Inside nature's smallest black body

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Sonoluminescence is the intriguing phenomenon of strong light flashes from tiny bubbles in a liquid [1]. These bubbles are driven by an ultrasonic wave and need to be filled with noble gas atoms. The spectrum of the emitted light corresponds to very high temperatures [2] and hints the presence of an hot opaque plasma core [3]. Although sonoluminescence has been studied extensively, the origin of the observed sudden temperature increase is still controversial. Here we attribute this effect to a weak but highly inhomogeneous electric field as it occurs during rapid bubble deformations. The field couples the quantised motion of the atoms to their electronic states, thereby resulting in very high heating rates and a small amount of population in excited states [4]. The latter explains the presence of emission lines in the optical regime, independent of the temperatures in the bubble. Finally, we propose an experiment to enhance the energy concentration in sonoluminescence experiments with potential applications in sonochemistry.