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Neutrino flavor evolution in dense environments and the r-process

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In the last two decades atmospheric, solar, reactor and accelerator experiments have precisely measured neutrino squared mass differences and mixings, responsible for neutrino vacuum oscillations. An intense experimental program will keep addressing unknown neutrino properties including neutrino mass ordering and mass scale, the neutrino nature, the existence of sterile neutrinos, of CP violation and also non-standard interactions.

Neutrinos play an important role in astrophysics. Beyond the established Mikheev-Smirnov-Wolfenstein effect, novel neutrino flavor mechanisms are uncovered in particular in dense environments such as core-collapse supernovae and binary compact mergers remnants, where elements heavier than iron can be synthetised through the r-process. In this talk, I will highlight the importance of flavor evolution in dense media, in connection with future observations and with GW170817. I will also stress the interplay with non-standard physics.

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