Title:	Trace Dynamics, Octonions and Unification
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Abstract:	The transition from a Classical system to quantum mechanics is done by raising clas- sical variables to the status of operators, raising questions about the origin of canonical quantization. This is a review of a deeper underlying dynamics, known as Trace Dynamics, which is a matrix-valued Lagrangian dynamics, where quantum phenomenon emerge from statistical mechanics of matrix models is used to develop a pre-quantum pre-spacetime the- ory that does not depend on classical time. The ingredients for constructing such a theory, which is also a unification of the Standard Model and Gravitation, are Trace dynamics, the spectral action principle of non-commutative geometry, Octonions as a coordinate sys- tem, and Clifford algebra ideas for elementary particle representation, a Lagrangian with e 8 □ e 8 symmetry. The branching e 8 □ e 8 is proposed in such a way that it represents all fermionic and bosonic degrees of the Standard Model, and the SM symmetries along with a pre-gravitation gauge group are naturally present in this group. The root diagram anal- ysis of the exception lie groups shows a magic star structure that acts as a unifying tool for exceptional lie groups. This might be helpful in defining interactions in the octonionic theory.
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