MAR16-2015-009291

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Neural relativity principle

ALEXEI KOULAKOV, Cold Spring Harbor Laboratory

Olfaction is the final frontier of our senses - the one that is still almost completely mysterious to us. Despite extensive genetic and perceptual data, and a strong push to solve the neural coding problem, fundamental questions about the sense of smell remain unresolved. Unlike vision and hearing, where relatively straightforward relationships between stimulus features and neural responses have been foundational to our understanding sensory processing, it has been difficult to quantify the properties of odorant molecules that lead to olfactory percepts. In a sense, we do not have olfactory analogs of "red", "green" and "blue". The seminal work of Linda Buck and Richard Axel identified a diverse family of about 1000 receptor molecules that serve as odorant sensors in the nose. However, the properties of smells that these receptors detect remain a mystery. I will review our current understanding of the molecular properties important to the olfactory system. I will also describe a theory that explains how odorant identity can be preserved despite substantial changes in the odorant concentration.