**Exploiting optical lateral forces in optical tweezers**

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Optical tweezers have revolutionized the way of manipulating tiny objects and endowed enormous physical and biomedical applications. Optical gradient force and radiation pressure forces are prevalent in optical manipulation, while exotic forces, e.g., optical lateral force (OLF), have been conceptually proposed recently and may found potential applications in optical sorting, sensing, etc. However, most studies are theoretical investigations, and few experimental demonstrations and applications have been reported. We have proposed a series of new mechanisms for generating OLFs, such as momentum topology, lateral momentum increase, multipole, transverse spin momentum, light-chirality interaction, etc. Experimentally, we demonstrate the bilateral enantioselective separation, bilateral locomotion of particles in a single circularly polarized beam with the transverse spin momentum. Intriguingly, by harnessing the complex and nontrivial chiral forces in a spin field, we can dynamically sort chiral particles with different sizes and handedness by controlling light polarizations. Our studies on OLFs may pave a new avenue for utilizing them for ultra-precise manipulation and enormous biochemical applications.

**Short Bio:**

Yuzhi Shi is a professor at the Institute of Precision Optical Engineering, School of Physics Science and Engineering, Tongji University, China. He received B.Sc. and Ph.D. degrees both in mechanical engineering from Xi’an Jiaotong University, China, in 2012 and 2018, respectively. He studied and worked at Nanyang Technological University, Singapore, from 2013 to 2021. He has innovated various optofluidic manipulation techniques, such as bacteria and virus screening and binding, chiral sorting, and optical forces by multipoles. His research interests include optical manipulation, optofluidics, biosensing, and metaoptics.