Key lecture | Neural correlates of consciousness: lessons from coma and related states

Prof. Steven Laureys, Clinical Professor of Neurology, Coma Science Group, Cyclotron Research Centre, University of Liège, Belgium

Registration is obligatory due to limited places. You can register by sending an e-mail to: p.bisschoff@maastrichtuniversity.nl

Wednesday April 22, 2015 | 16.00 – 17.00 hrs.
Location: University Hospital, Greepzaal, 4th floor
Maastricht University / EURON
School for Mental Health and Neuroscience - MHeNs

BIOSKETCH / ABSTRACT

Steven Laureys, MD, PhD, leads the Coma Science Group at the Cyclotron Research Center and Department of Neurology, Sart Tilman Liège University Hospital.

Steven is Clinical Professor (ULg) and Research Director (tenure) at the Belgian National Fund of Scientific Research (FNRS). He graduated as a Medical Doctor from the Vrije Universiteit Brussel Belgium, in 1993. While specializing in Neurology he entered a research career and obtained his M.Sc. in Pharmaceutical Medicine working on pain and stroke using in vivo microdialysis and diffusion MRI in the rat (1997). Drawn by functional neuroimaging, he moved to the Cyclotron Research Center at the University of Liège, Belgium, where he obtained his Ph.D. (2000) and his “thèse d’agrégation de l’enseignement supérieur” (2007) studying residual brain function in coma, vegetative, minimally conscious and locked-in states.

He is board-certified in neurology (1998) and in palliative and end-of-life medicine (2004) and presently is invited professor at the Collège Belgique (Belgian Royal Academy of Sciences) and chair of the “European Neurological Society Subcommittee on Coma and disorders of consciousness”.

A recipient of the William James Prize (2004) from the Association for the Scientific Study of Consciousness (ASSC) and the Cognitive Neuroscience Society (CNS) Young Investigator Award (2007), he published several books: The Neurology of Consciousness (with Giulio Tononi, Academic Press, 2008); Coma Science (with Adrian Owen et Nicholas Schiff; Elsevier 2009); Disorders of Consciousness (with Nicholas Schiff, Wiley, 2009) and The Boundaries of Consciousness (Elsevier, 2005).

He is a member of the American Academy of Neurology Committee for the Development of Practice Guidelines for the Vegetative and Minimally Conscious State (2007) (Robert G. Holloway, Dan Larriviere, Michael A. Williams), is Honorary International Fellow of the Royal Hospital of Neuro-disability, London, UK (Keith Andrews) and was invited member of the 2004 Congress on Life-Sustaining Treatments in the Vegetative State organized by the Vatican’s Pontifical Academy of Life (Gian Luigi Gigli) and the 2006 Mohonk Consensus Meeting for the US Congressional Report on Disorders of Consciousness (Joseph Giacino).

ABSTRACT

Neural correlates of consciousness: lessons from coma and related states

Steven Laureys, Coma Science Group, University and University Hospital of Liège, Belgium

http://www.coma.ulg.ac.be

The past 15 years have provided an unprecedented collection of discoveries that bear upon our scientific understanding of recovery of consciousness in the human brain following severe brain damage. Highlighted among these discoveries are unique demonstrations that patients with little or no behavioral evidence of conscious awareness may retain critical cognitive capacities and the first scientific demonstrations that some patients, with severely injured brains and very longstanding conditions of limited behavioral responsiveness, may nonetheless harbor latent capacities for recovery. Included among such capacities are particularly human functions of language and higher-level cognition that either spontaneously or through direct interventions may reemerge even at long time intervals or remain unrecognized.
When patients in “persistent vegetative state” (recently also coined unresponsive wakefulness syndrome) show minimal signs of consciousness but are unable to reliably communicate the term minimally responsive or minimally conscious state (MCS) is used. MCS was recently subcategorized based on the complexity of patients’ behaviors: MCS+ describes high-level behavioral responses (i.e., command following, intelligible verbalizations or non-functional communication) and MCS- describes low-level behavioral responses (i.e., visual pursuit, localization of noxious stimulation or contingent behavior such as appropriate smiling or crying to emotional stimuli). Patients who show non-behavioral evidence of consciousness or communication only measurable via ancillary testing (i.e., functional MRI, positron emission tomography, EEG or evoked potentials) can be considered to be in a functional locked-in syndrome.

An improved assessment of brain function in coma and related states is not only changing nosology and medical care but also offers a better-documented diagnosis and prognosis and helps to further identify the neural correlates of human consciousness. Taken together, recent studies show that awareness is an emergent property of the collective behavior of frontoparietal top-down connectivity. Within this network, external (sensory) awareness depends on lateral prefrontal/parietal cortices while internal (self) awareness correlates with precuneal/mesiofrontal midline activity. Of clinical importance, this knowledge now permits to improve the diagnosis, prognosis and treatment of patients with disorders of consciousness, which currently remains very challenging. New technological advances now also permit to show command-specific changes in fMRI, EEG or eye-pupil measurements providing motor-independent evidence of conscious thoughts and in some cases even of communication. We will conclude by discussing related ethical issues and the challenge of improving our clinical care and quality of life in these challenging patients with disorders of consciousness.

References
- Preserved feedforward but impaired top-down processes in the vegetative state *Science* (2011) 858-862