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Unitary Mixing Matrix Parameterizations CARL BRANNEN, Washington State University, Department of Physics — Unitary mixing matrices, such as the quark and lepton mixing matrices, have unphysical degrees of freedom; one can multiply rows and columns by arbitrary complex phases. In elementary particles, standard practice is to choose phases and parameterize what's left of the unitary matrix. We show that one can use an "unbiased state" to define the complex phases. This defines a natural parameterization of unitary mixing matrices through a Lie subgroup of $U(n)$ that contains no phase information and is isomorphic to $U(n-1)$. We show that Jarlskog invariants and J_{CP} are related to Berry-Pancharatnam or quantum phases. For 3×3 matrices, we solve the relationship between the Lie subalgebra and Lie subgroup in closed form. This defines a new parameterization that is close to the standard 3×3 parameterization used for the CKM matrix, but treats the (12), (23), and (13) permutations equally. The new fourth parameter gives the (123) and (132) permutations. We provide two more parameterizations for these matrices, one of which brings the tribimaximal form for the MNS matrix into a particularly simple form.

Carl Brannen
Washington State University, Department of Physics

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