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Seminar Room 0.03, Institut für Theoretische Physik

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Space - Time - Matter: Finite Projective Geometry as a Quantum World with Elementary Particles

A unified theory for space-time and matter might be based on finite projective geometries instead of differentiable manifolds and fields. Each point of the world is equipped with a quadratic form over a finite Galois field which define neighbors in the finite set of points. Due to the projective equivalence of all quadratic forms this world is necessarily a 4-dimensional, locally Lorentz-covariant space-time with a gauge symmetry G(3)xG(2)xG(1) for internal points which represent elementary particle degrees of freedom. Thus, matter appears as a geometric distortion of an inhomogeneous field of quadrics and all physical properties (spins, charges) of the standard model seem to follow from its finite geometric structure in a continuum limit. The finiteness inevitably induces a fermionic quantization of all matter fields and a bosonic for gauge fields. The main difference to Einstein's general theory of relativity is the use of finite fields instead of real numbers to parametrize points of events.