

25<sup>e</sup> Congrès Général  
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de Physique 



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## SP4: Functional renormalization: from quantum gravity and cosmology to superconducting solids - Prix Gentner-Kastler

*mardi 9 juillet 2019 11:30 (30 minutes)*

Séance “grand prix” / Prix Gentner-Kastler

At a given length scale the laws of physics are encoded in an effective action, a type of generalised Landau theory. Functional renormalisation relates the effective action at different length scales. It acts like a theoretical microscope with variable resolution and permits to follow continuously how macroscopic laws emerge from more fundamental microscopic laws. The wide applications in different areas of physics are demonstrated by examples: Quantum gravity is formulated as a non-perturbatively renormalisable quantum field theory, and we discuss the resulting prediction for the mass of the Higgs boson. Scale symmetry related to a fixed point in the renormalisation-flow explains the approximate scale invariance of the primordial fluctuation spectrum of cosmic structures. Its spontaneous breaking leads to dynamical dark energy. From the microscopic formulation of the Hubbard model for correlated electrons emerges at long distances an effective action for spin waves and superconducting order parameters.

### Choix de session parallèle

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