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Autore	Adler Stephen L
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Nota di contenuto	The quantum measurement problem -- Reinterpretations of quantum mechanical foundations -- Motivations for believing that quantum mechanics is incomplete -- Brief historical remarks on trace dynamics -- Trace dynamics: the classical Lagrangian and Hamiltonian dynamics of matrix models -- Bosonic and fermionic matrices and the cyclic trace identities -- Derivative of a trace with respect on an operator -- Lagrangian and Hamiltonian dynamics of matrix models -- The generalized Poisson bracket, its properties, and applications -- Trace dynamics contrasted with unitary Heisenberg picture dynamics -- Additional generic conserved quantities -- The trace "fermion number" N -- The conserved operator C -- Conserved quantities for continuum spacetime theories -- An illustrative example: a Dirac fermion coupled

to a scalar Klein-Gordon field -- Symmetries of conserved quantities under p[subscript F left and right arrow] q[subscript F] -- Trace dynamics models with global supersymmetry -- The Wess-Zumino model -- The supersymmetric Yang-Mills model -- The matrix model for M theory -- Superspace considerations and remarks -- Statistical mechanics of matrix models -- The Liouville theorem -- The canonical ensemble -- The microcanonical ensemble -- Gauge fixing in the partition function -- Reduction of the Hilbert space modulo i[subscript eff] -- Global unitary fixing -- The emergence of quantum field dynamics -- The general Ward identity -- Variation of the source terms -- Approximations/assumptions leading to the emergence of quantum theory.

Sommario/riassunto

Quantum mechanics is our most successful physical theory. However, it raises conceptual issues that have perplexed physicists and philosophers of science for decades. This 2004 book develops an approach, based on the proposal that quantum theory is not a complete, final theory, but is in fact an emergent phenomenon arising from a deeper level of dynamics. The dynamics at this deeper level are taken to be an extension of classical dynamics to non-commuting matrix variables, with cyclic permutation inside a trace used as the basic calculational tool. With plausible assumptions, quantum theory is shown to emerge as the statistical thermodynamics of this underlying theory, with the canonical commutation/anticommutation relations derived from a generalized equipartition theorem. Brownian motion corrections to this thermodynamics are argued to lead to state vector reduction and to the probabilistic interpretation of quantum theory, making contact with phenomenological proposals for stochastic modifications to Schrodinger dynamics.