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Steve Shkoller* (shkoller@math.ucdavis.edu), Department of Mathematics, University of California at Davis, Davis, CA 95616. *Free-boundary problems for the incompressible and compressible Euler equations.*

We describe a new method for treating free boundary problems in perfect incompressible and compressible fluids, and prove local-in-time well-posedness in Sobolev spaces for the free-surface 3D Euler equations for arbitrary initial data, and without any irrotationality assumption on the fluid. This is a free boundary problem for the motion of a perfect liquid in vacuum, wherein the motion of the fluid interacts with the motion of the free-surface at highest-order. We will describe the geometry behind the a priori nonlinear estimates and the approximation schemes that must be developed in order to prove existence of solutions. This is joint work with D. Coutand and H. Lindblad. (Received February 12, 2008)