The mesoscopic physics of tissue dynamics and morphology

Prost Jacques

After introducing the notion of homeostatic pressure, I will first show that when two tissues compete for space, in the absence of chemical signaling, the one, which has the largest homeostatic pressure, always win. I will then show that in order for a micro-tumor to grow it must exceed a critical radius and calculate the probability for a tumor to exceed that radius. I will subsequently introduce dynamical equations, which exhibit fluid like behavior on time scales long compared to duplication and apoptosis times, in the vicinity of homeostatic conditions.. At last, I will show how our theory can reproduce all structures observed in intestinal villi. If time permits, I will also describe stress-clamp experiments, which provide numbers on the effects of stress on cell division and apoptosis.