UNIVERSITY OF OXFORD

OSCAR

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## OSCAR RESEARCH ARTICLE most cited in Microbial Biotechnology in 2020 and 2021

## OSCAR'S DIGITAL HEALTH LABORATORY'S RESEARCH published in NeurIPS 2022

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# OSCAR research article most cited in Microbial Biotechnology in 2020 and 2021

On October 28, *Microbial Biotechnology* announced on its official Twitter account that the research article on RT-LAMP for rapid diagnosis of coronavirus SARS-CoV-2 produced by Professor Wei Huang, Professor Zhanfeng Cui, and their teams at Oxford University and OSCAR, is one of the most cited articles in both 2020 and 2021, with a "times cited" count of >360 by the end of October. This paper is also the top 1% cited paper in the academic field of microbiology based on a highly cited threshold for the field and publication year, according to the Web of Science.

**Microbial Biotechnology (MBT)**
@MicrobialBiote1

MOST CITED ARTICLES 2020-21 ‼️ Research Article on RT-LAMP for rapid diagnosis of coronavirus SARS-CoV-2 by Huang et al. @weiehuang1 . CONGRATULATIONS to the authors 👏. Read it here 👇 my.mtr.cool/noojvslrzo (1/3)

When China began lockdown in January 2020, OSCAR PI Prof. Wei Huang and Prof. Zhanfeng Cui called a joint research team of the University of Oxford and OSCAR to start developing a simple and rapid test to identify the SARS-CoV-2 virus from human swab samples.

Pooling their expertise in bioengineering, bioprocessing, and molecular biology, the team successfully worked out a rapid kit for SARS-CoV-2 that provides a result within 30 minutes. The test was clinically validated, and it was first reported by Microbial Biotechnology on April 25, 2020. It is available to read at https://sfamjournals.onlinelibrary.wiley.com/doi/10.1111/1751-7915.13586.

Scientists designed loop mediated isothermal amplification (LAMP) assays by targeting 4 different regions of the SARS-CoV-2 virus. The target on Orf1ab region is highly conserved. Therefore, despite the continuous evolution of SARS-CoV-2, the rapid test remains solid and capable of detecting all variants that have so far been identified.

Further improvement on this research work has reduced the detection time to merely 15 minutes. In addition, researchers have eliminated false positive results by designing a molecular switch and achieved a sensitivity level on par with that of RT-qPCR. The team also managed to make freeze-dried enzymes, which enables the testing kits to be stored and transported at room temperature. This furthered expanded work has also been published in *Microbial Biotechnology* at https://sfamjournals.onlinelibrary.wiley.com/doi/10.1111/1751-7915.13586.

According to Prof. Wei Huang, OSCAR is working on the 3rd generation of Ox-LAMP technology which is easy to use, fast (<15 min), robust (no false positive), highly sensitive (comparable to qPCR) and reliable.



OXFORD SUZHOU CENTRE FOR ADVANCED RESEARCH

# Recent OSCAR publication

## OSCAR's Digital Health Laboratory's research published in NeurIPS 2022

The Digital Health Laboratory at OSCAR, led by Prof. David Clifton, has developed a novel method for generating the instructions given to patients when they leave hospital, which are derived from health records during their hospitalization. This work has been accepted by NeurIPS 2022, the leading AI conference, with Fenglin Liu as first author, a doctoral student in Prof Clifton's Oxford lab and winner of a prestigious Clarendon Scholarship.

**Retrieve, Reason, and Refine:**
**Generating Accurate and Faithful Patient Instructions**

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These “Patient Instructions” contain critical information on (i) why a patient was in hospital, (ii) details of the patient’s condition, and (iii) instructions for which, if any, medication to take afterwards. The instructions are provided to both carers and the patient at the time of discharge, and facilitate safe and appropriate continuity of care – they are essential for the patient to manage their health conditions outside the hospital.

An accurate and easy-to-follow set of patient instructions can improve the patient’s self-management, which can in turn reduce hospital readmission rates and improve outcomes. Compiling an appropriate Patient Instruction, however, can be extremely time-consuming for doctors, exacerbating the workload of clinicians who would otherwise focus on patient care. In addition, doctors are exposed to an overwhelming amount of patients' health records in their daily work, and there exists a well-documented, substantial risk of incompleteness or factually incorrect wording in the resulting Patient Instructions.

To assist doctors with producing such documents, the Digital Health team propose a new machine learning system that aims to generate an accurate and fluent set of patient instructions in textual form, given as input the health records of the patient during hospitalization. The automatically generated instructions are intended for a clinician to then review, modify as appropriate, and approve as necessary – this envisages the system as supporting the clinicians, rather than “taking the human out of the loop”. The goal is to assist doctors with their heavy and complex workload, by automating otherwise-burdensome tasks such as these. Additionally, the team believes that such a system would be particularly useful in resource-limited countries, where access to clinicians that can produce accurate patient instructions may be limited, and where the assistant of a good “first draft”, as produced by the proposed system, can be helpful.

In their work, scientists built a clinical dataset and proposed the method ‘*Re$^3$ Writer*’, named after the three key activities of ‘retrieve, reason and refine’ in the method’s working. *Re$^3$ Writer* imitates the working patterns of a doctor to first retrieve related working experience from historical instructions written by physicians, then reason related medical knowledge. Finally, the retrieved working experience and reasoned medical knowledge are refined to extract useful information that is used to generate an accurate and faithful patient instruction. The experiments conducted on this clinical dataset show that a panel of human reviewers regard the system-generated instructions as meaningful and accurate – often reducing errors that otherwise might creep into such instructions if produced entirely manually.



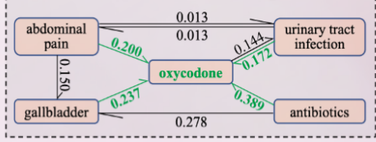
OXFORD SUZHOU CENTRE FOR ADVANCED RESEARCH

**Ground Truth:** dear ms. [name], you were admitted to the hospital with abdominal pain, nausea, vomiting and inability to eat. you were diagnosed with a urinary tract infection, and treated with antibiotics. your pain did not improve, and you were diagnosed with chronic cholecystitis (inflammation of your gallbladder). your gallbladder was removed. changes to your home medications include: for pain, you can take acetaminophen. you can also take oxycodone 5 - 10mg every 4 - 6 hours for pain. your pain should be improving, so you should require less medication over time.

**Retrieved Working Experience**

1. [...] the fevers and urinary tract infection were treated with antibiotics [...]
2. [...] you will also be prescribed an antibiotic for your urinary tract infection [...]

**Reasoned Medical Knowledge**




**Baseline:** dear ms. [name], it was a pleasure taking care of you at [hospital]. you were admitted to the hospital for abdominal pain and nausea / vomiting. you were found to have an infection in your blood stream which we treated with antibiotics. you were also started on iv antibiotics for this infection. you will need to follow - up with dr. [name] as listed below.

**with Re$^3$Writer:** dear ms. [name], it was a pleasure taking care of you at [hospital]. you were admitted to the hospital with abdominal pain and found to have an infection in your gallbladder. you were treated with antibiotics for this infection. you also had a urinary tract infection which was treated with antibiotics. we made the following changes to your medications : - start oxycodone 5 mg every 6 hours as needed for pain.

*Figure: An example of a patient instruction generated by the baseline method compared with that generated by Re3 Writer , where ‘Ground Truth’ shows the actual instructions written by the doctor. Underlined text denotes alignment between the ground truth text and the generated text.*

*Red-coloured text denotes unfavourable results generated by the baseline method. The blue and green-coloured text is generated by Re3 Writer . They denote the retrieved working experience and reasoned medical knowledge, respectively, when corresponding sentences are generated.*

The research paper is available at https://openreview.net/pdf?id=dp0zWsdOV1h

# OSCAR Outreach

In October, Prof. Zhanfeng Cui visited School of Chemical and Biomedical Engineering, University of Melbourne where he delivered a talk on regenerative medical engineering.


Prof. Zhanfeng Cui visited Department of Chemical Engineering and Materials, University of Auckland. During the visit, Prof. Cui explored potential collaboration opportunities in research interests shared by OSCAR, including biomedical food processing, functional materials, and environmental technologies.

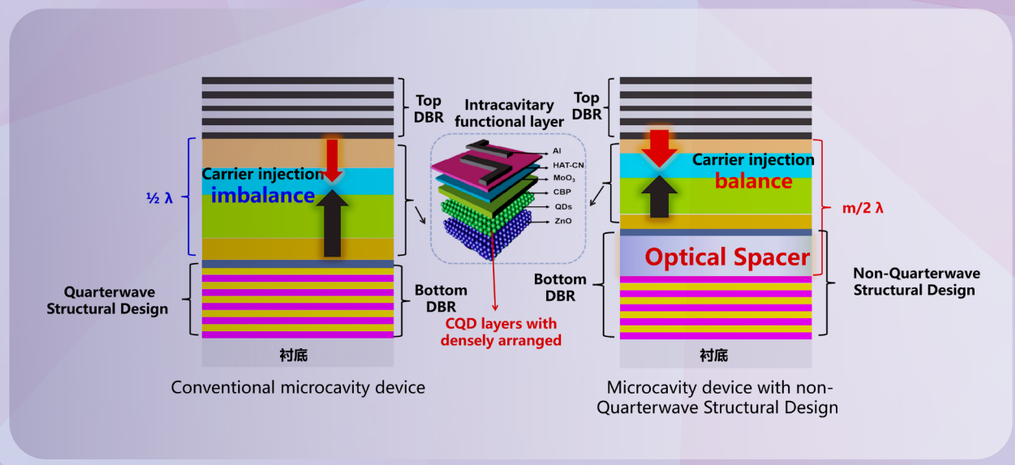




# 'When Scientist meets OSCAR': Dr. Jie Lin

'People's pursuit of advanced light sources with new properties is endless, including narrow linewidth, high colour purity, low energy consumption, low costs, high efficiency, easy integration, environment-friendliness, and many others. My research goal is to achieve high-quality light sources based on novel semiconductor materials, such as organic semiconductors, colloidal quantum dot, perovskites, and carbon dots, through a completely new research strategy.' Dr. Jie Lin, Deputy Head of OSCAR's Optoelectronic Technology Laboratory (OeTL), talks passionately about the technical solutions his research can provide for real world problems.

'When applied to optical communication, interconnection, biomedical detection, and other fields, they will make a significant difference in the future era of the Internet of Everything and significantly change people's perceptions of traditional display and lighting devices.'




Dr. Jie Lin joined Prof. Paul Stavrinou's Optoelectronic Technology Laboratory at OSCAR in April 2021, after spending 20 years studying, working, and starting a family in Changchun, a city in China's north-eastern province of Jilin. He received his bachelor's degree in Electronics

Science and Technology from Jilin University, and Ph.D. from the Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP), Chinese Academy of Sciences (CAS). After completing his doctoral study, Dr. Lin joined the State Key Laboratory of Luminescence and Applications (SKLA) and worked there until March 2021.

When asked why he chose to uproot himself and his family for OSCAR in Suzhou, a city more than 2000 kilometres away from Changchun, Dr. Lin says OSCAR is exactly the place where he can continue his dream. 'Despite a deep bond with CIOMP, I realised I had encountered bottlenecks in my research, and that I needed a new and suitable research platform to overcome them. OSCAR is based on the platform of Oxford University. It has an advanced and efficient management model and sets a high bar for academic research. Our lab is guided by Prof. Paul Stavrinou and Visiting Academician Prof. Donal Bradley, who have a high reputation in the field of organic electronics. That said, our lab never ceased cooperating with CIOMP. With my connections to CIOMP, I can fully leverage more than ten years of my research experience to take our collaboration further and jointly promote the development and commercial application of microcavity organic devices.'

OSCAR's Senior HR Supervisor assisted with this transition in Dr. Lin's career and life. 'I received so much help from HR, who always provide professional support and assistance with great enthusiasm. Whenever there's a question, there's a quick and satisfactory response from HR, be it about professional title assessment, talent project application or my child's school enrolment, personal archive management, and social security matters.'

With the HR department easing some of the hustle associated with joining a new organisation, Dr. Lin was able to adapt to his new role and move ahead with his research.

'The research direction I'm engaged in is interdisciplinary. It requires research backgrounds in such areas as physics, chemistry, and materials, especially familiarity with LED device fabrication and microcavity optics. Our research faces many challenges. It has a low tolerance for error and requires the use of highly standardised operating procedures to achieve unpredictable results.' Dr. Lin shares his insight. Nevertheless, Dr. Lin is not easily discouraged. 'Once I choose the research direction I believe in, I will stick to it.' Dr. Lin says. 'There has been academic controversy about the realisation of electrically pumped microcavity organic emitters, but I'm firmly convinced that it is possible to achieve narrow linewidth and high quality microcavity organic devices by selecting suitable material systems and optimising device structure design. That's why I have been doing this research for more than ten years. Although there is no sensational discovery yet, original breakthroughs are expected.'





In the 18 months he's been with OSCAR, Dr. Lin has built a new research platform with the help of his colleagues. The platform is able to meet the basic characterization requirements of optically and electrically pumped microcavity emitting devices. Through theoretical simulation and experimental verification, the optical microcavity structure designed by OeTL achieves the best efficiency and quality reported so far for the same material system.

Relocating to Suzhou has introduced some welcome changes to Dr. Lin's family life as well. 'I finally understand what it's like to be able to walk to work every day instead of rushing out the door. I have more time now to spend with my family during the holidays. Suzhou's climate is also more suitable for children to play outdoors.' Dr. Lin gives credit to Suzhou's liveability. 'Of course, because of the pandemic, I have not seen that much of Suzhou yet, and I have only checked one item off the Suzhou Leisure Card (which offers discounts for scenic sites and leisure activities in Suzhou). But the whole family is getting used to and fond of Suzhou more and more. We will have a home in Suzhou, and by then we'll have plenty of time to experience Jiangnan culture and enjoy the beautiful scenery of Suzhou.'


*Dr. Jie Lin and his family at OSCAR Family Day*

As a devoted member of the OSCAR Big Family, Dr. Lin has also made keen observations about OSCAR's people, organisational culture and organisational development.

'It's a blessing to be able to concentrate on doing what you love. OSCAR can make every employee come to work with joy and leave work feeling fulfilled. The two most impressive characteristics of OSCAR's people are equality and professionalism. My colleagues see their work not only as a means of survival but more as voluntarily delivering on the responsibilities of each position. They are an indispensable part of the OSCAR culture which I think can be summarised as modesty, self-drive, humble pragmatism, sustainability, and farsightedness.'

Regarding OSCAR's growth, Dr. Lin says, 'After one and a half years of employment, I feel that the division of function among departments has become clearer. OSCAR has been gaining strength and impact thanks to increased but strictly factual publicity. The many team events taking place at OSCAR have also enhanced employees' sense of honour and belonging. The concept of 'I am proud of OSCAR today, and I'll strive to make OSCAR proud of me tomorrow' is taking shape.'

# Meet OSCAR's New Researchers

## Dr. Lin Li
### Research Scientist in OSCAR-Prenetics ITC for Advanced Molecular Diagnostics (ITC)

Dr. Lin Li joined OSCAR on October 8, 2022. She received her PhD from the Institute of Microbiology and Epidemiology in 2017. After that, she worked as a postdoc at the Suzhou Institute of Nanotech and Nanobionics, Chinese Academy of Science from 2017 to 2022. Her former research interests included cancer biomarker discovery, technology development in tumour immunotherapy, and protein engineering. She has published more than 10 research articles and patents in related fields.

In OSCAR, Dr.Lin Li will focus on the development of molecular diagnostic reagents, which provide faster, more sensitive, and more specific technology in the application of infectious disease detection, blood screening, tumour early detection, and other fields. Lin said, "My colleagues have successfully developed a COVID-19 rapid test kit which was used on many occasions for public health. Their story gives me confidence and enthusiasm for the future work."

Lin also says, "OSCAR is where scientific discoveries can be translated into technological applications rapidly. Let science and technology serve the people is our ultimate goal. I think I'll learn more and do better in OSCAR."





## Wei Li
### Research Scientist in Prof. Wei Huang's group

Wei joined OSCAR in October. He was enrolled in the Shanghai Jiaotong University (SJTU) TR class (talent class directly under the Administration Affairs Office) and received his B.S. degree in 2009. In 2011, he obtained his M.Phil. degree in biomedical engineering at the Key Lab of System Biology under the Ministry of Education, SJTU. In 2022, he was awarded his second M.Phil. degree in computer science at the Hong Kong University of Science and Technology. His research topic at HKUST was the multilingual document vectorization model and cross-lingual knowledge transfer in deep neural networks.

Wei has over seven years of working and research experience in machine learning, encompassing speech recognition, natural language understanding, medical image processing, and quantitative investment. Wei served in many roles prior to OSCAR. As a former senior research engineer in NUANCE, Shanghai R&D, Wei was the tech lead for the Chinese Dragon Drive project, the ECOR project (integrated solutions for LVCSR, text messaging correction/editing in automotive), and the Smart Speech Assistant project. His patents and projects provided speech-NLU integrated solutions for BMW, Audi, Lenovo, and the first-generation Apple Siri.

As the former tech director of First Imaging Medical Equipment, Wei's team was responsible for the Post-processing Framework for CT Images, which included data augmentation, CT image classification, segmentation, and enhancement. As the former chief data scientist of Louis Investment Management, Wei led his team to develop the Time Series Forecasting Model for Stock Prices and the Statistical-based Stock Ranking System.

At OSCAR, Wei will focus on the machine learning framework for Raman micro spectroscopy signal reconstruction and sequence-to-sequence models for therapeutic science.

'Most machine learning companies find it increasingly difficult to turn technology into profit, given the many free, competitive, open-source projects online. In the future, the machine learning industry's profit model must be built on 'machine learning plus something.' This `something' must have an entry barrier (e.g., hardware, data, or training), and the algorithms must indisputably enhance the productivity of the aforementioned field. Machine learning and biomedical science would be a perfect match. OSCAR and Professor Huang's group are an excellent platform to combine biomedical technology and my expertise. With so many talented people pioneering various research fields, I believe OSCAR will become the nexus of future technology and interdisciplinary research; machine learning and data science can be the most crucial piece of this mosaic.'

# SIP News in October

## Global companies show growing confidence in Suzhou

Suzhou remains a hot spot for domestic and international businesses, with several new projects underway.


**FuturaSun** announced on October 24 that it would establish its China headquarters as well as a photovoltaic module R&D production base in Wuzhong District. Upon completion, the company is expected to generate an annual sales volume of 2 billion RMB.


**ImmVira** Global R&D and Production Base laid the foundation stone in Wuzhong Biomedicine Industrial Park on October 18. The first phase, a comprehensive industrial base integrating production, R&D and office work, will cover a total area of nearly 30,000 square meters.





**Saint-Gobain Abrasives** (Suzhou) Co., Ltd. held a ceremony in SIP on October 17, marking its new journey towards net zero carbon. Saint-Gobain Suzhou has already become the group's model plant for environmental protection across China and the globe.


**The ZEISS Group** of Germany launched the "Fengqi" project in Suzhou on October 18, which is the first time the group has purchased land for self-construction in China. With a total investment of $25 million, the project will introduce the B&C Global Product Centre of the Microscope Department, marking the further deepening and expansion of ZEISS Group's localization in China.


On October 14, **tesa Site** Suzhou opened its R&D and Customer Solution Centre in SIP. With the Centre launched, the company will now focus on expanding its R&D scale and providing customers in Asia-Pacific and Greater China with whole-process customised services.