Frederic Mazenc (Frederic.Mazenc@[omit]supagro.inra.fr), Projet MERE INRIA-INRA, UMR Analyse des Systèmes et Biométrie INRA, 2 pl. Viala, 34060 Montpellier, France; **Michael Malisoff*** (malisoff@[omit]lsu.edu), Department of Mathematics, Louisiana State University, Baton Rouge, LA 70803; and **Patrick De Leenheer** (deleenhe@[omit]math.ufl.edu), Department of Mathematics, University of Florida, 411 Little Hall, PO Box 118105, Gainesville, FL 32611–8105, *Further Results on the Stability of Periodic Solutions in the Chemostat.*[1]

Abstract. We study the chemostat model for one species competing for one nutrient using a Lyapunov-type analysis. We design the dilution rate function so that all solutions of the chemostat converge to a prescribed periodic solution. In terms of chemostat biology, this means that no matter what positive initial levels for the species concentration and nutrient are selected, the long-term species concentration and substrate levels closely approximate a prescribed oscillatory behavior. This is significant because it reproduces the realistic ecological situation where the species and substrate concentrations oscillate. We show that the stability is maintained when the model is augmented by additional species that are being driven to extinction. We also give an input-to-state stability result for the chemostat-tracking equations for cases where there are small perturbations acting on the dilution rate and input nutrient concentration. This means that the long-term species concentration and substrate behavior enjoys a highly desirable robustness property, since it continues to approximate the prescribed oscillation up to a small error when there are small unexpected changes in the dilution rate function. This talk is based on the paper [Mazenc, F., M. Malisoff, and P. De Leenheer, "On the stability of periodic solutions in the perturbed chemostat," *Mathematical Biosciences and Engineering*, Volume 4, Number 2, April 2007, pp. 319-338.] which is available from http://www.math.lsu.edu/∼malisoff/research.html. Time permitting, we will also discuss some extensions from [Mazenc, F., M. Malisoff, and J. Harmand, "Stabilization of a periodic trajectory for a chemostat with two species," *Proceedings of the 2007 American Control Conference (New York, NY, 11-13 July 2007)*, to appear.] for chemostat models of two species competing for one limiting nutrient.

Biographical Sketch. Michael Malisoff was born in the City of New York and received his B.S. degree summa cum laude (Phi Beta Kappa) in Economics and Mathematical Sciences from the State University of New York at Binghamton. He received the first place Student Best Paper Award plaque from the 38th IEEE Conference on Decision and Control in 1999. He earned his Ph.D. in Mathematics from Rutgers University in 2000 under the direction of Hector Sussmann. Since 2001, he has been an Assistant Professor and Associate Member of the Graduate Faculty in the Department of Mathematics at Louisiana State University in Baton Rouge. Together with Marcio de Queiroz and Peter Wolenski, he jointly organized the Louisiana Conference on Mathematical Control Theory (MCT'03) whose edited proceedings have been published in the Springer volume *Optimal Control, Stabilization, and Nonsmooth Analysis.* He has been the sole principal investigator on research grants from the Louisiana Board of Regents, the National Academy of Sciences, and the NSF including a 3-year NSF Mathematical Sciences Priority Area award. He has more than 40 technical publications in the areas of Lyapunov function theory, feedback stabilization, Hamilton-Jacobi equations, and optimal control.

[1]The [omit] should be omitted when sending email. It was included here to avoid automatic "harvesting" by spam-list makers. This material is based upon work supported by the National Science Foundation under Grant No. 0424011. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.