

**THE INFLUENCE OF RESPIRATION ON HEART RATE  
VARIABILITY DURING SLEEP**

**Mirosław Latka<sup>1</sup>, Wojciech Jernajczyk<sup>2</sup>, Jean-Pol Lanquart<sup>3</sup>, Paul Linkowski<sup>3</sup>,  
Bruce J West<sup>4</sup>**

<sup>1</sup>Institute of Biomedical Engineering, Wrocław University of Technology, Wrocław, Poland;

<sup>2</sup>Department of Clinical Neurophysiology, Institute of Psychiatry and Neurology, Warsaw, Poland;

<sup>3</sup>Sleep Laboratory, Department of Psychiatry, Hôpital Erasme, Brussels, Belgium;

<sup>4</sup>Information Sciences Directorate, Army Research Office, Research Triangle Park, NC 2770, USA

Respiration sinus arrhythmia (RSA) is a well known mechanism that affects heart rate variability of awake subjects. On an electrocardiogram this phenomenon is manifested as rather subtle changes in the RR interval synchronized with respiration. The RR interval is shortened during inspiration and prolonged during expiration. We find that the nature of coupling between the respiratory and cardiovascular systems during sleep may be different than that of RSA. The end of expiration may trigger the dramatic rebound of the RR interval length. The length of adjacent R-R intervals may increase by as much as 50%. We call such effect an RR-complex in reference to the K-complex -- the largest physiological electroencephalographic graphoelement. The relation between these two processes goes far beyond their spectacular magnitude of variation. During stage 2 sleep, the K-complexes frequently precede the RR jumps.