The Cauchy problem for a fourth-order thin film equation

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In this talk we will discuss different aspects of the Cauchy problem of a class of fourth order thin film equation of the form $u_t = -\nabla\cdot(|u|^n\nabla\Delta u)$. We will show recent results in which we obtained a countable number of similarity solutions of the *thin film equation* via a homotopy transformation as $n \to 0^+$ to the similarity solutions of the classic *bi-harmonic equation* $u_t = -\Delta^2 u$. Also, another similar homotopic approach is performed directly from the *thin film equation* to the *parabolic bi-harmonic equation* in order to obtain important properties for the Cauchy problem. This is a joint work with Prof. Victor. A. Galaktionov at the University of Bath (UK).