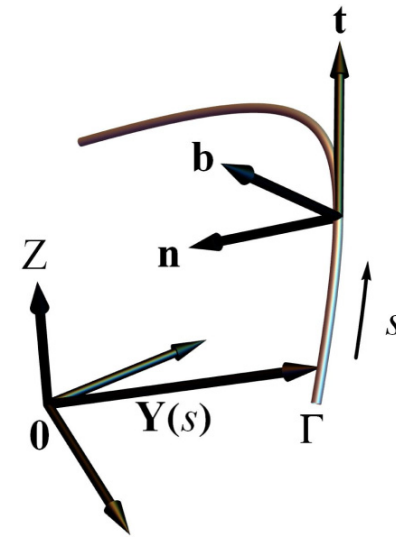


# Paramagnetic filaments in a fast precessing field: Planar versus helical conformations

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In this paper, we have shown how the competition of the elasticity and magnetic properties of paramagnetic filaments can determine their behavior. In particular, by controlling the precession angle, filaments lying on plane may behave as if they were pushed or pulled in the direction orthogonal to the precession axis, tending to get as close or as far as possible to or from the precession axis by changing the magnitude of the magnetic field. We found that ground states for planar curves and helices correspond to filaments developing one undulation and one period respectively. Moreover, a stability analysis in the perturbative regime indicated that the planar ground state is the only stable state.



*Fig. 1. The filament is described by a space curve :  $s \rightarrow \mathbf{Y}(s)$  parametrized by arc length  $s$ . The adapted FS basis is formed by the tangent vector  $\mathbf{t}$ , the principal normal  $\mathbf{n}$  and the binormal  $\mathbf{b}$ .*