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Title: Control of fate decisions during proliferation and morphogenesis

The goal of our research is to delineate the cellular networks that regulate cell form, proliferation, and growth. To study cellular networks, we employ quantitative single cell imaging, functional genomics, statistics, and mathematical modeling in a highly integrative fashion. Here I will discuss our efforts to understand the dynamics of signaling networks that regulate two distinct cellular decision making processes; the decision to commit to S-phase during proliferation, and the decision between "mesenchymal" and "amoeboid" fates during the 3D migration of metastatic cells. In both studies we have developed new high-throughput live imaging tools, as well as novel computational methods, to describe the signaling network dynamics that underpin cell fate decisions. Despite the fact these two decisions represent very different cellular processes, I will show how they share common systems-level properties. Specifically, I will describe how in both committing to S-phase, and deciding between different shapes, cells undergo switch-like conversions between bistable fates. Moreover, I will discuss how these switch-like conversions and bistability are evolvable processes that are rewired in cancer cells to drive disease and tumour heterogeneity. The Institute of Cancer Research: Royal Cancer Hospital, a charitable Company Limited by Guarantee, Registered in England under Company No. 534147 with its Registered Office at 123 Old Brompton Road, London SW7 3RP. This e-mail message is confidential and for use by the addressee only. If the message is received by anyone other than the addressee, please return the message to the sender by replying to it and then delete the message from your computer and network.