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**Stefan Forcey\*** (sf34@uakron.edu), **Aaron Lauve** and **Frank Sottile**. *Composing species and composing coalgebras*.

We develop the notion of the composition of two coalgebras, which arises naturally in higher category theory and the theory of species. We prove that the composition of two cofree coalgebras is cofree and give conditions which imply that the composition is a one-sided Hopf algebra. These conditions hold when one coalgebra is a graded Hopf operad  $\mathcal{D}$  and the other is a connected graded coalgebra with coalgebra map to  $\mathcal{D}$ . We conclude with examples of these structures, where the factor coalgebras have bases indexed by the vertices of multiplihedra, composihedra, and hypercubes. (Received June 28, 2011)