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**Aaron N. Brookner\*** (brookner@math.berkeley.edu). *On the Problem of Extension of Coalgebras to Bialgebras.*

Over a fixed base-field  $k$ , a bialgebra is a vector space which is an algebra, a coalgebra, and which satisfies some compatibility axioms. We present a sequence of coalgebras, all defined over the integers (as [co-]modules). And now varying  $k$ , we find the question of whether a coalgebra admits a bialgebra structure, and whether uniquely (even up to isomorphism), depends interestingly yet elementarily on the characteristic and algebraicity of  $k$ . We interpret one of the results both as a statement about trigonometry, and as a Morita equivalence between comodule categories. Finally we discuss ongoing work, involving the reinterpretation of the above results from an algebra-geometric perspective, and a new example of a bialgebra(-object) based on elementary trigonometry. (Received February 16, 2020)