

**OSCAR PRESENTS
A METHOD**
for automated signal
quality assessment of
non-invasive foetal
electrocardiogram
recordings

DR. HAIYUN PEI
appointed Topic
Editor of five MDPI
journals



**ON THE THRESHOLD
of a new career chapter
at OSCAR**

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OSCAR presents a method for automated signal quality assessment of non-invasive foetal electrocardiogram recordings

Scientists from OSCAR's Digital Health group have recently developed an algorithm to assess foetal electrocardiogram (fECG) recordings for prenatal diagnosis and monitoring. The approach is expected to improve the reliability of foetal monitoring and contribute to healthier births.

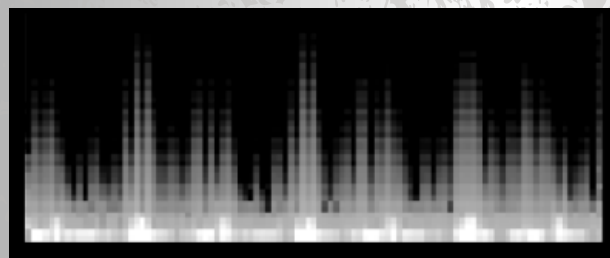
Foetal arrhythmia has a 1%-to-2% incidence among pregnancies, of which about 10% are severely fast or slow foetal arrhythmias, often accompanied by foetal heart failure. Foetal arrhythmia can further lead to secondary damage to important organs, and even premature birth or death of the fetus.

Most fetuses with arrhythmia have a good prognosis, with a 0.3% incidence of cardiac malformations. Continuous foetal bradycardia is associated with severe congenital heart structural defects. When an arrhythmia is observed in foetal heart rate, there is a 1% likelihood that it is linked to abnormalities in the foetal heart structure. Eight to twelve in a thousand infants in China are born with foetal congenital heart diseases, and more than 20% of them fail to receive proper treatment or even die in the early period of infancy, making congenital heart disease one of the main causes of death in new-borns.



▲ Abdominal foetal ECG monitoring

Foetal ECG is a useful tool for monitoring foetal heart activities, providing a reliable basis for the clinical diagnosis of congenital heart conditions. Nevertheless, it is challenging to accurately identify and extract foetal ECG signals as they are weak and blended with maternal ECGs, maternal respiration, and muscle motions.



▲ High-quality fECG signals facilitated by the algorithm

The algorithm developed by OSCAR researchers helps derive high-quality fECG signals desirable for the monitoring of foetal development in uterus, the detection of foetal hypoxia and other pathological conditions during pregnancy or delivery, as well as the screening of foetal congenital heart diseases.

The technology is relevant for hospital scenarios where figure recordings are taken as part of a routine prenatal monitoring screening for foetal defects, in particular heart defects or abnormalities. The assessment results will inform the technician whether the recording is of sufficient quality or if a rerecording is required. The invention is equally useful in home-monitoring fECG devices, assessing the quality of routinely collected data.

The research is led by OSCAR PI Prof. David Clifton and led to a Chinese patent application being filed in April.



David Clifton

Professor of Clinical Machine Learning
University of Oxford



Dr. Haiyun Pei appointed Topic Editor of five MDPI journals

Dr. Haiyun Pei, a Senior Research Scientist at OSCAR, has recently been appointed as Topic Editor of five related international academic journals by the Multidisciplinary Digital Publishing Institute (MDPI), a leading open access publisher. The five journals are *Cells*, *Epigenomes*, *Genes*, *International Journal of Molecular Sciences (IJMS)* and *International Journal of Translational Medicine (IJTM)*.



Dr. Pei will be responsible for the new interdisciplinary topic of 'Stem Cell Differentiation and Applications', together with Dr. Hiroyuki Hirai, Northwestern University, and Dr. Atsushi Asakura, University of Minnesota Twin Cities. She will also collaborate with the editorial team at MDPI in making final decisions on articles after peer-review.

MDPI is a leading open access publisher based in Basel, Switzerland. MDPI publishes over 85 journals that are ranked as high impact within their fields.



Dr. Haiyun Pei

Dr. Haiyun Pei joined OSCAR in September 2021 as a Senior Research Scientist in the Regenerative Medical Engineering group, led by Prof. Zhanfeng Cui.

She was a post-doctoral associate in the Stem Cell Institute and in the Department of Chemical Engineering and Materials Science at the University of Minnesota.

On the threshold of a new career chapter at OSCAR

by Dr. Avinash Pandreka,
Research Scientist



In August 2019, I joined Professor Luet Wong's research group at OSCAR, with an interest in secondary metabolite biosynthesis and their metabolic engineering in microbes.

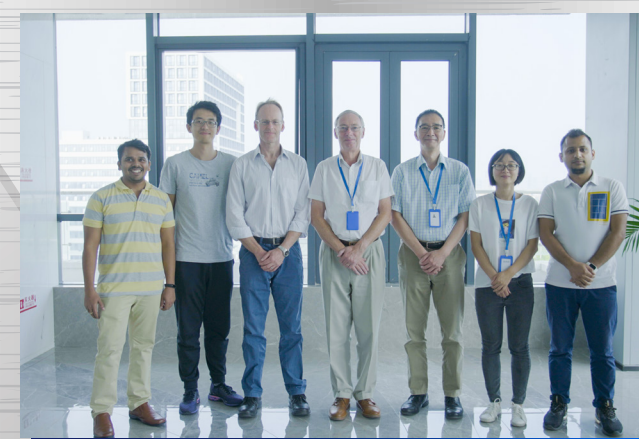
When I arrived at OSCAR, the first thing that surprised me was the professional logistical support I received, which enabled me and my wife to settle in Suzhou in just a few weeks. I was able to get down to my research work in no time in a supportive, flexible, and cooperative research environment.

At OSCAR, researchers are allowed to work flexible hours and are not imposed back-to-back deadlines. Work plans are established through interaction among group members and collaborators. We are exposed to exciting opportunities to interact with industries. Encouragingly, OSCAR provides enormous support to its research teams to spin off their research outputs into start-up companies. All of this speaks to a working environment where researchers can dive into problem identification, resolution, and optimization. Interaction among researchers is increased with the monthly birthday celebration, annual gatherings and other social events organised by OSCAR. As an Indian, I joined OSCAR's Foreign Staff Club, where international staff can talk about the challenges they are faced with when adapting to work and life in a new country.



▲ Avinash participates in an OSCAR Foreign Staff Club gathering

There are thirteen researchers working on the same floor as me who are engaged in various projects in environment and biotechnology. Professor Luet Wong and Professor Jeremy Robertson collaborate closely, with a focus on the establishment and rational evolution of biocatalysts for small molecule synthesis and engineering microbes for bioproduction. Together, they lead an extended research team that comprises Ziyue, Xinxin, Yang, Linxue, Baolong and I. Luet and Jeremy keep a friendly environment to increase our curiosity for research. We draw on each other's strengths and expand our knowledge through sharing and training. Each of us brings a different puzzle piece to the table when solving research problems.



▲ Prof Jeremy Robertson (3rd from left), Prof. Mark Moloney (middle), Prof. Luet Wong (3rd from right) and their teams at OSCAR



▲ Avinash and lab members

In the first few months at OSCAR, the most challenging part was sourcing particular materials from outside China. The materials were critical for establishing metabolic engineering work. I received great support from my lab members and the administration team throughout the purchasing and Customs clearance process. By the time I received confirmation of the shipment of research materials, the Covid-19 pandemic struck, to everyone's surprise.

As a non-Chinese staff member, the shock of Covid-19 is even stronger. I was advised by Luet and the administration team to either work from home in Suzhou or travel back to India. At the end of January 2020, I decided to go back to India with my wife. OSCAR was very helpful in providing us with personal protective supplies to keep us safe during international travel.

As the pandemic subsided in China, the research materials finally arrived at the end of February 2020, and I was able to travel back to China alone and start establishing and improving terpene metabolic engineering research. Within 16 months, I achieved exciting results in new microbial systems for terpene biosynthesis and further downstream processing.

At this time, however, India was seeing huge waves of Covid-19 and most of my family members were infected with the virus. My wife was stuck in India due to international travel restrictions. I grew concerned and thought about going back to India to meet my family, not knowing when I would be allowed to enter China again. Luet and the team showed great understanding of my wish to be with my family at this trying time. The desire for OSCAR's non-Chinese research staff to visit home during the pandemic was quickly brought to the attention of the senior management, who quickly put into place the support needed, and in August 2021, I travelled back to India.

While I was continuing my research in India, there was no sign of the travel restrictions being relaxed. Even now, it remains impossible

for me to go back to OSCAR. Again, OSCAR shows care for its people and offered me the opportunity to be based at Oxford University for one year before returning to OSCAR to continue my research.

This is a testimony to OSCAR's people-centred nature. I couldn't be where I am without the support from Luet, Jeremy, the team, and OSCAR's dynamic adaptation in times of uncertainty. All of these have given me faith in embracing a new chapter in my career at OSCAR where I plan to further my research into secondary metabolite biosynthesis and the understanding of the language of plants and microbes. In the long term, I hope to apply microbiota in secondary metabolite biosynthesis and the improvement of environmental health for both humans and plants.



Meet OSCAR New Staff Member



Dr Edward W. Welbeck

MRSC

*Executive Assistant to the Director
and Research Coordinator*

Dr. Edward Welbeck received his DPhil in Chemistry from London Metropolitan University in 2010. His research work focused on extraction and investigations of flavonoid polyphenol plant metabolites found in natural products and commonly used in traditional Chinese herbal medicinal (TCM) formulations. Edward used a combination of chromatographic and spectroscopic techniques in addition to multivariate statistical analysis with the intention of enhancing existing standardization methodologies used for natural products determinations.

Edward originally came to China directly following his DPhil in London after being awarded an EU-funded Science and Technology Fellowship. The award provided Edward an opportunity to carry out research in a Chinese host institution. Edward was based in Shanghai at the Ministry of Education Key Laboratory for Standardization of Chinese Medicines, Institute of Chinese Materia Medica where he continued his research on standardization methodologies of herbal extracts using NMR spectroscopy as the primary analytical tool.

After his Postdoctoral research, Edward was offered a position in Merck Group in Shanghai (formerly, Merck Chemicals, China), Performance Materials division, working with Liquid Crystal (LC) material used in display technology. He was employed as a Team lead in their Quality Control department at their production facility in Pudong District. It was there that Edward learnt how to run a QC lab gaining ISO accreditation, leading a small team, the production process of LC and the scale-up and testing plans from small test batches to jumbo vessels, statistical process control, batch specifications, project management and laboratory design. In his time at Merck, the QC team grew from 3 to 10 people. He also developed his skills in leadership, handling global collaboration projects with an emphasis on teamwork to harmonize processes.

Since leaving Merck Group, Edward worked at the British Embassy (Beijing) within the Foreign, Commonwealth and Development Office, prior to joining OSCAR as the EA to the Director and Research Coordinator.

“I am excited to be returning to a research-based environment after spending an extended period away from this sector, trying new things and developing new skills. This is a unique opportunity to be immersed in pioneering research developed at OSCAR, and I would like to thank the Senior Management Team for providing a route back into the research world.”

“I look forward to meeting and engaging with each researcher in OSCAR, to learn about the research work they are currently doing, as well as getting to know the broader OSCAR family.”



OSCAR makes list of entities eligible for fast-track patent filing

In April, Suzhou Intellectual Property Protection Centre (SIPPC) announced the inclusion of OSCAR, alongside 1584 other tech businesses, universities and academic research institutes, in the list of patent filing entities eligible to receive SIPPC's high-way prosecution service.

High-way prosecution involves a pre-examination of patent application paperwork by the local Intellectual Property Protection Centre before it is formally filed with the State Intellectual Property Office. This approach puts patent examination on a fast track and brings the patenting timeline down from up to three years for an invention to just around three to six months.

For the moment, SIPPC's high-way prosecution service is only open to invention and utility model applications in the areas of new materials, optoelectronic materials and equipment, medical and health information processing, and biological products.

‘High-way prosecution allows us to acquire a patent grant much faster.’ says Yechen, OSCAR's IP Manager. ‘A patent grant is a credible vote of confidence in our innovative technology. It will benefit the process of technology commercialisation. Nevertheless, going through high-way prosecution also means that the technology will go into the public domain at a much earlier stage, a downside that calls for our full evaluation and case-by-case decision-making, so that the confidentiality of OSCAR's research outputs is not compromised.’