1083-92-2 **Anita Layton***, Duke University, Department of Mathematics, Durham, NC. *Mathematical modeling of renal hemodynamics: Feedback dynamics and coupled oscillators.*

We have formulated a mathematical model for the rat afferent arteriole (AA), glomerulus, and short loop of Henle, and used that model to study the interactions between the tubuloglomerular feedback (TGF) and myogenic mechanism, the two key mechanisms that mediate autoregulation in the kidney. Blood flow is described by Poiseuille flow. The AA model consists of a series of arteriolar smooth muscle cells, each of which represents ion transport, cell membrane potential, cellular contraction, gap junction coupling, and wall mechanics. The myogenic response representation is based on the hypothesis that the voltage dependence of calcium channel openings responds to transmural pressure so that the vessel constricts when pressure increases. The glomerular filtration model is based on the model by Deen et al. (AJP 1972). The TGF model represents the pars recta, descending limb, and thick ascending limb, and predicts tubular fluid flow rate and [Cl-] along the loop. The model can be used as a fundamental component in a multi-scale renal microvasculature model for investigations of pathogenesis of hypertensive renal diseases. This research was supported in part by NIH grant DK-89066 and NSF grant DMS-0715021. (Received March 25, 2011)