

WICHITA STATE UNIVERSITY
Department of Mathematics and Statistics

*The Lecture Series in the
Mathematical Sciences Presents Our Guest:*

Prof. Heinz W. Engl

J. Kepler University, Austrian Academy of Sciences, Linz, Austria

*"Regularization of Nonlinear Inverse Problems:
Convergence Analysis, New Challenges"*

Abstract:

Since our task is to give a survey indicating future lines of research, we first present the functional analytic theory of nonlinear inverse problems and their regularization by Tikhonov's method and by iteration. This includes questions of convergence, convergence rates and implementable parameter choice and stopping rules for such procedures. We give some numerical examples from parameter identification in partial differential equations.

The (by now) classical theory usually works in Hilbert spaces, which is quite restrictive. In many applications, one needs a regularization term which does not live in a Hilbert space involving, e.g., the total variation seminorm or entropy-like terms. Some convergence theory (based on Bregman distances) is available, but there are also open questions.

A further restriction of the classical theory is that the error concept is deterministic, bounds for data noise are given in terms of norms in function spaces. This gives rise to worst-case error estimates for regularized solutions. Such concepts neglect statistical error concepts. We present a recently developed theory for convergence in distribution of regularized solutions of stochastic ill-posed problems; the tool used is the Prokhorov distance of probability measure. We also indicate relations to other stochastic approaches to inverse problems including Bayesian methods.

Application fields which will present new challenges to our community include mathematical finance and systems biology. We present some examples from these fields, e.g., identification of two-factor interest rate models in financial derivatives and of metabolic and genetic networks.

The results we present have many coauthors from our group, whom we will acknowledge in talk.

**Friday, August 25, 2006
3:00 PM in 372 Jabara Hall**

*Please come join us for refreshments before the lecture
at 2:30 p.m. in room 353 Jabara Hall.*