Peter beim Graben is a promising neuroscientist who takes seriously the challenges of interdisciplinary work as is required at the interfaces of physics, psychology, linguistics, and philosophy. Originally trained as a physicist, Peter beim Graben has put emphasis on formal modeling within contemporary physical and mathematical frameworks. At the same time he has fruitfully interacted with experimental scientists and worked on the refinement of experimental methods.

His specific contributions lie in the areas of

A) computational psycholinguistics ("event-related brain potentials in language processing", "nonlinear dynamical automata", "Fock Space models of parsing", "pragmatic information theory")
B) computational neuroscience ("symbolic dynamics of neurophysiological data", "emergence in complex neural networks", "neural field theories")
C) philosophy ("epistemic foundations of symbolic dynamics", "emergence of mental states and cognitive processes").

Peter beim Graben has published in a wide variety of refereed journals in his field(s) and contributed to various books, among which a chapter on the "Foundations of Neurophysics" to a recent textbook-like collection of "Lectures in Supercomputational Neuroscience".

Three important recent works are

i) "Towards dynamical system models of language-related brain potentials" Cognitive Neurodynamics 2008 (with Sabrina Gerth and Shravan Vasishth),
ii) "Pragmatic Information in Dynamic Semantics" Mind & Matter 2006
iii) "Contextual Emergence of Mental States from Neurodynamics" Chaos and Complexity Letters 2007 (with Harald Atmanspacher).

i) presents two different nonlinear dynamical language processors where ERP effects (N400,P600) are adequately reflected by functionally and causally different regions in phase space. An important ingredient are Smolensky's tensor product representations for syntactic phrase structure grammars, which limits the latter to being non-recursive and context-free.

ii) develops an argument in favor of the applicability of Shannon&Weaver's mathematical theory of communication to the semantic and pragmatic levels.
Among other things, von Weizsäcker's theory of pragmatic information is reconstructed in terms of dynamic semantics. This allows "derivation" of Bar-Hillel&Carnap's theory of semantic information and is compatible with decision-theoretic measures of relevance.

iii) develops stability criteria for "well-defined mental states" as a tool for probing neural correlates of consciousness, the definition of macroscopic neural states, and the symbol grounding problem. In particular, compatibility of mental states is linked to partitioning properties of the neural phase space.

(Note that the above summaries just skim the surface of highly explicit and technical in-detail studies.)

H.-M.G