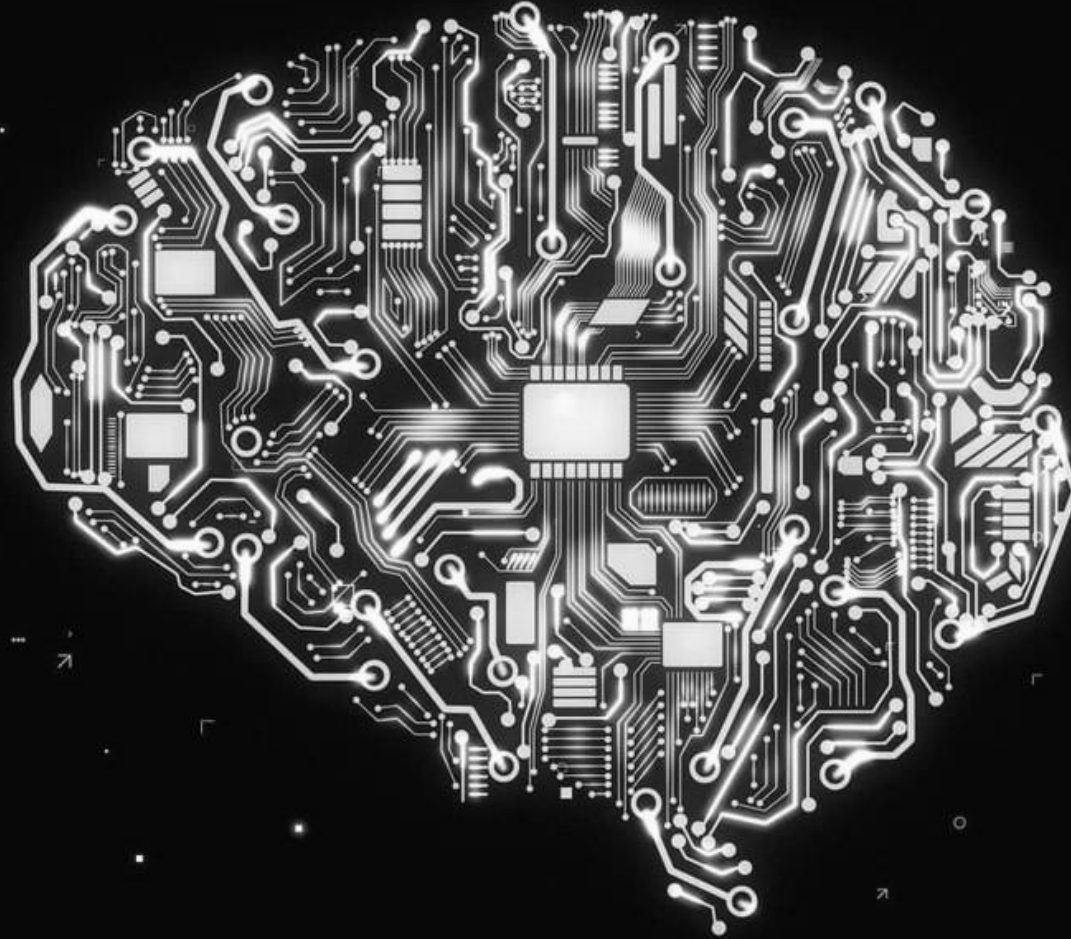


Neurotechnology



Hannah Claridge



Alex Stokoe



The future of connected medicine?



The Technology
Partnership



What is neurotechnology?

“Methods or instruments that allow the connection of technology with the nervous system”

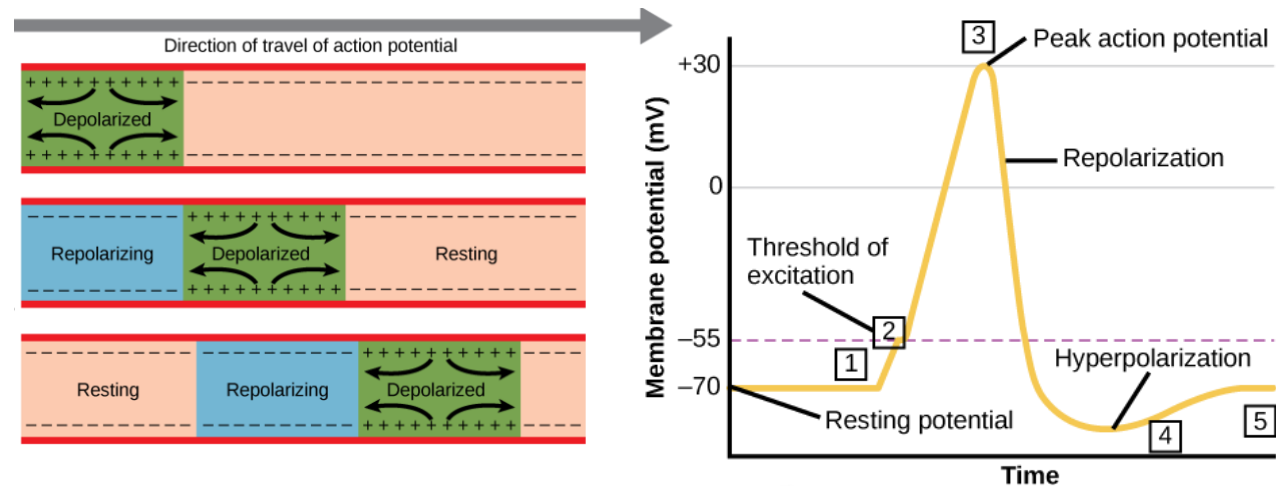
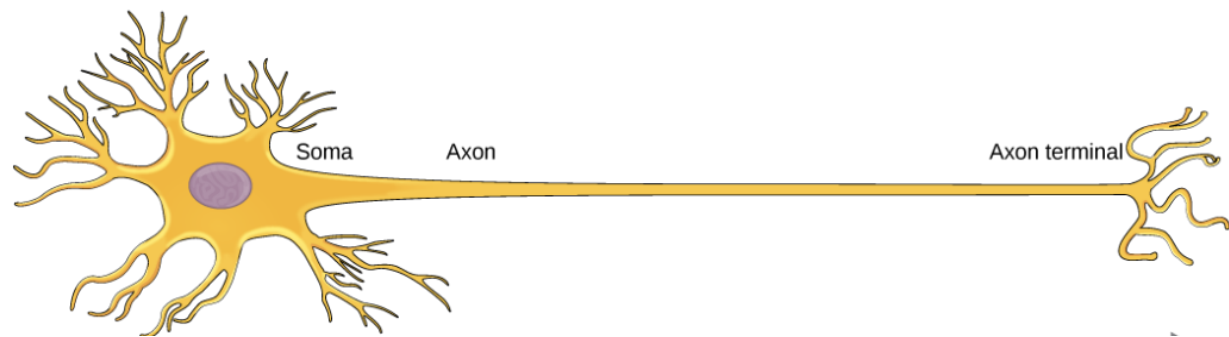


NERVE-CELL ENIGMA SOLVED

The British scientists, A. L. Hodgkin and A. F. Huxley, experimenting with the nerve fibers of squids and lobsters.

Biological communications

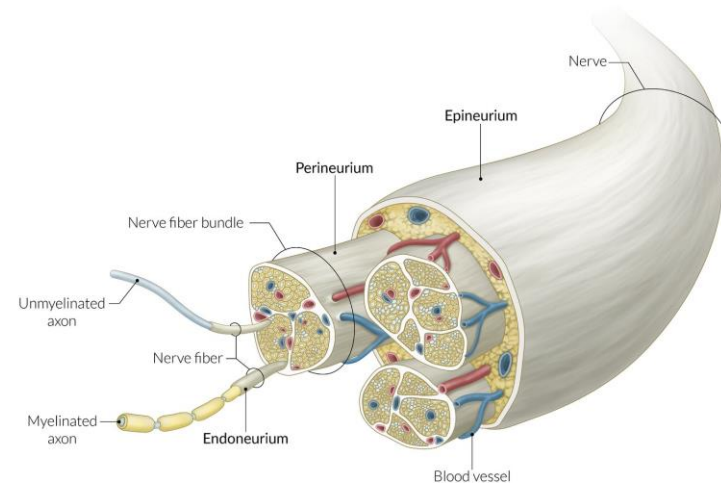
Neurons process and transmit biological 'bits'



Problem is scale:



100 billion neurons

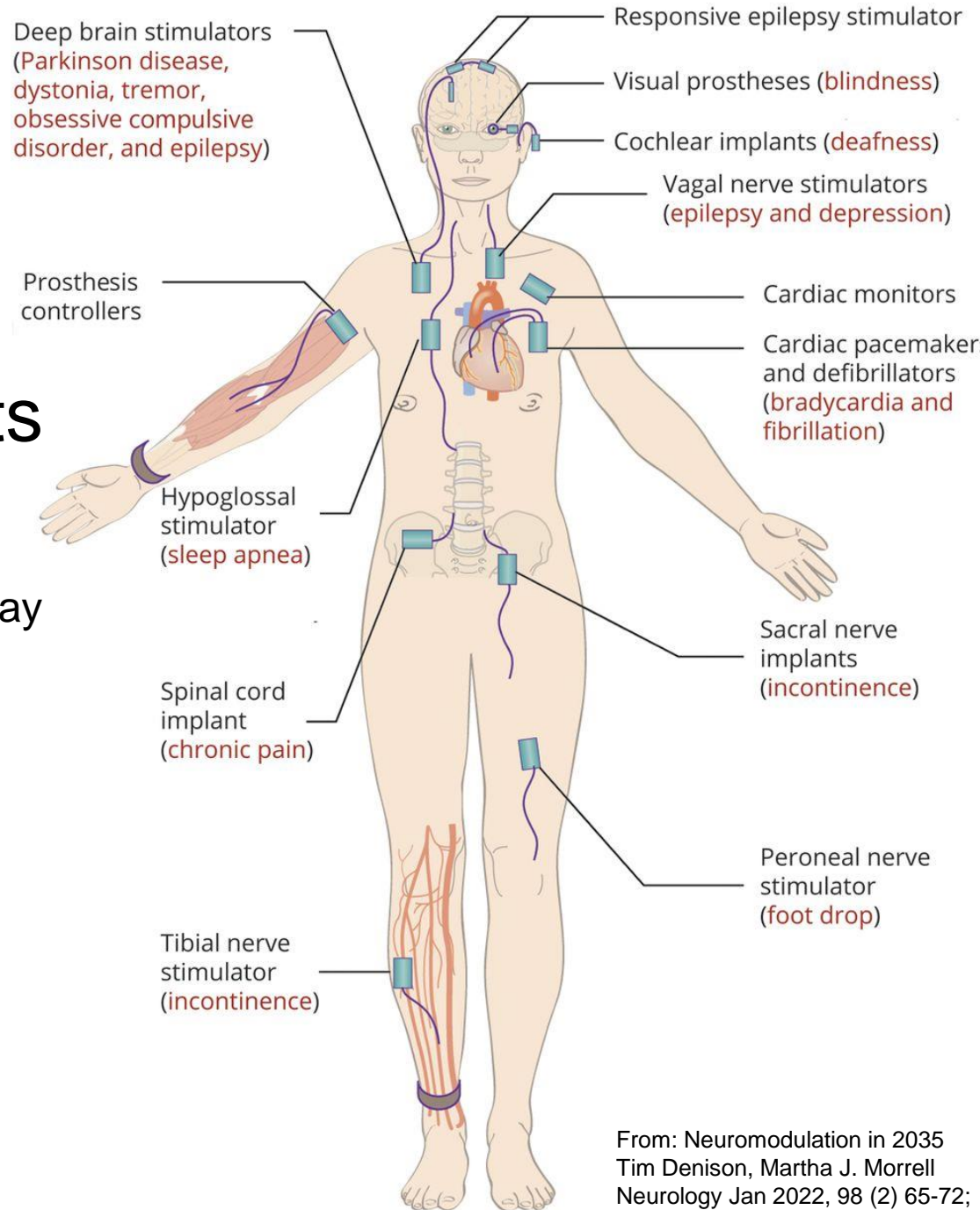
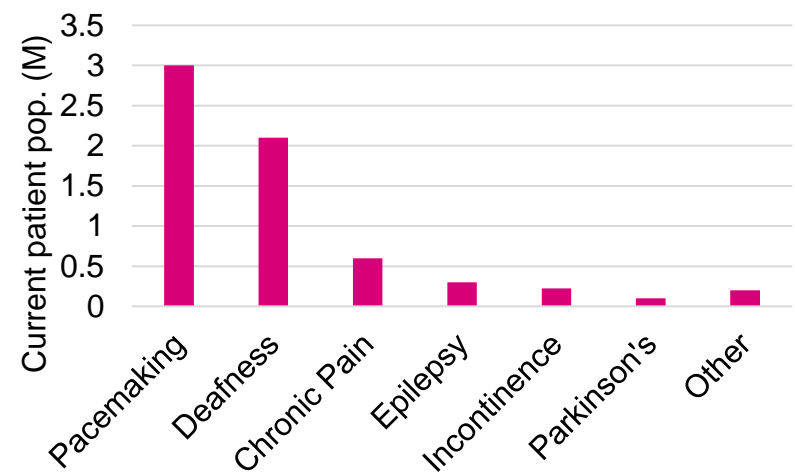


each with 40,000 connections



Neuromodulation therapies are already here and treating patients

>6M patients with systems in use today



From: Neuromodulation in 2035
Tim Denison, Martha J. Morrell
Neurology Jan 2022, 98 (2) 65-72;

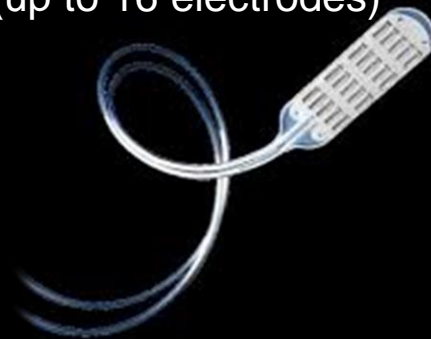


The contemporary neuro therapy system

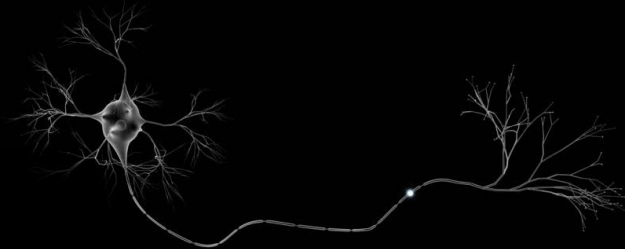


Implant Electronics
(low power / small space)

Stimulation lead
(up to 16 electrodes)



Anatomical therapy target
(thousands of neurons)

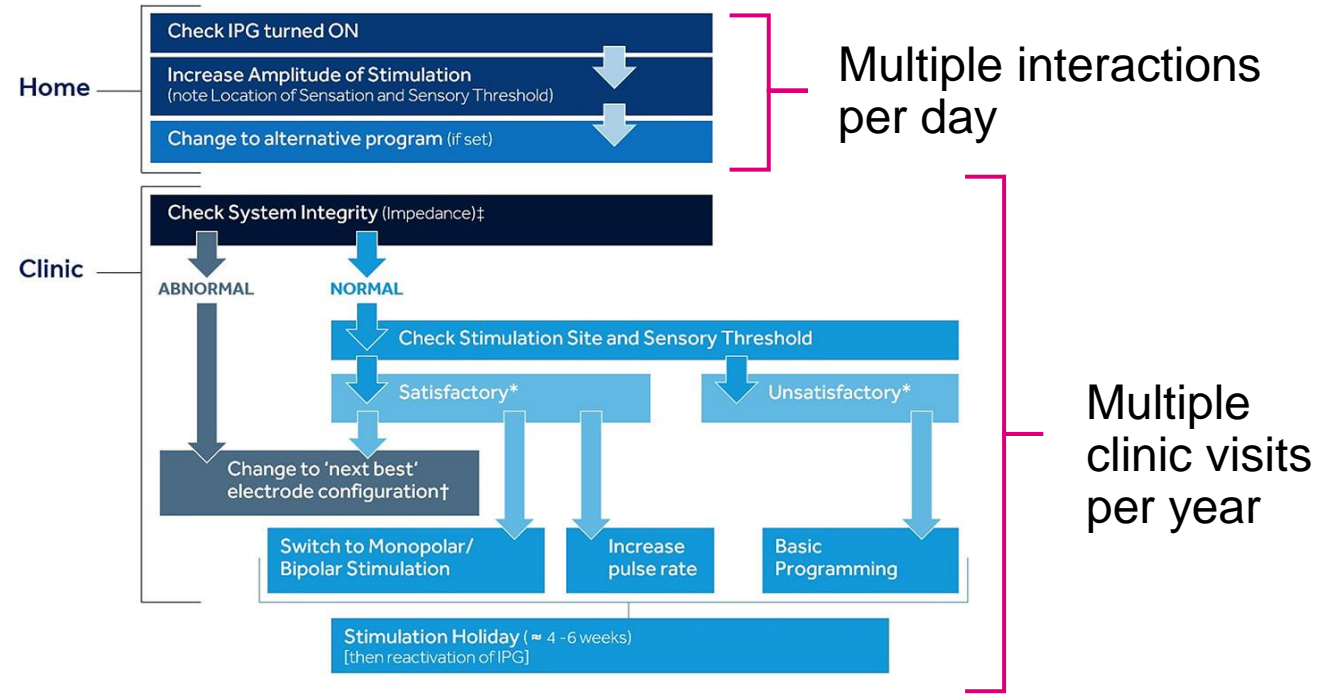


Near-Field or MICS comms
(403MHz)





Therapy limitations driven by technology approach and regulation

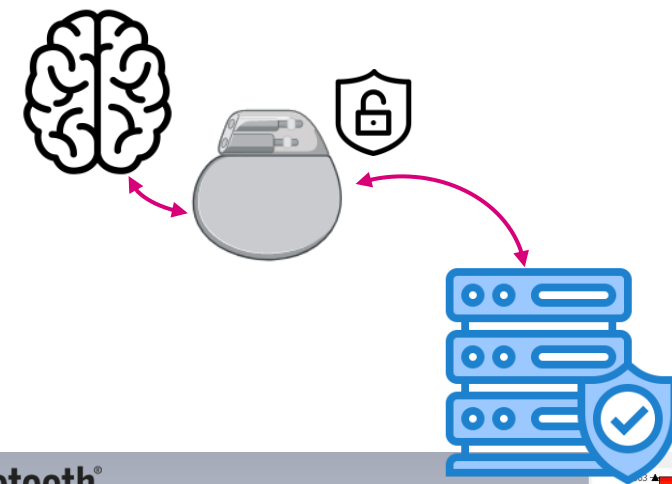


Hard to use proprietary companion devices



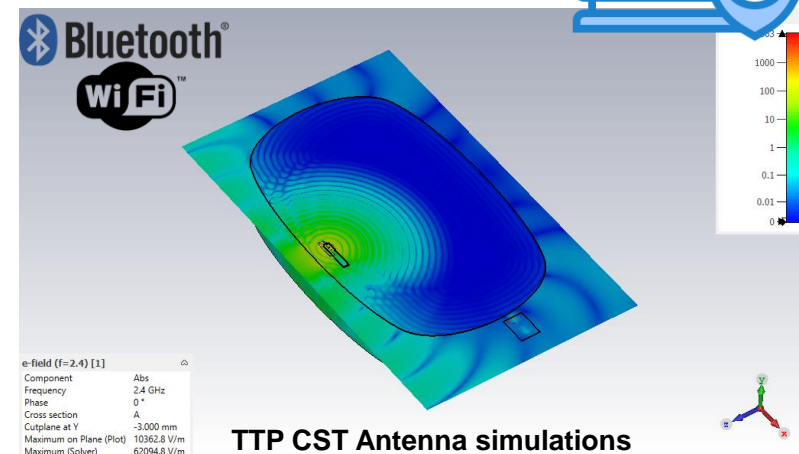
Innovations underway for a secure passive connectivity stack

Secure medical data backhaul and links to healthcare systems

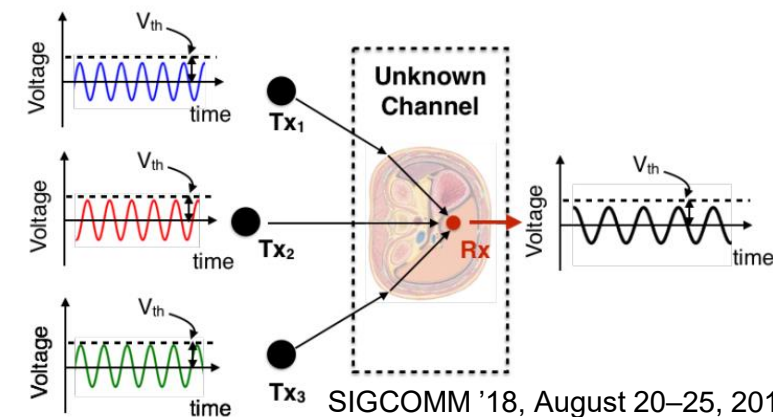


Utilising standard protocols and coping with lossy tissue transmission:

- High-gain miniaturised antennas
- Low power transceiver SoCs



MIMO RF energy harvesting approaches for bedside monitoring

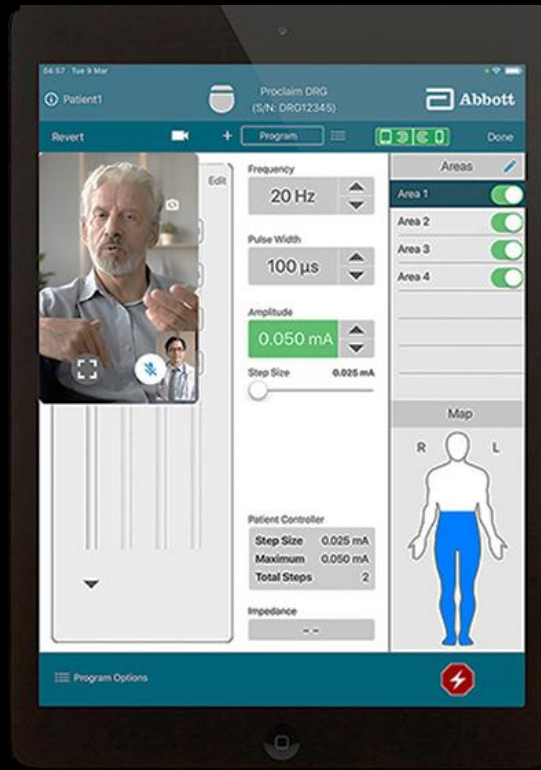


SIGCOMM '18, August 20–25, 2018, Budapest, Hungary Y. Ma et al.

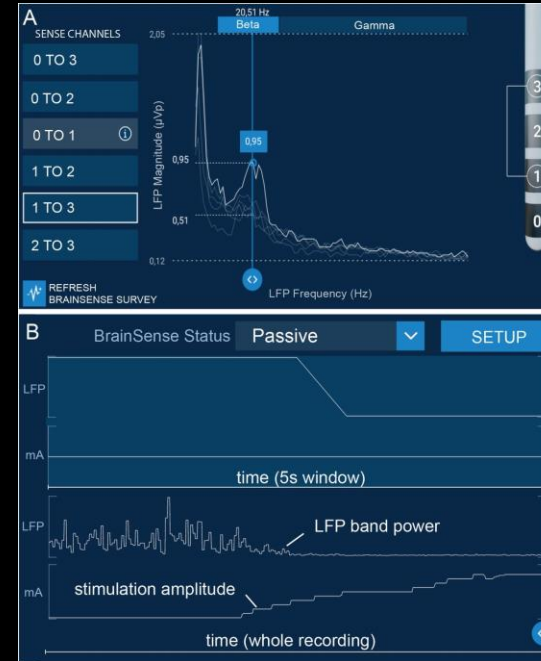


Closing-the-loop for life changing treatments

Seamless interaction:
Digital appointments and “digital prescriptions”



Fit-and-forget therapy:
Real-time biometric data analytics and adaptive stimulation waveforms



True BCI?
1000 Channel I/O
brain-computer interfaces



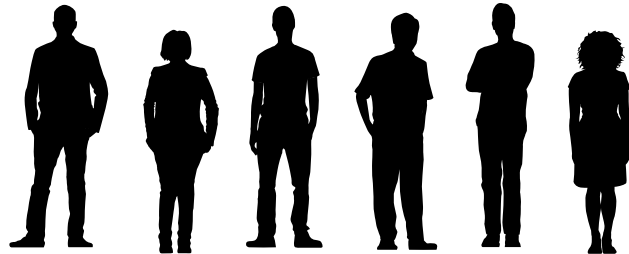
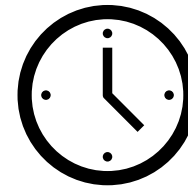
Invent. Design. Develop.

TTP - The Technology Partnership



200+ Development Projects Annually

34 Years of independent technology and product development

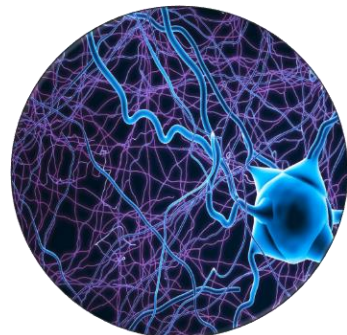


300+ Scientists & Engineers

1000+ Patents filed



Multidisciplinary teams serving wide range of industries



Based Near Cambridge, UK



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