf{a}$$

$$= -\,m_i\,\mathbf{a} \qquad \rightarrow m_i = m_0$$

Distortion (asymmetry) of ZPF in the vicinity of matter is the origin of gravity → equivalence principle

Genesis – Selective Restriction of the Absolute (3)



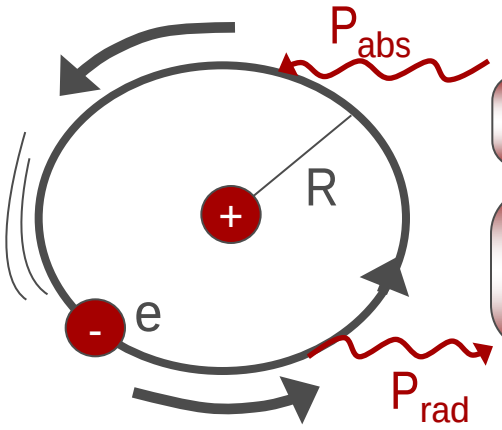
Genesis – Selective Restriction of the Absolute (4)

Selective restriction of the plenum

Level 2: atoms → creation of stability

Equilibrium: $P_{rad} = P_{abs}$

Resonance



Bohr radius: $R = R_{Bohr}$

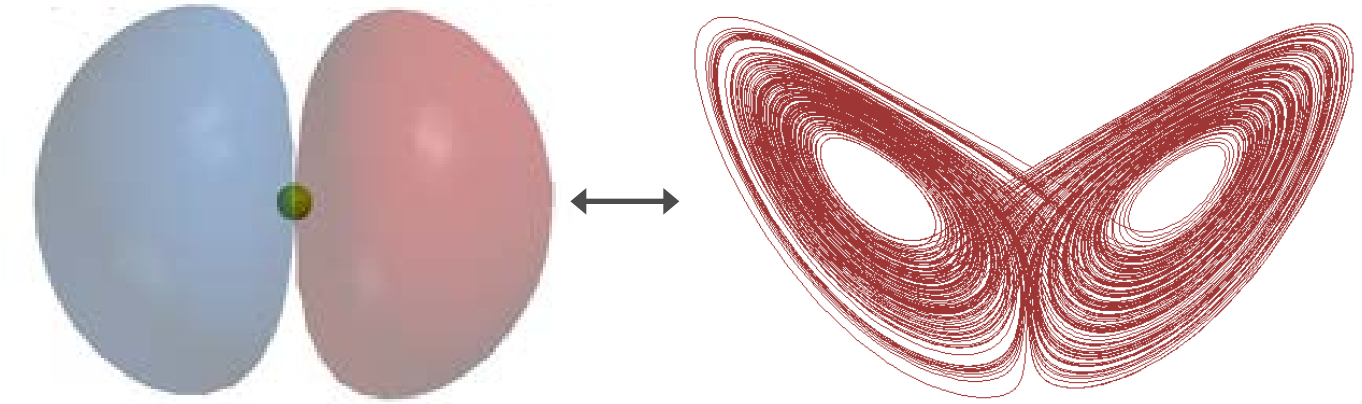
Quantization of energy levels: $m\,v\,R = n\,\hbar$

$$m\,\ddot{\mathbf{r}} = -\frac{e^2\,\mathbf{r}}{|\mathbf{r}|^3} + \frac{2\,e^2}{3\,c^3}\,\dddot{\mathbf{r}} - e\left(\mathbf{E}_{ZP}(\mathbf{r},t) + \frac{\mathbf{v}}{c} \times \mathbf{B}_{ZP}(\mathbf{r},t)\right)$$

Genesis – Selective Restriction of the Absolute (5)

Selective restriction of the plenum

Level 2: atoms → creation of form



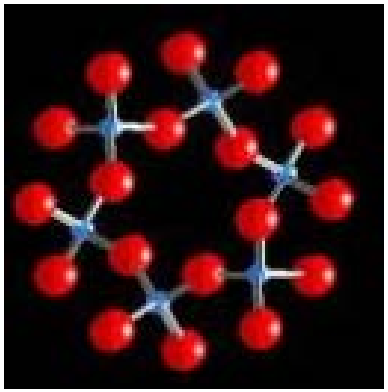
Structure of atoms is governed by the ZPF

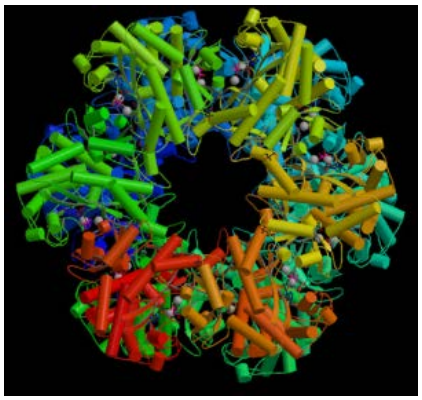
Orbitals are stable attractors of a stochastic interaction process

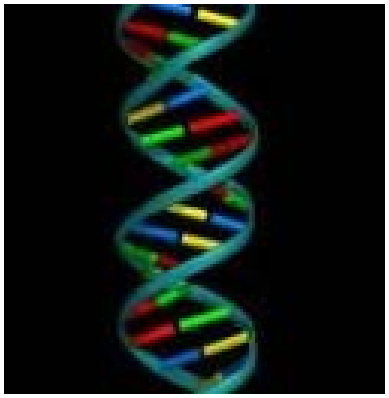
Genesis – Selective Restriction of the Absolute (6)

Selective restriction of the plenum

Level 3: molecules → creation of form







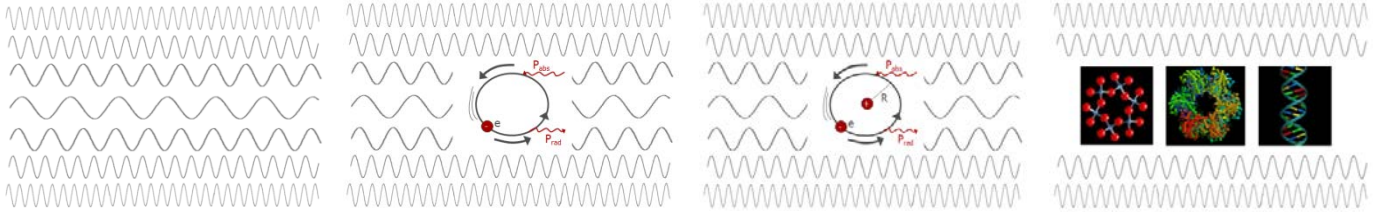
3-dimensional conformation of molecules is governed by the ZPF

Interaction between molecules (van der Waals force) is also governed by the ZPF

Genesis – Universal Mechanism of Structure Formation

Structure builds up hierarchically through selective filtering of the ZPF

Plenum	Elementary particles	Atoms	Molecules	Macroscopic systems
Free ZPF	Quantization of spin and mass	Quantization of atomic levels	Quantization of molecular levels	Macroscopic quantum phenomena



- Quantum behavior results from interaction between ZPF and matter (balance condition)
- New properties emerge on each hierarchical level (basis of diversity and complexity)
- On each level stationary states (= stable attractors) arise
- Self-similarity of nature is due to scale-invariance of the ZPF

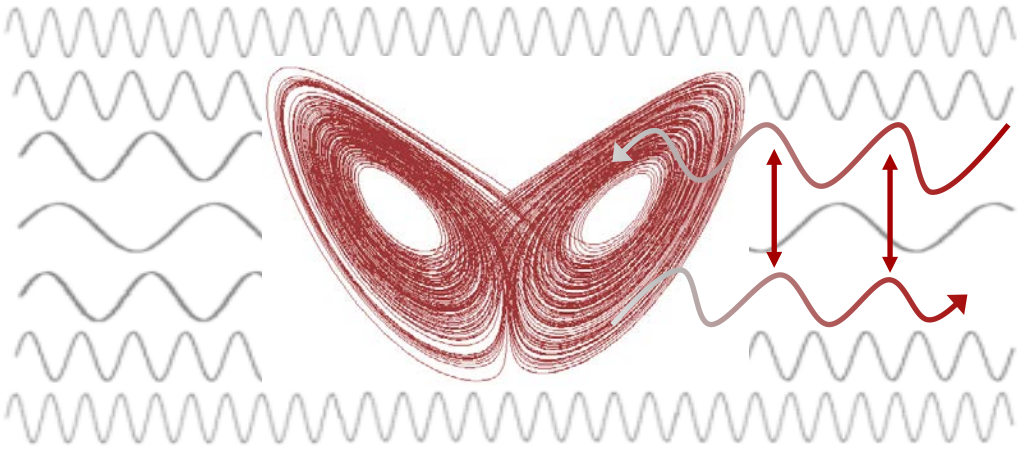
Genesis – Matter Leaves Imprints in the Plenum

- Study simple nonlinear system driven by the ZPF:

$$\ddot{x} = -\omega_0^2 x - \beta x^2 + \tau \dddot{x} + \frac{e}{m} E_{ZP}(t) \quad \text{with} \quad E_{ZP}(t) = \int d\omega \, \tilde{E}(\omega) \, e^{-i\,\omega t + \theta(\omega)}$$

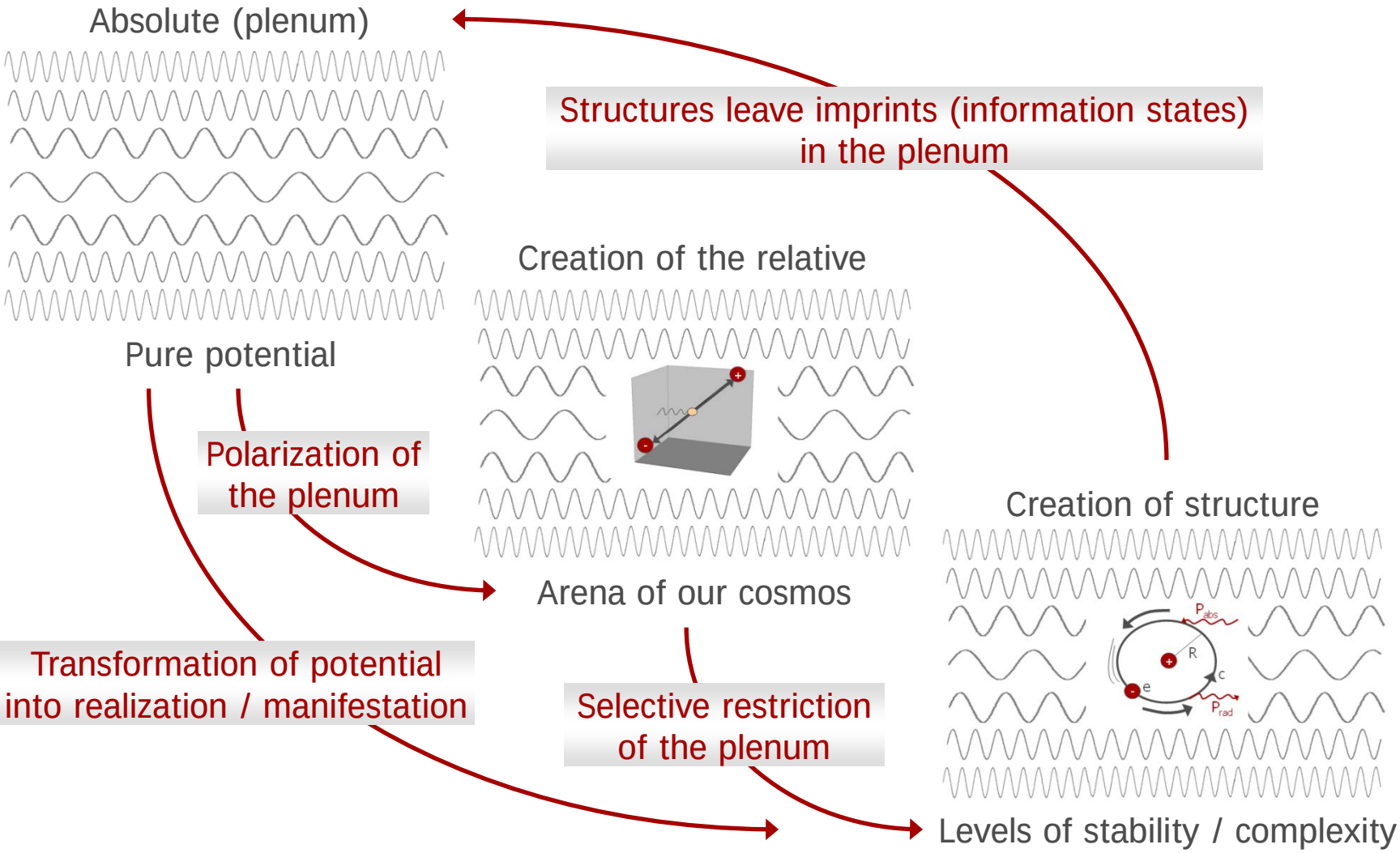
initially random phase

- ZPF is modified as soon as the system reaches a stable attractor:



- Relevant frequency components involved in the maintenance of the equilibrium become highly correlated ("de-randomization")
- Different attractors are associated with different ZPF configurations

Genesis – Summary



- 1 Introduction to Consciousness
- 2 Physics: Unsolved Problems and Promising Solutions
- 3 Link between Physics and Consciousness

Comparison between Physics and Eastern Philosophy

Physics (SED)

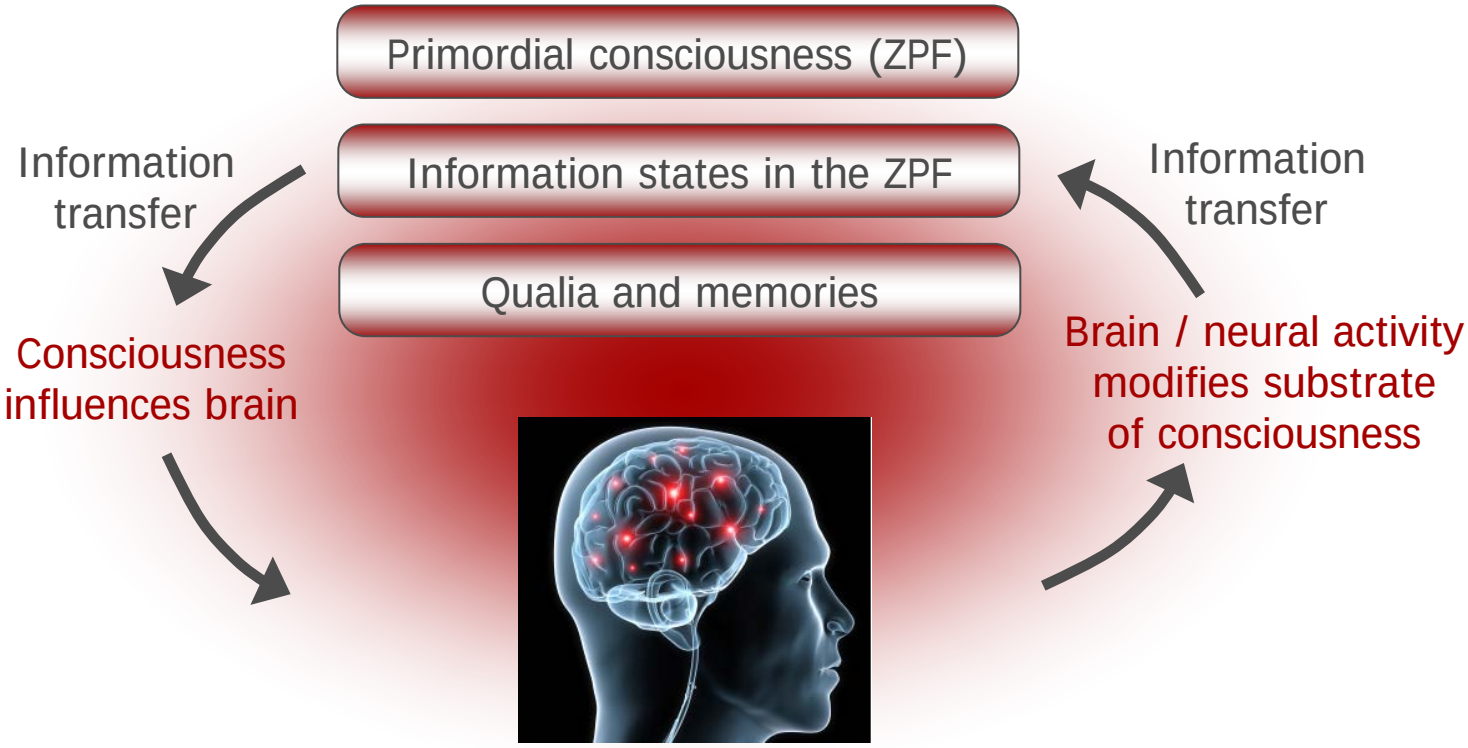
1. The universe is based on an all-pervasive radiation field (ZPF) exhibiting infinite potential and energy.
2. All phenomena result from selective restriction of the ZPF and dynamic interaction between the ZPF and matter.
3. Nothing exists on its own. The properties of matter are not intrinsic, but acquired in an interaction process.
4. The ZPF shapes matter and matter shapes the ZPF. This interplay gives rise to information states in the ZPF.
5. All forces of the universe are mediated by the ZPF, i.e., local modifications and distortions of the ZPF result in forces.

Eastern Philosophy (Buddhism)

1. The universe is formed out of an infinite potential (Prana). Everything is produced by this primordial energy.
2. All phenomena spring forth from Prana through a transformation process, a dynamic flow of interactions.
3. Phenomena have no intrinsic existence (emptiness). The properties of matter are caused by interdependence.
4. Consciousness shapes matter and matter shapes consciousness. Mind and matter are composed of the same primordial energy.
5. All forces of the universe are modifications of Prana, also those of the human mind from consciousness to the subconscious.

The Relationship between Brain and Consciousness

- There is an implicit unity of primordial energy and primordial consciousness.
- The ZPF is an appropriate candidate for the substrate of consciousness.
- Our individual consciousness is the result of an interaction (filtering) process which causes the realization of information states in the ZPF.



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