UNIVERSITY OF
OSCAR OXFORD

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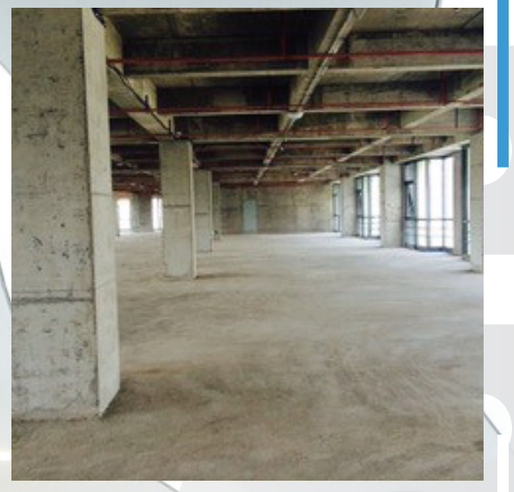
OSCAR will look very different in 5 years' time

by Prof. Mark Moloney, OSCAR Deputy Director

The end of OSCAR's second year of full operation, and the start of the Chinese Year of the Ox, is a good occasion to reflect on what has been achieved so far and what remains to be done in the future.

I well remember the first conversations here in Oxford about the possibility of opening a research institute in China. This led, in April 2015, to a visit to Suzhou to investigate in detail its feasibility. I also well remember the hospitality that we received from the SIP team on that visit, along the dawning awareness of the opportunity which was being presented along with the scale of the task. Through the determination and diplomacy of the now OSCAR Director, Professor Cui - along with the SIP team - doubts, misunderstandings and obstacles were overcome.

After 18 months of renovation, the empty shell which we had seen in 2015 was opened as a fully functional research institute in October 2018, thanks to heroic efforts by the very small team which was then OSCAR. Since then, all employees of OSCAR, be they scientific and technical; administrative and support, have worked tirelessly to make OSCAR what it is today under the leadership of Leah He and of course the research group PIs. The small start-up team has significantly expanded.



The empty shell (pictured during construction in 2015) has since transformed into OSCAR's suite of offices and specialist laboratory areas

Transformed: the completed state-of-the-art OSCAR building on its official launch day

We have now achieved a fully functional institute, conducting international level research and development, and with a rapidly developing reputation. To have achieved this in only 2 years, one of which has seen much of the world locked down with all travel and communication difficult, is remarkable, and we can and should all be proud of that. We can be further heartened that such success comes not from our own assessment, but from considerable external recognition in which OSCAR has won many awards, the most recent of which is “Organisation of the Year 2020” awarded by SEID in January 2021.

But what of the future? OSCAR’s mission is to pursue research and technology maturation in collaboration with local academic and industrial partners, with a focus on environmental, medical, engineering and quantitative financial sectors. With the recent continuation of our funding agreement with SIP for the next 5 years, we will seek to maintain and expand our current activities, particularly for downstream commercialisation of technology which comes from the OSCAR research programme. We will see a significant uplift in staffing levels, a second phase of building fitout, and the creation of several Innovation and Technology Centres, spin-outs and commercial collaborations.

These ambitions mean that OSCAR will look very different in 5 years’ time, just as today it is unrecognisable by comparison to the empty building shell which was here 5 years ago. There is no room for complacency and there is much to be done! Every member of the OSCAR team has a role to play in this, and it is by teamwork that we will succeed. Besides its considerable reputation for research, I hope that OSCAR will be a champion for innovation and collaboration, seeking mutual beneficial outcomes with an open and friendly international cooperation model. ”

Prof. Mark Moloney

Prof. Mark Moloney is OSCAR's Deputy Director and the Principal Investigator of the Functional Materials group within the chemistry cluster. He is a Professor of Chemistry at the University of Oxford and the Sydney Bailey Fellow and Tutor in Chemistry at St. Peter's College, Oxford.

Prof. Moloney specialises in surface modification, which enables the introduction of new surface properties onto a material without changing its bulk properties. His work to develop novel antibacterial chemical structures, currently under evaluation for clinical exploitation, has resulted in more than 200 scientific publications, patents and reviews. He is the academic founder of Oxford Advanced Surfaces and the Oxford Antibiotics group. In 2002 Prof. Moloney was the University of Oxford nominee for Excellence in Teaching, and in 2009 he won the Times Higher Education Serendipity Award.

Prof. Moloney's team at OSCAR currently comprises Research Scientists Dr. Dandan Wang and Dr. Kamran Khan, and is planning to expand in the coming months.

OSCAR's specialist surface chemistry lab

Prof. Moloney and his OSCAR research team working in OSCAR's specialist surface chemistry lab

Dr. Dandan Wang received her doctoral degree from the Department of Chemistry, National University of Singapore. Her research interests lie in the surface modification of various materials, development of polymerization of biscarbene systems, and the introduction of thermal responsive, wetting, adhesion or biocidal behaviours to polymer and protein surfaces.

Dr. Dandan Wang and Dr. Kamran Khan at OSCAR

Dr. Kamran Khan received his PhD from the Chinese Academy of Sciences before undertaking a postdoctoral research post at the Department of Chemical Engineering, Tsinghua University. His research centres around material functionalization using biscarbene systems and its application for protein, polyphenols and water purification; and development of novel antifouling polymer blends using biscarbenes.

Research Spotlight– Optoelectronic Technology Laboratory

Senior Research Scientist Dr. Jingsong Huang and Assistant Research Technician Ms. Wenwen Tao in OSCAR's Optoelectronic Technology Laboratory (OeTL) recently published a joint paper with collaborators in Nanjing University of Posts & Telecommunications, King Abdullah University of Science and Technology, South China University of Technology, and Ciudad Universitaria de Cantoblanco.

Dr. Jingsong Huang has a 20-year track record of research activities in leading universities and industries.

His research interests include organic optoelectronics and its applications in information display, solar cells and biosensors; micro-nano manufacturing technologies.

Wenwen Tao's research work at OSCAR involves the development and application of fully-solution processed organic light-emitting diodes. She earned her Master's degree from Soochow University with distinction as an Excellent Graduate in 2020. She was engaged in the design and synthesis of thermally activated delayed fluorescence emitters and their application on organic light-emitting diodes.

The paper, entitled "*Toward Electrically Pumped Organic Lasers: A Review and Outlook on Material Developments and Resonator Architectures*" was published in *Advanced Photonics Research* in February 2021.

Organic lasers have excellent emission characteristics, simple solution processability and plastic-like mechanical properties, making them attractive for flexible low-cost devices. However, electrically pumped organic lasers have not been achieved due to the inherent drawbacks of organic semiconductors: modest carrier mobility, long-lived excited-state absorption, and extra losses which originate in the device (e.g absorption from metal electrodes). These represent the main challenges of organic semiconductor research. In this review article, the researchers discussed past developments and achievements surrounding organic lasers, providing insights into the mechanism of realization of electrically driven organic lasers.

The Optoelectronic Technology Laboratory's interests span the development of novel semiconducting optoelectronic materials and devices and their application, such as lasers, light emitting diodes, and solar cells.

Dr. Qi Zhang(L1), Dr. Jingsong Huang (middle), Wenwen Tao (R2) and other researchers in OSCAR's OeTL

The lead author, Dr. Qi Zhang, spent 6 months at OSCAR in 2020 in a consulting capacity, working closely with OSCAR's OeTL researchers.

The full open access paper is available to read online and in print:
Zhang, Q., Tao, W., Huang, J., Xia, R. and Cabanillas-Gonzalez, J. (2021). *Toward Electronically Pumped Organic Lasers: A Review and Outlook on Material Developments and Resonator Architectures.* Advanced Photonics Research: 2000155 (DOI: 10.1002/adpr.202000155).

OSCAR's Innovation Technologies Centres

The second phase of OSCAR's development focuses on consolidation of its position in SIP and roots in Oxford by creating new channels for innovative, disruptive and transferable technologies. One way in which this will be achieved is the foundation of six Innovation Technology Centres ("ITCs"). These centres will each focus on strategic emerging areas and capitalise on the research strength of OSCAR's PIs from the MPLS Division at the University of Oxford. They will accelerate technology transfer and commercialisation by increasing technology readiness level of OSCAR's core research.

The ITCs will champion and thrive on collaboration, both internally and externally. Each centre will be led by OSCAR PIs, encouraging exciting research in new and intersectional areas and strengthening working relationships between existing groups. Industry involvement is also key – either as a partner during development; a sponsor seeking a solution to a specific problem; or as a means of applying research in a practical and marketable setting. The Centres will also involve collaboration with an external expert in the field who can contribute more advanced or more specific knowledge in the specific project area.

The ITCs will complement, rather than replace, OSCAR's existing research groups. ITCs are devolved labs to increase technology readiness level and move towards commercialisation. The research work will be:

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- Need-driven – either into a problem presented by industry (pro-active), or in response to an urgent societal need;
- Interdisciplinary or requiring involvement of different disciplines and backgrounds to develop highly applicable technologies;
- Tailored to demand, attitudes or behaviours particularly in China;
- Of commercial or societal value, increasing business and distribution links and creating potential for new income streams.

The ITCs will sit within the innovation hub that will enable technology demonstration, prototype construction and pilot manufacturing. Potentially impactful and marketable research will be refined and developed, increasing technology readiness level and adapting for specific market niches. Each ITC will be supported by a team of dedicated researchers, with an additional experienced team of technicians collectively serving all the centres.

Initially, six ITCs are planned and will drive technology transfer in:

1. Molecular diagnostics
2. Biomanufacturing, bioprocessing and bioformulation ("3B")
3. Biotechnology
4. Personalised health
5. Financial, investment and economic innovation
6. Energy materials

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Visiting Academicians

These external experts, all senior academics in their field with significant fellowships, will help steer research at the ITCs. There are currently four Visiting Academicians already on board:

Prof. Jonathan Cooper
FREng FRSE
(University of Glasgow)

- Expert in 'lab-on-a-chip' biomedical engineering
- Hosted by Prof. Zhanfeng Cui

Prof. Nigel Slater
FREng CEng FIChemE
(emeritus, University of Cambridge)

- Expert in Biopharmaceuticals
- Hosted by Prof. Zhanfeng Cui

Prof. Kenneth Timmis
FRS AAM EAM EMBO
(Technische Universität Braunschweig)

- Expert in microbiology and environmental biotechnology
- Hosted by Prof. Wei Huang

Prof. Donal Bradley
CBE FRS CEng FIET FInstP FRA
(KAUST)

- Expert in molecular electronic materials and devices
- Hosted by Prof. Paul Stavrinou

British Consul General in Shanghai and Vice Chair of the SEID Administrative Committee help unveil the plaque for ITC

OSCAR's first ITC, focussed on Molecular Diagnostics, was launched in November 2020.

This ITC is led by Prof. Zhanfeng Cui and Prof. Wei Huang (OSCAR) and is supported by Visiting Academician Prof. Jon Cooper FREng FRSE (University of Glasgow), Visiting Fellow Dr. Monique Andersson (senior clinician with Oxford University Hospitals NHS Foundation Trust) and Visiting Fellow Dr. Hong Chang (Oxford MEStar Ltd.). Dr. Andersson and Dr. Chang are lending their expertise – as a clinician and medical microbiology expert, and a scientist with industrial experience of developing and marketing in vitro diagnostic devices, respectively – to the Oxsed project. Their collaboration, both directly and indirectly, has been invaluable in supporting the more nebulous aspects of the Oxsed project as it neared clinical trials and subsequent regulatory approval before launch. Their involvement in the ITC will again capitalise on these specific strengths.

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SIP News for February

SIP authorities take measures to upgrade services for foreign talents

SIP authorities unveiled a new policy *New Measures for Bettering Services for Foreign Talents* on 19th February, setting out 19 measures to upgrade services for foreign talents. Among these measures, three are first of their kinds nationwide and ten are considered pioneering in Jiangsu province.

Statistics show that Suzhou, one of the "Top 10 Most Attractive Chinese Cities for Foreigners" ("Amazing China" annual survey, 2019), has thus far welcomed more than 20,000 long-term residents from other countries and regions, half of whom live in SIP. This has prompted SIP authorities to increase services and support to help foreign residents adapt to local life and consequently to attract more talents from overseas. Last year, a specialised service outlet for high-caliber foreign talents opened in SIP, and in a leading move nationally, SIP authorities released a catalogue for more efficient professional qualification authentication for foreign talents. This simplifies the recruitment and immigration process and helped attract 318 high-caliber foreign talents to SIP last year.

The new measures outlined in SIP's policy are aimed at streamlining administrative procedures, relaxing restrictions for professional qualification authentication, and offering foreign talents privileges in applying for work permit and other requests concerning their work and life in SIP. They will be beneficial to the formation of a more open, and global talent cooperation mechanism.

Visit http://jiangsu.china.com.cn/html/jsnews/around/10810577_1.html for the full paper.