

# Jörg Langowski

1982 Dr. rer. nat. Biophysical Chemistry Universität Hannover  
1983-1984 Postdoc University of Washington, Seattle  
1985-1994 Group Leader, EMBL Outstation, Grenoble  
1994-now Head of division, Biophysics of Macromolecules,  
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## Current Research

Our group is interested in the relation between the flexibility of biomolecules and their function. We study the three-dimensional in vivo structure of the genomic DNA and its relationship to its function, using simple theoretical and experimental model systems. Major questions are the influence of local structural transitions on the global conformation of large DNA domains, nucleosome and chromatin fiber structure and the functional organization of the interphase nucleus. As experimental model systems we investigate the structure and dynamics of superhelical DNA, of complexes between DNA and regulatory proteins, of oligonucleosomes and of chromosomes in living cells. In our studies we apply a large palette of modern biophysical techniques: single molecule spectroscopy, analytical ultracentrifugation, scanning force microscopy, light and X-ray scattering, as well as fluorescence and absorption spectroscopy. The experimental data are interpreted with the aid of advanced computer modeling techniques such as Brownian dynamics, which allow us to predict the time-dependent structure of large DNAs and chromatin fibers on a millisecond to second time scale. Recently we have taken particular effort in the development of single molecule spectroscopy and imaging techniques for the analysis of biomolecular interactions in vitro and in vivo, such as fluorescence correlation spectroscopy combined with laser scanning microscopy.

## Contact:

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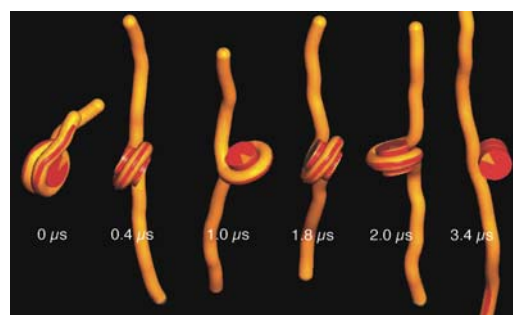


## Burning questions for the future

- How do histone modifications affect the chromatin structure?
- How flexible is the chromatin fiber? And how flexible are intermediate filaments?
- How can two distant parts of the genome interact with each other?
- How are chromosomes organized and how can this be described in a computer model?
- How are macromolecules transported inside the cell nucleus?
- How do transcription factors find their goal on the genome?

## Selected Publications

- M. Renz, D. Niederacher, H.-G. Bender, J. Langowski: Invasive breast cancer cells exhibit increased mobility of the actin-binding protein CapG. (2007) *Intl J Cancer*, <http://dx.doi.org/10.1002/ijc.23215>
- A. Gansen, F. Hauger, K. Tóth, J. Langowski: Single pair FRET of nucleosomes in free diffusion: Optimizing stability and resolution of subpopulations. (2007) *Anal. Biochem.* **368**, 193-204
- K.V. Klenin, H. Merlitz, J. Langowski, C.-X. Wu: Facilitated diffusion of DNA-binding proteins. (2006) *Phys. Rev. Lett.* **96(1)**, 18104
- N. Baudendistel, G. Müller, W. Waldeck, P. Angel, J. Langowski: Two-Hybrid Fluorescence Cross-Correlation Spectroscopy detects protein-protein interactions in vivo. (2005) *ChemPhysChem*, **6(5)**, 984-90



Computer simulation of DNA unwinding from the histone core (Wocjan, Klenin, Langowski, in preparation)