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Taut foliations, contact structures and left-orderable 3-manifold groups

Let M be an irreducible $\mathbb{Q}$-homology sphere (i.e. $H_*(M, \mathbb{Q}) \cong H_*(S^3, \mathbb{Q})$). The L-space conjecture suggests the following statements are equivalent: a) $\pi_1(M)$ is left-orderable; b) M admits a co-orientable taut foliation; c) M is not a Heegaard Floer L-space. The implication from b) to c) was established and was proven by utilizing a contact structure that is close to a taut foliation.

In this talk, we discuss how contact structures could also play a role in studying the interconnection between the left-orderability of $\pi_1(M)$ and the existence of co-orientable taut foliations on M. Following this idea, we confirm the L-space conjecture for cyclic branched covers of families of hyperbolic knots. An important concept occurs in our argument is Fractional Dehn twist coefficients of mapping classes.

This is joint work with Steve Boyer.