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Magnetocapacitance and the physics of solid state interfaces[1]

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When Herbert Kroemer stated in his Nobel address [1] that "the interface is the device," he was implicitly acknowledging the importance of understanding the physics of interfaces. If interfaces are to have character traits, then "impedance" (or complex capacitance) would be a commonly used descriptor. In this talk I will discuss the use of magnetic fields to probe the "character" of a variety of interfaces including planar capacitor structures with magnetic electrodes, simple metal/semiconductor contacts (Schottky barriers) and the interface-dominated competition on microscopic length scales between ferromagnetic metallic and charge-ordered insulating phases in complex oxides. I will show that seeking experimental answers to surprisingly simple questions often leads to striking results that seriously challenge theoretical understanding. Perhaps Herbert Kroemer should have said, "the interface is the device with a magnetic personality that continually surprises."

[1] Herbert Kroemer, "Quasielectric fields and band offsets: teaching electron s new tricks," Nobel Lecture, December 8, 2000:

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