

Biosensors: trends and trajectories

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Biosensors have grown from a tiny, niche activity in the 1980's into a major, US\$13 billion, worldwide industry. At the heart of this success lies the art of interfacing biology and electronics, which enables the exquisite specificity and sensitivity of natural systems to be integrated with modern microelectronics. Novel electronic materials, nanomaterials and engineering design are playing key roles in this development, not only in sensors and diagnostics, but also in sectors such as telecommunications, paper and textiles. Biological sensing is a fundamental tool for understanding living systems, but also finds practical application in medicine, drug discovery, process control, food safety, environmental monitoring, defence and personal security. Moreover, a deeper understanding of the bio/electronic interface leads us towards new horizons in areas such as bionics, power generation and computing. Advances in telecommunications, expert systems and distributed diagnostics prompts us to question the current ways we deliver healthcare, while robust industrial sensors enable new paradigms in R&D and production. Personalisation of everything from medicine to environmental control gives new impetus to consumer choice and ownership of information, and will inevitably generate new payment structures and business models. Wearable, mobile and integrated sensors are becoming common place, but most current products have taken the easy path of incorporating physical sensors for parameters such as temperature, pressure, orientation or position. There is a glaring absence of suitably robust and convenient sensors for body chemistries and herein lies the real opportunities for progress. This tutorial overview will examine the origins and current trajectories of the key biosensor technologies that are fuelling scientific discovery and underpinning new products to enhance the length and quality of our lives. The convergence of skills and knowledge taking place at the moment paves the way for an exciting, person-orientated future that takes into proper account individual needs in a new outcomes-driven paradigm.

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