Uhlenbeck-Riviere decomposition theorem and its generalizations

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The talk is based on a joint work with Paweł Goldstein

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Among different classes of elliptic PDE's of particular interest are systems with critical growth, i.e. such that the (some of the) nonlinear terms are *a priori* only integrable. A result of this feature is that standard tools of regularity theory, in particular constructions of test functions, cannot be used and the available toolbox is severly limited.

Important examples of such systems include systems describing harmonic maps between manifolds (and their various generalizations) or parametrizations of surfaces with prescribed mean curvature.

A tool that proved, in the last two decades, very beneficial for this field, is the so-called Uhlenbeck's decomposition theorem. Developed first in the regularity theory of Yang-Mills fields, as a method of finding the so-called Coulomb gauge, in which the Riemannian connection takes a particularily simple form, it has been reformulated and applied to other elliptic systems by Tristan Rivière and later by others, in order to obtain conservation laws for various elliptic systems. Different versions of this theorem, adapted to specific problems, have been proved.

In a joint work with Pawe Goldstein we seek a general form of the Uhlenbeck-Rivière technique and study possible generalizations.