Degenerate convergence of solutions to semilinear equations.

A *degenerate semigroup* is a strongly continuous family $T = (T(t))_{t\geq 0}$ of bounded linear operators on a Banach space X that satisfies the semigroup law $T(t+s) = T(t)T(s)$ for all $t, s \geq 0$. Note that we do not require that $T(0)$ is the identity operator. Instead, $T(0)$ is a projection onto a closed subspace X_0. The degenerate semigroup acts as a strongly continuous semigroup on X_0 while it is the zero operator on $I - T(0)$.

It may happen that a sequence T_n of strongly continuous semigroups converges – in a cerain sense – to a degenerate semigroup; in this case, one speaks of *degenerate convergence*. In the first part of this talk we present a criterium for degenerate convergence in terms of quadratic forms and illustrate this by some applications in mathematical biology.

Afterwards, we consider semilinear equations of the form

$$u'(t) = Au(t) + F(u(t)),$$

where A generates a strongly continuous semigroup and $F : X \to X$ is Lipschitz continuous. We then replace A with a sequence A_n of generators such that the associated semigroups converge degenerately to a degenerate semigroup and discuss convergence of the associated solutions.

This talk is based on joined work with Adam Bobrowski und Bogdan Kazmierczak.