Editorial

Brian J. Meenan* and Adrian R. Boyd

Nanotechnology and Integrated Bioengineering Centre (NIBEC),
University of Ulster,
Shore Road, Newtownabbey, Co. Antrim,
Northern Ireland BT37 0QB, UK
E-mail: bj.meenan@ulster.ac.uk
E-mail: ar.boyd@ulster.ac.uk
*Corresponding author

Biographical notes: Brian J. Meenan is a Professor of Biomedical Materials at the University of Ulster and Head of the Biomaterials and Tissue Engineering Research Group within the Nanotechnology and Integrated Bioengineering Centre (NIBEC). He directs the university's contributions to the EPSRC Multidisciplinary Assessment of Technology Centre for Healthcare (MATCH) and the EPSRC Grand Challenge: Regenerative Medicine: A New Industry (Remedi). His research is focused on surface engineering for control of cell-surface interactions with emphasis on nanoscale effects. He has published over 100 papers in peer reviewed journals and conference proceedings and is a Past President of the UK Society for Biomaterials.

Adrian R. Boyd is a Lecturer within the Nanotechnology and Integrated Bioengineering Centre (NIBEC) at the University of Ulster. He was educated at the University of Ulster and his research activities are directed towards the development of functional biomaterials, with particular emphasis on the nano- and meso-scale. Other research interests include the application of surface science and spectroscopy in the understanding of the biological interface. He has over 30 publications in peer reviewed journals and conference proceedings. He is a Council Member of the UK Society for Biomaterials and is currently President of the Northern Ireland Biomedical Engineering Society.

Biomaterials, due to their integral role in the fabrication of most of the current generation of medical implant devices are a critical consideration for the provision of advanced healthcare technologies. Indeed, the various medical implants that are now commonly used to replace and/or augment diseased or damaged tissues and organs in the human body owe much of their clinical success to the properties of the materials from which they are fabricated. Moreover, the function of such devices is critically dependent upon the interactions that occur at the interface between the surface of the implanted device/material and the biological environment in which it is placed. As such, the development of biomaterials that can direct and control specific cellular processes at this interface is a key consideration in furthering implant utility. This is particularly the case in the emerging areas of tissue engineering and regenerative medicine where the function of the product is dependent upon the nature and scale of the molecular and macromolecular interactions that occur within a scaffold or delivery system. The development of surface features that can direct such processes has the potential to

improve tissue regeneration *in vivo* and thereby forms the basis of much of the developing technology in the area. An increasingly important aspect of such studies is the determination of those surface properties that will promote and support early stage bioprocesses that can lead to the formation of viable tissue. In this regard, the role of those effects that might be available at the nano-scale becomes an exciting proposition. The provision of targeted features (surface and/or bulk) in the region of ≤100 nm offers the opportunity for materials to interact directly with the molecular scale biochemistry on the subcellular level with the aim of directing a specific process that can lead to a targeted response *in vivo*. The opportunities that this approach offers have already been embraced in several areas of medicine, most specifically in the treatment of cancerous cells by the use of nano-particles with the capability of releasing a highly targeted chemotherapy payload or by providing a target for their localised thermal inactivation *in vivo*. It is clear that the medical applications of nanotechnology will continue to expand rapidly and therefore the attendant materials science will need to develop in a concerted manner. Specifically, the need to consider nano- and biomaterials in a way that provides for a process of convergence that will result in a clear understanding of the role of the nano-scale is now evident.

The purpose of this new journal is to present innovative research and development in the areas of nano- and biomaterials science and to report on the application of such systems. Specific emphasis is given to the convergence of nano-scale effects, as they relate to the delivery of enhanced biofunctionality. The papers presented in this inaugural issue bring together a number of materials-based approaches that are currently being explored to deliver systems that can impart real clinical benefit. As such, they represent many of the significant challenges that exist to our producing medical implants and therapies that are capable of achieving regeneration of viable tissues and organs for implantation. We hope that they will therefore serve as a key reference volume of high-quality research papers for those who wish to contribute to the global endeavour of improving clinical outcomes for the benefit of patients today and tomorrow.

As invited Guest Editors of the launch edition of this important journal, we would like to thank Professors Jackson and Ahmed for their expert guidance and contributions to the publication. In addition, we would also like to acknowledge the contributions of the peer reviewers for the suite of papers presented here. We hope that the academic community will find the topics covered of interest and that they will continue to support the journal with future contributions from their research activities. Moreover, we trust that this convergent journal will offer a means to stimulate new ideas and innovation in the fields of nano- and biomaterials.