What is Quantum in Quantum Pumping: The role of the Phase and Asymmetries KUNAL DAS, Fordham University, TOMAS OPATRNY, Palacky University — By studying several examples, we show that quantum pumping does not always necessitate a strictly quantum description, neither is phase always a necessary concept. The same quantum mechanical picture of pumping encompass a variety of distinct mechanisms, some can be simulated by classical mechanisms while others can be explained only in a quantum picture; the role of the phase of the wavefunction is the crucial differentiator. We also show that most pumping processes have a previously unconsidered antisymmetric component which contributes significantly to the instantaneous current at each terminal but causes no net charge transfer. We have also computed the exact pumped current for arbitrary rates of time variation for certain potentials, not just in the adiabatic regime as has been previously studied.