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Phase and curvature CURT WITTIG, University of Southern California — It is known that geometric phases play important roles in atomic and molecular science, from the Aharonov-Bohm effect including flux quantization to the Born-Oppenheimer approximation and its conical intersections. When judged from a geometrical perspective, these and related phenomena can be assigned the common parentage of quantum holonomy on curved surfaces. Moreover, this perspective can be extended to larger arenas. For example, adiabatic transport of a state in phase space is nonzero if and only if $[x, p]$ is nonzero. This yields a curvature that is equal to $\hbar^{-1}$. This talk will explore additional aspects of geometric phase: (i) the origin of the curvature in parameter space imposed by $\hbar$, and therefore by the existence of quantum mechanics; and (ii) the relationship of the curvature to matrix elements, *e.g.*, between which kinds of states.

Curt Wittig
University of Southern California

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