Mapping class group representations via Heisenberg homology

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Abstract.

One of the earliest interesting representations of the braid groups is the *Burau representation*. It is the $n = 1$ case of the family of *Lawrence representations*, defined topologically by thinking of the braid group as the mapping class group of the punctured disc, which acts naturally on the homology of certain infinite coverings of the n-point configuration space on the punctured disc. Famously, the Burau representation is almost never faithful, but the $n = 2$ Lawrence representation is always faithful.

I will describe an analogue of the Lawrence representations for mapping class groups of compact orientable surfaces Σ, associated to any given representation V of the discrete Heisenberg group $\mathcal{H} = \mathcal{H}(\Sigma)$. These are twisted representations of the mapping class group $\mathfrak{M}(\Sigma)$, but they may be untwisted on the Torelli group by passing to a $\mathbb{Z}$-central extension. Moreover, when V is the Schrödinger representation of $\mathcal{H}$, they may be untwisted on the full mapping class group $\mathfrak{M}(\Sigma)$ by passing to a double covering.

This represents joint work with Christian Blanchet and Awais Shaukat.