DYNAMICS WG 3: DYNAMICS AND STRUCTURE OF MEMBRANES AND THEIR CONSTITUENTS

Image by Basics (www.basics.land)

LUND INSTITUTE OF ADVANCED NEUTRON AND X-RAY SCIENCE

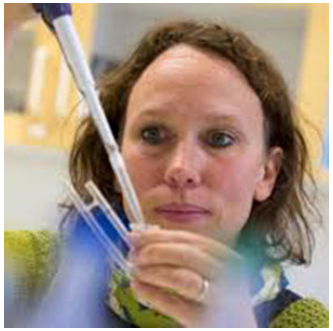
LINXS

LUND UNIVERSITY

www.linxs.se

WG 3: DYNAMICS AND STRUCTURE OF MEMBRANES AND THEIR CONSTITUENTS

Peter Jönsson



Emma Sparr

Cedric Dicko

Tommy Nylander

Marité Cardenas

LUND UNIVERSITY

GUEST RESEARCHERS

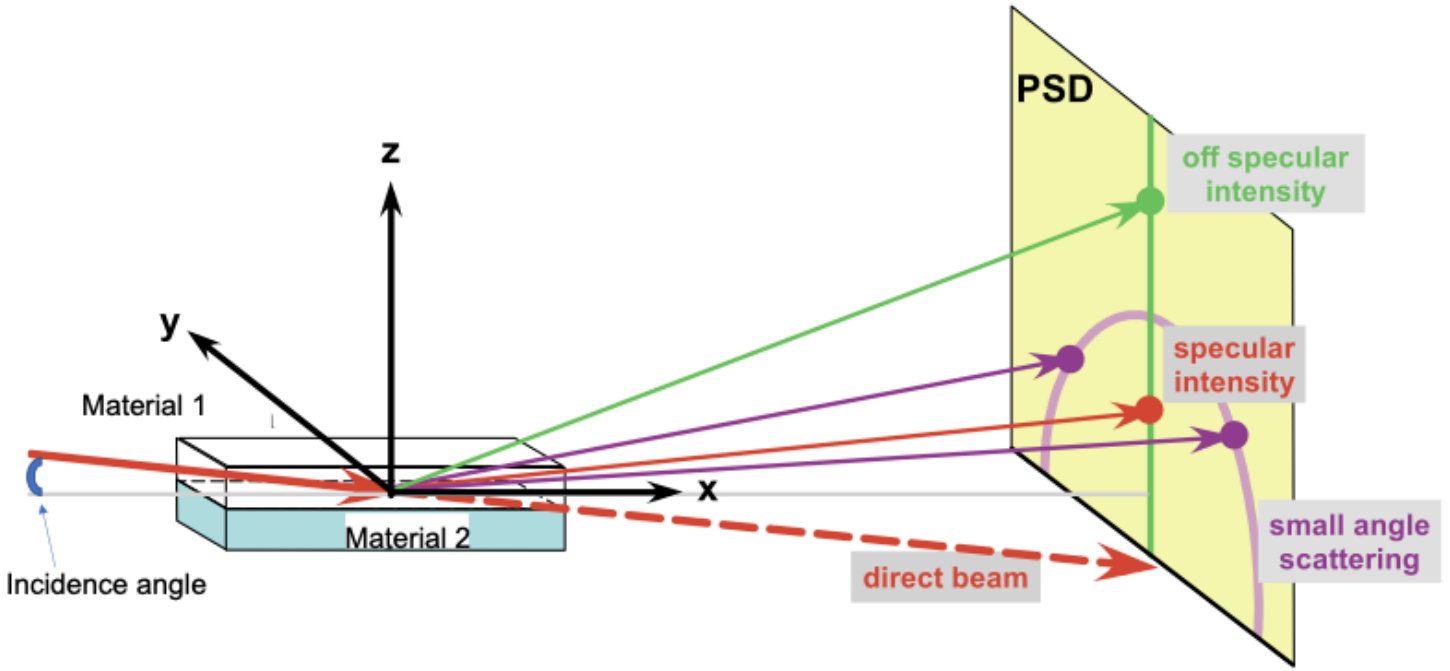
WG 3: DYNAMICS AND STRUCTURE OF MEMBRANES AND THEIR CONSTITUENTS

- Prof. Thomas Hellweg, Bielefeld University, Germany
  - » At LINXS between June 2019 - August 2019
- Prof. José Campos Terán, Universidad Autónoma Metropolitana Unidad Cuajimalpa (UAMC), Mexico
  - » At LINXS between July 2019 - July 2020
- Dr. Chris Garvey, ANSTO (The Australian Nuclear Science and Technology Organisation)
  - » At LINXS between July 2019 - August 2020

LUND UNIVERSITY

Research programme 1: Structure and dynamics utilizing the GISANS technique

- GISANS is a relatively new technique that has evolved to study nanostructured surfaces-first paper published mid 90's:
  - W.A. Hamilton, P.D. Butler, S.M. Baker, G.S. Smith, J.B. Hayter, L.J. Magid and R. Pynn, Physical Review Letters 72, 2219 (1994) and other publications of the same group. They discussed the technique as near-surface or over the horizon SANS.



LUND UNIVERSITY

Why should Swedish scientists engage in a GISANS instrument project?

- Surface science and colloid science have been and continue to be research areas where Swedish academic research is world leading.
- Interfaces are integral to major research fields in chemistry, physics, biology and engineering science in Sweden.
- GISANS is also directly relevant to industry as a tool to develop modern electronics and nanoscience products, biomaterials and biomedical devices.
- We foresee major break-throughs in Life Sciences, Soft Matter as well as in Hard Condensed Matter as a consequence of development of such experimental technology.

LUND UNIVERSITY

Why do we need a dedicated GISANS instrument at ESS?

- GISANS has so far been challenging to develop due to the limited intensity of existing neutron sources. The high flux ESS provides a unique opportunity
- Better resolution of instruments, faster data collection, possibility to use smaller samples and dedicated sample environment will largely improve quality and quantity of data.
- The data evaluation and modelling has so for challenging as the theory is not fully developed. Recent progress made in developing GISANS and GISAXS data analysis opens new opportunities.
- Recent developments in machine learning have opened up new possibilities for data analysis and experimental planning

LUND UNIVERSITY

Research programme 1: Structure and dynamics utilizing the GISANS technique

TODAY:

- Building a strategic document to be submitted to Swedish research council. This should be submitted beginning of September.
- Strong support from ESS, (Ken Andersen, Tom Arnold, Clara Lopez) and Super ADAM board/team (Sean Langridge, Giovanna Fragneto, Max Wolf, Björgvin Hjörvarsson, Jens Birch, Ken Andersen)
- Engaging the Swedish community in an inclusive way to build common ground for a concerted initiative
- Build on the Super ADAM experience and competence
- LINXS can play a key role
  - GISANS workshop to develop science case, 3-4 December 2019
  - Dedicated GISANS fellow with world renowned expertise in GISANS
  - Coordinate international contacts
  - Promote GISAXS and GISANS cases at MAX IV and ESS, respectively

LUND UNIVERSITY

Research programme 2: Sample environment and data evaluation of biological membranes

14th of September 2018 LINX workshop on Dynamics of Membranes and their constituents highlight the following aspects:

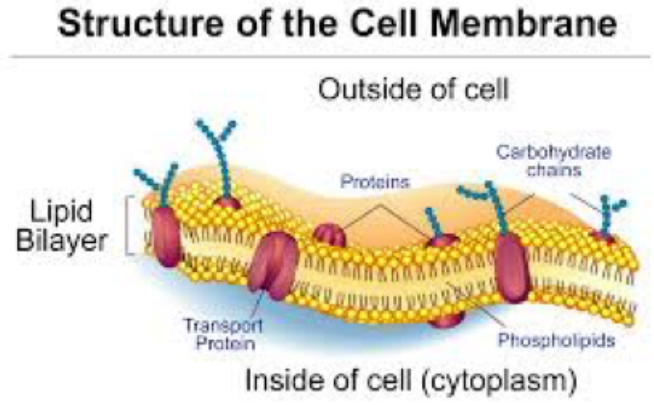
- Need to revisit the current state-of-the-art in biomembrane model systems emerged.
- Experimental and theoretical models used.
  - New and refined toolbox
  - Comparing experimental and modelling timescale
  - Delivery and mechanistic understanding
  - Dynamics of biomembranes interfaces that also includes reactions and propagation of structure.
  - How do we look at living systems?

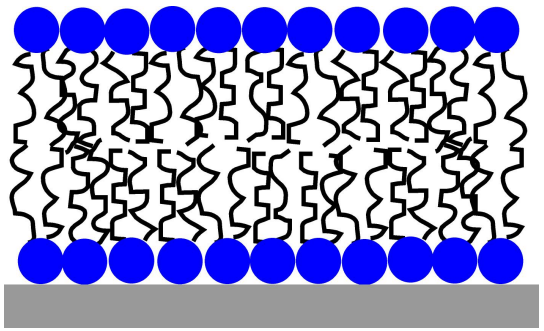
LUND UNIVERSITY

Research programme 2: Sample environment and data evaluation of biological membranes

Workshop for the Membrane structure and dynamics

- Date: January or February 2020
- Time: 3 days – lunch to lunch
- Location: Lund
- Number of participants: 80-100 max
- Title: Biomembrane model systems: Closing the gap between in vitro models and the living cell membranes





LUND UNIVERSITY

Research programme 2: Sample environment and data evaluation of biological membranes

Workshop Aims: Revisiting membrane models will help:

- Highlight the current needs and how LINXS can help to advance the science with help of neutron and x-ray techniques.
- Bring together communities of biophysicist, medical scientists and clinicians
- Engage the Swedish community in biomembrane structure and dynamics research

LUND UNIVERSITY