Representations of the Torelli group via the Heisenberg group

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Abstract.

One of the earliest interesting representations of the braid groups is the *Burau representation*. It is the $k = 1$ 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 k-point configuration space on the punctured disc. Famously, the Burau representation is almost never faithful, but the $k = 2$ Lawrence representation is always faithful.

I will describe recent joint work with C. Blanchet and A. Shaukat, where we construct analogues of the Lawrence representations for the Torelli groups of orientable surfaces. A notable feature of our construction is that the ground ring over which the representations are defined is *non-commutative* – it is the group-ring of a certain discrete Heisenberg group. This is important since any commutative analogue for the Torelli groups necessarily loses a lot of information (in a precise sense that I will explain).