

Bath Monash Global PhD Programme in Sustainable Chemical Technologies

Project Title:	Printed cell scaffolds for rapid, robust tox testing of new chemicals – beyond animal testing.
Supervisors at Bath:	Professor Janet L. Scott (lead) and Dr Paul de Bank
Supervisor at Monash:	Professor Bayden Wood
Home Institution:	University of Bath
Indicative period at Host Institution:	From February 2021 to January 2022

Project Summary

The introduction of new chemicals to the market must be preceded by a range of tests to ascertain whether or not these can cause deleterious effects on humans or other organisms. Regulations, such as REACH list a large number of endpoints that must be tested for and many of the requisite tests are (currently) animal based studies. These apply even for new compounds that may be greener or more sustainable replacements for current chemicals in wide use. This can be a barrier to entry to the market for replacement chemicals and this is even recognized by agencies such as the European Chemicals Agency, ECHA, which “*encourages industry to use reliable non-animal approaches to adequately comply with the information obligations of the regulations*”.

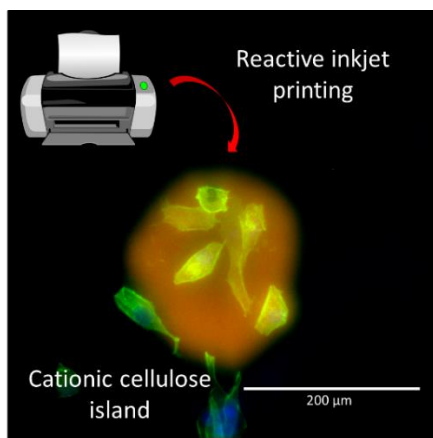


Figure 1. A printed “cationic cellulose” scaffold, bearing stained MG63 cells, localized to the printed island. Smaller structures are also achievable and can be combined with printed channels.

In this PhD project, we propose to combine the expertise at Bath in production of materials for tissue scaffolds¹ and cell growth (Scott and De Bank, Bath) with the exquisite imaging and spectroscopic tools being developed at the Monash Centre for Biospectroscopy, MCB (Wood, Monash), to generate easy-to-use rapid testing devices for the effect of new and known chemicals on cells. While cytotoxicity tests relying on live/dead assays are relatively simple to implement, detection of more subtle changes in cells, such as those that might indicate teratogenicity, is far more challenging.

Thus, these printed cell scaffolds for rapid, robust tox testing would be achieved by: a) immobilizing cells² onto discrete sensing points on 2D printed scaffolds (capability already demonstrated at Bath, Fig. 1); b) to combine these “cell islands” into printed microchannel devices that will allow variable dosing of chemicals to be tested; and c) to use the

- ¹ C.F. Redigueri, T. de Jesus Andreoli Pinto, N. A. Bou-Chacra, R. Galante, G. L. de Araújo, T. Do Nascimento Pedrosa, S. S. Maria-Engler, P. A. De Bank, Ozone Gas as a Benign Sterilization Treatment for PLGA Nanofibre Scaffolds. *Tissue Engineering Part C: Methods*, 2016, **22**, 338-347; T.M.Fortunato, *et al.* Platelet lysate gel and endothelial progenitors stimulate microvascular network formation in vitro: tissue engineering implications. *Scientific Reports*, 2016, **6**, 25326.
- ² J. C. Courtenay, M. A. Johns, F. Galembeck, C. Deneke, E. M. Lanzoni, C. A. Costa, J. L. Scott, R. I. Sharma, Surface Modified Cellulose Scaffolds for Tissue Engineering, *Cellulose*, 2017, **24**, 253-267; J. C. Courtenay, C. Deneke, E. M. Lanzoni, C. A. Costa, J. L. Scott, R. I. Sharma, Modulating cell response on cellulose surfaces; tunable attachment and scaffold mechanics, *Cellulose*, 2017, **25**, 925–940

advanced spectroscopic techniques demonstrated at the MCB for disease detection to probe subtle changes to cell chemistry, indicating endpoints that usually rely on animal models.

The expertise of the two centres is entirely complementary, yet not overlapping making this a very balanced partnership and providing a PhD student with access to knowledge and skills that could not be gained at a single institution. The technology developed could also be applied to drug testing, but we focus on tox testing as this will be a limiting factor in the introduction of new, safer chemicals in well regulated markets.

Features of the programme

- PhD researchers will be registered at both institutions and will be awarded a joint PhD degree.
- PhD researchers will be jointly supervised by academics from both Monash and Bath Universities.
- All PhD researchers in the joint programme will also undertake a bespoke advanced training plan covering a range of topics focusing on sustainability.
- Applicants can apply to either Monash University or the University of Bath as their nominated home institution.
- PhD researchers will undertake a period of no less than 12 months at the partner institution.
- Up to four scholarships/studentships will be offered. Additional and suitably qualified applicants who can access a scholarship/studentship from other sources will be also considered. Evidence of funding must be provided.
- The scholarships/studentships include:
 - *a full tuition fee sponsorship* provided by Bath (home or EU students only) or Monash for the course duration (up to a maximum 42 months)
 - *a living allowance (stipend)* provided by Monash or Bath Universities. Note: Overseas Student Health Cover (OSHC) must be paid by the student, unless covered by the university.

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How to apply

Please express interest for up to three projects in order of preference. Please submit your application at the Home institution of your preferred project. However, please note that you are applying for a joint PhD programme and applications will be processed as such.

The deadline to submit applications is Sunday 12 May.

Monash University

Expressions of interest (Eoi) can be lodged through <https://forms.gle/XkC1TKpqVQh4B4N1A>. The Eoi should provide the following information:

CV including details of citizenship, full transcripts of academic records, evidence of English language level (IELTS or TOEFL), nominate your host institution (ie Bath or Monash), two referees and contact details, indication of which projects are of interest.

University of Bath

Please submit an application through the following link:

https://samis.bath.ac.uk/urd/sits.urd/run/siw_ipp_lgn.login?process=siw_ipp_app&code1=RDUCH-MO01&code2=0001

Please make sure to mention in the “finance” section of your application that you are applying for funding through the joint Bath/Monash PhD programme for your specified projects.

In the “research interests” section of your application, please name up to three projects you are interested in and rank them in order of preference. Please also include the names of the Bath lead supervisors.