Biomatter 3:3, e25887; July/August/September 2013; © 2013 Landes Bioscience

# Biomaterials and bioengineering tomorrow's healthcare

Suwan N. Jayasinghe

BioPhysics Group; UCL Institute of Biomedical Engineering; UCL Centre for Stem Cells and Regenerative Medicine; Department of Mechanical Engineering; University College London; London, UK

It is with great pleasure that I write this guest editorial for *Biomatter*, a journal that is rapidly evolving into an international forum highlighting innovation and insight into evolving and emerging biomaterials. Before I move to my thoughts behind the special focus issue, I would like to wholeheartedly thank Professor Pedro Granja for inviting me to do a special focus in his journal. I also take this opportunity to thank the editorial team and Landes Bioscience who have been extremely efficient in handling the many manuscripts received for this special focus, and have made this challenge a pleasure for me. To both the Editor-in-Chief and editorial team it is a testament that you're driving this journal with conviction to be a leading forum in biomaterials!

My thoughts behind this challenge was to bring together some leading scientists in this ever expanding field to highlight advances made in their respective expertise, under the remit of biomaterials, which will bioengineer tomorrow's healthcare. It is my opinion that we have achieved this through this special focus and hence without further ado I take this opportunity to thank each and every author for his/her valued contribution to this issue. I would have not been able to carry out this task without you.

It is a classical procedure when writing a guest editorial for one to introduce each paper as they appear in the issue. I will not follow this process but instead will leave this to the reader to do for themselves, but hope to elucidate the endeavor of how each aspect will fit together in this constantly evolving jig saw puzzle we are fighting to solve. A few examples of the endeavor we are constantly trying to solve take the form of disease, damaged and/or aging tissues or organs. In order to repair, replace and rejuvenate such tissue/organs we need to understand how they function and how they repair themselves when possible. In this context developmental biologists have been making advances in understanding how tissue and organs form and function as an organism develops. Cell and molecular biologist have in parallel been investigating and building an understanding of these developments from a molecular to cellular level. These insights have been most useful in understanding many features of developing organisms from model-based systems to humans. In fact such studies have given rise to innovative small molecular modifications and development as therapies, which target from molecules and/or cells (experimental/medical genes and/or cells). This is particularly relevant to understanding stem cells and their exploration for disease control, tissue repair and many other clinically relevant scenarios. Although such studies have made a significant impact and many advances, in several cases they have reached a roadblock, which limits their progression from the laboratory to the possibility of being explored in humans. At this stage the physical sciences have been brought into assisting in many ways for overcoming many such roadblocks while also demonstrating innovative approaches to developing delivery systems and tissues for a wide range of applications having remarkable feats for both the laboratory and the clinic.

These innovations have yielded from the materials, chemical and engineering sciences, which have seen techniques and systems commonly explored in these fields of research undergoing adoption for the biomedical and health sciences. In terms of biomaterials, chemists have been working in close collaboration with biologists and clinicians to develop synthetic polymers, which are able to accommodate the intricate metabolisms and other functions of cells and molecules. These biopolymers have been most useful to many applications, which range from controlled and localized drug delivery vehicles to those which could be used for delivering cells (including stem cells) to given tissue and organs. In this very aspect materials and engineering scientists have been able to take the biomaterials and the molecules and/or cells and develop techniques for efficiently forming either encapsulations as beads or as fiber scaffolds for systemic or targeted delivery and for forming cellular sheets and vessels which truly are able to mimic native respective tissues. These structures have undergone further investigation under the physical sciences where their microstructure and their biomechanics are studied from a molecular level upwards for understanding the ability to use these architectures as repair systems. Such structures are being created in multiwell plates for developing tissues in a dish for carrying out studies in a more humane manner while also opening the ability to screen tissues and develop drugs more rapidly and personally. These studies have also given rise to a new field of research referred to as synthetic biology. The innovations expand even further where scientists have coupled the ability to modify surfaces from the nanoscale upwards for understanding basic biological aspects such as the ability to increase adhesion for adherent cells to those, which would repel

Correspondence to: Suwan N. Jayasinghe; Email: s.jayasinghe@ucl.ac.uk
Submitted: 07/19/13; Accepted: 07/19/13
Citation: Jayasinghe SN. Biomaterials and bioengineering tomorrow's healthcare. Biomatter 2013; 3:e25887; http://dx.doi.org/10.4161/biom.25887

bacterial attraction, which is most relevant to culturing cells in the laboratory to the surface treatment of orthopedic devices introduced into the anatomy. These and other advances will continue to flourish and see many revolutionary concepts emerge from the laboratory and enter the clinic.

The advances mentioned above are only a glimpse of the tip of the iceberg. The articles will not only elucidate these many advances but will also demonstrate the cross-fertility of these endeavors, which are truly exciting and groundbreaking. It is my opinion that we are constantly challenging ourselves to better our understanding of ourselves while also striving to better our wellbeing.

To the readers of *Biomatter* I sincerely hope you enjoy reading this focused issue and hope you submit your next exciting manuscript to *Biomatter*!