Hadron colliders provide an important laboratory for studying the production of bound states of heavy quarks, namely the $J/\psi$, $\psi'$ and the $\Upsilon$ mesons. The large cross section for heavy quark production and the relatively large branching fraction to $\mu^+\mu^-$ allow the collection of very large data samples from which the basic properties of quarkonium production mechanisms can be studied. Nevertheless, studies of quarkonium states in proton anti-proton collisions have yielded surprises to which the theoretical descriptions of their production mechanism have had to adapt. I will summarize the past history and current state of quarkonium production and polarization measurements at the Fermilab Tevatron and highlight the first quarkonium cross section measurements from the CMS experiment at the LHC.