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Dynamics of visual perception and collective neural activity

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Dynamics of visual perception and collective neural activity

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Visual perception has all the hallmarks of an ongoing, cooperative-competitive process: probabilistic outcome, self-organization, order-disorder transitions, multi-stability, and hysteresis. It is therefore tempting to speculate that the underlying collective neural activity performs an exploratory attractor dynamics (spontaneous transitions between distinct steady-states), perhaps at multiple spatial and temporal scales. Here I summarize our recent investigations of this dynamical hypothesis. In several instances, a careful empirical study of perceptual dynamics *fully constrains* an idealized model of the stochastic dynamics of collective neural activity.
I conclude that the dynamical hypothesis outlined above permits a particularly close and direct back-and-forth between perceptual experiment and computational theory and thus has the potential to dramatically accelerate our progress in understanding visual function.

Related publications:

Cao, Braun, Mattia (2014) Stochastic accumulation by cortical columns may explain the scalar property of multistable perception. *Phys. Rev. Let.,* 113: 098103

Pastukhov, Garcia-Rodriguez, Haenicke, Guillamon, Deco, Braun (2013) Multi-stable perception balances stability and sensitivity. *Front. Comput. Neurosci.,* 7: 17.

Pastukhov, Vonau, Braun (2011) Believable change: bistable reversals are goverened by physical plausibility. *Journal of Vision*, 12 (1): pii 17.