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Non-trivial actions on Floer homology

Given a finite order orientation-preserving diffeomorphism $\tau \colon Y^3 \to Y^3$ of an integer homology sphere Y^3, it is an interesting and difficult general problem to understand the effect of the induced map on instanton Floer homology. In this talk, we consider odd-order diffeomorphisms of integer homology sphere and their induced effect on $\mathrm{SU}(2)$-character varieties and Floer homology. We are interested in cases where the resulting equivariant Casson invariant differs from the Casson and the consequences for finding non-trivial actions on Floer homology. This provides the first examples of non-trivial odd-order actions on the Floer homology of irreducible homology spheres. We shall also see how this can be related to the existence of incompressible surfaces in the 3-manifold Y^3.