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Generalized complex geometry

Two of the most compelling subjects in mathematics are the study of algebraic geometry and the investigation of symplectic manifolds. Unlike Riemannian metrics, neither complex nor symplectic structures have any local invariants; nevertheless, the amount of complexity they contain globally is truly astounding. In the last thirty years, both fields have experienced a number of developments which point to deep relationships between the two apparently quite different structures. These have come from the study of integrable systems, quantization, pseudo-holomorphic curves, and, perhaps most significantly mirror symmetry of quantum field theories.

A different way in which the subjects are closely related was discovered by Hitchin in his groundbreaking work on geometric structures determined by differential forms of mixed degree. He found a new type of geometric structure which interpolates between symplectic and complex geometry and called it a generalized complex structure. I will describe the development of the subject over the past decade, how it has influenced other parts of mathematics and physics, and outline some of its major open problems.