On the heat equation with a dynamic singular potential

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Motivated by the celebrated work of Baras and Goldstein (1984), we discuss the existence and non-existence of singular solutions for the heat equation with a time-dependent Hardy-type term, particularly, when the singular point is moving. It is shown that there exist two types of solutions in the subcritical case, and there are no positive solutions in the supercritical case. There appear various critical values which play an essential role for the existence. This talk is based on a joint work with Jann-Long Chern, Gyeongha Hwang and Jin Takahashi.