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## The topology of symplectic manifolds

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**Abstract:** A topological structure is introduced that seems likely to provide a complete topological characterization of compact symplectic manifolds. The article begins with a leisurely introduction to symplectic manifolds from a topological viewpoint. It then focuses on Thurston's construction of a symplectic structure on the total space of a fiber bundle. This is generalized to a technique for putting a symplectic structure on the domain of a J-holomorphic map. A topological structure called a hyperpencil on a compact 2n-manifold is then defined; this is motivated by the special case of a linear system of curves on an algebraic manifold, and it generalizes the notion of a Lefschetz pencil on a 4-manifold (although the critical points of a hyperpencil can be much more complicated). A deformation class of hyperpencils determines an isotopy class of symplectic forms, via the above generalization of Thurston's construction. This correspondence seems to be essentially an inverse to the technique of Donaldson and Auroux for constructing linear systems on symplectic manifolds. The likely end result is that any symplectic form whose cohomology class is rational should be realized up to scale by a hyperpencil. This would topologically characterize symplectic manifolds as being those smooth manifolds admitting hyperpencils, and put a dense subset of all symplectic forms on a manifold (up to scale and isotopy) in bijective correspondence with the set of all hyperpencils on it modulo a suitable equivalence relation.

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