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**How do cells move?
- Illuminating the process of cell migration by
quantitative fluorescence microscopy techniques**

Active movement of single cells plays a central role in various biological processes such as tissue development, cancer metastasis and immune response. In contrast to e.g. flagellar movement, cell migration is not driven by a distinct organelle, but rather by the concerted integration of multiple dynamic processes throughout the whole cell. These involve actin-driven membrane protrusions, turnover of substrate adhesions and generation of traction forces. Due to the lack of data integration methods for optical imaging experiments, the dynamic interplay of those processes is still poorly understood.

In this work we present spatial patterns of focal adhesion dynamics, actin flow and traction forces in migrating cells based on a new quantitative image analysis approach enabling rigorous averaging of microscopic data over time and whole cell populations. Whereas modern imaging techniques allow the precise mapping of e.g. traction forces and actin dynamics, the spatial organization of these processes has been intuitively inferred from snapshot-like observations of single cells so far. Although this procedure has led to remarkable insights, its subjective nature is a severe limitation. A promising strategy to extract information on generalized cell architecture more objectively is averaging microscopic data over time and various cells. However, since migrating cells usually perform a random walk by constantly changing their location, shape and cytoskeletal organization, averaging is usually hindered by highly heterogeneous data sets. To overcome these problems, we established an algorithm to map data from functional live cell microscopy into a standardized cell coordinate system enabling precise averaging of maps over time and cell populations. This approach is not only suitable to integrate large data sets from high-throughput microscopy, but also allows the fusion of independent measurements of different molecular targets to one consistent picture.

Monday, July 25, 2011 at 02.00 p. m.

Institute for Genetics,
Zülpicher Str. 47 a, Lecture Hall, 4th floor

Host: Astrid Schauss,
CECAD Imagingfacility, Institute for Genetics