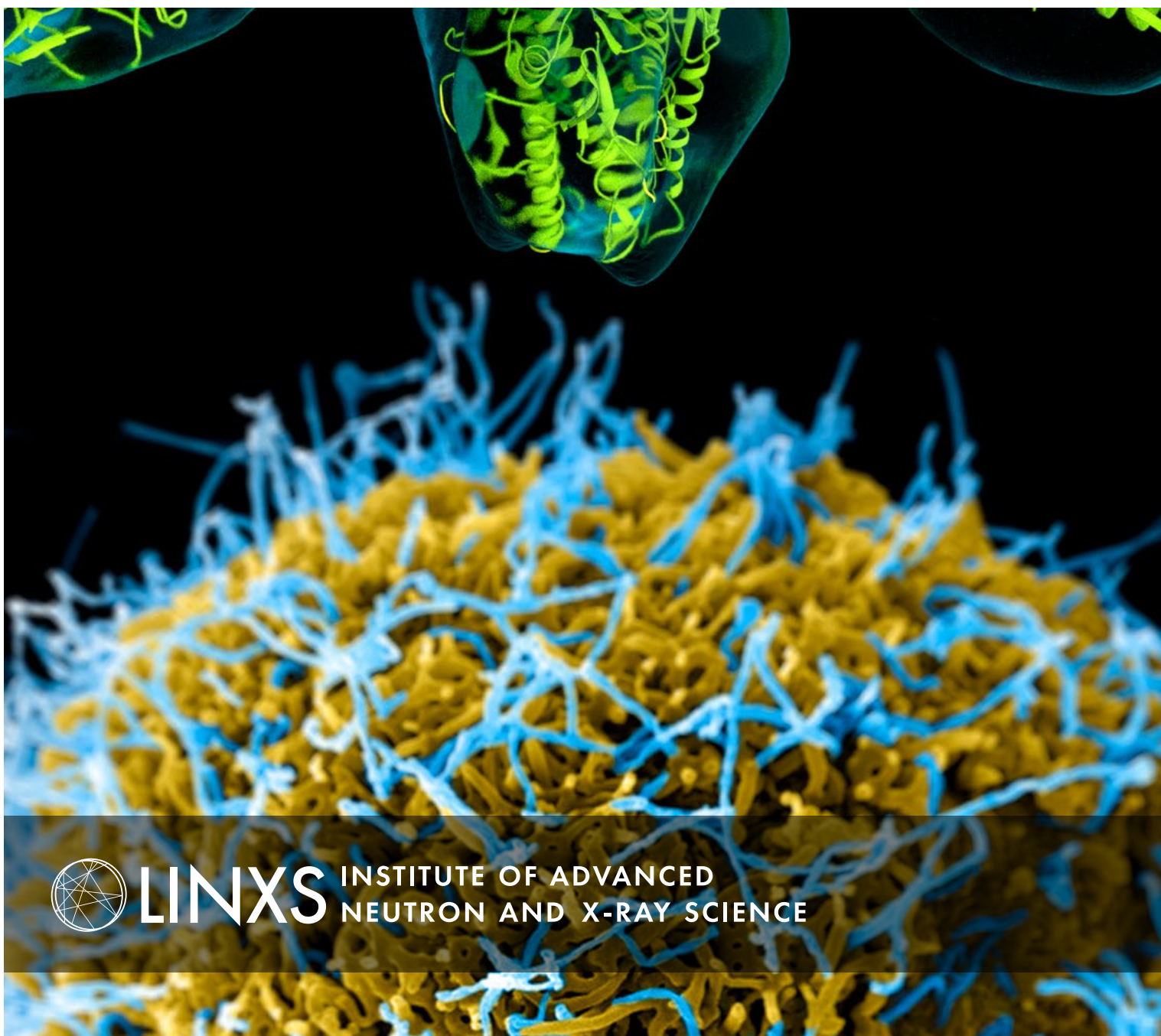


LINXS Annual Report 2022 Highlights



LINXS

INSTITUTE OF ADVANCED
NEUTRON AND X-RAY SCIENCE

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Exutive Summary and Reflections from LINXS Director

2022 has been a remarkable year for everyone, and certainly a remarkable one for LINXS as a developing institute. The passing of the pandemic and turbulent world affairs has left conflicting feelings of recovery, uncertainty, and opportunity – with pervasive sense of unpredictability and urgency. During this period, LINXS has grown with increasing confidence in its mission for Sweden as well as for the large-scale infrastructures and the international landscape. A great deal of this progress has been due to the previous LINXS managements: Peter Schurtenberger as the original director brought LINXS into existence as an advanced study institute, and Stephen Hall maintained and developed it throughout the very challenging circumstances of the pandemic. Increased digital and hybrid engagement is now part of our daily lives and has helped establish LINXS as a physical and digital platform of wide international transdisciplinary scientific interaction – as well as minimising unnecessary travel.

As many of you will know, LINXS' core activities are based around fixed-length scientific Themes that are proposed competitively by the scientific community and reviewed by an independent external Scientific Advisory Board (SAB). Themes typically fall into science areas that can be addressed using techniques often related to areas of hard condensed matter, soft condensed matter, and life sciences research – although the Themes themselves may not be confined by these areas. During early 2022, a new Theme entitled Integrative Pharmacology and Drug Discovery (IPDD) started its activities, with working groups focused on pharmacology, with activities covering structure-based drug design, macromolecular drugs/antibodies, biomedical imaging, and drug delivery. The IPDD core group contains the Chief Scientific Advisor of Pfizer (Mikael Dolsten). It joins the existing Themes on New Materials, and Northern Lights on Food, which have also been very active during 2022.

We were also very pleased to host several schools: continuing the very successful CoWork webinar series dedicated to the exploitation of the coherence properties of X-rays, and initiating the IPDD Antibodies in Solution LINXS-NIST webinar series designed as an educational venture into antibody research using scattering methods. During the year it was good to see guest researchers returning to LINXS, and that the interest is growing rapidly.

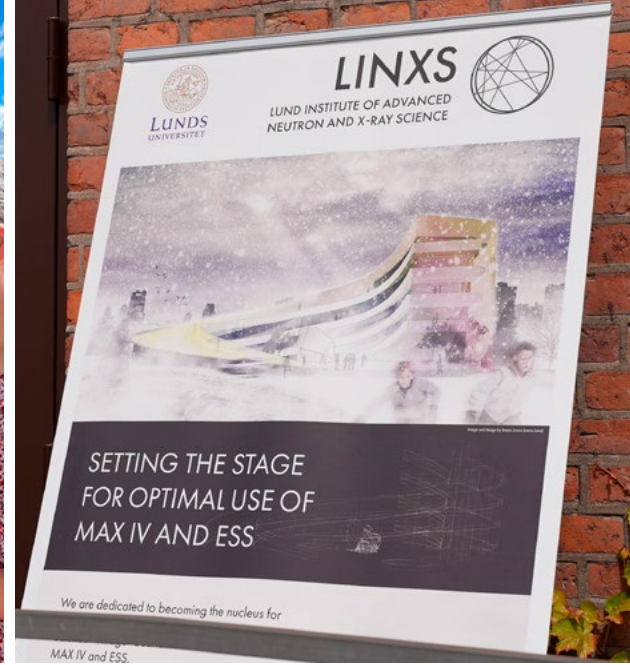
It is important to emphasise that LINXS activities contribute to an extensive repository of educational material. Webinars and recorded presentations are continuously accumulating, and work on structuring and customising this resource to meet the various levels of scientific need accessibility is ongoing.



Trevor Forsyth,
LINXS Director

This repository grew significantly during the year to 130+ items – and is still growing rapidly. Numerous consortia created via the LINXS Themes have procured substantial funding and facility beam time allocations. Scientists involved in the Northern Lights on Food Theme have been funded by VR for a national project focused on a GISANS instrument at ESS (SAGA GISANS). Generous funding from the LMK Foundation has also been obtained for research on the molecular work relating to amyloidosis. The postdoctoral researchers associated with both these projects – Sebastian Köhler and Daniel Sarabi respectively – contribute to day-day activities at LINXS and help develop connectivity with early-stage researchers.

Throughout the year, LINXS has been building an increasingly open agenda with the Swedish scientific community as well as a deepening engagement with the international communities. The model for LINXS Theme applications has been developed in a way that now allows principal investigators to apply from anywhere, greatly broadening the scientific scope and volume of LINXS activities. This led to the first open (international) Theme call autumn 2022. Applications to this call are being reviewed by the LINXS SAB as part of a two-stage application process, with outcomes announced in spring 2023, and successful Themes starting the following September. This will result in substantial growth of LINXS Thematic activities and scientific engagement. In parallel with this, LINXS has also (in collaboration with MAX IV and ESS) applied to the Swedish Research Council for the creation of a *LINXS Centre of Excellence*. A successful outcome to this proposal will provide funding for LINXS Themes led by scientists/groups from anywhere Sweden, extending the resourcing of its mission to develop interdisciplinary science over the country. In addition, LINXS also intends to apply for MSCA COFUND resourcing from the European Commission to fund over 40 postdoctoral researchers for a project entitled *Advanced Multiscale Biological Imaging using European Research Infrastructures* (AMBER). This project will



be designed to empower a wide range of European scientific capability ranging from clinical imaging through to molecular characterisation, bridging lengthscale and inter-sectoral science gaps and making crucial impact on the need to develop the principal investigator user base of the future.

2022 has also been an extremely important year in terms of the LINXS arrangements to move onto the Science Village in the short/medium term – a move that will place us right in the middle of a brand new national and international science environment in close physical proximity to both the MAX IV and ESS. The LINXS Board is evaluating bids by different companies, which will be discussed in detail during 2023.

We are deeply grateful to many people for the success of this year, not least to our LINXS staff and management. The LINXS SAB has of course played a crucial role in helping us chart the way forward and I would like to say a special thanks to Stefan Egelhaaf (SAB Chairperson, currently on leave for personal reasons) for the huge contribution he has made, and to Christiane Alba-Simionesco for stepping in at short notice. We are also very grateful to our Board members and to Anders Tunlid, who as the Chair, has played a vital role in providing constructive guidance during a time of substantial change and development.

Sammanfattning och reflektioner från LINXS föreståndare

2022 har varit ett omvälvande år för alla, och särskilt för LINXS som befinner sig i en utvecklingsfas. Pandemin och turbulenta världsaflärer har hos många lett till motstridiga känslor av återhämtning, osäkerhet och möjligheter – och en övergripande känsla av oförutsägbarhet och brådska. LINXS har under denna period vuxit, med ökat förtroende för sitt uppdrag för såväl Sverige som de storskaliga infrastrukturerna och den internationella arenan. En stor del av dessa framsteg har berott på de tidigare ledningsuppsättningarna på LINXS: Peter Schurtenberger, som i sin roll som LINXS första föreståndare etablerade LINXS som ett institut för avancerade studier, och Stephen Hall som upprätthöll och utvecklade institutet under de mycket utmanande omständigheterna under coronapandemin. Digitala- och hybridenemang ingår nu i LINXS verksamhet och har bidragit till att etablera LINXS som en fysisk såväl som digital plattform för internationell transdisciplinär vetenskaplig interaktion, samt minimerat onödiga resor.

Som många av er vet baseras LINXS kärnverksamhet runt vetenskapliga teman som pågår under en avgränsad tid. Dessa föreslås i konkurrens av forskare och granskas av en oberoende extern vetenskaplig rådgivande nämnd (SAB). Teman faller vanligtvis inom vetenskapsområden som kan undersökas med tekniker som relaterar till hård kondenserad materia, mjuk kondenserad materia och livsvetenskaper – även om temana i sig kanske inte är begränsade till dessa områden. Under början av 2022 startade ett nytt tema med titeln Integrative Pharmacology and Drug Discovery (IPDD) sin verksamhet, med arbetsgrupper fokuserade på farmakologi och aktiviteter som täcker strukturbaserad läkemedelsdesign, makromolekylära läkemedel/antikroppar, biomedicinsk bildbehandling och läkemedelsleverans. I IPDDs arbetsgrupp ingår Mikael Dolsten, Pfizers Chief Scientific Advisor. Temat sällar sig till LINXS redan befintliga teman, New Materials och Northern Lights on Food, som också har varit mycket aktiva under 2022.

Vi är också glada över att ha stått som värdar för flera olika skolor, den framgångsrika CoWork-webinarieserien, som syftar till att sprida kunskap om koherenssegenskaper hos röntgenstrålar och Antibodies in Solution, en LINXS-NIST webinariserie under IPDD-temat. Webinariseringen är en pedagogisk satsning på antikropps forskning. Under året har det varit kul att se gästforskare återvända till LINXS och att intresset för LINXS ökar.

Det är viktigt att betona att LINXS aktiviteter genererar ett omfattande utbildningsmaterial. Webinarier och inspelade presentationer ackumuleras kontinuerligt, och arbetet med att strukturera och anpassa dessa resurser för att möta olika



Trevor Forsyth,
LINXS Director

vetenskapliga behov pågår. Mer än 130 videos och annat material tillkom under året, och materialet växer fortfarande snabbt. Många av de konsortier som har etablerats med hjälp av LINXS teman har varit framgångsrika i att säkra betydande finansiering och tilldelats stråltid. Forskare involverade i Northern Lights on Food-temat har finansierats av Vetenskapsrådet för ett nationellt projekt som syftar till att utveckla ett GISANS-instrument vid ESS (SAGA GISANS). Generösa medel från LMK-stiftelsen har också erhållits för forskning som relaterar till det molekylära arbetet kring amyloidos. Sebastian Köhler, respektive Daniel Sarabi, de postdoktorer som är knutna till dessa projekt, bidrar till LINXS verksamhet och hjälper till att utveckla kontakten med forskare tidigt i karriären.

LINXS har under året drivit en allt öppnare agenda gentemot svenska forskare och lärosäten och utvecklat ett fördjupat engagemang mot den internationella forskarvärlden. Modellen för LINXS temaansökningar har utvecklats på ett sätt som nu gör det möjligt för temaledarna att ansöka från varsomhelst i världen, något som betydligt breddar den vetenskapliga omfattningen och volymen av LINXS-aktiviteter. Detta ledde till den första öppna (internationella) temaansökan hösten 2022. Dessa kommer att granskas av LINXS SAB som en del av en ansökningsprocess i två steg, med resultat tillkännagivna våren 2023, med start i september för framgångsrika teman. Detta kommer att resultera i en stor ökning av LINXS tematiska aktiviteter och vetenskapliga engagemang. Parallellt med detta har LINXS (i samarbete med MAX IV och ESS) ansökt till Vetenskapsrådet om att skapa ett *LINXS Center of Excellence*. Om ansökan beviljas kommer att det att ge finansiering för LINXS-teman ledda av forskare/grupper från var som helst i Sverige, vilket utökar möjligheterna för oss att främja och utveckla tvärvetenskaplig vetenskap i hela landet. Dessutom avser LINXS också att ansöka om MSCA COFUND-resurser från Europeiska kommissionen för att finansiera över 40 postdoktorer för ett projekt med titeln *Advanced Multiscale Biological Imaging using European*



Research Infrastructures (AMBER). Detta projekt ska utformas för att stärka ett brett spektrum av europeisk vetenskaplig kapacitet, allt från klinisk utbildning till molekylär karakterisering, överbrygga längdskalor och intersektoriella vetenskapliga kunskapsglapp, samt bidra till att stötta framtidens forskningsgruppsledare, och öka deras antal.

2022 har också varit ett viktigt år vad gäller LINXS flytt till Science Village. Det är en flytt som kommer att placera LINXS i en helt ny nationell och internationell vetenskaplig miljö, med närhet till de stora forskningsinfrastrukturerna MAX IV och ESS. LINXS styrelse utvärderar just nu attraktiva bud som lagts av olika företag, dessa kommer att diskuteras i detalj under 2023.

Vi vill rikta ett stort tack till LINXS personal och ledning, LINXS vetenskapliga rådgivande nämnd (SAB) och LINXS styrelse för våra framgångar detta år. LINXS vetenskapliga rådgivande nämnd har spelat en avgörande roll i att karllägga vägen framåt. Jag vill rikta ett särskilt tack till Stefan Egelhaaf (ordförande) för den enorma insats han har gjort och till Christiane Alba-Simionesco som trädde in med kort varsel när Stefan var tvungen att ta en paus pga personliga skäl. Vi är också mycket tacksamma för det stöd vi har fått från LINXS styrelse, med Anders Tunlid som ordförande. Den har spelat en viktig roll vad gäller att ge konstruktiv vägledning i en tid av stora förändringar och snabb utveckling för LINXS.



About LINXS

Established in 2017, LINXS is an advanced study institute whose mission is to promote science and education focusing on the use of neutrons and X-rays.

LINXS brings together world-leading scientists for short-term focused research visits and creates international networks. It is a place to explore new ideas and research questions, to discuss methods and approaches, as well as meet and collaborate with scientists from around the world and from different disciplines and organisations. LINXS works under strategic focus areas, reflecting broad long-term research

priorities. These are: **Soft matter**, **Life Science** and **Hard Matter**.

LINXS' work is based around Themes, governed by a *core group*, with multiple *working groups* connected to it. The Themes develop networks, research and activities in different fields of science relevant for one or more of the LINXS focus areas. A Theme is a time-limited collaborative effort over three years to enable a network of researchers to push the frontiers of research in a specific topic.

Linxs Mission

Establish

LINXS as a world-leading advanced study institute for all scientific and technological disciplines which can benefit from the use of neutrons and X-rays.

Attract

Outstanding scientists for short-term focused research visits to contribute to excellent science. The goal is to further research collaboration within national and international research networks, especially for early career researchers.

Promote

Science and education focusing on use of neutrons and X-rays in research and development, and help educate potential users of ESS, MAX IV and other major research infrastructures to enable ground-breaking research.

Create

International networks and enhance the visibility of Sweden internationally in the use of neutrons and X-rays. We want to invigorate the dialogue between academia and society in all aspects of large-scale research infrastructures using neutron and X-rays. The goal is to become a nucleus for local, national and international activities in Science Village Scandinavia and a think-tank initiating new ideas and themes.

Focus Areas

Soft Matter

Liquids, colloids, polymers, foams, gels, granular materials, liquid crystals, and a number of biological materials. These materials share an important common feature in that predominant physical behaviors occur at an energy scale comparable with room temperature thermal energy.

Life Science

Fields of science that involve the scientific study of living organisms – such as microorganisms, plants, animals, and human beings – as well as related considerations. While biology and medicine remains the centerpiece of the life sciences, technological advances in molecular biology and biotechnology have led to a burgeoning of specializations and interdisciplinary fields.

Hard Matter

Materials science and solid-state physics, the study of rigid matter, or solids, through methods such as quantum mechanics, crystallography, electromagnetism, and metallurgy. It is the largest branch of condensed matter physics. Solid-state physics studies how the large-scale properties of solid materials result from their atomic-scale properties. Thus, solid-state physics forms a theoretical basis of materials science. It also has direct applications, for example in the technology of transistors and semiconductors and all solid-state nanoscience.

Why Join LINXS?

All researchers whose work can develop through the use of X-ray and neutron methods can benefit from being part of the LINXS community and participating in LINXS activities. LINXS is a place to explore new ideas and research questions, to discuss methods and approaches, as well as meet and collaborate with scientists from around the world and from different disciplines and organisations. There are many ways to interact with and join the LINXS community:

- Attend LINXS activities and participate in the scientific discussions.
- Join existing Themes and working groups.
- Initiate new Themes, working groups and research activities connected to the LINXS focus areas through collaboration.

As a member of a LINXS working group or Theme, you get an opportunity to organise research activities connected to your area of interest, and to create new contacts and networks. LINXS offers administrative support to organise and run activities, disseminate information, and create a setting to highlight and discuss research developing and exploiting X-ray and neutron methods, with an aim to further research collaboration within national and international research networks.

LINXS welcomes researchers from all disciplines and organisations worldwide to join the LINXS community.

"LINXS has been integral to establishing, and progressing, our research programme on antibodies in solution. With LINXS support, we have been able to set up a research investigation that covers all relevant length and time scales needed to understand the properties of individual antibodies as well as those of concentrated solutions. Our large consortium, all working towards a common goal, is key to scientific development and discovery for such complex systems."



Anna Stradner,
Professor at
Physical Chemistry,
Lund University.

How LINXS Works

Core group

A Theme is governed by a core group composed of prominent external and local researchers. One of the main missions of LINXS is to bring external excellence in to work with local and national researchers. A core group suggests to the management group how resources should be allocated for that Theme.



1. THEME

Working group

Under the core group there are working groups working on specific activities. These range from conferences, workshops and schools to specific research programmes aided by external research fellows. Working groups are also formed via an application procedure, though this is shorter and more quickly evaluated than that for Themes.



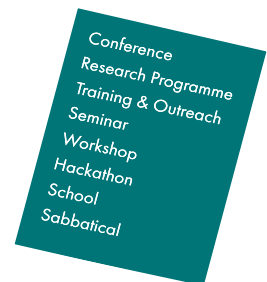
2. CORE GROUPS



3. WORKING GROUPS

Activities

Each working group has a palette of budgeted activities to draw from that can be useful to its defined goals. The nominal budget enables planning of the scientific scope in relation to the total LINXS budget. The activities can be: conferences, research programmes, workshops, hackathons, sabbaticals, schools, seminars and training & outreach, instance.



4. ACTIVITIES

LINXS Themes and Working Groups 2022

Integrative Structural Biology (ISB) – Concluded

Theme and Core Group Leader: Karin Lindkvist, Lund University, Sweden

- WG 1 Biocompute and Artificial Intelligence & Machine Learning (concluded)
 - WG 2 Time-Resolved Structural Biology – New possibilities in a time of new facilities
| Leader – Thomas Ursby, MAX IV, Lund University, Sweden
 - WG 3 Amyloid: An integrative approach | Leader – Oxana Klementieva, Lund University, Sweden
 - WG 4 Membrane Proteins – Structural resolution and homology modelling | Leader – Urban Johanson, Lund University, Sweden
 - WG 5 Lund Integrative Structural Biology Centre Initiative (LISBC) | Leader – Karin Lindkvist, Lund University, Sweden
-

New Materials

Theme and Core Group Leader: Elizabeth Blackburn, Lund University, Sweden

- WG 1 Functional Magnetic Materials | Leader – Elizabeth Blackburn, Lund University, Sweden
 - WG 2 Charge Transfer Materials (fused with WG 3)
 - WG 3 Light Harvesting Processes | Leader – Jens Uhlig, Lund University, Sweden
 - WG 4 Catalysis | Leader – Sara Blomberg, Lund University, Sweden
 - WG 5 Nanostructures and Interfaces | Leader – Maria Messing, Lund University, Sweden
-

Northern Lights on Food (NLF)

Theme and Core Group Leader: Selma Maric, Lund University, Sweden
and Tommy Nylander, Lund University, Sweden (from August 2022)

- WG 1 Structure of food raw materials | Leader – Francisco Vilaplana, KTH, Sweden
 - WG 2 Food colloids and structured interfaces | Leaders – Ben Boyd and Jacob Kirkengaard, Copenhagen University, Denmark
 - WG 3 Structure of food during processing | Leaders – Stephen Hall, Lund University and Niklas Lorén, RISE, Sweden
 - WG 4 Food interactions on surfaces | Leader – Jenny Schelin, Lund University, Sweden
 - WG 5 Food structure and health | Leader – Peter Spéjel, Lund University, Sweden
-

Integrative Pharmacology and Drug Discovery (IPDD)

Theme and Core Group Leader: Karin Lindkvist, Lund University, Sweden

- WG 1 Structure-based drug design | Leader – Raminta Venskutonytė, Lund University, Sweden
- WG 2 Macromolecular Drugs –Antibodies | Leader – Anna Stradner, Lund University, Sweden
- WG 3 Biomedical Imaging | Leader – Lars E. Olsson, Lund University, Sweden

LINXS Community 2022

In 2022, LINXS Fellows came from the following organisations:

1. Aarhus University, Denmark
2. Alfa Laval Sweden
3. Arla Foods, Sweden
4. Arwa Foodtech AB, Sweden
5. AstraZeneca Mölndal, Sweden
6. Australian Synchrotron (ANSTO), Australia
7. Centro de Física de Materiales (CSIC-UPV/EHU), Spain
8. Chalmers University of Technology, Sweden
9. Deutsches Elektronen-Synchrotron DESY, Germany
10. European Molecular Biology Laboratory (EMBL) Hamburg, Germany
11. European Spallation Source ESS AB, Sweden
12. Forschungszentrum Juelich GmbH, Germany
13. French Institute of Health and Medical Research, France
14. Fritz Haber Institute Berlin, Germany
15. Hamburg University, Germany
16. Institut de Biologie Structurale (IBS) – Grenoble, France
17. ICREA, Catalan Institute of Nanoscience and Nanotechnology, Spain
18. ISIS Facility, STFC, United Kingdom
19. Johnson Matthey Formox AB, Sweden
20. Karlstad University, Sweden
21. Karolinska Institutet, Sweden
22. KTH Royal Institute of Technology, Sweden
23. La Trobe University, Australia
24. Linnaeus University, Sweden
25. Lund University, Sweden
26. Malmö University, Sweden
27. MAX IV, Sweden
28. Novartis, Switzerland
29. Norwegian University of Science and Technology, Norway
30. Novo Nordisk, Denmark
31. Novozymes, Lyngby, Denmark
32. Oatly, Sweden
33. Örebro Universitet, Sweden
34. Pfizer, USA
35. Research institutes of Sweden (RISE), Sweden
36. RWTH Aachen University, Germany
37. Spanish Council for Scientific Research (CSIC), Spain
38. Stockholm University, Sweden
39. Swedish University of Agricultural Sciences (SLU), Sweden
40. Tampere University, Finland
41. Technical University of Darmstadt (TU Darmstadt), Germany
42. Technical University of Munich (TUM), Germany
43. Technical University of Denmark (DTU), Denmark
44. Tetra Pak, Sweden
45. University of Copenhagen, Denmark
46. University of Florida, USA
47. University of Gothenburg, Sweden
48. Université Grenoble Alpes, France
49. University of Helsinki, Finland
50. University of Luxemburg, Luxemburg
51. University of Newcastle, United Kingdom
52. University of Nottingham, United Kingdom
53. University of Pavia/University College London, United Kingdom
54. University of Pisa, Italy
55. University of Regensburg, Germany
56. University of Santiago de Compostela, Spain
57. University of Southern Denmark, Denmark
58. Uppsala University, Sweden



Northern Lights on Food (NLF) Theme

The Northern Lights on Food (NLF) Theme was started with the aims to bring together expertise in food science and technology together with experts in characterisation methods using neutrons and X-rays as well as other complementary techniques to generate new knowledge and cutting-edge technology within food science.

The Theme had a very busy year, with many events within the five working groups, as well as high-profile additional activities such as the third annual conference 1–3 June. It brought together 80 researchers from academia and industry and presented new research using X-rays and neutron tools to make progress in our understanding of food structures. Another occurring event was the third Northern Lights on Food Masterclass, held 29 August – 2 September, with 30 participants, focusing on hands on exercises at Copenhagen University. This year's Theme was on how X-ray and neutron scattering can reveal the complexity on food materials.

Northern Lights on Food, together with Business Sweden, also hosted a delegation from San Francisco area on 5 June. 20 people with an interest in food, including entrepreneurs, investors, those in food tech, and chefs, spent a day in Lund to learn more about the latest food research at Lund University, and within Northern Lights on Food, as well as to start new collaborations. Other events include a breakfast event as part of the Skåne

Innovation Week on 16 June with food scientists working in the research environment around MAX IV and ESS.

The Theme's visiting research fellows took very active part in the Theme. Prof Elliot Gilbert, Food Materials Science, Australian Nuclear Science and Technology Organisation (ANSTO), who visited June – July 2022, in particular contributed, by helping formulate the strategy for creating a European Food Laboratory. In turn, LINXS guest professor Jeremy Lakey, Structural Biochemistry, Biosciences Institute, Newcastle University, UK, led a discussion session on 9 June.

The Theme also worked toward securing long-term funding. They applied to become a Lund University profile area. The proposal was not selected among the five granted but was favourably judged and got 600 000 SEK to strengthen the case. Members of the Theme also submitted an infrastructure proposal "Extruder for in situ structure characterisation of sustainable protein melts using photons and neutrons" to the Swedish Research Council – VR. Decision pending. Finally, a pitch to the Novo Nordisk Foundation for "An International Center for Advanced Food Structure Studies" was made together with Copenhagen and Aarhus Universities in December 2022. The pitch was very well received, and NLF will be invited to another meeting in the beginning of 2023.

Northern Lights on Food Conference III, From Milk to Limoncello – the Best of Food Science and Innovation

Northern Lights on Food III was the third annual conference bringing together researchers from academia and industry. Three days of presentations included new research using X-ray and neutron tools to make progress in our understanding of food structures, as well as connections to the wider food industry and society as a whole. After last year's conference was an online-only event, this year 80 participants gathered in the heart of Lund to meet once more in person, learn about each other's work, and discuss the way forward for the Northern Lights on Food initiative.

The opening keynote presentation was given by Prof. Elliot Gilbert from ANSTO Australia, who provided a comprehensive summary of how scattering can be used in the characterisation of food materials. The focus was starch, where Prof. Gilbert has made significant contributions to the structural analyses of different types of starches, and how these structures are affected by food processing.

– It is fantastic to finally meet people again after two years, and especially to discuss this fascinating topic. The development of food materials requires interdisciplinary research, and Northern Lights on Food offers this: to let researchers from diverse backgrounds to come together. And in such an engaging and friendly environment, Prof. Gilbert says.

From there, the first two days of the conference featured a wide array of subjects and participants. This included talks on cellulose in plant-based foods, the structure and function of lipid systems, and several examples of food

processing and direct applications. Day two included a session on industrial access to large-scale facilities, as well as broader talks on changing consumer behaviour, and assessing social and environmental impacts of food production using a systems perspective. Hanna Barriga from Karolinska Institutet summarises:

– The NLF conference is an excellent platform for industrial and academic partners to share data, discuss projects and identify the challenges within the sector that we can contribute to. It really encompassed the NLF ethos of working together to provide solutions using scattering techniques.

Day three of the workshop focused on strategy discussions – how to build up the collaboration platform for future food solutions. Prof. Daniel Söderberg (KTH, Director of Treesearch) was invited to describe the establishment of the Treesearch platform, and the lessons learnt along the way. Prof. Rickard Öste (founder of Oatly) also summarised the need to create new knowledge in food material science.

The discussion that followed led to the clarification of the general aims of Northern Lights on Food:

- To focus on solvable research questions that can make a real difference to today's food systems.
- To create an environment that attracts young scientists and students to the world of food science and research.
- To bridge the communicative gap between food scientists and the facilities.



Participants at the Northern Lights on Food III conference in June.

New Materials Theme

The New Materials for Energy and Sustainability Theme pushes forward the development and characterisation of new materials with potential future applications in the fields of energy and sustainability, bringing together X-ray and neutron experts with material development experts.

The Theme was in its second year in 2022 and the individual working groups started developing very clear and distinct identities. Each working group has ended up focusing on particular aspects of the overall LINXS mission. As an ensemble, the Theme has been active in teaching the next generation of experts, via specialist schools and training sessions, developing data analysis methods and tools for both the expert and the newcomer, and in developing networks laserling in on key scientific questions.

The Theme started during the Covid era, and it was still feeling the effects in 2022 on many of its activities. One key issue has been the difficulty in inviting visiting researchers to LINXS to participate in shared activities. Previously, the Theme's only visitor had been Prof. Regina Dittmann (FZ Jülich and RWTH Aachen) which visited as a part of the Nanostructures and Interfaces working group's activities. Subsequent to that visit, she was nominated independently for a Lise Meitner professorship in 2022 at Lund University.

In 2022, the Theme's first long-term visitor was Prof. Jason Weaver (University of Florida, US), who was hosted by the Catalysis working group over the summer. He took part in several of their activities and gave several seminars at different institutions.

All the working groups have put in a coordinated effort to promote in-person meetings, supplemented with hybrid accessibility. A key example here is the series of workshops on catalysis organised by the Catalysis working group. This has brought together a number of distinguished researchers, five primarily from around Europe, but using the Visiting Fellow programme to ensure contact with the US community via Prof. Weaver.

The Functional Magnetic Materials working group also brought together researchers in the magnetic small angle neutron scattering community from around the world to develop a priority list on how to improve the data analysis workflow, both for standard experiments and for more unusual ones. Participants included both long-standing experts and new doctoral students. The working group was able to engage scientists involved in a well-established open source analysis program, SasView, that is well supported by the community. Following directly on from the working group's workshop, there was a SasView CodeCamp, involving some of the LINXS participants, to start to put the plan into action.

In 2021, the Charge Transfer Materials and Light Harvesting Processes working group had run a successful school for hands-on training in the design, performance and analysis of X-ray Absorption Spectroscopy experiments. A key component of this was the coupling with experimental time at the BALDER beamline at MAX IV. The second edition of the school could not take place in autumn 2022 as planned, as it was not possible to schedule the beamtime at BALDER at the right time, but the school has been scheduled to take place in March 2023. The working group's ambition is to develop this into sustainable long-term activity after the end of the Theme.

The Catalysis Working Group Has Established New Collaborations and Stimulated Ongoing Projects

The Catalysis working group has been in existence for two years. Sara Blomberg, Associate Senior lecturer at the Department of Chemical Engineering at Lund University, and working group leader, is happy with how the work is progressing: – We have established new collaborations but also stimulated already ongoing joint projects.

The Catalysis working group aims to increase fundamental knowledge and understanding on catalysis. The group strives to facilitate collaboration and create arenas for new scientific discoveries. Since the group was formed, under the New Materials theme, it has organised two workshops to gather different researchers in the field.

The most recent event in June, which gathered 30 participants, focused on X-ray based research related to catalysis theory and electrochemistry. Both experimentalists and theoreticians attended the workshop. Sara Blomberg notes that it is good to present many different perspectives, so that you can gain more in-depth knowledge of the area.

– We want these events to be informal to help with networking, and to spark new research discussions. They also present an opportunity to invite senior scientists to come and present, and for younger PhDs to talk about their science. I think this is very important in terms of younger researchers gaining new contacts and ideas.

LINXS Guest Researcher programme is beneficial for collaborations

She is very pleased with the overall progress of the group's work. Inviting visiting guest researcher Jason Weaver, Professor in Chemical Engineering, from Florida University, in the USA, has been very fruitful. He stayed at LINXS from May unto July 2022. She says that having someone stay for a longer period, which is the aim of LINXS visiting guest researcher programme, is important in terms of enabling more focused discussions – which in this case led on to formal collaborations in the form of beamtime proposals.

– We have been able to send in several joint proposals for beamtime at different synchrotrons. The joint beamtime applications is another result of the large network created within our group where people bring in colleagues from their home universities.

The beamtime proposals focuses on situ-experiments with an aim to increase the fundamental understanding of catalysis, and cover both electrochemistry and thermal catalysis. Questions that are important to investigate include for example, how do catalyt materials behave in gases or in

other chemical processes? And what happen to the catalysis process when you change the material alloy, or change its properties?

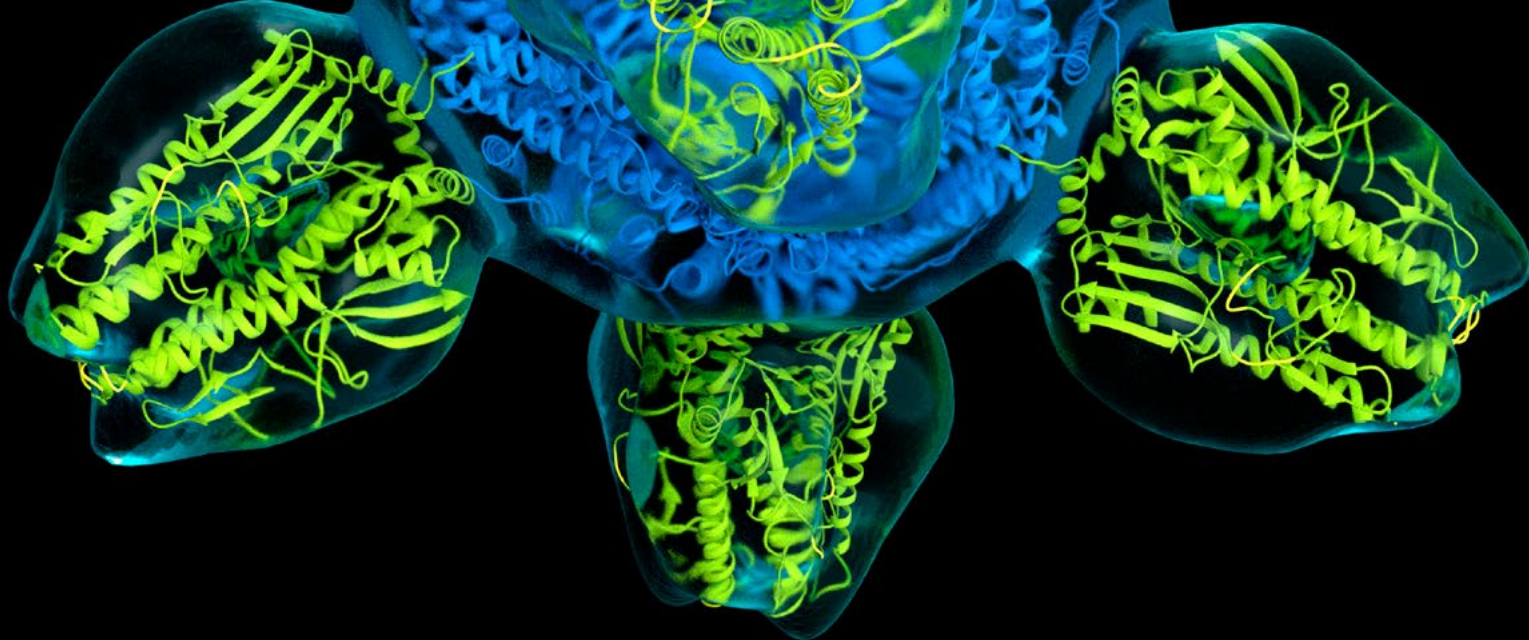
Bridge the gap between industry and fundamental science

Sara Blomberg explains that the proposals bring together people who work on both applied and fundamental catalysis.

– Since I work a lot with industry, I hope that our experiments can prove useful for them too. One goal with our working group is to bridge the gap between industry and fundamental science. Therefore, we want to involve industry and get their input too. The overall aim is of course to have more efficient catalysis: but how should the process look like: how should we get there? Industry can help guide us scientists in terms of what questions we should ask, and how we should design our experiments to mimic industrial conditions, she concludes.



Sara Blomberg,
Associate Senior lecturer
at the Department of
Chemical Engineering
at Lund University.



Integrative Pharmacology and Drug Discovery (IPDD) Theme

The Integrative Pharmacology and Drug Discovery (IPDD) Theme focuses on various aspects of pharmacology, going from structure-based drug design of both small molecules and macromolecular drugs to their interplay with tissue and its formulation.

2022 was a successful year for IPDD, and also the first year for the Theme at LINXS. The Theme includes three working groups, the Structure-based drug design, the Macromolecular Drugs-Antibodies and the Biomedical Imaging.

In 2022 the Theme has had several activities within the different working groups and also a very successful kick-off for the whole Theme. The kick-off took place in May and gathered around 50 participants at LINXS premises. The different working groups gave presentations, and there was also a successful round-table discussion session to plan for the upcoming events. The IPDD core group (including the working group leaders) met every second week (online) to discuss the work that was going on within the working groups and at LINXS. In addition, the core group gave a seminar at NextBioForm, which was very well received.

Some of the activities organised by the Theme include a meeting by the Structure based Drug Design working group on 14–15 November. Around 40 participants from all over Sweden and also a few from abroad joined the event. Several keynote speakers from both academia and industry as well as participants presented their research of high scientific quality covering various aspects of SBDD. Also, there was a poster session, which was especially appreciated by the students who were happy to present and discuss their work. By the end of 2022 the working group also started a discussion and prepared a first draft for the major planned event in 2023 – a course on Fragment base lead discovery.

The Macromolecular Drugs-Antibodies working group continued its “Antibodies in Solution research programme” in 2022. They had a successful mid-term meeting in September. One of the important outcomes of the meeting was that in addition to the NISTmAb, a new antibody will be provided by Novartis free of charge. In the end of 2022, the working group launched the Antibodies in solution: A LINXS-NIST Webinar Series. This webinar series is meant as an educational venture addressed to a broad audience including students and researchers from various backgrounds and all those who are interested to dive into the fascinating world of antibody research and learn more about the use of scattering methods for this purpose.

The Biomedical Imaging working group started in spring. It has eleven active members representing both academy and industry including members from Denmark and France. A dedicated LINXS workshop on “Biomedical Imaging for drug discovery/development – Opportunities for MAX IV” was organised in October 2022. It had 40 participants on-site and another 20 on-line. During the workshop, scientists from the pharmaceutical industry explained the process and the hurdles in drug discovery and development, and how biomedical imaging can be used to facilitate the process. During December a dialogue with MAX IV Life Science director Marjolein Thunnissen was commenced. Several different initiatives and funding applications were outlined that would facilitate the MedMAX beamline.

During 2022 IPDD also initiated the discussions to start a new working group focusing on Drug Delivery. Dr Vito Foderà at Copenhagen University at the Department of Pharmacy will lead the working group started in January 2023.

Workshop Set the Scene for “Biomedical Imaging for Drug Discovery and Development” and Started Important Dialogues

Up to now synchrotron techniques have rarely been used in the latter stages of biomedical drug development and drug discovery processes. A novel educational workshop, organised by the Biomedical Imaging working group, as part of LINXS’ Theme IPDD, gathered 40 participants in mid-October, with another 23 people attending online.

– I see the use of synchrotron imaging as a method to turn to when you get stuck during a drug discovery and development process. To be able to see what is happening in high resolution during experiments with live animals can potentially add that extra bit of information you need, says Lars E. Olsson, Professor of Medical Physics at Lund University, and working group leader.

Processes, hurdles, and development of new drugs explained

During the workshop, scientists from the pharmaceutical industry explained the process and the hurdles in drug discovery and development, and how biomedical imaging can be used to facilitate the process. Educational lectures were also given, which reviewed the imaging methods for both synchrotron imaging and competing imaging technologies. In addition, state-of-the-art lectures on biomedical imaging applications from the synchrotron facilities at ESRF and PSI, were also presented.

In the panel debate that followed, the focus was on how biomedical imaging can be developed at MAX-IV. The main topics were “ECO-system”, i.e. how do we bring researchers together from different disciplines for applications at MAX IV? Further, it was discussed that the many, but scattered

initiatives, to promote in-vivo imaging are suboptimal to promote the MedMAX beamline. In addition, the need for practical help to users with data handling and analysis were expressed.

– It is important to concentrate efforts, and gather these scattered initiatives, as well as look into ways to support researchers looking to use X-rays. One aspect of that is getting networks and contacts together so that we are ready once MedMAX opens. The field of drug discovery is moving very fast, and here we have techniques that can yield novel information.

Lars E Olsson, reflects that he is happy with the workshop:

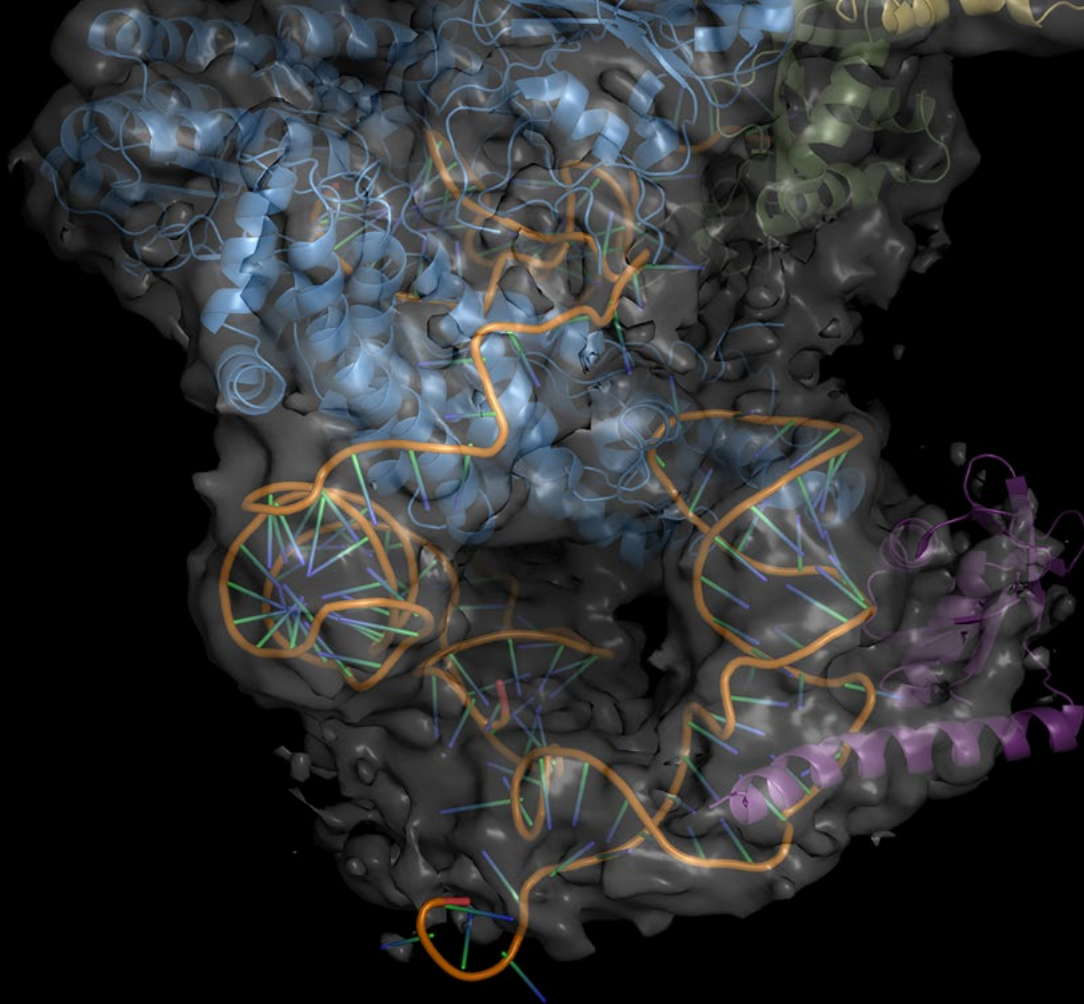
– It was very well received, and it set the scene for progress on “Biomedical Imaging for drug discovery and development”. During the day, we started dialogues that will be bring scientists together on future in-vivo drug applications at MAX IV, he says.



Lars E. Olsson,
Professor of Medical Physics
at Lund University.



Participants at the Biomedical Imaging workshop in October.



Integrative Structural Biology (ISB) Theme – final reflections

2021 was the last year for the Integrative Structural Biology Theme, but since the COVID-19 pandemic, had affected many of the planned activities, ISB had events also during 2022. After two very successful ISB symposia in 2018 and 2019, the ISB core group decided to have the final ISB symposium on 4–6 May. The final meeting, with approximately 100 participants, was truly successful. The three days meeting was inspiring, with the program having a mix of invited keynote speakers as well as many short talks which created a lot of interactions. In addition, there was a round table discussion centred around the future for structural biology, which was very well received. The discussions focused on how structural biology can be better intertwined with the clinics, and how structural biology can contribute even more in the future and how the communication can be improved.

The Time-resolved Structural Biology working group organised the second Time-Resolved Structural Biology workshop that was held at LINXS 26–28 October as an in-person meeting. The workshop had 48 participants including 18 speakers (plus one remote speaker) and a discussion moderator.

The Theme has contributed to a stronger and better communication between scientific areas that were previously more separated. Although, the ISB has come to an end within LINXS, the Theme has made many important contributions to the structural biology community in Sweden and the Nordic countries. This is supported by the fact that SciLifeLab initiated an ISB platform in 2021 showing the importance of integrative research within the structural biology community in Sweden. In addition, an application to the NordForsk foundation to continue strong collaborations within integrative structural biology in the Nordic countries was submitted in the end of 2022.

Another initiative to strengthen integrative structural biology research in Lund was the application during 2022 that Integrative structural biology would become a scientific profile area at Lund University. It was submitted by the working group, Lund Integrative Structural Biology Centre Initiative (ISBC), established in 2020. The application was well received, and was selected for interview, but was unfortunately not selected as one of the five profile areas in the end.

The 2nd Time-Resolved Structural Biology Workshop Filled Important Gaps and Opens Up for Future Gatherings

The 2nd workshop on time-resolved methods to study dynamics in integrative structural biology filled a key gap, and continued important discussions on how to combine methods, how to interpret data and avoid pitfalls, and on what developments that are important for the field. It was the very final event of the Integrative Structural Biology Theme – but the ambition is to organise a similar workshop in two years' time.

Thomas Ursby, previous leader of the Time Resolved Structural Biology working group, researcher, and project manager for the MicroMAX beamline at MAX IV, reflects that the three-day event was a great success. Not least being able to meet in person, and having the opportunity to continue discussions during breaks and coffee.

– We thought quite a bit about the set-up this time. We wanted to stimulate discussions, and encourage participation. With that in mind, we decided to have relatively short talks, and longer moderated discussions. This worked very well, since otherwise people might be hesitant to ask questions.

The event was limited to 50 people. There are pros and cons with being restricted to a smaller group, notes Thomas Ursby.

– Of course, the atmosphere benefited from being a smaller group. It was more informal, and more open. On the other hand, the research field of integrative structural biology is growing, and it would have been interesting to open up for more participants too.

Participants gained a lot from attending the workshop

In contrast to the very first workshop on time-resolved structural biology, which presented a broad palette of methods and techniques such as NMR, Cryo-EM, SAXS, electron diffraction, neutron scattering, lasers and computational techniques, the programme this time had a stronger focus on X-ray crystallography, the experimental science of determining the 3D arrangement of atoms in biological molecules such as proteins. Talks covered topics such as “Combining biomolecular simulations with time-dependent and time-resolved experiments” and “Time-resolved serial femtosecond crystallography of a photoenzyme: pitfalls and progress”.

– Many people have mailed me to say that they really enjoyed the workshop, and that they gained a lot from attending. Getting this type of feedback is really nice,

and an indication that our scientific programming is of value to the research community.

As the research area of integrative structural biology is expanding, more conferences and scientific events are being organised in different parts of the world.

New workshop planned in two years' time

Thomas Ursby and his colleagues plan to organise a follow-up workshop on time-resolved structural biology in two years' time.

– It is great to see so much activity. It is important to grow the field, and capture the momentum. With our next workshop, we want to follow up on some of the projects and techniques presented at the two previous events, and maintain networks.

Another reason to organise a follow-up event is that Thomas Ursby believes that the content and scheduling of these specific workshops fill an important scientific gap since a couple of related meetings have been discontinued as the particular funding grants have ended, and individual sessions at larger conferences do not give the opportunities of a dedicated workshop.

– There is a high pace of development within the field of integrative structural biology, including of time-resolved methods. It will be interesting to see what the hottest topics will be in two years. We might move to another location. There are many benefits of moving around, especially in terms of study visits to large scale facilities. But time will tell, says Thomas Ursby.



Thomas Ursby, researcher, and project manager for the MicroMAX beamline at MAX IV

Some LINXS Highlights in 2022

LINXS Supports The Research Programme: SAGA-Preparing for a GISANS Instrument at ESS – a Swedish Initiative

LINXS has continued to serve as a meeting point and a hub to solidify collaboration and progress on the preparatory work for a Grazing-Incidence Small-Angle Neutron Scattering (GISANS) instrument at ESS. The instrument will enable researchers to analyse in detail how a neutron beam spreads when reflected from a surface.

In 2021, Professor Tommy Nylander, LINXS fellow, was granted funding for the project “Preparing for a GISANS instrument at ESS – A Swedish Initiative” by the Swedish Research Council. The project, SAGA, is jointly conducted by Lund University, Uppsala University, Malmö University, Linköping University and KTH.

SAGA had a kick-off on 14th January, followed up by a SAGA GISANS workshop on 12 May in connection with the Swedish Neutron week 10–12 May in Kolmården. In addition, a SAGA GISANS update meeting was held during the MAX IV & ESS user meetings in October.

In early spring, a postdoctoral researcher, Sebastian Köhler, was recruited to work on the project, and placed at LINXS. Sebastian has started the design work on a potential instrument in close collaboration with ESS and project partners.



Sebastian Köhler,
postdoctoral
researcher, LINXS



Aerial overview of ESS, European Spallation source. Photo: Perry Nordeng/ESS

LINXS-LMK Post-Doctoral Researcher Explores Transthyretin (TTR) Amyloidosis

In June, Daniel Sarabi, the LINXS LMK post-doctoral researcher, started at LINXS. He is supervised by LINXS Director Trevor Forsyth, with funding obtained by the LMK Foundation. His research focuses on transthyretin (TTR) amyloidosis. Daniel is currently running molecular dynamics simulations on the tetrameric structure wild-type and two mutants, in order to estimate the change in protein stability upon amino acid mutation. This work is based on the previous work led by Professor Trevor Forsyth, and Daniel's first objective is to replicate the results achieved previously, prior to exploring mutants and alchemical perturbations on the tetramer, dimer and monomeric structures of TTR.

During the year, Daniel Sarabi has been instrumental in establishing a Young Researchers Life Science activity and network. The first event of the initiative was organised on 13 March 2023. It brought together young researchers (PhDs and postdocs) nationally and internationally that utilise X-rays and neutrons from a wide variety of research fields and applications, in order to create opportunities for

collaboration and networking. A positive outcome from the event is that Daniel Sarabi has now formed a larger network of researchers engaged in the Young Researcher Life Science activity.



Daniel Sarabi,
postdoctoral
researcher, LINXS.

The CoWork Webinar Series: "A Gift to the Community Interested in Coherence"

CoWork is a webinar series mutated from a "Coherence Workshop", originally planned for October 2020 and cancelled due to the world pandemic. Initiated and driven by Gerardina (Dina) Carbone, MAX IV Laboratory, this series has been followed with interest since its beginning and is continuing without interruption until today. 32 renowned scientists worldwide have already contributed to this series until the end of 2022.

The attendees are from a wide international community of experts and of newbies (many from European countries, USA, Brazil and a few from Canada, India, Taiwan and Australia). Their number has increased by a factor of ten since the beginning of the series, reaching an impressive count of 450 today. The average number of attendees for each webinar is around 62, with a 90% effective presence. The webinars last little more than one hour and the Q&A session is usually very lively and quite informal.

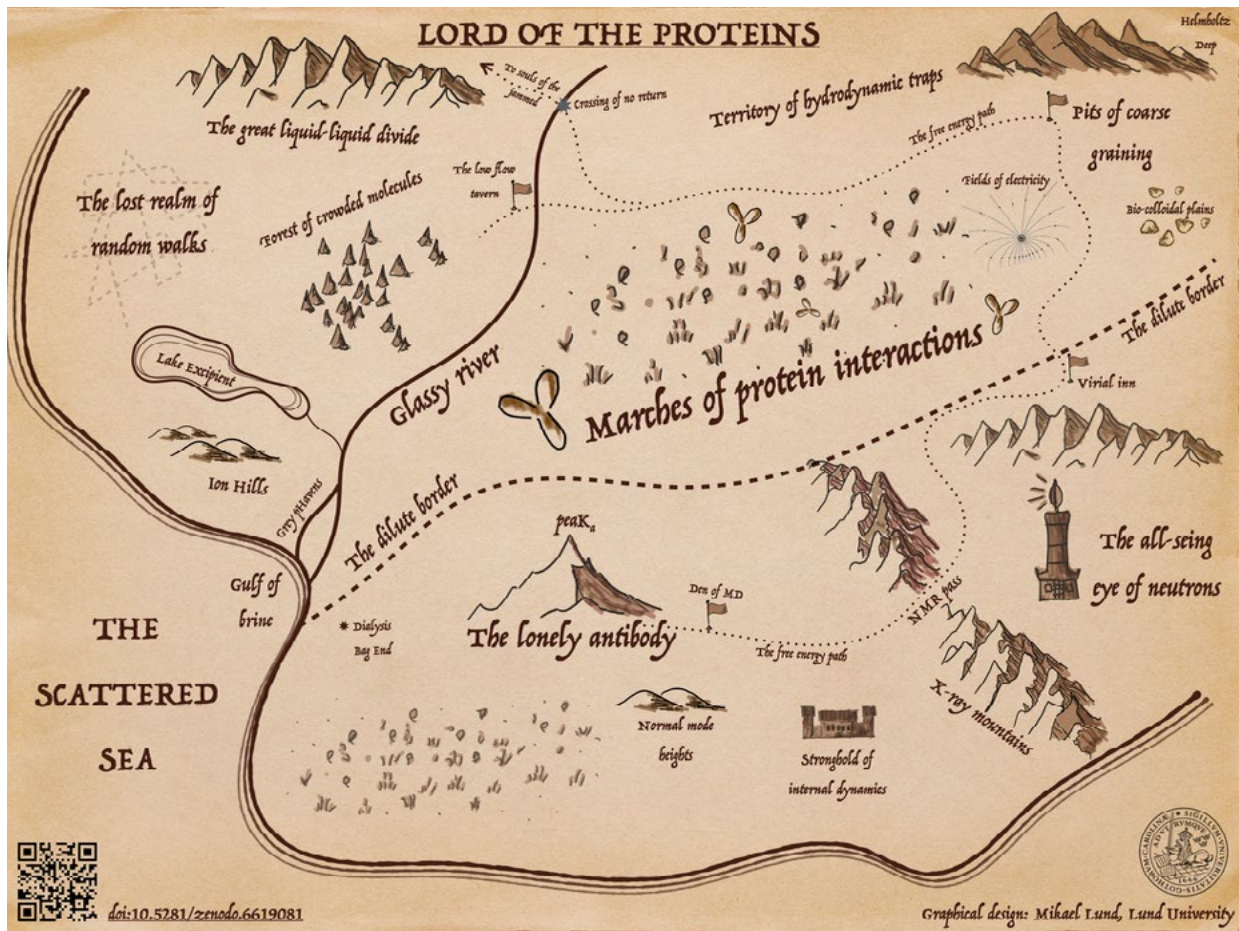
The topics of the webinars, initially focused on the exploitation of Coherence of X-rays for inverse microscopy, have expanded to encompass other techniques exploiting coherence (e.g., XPCS, XCCA), analysis methods (e.g., phasing algorithms and the use of AI), instrumentation (e.g., beamlines worldwide providing access to these

methods) and similar approaches in a different wavelength domain (e.g., high resolution microscopy with electrons and visible light).

All webinars are recorded and published in the educational platform of LINXS. This is an especially appreciated feature, and people consistently ask for the recordings. On many occasions Dina Carbone gets attestations of appreciation for this series which has been also defined a "gift to the community interested in coherence".



Dina Carbone,
researcher at MAX IV
laboratory.



An illustration of a protein map in the style of Tolkien.

New Webinar Series on Antibodies in Solution Aims to be An Educational Venture Addressed to a Broad Audience

In 2022, LINXS and the Antibodies in Solution research programme launched a new webinar series: the Antibodies in Solution: a LINXS – NIST webinar series. It aims to be an educational venture addressed to a broad audience including students and researchers from various backgrounds, and all those who are interested to dive into the fascinating world of antibody research and learn more about the use of scattering methods for this purpose.

A central aspect of the webinar series is to illustrate the full power of neutron and X-ray scattering science that can be achieved in combination with complementary experimental methods and different unifying simulation techniques.

– Progress in understanding complex biomolecules such as antibodies in solution requires an interdisciplinary approach and collaboration of experimentalists and theoreticians with different scientific backgrounds from academia and industry. This initiative aims to create a common basis through didactical lectures in order to enable a successful future

collaboration in this important field of research, says Anna Stradner, Professor at Physical Chemistry, Lund University, and research programme leader.

About the webinar series

The Antibodies in Solution: a LINXS – NIST webinar series provides background information related to the currently ongoing LINXS programme, under the IPDD Theme. This is a concerted experimental and theoretical effort that aims to investigate the properties of monoclonal antibodies in solution, which comprise a major platform for potential drug candidates and are of high academic and pharmaceutical interest. An international consortium of researchers at academic institutions, research centers, NIST and Novartis has teamed up for this.

Didactical lectures given by members of the consortium on different experimental and theoretical topics that are highly relevant for state-of-the-art antibody research as well as insight from pharmaceutical industry are included in the webinar series.

Linxs Science Day – Amazing Work Presented by the Imaging and Dynamics Themes

More than 100 people registered for the LINXS bi-annual Science Day on 28–29 September, a testimony to the interest and engagement in LINXS' work. This time, the focus was on LINXS two legacy Themes: Imaging and Dynamics. Researchers from within the Themes presented research, and relevant results coming out from the Themes.

Reflections from the Theme leaders

– The LINXS Science Day brought together researchers who have been involved with the LINXS Imaging Theme since its creation late 2017. The presentations covered planetary geology (including mars meteorites) to in-vivo imaging of hearts and spectroscopic imaging of soils to imaging of barley kernels. They gave a snapshot of the Theme and illustrated its broad reach across scientific domains from the acquisition of images with X-rays and neutrons, through to image quantification to answer key questions in the respective fields.

– This broad scientific scope and the collaboration across disciplines has been one of the great successes of the Theme in addition to more tangible outcomes such as the foundation of the Northern Lights on Food Theme and the Biomedical Imaging working group in the current IPDD Theme. I would like to thank everyone who has been involved in the Theme over the past years, and who made it a great success, says Stephen Hall, senior lecturer at Solid Mechanics at Lund University, and Theme leader.

– The Dynamics Theme has been very successful, with many exciting and fruitful events, giving the possibility to create new networks and do interesting research. It is all about the people involved, which was clearly showed at the Science

Days by all the great presentations. Even though it was the final meeting for the Theme – this is just the beginning of an interesting research journey, and I am very much looking forward to following the progress, says Marie Skepö, Professor in Theoretical Chemistry, Lund University, Theme leader, and LINXS Vice-Director.

About the Themes

The Imaging Theme covered acquisition, processing and applications in imaging that are relevant to systems using synchrotrons and/or neutron sources. The focus was on finding new image reconstruction and/or analysis techniques that can help to extract meaningful information from X-ray/neutron imaging data and on connecting different methodologies and competences in order to shed new light on challenges in imaging of different subject matters.

The Dynamics Theme addressed time dependent phenomena, such as biological processes, motion of biomolecules and colloids, or transport processes in hard matter, utilizing the accessible time and length scales with neutrons and X-rays, and the coherent properties of MAX IV. It focused in particular on the application and future development of experimental tools such as quasi-elastic neutron scattering (for example neutron spin echo or backscattering experiments), X-ray photon correlation spectroscopy or fast pump probe experiments, and computer simulations performed in order to help und understand experimental data.



Participants listening to Stephen Hall at LINXS Science Day in September.

List of LINXS Activities 2022

LINXS Guest Researcher Programme:

1. Jason Weaver, LINXS Guest researcher May–July 2022 (New Materials)
2. Jeremy Lakey, LINXS Guest researcher June 2022 (NLF)
3. Elliot Gilbert, LINXS Guest researcher June–July 2022 (NLF)

LINXS events and events organised in partnership:

1. Northern Lights on Food LU Profile Area Workshop, Jan 12–13, 2022 (NLF)
2. LINXS partner event – Kick-off SAGA – Preparing for a GISANS instrument at ESS – A Swedish Initiative, Jan 14, 2022 (SAGA GISANS)
3. LINXS event – Food WG5 Webinar on the study of lipid structures in membranes and food formulations, Feb 8, 2022 (NLF)
4. 2nd workshop Metals and manufacturing @ next generation sources – Partner event, Mar 10, 2022
5. LINXS event – WEBINAR: CoWork series – Structural evolution of nanoparticles under realistic conditions observed with Bragg coherent X-ray imaging with Marie-Ingrid Richard, Mar 10, 2022
6. Food WG4 meeting, Mar 18, 2022 (NLF)
7. LINXS event – WEBINAR: CoWork series – Single-particle diffraction imaging at the European XFEL with Filipe Maia, Mar 24, 2022
8. LINXS event – WEBINAR: CoWork series – Coherent X-ray diffraction imaging at Nanoscale with Ivan A. Vartanyants, Apr 7, 2022
9. LINXS partner event – 18th Food colloids digital conference: Structure, Dynamics and Function, Apr 10–13, 2022 (NLF)
10. ISB Core group, pre-symposium meeting (ISB)
11. LINXS event – Northern Lights on Food 3D hackathon, Apr 27–28, 2022 (NLF)
12. LINXS event – LINXS Science Day – rebooting from the pandemic, Apr 29, 2022
13. LINXS event – IPDD Kick-off meeting, May 2, 2022 (IPDD)
14. LINXS event – 3rd Integrative Structural Biology Symposium, May 4–6, 2022 (ISB)
15. LINXS event – Imaging Workshop: Imaging possibilities for Breakthrough in medical research, May 11, 2022
16. LINXS event – Food WG 4 Workshop, May 11, 2022 (NLF)
17. LINXS event – Workshop: Northern Lights on Food III, Jun 1–3, 2022 (NLF)
18. US Delegation visit to Lund, Jun 5, 2022 (NLF)
19. LINXS event – WEBINAR: CoWork series – Magnetic chirality in multilayers probed by Soft X-ray (coherent) scattering, with Nicolas Jaouen, Jun 9, 2022
20. NLF WG4 meeting with Guest professor Jeremy Lakey, Jun 9, 2022
21. LINXS event – Workshop: Magnetic SANS – Data Analysis and Software Prospects, June 13–14, 2022 (New Materials)
22. LINXS partner event – Lipid Bilayers at ESS – BESS in Lund, Jun 13–15, 2022
23. LINXS event – SasView CodeCamp (ESS), June 14–16, 2022 (New Materials)
24. Swedish Physics Days in Lund, Jun 15–17, 2022 (New Materials)
25. LINXS Guest Seminar – D.D Sarma, Indian Institute of Science (IISc), Bangalore, Jun 16, 2022
26. LINXS event – WEBINAR: CoWork series – Atomic Resolution Imaging by Electron Ptychography with David A. Muller, Jun 16, 2022
27. LINXS event – Workshop – Catalysis Workshop, Jun 30, 2022 (New Materials)
28. LINXS event – Masterclass: 3rd Northern Lights on Food Masterclass, Aug 29–Sep 2, 2022 (NLF)
29. LINXS event – WEBINAR: CoWork series – Recent developments on Bragg ptychography with Peng Li, Sep 15, 2022
30. Chemistry of Life Joint Symposium University of Leicester and LU, Sep 23, 2022
31. LINXS event – Antibodies MoB meeting mAb Mid-term Meeting 2022, Sep 27–28, 2022 (IPDD)
32. LINXS event – LINXS Science Day – Imaging and Dynamics, Sep 28–29, 2022
33. LINXS event – WEBINAR: CoWork series – Complexity and Local Heterogeneity by Coherent X-ray Diffraction Imaging with Hyunjung Kim, Sep 29, 2022
34. LINXS event – Food Colloids and Structured Interfaces Industry Workshop NLF WG 2, Oct 4, 2022 (NLF)
35. LINXS partner event – Saga Gisans update meeting in connection to MAX IV & ESS user meetings, Oct 4, 2022 (SAGA GISANS)
36. LINXS partner event – HELIOS research school, Oct 10–14, 2022
37. LINXS event – WEBINAR: CoWork series: A new Bragg Coherent Diffractive imaging beamline at NSLS.II, with Garth Williams, Oct 13, 2022

38. LINXS Northern Lights on Food Theme Meeting at ESS and LINXS, Vinnova-project: Strengthened research and innovation in the food sector made possible by neutron and synchrotron techniques, 2021-0409-NLF, Oct 17–18, 2022 (NLF)
39. LINXS event – Workshop on Biomedical Imaging for drug discovery/development – Opportunities for MAX IV, Oct 19, 2022 (IPDD)
40. LINXS Partner event – Joint LINXS/Physical Chemistry /KILU/Food Technology, engineering, and Nutrition seminar: Leoni Van't Hag, Oct 19, 2022 (NLF)
41. LINXS Event – TRSB Final workshop – 2nd Time-Resolved Structural Biology Workshop, Oct 26–28, 2022 (ISB)
42. LINXS event – WEBINAR: Antibodies in Solution: a LINXS-NIST webinar series – Therapeutical monoclonal antibodies- significance for patients and evolution into the future with Karoline Bechtold-Peters, Oct 2, 2022 (IPDD)
43. NLF WG5 Webinar – Dr Marta Martinez-Sanz, Prof. Judith Peters, Nov 7, 2022 (NLF)
44. NLF Guest Seminar – Izabela Milogrodzka, Nov 8, 2022 (NLF)
45. LINXS event – IPDD – Structure based drug design meeting, Nov 14–15, 2022 (IPDD)
46. LINXS event – LINXS virtual Town Hall meeting, Nov 29, 2022
47. LINXS Guest Seminar – Paul Langan Director General of the Institute Laue Langevin, Nov 30, 2022
48. LINXS Guest Seminar – Robert McGreevy, Dec 2, 2022
49. LINXS event – WEBINAR: Antibodies in Solution: a LINXS–NIST webinar series – John Schiel, Dec 7, 2022 (IPDD)
50. LINXS Christmas Open House, Dec 15, 2022
7. BiSS@LU Contributions to RIs, Jun 23, 2022
8. ESS instrument scientists' "Science Afternoon at LINXS", Jun 29, 2022
9. N-fak Faculty Board meeting, Aug 18, 2022
10. ESS instrument scientists' "Science Afternoon at LINXS", Aug 30, 2022
11. 5th Nordic/Baltic school of neutron scattering NNSP SwedNess, Sep 3–12, 2022
12. SuperADAM board meeting – NLF, Oct 10, 2022
13. SESAM project meeting, Oct 25, 2022
14. SwedNess Sall-Angle Neutron Scattering (SANS) Research school on neutrons, Nov 7–11, 2022
15. Nanolund Career development workshop, Nov 17, 2022
16. LU Collaboration department meeting, Nov 23, 2022
17. ESS scientist away day, Nov 25, 2022
18. COMPUTE Jupyter Course, Dec 6–9, 2022
19. LU Collaboration department meeting, Dec 14, 2022

LINXS Outreach activities:

1. SXNS16 Conf - LINXS (digital), Jan 10–14, 2022
2. MAX IV – UPPSALA meeting, Apr 7, 2022
3. DTI visit, Apr 21, 2022
4. ISB meeting with Leicester University, May 3, 2022 (ISB)
5. Swedish Neutron Week 2022, May 16–19, 2022
6. HALOS Final Conference, Jun 8, 2022
7. Chemical Society SCS 2022, Jun 20
8. Northern Lights on Food at Innovation week, Jun 23, 2022
9. Connecting LINXS and ISBUC meeting, Aug 8, 2022
10. Director visit to Uppsala, Sep 21, 2022
11. 34th MAX IV User meeting "Collaboration in Focus", Oct 3–5, 2022, LINXS stand
12. ESS and ILL European Users meeting, Oct 5–7, 2022, LINXS stand
13. Visit to LINXS of Eric Cassan, deputy vice-president from University of Paris-Saclay (EUGLOH), Nov 16, 2022
14. Learning meeting about the societal benefit of the research facilities ESS and MAX IV, Nov 22, 2022
15. ESS/MAX IV Summit 2022
16. SVS open house, Dec 14, 2022

LINXS Hosted activities:

1. Research Group meeting, Theoretical Chemistry, Feb 16, 2022
2. Magnet reference group, Mar 23, 2022 (NLF)
3. RÅC governing committee meeting, May 4, 2022
4. Research Group meeting, Theoretical Chemistry, May 18, 2022
5. Summer School Structural biology, LINXS – MAX IV "MicroMAX Masterclass – Summer School. HALOS-EUGLOH Summer School 2022, Jun 6–7, 2022
6. N-fak Faculty Board meeting, Jun 6, 2022

Timeline

2022 International and National Theme call
New Theme starting
Conclusion of LINXS Themes

2023 Regular call for themes
New Themes starting
Conclusion of LINXS theme
LINXS partnership model updated

2024 Long-term funding secured
Regular call for Themes
New Theme starting
Conclusion of LINXS Theme

2025 Permanent location in Science Village
Regular call for Themes
New Theme starting

2026 Ongoing activities in Science Village
Steady state operations achieved at
16M/24M a year.

“2022 has been an extremely important year in terms of the LINXS arrangements to move onto the Science Village in the short/medium term – a move that will place us right in the middle of a brand new national and international science environment in close physical proximity to both MAX IV and ESS.”

Trevor Forsyth, LINXS Director

ESS

Location 2025 +

Science Village

MAX IV

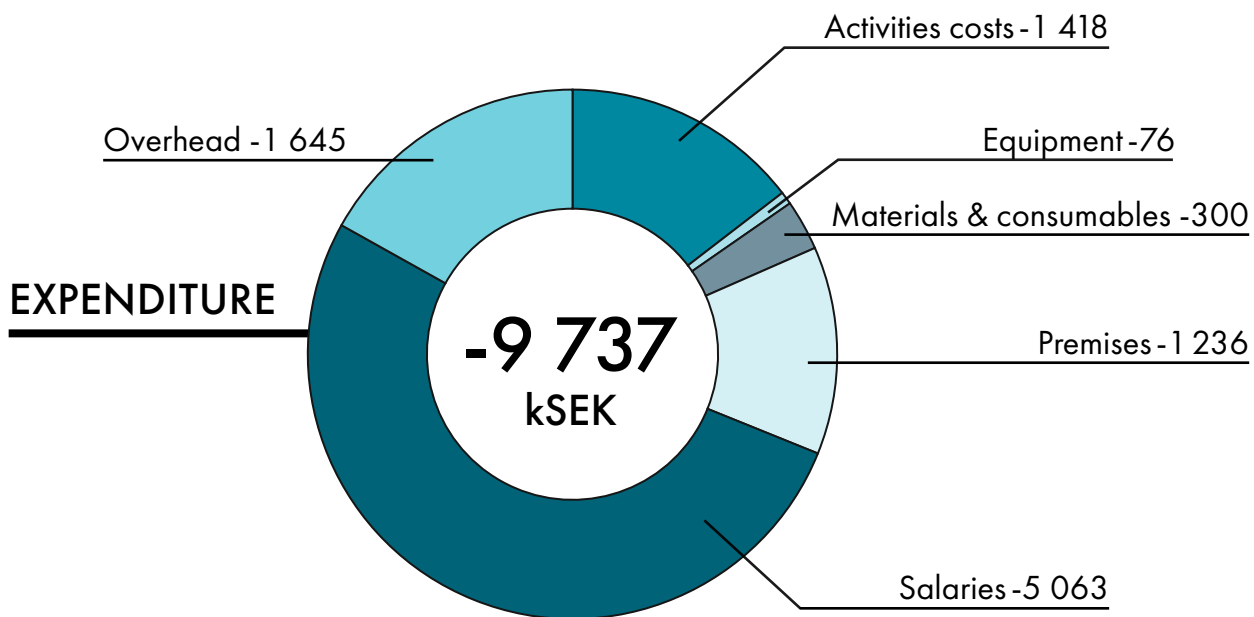
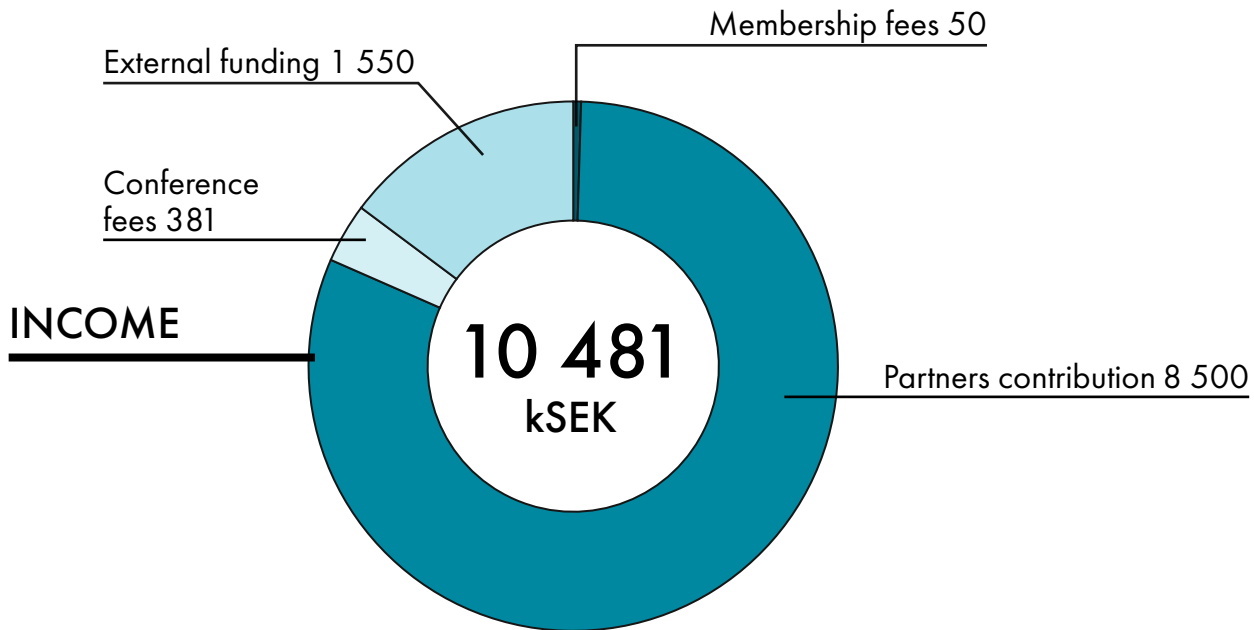


Location 2018 - 2024

Tramline



Finances 2022



Current partner is Lund University and contributions are from the Central administration, the Faculty of Science, Faculty of Engineering and Faculty of Medicine.

Activities mainly include costs for the organisation of LINXS events, accommodation, travelling and outreach.

Equipment mainly includes costs and depreciation for computers, equipment for the operation of scientific activities and furniture.

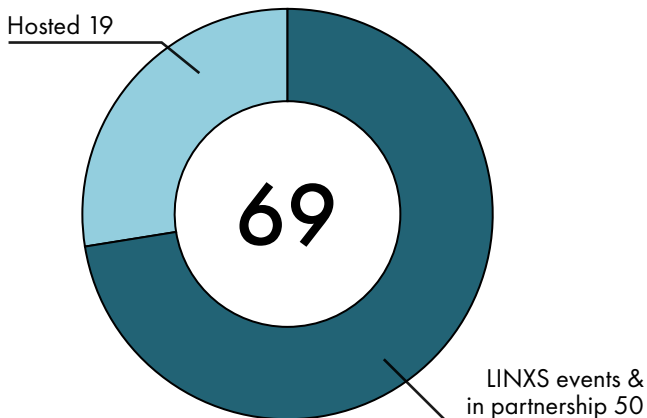
Materials and consumables mainly include office supplies and printing equipment.

Premises include costs for rental, internet connection and cleaning services.

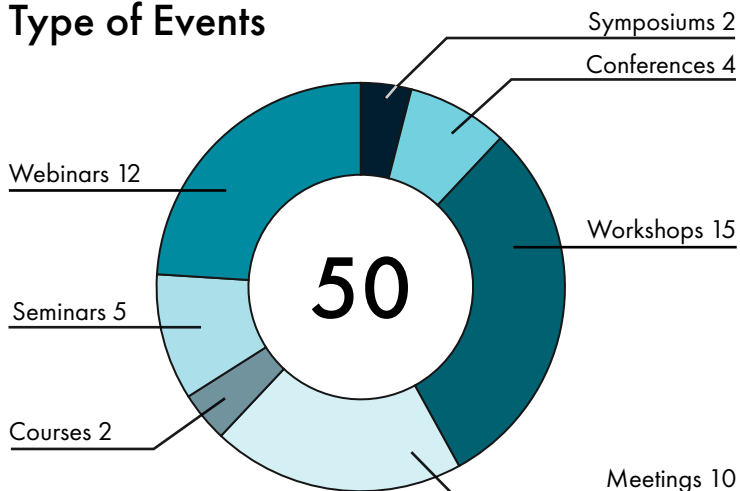
Salaries include staff, management and emoluments.

Statistics 2022

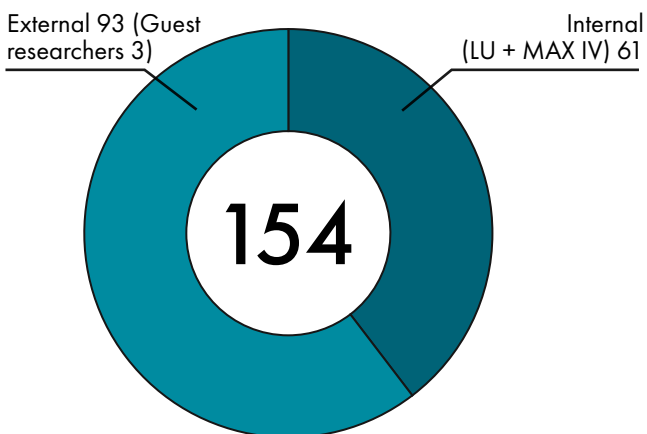
LINXS Events



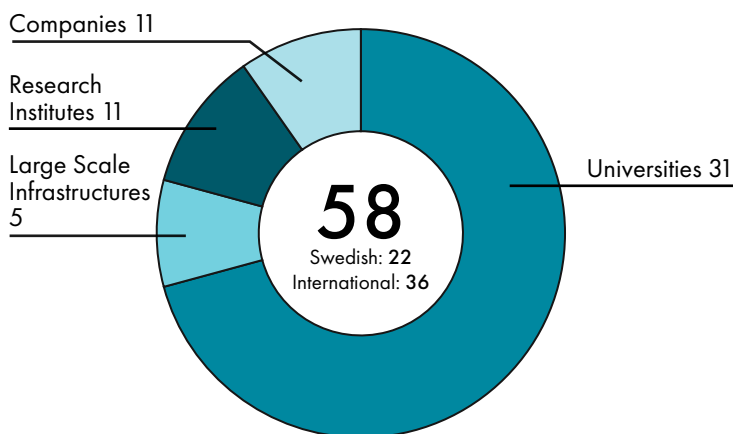
Type of Events



LINXS Fellows



Organisations involved in LINXS core and working groups and visiting researcher programme



Communication & outreach

2650 Subscribers to the LINXS newsletter

6 Newsletters

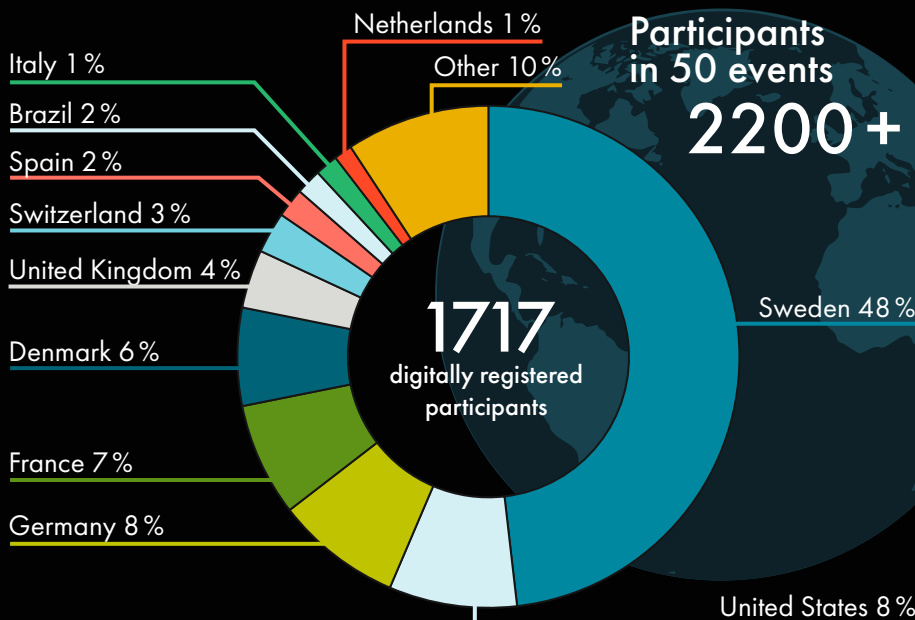
1164 LinkedIn followers

420 Twitter followers

Keynote speakers

189 total

34% Female 66% Male



Organisation

Scientific Advisory Board



Prof. Christiane Alba-Simionesco

SAB Chair (interrim)
– Area Soft Matter
Christiane is the Head of the Laboratoire Léon Brillouin (LLB). Her research focuses on the thermodynamics, structure and dynamics of molecular condensed phases, liquid, solid and amorphous.



Prof. Andrew Boothroyd

SAB Member – Area Hard Matter
Andrew is a Professor of Physics at the University of Oxford, a Tutorial Fellow of Oriel College, and Associate Head of the Department of Physics. He is an experimentalist with broad interests in the fundamental properties of quantum materials, especially superconductors, magnetic materials, and topological semimetals.



Prof. Annette Eva Langkilde

SAB Member – Area Life Science
Annette is an Associate Professor at the Department of Drug Design, University of Copenhagen. Her research projects are on structure and dynamics of complex macromolecular systems using several X-ray and neutron based techniques.



Dr. Alexandra Pacureanu

SAB Member – Area Life Science
Alexandra is leading the X-ray nanoneuroimaging group at the European Synchrotron. With her team, she develops instrumentation and methods for image acquisition, reconstruction and analysis, together with sample preparation approaches tailored for nanoscale X-ray 3D bioimaging.



Prof. Jan Skov Pedersen

SAB Member – Area Soft Matter
Jan Skov Pedersen is a Professor of Chemistry at Aarhus University, Denmark. His research is on physical chemistry of soft matter, colloidal polymers science, and biophysics with emphasis of application of small-angle X-ray scattering for structural investigations.



Prof. Stefan U. Egelhaaf

SAB Chair (on leave)
– Area Soft Matter
Stefan is a full professor (Soft Condensed Matter Physics) at the Heinrich-Heine University Düsseldorf. Interested in the physics of soft condensed matter, in particular its non-equilibrium behaviour.

The LINXS Scientific Advisory Board (SAB) is made up of high-level international researchers in science involving neutrons and X-rays. The SAB provides advice on the scientific direction and strategy for LINXS, based on ensuring a high standard in the academic quality.

Reflections From the Scientific Advisory Board 2022

“The SAB would like to congratulate the LINXS management on the recent progress it has made and for the dynamism of the Institute. LINXS has clearly passed to a new stage in its development with – a greater national visibility with a corresponding update of the name, – the first international call for Themes – a project for a LINXS Centre of Excellence, with a VR proposal that will expand LINXS capacity to eight Themes instead of the current three. With the last expansion, LINXS would be able to access a national rather than local coordination role between universities, industries, and institutes, ensuring independent funding. The SAB strongly supports and welcomes all these actions. ”

LINXS Management

Trevor Forsyth

LINXS Director. Professor of Molecular Biophysics at the Faculty of Medicine, Lund University. Head of the Life Sciences group at Institut Laue-Langevin in Grenoble 2000–2021 and a Senior fellow in Biology. He is also a Professor of Biophysics at Keele University in the United Kingdom.

Marie Skepö

LINXS Vice-Director. LINXS Vice-Director responsible for the focus area of Soft Matter. Professor, Docent and Head of Division of Theoretical Chemistry at Lund University.

Oxana Klementieva

LINXS Co-Director. LINXS Co-Director responsible for the focus area of Life Science. Associate Professor, Docent, Co-coordinator Nanobiology & Neuronanoscience at NanoLund and Head of Medical Microspectroscopy group at the Medical Faculty of Lund University.

Jörgen Larsson

LINXS Co-Director. LINXS Co-Director responsible for the focus area of Hard Matter. Jörgen Larsson is a professor and the head of the division for Atomic Physics at the Dept. of Physics at the Faculty of Engineering (LTH) at Lund University.

Anna Ntinidou

Head of Administration. Anna Ntinidou is the head of administration responsible for operations and supporting future strategic and operational development. She is a senior project manager with long experience in implementing EU and nationally funded transdisciplinary projects.

LINXS Board

Anders Tunlid, Board Chair

Pro-Dean at the Faculty of Science, Prof. Microbial Ecology, Lund University.

Anders Karlhede

Board Member, Senior Advisor on research infrastructure issues at Stockholm University and former Dean of its Faculty of Science.

Heiner Linke

Deputy Dean LTH, Prof. Nanophysics, Lund University. Representing Faculty of Engineering LTH, Lund University.

Kajsa M. Paulsson

Group Leader, Experimental Medical Science. Representing Faculty of Medicine, Lund University.

Ulf Olsson

Prof. Physical Chemistry, Lund University. Representing Faculty of Science, Lund University.

Sindra Petersson Årsköld

Senior Advisor at the European Spallation Source ERIC.

Marjolein Thunnissen

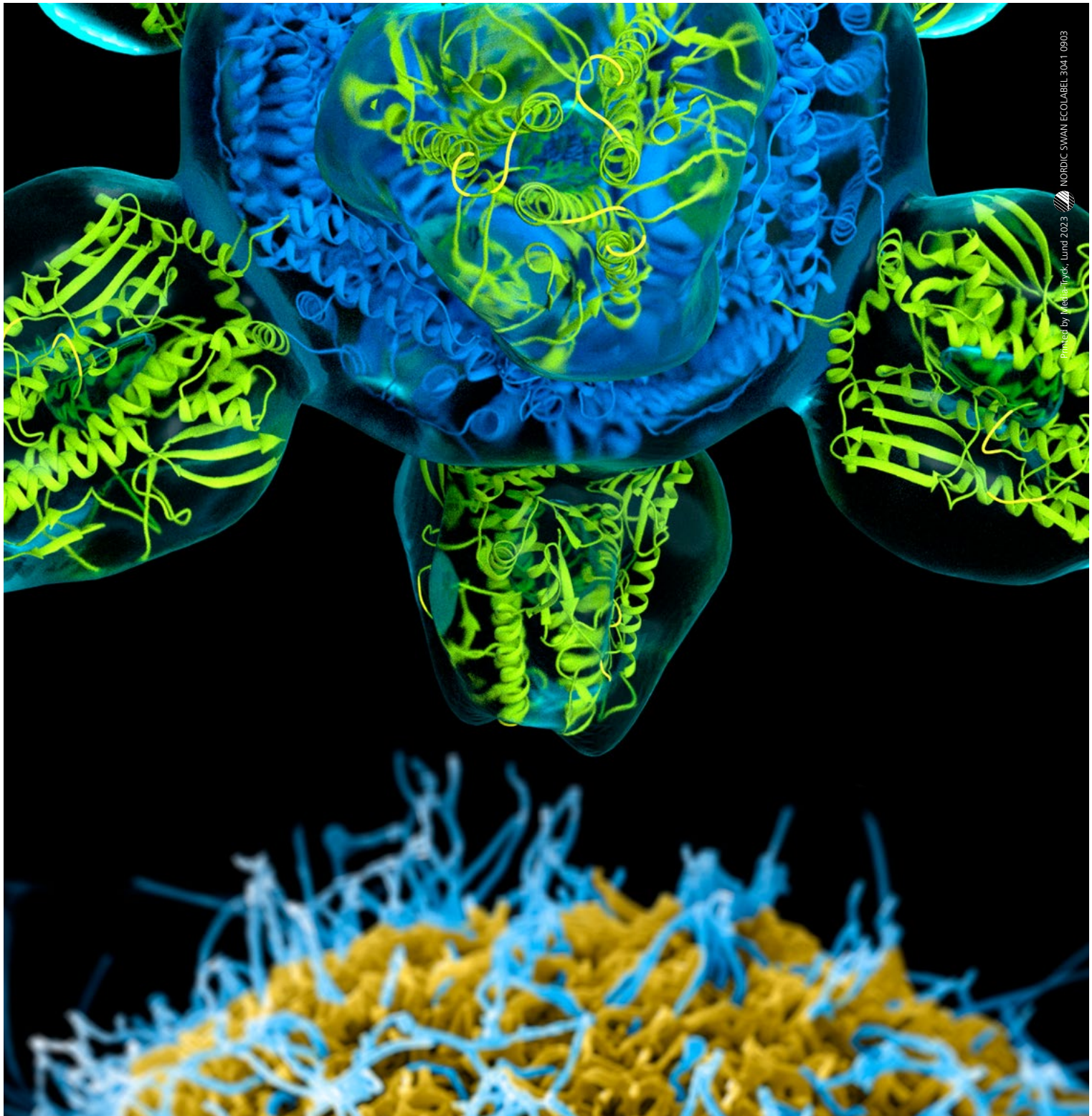
Life Science Director at MAX IV.

Sofia Bjarnheim

Student representative, Lund University. President of the Science Student Union (LUNA).

Sandra Benter

Representative of the Science Doctoral Student Council (NDR), Lund University.



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 Scientific Research



Swedish
 Research
 Council

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