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Protoneutron star dynamos and magnetar formation

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Magnetars are isolated young neutron stars that exhibit the most intense magnetic fields known in the Universe and are characterized by a wide variety of high-energy emissions. The birth of rapidly rotating magnetars is also a promising scenario to power outstanding explosive transients. The formation process of these objects, as well as the origin of their ultra-strong magnetic fields, remains an open question, but the amplification of magnetic fields by MHD instabilities inside protoneutron stars seems inevitable. I will review the different dynamo scenarios that can explain magnetar formation, focusing on recent progress achieved with 3D-MHD HPC simulations, and discuss them in light of various observational constraints.

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