Euler Buckling – Induced Folding And Rotation Of Red Blood Cells In An Optical Trap

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We investigate the physics of an optically driven micromotor of biological origin. When a single, live Red Blood Cell is placed in an optical trap, the normal biconcave disc shape of the cell is observed to fold into a rod-like shape. If the trapping laser is circularly polarized, the folded RBC rotates. A model based on geometric considerations, using the concept of buckling instabilities, captures the folding phenomenon; the rotation of the cell is rationalized using the Poincare sphere. Our model predicts
(i) At a critical power of the trapping laser beam, the RBC shape undergoes large fluctuations
(ii) The torque that is generated is proportional to the power of the laser beam
These predictions are verified experimentally.