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OSCAR Visiting Academician Prof. **KENNETH TIMMIS** wins prestigious award for achievements in microbiology

OSCAR's collaborative research published in **LEADING BIOMEDICAL JOURNAL**

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OSCAR Visiting Academician Prof. Kenneth Timmis wins prestigious award for achievements in microbiology

Professor Kenneth Timmis, OSCAR Visiting Academician and former Editor-in-Chief of AMI journals *Environmental Microbiology*, *Environmental Microbiology* Reports and *Microbial Biotechnology*, has been awarded the 2023 FEMS-Lwoff Award for Achievements in Microbiology.

Launched in 2000, the FEMS-Lwoff Award for Achievements in Microbiology rewards those who create high quality knowledge that helps to solve today's societal problems around microbiology. It was named in honour of the 1st FEMS President (1974-1976), Professor André M. Lwoff.

Kenneth Timmis was selected for the award for his contributions to the field of environmental microbiology and advocacy of microbiology literacy.

The jury praised Professor Timmis, not only as an excellent scientist, but also as a pioneer in the field of plasmids, environmental microbiology and microbial biotechnology. They also recognized his efforts in advocating for microbiology literacy.

His education initiative 'The Urgent need for Microbiology Literacy in Society' brought microbiology closer to society and has had a wide impact. Other important initiatives around this topic were his article in Environmental Microbiology: 'Microbiology education and human stewardship of Planet Earth: the generational contract' and the initiative he supports and co-authored, 'Scientists Warning to Humanity: Microorganisms and Climate Change', which also had a global impact.

Professor Timmis joined OSCAR as a Visiting Academician in 2020, hosted by Professor Zhanfeng Cui and Professor Wei Huang. His experience will drive and support innovative

new projects at OSCAR, while supporting the development of our talented young research team. The breadth of his expertise and position at the forefront of the microbiology field will make Professor Timmis an excellent collaborator to enhance existing work and drive.

Biography

Professor Timmis is currently Emeritus Professor at the Technical University of Braunschweig in Germany. He is a Fellow of the European Academy of Microbiology (EAM), the American Academy of Microbiology, the Royal Society, and Laureate of the Erwin Schrödinger Prize.

He was the Founding Editor of the journals *Environmental Microbiology*, *Environmental Microbiology Reports and Microbial Biotechnology*, published by AMI and Wiley, and served as Editor-in-Chief of *Environmental Microbiology* for 25 years, stepping down in November 2022.

He studied microbiology at Bristol University, undertook postdoctoral research training at the Ruhr University, Yale and Stanford, and headed research groups at the Max Planck Institute for Molecular Genetics, the University of Geneva Medical Centre, the German National Research Centre for Biotechnology (later, the Helmholtz Centre for Infection Research) and the Technische Universität Braunschweig.

His research focus has been environmental microbiology, microbial pathogenesis and vaccine development, and microbial biotechnology, mostly involving genetic approaches, and he has designed and engineered bacterial metabolic strategies to remove environmental pollutants from contaminated soil and water.
His early studies of microbial molecular genetics clarified how bacteria control the reproduction of their genetic material in the form of plasmids. He went on to demonstrate the 'minimal replicon', the minimum set of genes needed for a plasmid to reproduce, a discovery central to the development of vectors for gene cloning and the creation of genetically altered bacteria for biotechnology.

Professor Timmis pioneered the cloning of entire metabolic pathways and the design of novel biochemical pathways and microbes for bioremediation and has made significant contributions to microbial ecology, especially concerning soils and waters polluted with hydrocarbons and xenobiotics.

FEMS-Lwoff Award for Achievements in Microbiology 2023 awarded to Professor Kenneth Timmis. FEMS News. 5th December 2022, from https://fems-microbiology.org/about_fems/network-and-activities/awards/fems-lwoff-award/

OSCAR's collaborative research published in leading biomedical journal

Professor David Clifton's research team, and their colleagues at Fudan University, Nanjing University and Shanghai Jiao Tong University, have recently proposed a neural network-based approach for the clustering of patients with organ failure – a serious problem in clinical medicine, and intensive care in particular. This work has been published in *IEEE Transactions on Biomedical Engineering* – one of the world's most selective journals for biomedical engineering. The full article is available to read at https://ieeexplore.ieee.org/document/10040738

Patient Clustering for Vital Organ Failure Using ICD Code with Graph Attention

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Heart failure, respiratory failure and kidney failure are three types of severe organ failure (OF) with high mortality rates, being especially prevalent in intensive care units. In such settings, being able to understand and act on complex diseases such as this is of vital importance in ensuring that patients get the best care, and that resources are used to their best effect. In this work, the researchers developed novel methods using graph neural networks to improve the state-of-the-art in understanding these complex diseases.

This paper proposes a neural network-based pipeline, as illustrated in Fig 1, to cluster three types of organ failure patients by incorporating a knowledge graph of patients' clinical history. Complex deep learning methods were developed to show how these diseases could be clustered using complex real-world data from intensive care units.

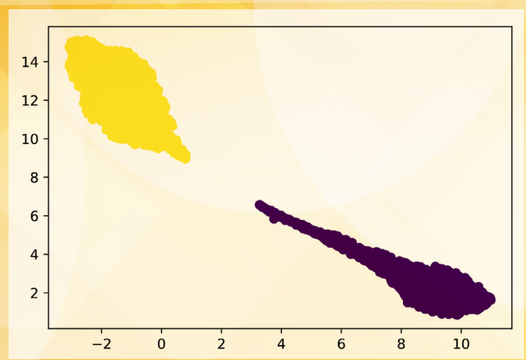

Fig.1. Visualisation for the patient clusters

The proposed clustering pipeline discovered two distinctive patient clusters that exhibit different illness severities (showing different comorbidities) and are independent of the organ failure type. This outcome suggests that although the patients had different types of organ failures, they share significant hidden characteristics in their diagnoses. These clusters can be used to signal possible complications and aid personalised treatment. For example, patients in cluster 1 are very likely to develop urinary tract infections and chronic skin ulcers, whereas patients in the other cluster are not, despite their organ failure type. Therefore, precautions for these comorbidities can be raised for patients in cluster 1.

The pipeline (see Fig. 2) proposed in this work displayed superior clusters compared with several state-of-the-art methods.

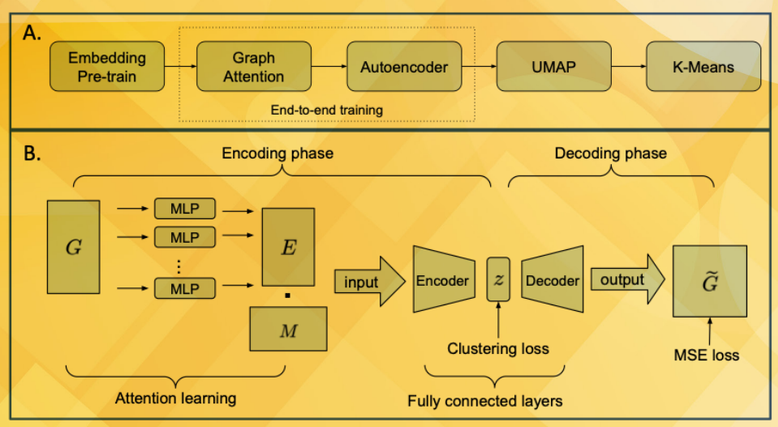

Fig. 2. Box A shows the method pipeline which includes 5 components. Box B shows the details of the main neural network component (dotted box in Box A). It involves multiple `attention' modules `Attention learning' stage which can be used to improve model performance and interpretability. `Fully connected layers' are used to learn clusterable patient representations.

OSCAR researchers develop multi-functional optical equipment for measuring light emitting devices

OSCAR's researchers from the Optoelectronic Technology Laboratory (OeTL) have developed a piece of multi-functional optical equipment that enables precise measurement of the intrinsic characteristics of light-emitting devices such as polariton micro-lasers and other new light sources.

At present, there has been substantial advancement in the development of thin-film light-emitting devices that employ organic materials, colloidal quantum dots, and perovskite as the emission layer. However, the pace of development of test systems for these novel devices has been relatively slow, making them inadequate to meet the precision testing demands. One such instance is the testing of high-precision angular resolution. High-precision angular resolution is a critical criterion for evaluating new types of microcavity light emitter. Testing of this property cannot be adequately fulfilled by the currently available detection systems.

To address these issues, researchers at OSCAR invented a new piece of multi-functional equipment that precisely controls the movement of a test sample and the detector at every angle to attain a high precision in angular resolution. This equipment is especially suitable for angle-resolved property tests. A super high angular resolution of 0.05° is obtained (see Fig.1) compared to a typical resolution in the range of 0.5°~3° from commercially available instruments.

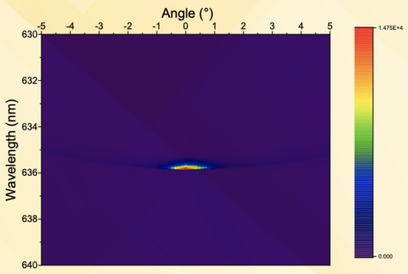

Fig. 1 Test results of the luminous angular resolution of the outgoing light of the light source device.

Flexibility is built into the design of the new device, allowing the incorporation of a variety of functional tests of light-emitting devices. By choosing specific accessories, the equipment can realize the characterization of different optical properties, including angle-resolved property, beam profile, polarization property, emission property, power property, reflection and transmission, and the threshold of laser devices. Moreover, the equipment enables the testing of several optical properties simultaneously as needed.

This work is led by Mr. Geng He, Dr. Jie Lin and Dr. Jingsong Huang under the guidance of Professor Paul Stavrinou.

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OXFORD SUZHOU CENTRE FOR ADVANCED RESEARCH

OSCAR Academic Seminar series

On Friday 24th February, Oxford-Suzhou Centre for Advanced Research (OSCAR) held its 1st Academic Seminar of the year. The symposium was the 15th intercontinental video conference to date, with participants from the UK, Europe, and China in attendance. The two nominated guest speakers, invited to showcase their expertise and academic achievements were: (i) Professor Monique Andersson, visiting Professor at OSCAR, Senior Clinical Lecturer in Microbiology, University of Oxford, Consultant in Clinical Infection at the Oxford University Hospitals NHS Foundation Trust; and (ii) Professor James Kwan, OSCAR PI in Engineering Science, Associate Professor and Tutorial Fellow in Engineering Science, University of Oxford. Deputy Director Professor Mark Moloney chaired the session.

Talk 1 - 'Shedding light on Sexually Transmitted Infections using LAMP'

An estimated 376 million treatable sexually transmitted infections (STIs) occur globally every year as described by the WHO. STIs are the third most common cause of loss of life by women of reproductive age, exceeded only by maternal causes and HIV. In a broader

sense, the morbidity and mortality related to STI directly influences quality of life, sexual and reproductive health, and child health, and STIs act indirectly as a co-factor for HIV transmission.

It is imperative that STIs are diagnosed in a timely and accurate manner to reduce transmissions and prevent complications. Unfortunately, in resource-limited settings where STI prevalence and burden is high, diagnosis is only characterised by a set of associated symptoms which results in missed treatment, incorrect treatment, and over treatment. This in-turn leads to the spreading of STIs and is a contributor to antimicrobial resistance.

During this seminar Prof. Andersson shared her expertise developing diagnostic tools for the detection of STIs for implementation in resource limited settings. Loop mediated isothermal amplification (LAMP) technology, uses a simple and rapid gene amplification technique working at constant temperature. The technique utilises several primers which span different sequences of a target gene in a single tube. Its simplicity allows for no sophisticated equipment or highly trained personnel, ideal for use in locations where specialist facilities and trained staff are limited or unavailable.

Talk 2 - 'Sonochemistry: How bubbles create unique chemistry

Making new bubbles in nature takes a significant amount of effort and for this reason, are not abundantly found. When bubbles burst they will ultimately violently collapse in on themselves and implode. These imploding bubbles can melt nearby steel surfaces, create light, and even break down molecular bonds. By engineering bubble collapses with sound, we can manipulate (tune) these effects for any given specific application.

During the seminar, Prof. Kwan presented novel methods to take advantage of these bubble collapses to tackle environmental challenges, specifically focusing on improving or 'greening' chemistry. Cavitation, together with ultrasound, was used to exploit mechanical, thermal, and chemical effects to address challenges in personal and environmental health. The talk also described how ultrasound-responsive micro- or nanoparticles may facilitate localised heating, mass transport, and/or free radical formation.

About the speakers

Monique Andersson is Visiting Professor to OSCAR. She is a Senior Clinical Lecturer at the University of Oxford and Consultant in Infection at the Oxford University Hospitals NHS Foundation Trust. She is an Extraordinary Associate Professor in Medical Virology, University of Stellenbosch, South Africa. She is the clinical collaborator in developing OxLAMP for rapid detection of Covid-19, which led to OSCAR's first spinout, Oxsed Limited. Her research interests include infection diagnostic development, maternal infections and infections in the immunocompromised.

Professor Kwan's work primarily focuses on the use of mechanical, thermal, and chemical effects of ultrasound and cavitation to address challenges in personal and environmental health. Specifically, his current research concentrates on developing ultrasound-responsive micro- or nanoparticles that facilitate localised heating, mass transport, and/or free radical formation. He also has an interest in understanding the biological effects of ultrasound and cavitation on bacterial biofilms.

OSCAR receives SEID's Publicity Innovation Award

OSCAR was recognised with Suzhou Dushu Lake Science Education and Innovation District's Publicity Innovation Award for introducing creative and impactful forms of publicity to communicate to OSCAR's stakeholders, the press and the general public.

In 2022, OSCAR's publicity arrangements centred around OSCAR's success in delivering world-benefiting innovation. This central message was disseminated through media interviews with the Director Professor Zhanfeng Cui, the publication of the OSCAR's Triennial Yearbook, the OSCAR Open Day, and the OSCAR Fourth Anniversary film.

Professor Zhanfeng Cui during a media interview

The Yearbook charts three years of achievements made possible by our people and their scientific endeavours

OSCAR Open Day to connect Chinese and British innovators

Meet OSCAR's New Researcher

Yuanyuan Cheng

Research Technician in Perovskite Thin Film Innovation Technology Centre (ITC)

On February 1, 2023, the Perovskite Thin Film Innovation Technology Centre (ITC) welcomed its new employee, Yuanyuan Cheng. She received a master's degree from Henan University in July 2015. Her postgraduate research work involved solution-processed Au-ZnO nanocomposites as electron transfer layers for OPVs, which significantly improved power conversion efficiency and stability of devices.

After graduation, she gained rich experience in the field by working in the industry, conducting research, development, and application of solar cell thin films. Her previous work focused on optimizing processes for new solar cell thin films, such as the preparation of high crystallinity CIGS thin films by optimizing annealing conditions; fabrication of high-quality solution-processed perovskite thin-films; development of large-area photovoltaic devices, especially perovskite solar cells, using printing methods (The power conversion efficiency of 14% has been reached, the active area is 50 cm^2).

"I am honoured to join OSCAR," said Yuanyuan. "The colleagues here get along well with each other, and there is a first-class R&D platform and technology. Perovskite material is a very hot new material. The Perovskite Film Technology Innovation Centre prepares high-quality perovskite films through different preparation methods and applies them to different fields, such as solar cells, LED, and more. In my future work, I will leverage my strengths and contribute to the Perovskite Thin Film Innovation Technology Centre."

SIP News in February

SIP's biological pharmaceutical and product manufacturing cluster designated a national-level innovative industrial cluster

SIP's biological pharmaceutical and product manufacturing cluster has been recognised as a national-level innovative industrial cluster, according to the 2022 List of Innovative Industrial Clusters released by the Torch High Technology Industry Development Centre at the Ministry of Science and Technology of China.

SIP is now home to more than 2,200 biomedicine enterprises with a total annual output value of RMB 130 billion. These enterprises attract around RMB 20 billion each year in social capital investments. Up until now, they have secured over 500 approvals in total for clinical trials of Class-I drug candidates and 1,300 registration certificates for medical devices. These enterprises were also behind the launch of 22 new drugs into the market.

SIP has been introducing more than 300 biomedicine projects each year over the past three years with more than 50,000 people currently engaged in the innovation of biomedicine.

SIP authorities aim to foster a world-class biomedicine cluster supported by a strong innovation ecosystem and industrial value chain.