Imaging without lenses

The fast improvements that digital sensor arrays are experiencing, largely thanks to their use in cell phones and high-end digital cameras, are also helping to boost the field of lens-free microscopy. In this imaging modality, biological specimens are placed directly onto an imaging chip, and the image is formed by sampling the light transmitted through the specimen. This geometry can decouple imaging field of view and resolution from each other, thereby creating unique microscopes in which both features can be improved at the same time. In this Perspective, Ozcan and colleagues describe the two main types of lens-free on-chip microscopes and discuss the achievements and remaining challenges of this promising imaging modality.

Perspective p889

Cell proliferation deconvolved

The proliferation of a cell population can be perturbed—for instance, upon drug treatment—in many ways. Cells can be stimulated to divide more quickly or more slowly, to die by apoptosis or to enter a nondividing but viable state. Cell proliferation assays based on static cell counts cannot easily distinguish among such scenarios. Tyson and colleagues describe a model that takes into account the rates of cell division, death and entry into a nondividing, or quiescent, state. They constrain the model using experimentally measured rates from automated imaging and tracking of single cells. Using the model, they deconvolve nonlinear perturbations of cell proliferation dynamics into component cell states.

Article p923

Biobank consent policy

Collections of human cells and tissues—biobanks—are growing worldwide and are an important source of samples for studies on the biological basis of disease. This is especially true when samples are linked to the donor, to information about their disease family history, and to long-term information about their health and lifestyle. Has the academic community reached a consensus on the best informed-consent model for biobanks? Caulfield and colleagues carry out an analysis of the PubMed-cited literature arguing for different biobank consent models. On the basis of this analysis, they argue that there is as yet no consensus among academics on biobank consent policy.

Commentary p885

Following the interactome through time

The role of protein complexes in intracellular processes, such as signaling, is subject to intricate regulation. Complexes are regulated by post-translational modifications of individual members and their stoichiometry, both of which can change over time. Foster and colleagues combine size-exclusion chromatography with protein correlation profiling—stable isotope labeling by amino acids in cell culture (PCP-SILAC) for a high-throughput look at temporal changes in the interactome. Using three SILAC labels allows the authors to determine the global changes in protein complexes in response to epidermal growth factor over time.

Brief Communication p907

Weighing cells through the cell cycle

Cells maintain their size around a homeostatic set point; how this is achieved is not completely understood. Manalis and colleagues now adapt their previously reported suspended microchannel resonator mass sensor and combine it with a fluorescence microscope to accurately determine cell mass during cell cycle progression. They monitor cells of a particular lineage over multiple generations and see evidence for a growth rate threshold in size regulation for mouse lymphoblast cells and a pro-B-cell lymphoid cell line.

Brief Communication p910