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Computer Modeling of Local Potential Fields in Neurological Systems.

In systems of coupled oscillators each element or oscillator in the system is affected by the surrounding oscillators through different types of local interactions. The oscillators in the system can become phase locked when different types of local interaction are implemented. I modeled such a system with computer simulations that depicted the communication of neurons within the brain. Each neuron was said to have an oscillating local potential field (LPF) and it is by these fields that the neurons communicated with one another. The degree of communication between the neurons was determined by a phase resetting curve (PRC) that was constructed from previous biological data. It was this PRC that contributed to making the simulations more biologically accurate. Each simulation started with every neuron's LPF at a random phase . Over time the neurons communicated with one another following the PRC. At the end of each simulation the neurons' LPFs locked phases in distinct patterns. Each different phase lock pattern was the byproduct of varying experimental parameters, such as the interaction strength or the distances between neurons. The simulations provided a pictorial understanding of what may go on in the brain in only a few milliseconds. In addition, the computer model can aid in the search for transient oscillations given a more biological specific parameter space.

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