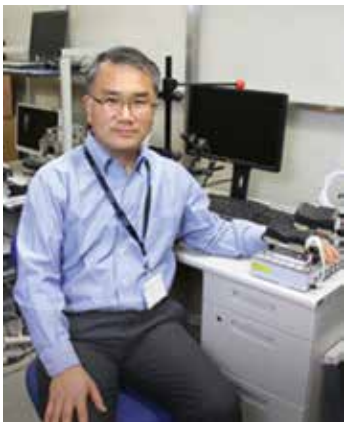

Tomatsu S, Ishikawa T, Tsunoda Y, Lee J, Hoffman DS, and Kakei S. (2016) "Information processing in the hemisphere of the cerebellar cortex for motor control of wrist movement." ***J. Neurophysiol.*** 115:255-270.

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Lee J, Kagamihara Y, and Kakei S. (2015) "A new method for functional evaluation of motor commands in patients with cerebellar ataxia."***PLoS One*** 10:e0132983.

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Project Leader **Shinji Kakei** Motor Disorders Project

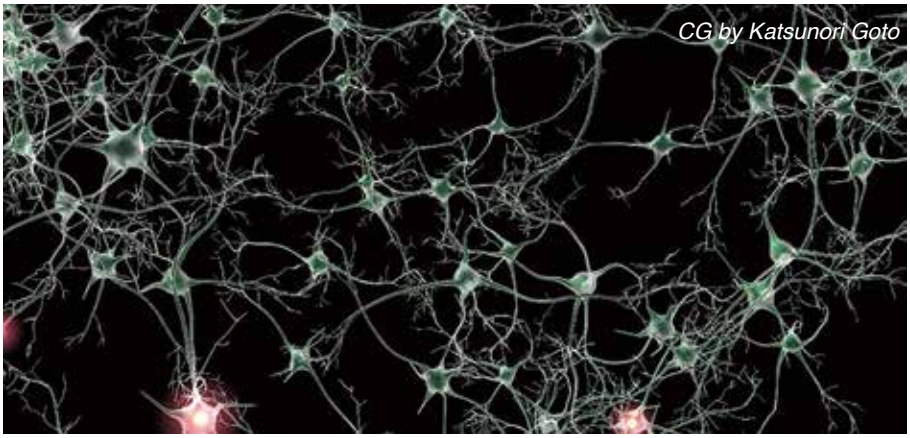
From Neuron to Action and its Disorders

We try to understand how the brain controls our movements in the real world. We study the process of action generation at a single neuron level using animal models to understand how the movement is processed in the brain. We also study actions of healthy people, as well as those with neurological disorders, such as cerebellar disorders, Parkinson's disease or strokes. We look for building-blocks of motor control with multidisciplinary approaches. We employ both invasive and non-invasive approaches to achieve the deepest understanding of our brain. Our tools include various neurophysiological recording techniques (single unit recording, electromyography(EMG) and electro-encephalography (EEG)), brain stimulation, neuroimaging, analysis of movement kinematics and a large-scale modeling. We have two long-term goals: 1) to understand the basic function of the motor structures of the brain including the cerebellum, the basal ganglia, and the motor cortex; and 2) to understand how our brain controls our movements on the basis of the findings in 1).

"Through our research, we are trying to understand the brain. The brain was first created to control movement and extended to control higher brain functions."

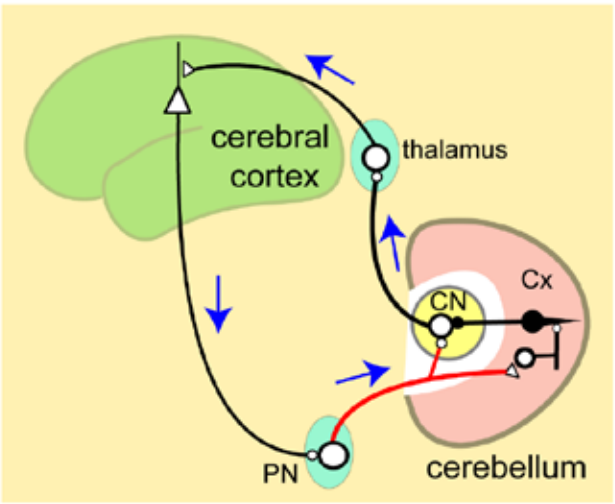
"The brain mechanism for motor control must provide a basic framework to understand higher brain functions."

The brain is an assembly of neural networks.

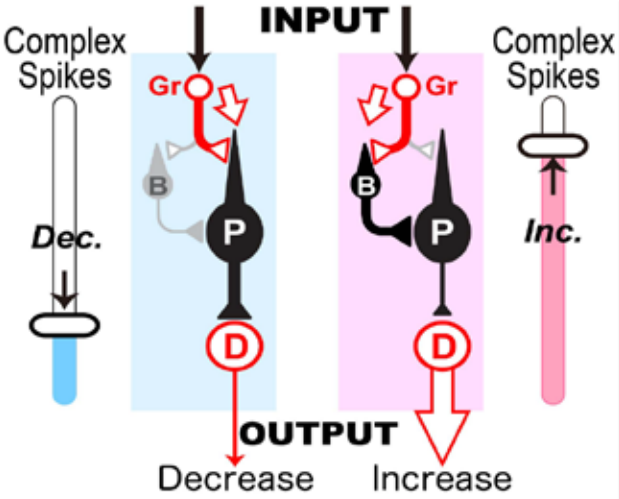


Motor Disorders

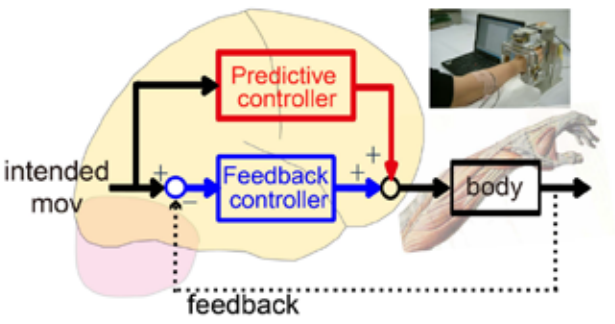
Hot Topics of Our Research



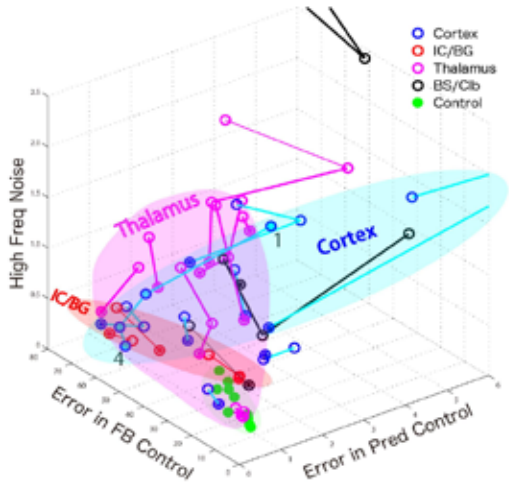
The cerebro-cerebellar communication loop plays essential roles to organize both motor control and higher brain functions such as thought and speech.



We found two modes of cerebellar input-output relationship that explain generation of precise motor commands.



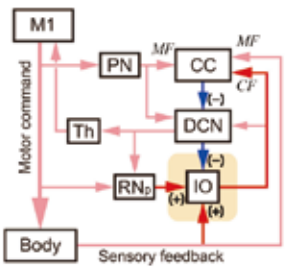
We were the first group in the world to build a system (*inset*) to dissociate predictive motor control and feedback motor control (below) in patients with neurological disorders. This system provides quantitative parameters that characterize the two controllers.



With new quantitative parameters, we were the first group to visualize different courses of recovery for stroke patients with different localization of brain lesions.

Members

Kyuengbo Min,
Jongho Lee,
Takahiro Ishikawa,
Takeru Honda



Motor Disorders