

Report on Nordita and Uppsala University

Annica Black-Schaffer and Maxim Zabzine

1 Background

The Nordic Institute for Theoretical Atomic Physics (Nordita) was established in 1957 in Copenhagen on the initiative of Niels Bohr to promote theoretical physics in the Nordic countries. Scientific focus was initially on atomic research for peaceful purposes. Nordita also came to act as an important meeting place between researchers from the West and the East during the Cold War. Nordita was originally fully financed by the Nordic Council of Ministers (NMR) and placed on the premises provided by the University of Copenhagen in the Niels Bohr Institute. The meaning of the name Nordita has nowadays been changed to Nordic Institute for Theoretical Physics and covers today large, and expanding, parts of theoretical physics. Nordita has played an extremely important role for Nordic physics during the last nearly 70 years. The Nordita brand's international status and attractiveness stand up well in comparison to top international centers in the area. Nordita has trained hundreds of researchers for faculty positions in the Nordic countries through its postdoctoral program. Nordita's role as conference organizer has been of decisive importance for Nordic physics and has given young Nordic researchers the opportunity to meet world-leading researchers.

In 2007 Nordita has moved from Copenhagen to the AlbaNova University Centre in Stockholm with KTH, Stockholm University (SU), and Uppsala University (UU) as host universities. Nordita was administered initially by KTH during 2007-2015 and from 2016 till present time Nordita is administered by SU. The main research areas at Nordita are astrophysics, high-energy physics, cosmology and gravitational theory, condensed matter physics, quantum information, statistic physics and complex systems.

2 Personnel at Nordita

Presently Nordita has 6 professors: Director Mikael Fogelström, condensed matter, Chalmers. Deputy director Axel Brandenburg, astrophysics, host university SU. Konstantin Zarembo, mathematical physics, string theory, host university University of Copenhagen. Alexander Balatsky, condensed matter, host university KTH, also

University of Connecticut, Storrs. John Wettlaufer, soft matter, host university SU, also Yale University. Antti Niemi, biological physics, host university UU.

Nordita also has 3 affiliated professors: Bengt Gustafsson, astrophysics, UU. Frank Wilzcek, high energy physics and condensed matter, SU, MIT, and others. Katherine Freese, astroparticle physics and cosmology, SU and University of Texas, Austin.

Other staff at Nordita (May 2024): 4 professors emeriti, 15 “assistant professors”, 36 postdocs, 8 “corresponding fellows”, 21 visiting researchers, 4 doctoral students, 24 master’s students, 2 bachelor’s students, 7 administrators (source: Nordita homepage).

3 Funding situation

Nordita is currently financed by grants from the host universities, by the Nordita VR grant, and by external grants to Nordita’s researchers. Since Nordita’s relocation to Stockholm, the funding from NMR has been dwindling and from January 2024 Nordita lost the last 11 MSEK/year in basic funding from NMR. The background is that NMR transferred the funds for the Nordic cooperation bodies to NordForsk, which is an organization under NMR who finances Nordic cooperation in research and research infrastructure. NordForsk was tasked with setting up a funding instrument suitable for applications from these existing Nordic cooperation bodies, of which Nordita is one of four. However, NordForsk decided to use the funds in a different way and no funding was made available to Nordita (or any of the other Nordic collaboration bodies).

The budget for 2023 and 2024 are summarized in the table below:

Source	2023 MSEK	2024 MSEK
SU	6.8	17.5 – 6.8 (OH)
KTH	5.3	5.3
UU	1.5	1.5
NordForsk	11	0
VR	5.5	5.5
Sum base funding	30	29.8 – 6.8 (OH) = 23
External grants	41	49
Total	71	72

Currently Nordita is in conversation with the host universities and the Swedish

Government trying to resolve the issue of missing 11 MSEK in the base funding. The UU funding consists of 0.75 MSEK from the Faculty of Science and Technology (TekNat) and 0.75 MSEK from the Department of Physics and Astronomy (IFA).

4 Activities involving UU: 2018 - 2025

Since Nordita moved to Stockholm in 2007, UU got very closely involved in different activities at Nordita. Below is a short summary of activities between Nordita and UU concentrating on the last years. For more detailed information, please see Nordita's homepage: <https://nordita.org>

4.1 Joint large excellence grants between UU and Nordita

Joint KAW project grant 2013 “Dirac Materials”: 32 MSEK over 5 years; Main PI: Alexander Balatsky (Nordita/KTH) Co-PIs: Annica Black-Schaffer (UU), Oscar Tjernström (KTH), Floriana Lombardi (Chalmers), Johan Åkerman (Göteborg)

Joint KAW project grant 2015 “Exact Results in Gauge and String Theories”: 34 MSEK over 5 year; Main PI: Joseph Minahan (UU), Co-PI: Konstantin Zarembo (Nordita)

Joint KAW project grant 2018 “From Scattering Amplitudes to Gravitational Waves”: 19 MSEK over 5 year; Main PI: Henrik Johansson (UU), Co-PI: Paolo Di Vecchia (Nordita)

Joint KAW project grant 2019 “Dynamic Quantum Matter”: 28MSEK over 5 years; Main PI: Alexander Balatsky (Nordita/KTH) Co-PIs: Annica Black-Schaffer (UU), Emil Bergholtz (Stockholm), Jens Bardarson (KTH), Stefano Bonetti (Stockholm)

4.2 Joint positions

Roope Uola, joint BUL in quantum information science starting Dec 2024. Position is funded 80 % by Nordita/WINQ for the first five years and also includes a start-up package consisting of 2 Ph.D. students and 1 postdoc. The Ph.D. students will be UU students, but primarily work at Nordita.

Dmytro Volin, joint UL with Nordita, Aug 2018 - Aug 2020 fully at Nordita following two years at UU with the funding provided by joint KAW grant with Nordita.

Henrik Johansson, joint UL with Nordita 2014 - 2019 funded by Wallenberg Academy Fellows grant, since 2019 Corresponding Fellow at Nordita, guest researcher at Nordita and UL at UU.

There are further a constant flow of postdocs between UU and Nordita, with multiple Nordita postdocs working one or more days per week at UU and vice versa, as well as regular meetings, seminars and working groups involving the junior members of UU and Nordita.

4.3 Program and conference organization

Below is a short list of the scientific programs, workshop, and conferences which have been organized at Nordita by staff from UU since 2017. For more details and a list of older activities, please see <https://nordita.org/events/all-events>

Nordita Program “Topology and geometry beyond perfect crystals: moiré, quasicrystals, disorder, and amorphous systems” 26 May - 15 June 2025. Organizers: Annica Black-Schaffer (UU), Jens Bardarson (KTH), and Adolfo Grushin (Institute Néel CNRS).

Nordita Workshop “33rd Nordic Network Meeting on ”Strings, Fields and Branes” 29 - 31 October 2024, Organizers: Henrik Johansson (UU), Konstantin Zarembo (Nordita), Magdalena Larfors (UU), Paolo Di Vecchia (Nordita), Watse Sybesma (Nordita).

Nordita Program “Extragalactic and galactic neutrino astronomy ” 8 - 26 July 2024, Organizers: Christian Glaser (UU), Erin O’Sullivan (UU), Carlos Perez de los Heros (UU), Chad Finley (SU), Evan O’Connor (SU).

Nordita Winter School 2024 in Particle Physics and Cosmology 15 - 26 January 2024, Coordinators: Florian Niedermann (Nordita), Henrik Johansson (UU), Olof Ohlsson Sax (Nordita), Paolo Di Vecchia (Nordita), Konstantin Zarembo (Nordita), Alexander Krikun (Nordita), Michele Del Zotto (UU)

Nordita Workshop “Materials for Quantum Technologies”, 11 - 12 December 2023. Organizers: Annica Black-Schaffer (UU), Alexander Balatsky (Nordita), Floriana Lombardi (Chalmers), and Jason Haraldsen (North Florida).

Nordita Program “Categorical Aspects of Symmetries” 14 - 25 August 2023, Orga-

nizers: Michele Del Zotto (UU), Ken Intriligator (UCSD), Muyang Liu (Southern Denmark U), Nicolai Reshetikhin (Beijing)

Nordita Program “Amplifying Gravity at All Scales” 26 June - 21 July 2023, Organizers: Henrik Johansson (UU), Oliver Schlotterer (UU) Alessandra Buonanno (Max Plank), Andrea Puhm (Amsterdam U), Daniel Baumann (Cambridge), John Joseph Carrasco (Northwestern U), Paolo Di Vecchia (Nordita), Zvi Bern (UCLA)

Nordita Workshop Di Vecchia-80 Fest 15 - 16 May 2023, Organizers: Henrik Johansson (UU), Konstantin Zarembo (Nordita), Niels Obers (Nordita), Oliver Schlotterer (UU).

Nordita Workshop “From Amplitudes to Gravitational Waves” 24 - 28 July 2023, Organizers: Henrik Johansson (UU), Oliver Schlotterer (UU) Alessandra Buonanno (Max Plank), Andrea Puhm (Amsterdam U.), Daniel Baumann (Cambridge), John Joseph Carrasco (Northwestern U), Paolo Di Vecchia (Nordita), Zvi Bern (UCLA).

Nordita Workshop “Is there still room for naturalness?” 19 - 29 April 2022, Organizers: Rikard Enberg (UU), Elin Bergeås Kuutmann (UU), Sara Strandberg (SU), Jörgen Sjölin (SU), Gabriele Ferretti (Chalmers), David Milstead (SU).

Nordita Workshop 30th Nordic Network Meeting on ”Strings, Fields, and Branes” 22 - 24 November 2021, Organizers: Paolo Di Vecchia (Nordita), Henrik Johansson (UU), Agnese Bissi (UU), Marco Chiodaroli (UU)

Nordita Workshop “Challenges in Theoretical High-Energy Physics”, 23 - 27 September 2019, Coordinators: Agnese Bissi (UU), Valentina Giangreco Puletti (Iceland U), Magdalena Larfors (UU), Marta Orselli (Niels Bohr)

Nordita Program “Topological quantum matter: from low-temperature physics to non-equilibrium dynamics” (also funded by a VR conference grant), 29 July - 23 August 2019. Organizers: Annica Black-Schaffer (UU), Jens Bardarson (KTH), Emil Bergholtz (Stockholm U.), Jan Carl Budich (TU Dresden) and Roni Ilan (Tel Aviv).

Nordita Conference on Integrability in Gauge and String Theories 2019 15 - 19 July 2019, Organizers: Valentina Giangreco Marotta Puletti (Iceland U), Monica Guica (Saclay), Henrik Johansson (UU), Joseph Minahan (UU), Olof Ohlsson Sax (Nordita), Dmytro Volin (UU), Konstantin Zarembo (Nordita), Michelangelo Preti (Nordita).

Nordita Conference “Mathematical physics of anyons and topological states of matter” 11 - 16 March 2019, Organizers: Douglas Lundholm (UU), Michele Correggi (Politecnico Milano), Nicolas Rougerie (CNRS Grenoble).

Nordita School Nordita Winter School 2019 in Theoretical Particle Physics, 21 - 31 January 2019, Organizers: Paolo Di Vecchia (Nordita), Henrik Johansson (UU), Olof Ohlsson Sax (Nordita), Dmytro Volin (UU), Konstantin Zarembo (Nordita)

Nordita Workshop QCD Meets Gravity IV, 10 - 14 December 2018, Coordinators: Henrik Johansson (UU), Agnese Bissi (UU), Marco Chiodaroli (UU), John Joseph Carrasco (Northwestern U)

Nordita Workshop “Dynamics of quantum matter”, 10 - 14 December 2018. Organizers: Annica Black-Schaffer (UU), Alexander Balatsky (Nordita), Jonas Weissenrieder (KTH), Johan Hellsvik (Nordita), Jens Bardarson (KTH), Philip Hoffmann (Aarhus), and Jason Haraldsen (North Florida).

Nordita Conference “International workshop on multifunctional Dirac materials”, 20 - 22 November 2017. Organizers: Heike Herper (UU), Biplab Sanyal (UU), Barbara Brena (UU), Alexander Balatsky (Nordita).

Nordita Conference “Frontiers of topological quantum matter”, 1 - 5 May 2017. Organizers: Annica Black-Schaffer (UU), Jens Bardarson (KTH), Emil Bergholtz (SU).

5 Motivation for continued UU support for Nordita

Nordita continues to be a very strong international brand broadly within theoretical physics and has a substantial portfolio of external funding, including grants from ERC, Wallenberg, and VR. Still, Nordita is in a complicated financial situation in terms of its base funding, which is essential for its core operations. We judge that it is crucial to continue the UU support at least the present level. From the point of view of UU, the following reasons should be stressed for continued support from UU:

- The financial support allows us to be a host university for Nordita. UU thereby has an observer place on the Nordita governing board and can thus influence the decisions taken by the board.
- Being one of the three host universities allows Nordita staff to easily work also at UU and thus enrich our local environment. Currently this is used by multiple Nordita postdocs and assistant professors, across the theoretical programs at IFA.
- Due to its international reputation, Nordita allows us to attract and retain top international staff (at all levels) and write stronger grant applications, including jointly with Nordita staff.

- Nordita/WINQ has allowed us to just recently do a top young recruitment in a field (quantum information theory) we are not strong in, i.e. Nordita directly enables us to build an activity in a field that is growing rapidly, something we could not have done ourselves.

Looking into the future, we envision the last point to be one of Nordita's key aspect to us: helping us to move into new expanding fields where we should be but cannot get to ourselves. This of course requires Nordita to continue to be agile about finding such fields and funding for it, such as the current multi-year WINQ (Wallenberg initiative for networks and quantum information) center based at Nordita.