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Optogenetic cochlear implant

When hearing fails, cochlear implants (CIs) provide open speech perception to most of the currently half a million CI users. CIs bypass the defective sensory organ, and stimulate the auditory nerve electrically. The major bottleneck of current CIs is the poor coding of spectral information, which results from wide current spread from each electrode contact. As light can be confined more conveniently, optical stimulation of the auditory nerve presents a promising perspective for a fundamental advance of CIs. Developing optogenetic stimulation for auditory research and future optical CIs requires efforts towards the design and characterisation of appropriate optogenetic actuators, efficient and safe viral gene transfer to the neurons, as well as engineering and characterisation of multichannel optical CIs. The presentation will summarise the current state of optogenetic hearing restoration, and report on recent breakthroughs on achieving high temporal fidelity and frequency resolution as well as on establishing multichannel optical CIs.