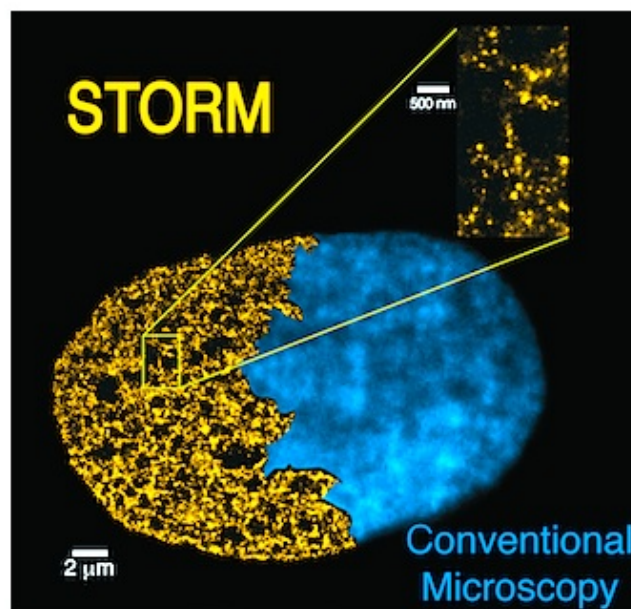


## A Super-resolution View of Nucleosome Organization in Living Cells

The link between genome packaging and cell pluripotency

**Commentary to** *Chromatin Fibers Are Formed by Heterogeneous Groups of Nucleosomes In Vivo* ([Cell, 160: 1145](#))



[Carlo Manzo, ICFO \(Barcelona\)](#).

The structure of chromatin inside the cell nucleus controls the regulation of gene expression, by impeding or permitting access of transcriptional factors to the genes. The current textbook picture of chromatin, based on *in vitro* or indirect measurements, postulates a hierarchical grouping of nucleosomes into compact and regular fibers. Looking at the details of this organization inside cell nuclei has so far been challenged by a number of limitations, such as the limited resolution of conventional microscopy techniques, and the invasiveness or lack of specificity of alternative approaches.

Through a fruitful collaboration involving biologists at the [Centre for Genomic Regulation – CRG](#) and physicists at the [Institute of Photonic Sciences – ICFO](#), we could overcome these constraints and reveal the arrangement of nucleosomes *in vivo* with unprecedented resolution. By means of **STORM**, one of the super-resolution techniques for which the [Nobel Prize in Chemistry has been](#)

awarded in 2014, we have visualized the organization of histone proteins in the nucleus of living mammalian cells with a resolution of 20 nm. The combination of super-resolution microscopy with statistical image analysis and computer simulations has further allowed us to quantify the nucleosomes packaging at the nanoscale.

We have found that the nucleosomes are structured in heterogeneous groups (called **clutches** for their similarity to “egg clutches”) displaying a broad distribution of composing units, sizes and densities. Importantly, the comparison of this organization in stem and somatic cells shows that these properties are correlated with the degree of pluripotency, i.e. the cell propensity to differentiate.

**Looking at the details of chromatin organization inside cell nuclei has so far been challenged by a number of limitations, such as the limited resolution of conventional microscopy, invasiveness or lack of specificity**

These findings provide a closer look at the chromatin architecture and open new possibilities for single cell screening by nucleosome arrangement, which might be useful to identify cell “stemness” as well as for cancer cell detection. In spite of these advances, **several challenges still remain**, such as the direct visualization of DNA structure and dynamics in living cell nuclei, and will require improvement in fluorescent probe design and fast imaging technology.

## More information

- Publication in Cell: [Chromatin Fibers Are Formed by Heterogeneous Groups of Nucleosomes In Vivo](#).
- [Video Abstract: Nucleosome Clutches](#).
- [Reprogramming and Regeneration Group](#) at CRG, Barcelona (Spain).
- [AFIB Group](#) at ICFO, Barcelona (Spain).
- [Single Molecule Biophotonics Group](#) at ICFO, Barcelona (Spain).

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