Seminar/Talk

Ion channels, critical points and emergent phenomena in biology

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Host:

Biological systems are immensely complicated at the molecular scale. However, they often display emergent behavior that is rich, but comprehensible. I will first discuss a geometric framework for quantifying this emergent simplicity, highlighting parallels to physics, where a similar compression of microscopic details explains the success of effective theories like the diffusion equation. I will then discuss how this same geometric framework can be used to bound the energetic cost of controlling a small system, with implications for the highly dissipative single molecule machines that carry out biological function.

The second part of my talk will focus on the plasma membrane, a two dimensional liquid that surrounds mammalian cells and which is home to many of the complex processes that carry out biological information processing. Recent experiments have demonstrated that this membrane is close to a liquid-liquid critical point, distinguished by emergent time and length scales much larger than individual molecules. I will talk about what this critical point means for the function of membrane bound proteins, mediating long-ranged forces, sensitive allosteric regulation and non-Markovian dynamics. I will also report on our recent experimental progress demonstrating that anesthetics move membranes away from criticality, and that anesthetic reversers also reverse effects on membrane criticality. Our results suggest a model wherein anesthetics exert their influence by interfering with membrane regulation of bound ion channels.

Monday, January 30, 2017 09:45am - 10:45am
Mondi Seminar Room 3, Central Building

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.