



Review

Towards solving the hard problem of consciousness: The varieties of brain resonances and the conscious experiences that they support



Stephen Grossberg*

Center for Adaptive Systems, Boston University, 677 Beacon Street, Boston, MA 02215, USA
 Graduate Program in Cognitive and Neural Systems, Departments of Mathematics & Statistics, Psychological & Brain Sciences, and Biomedical Engineering Boston University, 677 Beacon Street, Boston, MA 02215, USA

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ABSTRACT

The hard problem of consciousness is the problem of explaining how we experience qualia or phenomenal experiences, such as seeing, hearing, and feeling, and knowing what they are. To solve this problem, a theory of consciousness needs to link brain to mind by modeling how emergent properties of several brain mechanisms interacting together embody detailed properties of individual conscious psychological experiences. This article summarizes evidence that Adaptive Resonance Theory, or ART, accomplishes this goal. ART is a cognitive and neural theory of how advanced brains autonomously learn to attend, recognize, and predict objects and events in a changing world. ART has predicted that “all conscious states are resonant states” as part of its specification of mechanistic links between processes of consciousness, learning, expectation, attention, resonance, and synchrony. It hereby provides functional and mechanistic explanations of data ranging from individual spikes and their synchronization to the dynamics of conscious perceptual, cognitive, and cognitive–emotional experiences. ART has reached sufficient maturity to begin classifying the brain resonances that support conscious experiences of seeing, hearing, feeling, and knowing. Psychological and neurobiological data in both normal individuals and clinical patients are clarified by this classification. This analysis also explains why not all resonances become conscious, and why not all brain dynamics are resonant. The global organization of the brain into computationally complementary cortical processing streams (complementary computing), and the organization of the cerebral cortex into characteristic layers of cells (laminar computing), figure prominently in these explanations of conscious and unconscious processes. Alternative models of consciousness are also discussed.

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* Correspondence to: Center for Adaptive Systems, Boston University, 677 Beacon Street, Boston, MA 02215, USA. Fax: +617 353 7755.

E-mail address: steve@bu.edu.

URL: <http://cns.bu.edu/~steve>.

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