

Seminari de Geometria Algebraica 2015/2016 (UB-UPC)

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Open problems in Engel geometry

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Given a geometric structure, one can pose two natural questions. When does a manifold admit one such structure? In a fixed manifold, can those structures be classified? These questions have motivated the development of contact and symplectic topology for the last 40 years with incredible success.

Engel structures appeared first in the works of Cartan regarding distributions and they have proved to be quite mysterious. It was in Vogel's thesis, in 2004, that it was shown that any parallelizable 4-manifold admits an Engel structure. Since this condition is necessary, his work settled our first question, but his proof was very constructive and provided no insight on the classification problem. In a recent preprint we, Casals, Pérez, del Pino, and Presas, have given an alternative proof based on h-principle methods; the techniques introduced there can be used to provide some partial classification results.

In this talk, I will explain what an Engel structure is and I will give a flavour for the sort of questions one can ask about them. Some I will answer, but most have still a highly conjectural nature.
