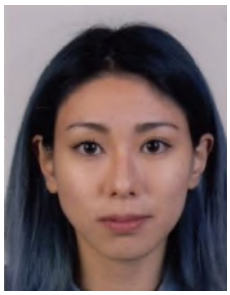
BioMEMS – Integrative bio-engineering

2017

Microfluidic Neurons



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Keywords: **Biomimetic Artificial Neurons, Microfluidic, Hybrid Experiment**

Context

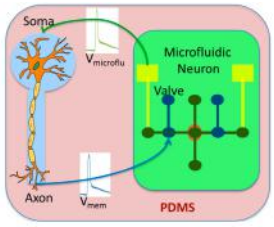

Fig. 1: A single chip representation of a hybrid experiment using microfluidic neuron (T. Levi)

Overall goal: Develop a hybrid experiment of a bidirectional communication between living neuron and artificial neuron

Objectives

- To build a microfluidic device with identical ionic currents as biologic neurons
- To develop a hybrid system between microfluidic (artificial) neuron device and living biological neurons

Methods

Hybrid experiment= Microfluidic neuron device+ Living biological neurons

Microfluidic neuron device

- 6 layered device: 2 PDMS layers, 1 PDMS membrane, 1 Nafion membrane, 1 glass, silver electrodes.
- Quake valve controls KCl flow depending on air pressure
- Nafion selective membrane mimics the exchange of chemical species found in biological neuron.

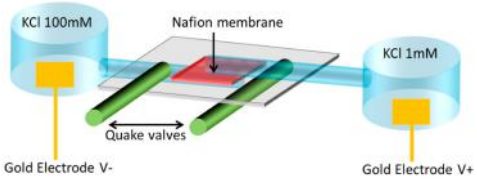

Fig. 2: Microfluidic neuron device (T. Levi)

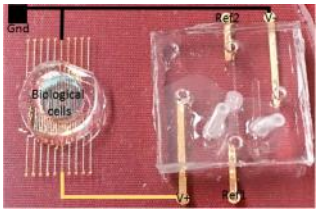

Fig. 3: First hybrid system (T Levi)

Biological cell culture

- Culture of living neurons is placed next to the microfluidic device

Reference

- Levi, T.; Fujii, T. Microfluidic Neurons, a New Way in Neuromorphic Engineering? *Micromachines* 2016, *7*, 146.

Contacts

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