The primary motor cortex (M1) is a region of the brain that is important for planning and executing motor movements, and motor skill learning. Neurons in M1 are undergoing plastic changes during acquisition of novel motor skills. Both, motor skill acquisition and plasticity in M1 neurons are critically dependent upon dopaminergic signaling. Dopamine in M1 is acting on two subtypes of dopamine receptors, D1 and D2. These receptors are located on different cell types within M1. It is hypothesized, that cells expressing D1 and D2 receptors may play a different and specialized roles in motor control. However, little is known about these neuron subtypes. In this project, we are planning to characterize subpopulations of M1 pyramidal neurons expressing D1 and D2 receptors. To achieve this goal, a combination of electrophysiological and behavioral methods will be used. Genetically modified mice, expressing fluorescent proteins in D1 and D2 receptor expressing neurons will be used for identification of cells of interest. By using electrophysiological techniques basic electrophysiological and morphological properties of these cells will be characterized. Finally, by combining behavioral and electrophysiological techniques, possible changes in activity and plasticity of these cells in animals undergoing motor training will be described. Behavioral experiments will be performed on healthy animals, and on animals with destructed dopaminergic terminals in M1. This will allow to gain insight into processes that may occur in neurodegenerative diseases, particularly Parkinson's disease. As a result, features of the two subpopulations of neurons in M1 will be characterized. In addition, the nature of plastic changes occurring in these cells under conditions similar to Parkinson's disease will be described. Better understanding of plastic changes occurring in the brain circuits involved in motor skill learning and fine motor control, in animal models, can contribute to the development of novel forms of therapy of people suffering from neurological disorders.