"Movement decoded: exploring neural control of the primate upper limb"

Even simple movements of the arm and hand require the coordination of more than 30 individual muscles. Studying how the brain efficiently controls this large number of degrees of freedom not only provides valuable insight into biological information processing, but can also aid in the development of the next generation of brain-controlled prosthetic devices. In the Donoghue Lab we combine two key technologies to study the motor system: chronically implanted mircoelectrode arrays, which allow us to monitor ensembles of more than 100 individual neurons, and Hollywood-style motion capture using reflective markers, yielding the precise position of the arm and hand with sub-millimiter accuracy. Using mathematical models we can link neural activity to movement information, decoding the electrical 'language' the brain uses to control complex upper limb motion. Our basic science work with primates led to the BrainGate clinical trials, which have allowed paralyzed patients to successfully control robotic limbs using only their thoughts.