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# Editorial
# A quarter century of European Biomaterials Conferences

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As Chairman of the 16th Conference of the European Society for Biomaterials it is my pleasant duty to introduce this Special Issue of the *Journal* with selected papers from the meeting. The conference took place at The Brewery, Chiswell Street in the City of London, 12–14 September 2001 and was the 25th anniversary meeting of the Society. I hope all the attendees enjoyed the unusual environment of an over 200-year-old brewery building, although, unlike the last few meetings, we were not beside the sea. Hopefully dinner on the River Thames convinced the delegates that we had not forgotten the importance of water to biomaterials research.

The papers published in this Special Issue reflect the range of papers and posters presented at the conference. I found looking through this group of papers and the others presented at the meeting, a range of themes and I hope that their presentation in this Special Issue reflects the direction of the research being performed by members of the European Society for Biomaterials and our colleagues worldwide. In terms of materials, progress continues to develop or to modify materials. These materials may be bioactive, with the intention of causing desirable reaction with the environment, or bioinert, to be, as far as possible, ignored by the body. A more recent additional application of materials is as scaffolds for tissue engineering. Novel polymers are being developed or current ones are being modified to make their properties more relevant for specific applications. Over the last few years one noticeable change is the increasing application of engineering polymer and composite technologies and coating technologies to the production of biomaterials. The use of composites technology builds on the advantages of the individual components thereby balancing the mechanical and biological requirements for the biomaterial concerned. Thus materials which had been considered to be merely acceptable are now being improved or novel applications being found due to changes in the processing technologies. Subtle changes in materials processing can lead to substantial changes in the properties. It is interesting to note the new soft tissue applications including urotheal and pericardial and in dialysis catheters presented.

In terms of coatings, our understanding of the adsorption of biological factors onto surfaces with biological function is increasing, both to provide a beneficial surface for the attachment of cells or to prevent the attachment of biofilms, thus discouraging bacteria adhesion.

All novel materials development requires understanding of the short- and long-term effects of the biological environment on the materials. Over the last 25 years, the techniques for investigating the interactions between biomaterials and their environment have increased substantially. In the past, the aim was no, which normally meant minimal, interaction between materials and their surroundings, now the aim is to generate a beneficial interaction between the material and the body, thereby co-operating with the biological system into which materials and devices are to be implanted. One obvious change has been in the introduction of cell culture as a method of assessing the biological response to materials thereby increasing the information which can be gained on the biological behavior of materials and reducing the number of animal experiments necessary. The benefits of cell culture include investigation of the inter- and intracellular signaling pathways and thus the effects of ions and other factors on the cellular response. In the longer term this understanding potentially could lead to controlled apoptosis. Working with cells enables the strength of the interface between cells and materials to be measured at the cellular, rather than the bulk, level. Additionally, the advances in cell culture techniques have enabled advances into tissue engineering, putting the cells into the implant before it is implanted into the body rather than waiting for the body's own cells to colonize the implant.

Once implants are in the body, they may degrade, or abrasion can lead to particle release. Thus when considering the responses to materials, those to the bulk material, to particles and to released molecules and ions are all important. This edition of the *Journal* has a range of papers both on the production of particles and the biological response to the particles and to ions released from materials. It is interesting to see how different the response is depending on both the cells being exposed to the ions and to the specific ions. The body is a dynamic system and cells react to the loads applied to them. In clinical treatments, ultrasound has been used to stimulate fracture healing, but in the two papers in this Special Issue two different effects have been seen depending upon the ultrasound intensity. Finally we have two papers on biosensors reflecting the growing interest in this field.

What further developments over the next 25 years can be foreseen from the papers presented here? The basic materials will improve, reflecting the changes in processing developed in the materials science outside the biomaterials field. These changes will be in both the structural or bulk properties of the materials and in the properties which the body sees, that is the surface. These will all combine to enable implants to be ''tailored'' for their specific application and potentially even for a specific patient. Tissue engineering is certain to increase and should progress from the current soft tissue applications into hard tissue implants and organ replacement. The cells in these implants will be influenced by the results of the human genome project. While currently biosensors are being developed to measure activities instantaneously, what more could be done? In conventional engineering in critical applications the use of ''smart'' components warns of impending failure. Will the application of biosensors in addition to all these other changes permit the manufacture of ''intelligent'' implants which warn that they are about to fracture or more interestingly that their local environment is changing enabling surgical intervention before the patient feels pain or more serious consequences?