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In the regularization theory for ill-posed problems mainly schemes with a single regularization parameter have been studied. Among these methods, probably the most famous one is the Tikhonov regularization method, in which a regularized solution is obtained by minimizing a quadratic functional with a penalty term. But even in this scheme, we are, in fact, dealing with a multi-parameter regularization, since not only regularization parameter, but also a penalization operator should be chosen properly. In the talk we are going to discuss several approaches to the multi-parameter regularization and present recent results in this direction. (Received August 10, 2010)