



## Applications of Single Cell Raman Sorting Technology in Life Sciences

B. Li

Chinese Academy of Sciences, China.

### Abstract

**R**aman spectroscopy is a non-invasive and label-free technology. Cells, the fundamental units of life, are the basis for understanding the processes of life, as well as the mechanism of diseases. Single cell research is an emerging field of biology which promises new insight into phenotypic heterogeneity in isogenic cell population. However, there are a great many of challenges, such as non-invasive cell analysis and in situ single cell sorting from complex samples, in front of single cell biotechnology. Single cell Raman spectroscopy (SCRS) is a non-invasive and label-free vibrational spectroscopy technique, which can provide intrinsic chemical fingerprint of an individual cell, possesses tremendous potential applications in every fields of life sciences.

Recently we developed a new type of single cell sorting system which combines Raman spectroscopy and cell separation based on laser-matter interaction which has advantages of visualization, pinpoint accuracy and label-free. We had successfully recognized and isolated various kinds of cells from a series of complex biological samples, such as seawater, soil and gut microbiome. Furthermore, the isolated cells can be used for sequencing, culture and other follow up studies. To combine single cell sorting with single cell sequencing technology could build the relationship between cell phenotypes and genotypes, which will help us to uncover fundamental biological mechanisms. We have also successfully achieved single cell culture of isolated cells, which provides an innovative strategy for engineering cell screening and uncultured microorganisms studies. Single cell sorter can also be coupled with mass spectrometry to shorten the detection period of pathogens by skipping culture step which often takes several days. In consideration of the wide applications of single cell Raman and sorting technique, it will surely bring significant breakthroughs in all branches of life sciences and biomedicine.

### Biography:

2019-present Professor of the State Key Lab of Applied Optics, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Changchun, China 2. General manager of the Hooke Instruments Ltd., Changchun, China. 01/2017-07/2018 Senior Researcher, University of Oxford, Oxford, UK 08/2014-01/2017, Optics and Photonics Research Engineer, University of Oxford, Oxford, UK 01/2013-07/2014, Optical Engineer, Nanotether Discovery Sciences Ltd, Cardiff,

UK 03/2012-01/2013, Research Fellow, School of Engineering and Design, Brunel University, UK 06/2010-02/2012, Research Associate, School of Physics and Astronomy, Cardiff University, UK 02/2010-05/2010, Part-time Research Assistant, Dept. of Electrical and Electronic Eng., University of Bristol, UK 10/2006-08/2009, Project Administration Assistant, European Union FP6 Project "IOLOS

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