The Quest for the Neural Code

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The quintessence of neuronal communication are the action potentials or “spikes”, sharp pulse-like electrical events that neurons send down their axons to evoke postsynaptic potentials in connected cells. All information our brains have about the external world, and all internal mental events, must ultimately be represented in the spatio-temporal patterns of spiking activity. However, there is still an ongoing debate as to what are the relevant features, elements, or dimensions within this spiking activity that form the basis for the neural code, partly because recordings from hundreds to thousands of neurons simultaneously became experimentally feasible only quite recently. My talk will give an overview of crucial experimental observations, and then discuss mathematical tools, models, and frameworks for addressing the neural coding question.