1136-34-250 **Ting-Hao Hsu*** (hsut1@mcmaster.ca), Department of Mathematics and Statistics, McMaster University, 1280 Main Street West, Hamilton, Ontario L8S 4K1, Canada. *Number and Stability of Relaxation Oscillations for Predator-Prey Systems with Small Death Rates.*

In this talk, we will discuss predator-prey systems $\dot{x} = rx(1 - x/K) - yp(x)$, $\dot{y} = y(-\epsilon + cp(x))$ for small $\epsilon > 0$, with $r, K, c > 0$, and functional response $p(x)$ satisfying $p(0) = 0$, $p'(0) > 0$ and $p(x) > 0$ for $x > 0$. When the function $F(x) = rx(1 - x/K)/p(x)$, $x \in [0, K]$, has a single interior local extremum, I will show that there is a unique nontrivial periodic orbit ℓ_ϵ for all sufficiently small $\epsilon > 0$. Moreover, ℓ_ϵ forms a relaxation oscillation, that is, the period of ℓ_ϵ tends to infinity as $\epsilon \to 0$, and the trajectory of ℓ_ϵ approaches a certain configuration.

When $F(x)$ has exactly two interior local extrema, assuming the convexity of $F(x)$ on the right of the local maximum and that $c > 0$ is small enough, I will show that either the positive equilibrium is globally stable for all sufficiently small $\epsilon > 0$, or the system has exact two periodic orbits. In particular, for the Holling type IV functional response $p(x) = mx/(ax^2 + 1)$, I will derive a threshold value $K_* > 0$ of K that separates these two outcomes. This result supports the so-called paradox of enrichment. The main tools are geometric singular perturbation theory and the theory of Floquet multipliers. (Received January 17, 2018)