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## **An application of the geometrical phase to a biophysical problem: pump current and its fluctuation**

Jun Ohkubo (ISSP, University of Tokyo)

The concept of the geometrical phase is applicable for various phenomena. In this poster presentation, we will discuss a new application of the geometrical phase to a ‘biophysical’ problem. The problem is not quantum mechanical one, but a classical stochastic one. It has been known that a stochastic system under a periodic perturbation shows a pumping phenomenon; i.e., the periodic perturbation causes a current which is not explained by a simple average of those in the strict static cases. Recently, a current and its fluctuation in an adiabatic case (with very slow periodic perturbation) has been calculated by using the Berry phase interpretation. Because a non-adiabatic case is also important for such classical stochastic systems, we evaluate the current and its fluctuation in the non-adiabatic case. In the non-adiabatic case, the statistics of the pump current is related to the Aharonov-Anandan phase, and the Floquet theory is used to calculate it.