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Geography problem for simply connected symplectic 4-manifolds

We will discuss the following *geography* problem: Given a pair of integers (a, b) , is there a simply connected minimal symplectic 4-dimensional manifold M such that the Euler characteristic of M is a , and the signature of M is b ? Here, we say that a symplectic 4-dimensional manifold is *minimal* if it is not diffeomorphic to a symplectic blow-up of some other symplectic 4-dimensional manifold. If we restrict our attention to *nonspin* 4-dimensional manifolds, then this problem has been completely solved in the case when the signature variable b is negative. We will discuss the remaining case when b is nonnegative, highlighting the speaker's recent joint works with his collaborators.