

ACADEMIA EUROPAEA KNOWLEDGE HUB REGION BERGEN (*AEkhRB*) Annual Report: 2015



THE ACADEMY OF EUROPE
KNOWLEDGE HUB REGION BERGEN

The Hub office in the premises of Business Region Bergen (BRB) opened for Hub business *4 March 2014*, and has operated regularly after the official *Hub inauguration 30 May 2014*.

AEkhRB – MISSION STATEMENT (short version)

AEkhRB will act as the AE branch in The Nordic, Northeastern and Arctic regions, fostering scientific knowledge and research, especially, but not exclusively, develop, and run activities focussing upon the Northern Seas and Arctic Region.

Specifically the Hub will concentrate upon Northern Seas related European resources and opportunities, in particular:

- (i) energy, seafood and maritime logistics, and also threats associated with the fragile northern margins;
- (ii) all related sciences and the social sciences and humanities aspects of issues identified; also
- (iii) the ‘hub’ will provide access to facilities, equipment and personnel for use by the AE and [subject to any separate agreements] with the Young Academy of Europe (hereinafter, YAE), to enable the development of this association’s activities. The Hub has structured its start up work according to the mission statement.

Considering also food as energy, the Hub’s focus is on ENERGY CULTURE. Survival and development in the surprisingly habitable Northern parts of Europe has since early times depended on energy although other words were used, the concept energy being coined in recent centuries. Knowledge about and ability to use natural resources with wisdom, combined with awareness of the tracks of humanity in the landscape, are central in our times. Energy and power is a unifying element – our culture is an Energy Culture, also in our health services where beams of various kind for scanning and therapy are employed.

L.P. Csernai is the Hub’s energy project director, and is together with professor John Ludden (UK) the AE members of EASAC’s Energy Steering Panel.

REGULAR EVENTS ORGANIZED BY AEkhRB

BHAG Meetings: The Hub’s advisory group BHAG had 3 regular meetings in 2015.

TT – Hub Topical Talks were given in all 3 BHAG meetings in 2015. These talks open for MAE, MYAE and Hub associates (not necessarily MAE), have been important for trying out project ideas, and for forming the Hub team. The talks were as follows:

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Professor Jan S. Vaagen

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www.ae-info.org

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TT Bergen 25 February: “Topical Talk for MAE and Energy Forum, Prof. Jarle Berntsen Department for Mathematics UiB: “Ocean Power” / “Havkraft”.

TT Bergen 9 November : ““Thematic talk” from 1630-1730: “Accidental explosions in process industries - a real threat?” by – Prof. Rolf K. Eckhoff, IFT/UiB (MAE).

TT Bergen 15 December “Thematic talk” from 1630-1730: “Fermi’s paradox: Extra-terrestrial life?” by – Ph.D. Student Jesper Tveit, Institute for Physics and Technology, UiB and BKK



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PTT – Hub Public Topical Talks – often in joint venture with other organizations. An extended (two or more hours, more than 1 speaker) version of the regular (max 1 hour, normally 1 speaker) Topical Talk(s) (TT) * attended by MAE, YAE and Associates of the Hub, in conjunction with regular BHAG meetings. (*The ‘Forum’ for the TT, rooted in Bergen history, is referred to as *QuodLibet-AE*, ((ask) whatever you like), reflecting the open atmosphere.)

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PTT Bergen 25 November 2015 A. Erdal (UiB), D. Röhrich (UiB MAE), J.S. Vaagen (UiB, MAE) « *Da Bergen fikk materiens byggesteiner til å fly* » («When Bergen got the constituents of matter to fly»). Arranged in collaboration with Bergens Geofysikeres Forening and IFT University of Bergen, at Geophysics’ Institute and the Van de Graaff (BEAM) laboratory.

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OUTREACH TOOLS: CONSENSUS and NorSAC

28 November 2014: BHAG decided in its meeting to organize in the future **two new types of regular annual events (Summer programme):**

CONSENSUS (annual, early summer) – Public discussion (2 hours) in the spirit of the Nordic Model - analogue to Barcelona’s DISPUTATIO.

NorSAC (annual, late summer) – **Northern Seas Achievement Colloquium:** Colloquium (Symposium) to highlight Hub-mission related scientific achievement or achievement related to strengthening interplay between Northern Seas countries.

THEMES AND PROJECTS

The **Workplan of AEkHRB** is divided in **Themes (T)** reflecting the mission statement, and related projects (**P**) running, or to be initiated. Milestones reached or to be reached will be reported later. Themes and projects have emerged since start up in 2014, and suggestions scrutinized by BHAG, giving the list below, and a number of candidates for future consideration. A selection criterium at start up was links to ongoing BR activities, relations to the Hub Partners, i.e. mechanisms to help a fast start-up, while at the same time keeping in mind relevance for the wider Northern Seas region. Thus,

contacts with AE Sections have been useful to guarantee interest for the projects. Feedback from the London office has also been very useful. The Hub has already been/become partner in joint ventures, also guest on Nordic visits, and a future role as mentor seems to be an appreciated and a realistic ambition.

The Hub has made preparations (SWOT analysis) for possible future participation in AE's contribution to the EC Scientific Advice Mechanism (EC-SAM).

The list of themes and projects may be ordered as follows, where [acronym] indicates collaborators:

- T1 ENERGY AND SOCIETY – HISTORY and HERITAGE [HFK, UNESCO – UiB]
- T1-P1 Energy in the development of Northern Seas
- T1-P2 Energy, Environment and Cultural Heritage of Northern Seas
- T1-P3 Exploration and harvesting in Northern Seas; Reconstructing a Viking Age Energy culture

T2 ENERGY AND FOOD PRODUCTION [UNIS]

- T2-P1 CSHQ (Cold Seas – Hot Questions), *see Regional Members Meeting (RMM)*

T3 ENERGY IN SCIENCE [BKK, UiB]

- T3-P1 BEAM – Bergen Energy and Accelerator Museum, being upgraded to become candidate for European historical (Van de Graaff) laboratory and tailored for visitors. (*See PTT 25 November*)

UiB EIA Forvaltningsplan 10312 “Kjernefysisk Laboratorium”.

(See also T4-P2).

- T3-P2 Exploring the shores of fundamental matter

- T3-P3 Fluid calculation: From Fermi Sea to Northern Sea (*see Summer Programme 2015 – NorSAC 2015- T3-P2&P3*)

T4 ENERGY AND HEALTH [UiB, Helse Bergen]

- T4-P1 BEAMED – Linked to BEAM and the upcoming Bergen Particle Therapy centre and other present and future Northern Seas facilities. Promoting a joint venture culture between physical sciences/technology and medicine.

See Summer Programme 2015 (IIA Leonardi) and PTT 25 November.

- T4-P2 ROLF WIDERØE (Norwegian) – Progenitor of particle accelerators



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“BESATT AV EN DRØM – Historien om Rolf Widerøe”, (Driven by a Dream – The History of Rolf Widerøe), Aashild Sørheim, 2015 Forlaget Historie & Kultur AS(730p), ISBN:978-82- 8323-000-0,

Widerøe made constituents of matter fly, designing accelerators, atom smashers and devices for particle therapy like betatrons. Hub AcaDir Vaagen and Hub Associate Finn Aaserud (NBA, Copenhagen) have been associated with the book project since its origin. A less comprehensive Widerøe biography was published by Pedro Waloschek in German (Vierweg 1993). English and Russian translations are now also available.



T5 ENERGY AND POWER PRODUCTION [UiB, EnergyForum]

T5-P1 Competance transfer between fossil and non-fossil production

T5-P2 A (near) future for CCS and Mongstad?

T5-P3 HOPE – Hydro and Ocean Power and Energy (EASAC partner project?)

See TT 25 February & TT 9 November

T6 THE NORDIC MODEL IN A CHANGING WORLD [UiB, NHH]

T6-P1 Assessing dependence of NORDIC MODEL on energy/technology resources

See Summer Programme 2015- CONSENSUS

T7-P1 TASIII- Text, Action and Space (Literature) [UiB, AAU]

AD-Vaagen has had numerous meetings with collaborators and working teams linked to the projects, and participated in relevant conferences, in particular in the Niels Bohr Archive / Carlsberg. Vaagen followed by Csernai have served as AE representatives on the **EASAC** Energy Panel, thus integrating the Hub energy work with the joint European work.

PRELIMINARY SUMMER PROGRAMME 2016

CONSENSUS 10 June and Regional Members' Meeting (RMM) 11 June.

NorSAC (late August) «Atom smashers and Cancer Therapy Tools (Northern Contribution)»

HANSADAGENE i Bergen (The Hansa Days) 9-12 Juni 2016

10 June 2016 The HANSA WAY (I) - Networks for EUROPE (AE, UiB & HFK)

Hanseatic League - Networks for Europe - Northern Dimension and Impact

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CONSENSUS 2016 17:00 – 19:00

Has the Hansa impact on the development of modern Europe been under-rated?

11 June 2016 The HANSA WAY (II)

RMM 8:30 – 9:45

Regional Members Meeting (RMM) for AEkhRB

Gastronomic HANSA Knowledge Symposium 09:30 – 17:00

European Cultural impact of Hansa networks -Northern Component:

Gastronomic impact: with focus on the stockfish trade – and Bergen’s new UNESCO status

Related knowledge for trading, sailing and navigation



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SUMMER PROGRAMME 2015:
Narrative Summary and more details enclosed (enclosure 1)

**YEARLY EVENTS (OUTREACH TOOLS) ORGANIZED BY
AEKHRB**

AND ASSOCIATED COLLOQUIA



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I - REGIONAL MEMBERS' MEETING AND "CONSENSUS"
IA - ASSOCIATED COLLOQUIA – LINKED TO I

Bergen 17 June

Venue: Grand Selskapslokaler, Spisesalen
(Bergen Chamber of Commerce and Industry)

14:00-17:00

I.1 Regional Members' Meeting (RMM)

Presentation of Hub Themes for comments and suggestions:
J.S.Vaagen (Hub Aca Dir. MAE), 15 minutes.

Short presentations of selected Projects:

K. Ytre-Hauge (UiB), O.A. Misund (MAE), S.E. Larsen (MAE), 45
minutes.

Special Theme- The Arctic Dimension:

Energy; L.P. Csernai (UiB MAE), *Environment;* E. Jansen (UiB
MAE), *Law;* (E. Nordtveit, UiB)
3 x 15 minutes.

Time in between for mingling.

18:00-20:00

I.2 CONSENSUS 2015

Public discussion in the spirit of the Nordic Model –
analogue to Barcelona's DISPUTATIO
Open Public Meeting.

Theme and Question: The Nordic Model is generally understood as a
social system blending a market economy with a robust welfare
system. **Is the Nordic model fading – outdated?** What do we learn
from Piketty?

Chair: S. Cloetingh (AE President): Opening remarks for
CONSENSUS-2015

Convener (Co): K. Moene (UiO, MAE): Profiling Theme and Question
(20 minutes).

CONSENSUS Panel: Moderator=Convener, X (F.H. Aarebrot, UiB),
Y (R. Hannesson, NHH). Debate between X and Y moderated by Co
(40 min max).

Contributor: Alf Erling Risa (UiB)

Contributor: Eirik Schröder Amundsen (UiB)

Questions from Audience to CONSENSUS Panel, (20 min)

Closure of CONSENSUS-2015 by Chair

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II - NorSAC 2015
II A -ASSOCIATED COLLOQUIA – LINKED TO II

Bergen 29 July
Venue: Institute of Physics and Technology (IFT), UiB AUD B
09:00-17:00

II: NorSAC 2015

NorSAC2015 – Northern Seas Achievement Colloquium – Colloquium to highlight Hub mission-related scientific achievement or achievement related to strengthening interplay between Northern Seas countries.

EXPLORING THE SHORELINES OF FUNDAMENTAL MATTER

Lessons of the RNBT Collaboration after 25 years (1990-2015)

IFT UIB

.....

PERSPECTIVES

AE has become increasingly visible via its involvement in projects; an example is its role in the creation and operation of EASAC (European Academies' Science Advisory Council) and its topical (Energy, Environment, Biosciences) Steering Panels. Members of the Hub have served/serve on these panels and in Council. This with success has linked Academia closer to Europe's decision making. Europe is known for its BIG SCIENCE "factory" CERN, European scientists have, however, also joined up in smaller teams and created competitive multinational intra-European collaborations with success on the catwalk of science. So also in the Northern Seas region. This has also helped to get the Hub started; it has strengthened the European Idea, and ties between the nations, providing in a sense a science diplomacy. It has focused European technology investments, and development of conceptual tools has guided European research.

Academic research has the last few generations increasingly underpinned the successful development in this part of Europe, where The Nordic Model has been widely implemented (hence the name) and lessons learned, relevant for understanding Piketty's recent book *Capital in the Twenty-first Century*. Driven by findings of resources, in particular in the energy sector, also the Nordic welfare states now face changing times and new challenges, requiring insight that is ever more scientific. Members of YAE will find many important and interesting tasks lying ahead, keeping Europe competitive. The vision of the AEkhRB is to be mentor in this transformative venture.



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**ACADEMIA EUROPAE Knowledge Hub REGION BERGEN
STATEMENT OF ACCOUNT 2015**



Recipient: Academia Europaea Knowledge Hub Region Bergen

Contract Partners (AERB): BRB (Business Region Bergen – with City and County Council behind), UoB (The University of Bergen) and NHH (the Norwegian School of Economics)

Amount of grant (TOTAL) in 2015: EUR 105609

BREAKDOWN OF RECEIPTS – INCOME:

Specific grants provided by the 2014-2018 agreement:

Grant (transfer obligation to London) provided by the City, County Council and The University of Bergen via BRB, EUR 50 000 for 2015

***INCOME (TOTAL) EUR 105609**

BREAKDOWN OF EXPENDITURE:

Office + running costs	EUR 6944
Staff	EUR 23400
Ordinary Activities	EUR 11751
+ Travel costs 6669	
+ HAD "Payment" 6845	
Total Ordinary Activities	EUR 25265
Transfers:	
AE central office (London)	EUR 50000
*EXPENSES TOTAL	EUR 105609

BALANCE REMAINING EUR 0

**Summer programme (CONSENSUS and NorSAC + associated activities): Substantial additional travel and accomodation cost (approx.11500 EUROS) support for speakers was provided by science budgets available to Hub members in the organizing team. These numbers are not included in the reported budget. In addition NorSAC obtained Curien support of 1500 EUROS from AE (London).*

Bergen, January/April 2016

Prof. Jan S. Vaagen, Hub Academic Director

Vidar Totland, Hub Business Coordinator

Enclosure: Summer programme 2015

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**ACADEMIA EUROPAEA KNOWLEDGE HUB
REGION BERGEN (AEkhrB)**

SUMMER PROGRAMME 2015:

**YEARLY EVENTS (OUTREACH TOOLS) ORGANIZED BY
AEKHRB**

AND ASSOCIATED COLLOQUIA

**I - REGIONAL MEMBERS' MEETING AND "CONSENSUS"
I A - ASSOCIATED COLLOQUIA – LINKED TO I**

**II - NorSAC 2015
II A -ASSOCIATED COLLOQUIA – LINKED TO II**

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Bergen 17 June
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*Special Theme- **The Arctic Dimension:***

Energy; L.P. Csernai (UiB MAE), *Environment*; E. Jansen (UiB MAE), *Law*; (E. Nordtveit, UiB)
3 x 15 minutes.

Time in between for mingling.

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CONSENSUS-2015

Convener (Co): K. Moene (UiO, MAE): Profiling Theme and Question
(20 minutes).

CONSENSUS Panel: Moderator=Convener, X (F.H. Aarebrot, UiB), Y (R. Hannesson, NHH). Debate between X and Y moderated by Co (40 min max).

Contributor: Alf Erling Risa (UiB)
Contributor: Eirik Schrøder Amundsen (UiB)

Questions from Audience to CONSENSUS Panel, (20 min)

Closure of CONSENSUS-2015 by Chair



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Short narrative (Summary) by Acad. Dir. Vaagen.

Offshore Northern Seas activities have underpinned Nordic Model Practice in Northern Europe. A year after a drastic drop in oil price, addressing the CONSENSUS question “Is the Nordic Model fading – outdated?” was very timely, with new lessons learned.

The site of the event was the Bergen Chamber of Commerce. The convener K. Moene (UiO, MAE) and the main debaters F. Aarebrot (UiB) and R. Hannesson (NHH), born in Iceland, are all well-known; From science - linked to the Nordic Model; from leading Norwegian newspapers and from TV. They created an exciting atmosphere and exchange of viewpoints.

A consensus was reached that in times that are a’ changin’ (Bob Dylan), the Nordic model provides a standard for better understanding what is going on.

With the AE board and former AE president Lars Walløe present, and contributors to the associated three-day programme, CONSENSUS 2015 became an informative scientific colloquium, still accessible to a wider audience. Invited contributors among the audience helped to sharpen the questions. So did the contributions from members of YAE.

ASSOCIATED PROGRAMMES

IA - June 15-18 COLLOQUIA linked to RMM, CONSENSUS and AE
Board meetings

15 -16 June: Joint YAE/AE symposium on clean energy and climate modeling

Lynn Kamerlin (Uppsala U.): Welcome and introduction to YAE, and recent activities

Inga Berre (U. Bergen): Geothermal Energy

Sveinung Hagen (Statoil); Carbon capture and storage

Break

Nedjlejka Zagar (U. Ljubljana): Atmospheric energy distribution and climate models

Bjørn Olav Brandsdal (U. Tromsø): Hunt for living gold, Enzymes, extreme environments

Jonatan Klaminder (Umeå U.): Fishy behavior

16 June

Lynn Kamerlin (Uppsala U): Research reward, recognition and excellence: The example of Biomedicine

Joeren van der Sluijs (U. of Bergen): Decades of climate research, lessons for science.

André Mischke (Utrecht University): Matter of the early universe.

Eldar Heide (University of Bergen): Textual Information on Viking Age Maritime Technology

16 June, a.m.: EASAC/JRC meeting on Nuclear Energy and Management of Spent Fuel

Jan S. Vaagen (Academic Director, AE Bergen Hub) Introduction & welcome by host:

Ole Didrik Lærum (EASAC Scientific Council) Presentation of EASAC



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Dóra Dudás (Project Officer, JRC-EC, Brussels) Presentation of JRC,

Ákos Horváth (EASAC & dir. Center for Energy Research, Hungary) Nuclear Energy in Europe

Gunnar Buckau (EC) Presentation of the Council Directive (2011/Euratom) Community framework for the responsible and safe management of spent fuel and radioactive waste

Break

Pierre Kockerols, Senior Expert – Nuclear Safety and Security, Joint Research Centre, European Commission) Presentation of the joint report of EASAC and JRC on the “Management of the Spent Nuclear Fuel and its Waste”

Round table discussion / Questions & Answers

Chair: Laszlo P. Csernai (AE Council)

Øivind Berg (Senior Advisor, Institute for Energy Technology, Halden reactor, Norway)

Gunnar Buckau (Inst. for Trans uranium Elements, Joint Research Center – European Commission)

Selected talks are available at the

<http://acadeuro.b.uib.no/activities/meetings/> website.



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Bergen 29 July
Venue: Institute of Physics and Technology (IFT), UiB AUD B
09:00-17:00

II: NorSAC 2015

NorSAC2015 – Northern Seas Achievement Colloquium –
Colloquium to highlight Hub mission-related scientific achievement or achievement related to strengthening interplay between Northern Seas countries.

EXPLORING THE SHORELINES OF FUNDAMENTAL MATTER

Lessons of the RNBT Collaboration after 25 years (1990-2015)

IFT UIB

Programme

Chair: L.P. Csernai (Bergen MAE)

Øyvind FRETTE, Chair of Department: Welcome address

09:15 - 09:30

Auditorium B, Allégaten 66, Bergen

Morning: J.S. Vaagen (Bergen) MAE: Forming RNBT-Paradigmatic Lessons, Shore (Drip)-line Architecture

09:30 - 10:00

Auditorium B, Allégaten 66, Bergen

Morning: M.V. Zhukov (Gøteborg, Kurchatov): Hindsight on RNBT Scientific Highlights

10:00 - 10:30

Auditorium B, Allégaten 66, Bergen

Break

10:30 - 10:45

Bergen, Norway

Morning: D. Gridnev (FIAS, Frankfurt am Main): Magic of Few-Body Systems

Chair: Strottman

10:45 - 11:15

Auditorium B, Allégaten 66, Bergen

Morning: Questions, Remarks and Discussion involving the NorSAC Audience

11:15 - 11:45

Auditorium B, Allégaten 66, Bergen

Lunch Break

11:45 - 13:00

Bergen, Norway

Afternoon: E. Osnes (Oslo) MAE: Nordic Nuclear Theory in Retrospect

Chair: Röhrich

13:00 - 13:30

Auditorium B, Allégaten 66, Bergen

Afternoon: C. Joas (Copenhagen): Many-Body Physics in the 1950s and 1960s.

13:30 - 14:00

Auditorium B, Allégaten 66, Bergen

Afternoon: R. Leonardi (Trento): European Visions and Birth of ECT* in Trento

14:00 - 14:30

Auditorium B, Allégaten 66, Bergen

Break

14:30 - 15:00

Bergen, Norway

Afternoon: S. Ershov (JINR, Dubna): Excursion into Borromean Continuum



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Chair: Cheng

15:00 - 15:30

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Afternoon: G. Hagen (Oak Ridge Nat. Lab.): Advances in Coupled-Cluster Computations of Nuclei

15:30 - 16:00

Auditorium B, Allégaten 66, Bergen

Afternoon: D.D. Strottman (Fellow, Los Alamos Nat. Lab.): Perspectives of Nuclear Theory from Los Alamos

16:00 - 16:30

Auditorium B, Allégaten 66, Bergen

Break:

16:30 - 16:45

Bergen, Norway

Afternoon: L.P. Csernai (Bergen) MAE: What will the Future Contain?

Chair: Vaagen

16:45 - 17:30

Auditorium B, Allégaten 66, Bergen

Selected talks are available at the

<http://acadeuro.b.uib.no/activities/meetings/> website.



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Narrative (Summary)

Reporters (V&Z): J.S.Vaagen (Bergen, mae) & M.V. Zhukov (Göteborg/Moscow)

RNBT and the Borromean Paradigm

The letters **RNB** in the acronym RNBTtheory have a dual interpretation: A Regional; *Russian-Nordic-British* and a Topical; *Radioactive Nuclear Beam*, - theory aimed at studies of the architecture of the nuclear stuff at the drip-lines where atomic nuclei dissolve.

The collaboration is associated with **Borromean** nuclei. It coined this name, chose the three

Borromean rings as logo and developed successful quantum theory for the architecture of exotic three-body halo nuclei at the shore-lines of fundamental matter. In physics, the rings now represent a **paradigm**, an analogue model that helps understand formation of exotic structure of composite quantum matter. Annually numerous new references to the Borromean concept are made.

NorSAC portrayed a team of **theorists**. Theorists are no longer necessarily lonely wolves who expect a one-way relation where the experimentalists come to them for advice.

The RNBT story could not have been told unless the **experimentalists** had become close partners. Neither could it without complementary insights and gifts in the theory team, including ability to communicate with the experimental community.

Learning how to collide nuclei in Big Science accelerators, in particular the art of using radioactive secondary beams, has during the last decades taught us how to manipulate the nuclear stuff, how to subject it to extreme conditions. Harvesting from the shore-lines of the nuclear territory has challenged and enriched our understanding of the nuclear stuff – and the venture is far from completed.

GENCO Award

In 2004 V&Z, the two now oldest living RNBT pioneers, were awarded The **GSI Exotic Nuclear Community Membership Award** in Darmstadt, for

“Basic Contributions to the Theory of Exotic Nuclei and the Realization of the Borromean Principle in the Organisation of the West-East Collaboration”.
How is the latter part to be understood?

*RNB is a purpose directed collaboration (alliance) of three partners R&N&B based on complementary competence: Three Partners (Constituents) where each one needs the other two for reaching a certain overarching goal. Thus it is not favourable for any two to break away and form a binary alliance. The structure follows that of The Three Musketeers, One for all, all for one, i.e. the **Borromean binding principle**: A stable 3C linked architecture of 3 Constituents (Clusters), without any binary (2C) stable links. Each Partner may contain a number of member institutions, free to move in and out as long as the overarching competence is maintained. This gives flexibility, and a mechanism for fertilizing the society with RNB ideas, with proper reference expected. Students and Young scientists in substantial numbers have got training within RNBT, free to later leave, even to serve competitors.*



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Such Partner rights simplify work with experimentalists and laboratories, which often have their own house theorists. The Borromean “democratic” principle was important in the formation of RNBT during the **perestroika** in Russia (Soviet Union).



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Formation of RNBT in Turbulent Times

In 1987 RNBT pioneers **Bang** (Copenhagen) & **Vaagen**, wrote a letter to Gorbachev from the international centre JINR in Dubna, where they were guest researchers. The letter reminded Gorbachev of the glasnost in the early 1920s when famous Russians like Landau and Kapitsa had research stays in Bohr’s Copenhagen, and emphasized the advantages of returning to less restricted foreign travel as part of the perestroika. This would also ease the collaborative work of RNBT pioneers, who had already met frequently in Copenhagen and Dubna during the past decade.

The RNBT pioneers considered themselves mainly as quantum reaction theorists with few-body cluster competence. In 1985, the **Tanihata** group at Berkeley had discovered exotic light nuclei of gigantic size, produced in secondary radioactive beam experiments. The observation had only attracted attention from a small part of the theory community.

The structure was still not understood in 1987, when the idea that the Berkeley discovery was caused by a **nuclear halo**, was put forward by Jens **Bang** in a lunchroom conversation in Copenhagen with the experimentalists P. Gregers **Hansen** (Aarhus) and Björn **Jonson** (Göteborg, mae). Using a simple model, the two turned the idea into a *Europhysics Letters*, with proper reference to the discussion with Bang, and to Russian pioneering work by Migdal and Efimov.

Thus the name halo nuclei came into being, what remained was a proper quantum mechanical explanation, in particular for halos with two nucleons, which required a 3-body treatment, in general considered notoriously difficult. This became the homefield of RNBT, a self-organized structure of friends, that grew in size.

The name **Borromean** appeared in RNBT’s most cited publication, **Physics Reports 231(1993)**, having already been used internally in the team. In NorSAC 2015 **Vaagen** and **Zhukov** outlined the formation of RNBT and paradigmatic lessons, and gave hindsight on scientific highlights, all in a style accessible for a wider audience. The youngest of the pioneers present, Sergey **Ershov** (Dubna), gave a perspective on running investigations of the Borromean continuum – open quantum systems.

Professors Eivind **Osnes** (Oslo, mae) and Renzo **Leonardi** (Trento) positioned RNBT in the Nordic theory context, the role of NORDITA, and in the creation of the European theory centre ECT* in Trento 1992/93. The great success of ECT* calls for a comprehensive historical hindsight.

Late RNBT pioneers Jens Bang (Copenhagen), Boris Danilin (Moscow), Fangil Gareev (Dubna), Valery Zagrebaev (Dubna, mae) and Konstantin Gridnev (St. Petersburg) were remembered.

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Models and Dilettantes

The inner dynamics of the creative Copenhagen environment in Bohr's Mecca for quantum physics, and its open society philosophy, underpinned the formation and running of RNBT.

*The physicist **Thomas Bohr**, grandson of Niels Bohr, emphasizes in a contribution to the article collection 'The atomic model 100 years' (2013), that his grandfather, inspired by the British science tradition, often liked to describe his own approach to science as that of a dilettante, derived from the Italian dilettare – to delight or amuse. The joy of nature and the fresh approach to the study of it – without too much erudition – was important to him. Niels Bohr placed himself as a connecting link between the systematic German school and the British. He wanted to base his science on fundamental principles, but if an issue was sufficiently important, one had to take it up and “do something” even though one may not yet know the ultimate principles. RNBT followed in Bohr's footsteps, now assisted by proper quantum mechanics.*

*The development of models and analogies became a crucial aspect of Bohr's theorizing, rooted in philosophical influence from very early in his life. The inventive dilettante goes, however, beyond simple copying. Bohr showed that, when he laid the ground for his first quantum architecture for the atom. Bohr historian John **Heilbron** made in 1977 the point that in addition to choosing the right constituents, those of Rutherford, probably the chief driving force for young Bohr (1913) was to provide binding for atoms known to be stable, knowing that the classical Saturnian atom model was mechanically unstable. At nuclear driplines RNBT showed that a Borromean quantum model provides binding for exotic halo nuclei which exhibit emergent cluster degrees of freedom.*

Young Experts – Young Voices

*Christian **Boas** (NBA, Copenhagen), Gaute **Hagen** (ORNL,US) and Dmitry **Gridnev** (FIAS, Frankfurt), the latter two with RNBT degrees from Bergen, linked the colloquium to history of science and creative environments, to ab-initio calculations of many-body systems on super-computers and to the magic of few-body systems. They were voices for a young generation which takes the work further, in collaborative non-Borromean settings dictated by the realities of our times. YAE may provide a suitable framework for bringing them together.*

Their contributions to NorSAC gave promises for a bright future.

*RNBT has been blessed with having had a number of exceptional students, some strongly visible nowadays in the original field, some choosing their own way, in companies or like James **Al'Khalili** (Guildford), now a profiled BBC science communicator, and Danas **Ridikas** now at IAEA & Saclay, involved in energy questions and non-proliferation.*

The Trans-Atlantic Connection

*A substantial part of the RNBT related action has in recent years moved to the USA: The UK pioneer Ian **Thompson** to LLNL, and as already mentioned Hagen to ORNL hosting Nordic visitors. NorSAC was fortunate to have*



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Professor D. **Strotzman** from LANL as last speaker. His wide experience from theory leadership, and science work on matter under extreme conditions from low to high energies, provided the colloquium with a global outlook.

A two-day very successful tail-part to NorSAC, open for participants and organized by the Chair L.P. **Csernai**, gave up-to-date insight in the role of nuclear beams and radiation in our understanding of both the early and present Universe, including particle therapy (R. **Leonardi**) with the recent proton facility in Trento as example.

Vaagen started the NorSAC colloquium by telling the story of **Herbert Curien**, French Minister of Science and Technology, arriving in Cambridge UK by helicopter in September 1988, to give the inaugural address in the Foundation Meeting for Academia Europaea. Vaagen drew attention to the close relations between Curien and **D. Allan Bromley**, White House Science Advisor for the George Bush Sr. administration (1989-93), Yale professor (and Vaagen's boss in the 70s'). Curien and Bromley shared concern about changing times for science, and for the outcome of the perestroika in Russia. The situation was better in Japan, which entered as a big player in dripline physics, in particular after Tanihata returned home. Thus RNBT had to address experimental results provided by Europe, US and Japan, and RNBT used the NorSAC opportunity to thank the experimentalists for the glasnost that made it possible to develop the field.

Northern Seas Alliances - past and future

Northern Seas alliances date more than 1000 years back. They were facilitated by the development of seafaring ships, for peace – trading routes, and for war. They linked Northern Seas and Russian rivers, and exchange with Mediterranean Europe and the Muslim world. The Northern Seas history is one of joint ventures, alliances involving young people and intermarriage, also to make alliances last.

In 1998 Vaagen and Zhukov were made honorary professors at the University of St. Petersburg, created by **Peter the Great** 275 years earlier. In 1698 on his first trip West, the young tsar while in Amsterdam, head-hunted Cornelius Cruys to create and build a Russian fleet for Northern Seas. He gave him rank of vice-admiral. A copy of one of the frigates (1703), the "Shtandart" sails the seas today. Two weeks before the NorSAC event it visited Stavanger, Norway where Cruys was born and given the more modest name Niels Olufsen.

We V&Z, the oldest living of the RNBT pioneers, are proud to be linked to a city, which in spite of great sacrifices during its construction, bound Europe more tightly together: Also in academia by creating a Russian Academy of Sciences which started the development that made Russia an outstanding academic partner. Science is a tool for keeping an open world, for uniting – not dividing. A lesson emphasized by Bohr and repeated at NorSAC2015 and to be remembered in our again turbulent times.

NorSAC 2015 was attended by about 50 participants, from Europe, America and Asia, and the tail-part by about half that number. From these there were 32 registered scientists, and several other dignitaries. About a dozen



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Members of AE participated. The meeting included two social dinners and a joint excursion to the Hardanger fjord.



ASSOCIATED PROGRAMMES

IIA - July 30-31 COLLOQUIA linked to NorSAC 2015

Thursday 30 July 2015

Chair: Bravina, Larisa MAE (University of Oslo (NO))

Morning: STROTTMAN, Daniel – The Three-Dimensional Relativistic Hydro PIC Code I

Morning: CHENG, Yun - Hybrid models for relativistic Heavy Ion Reactions

Morning: LEONARDI, Renzo (ECT*) - Hadron Therapy

Break

-

Chair: WANG, DuJuan

Morning: BARNAFOLDI, Gergely: The Soft+hard Model-an Application Non-extensive Statistics

Morning: ZABRODIN, Evgeny: Elliptic and triangular flows in Pb+Pb collisions at LHC

Lunch Break

Chair: Barnaföldi, Gergely

Afternoon: VELLE, Sindre - Two particle correlations

Afternoon: XIE, Yilong - Lambda Polarization in an exact rotating and expanding model for peripheral heavy ion reactions

Afternoon: KOPELIOVICH, Boris: Charmonium suppression in a cold medium

Friday 31 July 2015

Chair: Zabrodin, Evgeny (University of Oslo (NO))

Morning: BRAVINA, Larisa - The Hyjet++ model of heavy ion reactions

Morning: WANG, DuJuan - Rotation, Flow vorticity and Lambda polarization in pHiC

Morning: CSERNAI, Laszlo - Collective dynamics, in relativistic heavy ion collisions

Break

Chair: Kopeliovich, Boris

Morning: PAPP, Istvan - Inertial Confinement Fusion - Radiation Dominated Implosion

Lunch Break

Chair: Csernai, Laszlo

Afternoon: STROTTMAN, Daniel - The Three-Dimensional Relativistic Hydro PIC Code II.

Afternoon: KOPELIOVICH, Boris: Charmonium suppression in a hot medium

Selected talks are available at the

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Vidar Totland, Hub Business Coordinator

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