Hydrodynamic and elastic interactions of sedimenting flexible fibers[1] MARIA L. EKIEL-JEZEWSKA, MAREK BUKOWICKI, Institute of Fundamental Technological Research, Polish Academy of Sciences, Warsaw, Poland — Dynamics of flexible micro and nano filaments in fluids is intensively investigated in many laboratories, with a perspective of numerous applications in biology, medicine or modern technology. In the literature, different theoretical models of elastic interactions between flexible fiber segments are applied. The task of this work is to examine the impact of a chosen elastic model on the dynamics of fibers settling in a viscous fluid under low Reynolds number. To this goal, we construct two trumbbells, each made of three beads connected by springs and with a bending resistance, and we describe hydrodynamic interactions of the beads in terms of the Rotne-Prager mobility tensors. Using the harmonic bending potential, and coupling it to the spring potential by the Young's modulus, we find simple benchmark solutions: stable stationary configurations of a single elastic trumbbell and a fast horizontal attraction of two elastic trumbbells towards a periodic long-lasting orbit. We show that for sufficiently large bending angles, other models of bending interactions can lead to qualitatively and quantitatively different spurious effects. We also demonstrate examples of essential differences between the dynamics of elastic dumbbells and trumbbells.

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