

## LSGI Distinguished Lecture Series

### “Polarization of remote sensing”

#### Overview

It was our pleasure to invite Professor Lei Yan, Director of Beijing Key Laboratory, Peking University, to deliver a seminar of the LSGI Distinguished Lecture Series on 14 November 2018.



#### Biographies

Lei Yan is the director of Beijing Key Laboratory, Peking University. And also being the Senior Member of IEEE since 2003, the Senior Member of Executive Committee of International Institute for General Systems Studies since 1999 and so on. His professional expertise encompasses the principle, method and instrument of polarization remote sensing; High resolution remote sensing and calibration for studying the spatial, temporal, spectral and radiometric resolution of remote sensing quantitatively and designing the target for field calibration; A new generation of high speed imaging processing system was developed based on high precision and high speed processing for aerospace remote sensing image in polar coordinate and the its functional model of digital base-height ratio adjustable method; Research on methods and techniques of remote sensing control theory, special items of intelligent fusion of information, parallel calculation and processing, fault-tolerance reconstruction and Fuzzy control concerning various respects of precision, real time, reliability and complexity of navigation system; APS(advanced photo system): developed a first intelligent camera by himself in the world; Electrostatic suspension technique and its application of inertial sensors. In 2015, professor Yan gets Second Prize of National Technology Invention Award, and in 2017, gets The jury of the 45th Geneva International Invention Exhibition awarded the Gold Prize in particular. He has owned more than 300 articles (including more than 70 SCI) and 21 patents for invention.

## Abstract

Light is an electromagnetic wave vector and its wave equation of scalar propagation has three basic parameters, amplitude, frequency and phase, which is the physical basis of four major resolutions (radiation resolution, spectral resolution, spatial resolution and temporal resolution) of optical remote sensing. Light is also a vector shear wave, which is perpendicular to the direction of light propagation. Polarization refers to the asymmetry of the light vibration with the propagated direction and becomes the fourth basic parameter of light wave. Polarization has been studied in physical optics and applied in many fields, for example, precision instruments and microscopic observations. With mature physical basis, Polarization Remote Sensing (PoIRS) will definitely come into being sooner or later. Chinese researchers have been studying, exploring and exceeding theories, methods and instruments of PoIRS with international counterparts for more than 30 years and has made a leading progress. Polarized remote sensing technique can be applied to industry and influence related areas. In the field of surface inversion, the common retrieve model error can be 136% in the extremely weak scattering of polarized light effect; in the field of atmospheric attenuation, the atmospheric error declines by 50% through polarization methods; in the field of neutral point of atmosphere, New atmospheric window increases ground definition by 70%; in the field of polarization instruments, wavelength center offset and bandwidth degradation can be found; in the field of calibration benchmark, the indeterminacy of radiance will be declined to 1-2% With the polarization moon radiance criterion to 10<sup>-8</sup>. Therefore the final focus of the report is: whether or not polarization can be thought as an independent observation vector of optical remote sensing and become the fifth resolution of RS after radiation one, spectral one, spatial one and temporal one.