



# Aston University

Engineering & Applied Science



## Rigorous, Relevant Research

## Biomaterials

### ► Introduction

The Biomaterials Research Unit at Aston University (ABRU) is an interdisciplinary group of biochemists, biologists, chemists, chemical engineers and materials scientists based in CEAC. The group's main activities centre on polymeric biomaterials and in particular repair and replacement of soft tissue and the biological fluids with which they are in contact. One area of major emphasis is on the anterior eye as a body site – the other is the study of hydrogel polymers as a family of materials. The group has unique academic expertise in the design, synthesis and biological interaction of these materials, and uniquely equipped laboratories to support these activities.

### ► Sponsors and funders

The standing of the group is evidenced by its success in obtaining funding not only from Research Councils (BBSRC and EPSRC), Department of Health, DTI, EU and UK industry but also from major US-based and international companies (e.g. J&J VisionCare, Ciba-Novartis, P&G). In addition, we work closely with clinical collaborators which enables the work to be approached from broadly based fundamental, clinical and commercial viewpoints.

### ► Academic partners

We have academic and clinical links within Aston (Professor James Wolffsohn & Dr Shezad Naroo, in Vision Sciences and Dr David Webb in Photonics), at other UK institutions (Dr Jill Urban, Oxford University; Professor John Fisher, Leeds University; Professor Andrew Lloyd, University of Brighton; Dr Sally Roberts, Oswestry Orthopaedic Hospital; Mr Christopher Liu, Sussex Eye Hospital) and overseas (Professor Jean Jacob, Louisiana; Professor Lyndon Jones, Waterloo; Professor John Foster, New South Wales; Dr R Molloy, Chiang Mai, Thailand).

### ► Key projects

- The interaction of polymer surfaces with natural tissue surfaces, particularly tear film interactions with artificial cornea and contact lenses, the design of hydrophilic polymers for dermal applications such as ostomy adhesives and chronic wound healing.
- Biologically sustainable interpenetrating networks as analogues of natural tissue. Earlier work on artificial cartilage has been extended to artificial cornea, intraocular lenses and now to injectable intervertebral disc reinforcement.

- The design and synthesis of responsive surface active polymers and novel amphiphilic nanostructures has led to novel platform technology with a range of therapeutic applications including synthetic biolubricants for treatment of articular joints together with dry eye syndrome and applications in novel drug carriers in ocular and dermal delivery systems.

### ► Applications

The work of Aston Biomaterials Research Unit has led to several patents (lipid-based nanostructures, proteoglycan analogues for ocular applications, intervertebral disc repair systems) and the formation of spin-off companies (Astosomes, Lipisure and Aston Ophthalmic Analysis and Testing Services). ABRU is engaged in a range of cooperative CASE projects and KTP Programmes with UK industry (Salts Healthcare Ltd, First Water Ltd, Vista Optics Ltd, EvanesCo Ltd).

### ► Recent publications

- Tonge SR and Tighe BJ, "Responsive hydrophobically associating polymers: a review of structure and properties" *Advanced Drug Delivery Reviews* 2001; 53: pp 109-122.
- Foster LJR and Tighe BJ, "Centrifugally spun polyhydroxybutyrate fibres: accelerated hydrolytic degradation studies" *Polymer Degradation and Stability* 2005; 87: pp 1-10.
- Li L-y and Tighe BJ, "Numerical simulation of corneal transport processes" *J Roy Soc Interface* 2006; 3: pp 303-310.
- Mahomed A and Tighe BJ, "Structural aspects of the design of ocular drug delivery systems" *Acta Ophthalmologica Scandinavica* 2006; 84: (s239) p 181.
- Tighe BJ, "Contact Lens Materials" *Contact Lenses*, 5th edn: Anthony J Phillips & Lynne Speedwell, Editors Butterworth-Heinemann 2007, pp 59-78.
- Mann AM and Tighe BJ "Tear analysis and lens-tear interactions: Part I. Protein fingerprinting with microfluidic technology" *Contact Lens and Anterior Eye* 2007;30: pp 163-173.
- Li L-y, Tighe BJ "Nonlinear analysis of static axisymmetric deformation of the human cornea" *Computational Materials Science* 2007; 38: pp 618-624.

### Key contacts

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