1075-35-46 **Houman Owhadi*** (owhadi@caltech.edu), Caltech MC 9-94, 1200 E California blvd, Pasadena, CA 91125. *From homogenization with non separated scales to discrete geometric structures in inverse homogenization.*

In the first part of this talk we show how homogenization theory and (localized) cell problems can be generalized to divergence form operators with arbitrary rough coefficients. This generalization does not rely on concepts of ergodicity, epsilon sequences or scale-separation but on the property that the solution space of these operators is compactly embedded in H^1 if source terms are in the unit ball of L^2 instead of the unit ball of H^{-1}. In the second part of this talk we show that homogenization can be written as the composition of a nonlinear bijection with a non-injective linear operator (more precisely, although homogenization is a non-linear and non-injective operator when applied directly to conductivity coefficients, it becomes a linear interpolation operator over triangulations of the physical domain when re-expressed using convex functions) and show how this observation can be applied to inverse problems (such as EIT). Various parts of this talk are joint work with Leonid Berlyand, Mathieu Desbrun, Roger Donaldson and Lei. Zhang. (Received August 15, 2011)