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### Title

ON CRITICAL STATE TRANSITIONS BETWEEN DIFFERENT LEVELS IN NEURAL SYSTEMS

### Permalink

<https://escholarship.org/uc/item/7bx4r4sc>

### Journal

New Mathematics and Natural Computation, 05(01)

### ISSN

1793-0057 1793-7027

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### Publication Date

2009-03-01

### DOI

10.1142/S1793005709001222

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Peer reviewed

The abstract for this article is from the **Special Issue on Neurodynamic Correlates of Higher Cognition and Consciousness: Theoretical and Experimental Approaches - in Honor of Walter J Freeman's 80th Birthday Part I: Theoretical and Experimental Aspects of Higher Cognitive Functions** was provided by World Scientific.

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<http://www.worldscientific.com/toc/nmnc/05/01>

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DOI: 10.1142/S1793005709001222

GERHARD WERNER, *New Math. and Nat. Computation*, **05**, 185 (2009). DOI: 10.1142/S1793005709001222

## **ON CRITICAL STATE TRANSITIONS BETWEEN DIFFERENT LEVELS IN NEURAL SYSTEMS**

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The framework of "Modern Theory of Critical State Transitions"<sup>1,2</sup> considers the relation between different levels of organization in complex systems in terms of critical state transitions. A state transition between levels entails changes of scale of observables and, concurrently, new formats of description at reduced dimensionality. It is suggested that this principle can be applied to the hierarchic structure of the nervous system, whereby the relations between different levels of its functional organization can be viewed as successions of state transitions: upon state transition, the "lower" level presents to the "higher" level an abstraction of itself, at reduced dimensionality and at a coarser scale. The re-scaling in the state transitions is associated with new objects of description, displays new properties and obeys new laws, commensurate to the new scale. To illustrate this process, some aspects of the neural events thought to be associated with cognition and consciousness are discussed. However, the intent is also more general in that state transitions between all levels of organization are proposed as the mechanisms by which successively higher levels of organization "emerge" from lower levels.

**Keywords:** Critical state transitions; state space; neural systems; statistical mechanics; complex systems; consciousness; emergence

### **Cited by :**

*Diego Guidolin, Giovanna Albertin, Michele Guescini, Kjell Fuxe, Luigi F. Agnati.* (2011) Central Nervous System and Computation. *The Quarterly Review of Biology* **86**:4, 265-285. Online publication date: 1-Dec-2011. [ CrossRef ]