

CURRICULUM VITAE OF PETER O'BRIEN

SUMMARY

Head of the *Photonics Packaging Group* at the Tyndall National Institute and Deputy Director of the Science Foundation Ireland *Integrated Photonics Research Centre* (www.ipic.ie). Dr. O'Brien has a unique mix of academic and industry experience. He founded one and co-founded a second photonics company, and since joining the Tyndall Institute in 2008, has established a state-of-the-art photonics packaging facility that has become internationally recognised. His group collaborates with leading research institutes and companies in Europe and the US on integrated photonics, and he has secured significant funding to pursue this research programme (over 11M Euros into his group since 2009). His group also participates in leading integrated photonic foundry services, such as Europractice (Silicon) and JEPPIX (InP) MPW foundries, and the recently funded European integrated photonics Pilot Line (PIX4LIFE), where his group leads all advanced packaging and integration activities.

CONTACT DETAILS

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EDUCATION

- PhD in Physics, University College Cork, 1996-1999
- Masters in Electronic Engineering, University College Cork, 1990-1992
- BA Mod (Physics), Trinity College Dublin, 1986-1990

EMPLOYMENT

- Head of Group, Photonics Packaging, Tyndall National Institute, UCC (2008-present)
- CEO and Founder, Epi-Light Limited, The Rubicon Centre, Cork (2005-2008)
- CTO and Co-Founder, Biosensia Limited, Nova Centre, UCD, Dublin (2003-2005)
- Head of Group, Biophotonics and Microfluidics, Tyndall National Institute, UCC (2000-2003)
- Postdoctoral Scholar at Caltech and Micro Devices Laboratory at NASA's Jet Propulsion Laboratory, Pasadena (1999-2000)
- Silicon Fab Manager, General Instrument (Power Semiconductor Division), Cork (1993-1996)

RESEARCH ACTIVITIES

The Photonics Packaging Group at the Tyndall Institute is primarily involved in the development of packaging solutions for high-density integrated photonic systems, both InP and Silicon systems. This research includes the development of novel passive fibre-coupling processes, hybrid source integration on Si-PICs, development of generic packages for advanced PICs that take account of high optical and RF channel numbers. Target applications include short-reach datacoms and compact sensors for biomedical diagnostics. The group has 14 fulltime researchers and currently has 2 PhD students, with further openings for new PhD studentships. The group has state-of-the-art facilities which include; sub-micron fibre alignment (welding and epoxy attach), micro lens integration, multiple flipchip assembly systems, solder micro sphere jetting, wirebonding and a wide range of test systems, including optical-electrical test and failure analysis. These facilities are supported by extensive design capabilities including; Optical (Lumerical, Zemax), Electrical (HFSS, ADS), Mechanical (Solidworks) and Thermal design (Comsol). Much of this research is performed in collaboration with leading international institutes and companies, and the group is also a member of leading integrated photonic foundry MPW services such as ePIXfab and Europractice.

INTERNATIONAL RESEARCH COLLABORATIONS

- SFI-NSF programme with UC Berkeley, Columbia, Caltech and University of Arizona.
- EU-H2020 programmes on Silicon Photonics with IMEC, CEA-LETI and ST-Microelectronics.
- EU-H2020 programme on Silicon photonics with Roel Bates, University of Gent, Belgium.
- Europractice partner offering Silicon photonics foundry services in collaboration with IMEC.
- Collaboration with Phoenix Software and Mentor Graphics to develop packaging design rules for integrated photonic software tools.
- Collaboration on InP integrated photonics with Fraunhofer (Heinrich Hertz Institute), Technical University of Eindhoven (COBRA Institute) and Oclaro.
- Visiting researcher at the University of California, Santa Barbara (US), École Nationale Supérieure d'Électronique et de Radioélectricité de Grenoble (France), Wissenschaftlichen Zentrums für Materialwissenschaften der Phillips-Universität Marburg (Germany).
- Direct industry collaborations with Intel, Samsung, Macom, Kaiam, Nokia, CERN, Firecomms, Eblana Photonics, Medtronic, Stryker Instruments, Compact Imaging, Radisens Diagnostics, SensL, InfiniLEDs, Rayvio, Fiber Technobis Technology, Lake Region Medical (advanced photonics prototypes developed for all of the listed companies).

OTHER INFORMATION

- Principle Investigator in large-scale European research projects (H2020 and FP7 programmes) on integrated photonics including; PLAT4M, FABULOUS, CARDIS, PIX4LIFE, OCTCHIP, TIPS, MODEGAP. Additional European Space Agency funded programme on integrated optical transceivers for space flight applications.
- Successfully introduced the group's photonics packaging research activities into leading European and US Silicon Photonics foundry service (Europractice and MOSIS), providing advanced photonic packaging capabilities worldwide.
- Leading innovation at UCC in 2014 - "Peter O'Brien had the most significant research-to-commercialisation impact in 2014 and in that year Peter's research led to the issuing of three license agreements from four Invention Disclosure Forms (IDF). Furthermore the IP in the remaining IDF is currently under discussion with the intention of patenting and the subsequent licensing to a very large medical device manufacturer. Peter's research is targeted and delivers impact and his group is one of the most prolific in Tyndall and in UCC", David McGovern, UCC Technology Transfer Office.
- 1 of 5 expert technical panel selected by the Canadian Government's 'Networks Centres of Excellence' to review \$17M research proposal in Silicon Photonics (September 2013).
- Member of technical committee and funding review panel for the flagship European programme ACTPHAST to kick-start investments in photonic business ventures.
- Performed technical due diligence for international venture capital companies investing in photonic and life science start-ups, and significant experience raising venture funds.
- Guest Editor (with Meint Smit at TUE and Christian Koos at KIT) on special edition of 'Advanced Optical Technologies' focusing on integrated photonic technologies, April 2015.
- Leader of European Photonics Industry Consortium (EPIC) PIC Packaging working group dedicated to setting standards in generic PIC packaging.
- Lectures and accredited training through the Eurodots programme for European PhD students in photonics (www.eurodots.org).
- Received significant funding from Stryker Instruments (Michigan, US) for a PhD student programme to investigate integrated photonic systems for emerging surgical applications.
- Science Foundation Ireland 'Women in Science' award to support career development for women returning to a science career (September 2014).

- Sponsored and supported Tanzanian Scientist Young Competition (2015) and BT Irish Young Scientist Competition (2013, 2014 and 2015).
- Outreach to secondary schools in Ireland, including student internships in the photonics packaging laboratory and distribution of Photonic Explorer Kits to celebrate the International Year of Light.

INNOVATION & COMMERCIALISATION ACTIVITY

Dr. O'Brien has considerable industrial and commercialisation experience in photonics across a broad range of markets. Before joining the Tyndall Institute, Dr. O'Brien founded Epi-Light limited. He built-up the company, developing and marketing a range of advanced LED-based illumination systems for specialty markets, including bio-sensing (gene and protein imaging systems), medical devices and pharmaceutical inspection systems. He successfully sold the company in 2009, wishing to pursue his interest in photonics research and development. Since joining the Tyndall Institute, Dr. O'Brien has overseen development of an extensive range of advanced photonics packaging and integration capabilities. Besides performing basic research, his group collaborates with a large number of industry partners to provide advanced photonics prototypes (see - direct industry collaborations for details).

RECENT PEER REVIEWED PUBLICATIONS & CONFERENCE PROCEEDINGS

Book Chapter "Silicon Photonics III: Systems and Applications" (Springer Verlag): Packaging for Silicon Photonic Systems, P. O'Brien, J.S. Lee, L. Carroll, C. Eason, September 2015.

"Roadmap on silicon photonics - packaging of silicon photonic devices", P. O'Brien, Journal of Optics, accepted for publication, November 2015.

"Hybrid III-V/Silicon SOA in Optical Network Based on Advanced Modulation Formats", P. Kasper, G. de Valicourt, R. Brenot, M. Mestre, P. Jenneve, A. Accard, D. Make, F. Lelarge, G-H. Duan, N. Pavarelli, M. Rensing, C. Eason, P. O'Brien, S. Olivier, S. Malhouitre, C. Kopp, C. Jany, and S. Menezo, IEEE Photonics Technology Letter, Vol. 27, November, 2015.

"Optical and Electronic Packaging Processes for Silicon Photonic Systems", N. Pavarelli, J.S. Lee, M. Rensing, C. Scarcella, S. Zhou, P. Ossieur, and P. O'Brien, Journal of Lightwave Technology Vol. 33, Issue 5, 2015.

"A 4x20Gb/s WDM Ring-based Hybrid CMOS Silicon Photonics Transceiver", International Solid-State Circuits Conference (ISSCC), San Francisco, 2015.

"A sensitive optical micro-machined ultrasound sensor (OMUS) based on a silicon photonic ring resonator on an acoustical membrane", Nature Scientific Reports, No. 5, September 2015.

"Thermally controllable silicon photonic crystal nanobeam cavity without surface cladding for sensing applications", W. Fegadolli, N. Pavarelli, P. O'Brien, S. Njoroge, V. Almeidaan, A. Scherer, ACS Photonics, 2 (4), 2015.

"Packaging Process for Grating-Coupled Silicon Photonic Waveguides Using Angle-Polished Fibers", B. Snyder and P O'Brien, IEEE Trans on Comps, Packaging and Manufacturing Tech., Vol. 3, No. 6, June 2013.

"Hybrid Integration of the Wavelength-Tunable Laser With a Silicon Photonic Integrated Circuit", B. Snyder, B. Corbett, P. O'Brien, IEEE Journal of Lightwave Technology, Vol. 31, No. 24, December, 2013.

"Packaging Process for Grating-Coupled Silicon Photonic Waveguides Using Angle-Polished Fibers", B. Snyder and P O'Brien, IEEE Transactions on Components, Packaging and Manufacturing Tech., Vol. 3, No. 6, June 2013.

"Developments in packaging and integration for silicon photonics", B. Snyder and P. O'Brien, Proc. SPIE 8614, Reliability, Packaging, Testing and Characterization of MOEMS/MEMS and Nanodevices XII, 86140D, March, 2013.

"Butterfly packaged high-speed and low leakage InGaAs quantum well photodiode for 2000nm wavelength systems", H. Yang, N. Ye, R. Phelan, J. O'Carroll, B. Kelly, W. Han, X. Wang, N. Nudds, F. Gunning, P. O'Brien, F.H. Peters and B. Corbett Elec. Letts., Vol. 49 No. 4, February 2013.

"A 10 Gb/s Linear Burst-Mode Receiver in 0.25 μ m SiGe:C BiCMOS", P. Ossieur, N. Quadir, S. Porto, C. Antony, W. Han, M. Rensing, P. O'Brien and P. Townsend, IEEE Journal of Solid-State, Circuits, Vol. 48, No. 2, Feb. 2013.

"Analysis and Demonstration of a Photonic Integrated Mode Coupler with MDM and WDM Transmission over Few-Mode Fiber", H. Chen, V. Sleiffer, B. Snyder, M. Kushnerov, R. van Uden, Y. Jung, C. Okonkwo, O. Raz, P. O'Brien, H. de Waardt and T. Koonen, IEEE Photonics Technology Letters, Vol. 25, No. 21, Nov, 2013.

"Demonstration of a Photonic Integrated Mode Coupler with 3.072Tb/s MDM and WDM transmission over Few-Mode Fiber", H. Chen, V. Sleiffer, B. Snyder, M. Kushnerov, R. van Uden, Y. Jung, C. Okonkwo, O. Raz, P. O'Brien, H. de Waardt and T. Koonen, Post-Deadline OECC 2013.

"480 km Transmission of MDM 576-Gb/s 8QAM using a Few-Mode Re-circulating Loop", V. Sleiffer, H. Chen, Y. Jung, M. Kushnerov, D.J. Richardson, S.U. Alam, Y. Sun, L. Grüner-Nielsen, N. Pavarelli, B. Snyder, P. O'Brien, A.D. Ellis, A.M.J Koonen, H. de Waardt, Post-Deadline, IPC 2013.

"Employing an Integrated Mode Multiplexer on Silicon-on-Insulator for Few-mode Fiber Transmission", H. Chen, R. van Uden, C. Okonkwo, B. Snyder, O. Raz, P. O'Brien, H. van den Boom, H. de Waardt and T. Koonen, ECOC 2013.

"Investigation of the Packaging-Induced RF Attenuations and Resonances in a Broadband Optoelectronic Modulator Module", W. Han, M. Rensing, X. Wang, H. Yang, F. Peters. P. O'Brien, IEEE Journal of Lightwave Technology, 30 (16), August, 2012.

"Planar Fiber Packaging Method for Silicon Photonic Integrated Circuits", B. Snyder, P. O'Brien, Conference on Optical Fiber Communication (OFC), April 2012.

"Low-Power, Low-Penalty, Flip-Chip Integrated, 10Gb/s Ring-Based 1V CMOS Photonics Transmitter", B. Snyder, M. Rakowski, M. Pantouvaki, H. Yu, W. Bogaerts, K. de Meyer, M. Steyaert, P. O'Brien, J. Ryckaert, P. Absil, J. Van Campenhout, Conference on Optical Fiber Communication (OFC), 2012.

RECENT INVITED PRESENTATIONS & WORKSHOPS

Invited talks at ECOC 2013 (London), ECOC 2014 (Cannes) and ECOC 2015 (Valencia).

Invited talks at Photonics West (San Francisco) 2013 and 2015.

Invited talk at Fraunhofer Institute (Chemnitz, Germany), July 2015.

Organised ePIXfab training workshop (Tyndall Institute), November 2014.

Invited talk at Silicon Photonics Summer School (Gent, Belgium), July 2014.

Invited talk at German Optical Society (Karlshure, Germany), June 2014.

Invited talks at Photonics Europe (Brussels) 2014.

Invited talk at Semicon Europa 2014 (Dresden, Germany), October 2013

Invited talk at OFC Workshop on Silicon Photonics (Anaheim, California) 2012.

Member of Technical Committee (Photonics Packaging), IEEE Photonics Conference (IPC, Virginia), October 2015.

Co-Chair and speaker on Workshop on Packaging for Integrated Photonics, Optical Fiber Conference (Anaheim, California) 2016.

Co-Chair on Workshop on Integrated Photonics for Datacentres, Optical Fiber Conference (Anaheim, California) 2016.