

Laboratory profile

Michael Oelgemöller* and Matthew Bolte

The Applied and Green Photochemistry research group at James Cook University in Townsville, Australia

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The group

The activities of the Applied and Green Photochemistry group at James Cook University (JCU) are truly multidisciplinary and span the entire spectrum of pharmaceutical and chemical research. They range from the development of miniaturized early drug discovery tools to the solar production of chemicals, photostability testing and photochemical degradation of organic pollutants. To cover these broad areas, the team brings together graduate, undergraduate, internship students and research volunteers from across the world. Exchange agreements are also in place with various institutions in Europe and Japan. This international environment has resulted in a creative and lively team that is recognized globally for its research outputs.

The group leaders

During his career, Michael Oelgemöller has gained broad experiences in academia and industry. He studied chemistry at the University of Münster, Germany, and received his Diploma in 1995 with Professor Jochen Mattay. He subsequently moved to the University of Cologne, where he obtained his PhD in 1999 with Professor Axel Griesbeck. After research positions at the ERATO-JST Photobiogenesis project (1999–2001) and Bayer CropScience (2001–2004) in Japan [1], he was appointed as a lecturer at Dublin City University in Ireland. In January 2009 he joined JCU as an Associate Professor in Organic Chemistry. Matthew Bolte studied chemistry at the Australian

National University (ANU) and graduated with a First Class Honors Degree in Organic Chemistry in 1981. He spent 4 years with Associate Professor Wilfrid D. Crow's Plant growth regulators team at ANU and Tokyo University before moving into the chemical manufacturing industry for the bulk of his chemical career. He has had significant product and process development experience with ICI Australia (Research Scientist, Pesticide & Herbicide group), Coopers Animal Health (Technical Superintendent, Levamisole Plant), Coopers Pittman Moore (Chemistry Development Manager, Australia and New Zealand) and Minehan Agencies (Company Chemist). He joined JCU as a research worker in 2012 and has since been involved in the supervision and managing of the research group.

Current research activities

The research of the group is dedicated to photochemical applications and aligns seamlessly with JCU's motto: *Crescente Luce – light ever increasing*. The team develops and utilizes highly efficient phototransformations for the synthesis of potentially bioactive compounds or drug-delivery vehicles [2]. Through active collaborations with other researchers, these synthesis activities include the development of novel solid-supported sensitizers and photostimulated drug release. Other research deals with the development of continuous flow micro-photoreactors as novel, miniaturized synthesis tools (Figure 1) for the pharmaceutical R&D community [3]. The "Microflow Photochemistry" activities are funded by the Australian Research Council and the Clinton Health Access Initiative and involve collaborations with micro-reactor manufacturers as well as pharmaceutical companies. A special focus is solar chemistry, i.e., the implementation of sunlight in chemical production processes (Figure 2). This project takes advantage of the location of JCU in tropical North Queensland. It uses renewable materials from the local agriculture and forestry industry and converts these

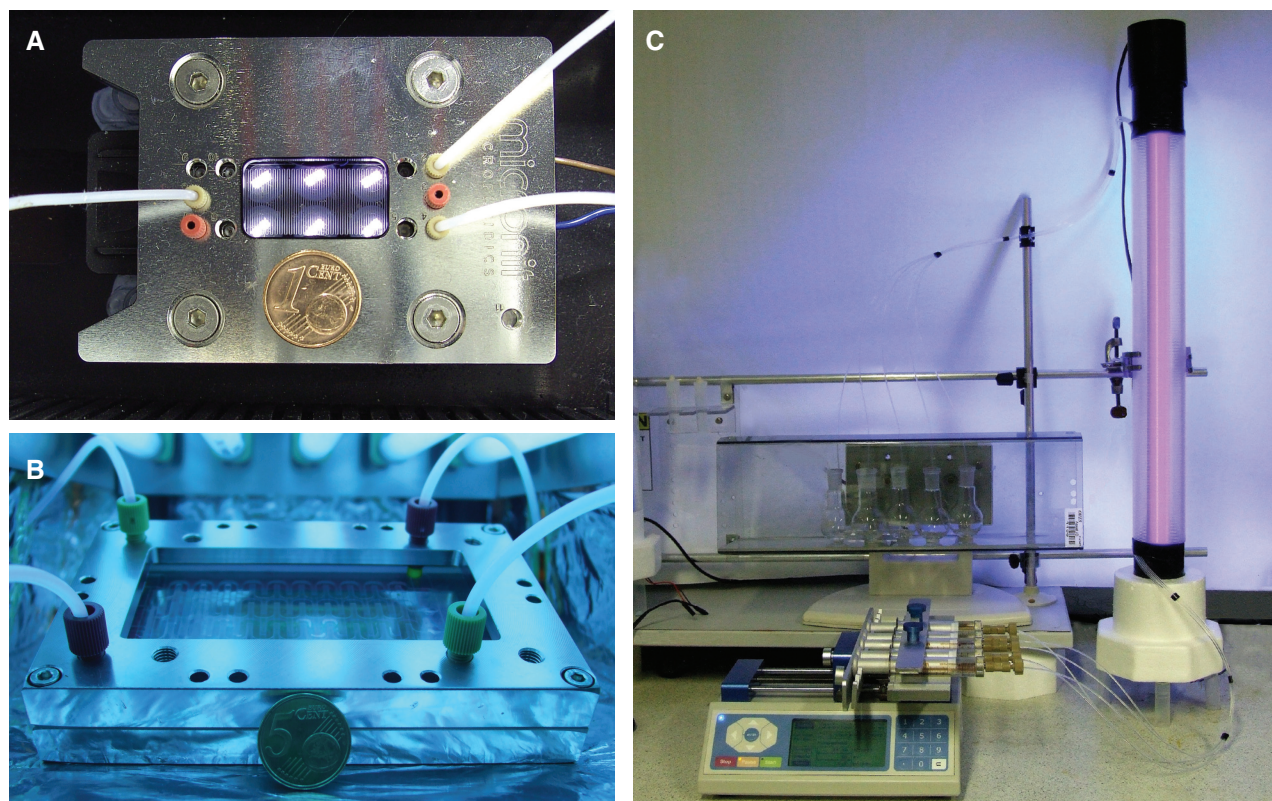


Figure 1 Microflow photoreactors: (A) UV-LED/microchip; (B) UV-panel/dwell device; and (C) UV-fluorescent tube/multicapillary tower.

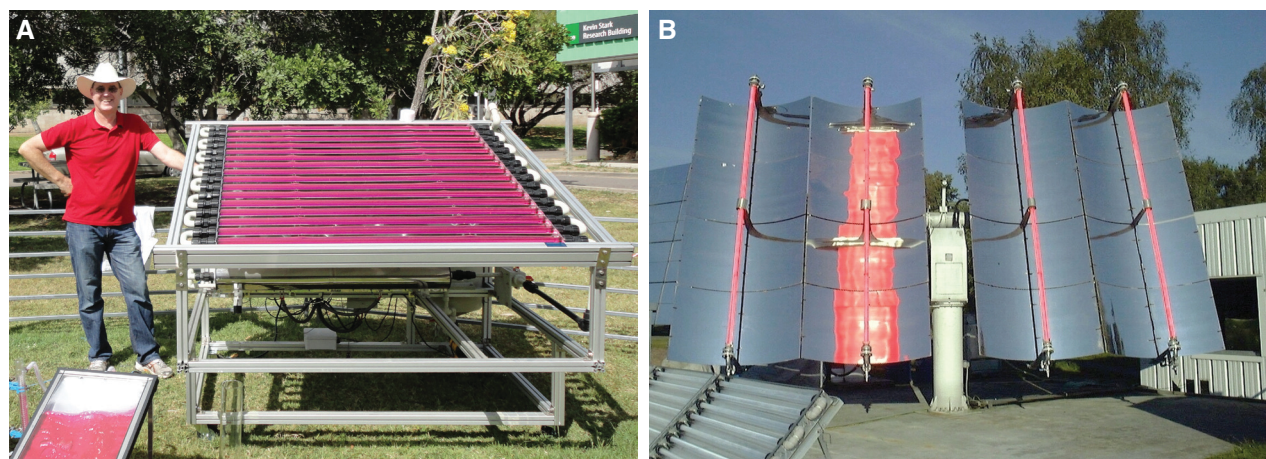


Figure 2 (A) Solar CPC-reactor at JCU; and (B) PROPHIS-loop at the DLR.

into high-value chemicals of economic importance to the region. The group is also collaborating with the German Aerospace Centre (DLR) in Cologne, Germany, on applications of concentrated sunlight [4]. Recently, the group launched a new research stream on photochemical water treatment. This applied area deals with the destruction of priority pollutants and microorganisms in industrial and aquaculture wastewaters [5]. In collaboration with Professor Beverley Glass from the discipline of pharmacy, the

team also investigates the stability of solid drug formulations and cosmetics, in particular sunscreen mixtures, towards sunlight [6].

The institution

The Applied and Green Photochemistry group is part of the Discipline of Chemistry at JCU in Townsville. Located



Author photo Michael Oelgemöller (left) and Matthew Bolte (right).
Homepage: http://www.jcu.edu.au/phms/chemistry/staff/JCUPRD1_059861.html.

at the Great Barrier Reef and surrounded by tropical rainforests and mining sites, the research activities within chemistry span from marine natural products to rare earth chemistry, organic electronics for PVC applications, tropical diseases and solar chemistry. The discipline is

also actively engaged in various tropical research centers and health initiatives at JCU. Chemistry has a long history and was one of the original disciplines when JCU (then as The University College of Townsville) was established in 1961. The university has since seen a number of reorganizations and chemistry is currently placed within the School of Pharmacy and Molecular Sciences in the Faculty of Medicine, Health and Molecular Sciences. With the completion of “The Science Place” in 2017, the Discipline of Chemistry will move into a modern and state-of-the-art teaching and research building. Another restructuring is currently ongoing and chemistry may soon reunite with some of the other natural science disciplines in a new college.

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