Large scale physics

Large scale fluid dynamics

Physical fields

- QPAD's
  - Photon
  - Gluon

$$\nabla\psi = 0$$
$$\nabla^2\psi = 0$$

harmonic

- Fields from particle properties
  - Quaternionic distributions
  - Charges are preserved
  - Fields represent influence of charges
  - Electromagnetic field
  - Gravitation field

$$\nabla\psi = m\varphi$$

$$\sum_i n_i e_i \psi_i$$

$$e_i = \pm e$$

$$\sum_i n_i m_i \varphi_i$$

Inertia-1

State functions of distant particles

- $\Phi_0 = \int_V \psi \, \mathrm{dV}$

Everywhere present potential

In a uniform background:
$\psi = {}^{\rho_0}/_{r}$; ρ_0 is constant

- $\Phi_0 = \int_V {}^{\rho_0}/_{r} \, \mathrm{dV} = \rho_0 \int_V {}^{1}/_{r} \, \mathrm{dV} = 2\pi R^2 \rho_0$
- $G = -c^2 \Phi$ (Dennis Sciama)
- $\boldsymbol{\Phi} = \int_V {}^{\rho_0 \boldsymbol{v}}/_{c\, r} \, \mathrm{dV} = \Phi \, {}^{\boldsymbol{v}}/_{c}$; $\dot{\boldsymbol{\Phi}} = \Phi_0 \, {}^{\dot{\boldsymbol{v}}}/_{c}$
- $\mathfrak{E} = \nabla_{\mathbf{0}} \boldsymbol{\Phi} + \boldsymbol{\nabla} \Phi_0 = \dot{\boldsymbol{\Phi}} + \boldsymbol{\nabla} \Phi_0 = \Phi_0 \, {}^{\dot{\boldsymbol{v}}}/_{c} + \boldsymbol{\nabla} \Phi_0$

Inertia-2

- Φ_0 is a scalar potential
- $\boldsymbol{\Phi}$ is a vector potential
- G is gravitational constant
- $\mathfrak{E} = \Phi_0 \, {}^{\dot{v}}/_{c} + \nabla\Phi_0$
- $\mathfrak{E} \approx \Phi_0 \, {}^{\dot{v}}/_{c} = G\dot{\boldsymbol{v}}$
- Acceleration goes together with an extra field $\mathfrak{E}$
- This field counteracts the acceleration

Inertia-3

- Starting from coupling equation
- $\nabla\psi = m\varphi$
- $\psi = \chi + \chi_0\, \boldsymbol{v}$
- χ represents particle at rest
- $\psi_0 = \chi_0$
- $\boldsymbol{\psi} = \boldsymbol{\chi} + \chi_0\, \boldsymbol{v}$
- $\nabla_0\boldsymbol{\psi} = \chi_0\, \dot{\boldsymbol{v}} = m\boldsymbol{\varphi} - \boldsymbol{\nabla}\psi_0 - \boldsymbol{\nabla}\times\boldsymbol{\psi}$
- $\mathfrak{E} \equiv \nabla_0\boldsymbol{\psi} + \boldsymbol{\nabla}\psi_0$

Small

Represents influence of distant particles

Continuity equation

- Balance equation
- Total change within V
  = flow into V + production inside V
- $\frac{d}{d\tau}\int_V \rho_0 \, dV = \oint_S \hat{\boldsymbol{n}} \rho_0 \frac{\boldsymbol{v}}{c} \, dS + \int_V s_0 \, dV$
- $\int_V \nabla_0 \rho_0 \, dV = \int_V \langle \boldsymbol{\nabla}, \boldsymbol{\rho} \rangle \, dV + \int_V s_0 \, dV$
- $\boldsymbol{\rho} = \rho_0 \boldsymbol{v}/c$
- $\rho = \rho_0 + \boldsymbol{\rho}$
- $s = \nabla \rho$
- $s_0 = 2\nabla_0 \rho_0 - \langle \boldsymbol{v}(q), \boldsymbol{\nabla} \rho_0 \rangle - \langle \boldsymbol{\nabla}, \boldsymbol{v} \rangle \, \rho_0$
- $\boldsymbol{s} = \nabla_0 \boldsymbol{v} + \boldsymbol{\nabla} \rho_0 + \rho_0 \boldsymbol{\nabla} \times \boldsymbol{v} - \boldsymbol{v} \times \boldsymbol{\nabla} \rho_0$

Gauss

Inversion surfaces

- $\frac{d}{d\tau}\int_V \rho \, dV + \oint_S \hat{\boldsymbol{n}}\rho \, dS = \int_V s \, dV$
- $\int_V \nabla \rho \, dV = \int_V s \, dV$

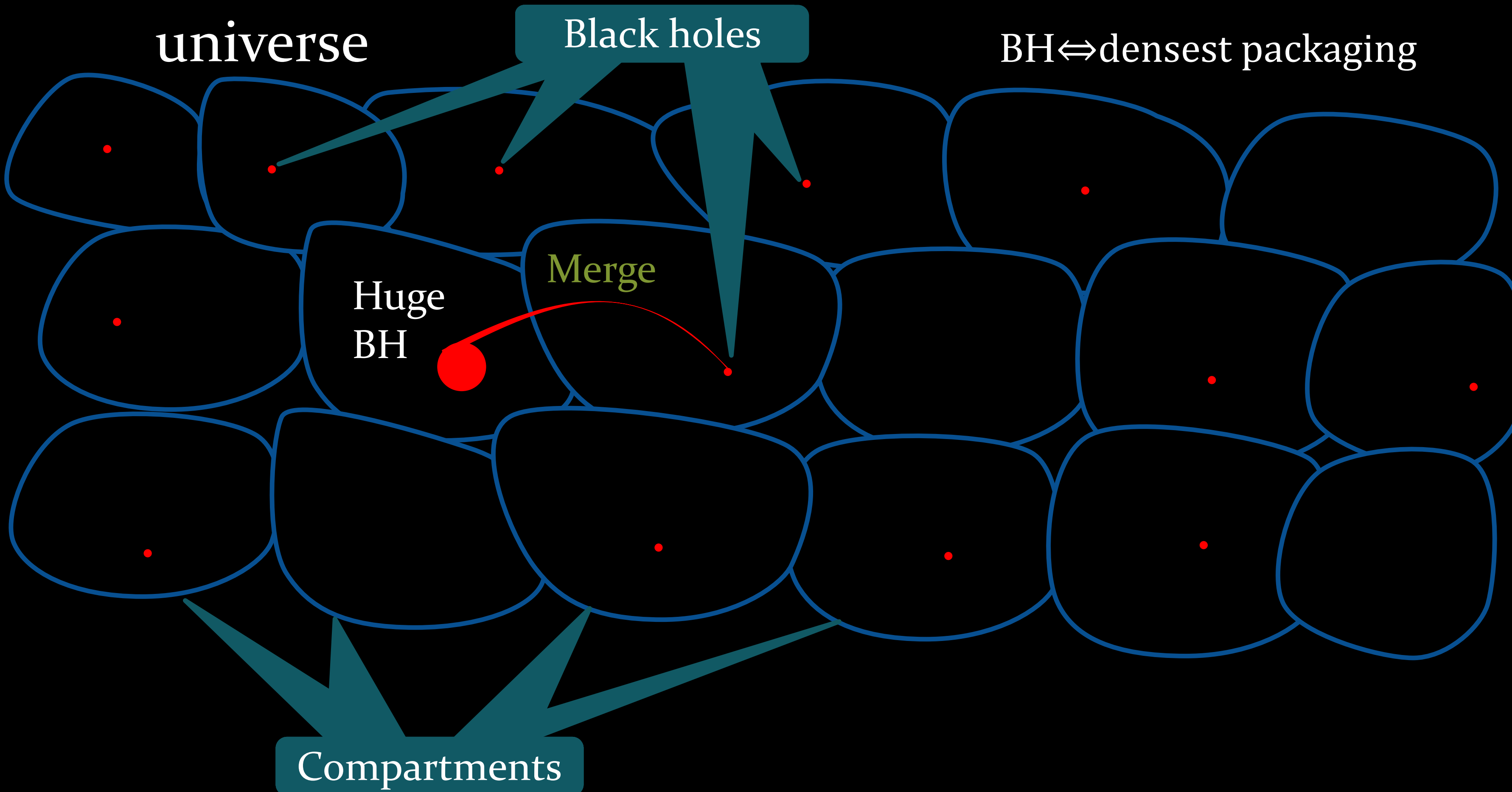
- The criterion $\oint_S \hat{\boldsymbol{n}}\rho \, dS$=0 divides universe in compartments

Inversion surface

Compartments

Huge BH ⇔ s tart of new episode

BH⇔densest packaging

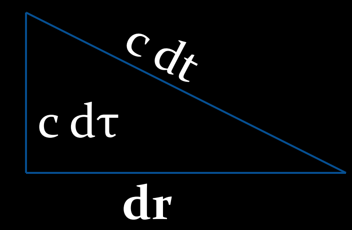


Never ending story

History of Cosmology

- Black hole represents natal state of compartment
- Black holes suck all mass from their compartment
- A passivated huge black hole represents start of new episode of its compartment
- Driving force is enormous mass present outside compartment $\Rightarrow$ expansion
- Whole universe is affine space
- Result is never ending story

Gravitation



- The Palestra is a curved space
- $\mathcal{P}_{blurred} = \wp_{sharp} \circ \psi\ _{blur}$
- $ds(x)\ = ds^{\nu}(x)e_{\nu} = d\wp = \sum_{\mu=0\ldots3} \frac{\partial\wp}{\partial x_{\mu}} dx_{\mu} =\ q^{\mu}(x)dx_{\mu}$

16 partial derivatives

- q^{μ} is quaternion
- $c^2\ dt^2 =\ ds\, ds^{*} = dx_0^2 + dx_1^2 + dx_2^2 + dx_3^2$ — Pythagoras
- $dx_0^2 = d\tau^2 = c^2\ dt^2 -\ dx_1^2 - dx_2^2 - dx_3^2$ — Minkowski
- $\Delta s_{flat} = \Delta x_0 + \boldsymbol{i}\,\Delta x_1 + \boldsymbol{j}\,\Delta x_2 + \boldsymbol{k}\,\Delta x_3$ — Flat space
- $\Delta s_{\wp} = q^0 \Delta x_0 + q^1\ \Delta x_1 + q^2\ \Delta x_2 + q^3\ \Delta x_3$ — Curved space

Metric

- $d\wp$ is a quaternionic metric
- It is a linear combination of 16 partial derivatives
- $d\wp = \sum_{\mu=0\ldots3} \frac{\partial\wp}{\partial x_\mu} dx_\mu = \ q^\mu(x) dx_\mu$

$$= \sum_{\mu=0\ldots3} \sum_{\nu=0,\ldots3} e_\nu \frac{\partial\wp_\nu}{\partial x_\mu} dx_\mu = \sum_{\mu=0\ldots3} \sum_{\nu=0,\ldots3} e_\nu q_\nu^\mu dx_\mu$$

- Avoids the need for tensors

Composites

The effect of modularization

Modularization

- Modularization is a very powerful influencer.
- Together with the corresponding ***encapsulation*** it reduces the ***relational complexity*** of the ensemble of objects on which modularization works.
- The encapsulation keeps most relations internal to the module.
- When relations between modules are reduced to a few types , then the module becomes ***reusable***.
- If modules can be ***configured from lower order modules***, then efficiency grows exponentially.

Modularization

- Elementary particles can be considered as the lowest level of modules. All composites are higher level modules.
- Modularization uses resources efficiently.
- When ***sufficient resources*** in the form of reusable modules are present, then modularization can reach enormous heights.
- On earth it was capable to generate ***intelligent species***.

Complexity

- ***Potential complexity*** of a set of objects is a measure that is defined by the number of potential relations that exist between the members of that set.
- If there are n elements in the set,
  then there exist $n \cdot (n-1)$ potential relations.
- ***Actual complexity*** of a set of objects is a measure that is defined by the number of relevant relations that exist between the members of the set.
- ***Relational complexity*** is the ratio of the number of actual relations divided by the number of potential relations.

Relations

- Modules connect via interfaces.
- Relations that act within modules are lost to the outside world of the module.
- Interfaces are collections of relations that are used by interactions.
- Physics is based on relations. Quantum logic is a set of axioms that restrict the relations that exist between quantum logical propositions.

Types of physical interfaces

- Interactions run via (relevant) relations.
- Inbound interactions come from the past.
- Outbound interactions go to the future.
- Two-sided interactions are cyclic.
  - They take at least two progression steps.
  - They are either oscillations or rotations of the inter-actor.
- Cyclic interactions bind the corresponding modules together.

Modular systems

- Modular (sub)systems consist of connected modules.
- They need not be modules.
- They become modules when they are encapsulated and offer standard interfaces that makes the encapsulated system a reusable object.

- All composites are modular systems

Binding in sub-systems

- Let ψ represent the renormalized superposition of the involved distributions.
  - $\nabla\psi = \phi = m\,\varphi$
  - $\int_V |\psi|^2\, dV = \int_V |\varphi|^2\, dV = 1$
  - $\int_V |\phi|^2\, dV = m^2$
- m is the total energy of the sub-system
- The ***binding factor*** is the total energy of the sub-system minus the sum of the total energies of the separate constituents.

Random versus intelligent design

- At lower levels of modularization nature designs modular structures in a stochastic way.
  - This renders the modularization process rather slow.
  - It takes a huge amount of progression steps in order to achieve a relatively complicated structure.
  - Still the complexity of that structure can be orders of magnitude less than the complexity of an equivalent monolith.
- As soon as more intelligent sub-systems arrive, then these systems can design and construct modular systems in a more intelligent way.
  - They use resources efficiently.
  - This speeds the modularization process in an enormous way.

Dual space distributions

- A subset of the (quaternionic) distributions have the same shape in configuration space and in the linear canonical conjugated space.
- We call them dual space distributions
- These are functions that are invariant under Fourier transformation.
- The Qpatterns and the harmonic and spherical oscillations belong to this class.
- Fourier-invariant functions show iso-resolution, that is, $\Delta_p = \Delta_q$ in the Heisenberg's uncertainty relation.

Why has nature a preference?

- Nature seems to have a preference for this class of quaternionic distributions.
- A possible explanation is the two-step generation process, where the first step is realized in configuration space and the second step is realized in canonical conjugated space.
- The whole pattern is generated two-step by two-step.
- The only way to keep coherence between a distribution and its Fourier transform that are both generated step by step is to generate them in pairs.

Conclusion

- Fundament
  - Quantum logic
  - Book model
  - Correlation vehicle
- Main features
  - Fundamentally countable $\Rrightarrow$ Quanta
  - Embedded in continuum $\Rrightarrow$ Fields
  - Fundamentally stochastic $\Rrightarrow$ Quantum Physics
  - Palestra is curved
  - Quaternionic metric

  } $\Rrightarrow$ Quaternionic "GR"

Conclusion

- Contemporary physics works (QED, QCD)
- But cannot explain fundamental features
  - Origin of dynamics
  - Space curvature
  - Inertia
  - Existence of Quantum Physics

End

- Physics made its greatest misstep in the thirties when it turned away from the fundamental work of Garret Birkhoff and John von Neumann.
- This deviation did not prohibit pragmatic use of the new methodology.
- However, it did prevent deep understanding of that technology because the methodology is ill founded.

Appendices

Logics

&

Higgs mechanism

Logic Systems

Lattices,
classical logic and
quantum logic

Logic – Lattice structure

- A lattice is a set of elements $a, b, c,$ ...that is closed for the connections ∩ and ∪. These connections obey:
-
  - The set is partially ordered. With each pair of elements a, b belongs an element c, such that $a \subset c$ and $b \subset c$.
  - The set is a ∩ half lattice if with each pair of elements a, b an element c exists, such that $c = a \cap b$.
  - The set is a ∪ half lattice if with each pair of elements a, b an element c exists, such that $c = a \cup b$.
  - The set is a lattice if it is both a ∩ half lattice and a ∪ half lattice.

Partially ordered set

- The following relations hold in a lattice:

$a \cap b = b \cap a$

$(a \cap b) \cap c$

$= a \cap (b \cap c)$

$a \cap (a \cup b) = a$

$a \cup b = b \cup a$

$(a \cup b) \cup c$

$= a \cup (b \cup c)$

$a \cup (a \cap b) = a$

- has a partial order inclusion ⊂:

  a ⊂ b ⇔ a ⊂ b = a

- A complementary lattice contains two elements *n* and *e* with each element a an complementary element a’

  $a \cap a' = n \quad a \cap n = n$

  $a \cap e = a \quad a \cup a' = e$

  $a \cup e = e \quad a \cup n = a$

Orthocomplemented lattice

- Contains with each element a an element a'' such that:

$$a \cup a'' = e$$
$$a \cap a'' = n$$
$$(a'')'' = a$$
$$a \subset b \Leftrightarrow b'' \subset a''$$

Distributive lattice

$$a \cap (b \cup c) = (a \cap b) \cup (a \cap c)$$
$$a \cup (b \cap c) = (a \cup b) \cap (a \cup c)$$

Modular lattice

$$(a \cap b) \cup (a \cap c) = a \cap (b \cup (a \cap c))$$

Classical logic is an orthocomplemented modular lattice

Weak modular lattice

- There exists an element d such that

$$a \subset c \Leftrightarrow (a \cup b) \cap c = a \cup (b \cap c) \cup (d \cap c)$$

- where d obeys:

$$(a \cup b) \cap d = d$$

$$a \cap d = n \qquad b \cap d = n$$

$$[(a \subset g) \text{ and } (b \subset g) \Leftrightarrow d \subset g$$

Atoms

- In an atomic lattice

$$\exists_{p \in L} \forall_{x \in L} \{x \subset p \Rightarrow x = n\}$$

$$\forall_{a \in L} \forall_{x \in L} \{(a < x < a \cap p) \Rightarrow (x = a \; or \; x = a \cap p)\}$$

p is an atom

Logics

- Classical logic has the structure of an orthocomplemented distributive modular and atomic lattice.
- Quantum logic has the structure of an orthocomplented weakly modular and atomic lattice.
- Also called orthomodular lattice.

Hilbert space

- The set of closed subspaces of an infinite dimensional separable Hilbert space forms an orthomodular lattice
- Is lattice isomorphic to quantum logic

Hilbert logic

- Add linear propositions
  - Linear combinations of atomic propositions
- Add relational coupling measure
  - Equivalent to inner product of Hilbert space
- Close subsets with respect to realational coupling measure

- Propositions ⇔ subspaces
- Linear propositions ⇔ Hilbert vectors

Superposition principle

Linear combinations of linear propositions are again linear propositions that belong to the same Hilbert logic system

Isomorphism

- Lattice isomorhic
  - Propositions ⇔ closed subspaces
- Topological isomorphic
  - Linear atoms ⇔ Hilbert base vectors

The Higgs mechanism

The HBM has its own solution

http://www.youtube.com/watch?v=JqNg819PiZY

Higgs mechanism

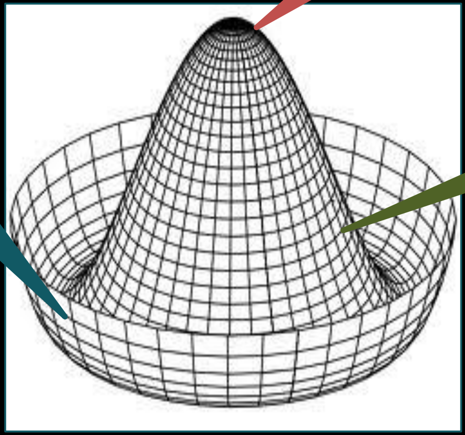
Complex number based
QP

Energy V(ψ)

Goldstone boson at bottom

Higgs boson at wall

Wave function



$\psi(\rho, \theta) = \rho(f)\, e^{i\theta}$

$\partial_\mu \psi = (\partial_\mu \rho + i\rho\partial_\mu \theta)e^{i\theta}$

$\mathcal{L} = \partial_\mu \psi \partial_\mu \psi^*$

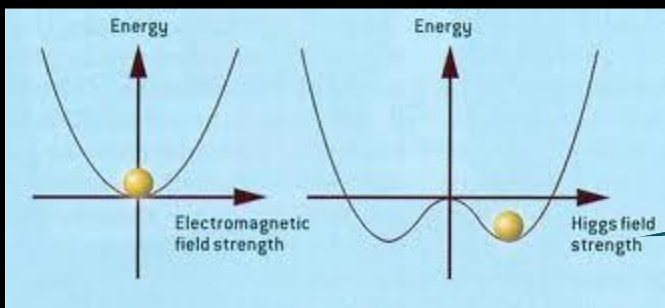
Lagrangian

$\longrightarrow \psi$

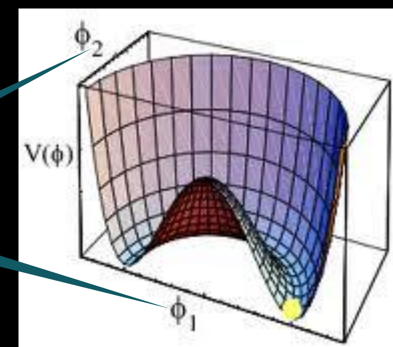
$$\mathcal{L} = (\partial_\mu \rho)^2 + i\partial_\mu \theta\,[\rho\partial_\mu \rho^* - \rho^* \partial_\mu \rho] + \rho^2(\partial_\mu \theta)^2$$

Thus, $e^{i\theta}$ is no symmetry!

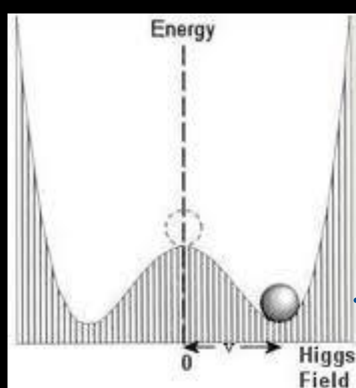
Higgs mechanism⇔HBM



Two fields



Qpattern pair



$$\nabla\psi^{x} = m\,\psi^{y}$$

Coupling equation

Mexican hat fields graph

Particle oscillates between fields at lowest energy

Gauge transformation

Covariant derivative

$$D_\mu\psi = \partial_\mu\psi - i\,A_\mu\psi$$

$$= (\partial_\mu\theta + A_\mu)i\rho e^{i\theta}$$

$$A'_\mu = \partial_\mu\theta + A_\mu$$

The new Lagrangian is

$$\mathcal{L} = D_\mu\psi D_\mu\psi^* = f^2(\partial_\mu\theta + A_\mu)^2 = f^2{A'_\mu}^2$$

θ is replaced by a new field A'_μ

The factor f represents mass