Bioelectronic Medicine
Ben Woodington

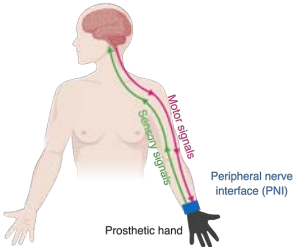
Feb 2022

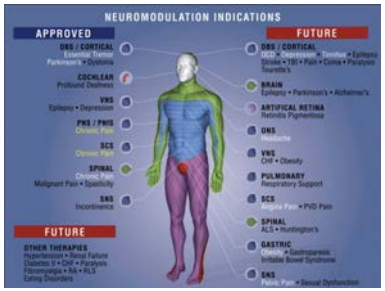
@WoodingtonBen
bw422@cam.ac.uk

1

What is Bioelectronic Medicine?

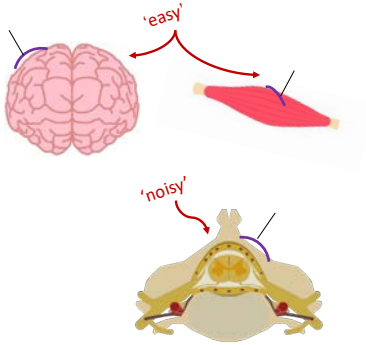
Bioelectronic medicine is a very broad term used to describe any technology which reads and/or writes to the system using electricity, it's a way of connecting to the communication system of the body - the nervous system.

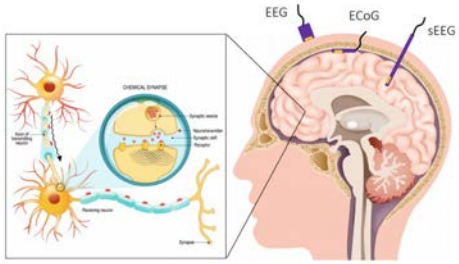




2

Sensing



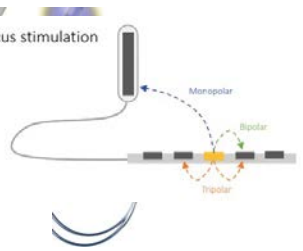


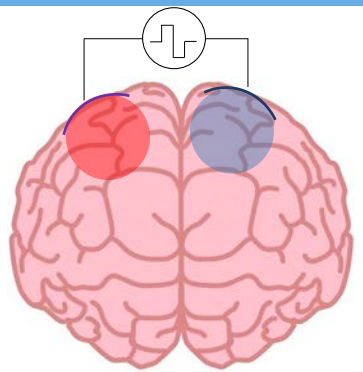
3

Stimulating

Stimulating therapies make up the majority of bioelectronic medicines today

- Spatial schemes to focus stimulation
  - Monopolar
  - Bipolar
  - Tripolar



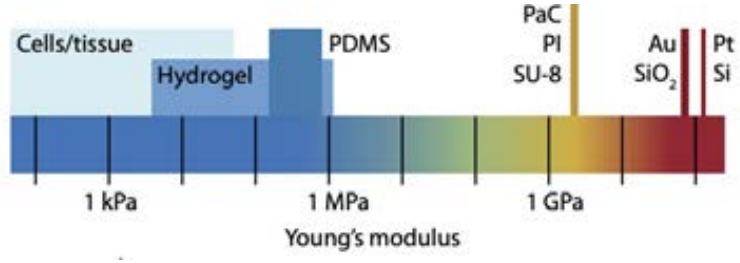


DBS: Hickey and Stacy: 2016, https://doi.org/10.3389/fnins.2016.00173
Spinal paddle Image credit: Abbott

4

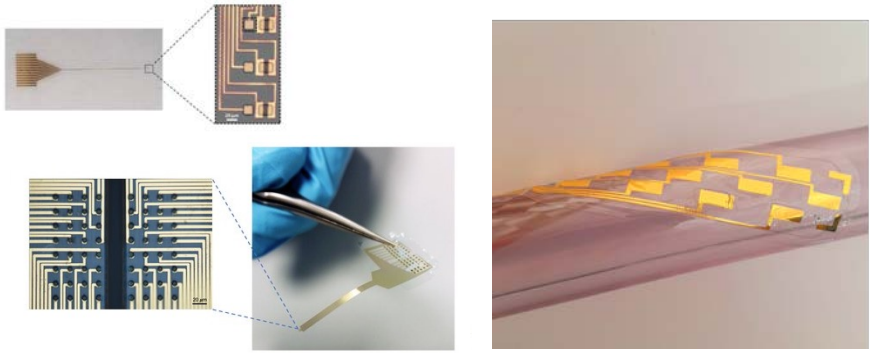
Tools for *Chronically* Interfacing with the CNS

Is it biocompatible, is it safe, is it soft?



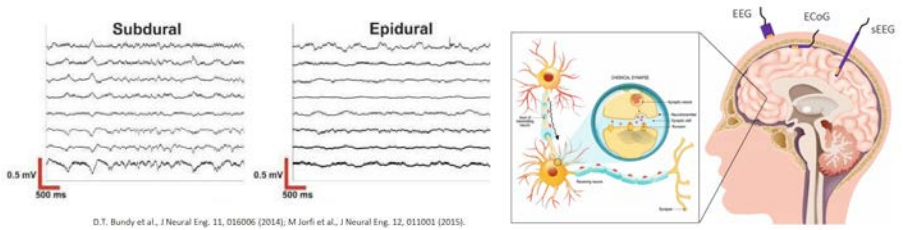
JonathanRivnay,HuiliangWang,LiefFenno,KarlDeisseroth,andGeorgeG.Malliaras. Next-generation probes, particles, and proteins for neural interfacing. 3(6):e1601649. Publisher: American Association for the Advancement of Science Section: Review

Flexible Electronics



Courtesy of the Malliaras Lab

How Invasive Do We Want To Be?

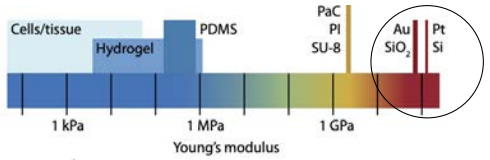


D.T. Bundy et al., J Neural Eng. 11, 016006 (2014); M Jorfi et al., J Neural Eng. 12, 011001 (2015).

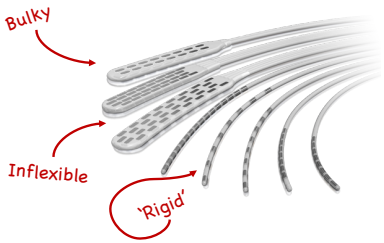
Organic Electronics

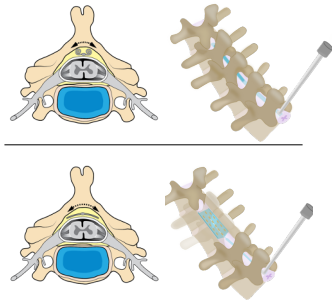
Metals are old news..

- Much less soft than the tissue
- Issues of charge injection
- They break.



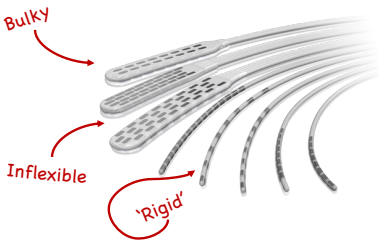
Soft Spinal Interfaces

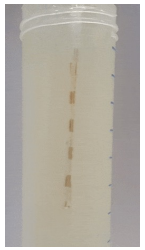


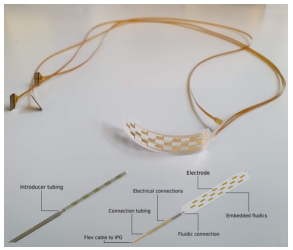


9

Soft Spinal Interfaces

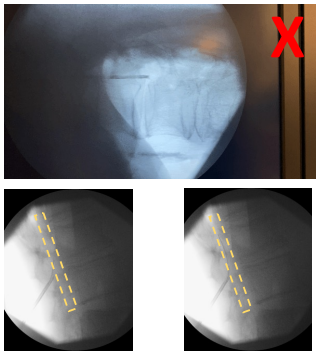


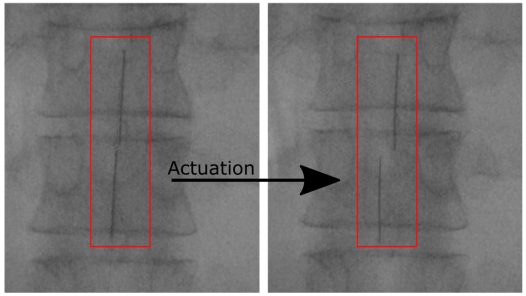




10

Making Devices with the Clinician in Mind





11

Soft Spinal Interfaces

The spinal cord is complex – it is an extension of the CNS, not just a bunch of communication wires

New applications - Parkinson's and SCI related health issues?

12