Thomas Cremer

Four decades ago most molecular biologists viewed the nucleus as a scarcely structured organelle with intermingling chromatin fibres drifting around in the nuclear sap. Thomas Cremer was one of the first supporters of the idea that cell type specific higher order chromatin arrangements of the nucleus are essential for cardinal nuclear functions, such as DNA replication, DNA repair and regulation of gene transcription. Spatial organization of chromatin, now considered as the highest level of epigenetic gene regulation, has been the main focus of the T. Cremer's research since the early 1970s.

Together with two physicists, his brother Christoph Cremer and Christian Zorn, T. Cremer pioneered laser-UV-microbeam experiments (1974). They demonstrated that after microirradiation of a small portion of an interphase nucleus, damage was restricted to a few chromosomes in the subsequent mitosis. This result implied a territorial organization of chromosomes in the interphase nucleus. In 1978 Thomas Cremer (again, in collaboration with Christoph Cremer) published a proposal for the construction of a confocal laser scanning fluorescence microscope with the goal of 3D imaging of cells. In the 1980s T. Cremer contributed to the development of a method for the visualization of individual chromosome territories by *in situ* hybridization (initially, using radioactive labeling) with chromosome–specific DNA probes. His concept of interphase cytogenetics (1976) had a broad impact in the field of clinical and tumor cytogenetics. Together with P. Lichter, T. Cremer also belongs to the pioneers of comparative genomic hybridization (CGH) performed on diploid metaphase spreads (1983) and of CGH arrays performed on a matrix with an ordered set of defined nucleic acid target sequences (1997). These methods have become widely used tools in cytogenetic analyses of chromosomal imbalances.

In 1996 T. Cremer was appointed Chair of Anthropology and Human Genetics at the Ludwig-Maximilians-University of Munich. Since then he has focused his research entirely on functional higher order nuclear architecture during the cell cycle, cell differentiation and malignant transformation, following his ideas of a functional compartmentalization of the nucleus. This research led to the formulation of the "Chromosome territory - Interchromatin Compartment (CT-IC) Model" (2000).

Two main approaches are currently used in his group: 1. Three-dimensional fluorescence in situ hybridization (3D-FISH) for 3D studies of nuclei in fixed cells and tissues. 2. In vivo labelling techniques of DNA and chromatin for the visualization and quantitative 4D-analysis of the dynamics of higher order chromatin domains in space and time. Since the 1980s Thomas Cremer has won numerous prestigious awards.