1084-35-336 **Charles K Smart*** (smart@math.mit.edu), Department of Mathematics, MIT, 2-339, 77 Massachusetts Avenue, Cambridge, MA 02139. *Regularity and stochastic homogenization of fully nonlinear equations without uniform ellipticity.*

Joint with Scott N. Armstrong: We prove regularity and stochastic homogenization results for certain degenerate elliptic equations in nondivergence form. The equation is required to be strictly elliptic, but the ellipticity may oscillate on the microscopic scale and is only assumed to have a finite dth moment, where d is the dimension. In the general stationary-ergodic framework, we show that the equation homogenizes to a deterministic, uniformly elliptic equation, and we obtain an explicit estimate of the effective ellipticity which is new even in the uniformly elliptic context. Showing that such an equation behaves like a uniformly elliptic equation requires a novel reworking of the regularity theory. We show that the moment condition is sharp by giving an explicit example of an equation whose ellipticity has a finite pth moment, for every $p < d$, but for which regularity and homogenization break down. While these results are new even for linear equations, we prove them in the fully nonlinear context. In probabilistic terms, our homogenization results correspond to quenched invariance principles for controlled diffusion processes in random media, including linear diffusions as well as diffusions controlled by one controller or two competing players. (Received September 04, 2012)