Will present some constructions of invariants for 3-dimensional volume-preserving vector fields under volume-preserving diffeomorphisms. The main such invariant is the helicity, which will be discussed. We then focus on invariants constructed using knot theory, following Arnol'd's strategy. Most invariants constructed in this way are actually in some sense proportional to helicity, but we will present one that is not, the trunkenness.
Another feature of 3-dimensional vector fields that we will be interested in is the existence of sections and Birkhoff sections. I will explain some aspects of Birkhoff sections and in particular the relation with the trunkenness.

These lectures are based in joint work with Pierre Dehornoy.