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COCHLEAR IMPLANTS IN THE THIRD MILLENNIUM

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In spite of the achievements with cochlear implants over the last 30 years many challenges lie ahead in the Third Millennium. The first major challenge is to better understand the coding of sound, and how this can be reproduced by electrical stimulation. With more advanced cochlear implants it should now be possible to better imitate patterns of responses in auditory nerve fibres. This will be facilitated by electrode arrays with considerably increased numbers of electrodes enabling more discrete groups of nerves to be excited.

The second major challenge is to increase our understanding of how signals are coded in the presence of background noise. This should enable the improved engineering of systems which perform better in noise.

The third major challenge is to improve implant performance for all prelinguistically deaf children. This will require a greater knowledge of plasticity in the central nervous system and speech development. This should lead to better and more specific training procedures.

The fourth major challenge is to develop totally implantable cochlear implants. Ideally this should be done with a sensor of tympanic membrane vibrations.

The fifth major challenge is the use of neurotrophins to sustain adequate populations of auditory nerve fibres for electrical stimulation with an implant. In the longer term neurotrophins offer hope that sensori-neural deafness may be ameliorated by the regeneration of hair cells and auditory nerve fibres.

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