Every 2-connected cubic graph $G$ has a 2-factor, and much effort has gone into studying conditions that guarantee $G$ to be Hamiltonian. We show that if $G$ is not Hamiltonian, then $G$ is either the Petersen graph or contains a 2-factor with a cycle of length at least 7. We also give infinite families of 2-connected and 3-connected cubic graphs in which every 2-factor consists of cycles of length at most, respectively, 10 and 16. (Received September 21, 2010)