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The electro-hydrodynamic flow about and the shape of strongly deformed drops EHUD YARIV, DOV RHODES, Technion - Israel Institute of Technology — A liquid drop is suspended in another liquid and is exposed to an otherwise uniform electric field. For strong fields, the drop can elongate significantly. We analyze the strong deformation problem using slender-body analyses, the solution being obtained via expansion in the small slenderness. This parameter is not a priori prescribed, and must be found throughout the course of the asymptotic solution. We employ matched asymptotic expansions to calculate the electric and flow fields. The fields within the drop are continued into the 'inner' region outside the drop, at the drop cross-sectional scale, and are then matched into a singularity representation in the 'outer' region, at the drop longitudinal scale. For both dielectric and leaky dielectric liquids we obtain the scaling of Sherwood (1991), where the aspect-ratio is proportional to the 6/7-power of the electric field.

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