Bryant-Salamon G_2 manifolds and coassociative fibrations

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Abstract: I will discuss joint work with Jason Lotay (arXiv:2002.06444). We show how the three Bryant-Salamon G_2 manifolds can be viewed as coassociative fibrations. In all cases the coassociative fibres are invariant under a 3-dimensional group and are thus of cohomogeneity one, In general there are both generic smooth fibres and degenerate singular fibres. The induced Riemannian geometry on the fibres turns out to exhibit asymptotically conical and conically singular behaviour. In some cases we also explicitly determine the induced hypersymplectic structure. In all three cases we show that the "flat limits" of these coassociative fibrations are well-known calibrated fibrations of Euclidean space. Finally, we establish connections with the multimoment maps of Madsen-Swann, the new compact construction of G_2 manifolds of Joyce-Karigiannis, and recent work of Donaldson involving vanishing cycles and "thimbles".