1035-37-1440 **Natasha A. Cayco Gajic*** (caycogajic@gmail.com), MSC 232, Caltech, Pasadena, CA 91126.

Synchronization in Coupled Phase Oscillators. Preliminary report.

In a system of coupled oscillators, *synchronization* occurs when oscillators spontaneously lock to a common frequency or phase. We study a system of $n \gg 1$ phase oscillators placed on a circle with random initial positions and sinusoidal coupling with their k nearest neighbors on each side. When all the oscillators are identical, the final state of the system is either full phase-locking (in which all oscillators have the same relative phase) or it is in a splay state characterized by a winding number q with the oscillators uniformly spread apart in phase. However, when the internal frequencies of the oscillators are uniformly distributed on a small interval, they settle into an "approximate" splay state, and their phases are no longer uniformly spread. When $k = 1$, we examine the system's final state as a discrete map and then show that phase-locking synchronization can never occur for non-identical oscillators. We also derive a sufficient and necessary condition for the existence of cycles. (Received September 19, 2007)