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Sema Salur* (salur@math.rochester.edu), Department of Mathematics, University of Rochester, Rochester, NY 14627. *Geometric Structures on Manifolds with Special Holonomy*. Preliminary report.

A 7-dimensional Riemannian manifold (M, g) is called a G_2 manifold if the holonomy group of its Levi-Civita connection of g lies inside of $G_2 \subset SO(7)$. Equivalently, a G_2 manifold is a 7-dimensional Riemannian manifold with a vector cross product \times on its tangent bundle, and a harmonic 3-form $\varphi \in \Omega^3(M)$ such that

$$\varphi(u, v, w) = g(u \times v, w)$$

G_2 manifolds have many applications in differential geometry and physics, and it is a very active area of research. One major problem in the field is a lack of an existence theorem that gives necessary and sufficient conditions for a 7-dimensional manifold to admit a G_2 metric. In this talk we give a report of recent research on this existence problem. (Received September 07, 2019)