Optical Coherence Domain Reflectometry in Brain Probes

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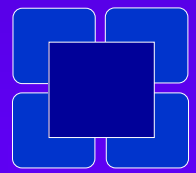
THE CLEVELAND CLINIC



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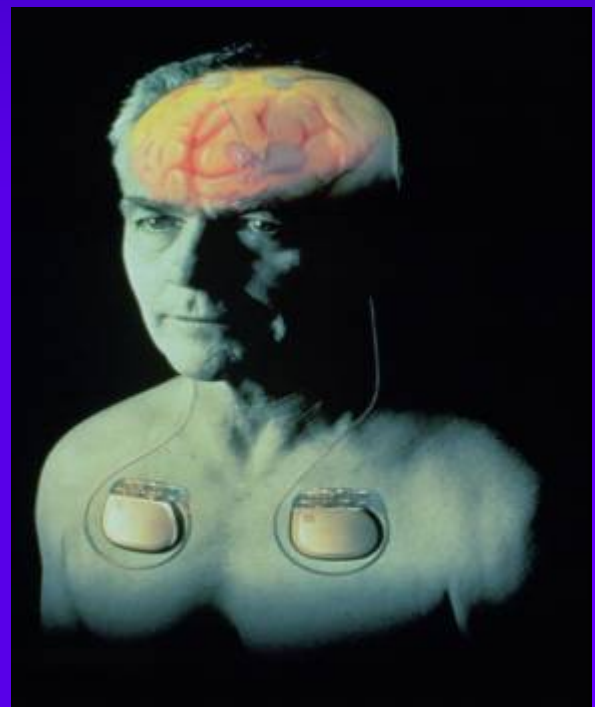
Deep Brain Stimulation (DBS)
Brain Pacemakers

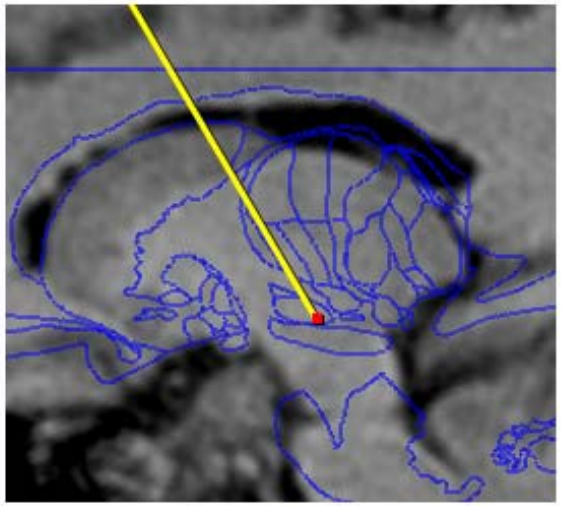
FDA approved indications for
- **Parkinson's disease**
- **Tremor**
- **Dystonia**

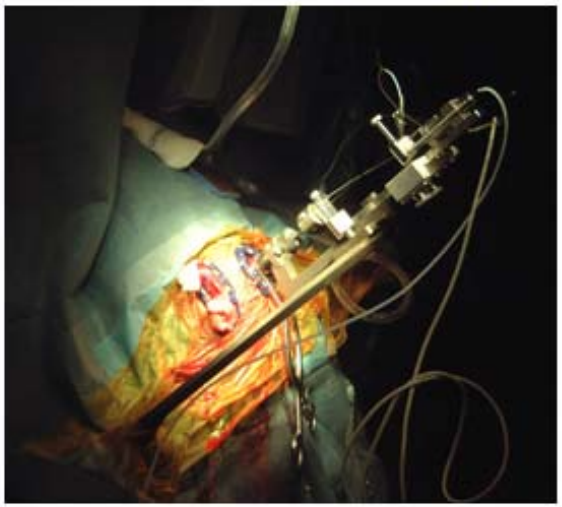
>25,000 implants to date

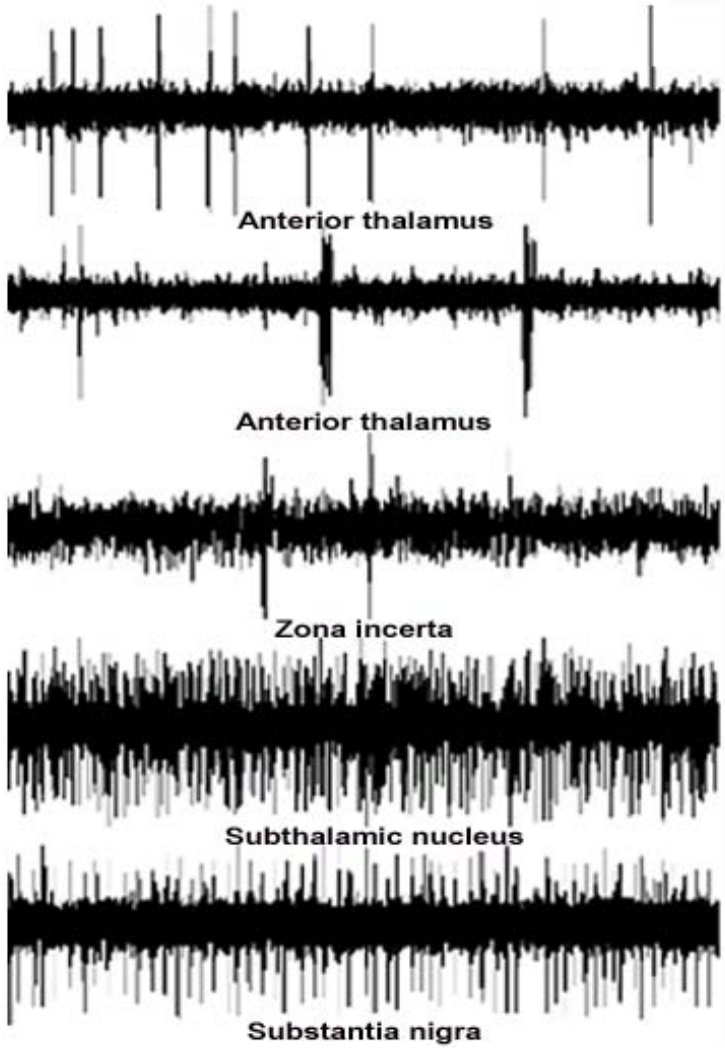
Reimbursed by Medicare and insurance in all states



Implantation of Deep Brain Probe



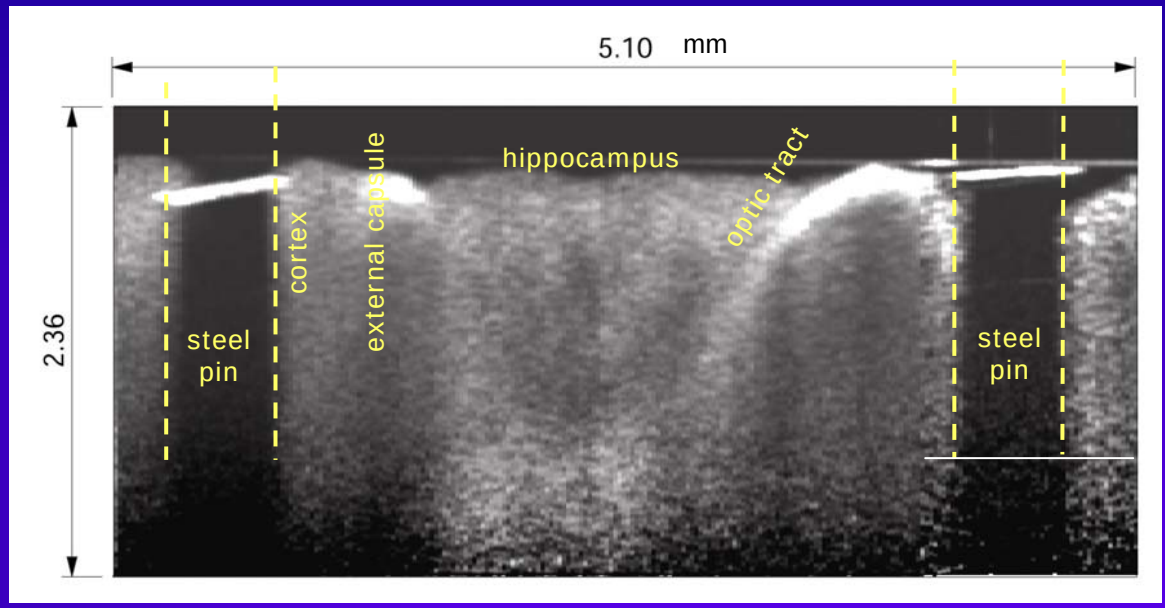




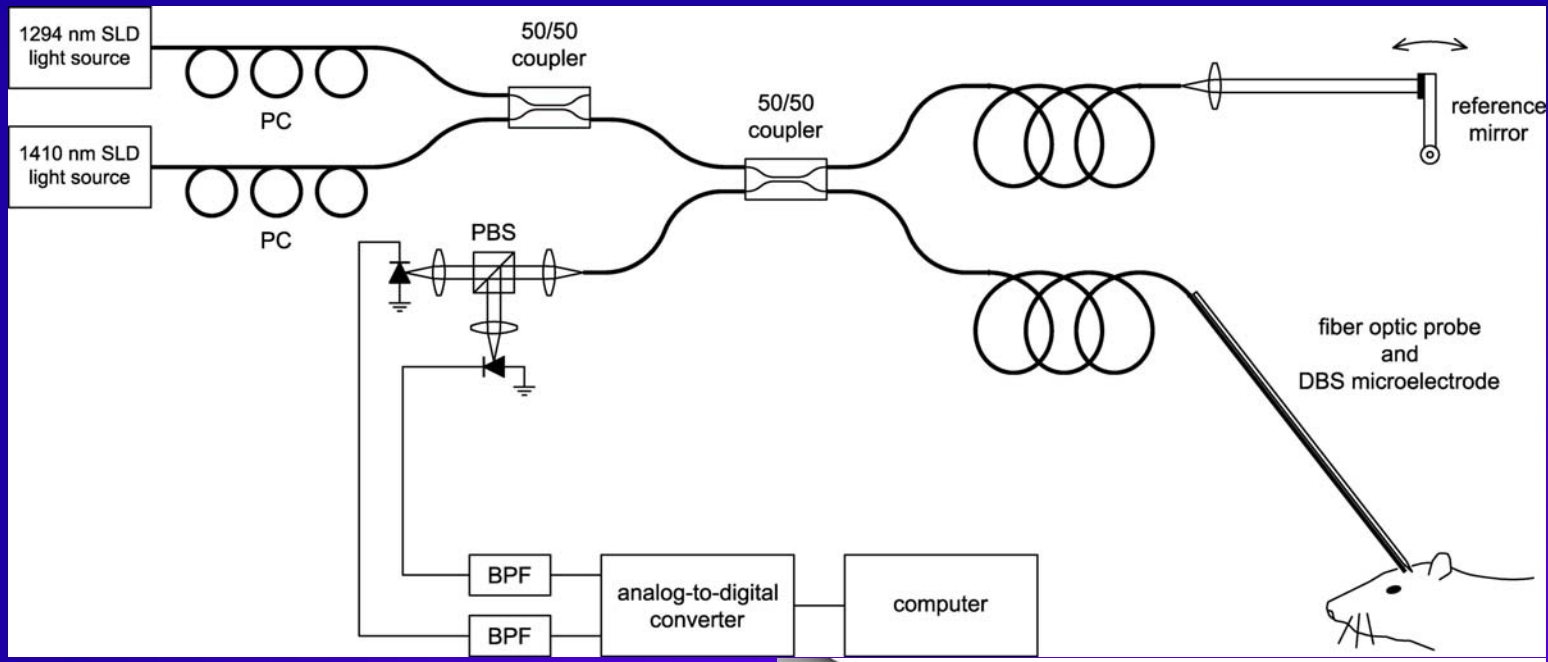
- Planning by MRI with brain atlas registration
- Stereotactic brain probe insertion guided by microelectrode recording
- Multiple insertion passes needed
- Blood vessel penetration & hemorrhagic stroke is a possible complication
- Additional intra-operative guidance mechanism needed

Preliminary Results: OCT of Rat Brain *in vitro*

- White matter tracts (axons) distinguishable from gray matter
- Greater scattering
- Higher signal
- Faster attenuation



OCDR Brain Probe Design



- 30 gauge (D=0.3 mm) for *in vivo* rat experiments
- 1.3/1.4 mm dual wavelength hydration measurement
- Doppler blood flow detection
- Polarization-insensitive detection