# Imaging the molecular processes of cell division across scales

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## Abstract

The recent rapid development of microscopy technologies allows unprecedented insights into the molecular machinery inside living systems. For the first time, imaging technologies have molecular resolving power and sensitivity and can be correlated to cover the whole range from structural detail of single molecules to imaging a whole living cell and organism. Aided by machine learning driven image analysis and open sharing of image data, this provides unprecedented opportunities for new insights into the molecular networks that drive life's core functions.

This presentation illustrates the progress we have made in studying the protein network and individual complexes that drive cell division in human cells and early mammalian embryos. To this end, we have developed advanced microscopy and image analysis, ranging from whole-live-embryo light-sheet microscopy, absolutely quantitative live-cell fluorescence imaging using correlation spectroscopy (FCS) calibration, to super-resolution and correlative light and electron microscopy. These examples will highlight how we can use microscopy to study dynamic cellular signaling networks inside cells, the dynamic structure of key individual protein complexes that they regulate and, in this way, better understand how they function to ensure faithful cell division and prevent errors inside developing embryos. The exciting opportunities for open access to such cutting-edge imaging technologies provided by the new EMBL Imaging Center will also be briefly discussed.