

Abstract Submitted  
for the MAR12 Meeting of  
The American Physical Society

**Physiological Networks: towards systems physiology**<sup>1</sup> RONNY P. BARTSCH, Harvard Medical School and Division of Sleep Medicine, Brigham and Womens Hospital, Boston, MA 02115, USA, AMIR BASHAN, Department of Physics, Bar-Ilan University, Ramat-Gan, Israel, JAN W. KANTELHARDT, Institute of Physics, Martin-Luther-Universitaet Halle-Wittenberg, Halle (Saale), Germany, SHLOMO HAVLIN, Department of Physics, Bar-Ilan University, Ramat-Gan, Israel, PLAMEN CH. IVANOV, Harvard Medical School and Division of Sleep Medicine, Brigham and Womens Hospital, Boston, MA 02115, USA — The human organism is an integrated network where complex physiologic systems, each with its own regulatory mechanisms, continuously interact, and where failure of one system can trigger a breakdown of the entire network. Identifying and quantifying dynamical networks of diverse systems with different types of interactions is a challenge. Here, we develop a framework to probe interactions among diverse systems, and we identify a physiologic network. We find that each physiologic state is characterized by a specific network structure, demonstrating a robust interplay between network topology and function. Across physiologic states the network undergoes topological transitions associated with fast reorganization of physiologic interactions on time scales of a few minutes, indicating high network flexibility in response to perturbations. The proposed system-wide integrative approach may facilitate new dimensions to the field of systems physiology.

<sup>1</sup>Supported by: NIH Grant 1R01HL098437-01A1, Office of Naval Research Grant 000141010078, BWH BRI Fund, US-Israel BSF Grant 2008137 and the German Academic Exchange Service (DAAD).

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Date submitted: 28 Nov 2011

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