DEPARTMENT OF
PHYSICS &
ASTRONOMY

Physics & Astronomy
Colloquium

Prof. Djordje Minic

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(Host: Prof. Dima Bolmatov)

3:30 - 4:30 p.m. | Tuesday, March 31, 2026

Rm: ESB I 120

Title: The Weight of the Quantum

Abstract: Spacetime, as it is currently known in physics, is a classical concept, and our deepest theory of spacetime physics, general relativity, the classical relativistic theory of gravity, is a background independent theory of a dynamical spacetime geometry. Quantum theory, on the other hand, is the deepest theory we have of matter degrees of freedom, and it is currently formulated in a classical spacetime, as an intrinsically probabilistic, contextual theory of non-classical, interfering probabilities, with a fixed rule for computing those probabilities, called the Born rule. I will argue that the quantum nature of spacetime, which apart from classical spacetime also includes a dual spacetime that does not commute with classical spacetime, is the reason behind an intrinsically probabilistic and contextual nature of quantum theory, with the fixed Born rule. So, quantum theory teaches us something new about spacetime! This insight is important for all applications of quantum theory. In the context of quantum gravity, quantum theory is gravitized into a background independent structure with dynamical and contextual quantum probabilities. This proposal (quantum gravity = gravitized quantum theory) can be checked experimentally by looking for intrinsic triple interference (which is identically zero in quantum theory, as implied by the Born rule) in the context of massive quantum probes. I will also discuss an explicit realization of such a gravitized quantum theory as well as its empirical implications for the observed vacuum energy and the masses of elementary particles. Finally, I will argue that these lessons about quantum probabilities (and their generalizations) can be applied in the context of complex adaptive (for example, living) systems.