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CP Violation in K Decay MALTE DYCKMANNS, Stony Brook University — In 1957, the symmetry of the fundamental forces under parity transformations (the inversion of all spatial coordinates) has been found to be broken in weak interactions. Charge conjugation, the interchanging of particles and antiparticles, is another discrete symmetry transformation that is broken by weak interactions. It was soon found that the combination of both transformations (CP) is a symmetry of the strong and electromagnetic force, that seems to be preserved by weak interactions as well. CP was then strongly believed to be a true symmetry of nature until 1964 when this symmetry has been proven to be broken in weak decays of neutral kaons. This symmetry breaking manifests itself in an asymmetric mixing between particles and antiparticles in the kaon system. It is thus one of the crucial ingredients for our universe to form the matter-antimatter asymmetry that makes our existence possible. Until today, it is extremely puzzling why CP is so close to being a perfect symmetry and why its violation only occurs in weak interactions. Tremendous efforts have been and are still being made to unravel this mystery of modern physics, which is experimentally still not very well constrained. Three large acceleration facilities have raced to provide the first evidence of CP violation outside the kaon system, but the observation of CP violation in B meson decay in 2001 was just the first discovery in a decade highly affected by the exploration of CP violation. With LHCb running and experiments like Super Belle planned, CP violation is very likely to remain one of the hottest topics in Physics for the next decades.

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