

On homological representations of mapping class groups

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Abstract.

The *Lawrence-Bigelow representations* of the braid groups are important in the study of these groups, as well as their connections with quantum invariants of links. They are defined homologically, and come in various different flavours, depending on the type of homology theory used, whether we take homology relative to part of the boundary, and whether we consider twisted homology or instead the homology of an associated covering space.

First, based on joint work with Cristina Anghel ([arxiv:2011.02388](https://arxiv.org/abs/2011.02388)), I will explain the fundamental relationships (non-degenerate pairings, embeddings and isomorphisms) between these different flavours of the Lawrence-Bigelow representations of the braid groups, in a setting that applies also to homological representations of mapping class groups of surfaces more generally.

Second, based on joint work with Christian Blanchet and Awais Shaukat ([arxiv:2109.00515](https://arxiv.org/abs/2109.00515)), I will describe a new construction of homological representations of mapping class groups of surfaces $\Sigma_{g,1}$, depending on a choice of representation V of the discrete Heisenberg group $\mathcal{H}(\Sigma_{g,1})$. These are twisted representations, but they induce untwisted representations of a \mathbb{Z} -central extension of the Torelli group, and, when V is the Schrödinger representation, of a double covering of the full mapping class group.