The most common cause of paralysis is injury to one cerebral hemisphere, leading to hemiparesis of the opposite half of the body. The pattern of paralysis is largely attributable to injury of the corticospinal tract, a crossed connection that is the principal pathway for voluntary movement in people. To restore motor control to the impaired half of the body, the primary strategy has been to restore motor control from the injured hemisphere. One reason that the injured hemisphere does not restore function is that it receives inhibitory signals from the uninjured hemisphere. These inhibitory connections, which are transmitted via the corpus callosum, allow independence of movement of the two sides of the body in health. After injury, however, these circuits can be deranged, causing the uninjured hemisphere to "bully" the injured hemisphere with excessive transcallosal inhibition. To reduce this bullying, many groups have sought to reduce activity of the uninjured hemisphere. An alternative approach is to drive control of both halves of the body from the uninjured hemisphere. This pattern of innervation can allow substantial hand function of the more affected hand, although it may come at a loss of independence of the two hands. Which hemisphere to support is a major question for systems neuroscience and especially for those of us who use brain stimulation to modulate corticospinal function. In this lecture I will present the evidence for both an adaptive (friend) and maladaptive (foe) role of the uninjured hemisphere in hemiparesis. I will present a framework of the important circuits that control the impaired limbs and how they might be optimally engaged to support motor recovery.

Three recent publications:

