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**Brenda Johnson\*** ([johnsonb@union.edu](mailto:johnsonb@union.edu)), Department of Mathematics, Union College,  
Schenectady, NY 12308. *Models for Taylor Polynomials of Functors.*

Let  $C$  and  $D$  be simplicial model categories. Let  $f : A \rightarrow B$  be a fixed morphism in  $C$  and  $C_f$  be the category whose objects are pairs of morphisms  $A \rightarrow X \rightarrow B$  in  $C$  that factor  $f$ . Using a generalization of Eilenberg and Mac Lane's notion of cross effect functors (originally defined for functors of abelian categories) to functors from  $C_f$  to  $D$ , we produce a tower of functors,  $\cdots \rightarrow \Gamma_n^f F \rightarrow \Gamma_{n-1}^f F \rightarrow \cdots \rightarrow \Gamma_0^f F$ , that acts like a Taylor series for the functor  $F$ . We compare this to the Taylor tower for  $F$  produced by Tom Goodwillie's calculus of homotopy functors, and establish conditions under which they agree. We use these constructions to show that two potential methods for defining an analogue of de Rham cohomology for  $E_\infty$ -algebras are equivalent. This is joint work with Kristine Bauer, Rosona Eldred, and Randy McCarthy. (Received June 28, 2011)