Lateral migration of a 3D elastic capsule in a Poiseuille flow BOY-
OUNG KIM, HYUNG JIN SUNG, Korea Advanced Institute of Science and Tech-
nology, KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY
TEAM — The lateral migration of a 3D elastic capsule undergoing large deformation
in a 3D Poiseuille flow was explored at moderate Reynolds number ($10 \leq \mathrm{Re} \leq 100$)
as a function of the initial lateral position (y_0), Reynolds number (Re), aspect ratio
(ε), viscosity ratio (λ), membrane stretching coefficient (φ) and bending coefficient
(γ). Several numerical methods were used to simulate the problem: the immersed
boundary method for fluid-structure interaction, the penalty method for volume con-
servation in the capsule and the front-tracking method for distinguishing the fluid in
capsule from the fluid outside capsule. Three different types of capsule motions were
observed: tank-treading (TT) motion, tumbling (TU) motion and swinging (SW)
motion according to variations of ε and Re. The initial behavior of the elastic cap-
sule was influenced by the initial lateral position (y_0), but the equilibrium position
and the dynamic motion of the capsule were not affected by such variations. The
capsule had a strong tendency toward TU motion at higher values of Re, φ and γ,
whereas the capsule underwent TT or SW motion as the values of ε and λ increased.

Boyoung Kim
Korea Advanced Institute of Science and Technology