

Flexible electrodes for EIT recording of fast neural activity in the rat brain

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Medical Physics and Bioengineering

Chemical Engineering

Background

•Electrical Impedance Tomography (EIT) is an imaging technique based on recording boundary voltages

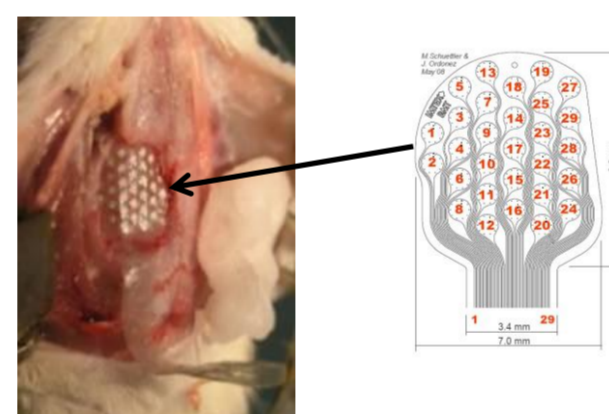
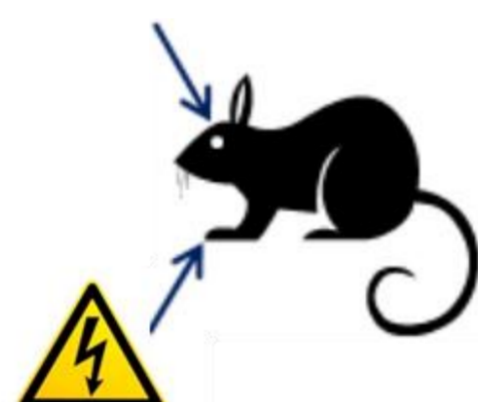
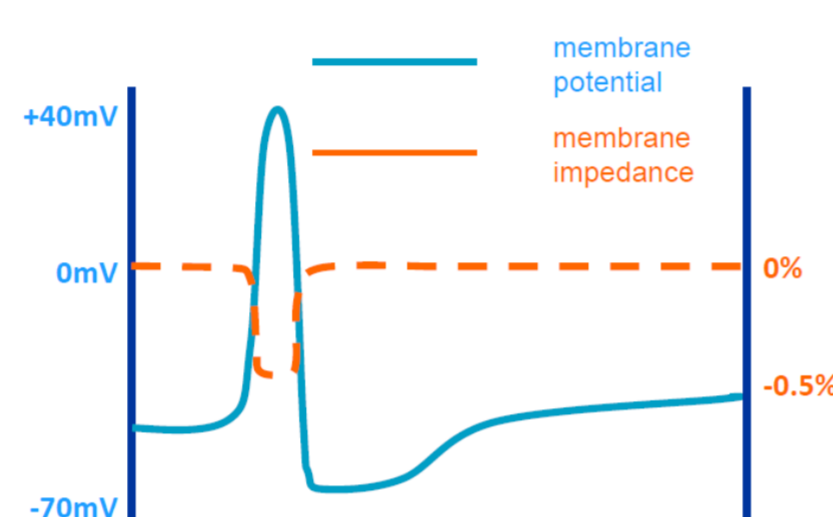
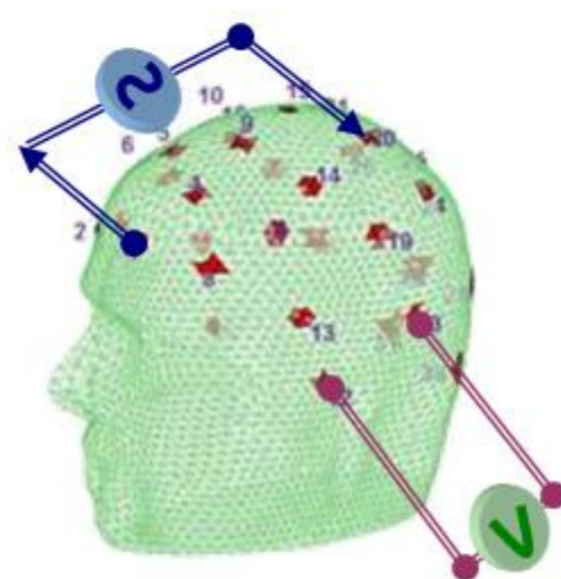
•Electrodes inject a small current and measure voltages attributed to the impedance changes.

•Potential to image fast neural activity in the brain

•Opening of ion channels during neuronal depolarisations leads to a drop in impedance

•Fast neural recording done in rats - brain activity, due to evoked potentials, recorded with planar electrode array

•Drawbacks of currently used electrodes: tracks commonly break, lack of desired flexibility



Aims and Objectives

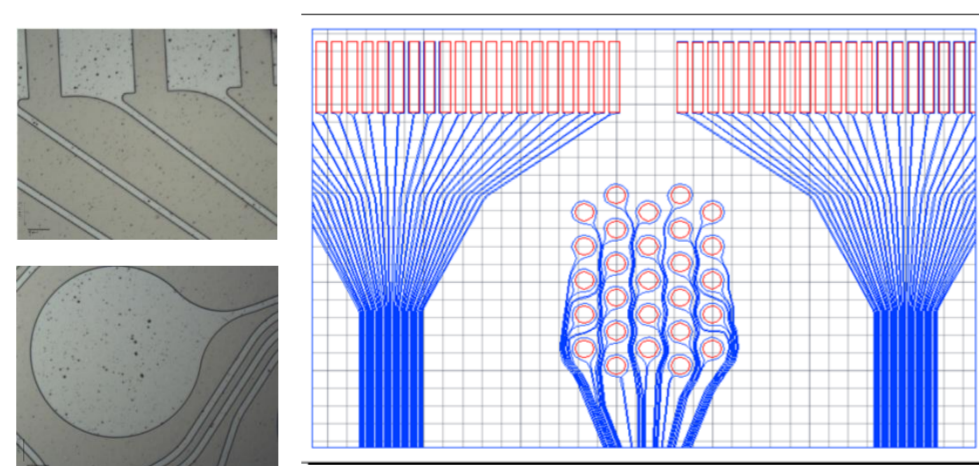
•The aim of this work was to design and build a new flexible electrode array

•Flexible thin (~10µm) polyimide backing

•Thermal evaporation of gold (~500nm) on polyimide

•Array Specifications:

- 27 electrodes
- 0.6mm electrode diameter
- 35µm track width

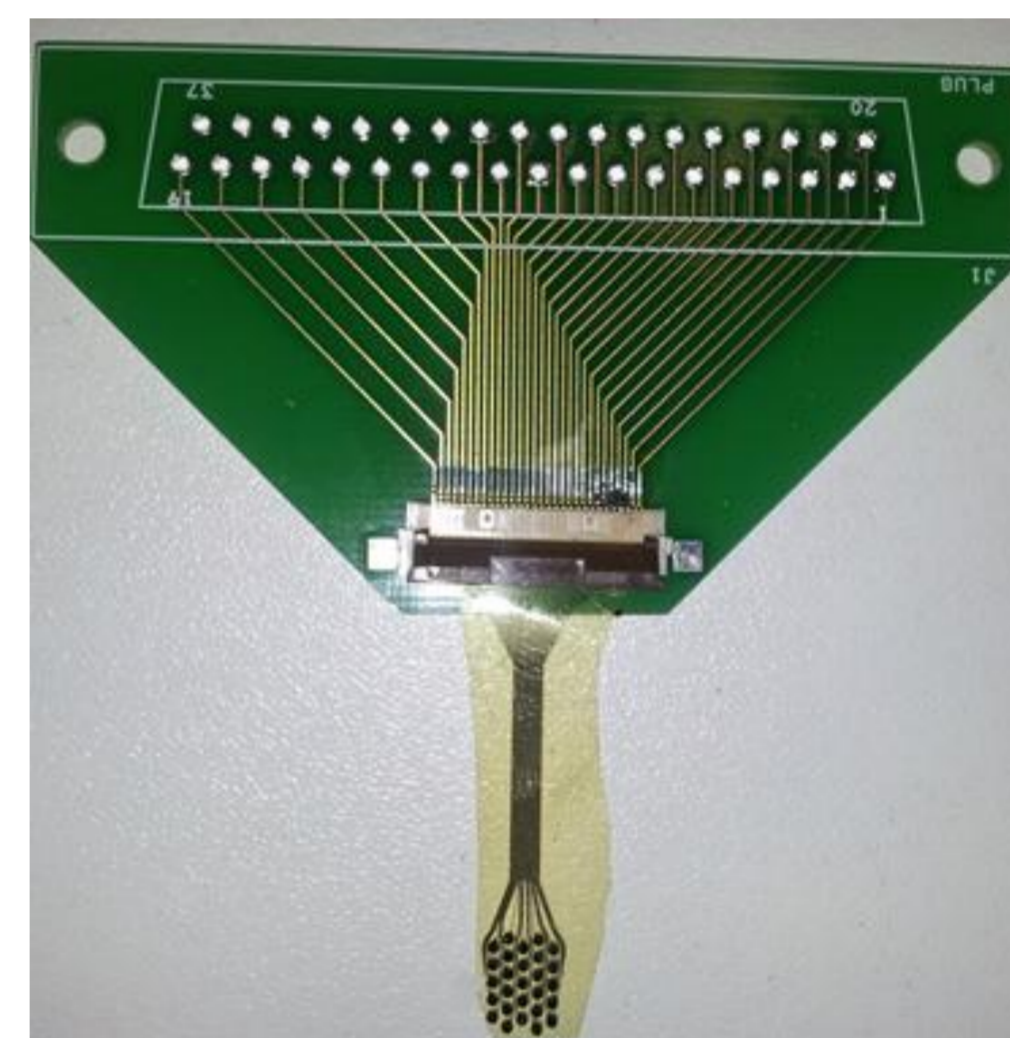


Cross disciplinary

This project draws on advances in material science and nanotechnology. The work is being done in the London Centre of Nanotechnology (LCN).

Activities

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Designing electrodes array	█							
Developing electrodes at LCN		█	█	█	█	█	█	
Testing and in vivo experiments							█	█



completed gold electrode array on a polyimide film

Outputs and impacts

•Tracks with stand mechanical testing through 180° bending

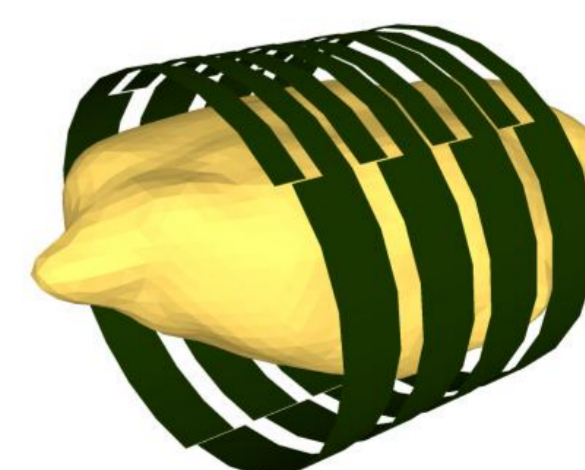
•Testing in progress:

- Electrode impedance
- Half cell potential

Conclusions

•New array provides flexible, stiff and mechanically reliable alternative

•These properties will allow for developing an electrode which can wrap around the rat cortex for 3D imaging



Future Work

- Build a flexible electrode helmet for human scalp
 - Suitable for application by unskilled staff
 - Low cost manufacturing

