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THE CONTRIBUTION OF ENGINEERS TO THE PRACTICE OF MEDICINE

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Bioengineering has a place in many disciplines. Sometimes it is thought of in relation to biotechnology through the utilisation of living processes, sometimes as medical instrumentation - a wide field encompassing electronics, computing and medical physics. Professor Paul's initial training was in mechanical engineering and the aspect of bioengineering that interests him most is the biomechanics and design of orthopaedic implants.

Professor Paul pointed out that materials scientists have always made a great contribution to bioengineering, but, curiously, few of their materials have been developed specifically for medical use. Most were developed for use in an aggressive environment such as sea water or high concentration of chemicals. All materials, with the possible exception of gold, cause some adverse reactions.

Professor Paul went on to talk about extracorporeal treatment of blood. He described the different engineering problems posed by mimicking the functions of the heart, the kidneys and the liver. Finally he described current research into the design of an implanted bioreactor to supplement or replace the pancreas.

Much work has been undertaken in Edinburgh on the development of control systems to artificial limbs. Professor Paul explained that engineers are working on external control systems (which will eventually be the size of a wrist watch) using electrical stimulation to supplement the remaining body control functions after spinal injury. However, there have been few successes as yet because of the muscular complexity of even a simple movement and the exhaustion caused to the patients. Although the technology exists to assist spine-injured patients to walk again, incorporation of the whole system in the body with an appropriate control system is a long way off. Professor Paul believes the current research into using the sensory and proprioceptive information stored in the intact nervous system in the legs looks promising.

Finally, Professor Paul looked at the properties of materials used in bioengineering, describing how they differ from biological materials. He went on to describe in detail the research into load cycles required before designing, for example, joint replacements.