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## Flows of $G_2$ structures

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### **Abstract**

A  $G_2$  structure is given by a certain non-degenerate 3-form on a 7-dimensional manifold. The 3-form determines a Riemannian metric in a highly non-linear way, and when the 3-form is parallel with respect to its induced metric, the metric has  $G_2$  holonomy. I will discuss flows of such  $G_2$  structures, and show how they are more non-linear than flows of metrics such as the Ricci flow. My considering a general flow, I derive new Bianchi-type identities in  $G_2$  geometry which lead to new simple proofs of several known results. I will also briefly discuss some candidates for specific flows that I am currently studying in collaboration with S. T. Yau.