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ICTS Astrophysics & Relativity Seminar

- Title** : GRMHD Simulations of Accreting Proto-Magnetars: Implications for Gamma-Ray Burst Jets, Energetic Explosions, and r-process Nucleosynthesis
- Speaker** : Tejas Prasanna (Columbia University)
- Date** : Thursday, 03 September 2026
- Time** : 03:30 PM (IST)
- Abstract** : We present axisymmetric GRMHD simulations of hyperaccretion onto rapidly rotating proto-magnetars, including a physical equation of state and charged-current weak interactions. Accretion opens additional magnetic flux, producing relativistic jet powers that exceed isolated dipole spin-down estimates by factors of ~ 10 . Accretion models show strong jet variability driven by plasmoid eruptions and intermittent magnetospheric accretion. Stronger neutron star magnetic fields progressively suppress accretion and redirect a larger fraction of the inflowing material into unbound outflows, even when the magnetosphere remains strongly compressed by the disk. Once the field is strong enough to produce magnetic channeling or centrifugal acceleration, the mass loss is enhanced further. Nuclear reaction network calculations show that these magnetically driven outflows can synthesize the full range of r-process nuclei, including the heaviest elements. Accreting proto-magnetars may therefore power GRBs, GRB-supernovae, and be important heavy r-process sources.
- Venue** : Feynman Lecture Hall
Zoom Meeting: <https://icts-res-in.zoom.us/j/96644050706?pwd=1u7dJtmim1QT8JiK1lb3cxn4S7X0q9.1>
Meeting ID: 966 4405 0706
Passcode: 030304