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## Electron-molecule collisions in harsh astronomical environments

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In the most energetic regions of space (shocks, photodissociation regions, comets, etc.), the electron fraction,  $x_e$ , can increase by several orders of magnitude. When  $x_e$  exceeds about  $10^{-5}$ , free electrons can compete or even dominate over neutrals in the collisional excitation of molecules. Recent theoretical studies, based on the UK molecular R-matrix method, have revisited the electron-impact excitation of many interstellar molecules. The accuracy of the calculations has been checked against storage ring experiments. We compare in this talk theoretical and experimental cross sections for the two benchmark species  $\text{HD}^+$  and  $\text{H}_2\text{O}$ . We also discuss the importance of electrons as a possible source of rotational (de)excitation in dissociative recombination. Finally, we will present the first observational results suggesting an electron density enhancement within the magnetic precursor of C-shocks.

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**Classification de Session:** Impact of cosmic rays over chemistry and climate