

Nordic and Baltic Neutron Scattering Communities, 2008-2024

- A bibliometric study

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17 Aug. 2026

0. Perspective and scope of the investigation

This document presents and discusses bibliometric information to investigate the present situation in the Nordic and Baltic scientific environment within neutron scattering science. The investigation is a part of a larger effort around the Nordic/Baltic involvement in the European Spallation Source (ESS). The investigation is organised by the Nordic Neutron Science Program, NNSP, under NordForsk.

We perform a bibliometric investigation of the publications produced by the five Nordic countries: Denmark, Norway, Sweden, Finland, and Iceland – as well as the three Baltic countries: Estonia, Latvia, and Lithuania. Our investigation concerns publications dealing with neutron scattering, including instrumentation, data collection, and analysis. In addition, theoretical work is included if it is specific to the experiments, i.e. prediction or modelling of experimental neutron data. However, the use of neutrons for fusion, nuclear and particle physics as well as for element analysis by nuclear activation analysis (NAA or PGAA) is excluded. The use of “ultra-cold” neutrons for e.g. fundamental studies of quantum mechanics is excluded as well. The present report is an update of a series of previous reports. The present work covers a 17-year period from 2008 to 2024, inclusive of both.

The report shows that there is a general tendency for the publication output and the size of the scientific communities in neutron scattering, to increase in both Denmark and Sweden. The Swedish increase happens primarily at ESS, where the community has almost doubled over the last 6 years. The Danish increase continued to around 2020 and the community size is since mostly steady. The community size in Norway shows a slowly increasing trend. The communities in Finland and Iceland are much smaller and constant. In the Baltic countries the communities are small, but Estonia has achieved a fair increase in the community size over the last decade.

Due to a current major data restructuring, the current report differs from those of previous years in that:

- Articles from 2024 are categorised using up to three “Topic” and “Type” tags, where they only had one of each for previous years.
- Specific numbers cannot be compared directly to those reported in previous years.
- Due to data availability, the current report only includes data as far back as 2008, not 2006.
- We do not include the separate count of high-impact articles

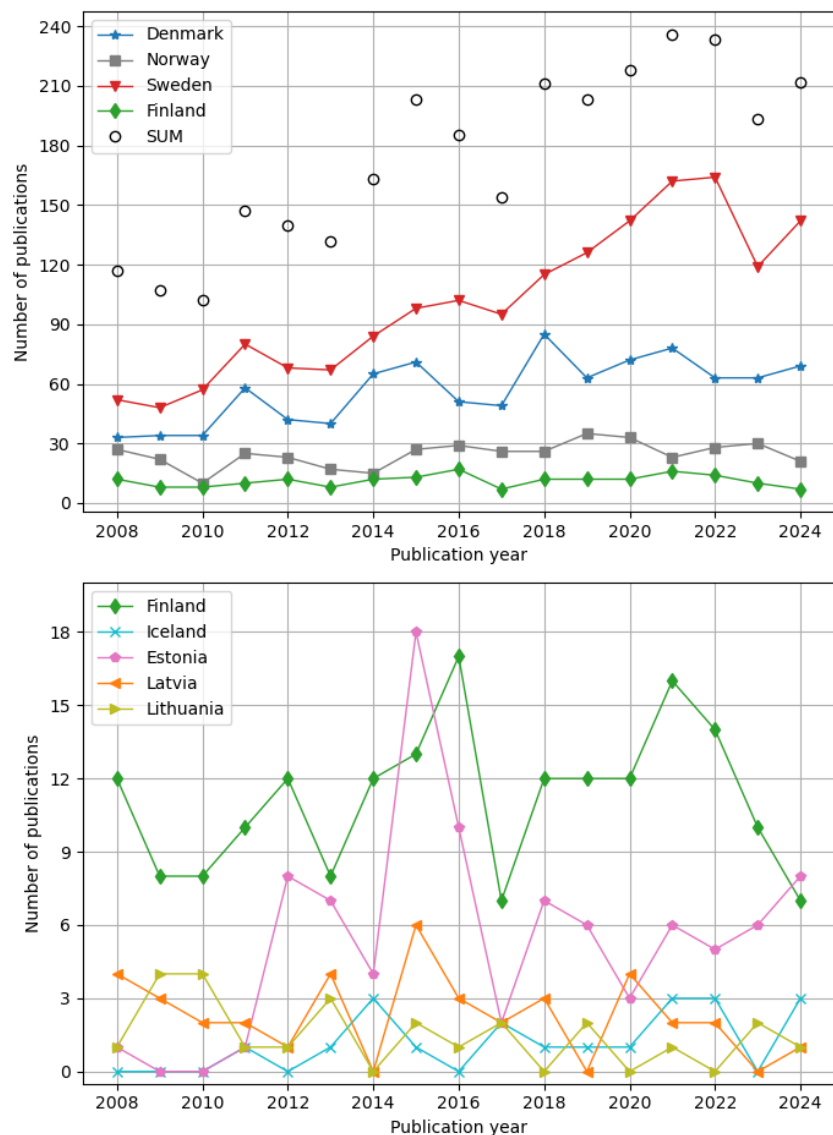
1. Neutron Scattering articles

An analysis of neutron scattering papers published in the period of 1/1-2008 to 31/12-2024 is presented in this section. All peer-reviewed articles have been counted for every Nordic/Baltic country within each year.

Most data have been found through ISI Web of Science: using a selection of neutron-related keywords. Abstracts were read to remove false searches, and potential articles were studied further to be classified according to the type of neutron science they are based on and for the origin of the neutron sources used. In addition, the Journal of Neutron Research has been searched manually since this journal, until recently, did not appear in ISI Web of Science.

The table below contains articles from the last 5 years. In appendix 1.A the table shows from 2008-2024. In the period 2008-2024 our analysis found, in total, 2952 articles. The articles have been classified by country and year of publication. In the sums, publications with authors from more than one Nordic/Baltic country are counted only once. Nordic/Baltic collaborations are discussed further in section 3.

Year/Country	2020	2021	2022	2023	2024	SUM last five years	SUM all years
DK	72	78	63	63	69	345	967
NO	33	23	28	30	21	135	417
SE	142	162	164	119	142	729	1718
FI	12	16	14	10	7	59	190
IS	1	3	3	0	3	10	20
EE	3	6	5	6	8	28	92
LV	4	2	2	0	1	9	39
LT	0	1	0	2	1	4	25
SUM	218	236	233	193	212	1092	2952



The data from all years are presented in the two figures above. In the top figure, blue represents Denmark, grey Norway, and green Finland. In the bottom figure, Finland is green, while Estonia, Latvia, and Lithuania are pink, orange, and olive, respectively. Cyan symbols represent Iceland.

Sweden has the largest publication number with Denmark being at approximately 50% of this value. Norway reaches 25% of Sweden, Finland is at 10%. Estonia is on average at 5%.

2. Neutron community, time development, and present location

The approximate size of the neutron scattering communities in the respective countries is listed here. The neutron community was defined to consist of the authors (current total 622 persons) with at least two neutron-related publication within the last 5 years. The authors were divided into three categories:

- **Infrequent users** with 2-4 publications. This would typically cover scientists new to the field, or where neutrons are one among several techniques, as well as new poPhD students close to the end of their studies.
- **Frequent users** with 5-9 publications. This would typically be professors or staff scientists working with neutrons as one of their research techniques, post docs within the field or very talented PhD students.
- **Expert users** with 10+ publications. This is typically professors or staff scientists with particularly strong neutron expertise or post docs specializing in neutron scattering and with a strong scientific potential.

The tables below cover the 5-year period from 2020 to 2024. The staff at ESS was separated from the rest of the Swedish scientists to highlight the direct effect of this facility. The sizes of the national communities are roughly proportional to the number of publications. The core of the Nordic/Baltic communities (the frequent and expert users) presently counts 189 scientists.

Authors with addresses in multiple countries are counted once per country but only appear as one person in the total sum.

Author type	Infrequent (2-4)	Frequent (5-9)	Expert (10+)	SUM
DK	116	33	20	169
NO	43	8	7	58
SE, excl. ESS	197	54	28	279
SE, ESS only	67	29	24	120
FI	13	3	0	16
IS	2	1	0	3
EE	14	3	2	19
LV	3	2	0	5
LT	0	0	0	0
SUM	433	120	69	622

We see that the neutron expertise is clearly concentrated in Sweden, which hosts around 65% of the Nordic community, with Denmark at just over 25%, Norway at 10% and Finland/Estonia each at 3% (the numbers do not sum to 100% for reasons explained above).

The tables on the next pages cover the distribution of the communities in all 8 countries into their affiliations. Authors are counted under any address they have published under during the five-year period (2020-2024). Authors with more than one affiliation are counted in all of them.

17 institutions are found to have at least 10 neutron users; 9 of these are in Sweden.

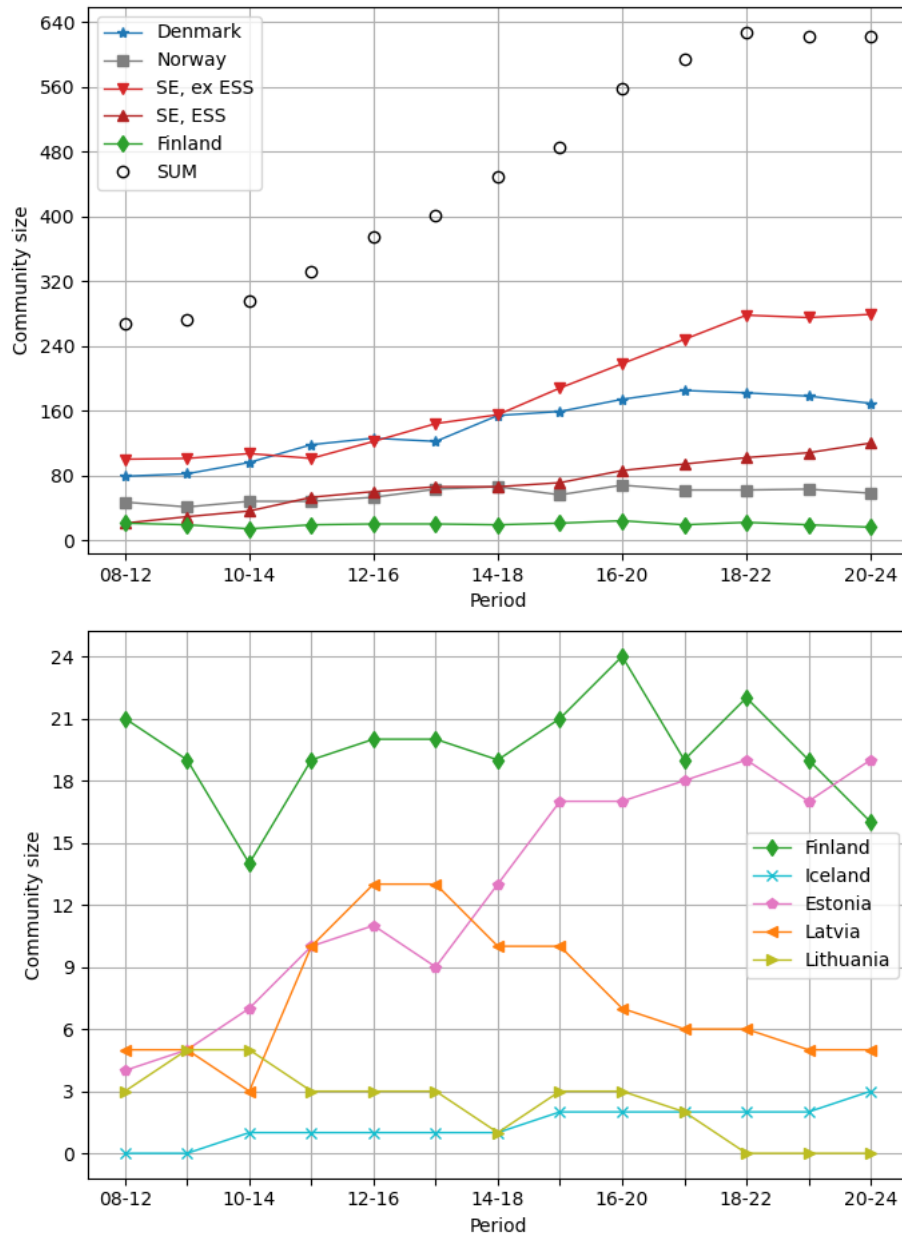
Denmark	Infrequent (2-4)	Frequent (5-9)	Expert (10+)	SUM
DTU (Lyngby)	30	8	5	43
KU (Copenhagen)	47	18	10	75
AU (Aarhus)	27	8	4	39
SDU (South Denmark)	3	1	0	4
AstraZeneca	2	0	0	2
ESS DMSC	6	2	2	10
AAU (Aalborg)	4	1	1	6
Subra	2	0	0	2
Novo Nordisk	0	1	0	1
Ferring Pharmaceuticals	1	0	0	1
RUC (Roskilde)	2	2	0	4
Danish Fundamental Metrol	1	2	0	3
DTI (Technol. Institute)	3	0	0	3
Saltfoss (Previous Seaborg)	0	0	1	1
Force Technologies	1	0	0	1
Copenhagen Atomics	1	0	0	1
Norway				
UiO (Oslo)	14	5	1	20
UiS (Stavanger)	2	2	0	4
IFE	11	1	6	18
NTNU (Trondheim)	12	0	2	14
Cerpotech	1	0	0	1
Ceramic Powder Technologies	1	0	0	1
Hystorsys	0	0	1	1
Justervesenet	1	0	0	1
SINTEF	2	0	0	2
UiB (Bergen)	1	0	0	1

IDEAS	1	0	0	1
Sweden	Infrequent (2-4)	Frequent (5-9)	Expert (10+)	SUM
ESS	67	29	24	120
LU (Lund)	50	22	14	86
KTH (Stockholm)	26	6	7	39
RISE	6	1	1	8
SU (Stockholm)	22	5	2	29
LTU (Linköping)	1	0	0	1
UmU (Umeå)	8	1	2	11
MAU (Malmö)	8	6	4	18
UU (Uppsala)	52	15	7	74
KI (Karolinska)	0	3	0	3
Linköping University	19	4	3	26
CTH (Chalmers, Göteborg)	21	9	5	35
MAX IV Lab	4	2	1	7
Enza Biotech	0	2	0	2
Saromics Biostructures	1	0	0	1
Swedish Res Council	1	0	0	1
GU (Göteborg)	1	0	0	1
Addit Composite Uppsala	1	1	0	2
ORU (Örebro)	0	1	0	1
AlbaNova	4	0	0	4
Westinghouse Elect	1	0	0	1
Studsvik	2	0	0	2
Norconsult	1	0	0	1
Swerim	3	0	0	3
Vetenskapens Hus	1	0	0	1
Svensk Kärnbränslehantering	1	0	0	1
Impact Coatings	0	1	0	1

Linköping University	0	1	0	1
HV	2	0	0	2
Finland	Infrequent (2-4)	Frequent (5-9)	Expert (10+)	SUM
Aalto University	5	2	0	7
University of Oulu	2	0	0	2
ÅAU (Åbo)	2	1	0	3
Turku Bioscience	1	0	0	1
VTT	2	0	0	2
LUT (Lappeenranta)	2	0	0	2
Iceland				
HI	2	1	0	3
Estonia				
UT (Tartu)	9	3	2	14
KBFI	5	0	0	5
Latvia				
University of Latvia	3	2	0	5
Lithuania				
Vilnius State Univ.	0	0	0	0

Below, the development of the Nordic/Baltic communities is shown over time. The numbers represent the total community, while the numbers in parentheses denote the sum of frequent and expert users.

Comm. Size	2008- 2012	2009- 2013	2010- 2014	2011- 2015	2012- 2016	2013- 2017	2014- 2018	2015- 2019	2016- 2020	2017- 2021	2018- 2022	2019- 2023	2020- 2024
DK	79 (27)	82 (28)	96 (32)	118 (43)	126 (43)	122 (47)	154 (54)	159 (58)	174 (52)	185 (60)	182 (58)	178 (58)	169 (53)
NO	47 (14)	41 (14)	48 (12)	48 (15)	53 (12)	63 (13)	66 (13)	56 (13)	68 (12)	62 (14)	62 (13)	63 (14)	58 (15)
SE, ex ESS	100 (29)	101 (25)	107 (27)	101 (30)	122 (34)	144 (39)	155 (45)	188 (51)	218 (67)	248 (67)	278 (73)	275 (76)	279 (82)
SE, ESS	21 (8)	29 (16)	36 (19)	53 (27)	60 (29)	66 (33)	66 (41)	71 (43)	86 (43)	94 (58)	102 (55)	108 (51)	120 (53)
FI	21 (0)	19 (1)	14 (3)	19 (5)	20 (6)	20 (6)	19 (7)	21 (4)	24 (2)	19 (4)	22 (4)	19 (4)	16 (3)
IS	0 (0)	0 (0)	1 (0)	1 (0)	1 (0)	1 (1)	1 (1)	2 (0)	2 (0)	2 (1)	2 (1)	2 (0)	3 (1)
EE	4 (0)	5 (1)	7 (1)	10 (3)	11 (3)	9 (3)	13 (4)	17 (4)	17 (4)	18 (4)	19 (5)	17 (5)	19 (5)
LV	5 (0)	5 (0)	3 (0)	10 (0)	13 (0)	13 (0)	10 (0)	10 (0)	7 (0)	6 (0)	6 (2)	5 (2)	5 (2)
LT	3 (0)	5 (0)	5 (0)	3 (0)	3 (0)	3 (0)	1 (0)	3 (0)	3 (0)	2 (0)	0 (0)	0 (0)	0 (0)
SUM	267 (72)	273 (77)	296 (84)	332 (103)	375 (106)	401 (116)	449 (141)	486 (146)	558 (159)	594 (188)	628 (191)	623 (190)	622 (189)



The data from the table is presented graphically in the two figures above. In the first plot, the black circles represent the sum of the Nordic and Baltic countries. In the second plot, Finland is presented along with Iceland and the three Baltic countries. The data shows an increasing tendency in the Nordic/Baltic communities; a 130% increase over the past 12 years. The increase is caused by 3 clear tendencies: 1) the community size for Sweden excluding ESS has almost tripled, 2) the number for Denmark has doubled although it has stagnated since 2020 and 3) the number for ESS has tripled and is still rapidly increasing. Estonia (pink) shows an increase as well, although this has stagnated in the recent years. Finland (green), and Iceland (cyan), show hardly any significant changes over the period. Latvia (orange) and Lithuania (olive) have decreased quite to very low numbers in the last five years.

By studying the numbers closer, the significant increase in Denmark's numbers until 2020 is seen to be

caused equally by the increase in PhD students and post docs as well as the attraction of new permanent staff. The slightly decreasing tendency in the Danish numbers since 2021 will be analysed separately.

3. Nordic-Baltic collaborations

The number of articles that feature authors from at least two Nordic/Baltic countries are listed here. Here they are listed for the last 5 years, and in appendix 3.A the numbers are specified for the full period, 2008-2024.

Year	2020	2021	2022	2023	2024	SUM (last 5 years)	SUM (all years)
Denmark/Estonia		1				1	1
Denmark/Finland				2		2	6
Denmark/Finland/Norway			1			1	2
DK/FI/N/S	1	2		1		4	6
Denmark/Finland/Sweden		1		1		2	2
Denmark/Iceland/Sweden		1				1	1
Denmark/Lithuania/Sweden						0	2
Denmark/Norway	1	6	2		1	10	29
Denmark/Norway/Sweden	6	1	3	3	1	14	24
Denmark/Sweden	25	28	23	20	31	127	290
Estonia/Latvia						0	7
Estonia/Norway						0	1
Estonia/Sweden		1	2		1	4	5
Finland/Norway	1					1	8
Finland/Norway/Sweden				1		1	5
Finland/Sweden	1	2	7		1	11	21
Iceland/Norway/Sweden	1					1	1
Iceland/Sweden		2	2		2	6	10
Lithuania/Norway						0	1
Lithuania/Sweden					1	1	4

Norway/Sweden	4	3	2	2	1	12	43
SUM	40	48	42	30	39	199	469

A significant number of collaborations between the countries can be seen. Around 16% of all publications in the investigations are with collaborations within the Nordic/Baltic countries.

The largest number of collaborative works is on the axis Denmark-Sweden with around 25 publications annually. The Denmark-Norway, Norway-Sweden and Sweden-Finland combination seen as well; each with around 2-3 annual publications.

We expect the collaboration patterns involving Norway to change due to the recent establishment of the Norwegian activity at PSI.

4. Scientific themes

The distribution of all articles according to different scientific themes is presented here, as given by the ILL categorizing into “colleges”. The categorizing is performed by our own judgement after studying the abstract of each article, or the full article in case of doubt. We have merged the ILL college 6: “glass and liquid dynamics” with college 7: “materials dynamics” and split the ILL college 1 into three: “Engineering”, “Earth science”, and “Instrumentation”. As for the other ILL colleges: Theory (coll. 2) is not a separate field in this investigation: it is distributed in the corresponding scientific themes, whereas Nuclear and Particle Physics (coll. 3) is altogether not included in this report.

To illustrate the latest trends, a count of articles for the last five years (2020-2024) is shown in grey.

	Hard Conden sed Matter	Materi al Dynam ics	Magne tic Struct ure	Magnet ic Dynam ics	Soft Conden sed Matter	Engi- neeri ng	Life Scienc es	Method s and Instru- mentati on	Data Scien ce	Eart h Scien ce	Cultur al Herita ge
DK	139	95	150	116	129	50	116	179	12	3	1
DK (5y)	52	36	49	28	49	31	43	62	11	3	0
NO	160	34	45	16	77	39	29	17	2	4	1
NO (5y)	29	8	24	8	17	26	13	11	2	2	1
SE	341	154	206	71	316	149	222	272	22	9	2
SE (5y)	127	54	85	27	133	86	104	129	17	8	1
FI	47	19	27	8	39	16	29	6	0	1	0
FI (5y)	7	4	9	5	11	12	8	5	0	0	0
IS	2	6	9	0	2	0	1	1	0	0	0
IS (5y)	2	0	6	0	1	0	1	1	0	0	0
EE	20	10	19	17	11	5	12	1	0	0	0
EE (5y)	4	2	4	3	6	5	7	0	0	0	0
LV	3	5	8	0	3	13	0	7	1	0	0
LV (5y)	0	1	0	0	1	6	0	1	1	0	0
LT	5	2	3	2	6	1	6	0	0	0	0
LT (5y)	0	0	2	1	0	0	1	0	0	0	0
SUM	639	263	410	200	514	236	337	370	32	14	3
SUM (5y)	195	80	148	57	190	141	143	159	27	10	2

The recent Danish activities are quite evenly spread over the topics. Sweden has a similar spread as Denmark, although with less on (magnetic) dynamics. The most frequent topic occurring in Danish

neutron research is instrumentation, reaching 17% of the recent publications, which is comparable to the fraction of recent Swedish articles in this field. Norway has a clear strong point in structure of hard materials, engineering, and in soft matter. Finland has some activity in hard matter structure, magnetism and soft matter. Estonia has a relatively large activity in magnetism.

Overall, the research in Nordic/Baltic countries has most volume within hard condensed matter, soft condensed matter, and magnetic structure, whereas magnetic dynamics is comparably lower. Life sciences are well represented with 12% of the total publication volume, slightly higher than the international level (which is approaching 10%).

Looking at the numbers for all countries for the last five years compared to the total amount (17 years), there is a general increasing fraction of articles within data science and engineering, where articles from the last five years account for 84% and 59% of the total number of articles published within these fields, respectively. The increase in publications focusing on engineering is almost solely due to the expanding possibilities within neutron imaging. A decreasing trend within hard matter structure can also be seen. Each of the individual countries seem to follow the same overall trends.

5. Neutron scattering methods

The distribution of the articles on different neutron scattering methods is presented here. This division is mostly based upon the instrument classes. However, triple axis machines are grouped after their use: Inelastic measurements or single crystal diffraction. As a new addition to this investigation, each publication can be given several tags, so work *e.g.* containing both diffraction and inelasticity is counted in both categories.

The numbers in grey show the results for the last five years (2020-2024).

	Powder Diff.	Single Crystal diffraction	Stress/Strain diffract	SAN S	Reflectometry	Texture	Inelastic	Imaging	Instrumentation	Review, Book, Old Data	Theory
DK	136	84	6	149	59	0	194	60	108	80	101
DK (5y)	58	33	3	51	29	0	58	32	32	31	24
NO	170	21	14	88	18	0	39	11	12	37	19
NO (5y)	49	9	7	28	6	0	19	9	7	10	0
SE	338	72	55	311	252	1	217	96	194	116	106
SE (5y)	119	35	23	153	109	1	94	55	96	47	32
FI	40	21	2	41	10	0	19	4	4	20	36
FI (5y)	9	9	1	17	3	0	8	2	3	8	5
IS	2	0	0	3	8	0	1	0	0	1	6
IS (5y)	1	0	0	2	6	0	0	0	0	0	1
EE	29	8	0	12	0	0	27	0	1	8	9
EE (5y)	3	4	0	9	0	0	11	0	0	3	0
LV	5	0	0	3	1	0	5	11	6	4	4
LV (5y)	0	0	0	1	0	0	0	7	0	0	1
LT	8	0	1	2	10	0	1	1	0	1	1
LT	2	0	0	0	1	0	0	1	0	0	0

(5y)											
SU M	641	173	75	544	288	1	401	145	249	238	258
SU M (5y)	208	71	34	232	120	1	140	87	105	88	57

Norway is seen to have a relatively high activity in powder diffraction, and some in SANS, which reflects the instrumentation that was present at the Kjeller reactor. Denmark has a high publication volume within SANS and inelastic scattering, reflecting the two Danish instruments working at PSI 2001-2018.

Furthermore, Denmark and Sweden have much work within instrumentation related to ESS and within related theory. Sweden and Denmark also have significant activities within reflectometry, powder diffraction and inelastic scattering. Estonia has a relatively high activity within powder diffraction and inelastic scattering, while the Finnish activity is focused on (powder) diffraction, SANS and theory.

Looking at the activity of the last five years (2020-2024) compared to the total number (17 years), some new trends are showing. For Denmark, around 50% of articles published within stress/strain, reflectometry and imaging have been published within the last 5 years. Sweden has a relative increase in most categories, one of the exceptions being theory, where only 21% of the articles are published within the last five years. The methods single crystal diffraction, SANS, reflectometry, and instrumentation all have around 40% or more of the articles published within the last 5 years. Imaging has the largest increase with 60% of the publications being within the last 5 years, reflecting the large recent development in this new field. In Norway single crystal diffraction, inelastic scattering, and instrumentation have around 50% or more published within the last five years, with imaging even higher with above 80% published in the last five years. For the Baltic countries, no significant trend can be observed due to low publication numbers.

In general, across all countries, there is a notable increase over the last five years in the number of publications within the methods stress/strain diffraction, SANS, reflectometry and especially imaging.

6. Neutron sources

We here list the neutron sources used to obtain the data behind the Nordic/Baltic neutron publications. Experimental work as well as site-specific instrumentation is included. Some publications use data from several sources, in which case all used sources are counted. Only the publications that use original data are counted here; i.e. not theory and review papers. For all these reasons, the sums are different from the sums in the previous sections. Sources in parentheses are permanently closed. The numbers in the parenthesis show numbers for the last five years (2020-2024).

Country/Facility	DK	NO	SE	FI	IS	EE	LV	LT	SUM
ANSTO	34 (12)	11 (4)	83 (43)	5 (4)		2 (1)			120 (58)
BNC	7 (2)	2 (0)	4 (0)	2 (0)					15 (2)
CIAE		1 (1)	1 (1)						2 (2)
CSNS			3 (3)						3 (3)
(Chalk River)	4 (1)	1 (0)	4 (2)						7 (2)
Delft	10 (4)	2 (2)	9 (0)						16 (6)
Dhaka			1 (0)						1 (0)
Dhruva	1 (1)		5 (2)	1 (0)					7 (3)
Dubna	1 (0)	6 (1)	4 (1)	3 (1)		6 (1)	6 (0)		23 (4)
ESS	62 (21)	5 (3)	101 (54)	1 (1)			2 (0)		116 (54)
FRM2	48 (15)	18 (10)	92 (39)	12 (4)		6 (6)		3 (0)	159 (65)
(GKSS)	6 (0)	7 (0)	15 (1)	3 (0)					24 (1)
HFIR	12 (3)	4 (1)	14 (4)	2 (1)		2 (2)			34 (11)
(HZB)	47 (19)	12 (4)	75 (36)	3 (2)		12 (4)	8 (0)	1 (1)	130 (51)
ILL	227 (73)	68 (35)	462 (195)	54 (24)	6 (3)	23 (9)	4 (1)	4 (1)	698 (274)
IPEN				1 (1)					1 (1)
(IPNS)	3 (0)		2 (1)	2 (0)					6 (1)
IRR1			3 (1)						3 (1)
ISIS	119 (63)	64 (31)	373 (166)	17 (10)	3 (2)	5 (2)		6 (1)	489 (217)
J-PARC	13 (9)	3 (1)	27 (20)	1 (0)		1 (0)			39 (26)
JRR3	1 (0)								1 (0)
(Jülich)	1 (0)	1 (1)	4 (1)	2 (0)					8 (2)
KENS				1 (0)					1 (0)
(Kjeller)	11 (2)	104 (13)	11 (3)	3 (0)					106 (14)

L.E.N.A.			2 (2)						2 (2)
LANL	6 (1)	5 (1)	18 (3)	7 (0)					33 (4)
(LLB)	11 (4)	8 (2)	39 (18)	6 (0)		3 (1)	4 (1)	1 (0)	65 (23)
MURR	2 (0)		1 (1)						3 (1)
NIST	43 (14)	11 (7)	56 (22)		2 (1)	3 (0)		6 (1)	111 (37)
NPI	2 (0)	2 (0)	29 (14)	1 (0)					32 (14)
PNPI				2 (0)					2 (0)
PULSTAR				1 (0)					1 (0)
(SILOE)			1 (1)						1 (1)
SINQ	184 (46)	48 (22)	126 (51)	4 (1)	2 (2)	17 (1)	12 (6)	2 (0)	331 (108)
SNS	62 (34)	10 (6)	67 (36)	7 (4)	1 (1)	4 (2)			120 (62)
(Studsvik)	1 (0)	2 (1)	14 (1)						16 (2)
Swierk			1 (1)						1 (1)
Zarechny			3 (0)						3 (0)
SUM	918 (324)	395 (146)	1650 (723)	141 (53)	14 (9)	84 (29)	36 (8)	23 (4)	2730 (1053)

The most overall used neutron sources are ILL, ISIS and SINQ, together accounting for around 55% of the Nordic/Baltic activity.

For all years ILL is accounting for 25%, ISIS for 18% and SINQ for 12%. Within the last 5 years ILL is at 26% while ISIS has increased to 21% and SINQ has declined to 10%. These small relative differences are hardly significant.

We see the same trend for most Nordic countries, with ILL being the most used facility and ISIS and PSI coming in alternately as second and third, except for Norway, which overall have mostly used Kjeller (JEEP-3). However, following the close-down of Kjeller, this source has in the last 5 years been overtaken by ILL, ISIS, and SINQ. Denmark and Sweden are the largest ILL users (and the only members among the 8 countries).

For the Baltic countries we see that the most frequently used sources are also ILL and SINQ but here followed by the now closed HZB in third place.

The world leading source J-PARC show relatively low numbers. This is explained by the fact that the distance to Japan that will hardly allow sources in this region to be the first choice of facility for any

European experimental group, unless special instrumentation is required. However, around 70% of the publications based on J-PARC have been published within the last 5 years, showing increasing activity.

7. Conclusions

The Nordic/Baltic neutron scattering community counts 622 scientists who have in total published 1092 neutron-related articles over the last 5 years. There is a clear increasing tendency in the annual publication rate over this period of the investigation; this increase comes mainly from the staff at ESS and from Swedish universities. 16% of the publications are made in collaboration between two or more Nordic/Baltic countries, with a rather steady tendency.

The publications are spread over most of the “usual” scientific topics for neutrons. This indicates that the research is broadly spread in the different communities.

Notable development is found within the topics Earth Science and Engineering, where the publication volume was initially very low, but shows a healthy increase: 60% of the total articles have been published within the last five years. Life sciences show an increasing trend as well, but have a potential for even further development, given the Nordic/Baltic countries' general high standing in this research area. Over the last five years, there has also been an increase of publications within the topic of materials dynamics, while the trend for magnetic dynamics is the opposite.

There have been some recent changes in the neutron scattering methods most commonly by the Nordic/Baltic communities. Powder diffraction, SANS and inelastic scattering are the methods used the most overall. However, several methods have had more than 40% of articles written in the last five years, showing an increasing trend. This is especially true in stress/strain diffraction, reflectometry and imaging, the latter with a more than 60% of articles published in the last five years.

The main neutron source used for obtaining the results is the ILL, which accounts for 25% of the (source-related) publications. In addition, Norway has had a strong use of JEEP-3 before its closure, Sweden of ISIS and Denmark of SINQ. This reflects the facilities with which the countries have (had) a particular collaboration due to an investment and the operation of neutron instrumentation. These instrument operations are clearly linked to the scientific strong points of each country. We expect the planned Norwegian establishment at SINQ to be reflected in these statistics within a few years.

8. Appendix

Here we have included tables from 2008 to present.

1.A – number of articles

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	SUM all years
DK	33	34	34	57	42	40	64	71	51	49	84	63	72	78	63	63	69	967
NO	27	22	10	25	23	17	15	27	29	26	26	35	33	23	28	30	21	417
SE	52	48	57	79	68	66	84	98	102	95	114	126	142	162	164	119	142	1718
FI	12	8	8	10	12	8	12	13	17	7	12	12	12	16	14	10	7	190
IS	0	0	0	1	0	1	3	1	0	2	1	1	1	3	3	0	3	20
EE	1	0	0	1	8	7	4	18	10	2	7	6	3	6	5	6	8	92
LV	4	3	2	2	1	4	0	6	3	2	3	0	4	2	2	0	1	39
LT	1	4	4	1	1	3	0	2	1	2	0	2	0	1	0	2	1	25
SUM	117	107	102	146	140	131	162	203	185	154	210	203	218	236	233	193	212	2952

3.A – Collaborations

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	SUM
Denmark/Estonia														1				1
Denmark/Finland		1	1						2							2		6
Denmark/Finland/Norway												1			1			2
DK/FI/N/S												2	1	2		1		6
Denmark/Finland/Sweden														1		1		2
Denmark/Iceland/Sweden														1				1
DK/Lithuania/S			2															2
Denmark/Norway	1	1	1	4		1	2		1	2	3	3	1	6	2		1	29
Denmark/Norway/Sweden	1			2	1	1			1	1	1	2	6	1	3	3	1	24
Denmark/Sweden	4	4	5	18	7	6	14	23	16	20	27	19	25	28	23	20	31	290
Estonia/Latvia	1					1		3	1		1							7
Estonia/Norway							1											1
Estonia/Sweden									1					1	2		1	5
Finland/Norway	1		1	1			1			1	1	1	1					8
Finland/Norway/Sweden	1							2				1				1		5
Finland/Sweden			1	2	2				1	1	1	2	1	2	7		1	21
Iceland/Norway/Sweden													1					1
Iceland/Sweden						1	1				1	1		2	2		2	10
Lithuania/Norway												1						1
Lithuania/Sweden		1						1		1							1	4
Norway/Sweden	2	5		2	4	4	1	2	4	4	2	1	4	3	2	2	1	43
SUM	11	12	11	29	14	14	20	31	27	30	37	34	40	48	42	30	39	469