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Relational dynamics in group field theory with the Page-Wootters formalism

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A common criticism to deparametrised quantum gravity formalisms, where a time variable is selected before quantisation, is that covariance seems to be lost. In this talk, I will resolve this concern for the group field theory (GFT) approach to quantum gravity thanks to the equivalence between the Dirac quantisation scheme and the Page-Wootters (PW) formalism — applied here to quantum gravity for the first time. By defining cosmological Dirac observables that evolve with respect to a dynamical clock, which is an internal *quantum* degree of freedom, I will show that the relational dynamics emerging from this "post-quantum time" framework coincide with the classical deparametrisation procedure of GFT cosmology, proving that quantisation and the choice of the clock commute. I will finally comment on the interpretation that the PW formalism suggests in terms of "synchronised" quantum geometry states. This construction works for any number of group field modes, and can generalise the PW formalism to the multi-fingered time scenario, typical of systems with multiple Hamiltonian constraints.

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