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*Chain rules and operads in abelian functor calculus*

The abelian functor calculus of Johnson and McCarthy associates to a functor of abelian categories a sequence of "polynomial" approximations analogous to a Taylor series. Work of Bauer, Johnson, Osborne, Riehl, and Tebbe shows that in this setting, a directional derivative can be defined which yields a higher order chain rule. In ongoing work with Bauer and Johnson, we have found another chain rule, this time for the higher order differential. Using this chain rule, we define an operad structure on the derivatives of monads of  $R$ -modules, and more generally, find a monoidal structure for the derivatives of functors of abelian categories. We expect this to lead to classifications of homogeneous and polynomial functors of abelian categories.