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OPEN LECTURE SERIES (VII)

"*Dynamics and organization of the cerebral cortex*"
by Prof. J.J. Wright

Thursday 30th June 2005 from 1 p.m. – 2 p.m.

At AUT Technology Park, James Fletcher House, Level 4 (PA421)

581-585 Great South Road, Penrose, Auckland

Short Biography:

Prof. J. J. Wright

Jim Wright is a psychiatrist, and an Honorary Professor in the Faculty of Medicine and Health Sciences. He took his medical degree at the University of Otago, and was subsequently educated at the California Institute of Technology and the University of London, before returning to Auckland. His primary research interest is, and has always been, the dynamics of the brain.

He was at one time head of the Department of Psychiatry and Behavioural Science at the Medical School, and more recently held a personal chair at the Mental Health Research Institute of Victoria.

In 2003 he shared the Royal Societies of Australia Prize for Interdisciplinary Research, with physicists and physiologists of Sydney University.

He currently is engaged in ongoing research in Brain Dynamics, with colleagues in Auckland, Hamilton, Sydney and Melbourne.

Abstract :

Dynamics of the cerebral cortex depends upon co-operative processes at three distinct spatial scales.

(1) At the whole-brain scale, interaction of cortex and subcortical systems produces organised and continually modulated patterns of cortical activation so that, in the alert state, the cortex is held near transition between dissipative and generative states of neuronal activity. Action potential and local field activity in the gamma frequency range play a major part in information processing in the alert state.

(2) At the millimetric to centimetric scale, synchronous oscillation at gamma frequencies acts to bind transient assemblies of neurones together in functional coalitions.

(3) At cellular scale, growth and decay of synaptic strength according to learning rules, probably of "floating hook" form, operates over a variety of temporal scales, and is subject to regulation by neuromodulators associated with motivational state.

Simulations of electrocortical activity have reproduced experimental phenomena at all three scales, and evolution of synaptic connections in accord with theory reproduces anatomically realistic features of the cerebral cortex. These findings imply a relatively simple model for brain self-organization, which would permit flexible behavioural adaptation.