Paths of discovery in motoneuron neurobiology

Douglas G. Stuart, François Clarac, Jean-Gaël Barbara, Robert M. Brownstone, Jacques Duchateau, Roger M. Enoka

Paths of Discovery in Motoneuron Neurobiology

D.G. Stuart, F. Clarac, J.G. Barbara, R.M. Brownstone, J. Duchateau, R.M. Enoka. 2011. « Paths of discovery in motoneuron neurobiology », Brain Research, 1409, 1-2, (ISSN 0006-8993).

Douglas G. Stuart[a,*], François Clarac[b], Jean-Gaël Barbara[c], Robert M. Brownstone[d], Jacques Duchateau[e], Roger M. Enoka[f]

[a]*Department of Physiology, University of Arizona, Tucson, AZ 85721-0093, USA*
b*P3M, CNRS, Université de la Méditerranée, 31 chemin Joseph Aiguier, 13402 Marseille, France*
[c]CNRS UMR7102, *Université Pierre et Marie Curie, et Université Denis Diderot, Paris, France*
[d]*Departments of Surgery (Neurosurgery) and Anatomy & Neurobiology, Dalhousie University, Halifax, NS, Canada B3H* 1X5
[e]*Laboratory of Applied Biology, Université Libre de Bruxelles, 808 Route de Lennik, CP 640, 1070, Brussels, Belgium*
[f]*Department of Integrative Physiology. University of Colorado, Boulder, CO* 80309-0354, *USA*

*Corresponding author: Physiol-Univ Arizona, PO Box 210093, Tucson, AZ 85721- 0093, USA. Tel: +520-626-7103. Fax: +520-621-8170.
E-mail: dgstuart@u.arizona.edu (D.G. Stuart)

Preface

The analysis of movement dates back to antiquity and by the early 20th C its study was tied closely to the properties of motoneurons, particularly those innervating limb and respiratory muscles. Now in the 21st C the analysis of movement is quite sophisticated, and motoneuron neurobiology is on the forefront of the integration of molecular genetics, traditional neuroanatomy, and neurophysiology. To provide a brief history of these developments, which included the important contributions of several Nobel Laureates, we present 5 articles on paths of discovery in motoneuron neurobiology.

The prologue by Barbara and our other five authors delves into the origins of research on mammalian spinal neurons. The following article by Clarac and Barbara jumps to the 19th and early 20th C with an emphasis on 19th C neuroanatomy and neurology, including work by Santiago Ramon y Cajal (1852-1934) and early 20th C concepts pioneered by Charles Sherrington (1856-1953) on the significance of motoneurons integrating communication between the central nervous system and the musculature. Next, an article by Duchateau and Enoka traces the history of work on the motor unit, from the inference of its organization in 1913 to a secure definition by Sherrington in 1925 and seminal electrophysiological recording in the laboratory of Edgar Adrian (1889-1977) in 1929 and subsequent refinements up to the present, which included early contributions from John Eccles (1903-1997) and Ragnar Granit (1900-1991). The third article by Stuart and Brownstone focuses on how intracellular recording in the central nervous system began with the study of motoneurons and interneurons in the cat spinal cord, with the initial reports in 1951/1952 coming from the efforts of Walter Brock (1923-1996), John Coombs (1917-1993) and Eccles in New Zealand and that of Walter Woodbury (1923-) and Harry Patton (1918-2002) in the USA. The subsequent intracellular recording contributions of Eccles had a major impact on 20th C neuroscience while that of Woodbury opened up many new avenues of biophysical research on a wide variety of tissues. Finally, the prologue by Brownstone and our other authors addresses the current state-of-the-play In motoneuron neurobiology.

Some of the above work was presented the authors in an historical session at the international meeting "Towards translational research in motoneurons," Paris, FRA, July 91-3, 2009 (Organizers: C.J. Heckman, Didier Orsal, Jean-François Perrier**,** Daniel Zytnicki**).**