The algebra of tertiary cohomology operations

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Abstract: The Adams spectral sequence computes homotopy classes of maps between spectra starting from cohomological information. The E_2 term is given by Ext groups over the Steenrod algebra, the algebra of primary cohomology operations. The E_3 term can be described as secondary Ext groups, over the "algebra" of secondary cohomology operations, a structure which is more complicated than an algebra. H.J. Baues showed that this algebraic structure can be replaced by a DG-algebra over the ring Z/p^2. This was used with M. Jibladze to compute the Adams differential d_2.

In an ongoing program with H.J. Baues, we are aiming to prove an analogous structural result for tertiary cohomology operations: that they can be encoded by a DG-algebra. In this talk, I will describe the project, some known results, and some recent developments.