Kohno LAB.

［Silicon neuron circuits］

＊A silicon neuron circuit is in demonstration

Center for International Research on MicroNano Mechatronics

http://www.sat.t.u-tokyo.ac.jp/~kohno

Biomimetic Mircosystems

Department of Electrical Engineering and Information Systems, Graduate School of Engineering
Department of Mathematical Engineering and Information Physics, Graduate School of Information Science and Technology

Silicon neuron circuits

Mimicing the neurophysiological activities of the neurons

The silicon neuron is an electronic copy of the neuronal cells. There was difficulty, however, in realizing simple circuitry that simulates their real behavior. We proposed a solution to this problem that utilizes the mathematical techniques in the nonlinear dynamics. Our silicon neuron circuit provides an element in the silicon neural networks closer to the nerve system. We are working on a silicon peripheral nerve system as the first step towards our final goal, an artificial brain.

◆**Copy structures in the phase portraits and the bifurcation diagrams in the nerve models utilizing silicon-native curves.**
◆**MOSFETs are operated in their subthreshold region to realize ultra-low power consumption under a few tens of nW.**
◆**Our silicon peripheral nerve system are being applied to neuromorphic smart MEMS actuator devices.**
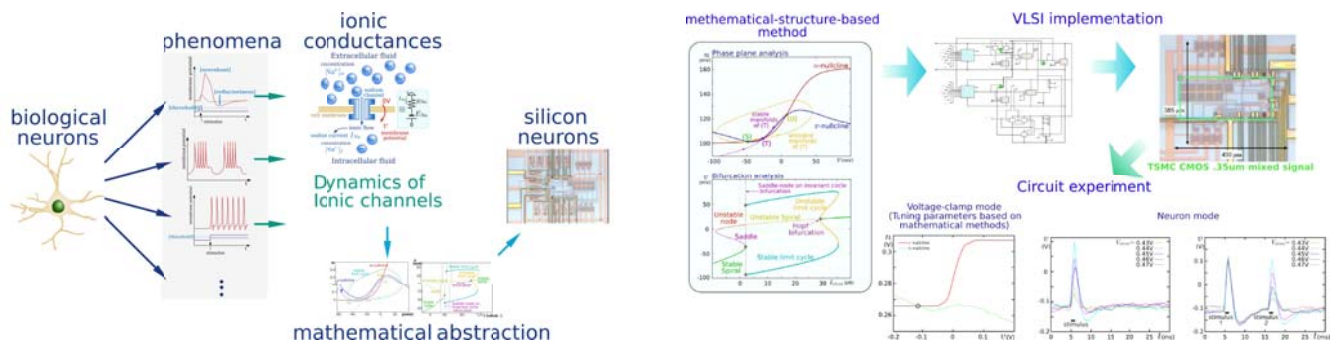
Mathematical-strucutre-based design method of silicon neurons

2-variable bsic silicon nerve circuit (Class I/II)
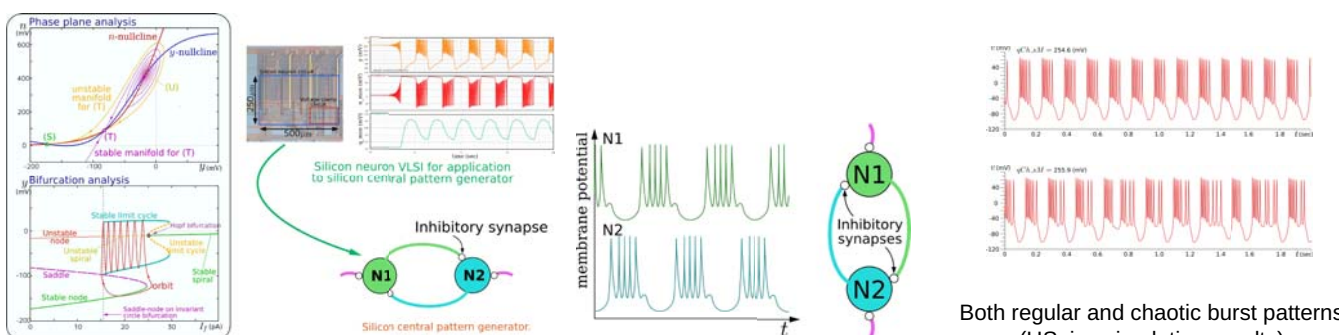
3-variable burst silicon neuron circuit and the half center oscillator

Both regular and chaotic burst patterns
(HSpice simulation results)