Concrete: Biophysical and functional aspects of bio-electricity in proteins, cells and networks, focusing on mechanisms underlying emergence, dynamics and adaptation of bioelectrical phenomena at extended timescales. The work involves experimental and theoretical analyses of variables at the levels of voltage-gated ionic channel proteins, excitable membranes, individual cells, and large-scale networks. The methods in use include membrane, single cell and multi-unit electrophysiology, real-time closed-loop designs, and formulation of low-dimensional mathematical models of excitability. For concrete demonstrations of such biophysical analyses leaf through (e.g.) publications 2013a, 2013b. A flavor for the concepts underlying the work is provided in an accessible review (2010) and in a short opinion paper (2016).

Broader: Advancing a framework of relational physiology, inspired by old and more recent ideas in a range of fields, from the science of self-organization and adaptivity, through theoretical biology, to psychology and anthropology. Within the physiological context, a relational approach entails focusing on the functional organization of systems that are embedded in a responsive and adaptive environment, analyzing processes rather than objects, implementing natural input statistics and closed-loop experimental designs. In a recent monograph (S. Marom, 2015), the relational framework is offered as a space for dialogue between physiology and psychology; an alternative to flat biologism — i.e., the interpretation of experience in terms of uniquely defined biological objects, this-or-that brain area, particular sets of genes, and so forth — that has plagued reductive approaches.