

# Kohno LAB.

## [Brain-compatible AI]



Department of Informatics and Electronics

Neuromimetic Systems

Dpt. Electrical Engineering and Information Systems, Graduate School of Engineering

Dpt. Mathematical Informatics, Graduate School of Information Science and Technology <https://www.neumis.iis.u-tokyo.ac.jp>

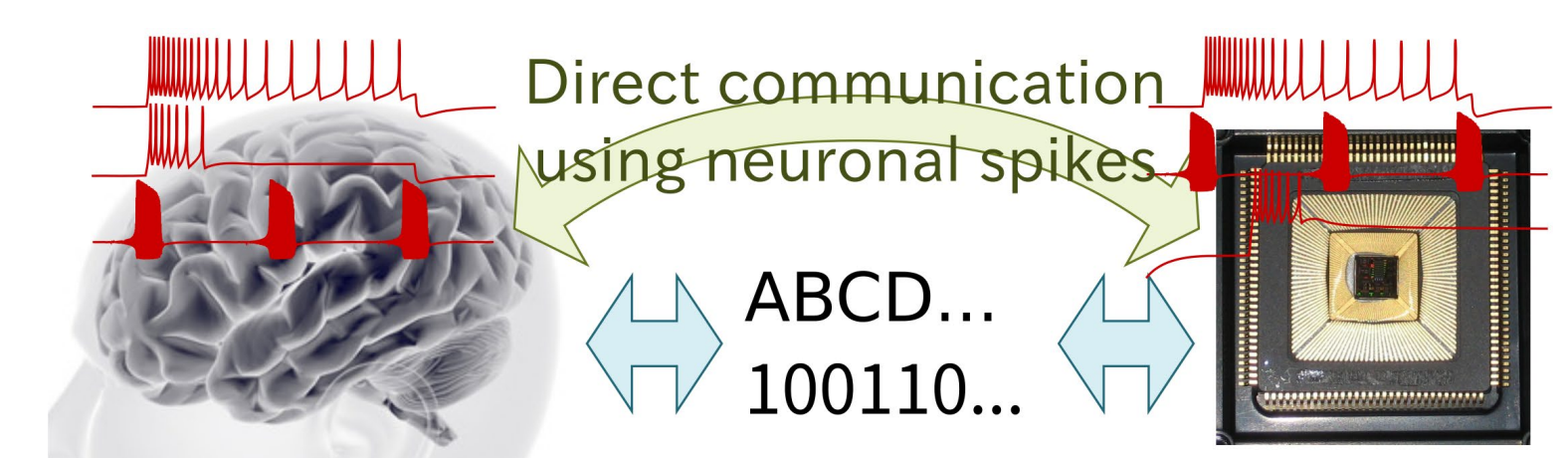
## Silicon Neuronal Networks

~Electronic circuit copies the nervous system~

Silicon neuronal network is electronic circuit composed of electronic circuit versions of neuronal cells and synapses. It reproduces electro-physiological activities in the nervous system in real-time or faster.

Final goal is to realize “Brain-compatible AI”

Capable of direct communication with the brain without symbols or languages. Efficiently deal non-linguistic information: sensations and sense.



Efficient learning with small amount of data similarly to the brain.

Applicable to neuro-prosthesis

Analog neuromimetic circuits designed using nonlinear mathematics theory.

### Ultralow-power

7nW / neuron

2pW / synapse

0.25  $\mu$ m CMOS process

Power supply voltage 1V

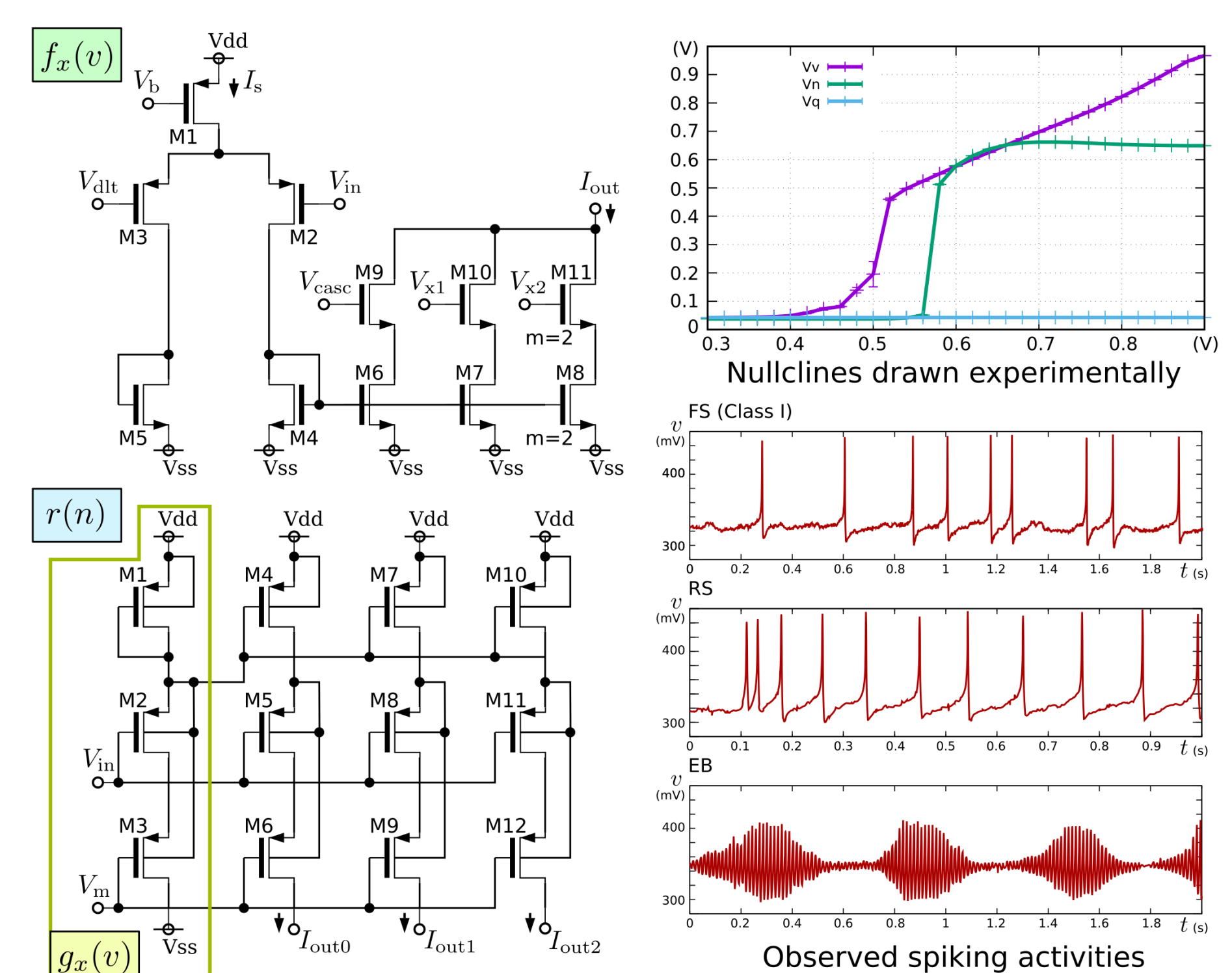
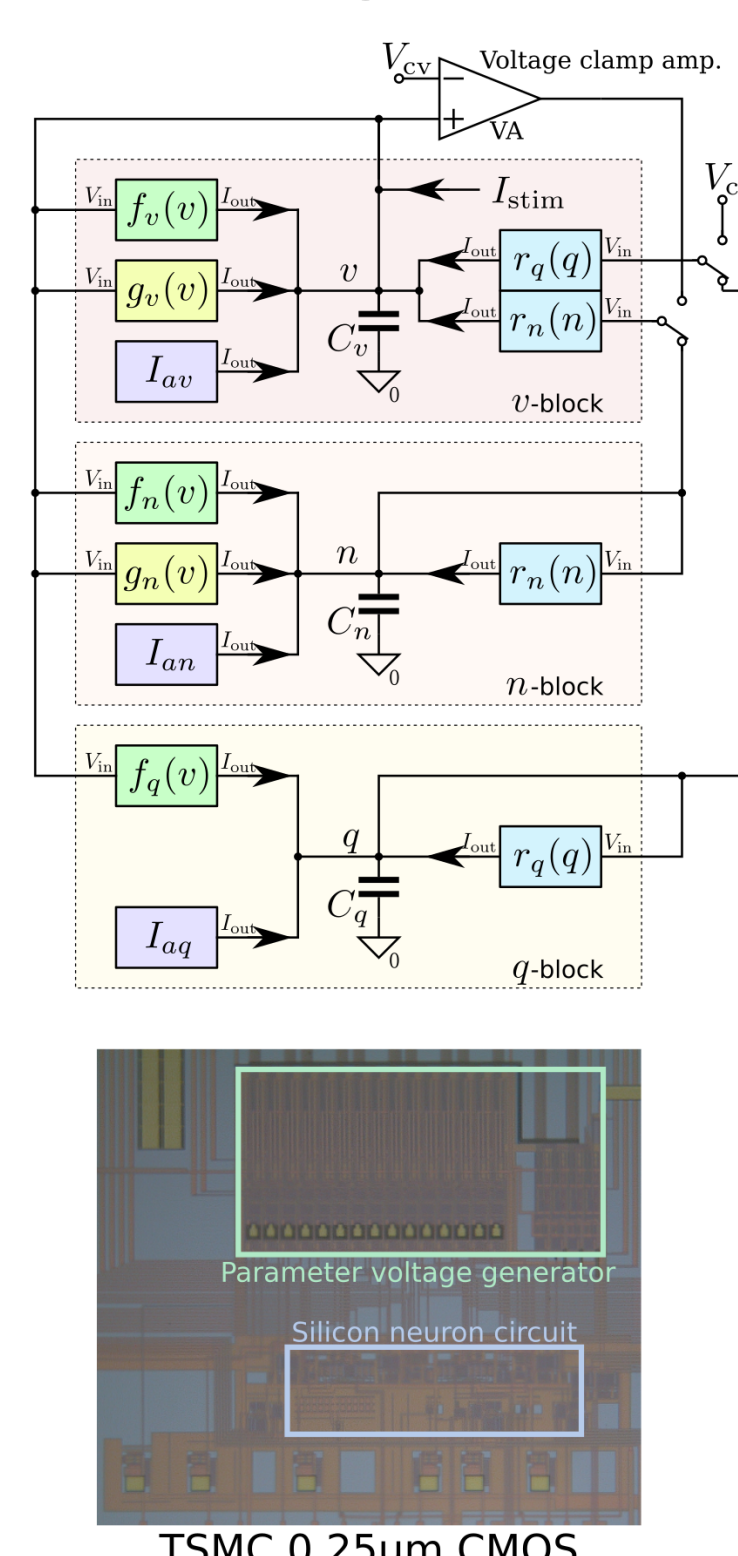
Supports important brain cells

7 types of cells including:

Regular Spiking cells

Fast Spiking cells

Elliptic Bursting cells



Towards reproduction of information processing in the brain

**Biologically realistic models** that differ from machine learning models such as deep learning.

Spatio-temporal pattern detection from noisy spike trains by single layer network with lateral inhibition (proposed by Masquelier)

“Autonomously finding needles in haystack”

