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In past few decades harmonic analysis has developed beyond the linear framework into the multilinear one where we find pioneer work by J.M. Bony and by R. Coifman and Y. Meyer. Still, questions remained about operators which could have (highly) singular multipliers or (multilinear) symbols with 'non-standard' decay conditions. In this lecture we describe recent work in this direction and some open questions. We first discuss (translation invariant) bilinear operators with non-smooth multipliers and a comprehensive criterion in one dimensions ensuring their boundedness. The approach relies on time frequency analysis as pioneered by C. Fefferman and further developed by Lacey and Thiele. The second part of the talk will be devoted to the unfolding theory of (non-translation invariant) bilinear pseudo-differential operators with  $x$ -dependent symbols; for which little is known beyond those in the Coifman-Meyer class. We will describe how the bilinear pseudo-differential setup differs from the linear one in terms of symbolic calculus and boundedness properties on products of Lebesgue and Sobolev spaces. We will finally explain a new boundedness criterion for bilinear pseudo-differential operators under modulation invariance. (Received February 05, 2006)