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Kohn localization in the quantum Hall regime RAFFAELE RESTA, University of Trieste, Italy — A two-dimensional electron fluid in the quantum Hall regime shows both quantized transverse conductivity and vanishing longitudinal conductivity: the latter property characterizes insulators. According to Kohn's theory of the insulating state, electron localization—defined in an appropriate sense—is the *cause* for the insulating behavior in any insulator. I show that a quantum Hall "insulator" is no exception; furthermore both quantization of the transverse conductivity and vanishing of the longitudinal one stem here from the same elegant formalism. Since 1999 onwards, the theory of the insulating state has been reformulated in term of a "localization tensor" which provides a measure of electron localization. This tensor is an intensive property, geometric in nature, having the dimensions of a squared length; it characterizes the ground wavefunction as a whole, *not* the individual states. It is finite in any insulator and divergent in any metal. A fluctuation-dissipation theorem relates this ground-state property to the system conductivity. So far, the theory has only addressed systems with time-reversal symmetry, in which case the localization tensor is real. I show that in absence of such symmetry the localization tensor is naturally endowed with an imaginary part, proportional to transverse dc conductivity, and quantized in two-dimensional systems. Therefore electron localization is the *common cause* for both vanishing of the dc conductivity and quantization of the transverse one in quantum Hall fluids.

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