

Abstract

Increasingly new medical techniques and patient expectation mean that treatment is being performed deep in the body without major intervention. This is better for the patient and can reduce costs but presents new challenges for the surgeon. Previously when the surgeon performed an operation, the area being treated was in full view and the surgeon could feel the tissue. In minimally invasive surgery this direct contact is lost. Sensors, small enough to fit on a catheter can give this information back to the surgeon. In addition to sensing, actuators can be integrated, to make a complete system. Sensor systems can also be implanted into the body for longer periods. This presents many new challenges for the designer in terms of materials, design and long term stability, but the benefits can be great. Devices can be implanted for medium term to monitor healing. For longer term devices can restore sensing such as with cochlear or retinal implants. Modern pacemakers use a range of sensors to optimise operation and maximise lifetime. With all in-vivo devices biocompatibility and safety are essential considerations in development. Miniaturisation of devices can also yield great benefits in in-vitro devices. Micro-fluidic systems enable analysis to be done with smaller samples and yield faster results. Smaller sample size and faster results can make the critical difference when treating in intensive care. This paper will look into the wide range of devices and systems which can greatly improve the effectiveness and safety of modern medicine.

Short Bio

Paddy French received his B.Sc. in mathematics and M.Sc. in electronics from Southampton University, UK, in 1981 and 1982, respectively. In 1986 he obtained his Ph.D., also from Southampton University, which was a study of the piezoresistive effect in polysilicon. After 18 months as a post doc at Delft University, The Netherlands, he moved to Japan in 1988. For 3 years he worked on sensors for automobiles at the Central Engineering Laboratories of Nissan Motor Company. He returned to Delft University in May 1991 and is now a staff member of the Laboratory for Electronic Instrumentation. In 1999 he was awarded the Antoni van Leeuwenhoek chair and in June 2002 he became head of the Electronic Instrumentation Laboratory. He is Editor-in-chief of Sensors and Actuators A and General Editor of Sensors and Actuators A&B. His research interests are integrated sensor systems, in particular for medical applications.