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BIOENGINEERED TEXTILES – THE CONVERGENCE OF BIOENGINEERING AND ELECTROACTIVE CONDUCTIVE POLYMERS FOR ASSISTIVE HEALTHCARE

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Two technological discoveries and developments relevant to synthetic polymers and biopolymers have emerged since the early 1980's, providing innovative opportunities and applications relevant to textiles. These are the discovery and development of electro & photo active conductive polymers and bio responsive, bio compatible hydrogels respectively.

Recently, we have started to examine how the convergence of biology, textiles /polymers and electronics can lead to beneficial 'Ambient Life' applications, for example: assistive healthcare through 'smart' bandages and intelligent materials, interactive surfaces for the monitoring & control of infection, and the creation of design led wearable technologies, enabling controlled release of active ingredients. The 'eScent' is an example of a design led wearable technology: a user-worn dispenser capable of delivering sensory effects triggered by an electrical signal through a built-in MEMS device, which can be embedded in jewellery and 'smart' clothes.

This paper will outline some of the issues associated with textile based bio medical devices and systems, in particular, the interface between biosensors and electronics for the monitoring (sensing) and treatment (controlled delivery therapeutics) in chronic wounds and the corresponding use of WiFi &/or Bluetooth technologies to send digital information to clinician databanks.

A key aspect of the above subject is how, in materials processing, nature replaces the use of energy intensive processes (i.e. high temperatures and pressure or harsh chemical reaction environments) with the utilisation of information intensive processes which stem from organisation in structure at all levels, from the molecular scale (nm) to macroscopic (km).

Indeed, most of the exceptional functionality of bio (and electro/photo active) materials is due to the combination of structure, composition and morphological hierarchy. It is here that the most important aspect of biomimetics approaches converge and has the power to create emphatic new possibilities through bioengineering. It also has significant parallels with the techniques employed within textile production and design, i.e. modern weaving, knitting, sewing & embroidery methodologies. By utilising organisation in structure through textile capabilities, it is possible, with bio responsive hydrogels and converging conjugated conductive polymers to create super synthetic textile devices & systems which will act as a product design platform and significantly enhance assistive preventative healthcare in the 21st century.