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Hopf-cyclic coefficients for a Hopf algebra in a rigid braided category.

A classical anti-Yetter-Drinfeld module for a Hopf algebra H was defined by Hajac-Khalkhali-Rangipour-Sommerhauser as a module and a comodule over H such that the two structures are compatible in a specific sense. These objects serve as necessary coefficients for cyclic cohomology theories of H-equivariant algebras.

If $\mathcal{B}$ is a braided category then there is a notion of a Hopf algebra H in $\mathcal{B}$. A braided version of anti-Yetter-Drinfeld modules has been considered by Khalkhali-Pourkia, and more recently by Bartulovic. These approaches generalize the classical definition, and are successful to the point of 1-dimensional coefficients (modular pairs in involution) for a balanced braided $\mathcal{B}$.

On the other hand, the classical definition has been variously generalized, and in particular, it is now possible to talk about anti-Yetter-Drinfeld modules for a monoidal category. Note that H-modules in $\mathcal{B}$ form a monoidal category $\mathcal{C}$. We will describe anti-Yetter-Drinfeld modules for $\mathcal{C}$ as modules and comodules (compatibly) over H, but not, as one would guess, in $\mathcal{B}$. Instead, one needs to replace $\mathcal{B}$ with anti-Yetter-Drinfeld modules for $\mathcal{B}$. This leads to an interesting decomposition result for the category of coefficients. The 1-dimensional coefficients for a balanced braided $\mathcal{B}$, mentioned above, form a part of this decomposition, when they exist.