Abdou K. Dramé (drame@[nospam]inma.ucl.ac.be[1]), Center for Systems Engineering and Applied Mechanics (CESAME), Université Catholique de Louvain, Bâtiment Euler, 4-6 av. G. Lemaître, B-1348 Louvain-La-Neuve, Belgium, *Semilinear Parabolic Boundary Value Problems: An Application to Bioreactors* (203 Prescott Hall, Tuesday May 23rd, 1:30-2:15).

This work deals with dynamical analysis of a bioreactor distributed parameter model. The dynamical modeling is based on mass balance principles and leads to a system of two autonomous partial differential equations. After a linear transformation, we prove that this system is equivalent to an asymptotically autonomous semilinear parabolic equation. We obtain a convergence result for solutions of the nonautonomous equation to equilibrium solutions of its limit autonomous equation. In addition, the existence of multiple equilibrium solutions is analyzed. We prove that, if the nonlinear term is in the class of non-monotone functions, the system can have one or multiple equilibrium profiles according to the diffusion coefficient and the superficial flow velocity. Numerical simulations illustrate the bifurcation phenomena of the system. The stability analysis of such equilibria proves that in the non-degenerate case, they are alternatively stable, unstable, stable, etc. The material presented in this talk is based on the following articles:

[1] Dramé, A., "A semilinear parabolic boundary-value problem in bioreactors theory," *Electronic Journal of Differential Equations*, Volume 2004, Number 129, 2004, pp. 1-13.

[2] Dramé, A., C. Lobry, J. Harmand, A. Rapaport, and F. Mazenc, "Multi-stability of equilibrium profiles in plug flow bioreactors," preprint submitted in 2006.

Biographical Sketch. Abdou K. Dramé received his M.S. degree in mathematics from Unversity Gaston Berger of Saint-Louis in Senegal in 2001. From 2000 to 2002, he was a teaching assistant in mathematics at the same university. From September 2002 to August 2005, he was a graduate research assistant in the joint INRIA-INRA MERE Projet (INRA-UMR Analyse des Systémes et Biométrie, Montpellier, France) and he received his Ph.D. degree in mathematics under the direction of Claude Lobry from University Montpellier II (France) in September 2005. Since September 2005, he has been a postdoctoral research assistant at Université Catholique de Louvain. He has been a reviewer for *IEEE Transactions on Automatic Control* since June 2006. His research interests include nonlinear ordinary and partial differential equations, dynamical systems, control theory, and mathematical biology.

[1] The [nospam] should be omitted when sending email. It was included here to avoid automatic "harvesting" by spam-list makers.