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the 'New Physics beyond the Standard Model'
in Scientific American, June 2003.

Dear Editors,

with great interest I have read the paper by Gordon Kane. Some of his remarks on the limits of the standard model and on effective theories have inspired me to write the little contribution attached, which you may find to be of interest to your readership.

With kind regards yours,

Michael Schmiechen.

Attachment: The Missing Link: Classical Mechanics

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The Missing Link: Classical Mechanics

by Michael Schmiechen, Berlin

The fun of Discworld is to explore all its implications.
Terry Prachett.

The paper by Kane repeats the well known fact that up to now neither gravitation physicists nor particle physicists have an idea how a theory of gravitation might look like. And, as has been pointed out by the present author two years ago in a short paper on the nature and mechanism of gravitation, this situation will not change unless theoretical physicists re-discover and understand their common roots, the missing link between their theories: classical mechanics. Although classical mechanics is the proto-mechanics of relativistic and quantum mechanics its exposition in all textbooks on theoretical physics inspected by the present author is felt to be completely inadequate.

An adequate conceptual framework for the purpose at hand is provided by Cauchy's universal momentum balance for classical continua. The basic concepts are the vectorial field of velocity, the scalar field of mass density, the tensorial field of diffusive momentum flux, alias mechanical stress field, and the vectorial field of mass specific momentum production, alias mechanical force field. *All these fields are probabilistic concepts*, the local values of which are defined and identified only over finite control volumes. In this simple model there are no mechanical stress fields and no mechanical force fields outside bodies of classical matter. Neither mechanical stress fields nor mechanical force fields in empty space can be proved to exist and nobody has ever seriously believed in their existence. According to d'Alembert's principle and Einstein principle of local equivalence physical momentum productions take place only in reaction to motion constraints, i. e. mechanical stresses.

While mechanical stresses are due to the molecular structure of matter macroscopic 'body forces' have long been known to be due to the nucleonic structure of classical matter, nucleons also being called baryons for that reason. They contain all the mass in which the momentum production takes place. The cause, the driving field of the momentum production is the gradient field of the mass potential, considered as a physical entity interacting with its singularities suspended in the nucleons. Exactly this physical interaction of the singularities with the whole universe, with Einstein's curved space, the 'reference molusk', and with Weyl's 'aether, merely the powerless transmitter of effects', is at the core of inertia and gravity.

The development up to this point implies that classical matter reacts with a 'universal' rate of mass-specific momentum production on unit gradients of the mass potential. This rate, traditionally called the gravitational constant and denoted by G, is a material property of the nucleons, and of their internal structure. The simplest aggregate mechanical, as it must be, low frequency (low energy) asymptotic model of this structure in accordance with Einstein's principle of local equivalence and with the basic level of the standard particle model, quarks of mass density ρ_S suspended in gluons, is an aggregate spring-mass system of circular eigenfrequency ω_N. In terms of this model the gravitation constant is simply

$$G = \omega_N^2 / \rho_S ,$$

suggesting that it might be possible to calculate its value from known data of the standard model.

But as has been pointed out by the present author it may be impossible to perform this exercise with the precision of interest. Correspondingly the phenomenological parameters of stress laws, the so called constitutive laws of materials, can be derived from molecular data only in very rare cases. Much more serious is the suspicion that the standard particle model may not include the relevant data. If we want to study the low energy asymptotic behavior of nucleons we should not destroy them in high energy collisions. This is like smashing window panes in order to establish their properties or, even worse, killing beasts in search of their souls.

The model developed combines all the bits and pieces of our current knowledge in one coherent, intellectually satisfying context. The undertaking may look old-fashioned, but has a sound theoretical basis in the best traditions of classical mechanics including Einstein's and Weyl's contributions and carefully tries to avoid classical superstition and fashionable speculation. In a way the model is as naive as Bohr's first model of the structure of atoms, but may be the starting point for the detailed solution of one of the problems pending since human beings started pondering the world they live in.

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