Vortex dynamics 150 years later

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Helmholtz's great paper of 1858 founded the field of vortex dynamics. The field is, thus, just about 150 years old and has by now taken on a life of its own. In particular, the various models of discrete vortices, stimulated in part by analytical convenience and in part by observations of close physical realizations in superfluids, have spawned a large literature. They give a "particle dynamics flavor" to many subjects in fluid mechanics that are otherwise treated exclusively by field theoretic approaches. While the discrete vortices used for modeling are not always terribly realistic from the point of view of real fluids, one can argue that they allow results to be obtained that could hardly be obtained in any other way. The talk will give examples of such insights and will highlight a number of problem areas that are currently of interest in the vortex dynamics community, including several that will be further elaborated in the presentations of the two sessions of invited papers for the minisymposium.