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EDITORIAL

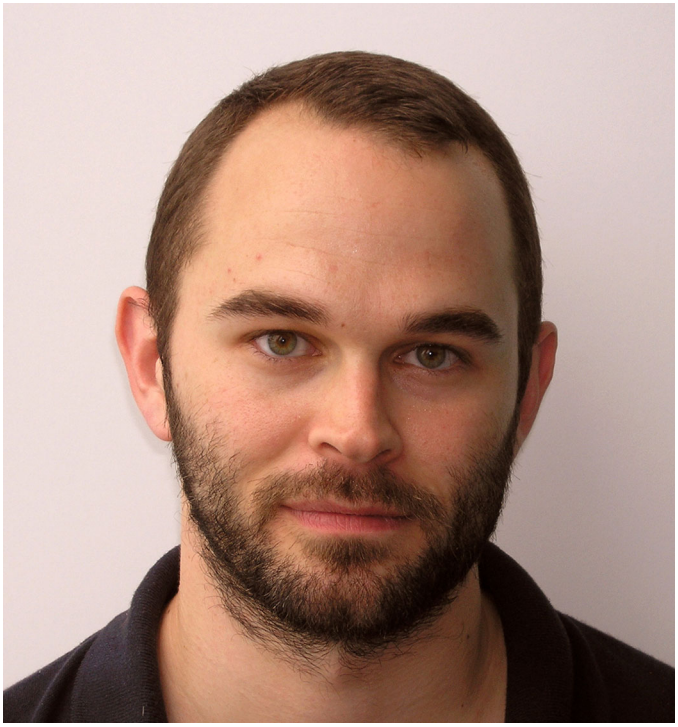
“What I cannot create, I do not understand”

Michael Way (Editor-in-Chief)

I am pleased to announce that the third Journal of Cell Science special issue will be focused on ‘Reconstituting cell biology’. Cell biology aims to understand not only what is going on inside individual cells, but also how those cells react and respond to each other and their immediate environment, regardless of whether they are single cells or the building blocks of multicellular organisms. We have made tremendous advances in addressing how the smallest unit of life is organized and how it functions since cells were first observed by Anton van Leeuwenhoek and Robert Hooke in the 1600s. Moreover, I also think it is fair to say that we are currently living in a golden age for cell biology: we have a near-full list of parts for many organisms, we can peer into cells with ever-increasing resolution, we can exquisitely manipulate genomes and even build tissues in a dish. Nevertheless, we are still far from having a complete molecular and physical understanding of how the different components and systems of the cell are integrated and organized into higher form and function.

Richard Feynman, the theoretical physicist who received the Nobel prize in 1965 for his work developing quantum electrodynamics, once famously said “What I cannot create, I do not understand”. The quote was written on his blackboard at the time of his death in 1988, and can be interpreted in several ways. The most straightforward one being that, using just fundamental principles, it should be possible to build up or understand an idea, proof or concept from the ground up. Such a bottom-up approach is not just restricted to theoreticians and physical scientists. Increasing numbers of researchers are taking a similar approach to reconstitute complex cellular processes and structures *in vitro* by using a minimal set of components and cell extracts. I could mention a long list of impressive ‘bottom-up’ experiments that have provided important mechanistic insights into the inner workings of the cell. However, I think it’s sufficient to say that in recent years we have seen the reconstitution of autophagosomes, centriole cores, endoplasmic reticulum networks, T-cell receptor signalling and mitotic chromatids, to name but a few.

It is far easier to take a cell or tissue apart than to reconstitute a fundamental cellular process with a handful of components in the absence of a book of instructions. While not easy, the rewards of bottom-up approaches are high, as defining the minimal set of components for any process or structure can provide tremendous molecular and mechanistic insights into the cell and how it works. However, it is not just all about the nuts and bolts; physical context and scale are also essential aspects of cellular function and organization. Researchers are now increasingly taking the biophysical and mechanical parameters of their systems into account to ensure their assays more accurately reflect the situation in the cell, rather than merely being an assay in a test tube. The use of technologies such as micro-patterning and microfluidics is also enabling reconstitution assays to become more sophisticated and elaborate, allowing them to tackle more-complex biological processes across a range of scales.



Manuel Théry

Given its potential for mechanistic insight, I am sure that an increasing number of us are already thinking of, or have already started down the road to, using ‘bottom-up’ reconstitution approaches to complement our existing ‘top-down’ cell biology strategies to uncover how cells are organized and function. I, therefore, invite you to submit your papers that use these approaches to our upcoming special issue on reconstituting cell biology, which will be guest edited by Manuel Théry (Hôpital St Louis, Paris and CEA Grenoble). Manuel follows Jenny Russinova (Ghent University, Belgium), who is currently handling a special issue on plant cell biology that will appear in the journal in January 2018.

Manuel Théry was trained in physics and chemistry at the ESPCI in Paris, France. He received his PhD from the University of Paris, Diderot in 2006. His thesis work, conducted under the guidance of Michel Bornens at the Institut Curie, analysed cell polarity and mitotic spindle orientation in response to cell adhesion cues. He developed micropatterned surfaces to control the spatial distribution of cell adhesion and co-founded the company CYTOO that commercialises these substrates. Manuel now divides his research activities between the CEA in Grenoble and the Hôpital Saint Louis in Paris. In collaboration with Laurent Blanchoin, Manuel has developed sophisticated *in vitro* assays to direct the self-organization of actin filaments and microtubules using microfabricated devices.

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Our upcoming special issue on reconstituting cell biology is intended to have a broad scope, so we are open to articles from a wide spectrum of areas. The special issue will also contain reviews and poster articles, commissioned by our in-house reviews editors. We look forward to working with Manuel on this exciting special issue, and invite you to contact us at jcs@biologists.com about any potential submissions.