Question List

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This is an evolving list of questions whose answer I do not know. If you (and/or your AI model) discover an answer, I would love to hear it. The difficulty of these questions probably ranges considerably.

Special Holonomy

H1. Classify the complete, simply-connected Calabi-Yau 3-folds (X^6, g_X) having $\mathrm{Hol}(g_X) = \mathrm{SU}(3)$ that are cohomogeneity-one under the action of a compact connected Lie group.

H2. Construct a compact G_2-manifold (X^7, g_X) containing an embedded, conformally flat associative 3-sphere.

H3. Construct a complete G_2-manifold (X^7, g_X) with $\mathrm{Hol}(g_X) = \mathrm{G}_2$ such that X contains an embedded, conformally flat associative 3-sphere (S^3, g_S), where g_S is not the round metric.

Calibrated Geometry

C1. Can every noncompact orientable 3-manifold be embedded into $\mathbb{R}^6$ as a complete special Lagrangian? In particular:

- Is there a complete special Lagrangian in $\mathbb{R}^6$ diffeomorphic to $T^3 - \{\mathrm{pt}\}$?
- Is there a complete special Lagrangian in $\mathbb{R}^6$ diffeomorphic to the Whitehead manifold?

C2. If a conformally flat associative 3-fold in $\mathbb{R}^7$ does not lie in a 6-plane, must it be (an open subset of) the Boruvka cone? Or do other examples exist?

C3. Does there exist a conformally flat coassociative 4-fold in $\mathbb{R}^7$ other than (open subsets of) 4-planes and the Ejiri cone?