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Imaging plasma membrane domains in signal transduction pathways

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Citation

Pezzarossa, A. (2012, March 13). *Imaging plasma membrane domains in signal transduction pathways*. Retrieved from https://hdl.handle.net/1887/18585

Version:	Not Applicable (or Unknown)
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Downloaded from:	https://hdl.handle.net/1887/18585

Note: To cite this publication please use the final published version (if applicable).

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Author: Pezzarossa, A.
Title: Imaging plasma membrane domains in signal-transduction pathways
Issue Date: 2012-03-13

Stellingen

behorende bij het proefschrift

Imaging of plasma membrane domains in signal-transduction pathways

1. Super-resolution photo-activatable light microscopy (PALM) permits to directly visualize the partitioning of proteins in nanometric membrane domains.

   Chapter 2, this thesis

2. The interplay between the lateral interaction of receptor subunits and the actin cytoskeleton in a cell is fundamental to maintain the lateral organization of interferon receptor components. Only this interplay ultimately leads to proper receptor assembly and efficient signaling upon stimulation.

   Chapter 3, this thesis

3. The time-resolution limit of single-molecule fluorescence microscopy to a few milliseconds, as set by the maximal photon-rate can be overcome. Using doubly labeled species and tailored pulse sequences, microsecond resolution can be achieved.

   Chapter 4, this thesis

4. The combination of advanced labeling technique employing split-GFP technology and microsecond single-molecule tracking allows us to observe the fast interaction between a protein and membrane domains. This confirms the existence of complex, theoretically proposed, diffusive modes.

   Chapter 5, this thesis

5. Comparative studies on simplified model membranes and live cell membranes give insight into active biological processes like cell-cell communication, that were not discovered in live-cell studies.
   Schwille, P., Diez, S. ***Crit. Rev. Biochem. Mol. Biol.****, 2009, 44: 223-42.*

6. The fate of a cell and its signaling properties are determined not only by pure biochemical cues, but rather by an interplay between biochemistry and the forces the surrounding environment exerts onto a cell.
   Engler, A.J., Sen, S., Sweeney, H.L., Discher, D.E. ***Cell****, 2006 126 (4):677-689.*

7. Gold nanoparticles are promising labels for optical microscopy. Their localized surface plasmon resonance gives rise to strong light absorption and scattering. However, specificity and efficiency of targeting is based on the recognition capabilities of antibodies, which is less reliable compared to genetic (GFP) technology.
   Wilson, R. ***Chem. Soc. Rev.****, 2008, 37, 2028-2045*

8. Nowadays, biological research is becoming what nuclear research was in the 1930's. History teaches us that the great power that comes from scientific advancement should be used with care. Scientists have ethical responsibilities regarding the divulgation of their discoveries and how these may be used.
   Fouchier, R. A. et al, ***Sciencexpress****, 20January 2012*
   Fouchier, R. A. et al, ***Nature****, 20 January 2012*

9. In recent years private funding has become more and more relevant to scientific research, as a response to severe cuts in public spending on research. Scientists carry a responsibility for the misuse of their results by private companies or defense-related agencies.
   Ganz, S.A, et al. ***JAMA****. 1995;274:219-224*

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February 8th, 2012