Voltage-Imaging of Association in Perirhinal Cortex

To investigate the potential associative function of the perirhinal cortex with respect to sensory and motivational stimuli and the influence of the association on the perirhinal/entorhinal/hippocampal neurocircuit, we prepared rat brain slices including the perirhinal cortex (PC), entorhinal cortex (EC), hippocampal formation (Hipp), and amygdala (AMG). We used an optical imaging technique with a voltage-sensitive dye to analyze the effect of associative inputs to the PC from both the AMG and the PC on the perirhinal-entorhinal-hippocampal neurocircuit. Our observations suggest that a functional neural basis for the association of higher-order sensory inputs and emotion-related inputs exists in the PC, and that transfer of sensory information to the entorhinal-hippocampal circuitry might be affected by the association of that information with incoming information from the AMG.

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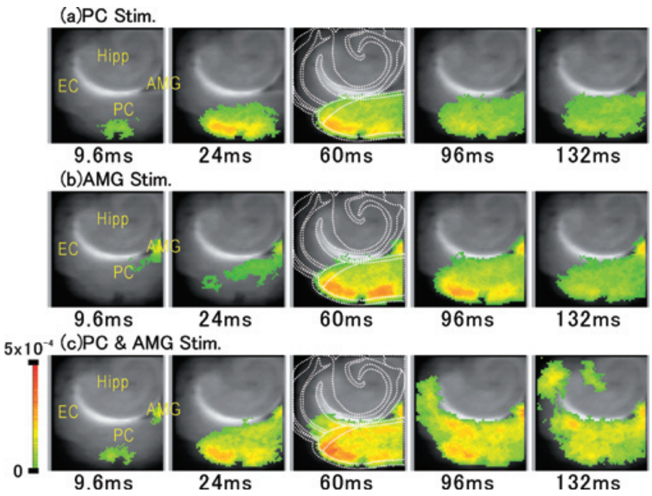
AIST Today Vol. 3, No. 7 (2003) 9



Optical recording of neural activity elicited by stimulation of the PC and/or the AMG.
Depolarization is measured as the fractional changes in fluorescence in each pixel, this value is encoded in "pseudocolor" as indicated in the scale and is superimposed on a bright-field image of the slice. The brain slice includes the hippocampus (Hipp), entorhinal cortex (EC), perirhinal cortex (PC), and lateral amygdaloid nucleus (AMG).

Two-Dimensional Particle-Mesh Ewald Method

- Fast and accurate molecular dynamics simulations for surfaces and membranes -

We developed a fast and accurate algorithm for calculating Coulomb interactions for three-dimensional systems with two-dimensional (2D) periodicity, i.e., quasi-2D systems, and built a numerical library that can be easily combined with molecular-simulation programs in widespread use all over the world. We refer to this new algorithm as the 2D-PME method. We present overview of the 2D-PME method, focusing on the advantage over the previous methods. The 2D-PME method is useful for the molecular simulations for surfaces and membranes.

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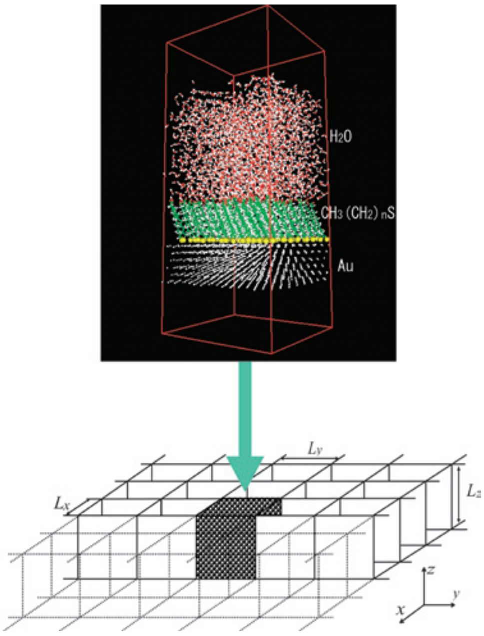
AIST Today Vol. 3, No. 7 (2003) 11



(Top) Self-assembled monolayer membrane system.
(Bottom) Quasi two-dimensional simulation system, Original particles are contained in the central box and images of the box are repeated in the (x,y) directions.