**Evolution and Development of Neural Circuits for Motor Control**

**Jeremy S. Dasen**

**NYU Neuroscience Institute, NYU School of Medicine, New York, NY**

The neural circuits controlling motor behaviors vital to mammals, including walking, breathing, and balance, rely on the ability of neurons within the spinal cord to establish selective connections during development. Work over the past decade has provided a fairly comprehensive understanding of the genetic pathways that determine the identity of each major neuronal class within the neural tube. The mechanisms through which neurons acquire subtype identities necessary for the incorporation into a particular motor circuit are, however, still poorly defined. Our studies on the specification of spinal motor neurons indicate that the large family of Hox transcription factors play central and evolutionarily conserved roles in generating the hundreds of subtypes required for selective innervation of limb muscle. Hox proteins orchestrate genetic programs that control diverse aspects of motor neuron maturation, including their topographic organization, peripheral target muscle specificity, and presynaptic partners. Emerging studies from our group also indicate that *Hox* genes function in multiple neuronal classes to shape synaptic specificity during development, suggesting a broader role in circuit assembly. I will discuss our group’s progress towards elucidating how Hox-dependent and –independent genetic programs establish the circuit architectures necessary for motor control. Ultimately, we hope to uncover the pathways through which genetically encoded developmental programs contribute to the emergence of specific motor behaviors. Our approach integrates selective genetic manipulations of neuronal subtypes, genome-wide interrogation of regulatory networks, modern circuit-tracing methods, comparative analyses in multiple vertebrate organisms, and rigorous analyses of behavior.