Feedback on HW1

1. In general, good answers.
2. Question #3 was misunderstood, potentially due to my wording of it.
3. Some answers had a lot of ideas, without much care to consequences.
   Tip: once you propose something, go ahead with it. Ask yourself 1) problems 2) advantages/disadvantages
4. Try to not quote the text - just refer to it.
5. Big picture questions ≠ numbers or details.
6. → Spectrogram
RECAP:

1. Electrodes:
   CV; CSC; APs; EPSPs

2. Implants:
   - block diagram
   - challenges
   - state-of-the-art

Today: chapter 2 of Bin He.

- \( \text{sensorial input} \rightarrow \text{other} \)
- \( \text{movement} \rightarrow \text{other CO}_2, T \)
- \( \text{El. Ch} \rightarrow \text{other} \)
- \( \text{El. Ch} \rightarrow \text{power} \)

**El.** = electrical signals
**Ch.** = chemical signals

**SIZES**
- soma: \( 10-50 \mu m \) \( \Phi \)
- gaps between cells: \( 20 nm \)
- packaging: \( 10^6 \text{cells/mm}^3 \)
- \( 10^5 \text{neurons/mm}^3 \)
- human axons: \( <1-25 \mu m \) \( \Phi \)
- length: \(<1 \text{mm to } >1 \text{m} \)
Chemical signals: interfacing to neural systems.

→ still rare, due to short lifetime and low selectivity.

Probes

± solid

± fluid

Permeselective membranes: memb with preferential permeation of certain ionic species. (Also ion-exchange membranes)

SOLID

FLUID:

Double barreled.

ION SELECTIVE FLUID

CONDUCTIVE FLUID + ION
Fluid probes:

![Diagram of a fluid probe with a membrane, reference electrode, and Nernst potential equation: $E = \frac{kT}{e} \ln \frac{[A]_0}{[A]_i}$.

1. Solution being measured.
2. Well controlled ionic environment.

Example of chemical sensor: NO.

Show slide:

m-phenylenediamine + resorcinol $\xrightarrow{\text{Nafion 600nm}}$ Carbon

\[ \text{Nafion 600nm} \]

\[ \text{Carbon} \]

\[ \text{lets only small molecules through.} \]

* Sensitivity: \[ \frac{\text{nA}}{\text{nM}} \]

* Specificity: Performance when interferents are in solution.