## E2会议专家系列报告：

## 10月29日上午：9:00－10:10

Open path Fourier transform spectroscopy measurements of greenhouse gases in the atmosphere: From surface measurements in the MIR and NIR to solar remote sensing in TCCON

**Professor David Griffith**

***School of Chemistry &Centre for Atmospheric Chemistry***

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***Biographical information***

David Griffith is Professor of Chemistry and coordinator of the Centre for Atmospheric Chemistry at the University of Wollongong, Australia. His research interests are in the applications of optical methods to atmospheric composition measurements, with a particular emphasis on the infrared and Fourier Transform spectroscopy.  He is co-chair of the Total Carbon Column Observing Network (TCCON) covering the eastern hemisphere – Asia and Australasia. In his seminar he will present an overview of TCCON and research in open path measurements in the atmosphere in both mid and near IR towards quantifying agricultural and urban emissions of greenhouse gases.

David Griffith教授是澳大利亚wollongong大学大气化学中心负责人。他的研究方向是应用光学方法测量大气成分，重点研究红外和傅立叶光谱技术。他是总碳柱观测网络（TCCON）共主席，负责东半球—亚洲和澳洲TCCON测量。在他的报告中，他将综述TCCON测量，并介绍用中红外和近红外光谱开路测量大气用以确定农业和都市温室气体排放的研究。

## 10月29日上午：10:20－11:30

Laser-based spectroscopic sensing of gas-phase molecules

in agricultural, combustion and environmental media

**Emeritus Professor Brian Orr**

***MQ Photonics* Research Centre, Department of Physics and Astronomy,**

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| ***Abstract***  Laser-spectroscopic techniques for sensing of gas-phase molecules at trace levels in air include those using tunable pulsed optical parametric oscillators (OPOs, both single- and multi-wavelength) and cavity-ringdown spectroscopy (CRDS). The talk will focus on developing injection-seeded optical parametric oscillators and fiber-coupled CRDS for applications in agricultural, combustion and environmental media. |  |

***Biographical information***

Emeritus Professor Brian Orr was educated at the Universities of Sydney (Australia) and Bristol (UK). After a postdoctoral period at the National Research Council of Canada in Ottawa, he returned to Sydney and spent 18 years on the academic staff of University of NSW. At the end of 1987, he became Professor of Chemistry at Macquarie University (also in Sydney, Australia) and then (15 years later) he joined the Department of Physics (and Astronomy) where he has been active for almost 13 years in research, journal editing and cooperative ventures (*e.g.*, setting up the *MQ Photonics* Research Centre). He is a Fellow of the Optical Society of America (OSA), the Australian Institute of Physics, and the Royal Australian Chemical Institute (RACI). His academic distinctions include the inaugural RACI Physical Chemistry Division Medal (1994), the Optical Society of America’s William F. Meggers Award ‘for outstanding work in spectroscopy’ (2004), and the Australian Optical Society W. H. (Beattie) Steel Medal (2005). He is visiting China to attend the OSA Light, Energy and the Environment Congress (Suzhou, 2–5 November 2015), where he will present an invited talk (with the same title as this seminar – but with different content!)

## 10月30日上午：9:00－10:20

Laser-based trace gas detection for sensitive chemical sensing

**Professor Frans J.M. Harren**

***Life Science Trace Gas Facility, Molecular and laser Physics***

***Institute for Molecules and Materials, Radboud University, Nijmegen, the Netherlands***

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There is a strong growing interest to develop laser systems (quantum cascade lasers, optical parametric oscillators) in the mid-infrared wavelength region for trace gas detection with applications in environmental sciences, biology, agriculture and medical sciences. Nowadays, such lasers provide output at relatively high power and narrow linewidth and emit at any desired wavelength within the infrared wavelength range 2.5 to 12 micrometer. Accurate detection of specific gases becomes into reach thanks to the infrared fingerprint absorption spectrum of molecular gases in this wavelength region and the exact tuning capabilities of lasers. When the lasers are combined with sensitive spectroscopic techniques, such as photoacoustic spectroscopy or optical cavity enhanced spectroscopy, gases can be determined extremely sensitive under atmospheric conditions.

Examples will be given on the detection the important plant hormone Ethylene, the detection of Nitric Oxide under pathogen attack, and whether plants do produce Methane, using C-13 enriched plants and detecting C13 Methane.

Within medical applications there is an increasing interest in the development of sensitive and selective methods for breath analysis for reliable and non-invasive monitoring of diseases. Investigations were made in the relation between Nitric Oxide and asthma, and between Hydrogen Cyanide and Pseudomonas Aeruginosa (PA) bacteria.

Also, recent developments in OPO-based dual frequency comb spectroscopy will be presented.

***Key learning points:***

* Infrared laser spectroscopy is a selective and sensitive way to detect trace gases.
* Applications within agriculture and biology demonstrate non-invasive monitoring of biological processes.
* Optical cavity enhanced methods are able to monitor trace gases from the breath of humans in real time.

***Biographical information***

Frans J.M. Harren completed in 1988 his PhD at the University of Nijmegen. At the moment he is Associate Professor at the Radboud University and his research focuses on the reliable sensing of minute quantities of trace gases in complicated gas mixtures. For this, state-of-the-art laser spectroscopy and mass spectrometry is used to monitor, on-line and in real-time, gases emitted from biological samples and humans. On this subject he published over 170 publications in refereed journals, and gave 80 invited lectures in the last 10 years. A part of the activities of the research group has been commercialized via the spin-off company Sensor Sense.

## 10月30日上午：10:30－11:40

高精度微波频率标准光纤远程同步

**Professor Yabai He**

## 11月6日上午：9:00－10:10

Nonlinear Optics for Remote Sensing and Atmospheric Lasing

**Research Scholar, Dr. Arthur Dogariu**

***Mechanical and Aerospace Engineering Department***

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Remote detection and identification is of great interest for many applications including environmental, medical, and national security. Optical techniques can achieve standoff trace detection by identifying the atomic or molecular spectroscopic fingerprints. While linear optical methods such as LIDAR, Raman spectroscopy, absorption spectroscopy are considered for such tasks, they are less suitable for single-sided standoff detection in real-time, with both high specificity and sensitivity. This talk will describe nonlinear atomic and molecular spectroscopy techniques which provide standoff trace detection and identification, as well as flow diagnostics. Firstly, a novel microwave scattering technique allows resonantly enhanced multi-photon ionization (REMPI) to be used for remote atomic spectroscopy and detection of gas traces. Secondly, I will present backwards lasing in atmospheric air. Multi-photon dissociation and excitation can lead to strong stimulated emission from the atomic components in air (O, N, and Ar). The strong coherent emission is an example of a mirror-less atomic laser which can aid remote atmospheric trace species detection. Finally, I will present a femtosecond laser molecular tagging diagnostic tool (FLEET), which can be used for remote non-invasive flow visualization and characterization.



Also, several aspects of current research will be presented.

## 11月6日上午：10:20－11:30

Development and application of airborne and spaceborne trace gas lidar systems

**Dr.** **Andreas Fix**

***Institute of Atmospheric Physics***

***National Aeronautics and Space Research Centre of the Federal Republic of Germany***

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## 11月6日下午：14:00－15:10

**New approaches to the measurement of atmospheric SO2 and other gases**

**Professor Dr. Ulrich Platt**

***Institute for Environmental Physics***

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## 11月6日下午：15:20－16:30

**Absolute radiance calibration of MAX-DOAS measurements & Determination of soil NOx emissions from space**

**Professor Dr.** **Thomas Wagner**

***Max Planck Institute for Chemistry***

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