

Group Physics of Cellular Interactions, K. Ganzinger (2017-2022)

Biography



After studying biochemistry and biophysics at Technische Universität München (DE), Kristina received her PhD in Physical Chemistry from the University of Cambridge (UK) in 2015, under the guidance of Sir Prof. David Klenerman FRS. After a postdoc at the Max Planck Institute for Biochemistry (Martinsried, GER) with Prof. Dr. Petra Schwille, she began her current position as tenure-track group leader at AMOLF in 2018. In 2021 she received a Vidi grant from the Dutch Research Council and in 2023 she became elected member of the Young Academy of the Royal Dutch Academy of Sciences (KNAW De Jonge Akademie). Since 2022, she is also a member of the NWO round table Physics in her function

as Chair of the NWO working group “Physics of Life”. The main aim of the Ganzinger group is to unravel how immune cells communicate with each other, both in natural and immunotherapy contexts: how do immune cells use molecular signaling pathways to transmit, process, and respond to information, both precisely and unambiguously? Her approach is based on microscopy that pushes technical boundaries and on synthetic biology. Combining signaling pathway reconstitution with single-molecule biophysics, her work provides a mechanistic and quantitative perspective on cell signaling. The Ganzinger group’s current research addresses immune cell signaling pathway reconstruction, engineering immune cell signaling pathways and signaling in synthetic cells.

Group output

Peer reviewed Publications 2017-2022

2018

1. Q. Wang, M. Taschner, K.A. Ganzinger, C. Kelley, A. Villasenor, M. Heymann, P. Schwille, E. Lorentzen and N. Mizuno, *Membrane association and remodeling by intraflagellar transport protein IFT172*, *Nature Commun.* **9**, 4684: 1-13 (2018). **Gold OA**
2. Sonal, Ganzinger KA, Vogel SK, Mucksch J, Blumhardt P, Schwille P. *Myosin-II activity generates a dynamic steady state with continuous actin turnover in a minimal actin cortex*. *J Cell Sci.* 2018 Dec 11;132(4) jcs219899. **Hybrid OA**
3. Wang Q, Taschner M, Ganzinger KA, Kelley C, Villasenor A, Heymann M, Schwille P, Lorentzen E, Mizuno N. *Membrane association and remodeling by intraflagellar transport protein IFT172*. *Nat Commun.* Nov 8;9(1):4684 **Gold OA**
4. Litschel T, Ganzinger KA, Movinkel T, Heymann M, Robinson T, Mutschler H, Schwille P. *Freeze-thaw cycles induce content exchange between cell-sized lipid vesicles*. *New J of Phys.* May 18;20(5):055008 **Gold OA**
5. Santos AM, Ponjavic A, Fritzsche M, Fernandes RA, Bernardino Serna J, Wilcock MJ, Schneider, F, Urbancic I, McColl J, Anzilotti C, Ganzinger KA, Aßmann M, Depoil D, Cornall J, Dustin ML, Klenerman D, Davis SJ, Eggeling C, Lee SF. *Capturing resting T cells: the perils of PLL*. *Nat Immunol.* Mar;19(3):203
6. Ranasinghe RT, Challand MR, Ganzinger KA, Lewis BW, Softley C, Schmed WH, Horrocks MH, Shivji N, Chin JW, Spencer J, Klenerman D. *Detecting RNA base methylations in single cells by in situ hybridization*. *Nat Commun* Feb 13;9(1):655. **Gold OA**

2019

1. S. Kretschmer, K.A. Ganzinger, H.G. Franquelim and P. Schwille, *Synthetic cell division via membrane-transforming molecular assemblies*, BMC Biology **17**, 43, (2019). **Gold OA**
2. K.A. Ganzinger and P. Schwille, More from less – bottom-up reconstitution of cell biology, J.Cell Sci. **132**, jcs227488, (2019). **Hybrid OA**
3. Sonal, K.A Ganzinger, S.K Vogel, J Mücksch, P Blumhardt, and P Schwille, *Myosin-II activity generates a dynamic steady state with continuous actin turnover in a minimal actin cortex*, J.Cell Sci. **132**, 219899, (2019). **Hybrid OA**
4. Fernandes RA, Ganzinger KA, Tzou JC, Jönsson P, Lee SF, Palayret M, Santos AM, Carr AR, Ponjavic A, Chang VT, Macleod C, Lagerholm BC, Lindsay AE, Dushek O, Tilevik A, Davis SJ, Klenerman D. *A cell topography-based mechanism for ligand discrimination by the T cell receptor. Proc Natl Acad Sci U S A 116(28):14002-14010. Hybrid OA*

2020

1. K.A. Ganzinger, A. Merino-Salomón, D.A. García-Soriano, A.N. Butterfield, T. Litschel, F. Siedler and P. Schwille, *FtsZ “Reorganization Facilitates Deformation of Giant Vesicles in Microfluidic Traps”*, Angew. Chem., Int. Ed. **59**, (48), 21372- 21376 (2020), **Hybrid OA**.

2021

1. F. Stehr, J. Stein, J. Bauer, C. Niederauer, R. Jungmann, K.A. Ganzinger and P. Schwille, *Tracking single particles for hours via continuous DNA-mediated fluorophore exchange*, Nature Commun. **12**, (1), 4432: 1-8 (2021) Gold OA
2. L. Van de Cauter, F. Fanalista, L. van Buren, N. De Franceschi, E. Godino, S. Bouw, C. Denelon, C. Dekker, G.H. Koenderink and K.A. Ganzinger, *Optimized cDICE for Efficient Reconstitution of Biological Systems in Giant Unilamellar Vesicles*, ACS Synth. Biol. **10**, (7), 1690-1702 (2021) Hybrid OA
3. B. Ramm, A. Goychuk, A. Khmelinskaia, P. Blumhardt, H. Eto, K.A. Ganzinger, E. Frey and P. Schwille, *A diffusio-phoretic mechanism for ATP-driven transport without motor proteins*, Nature Phys. **17**, (7), 850-858 (2021) Hybrid OA

2022

1. K.A. Ganzinger, C. Bonfio and A.P. Liu, *Editorial: From reconstituting minimal cell-cell signaling systems to bioinspired synthetic communication networks*, Front. Mol. Biosci. **9**, 979163: 1-2 (2022) Hybrid OA
2. C. Niederauer, C. Nguyen, M. Wang-Henderson, J. Stein, S. Strauss, A. Cumberworth, F. Stehr, R. Jungmann, P. Schwille, K. A. Ganzinger *DNA-PAINT single-particle tracking (DNA-PAINT-SPT) enables extended single-molecule studies of membrane protein interactions* bioRxiv 2022.08.25.503948; doi: <https://doi.org/10.1101/2022.08.25.503948>
3. C. Niederauer, M. Seynen, J. Zomerdijk, M. Kamp, K. A. Ganzinger *The K2: Open-source simultaneous triple-color TIRF microscope for live-cell and single-molecule imaging* bioRxiv 2022.12.19.521031; doi: <https://doi.org/10.1101/2022.12.19.521031>

Contributions to scientific books (chapters or entire book) 2017-2022

2019

1. K.A. Ganzinger, M. Challand, J. Spencer, D. Klenerman and R.T. Ranasinghe, *Imaging rRNA methylation in bacteria by MR-FISH*, Methods Mol. Biol. **2038**, 89-107 (2019). **Green OA**

PhD theses 2017-2022

N/A

Masters and Bachelors theses 2017-2022

2019

1. Laura Bouw, "Studying the interplay between membrane properties and cell signaling events in T-cell giant plasma membrane vesicles", University of Leiden (master thesis).

2020

1. Robert Strasser, "Establishing a Cell-Derived, 2D Membrane Model for Signalling Processes in Immune Cell Membranes", LMU Munich (master thesis)
2. Roi Hoitink, "Analysing Giant Unilamellar Vesicles from droplet to vesicle", Utrecht University (master thesis)
3. Thomas van Boxmeer, "Essential parameters for controlling supported lipid bilayer formation and protein reconstitution in membranes", Wageningen University and Research (master thesis)

2021

1. Ilaria Zanolla, "Towards bilayers derived from plasma membranes for the study of cell-cell interactions", Universiteit Maastricht (master thesis)
2. Chi Nguyen, "Developing a microfluidic chip for an integrated multi-OMICs platform to study host-pathogen interactions in antimicrobial resistance", Radboud Universiteit Nijmegen (master thesis)

2022

1. Guusje Mouton, "Generation of Giant Plasma Membrane Vesicles (GPMVs) and formation of native supported lipid bilayers (nSLBs) from tumor cells: first steps in the development of a general experimental platform for fundamental biophysical studies of $\gamma\delta$ T-cell activation", Leiden UMC (master thesis)

Invited lectures at international conferences and meetings

2019

1. *Reconstituting the 2D world of signalling proteins - exploring the role of membrane topography for information transfer*, 15th P4EU meeting, NKI, Amsterdam, November 7, 2019.

2020

1. *"Exploring information transfer in the immune system – reconstituting membrane-bound signalling processes in vitro"*, Dutch KNAW Biophysics Meeting, Netherlands, October 13, 2020.
2. *Exploring information transfer in the immune system – reconstituting membrane-bound signalling processes in vitro*, talk at (virtual) Solvay Workshop "Physics of living systems: from molecules to cells to whole organisms", December 2, 2020.

2021

1. K.A. Ganzinger, *"A New Spin on Efficient Reconstitution of Biological Systems in GUVs"*, 122nd Titisee Conference "Life 2.0: From designing the molecules of life to designing life", Titisee, Germany, 27/10/2021.

2022

1. BioSynSys2022 Conference "A New Spin on Efficient Reconstitution of Biological Systems in GUVs", Paris, France (*invited talk, 14-09-22*)
2. SynCell2022 Conference "A New Spin on Efficient Reconstitution of Biological Systems in GUVs", The Hague, The Netherlands (*invited talk, heading focus session, 20-05-22*)
3. fabriCELL Symposium, Institute of Chemical Biology at Imperial College, London, UK (*invited talk; invitation rejected due to child-care duties, June 2022*)

4. Center for Cellular Construction symposium “Reconstitution of Organelle Interactions: Towards Synthetic Cell Biology”, UCSF, USA “A New Spin on Efficient Reconstitution of Biological Systems in GUVs” (*online*), 03-03-22

Academic Teaching 2017-2022

2020

1. Co-teaching of master biophysics course “Mechanics and Thermodynamics in the Cell” with E. Peterman, Vrije Universiteit Amsterdam, October 26 – December 14, 2020 (two lectures).

Selected awards & recognitions 2017-2022

2020

1. Pieter Langerhuizen Bate 2020

2021

1. Vidi Grant of the NWO Talent Line

2022

1. KNAW De Jonge Akademie (DJA) – Appointed as academy member from 2023 for 5 years.

Valorization 2017-2022

1. In contact with companies ArgenX and Vycellix Sweden on separate joint research projects.