

AGPhil 1: Foundations of Physics I

Time: Monday 14:30–16:30

Location: HS XVII

AGPhil 1.1 Mon 14:30 HS XVII

Gravity and the bag model — ●HRISTU CULETU — Ovidius University, Constanta, Romania

The bag model from nuclear physics is used to show that, on the grounds of some gravitational arguments, a proton seems to behave like a microscopic black hole, with de Sitter spacetime as the inner geometry and a regular Schwarzschild spacetime outside it [1].

The basic idea is to assume that, for masses m smaller than the Planck mass, the Newton constant G may be given by $G_s = \hbar/m^2$, where m is the mass of the physical system under consideration, s subscript means 'strong', c is the velocity of light and \hbar stays for the Planck constant.

If m represents the Higgs mass $m_H \approx 125\text{GeV}/c^2$, we get $G_s = \hbar/m_H^2 = 10^{27}$ in CGS units, the same value obtained by Onofrio [2], who considers weak interactions as short distance manifestation of gravity.

1.H. Culetu, , Int. J. Theor. Phys. 54, 2855 (2015). 2.R. Onofrio, Mod. Phys. Lett. A 28, 1350022 (2013).

AGPhil 1.2 Mon 15:00 HS XVII

Is quantum mechanics real or complex? — ●SHU-DI YANG — 322-6 Oroshi, Toki, Gifu 509-5202

It has been long debated whether quantum mechanics is real or complex. Local experiments have been carried out confirming the complex nature of quantum mechanics in the standard formalism. Nevertheless, recent theoretical work demonstrated that in a closed universe, quantum mechanics is real. We discuss the philosophical implications of whether quantum mechanics is real or complex.

AGPhil 1.3 Mon 15:30 HS XVII

It from Knit — ●TIM GOUGH — Unaffiliated - Studio F Whitacre Mews Stannary Street London SE11 4AB UK

This paper will present a coherent philosophical position regarding the foundations of quantum physics with the following characteristics: **In line with the intuitionistic maths of Gisin, that physical reality is indeterminate, that time is real (no block universe), and therefore that something new (unpredictable from the past) happens quite often **In line with Rovelli's relational quantum mechanics, that the founda-

tions of reality are relational, not material **In line with Ladyman, that every thing must go **In line with Simondon, that physical reality is transductive (in his meaning of the word: a relation where the terms of the relation do not pre-exist that relation) **In line with Derrida, that at the foundation we find différance **In line with Deleuze, that the main question philosophy asks is: how is the production of the new possible? **That, in line with general systems theory, every thing is systemic, quantum theory being a (rich and extreme) subset of systems-oriented thought **That ontology is flat and immanent, but nonetheless not materialist **That maths is unreasonably effective **That the hard problem of consciousness disappears **That material stuff is an emergent property of relations

Not it from bit but it from knit.

AGPhil 1.4 Mon 16:00 HS XVII

Compositeness and spatial extension of fundamental particles justified by introducing a dual space concept — ●HANS-DIETER HERRMANN — Berlin

The assumption that organisms consist of cells and molecules consist of atoms is not analogously applicable to fundamental particles. Compositeness of leptons and quarks in space-time is excluded by experiment. We propose a dual space concept in particle physics, which complements space-time by an extra space, fixed to an individual particle as an 'eigenspace'. The eigenspace of a particle resembles the space spanned by body-fixed coordinates of a satellite, a drone or a spinning top. The body-fixed coordinates complement the lab-fixed or earth-fixed coordinates of a moving object, which define the common space-time. The twofold existence of natural systems in two spaces is investigated at different levels of reality. At the level of subatomic particles we identify space-time as the 'common space', however the 'eigenspace' of fundamental particles is missing. An inaccessible cylindrical 'eigenspace' is proposed where fundamental particles appear composited and spatially extended. Intrinsic properties of a particle such as invariant energy, spin, and magnetic moment have its origin in the eigenspace. The consequences of the dual space concept for the cosmic inflation and the nature of dark matter are discussed. A conjecture on the emergence of space-time caused by the emergence of fundamental particles from sub-particles is developed.