Promoting the next generation of scientists - joint activities and future needs

Röntgen Ångström Cluster

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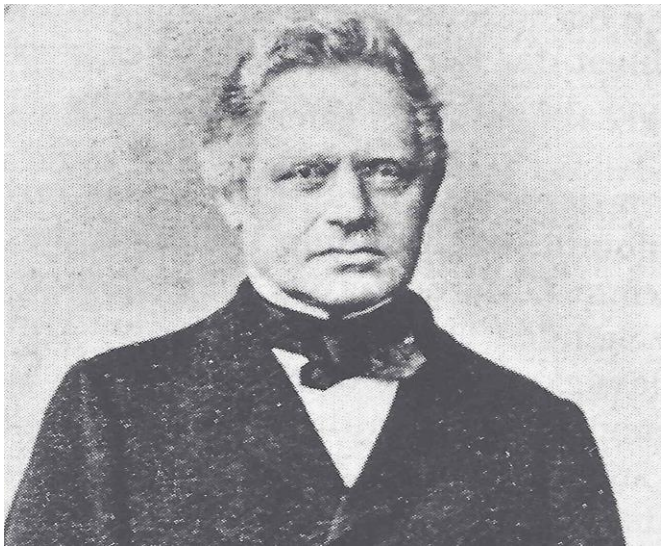
IRI Ioffe Röntgen Institute

- **Introduction**
- **RAC** & **IRI** platforms for bilateral scientific cooperation
- **Achievements in training junior scientists**
  - **RACIRI summer school**
  - **MATRAC summer school**
  - **Soft-matter winter school** at Björkliden
- **Future needs and developments**
  - **Focused workshops & schools, topical conferences**
  - **RAC mobility program & international graduate schools**
  - **Possible enlargement of RAC**
- **Summary and outlook**

Introduction

- **Sweden and Germany share a long history of cooperation in culture, trade, and science.**
  Just one example:

Jöns Jakob Berzelius (1779 – 1848)



Gustav Magnus (1802 – 1870)

- **G. Magnus** studied chemistry at the Berlin University (PhD in 1827), and spent a **postdoc year** with the famous chemist **J.J. Berzelius** in Stockholm – they became close friends
- Magnus started an influential physics school in Berlin and - in 1845 - became **Prof. for Technology** at the Berlin University. Many of his students became leading scientists and engineers, like **Hermann von Helmholtz**, **Werner Siemens** et al.
- **Magnus already understood the importance of basic research for technology and industry**

Introduction

- Analoguously, **Germany and Russia also share a long history of cooperation in culture, commerce, and science**, reaching back to **Czar Peter I**
- In 1724, Peter I founded the Sankt Petersburg Academy and ordered to hire "German" professors, including **Leonhard Euler** from Basel (in 1728). Euler sent the young **Michael W. Lomonossov** for studies to Marburg University and to Bergakademie Freiberg.
- Almost 200 years later,

W. C. Röntgen (1845-1923)

Abram F. Ioffe from Sankt Petersburg joined in 1902 **W. C. Röntgen** at LMU for doctoral work, completed in 1905

Back in Sankt Petersburg, Ioffe became the **father of modern physics in Russia**

Most Russian Nobel prize winners in physics were students of Ioffe

Igor W. Kurchatov was also a student of Abram Ioffe

Abram F. Ioffe (1880-1960)

RAC and IRI bilateral platforms

- **Röntgen-Angström-Cluster (RAC)**
  - **RAC** was initiated in 2009 by German BMBF and Swedish Government in view of the existing or under-construction best sources for x-rays and neutrons in the two countries, and based on these longstanding relations in science
  - It was named after 2 outstanding pioneers of the 19th century:

    Anders Jonas Angström (1814-1874) - pioneer in astro-spectroscopy

    Wilhelm Conrad Röntgen (1843-1923) - discoverer of X-rays
  - RAC has many purposes – the main ones are:

    to foster cooperation between the 2 countries in research using photons and neutrons

    to help financing collaborative projects

    to take measures for preparing junior researchers for optimally making use of the novel opportunities at these best sources

- **Ioffe-Röntgen Institute (IRI)**
  - **IRI** was founded - on an analogous basis and with comparable purposes - by the German and Russian Ministers of Research (after an initial proposal of 2008)
  - It was named after **A. Ioffe** and his PhD advisor and close colleague **W. C. Röntgen**

Achievements in training junior researchers

- **RACIRI Summer Schools (www.raciri.org)**

  - both **RAC & IRI aim at training junior researchers** for best use of the x-ray and neutron large-scale installations in the 3 countries involved

  - therefore, the **annual RACIRI summer schools** were initiated in 2013 as a trilateral coope-ration between RAC & IRI, i.e. between Sweden, Germany, and Russia

  - the **general theme** is **"Advanced Materials Design at X-ray and Neutron Facilities"**, where each summer school can choose a specific **focal theme** at the scientific frontier

  - program structure, topics, and lectures are designed to **improve the scientific knowledge base and necessary interdisciplinary literacy** of the users in the various fields

  - the program is worked out by a **trinational Scientific Committee**, which also proposes internationally renowned lecturers

  - a stimulating learning environment is realized by lectures that are followed each day by **tutorials** with individual lecturers, by competitive **poster** and **science-slam presentations** as well as with sufficient time for social and intercultural exchanges among the junior researchers

  - one goal of the RACIRI summer schools is to promote **close interaction and dialogues between the senior lecturers and the junior researchers**

Achievements in training junior researchers

- Up to now, **4 successful RACIRI Summer Schools**, for about 80 students each, have been organized, with the 5th one in planning for 2017 in Ronneby Brunnspark/Sweden

RACIRI 2013 - Petergof/Sankt Petersburg, Russian Federation, Aug. 17 – 25, 2013
Soft Matter and Nanocomposites

RACIRI 2014 - Stockholm, Sweden, Aug. 24 – 31, 2014
Imaging with X-Rays and Neutrons in Life and Materials Sciences

RACIRI 2015 - Rügen, Germany, Aug. 22 – 29, 2015
Time-resolved and in-situ Studies of Materials – Basics and Applications
Keynote Lecture: Prof. **Ada E. Yonath** (Nobel Prize in chemistry 2009)

RACIRI 2016 - Repino/Sankt Petersburg, Russian Federation, Aug. 21 – 28, 2016
Convergent Science and Technology for Society
Keynote Lecture: Prof. **Mikhail V. Kovalchuk** (President NRC Kurchatov Institute)

RACIRI 2017 - Ronneby Brunnspark, Sweden, Aug. 19 – 26, 2017
Grand Challenges and Opportunities with the Best X-ray and Neutron Sources
Keynote Lecture: N.N.

RACIRI SUMMER SCHOOL 2017
Advanced Materials Design at X-ray and Neutron Facilities

Achievements in training junior researchers

- **MATRAC Summer Schools**

  They are **markedly practice-oriented**, i.e. complimentary to RACIRI, with the general theme: ***"Application of Synchrotron Radiation and Neutrons in Materials Science"***

  The MATRAC schools are jointly funded by the German BMBF, the Swedish Research Council, and Northern German states

  They are organized by the Helmholtz Center Geesthacht HZG, supported by a Swedish-German Organizing Committee

  The **MATRAC school consists of 2 parts:**

  - **MATRAC I**: ***"Diffraction and imaging Methods in Engineering Materials Science"*,** with focus on **SR techniques** and practicals at **DESY** (in uneven years)
  - **MATRAC II**: ***"Neutron methods for the study of Fundamental Properties and Applications"***, with focus on **n techniques** and practicals at the **FRM II** (in even years)

- **Further Schools on specific topics**

  In addition to RACIRI and MATRAC there are further schools on specific topics organized within the RAC framework, e.g. the

  - **Soft-Matter Winter School at Björkliden**
    devoted to ***quasielastic and small-angle n scattering*** applied to polymers, liquids, and surface layers

Future needs and developments

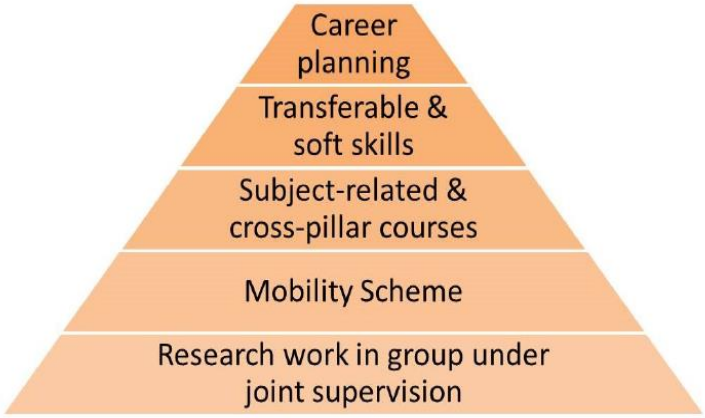
- **Focused workshops and schools, topical conferences**
  - In addition to these well-established schools, there will be a need for additional, more specialized and focused workshops and topical conferences as soon as all the best x-ray and n sources are in operation
  - A **particularly important topic** is the need **to train junior researchers** at these new top sources **in data analysis and scientific computing.**

    The reasons are in the **very high data rates** and **huge data volumes** that will have to be handled and processed
  - These events could be organized by RAC, but also in cooperation with other partners
- **RAC mobility program and international graduate schools**
  - There are many reasons, why a **RAC mobility program** for graduate students and junior scientists will be beneficial for the internationalization of research on these large-scale infrastructures
  - If **exchange stays up to 1 year** can be offered in a flexible way, international contacts between graduate students and junior scientists will be promoted at a rather early stage
  - Such a program **could strongly foster international networking and cooperation**

Future needs and developments

- As example: **Hamburg-Lund Research School**

- Recent **Helmholtz call** on **"International Research School"**
- **Joint DESY/U Hamburg – U Lund proposal for PhD mobility schemes**
- **Helmholtz-Lund International School (HELIOS)** for "Imaging and control at the nanoscale and beyond" - *From Isolated Molecules to Biomolecules and Functional Nanostructures*
- could be an opportunity to build a first corner stone for a **larger framework of educational cooperation**
- if approved, funding could begin in 2018



Thanks to Frank Lehner for the viewgraph

Future needs and developments

- **Possible enlargement of RAC**
  - **Denmark** is a natural candidate for such an enlargement, since **it is involved in MAX IV** and is also **home state of the ESS** with the ESS computing center being located there
  - At present, other possible candidates are **Finland** and **Estonia**

Summary and Outlook

- With **RACIRI and MATRAC**, RAC is offering a **well-balanced suite of summer schools** to junior researchers in order to optimally prepare them for fully exploiting the novel opportunities offered at the best sources of x-rays and neutrons
- In addition to these highly successful schools further **more specialized and focused workshops and topical conferences** will be needed to optimize the output from the big investments
- A particularly important topic in this respect is the **training of junior researchers in data analysis and scientific computing** due to the expected huge data rates and data volumes
- In order to attract the best students, it could be useful to offer at suitable centers **educational beamlines** that could even be integrated into the regular curriculum of a local university department, e.g. in an Advanced Practical Course
- **Mobility programs** and **international graduate schools** would be very beneficial to foster internationalization of research groups already at an early stage
- **RAC** is certainly a candidate **for enlargement by further member countries**
- **RAC and IRI** – in view of the young generations involved – **act as powerful catalysts for improving friendship between nations and building trust and understanding**, in addition to their main purpose of optimizing research in basic and applied science.

Thank you very much for your attention

with a photo from **the 1st RACIRI summer school in Petergof (2013)**

RACIRI SUMMER SCHOOL 2013
Advanced Materials Design at X-ray and Neutron Facilities

Petergof Castle, built 1714 – 1751 by A. Schlüter, J.F. Braunstein, and B.F. Rastrelli

and another one from the **2nd RACIRI summer school in Stockholm (2014)**

RACIRI SUMMER SCHOOL 2014

Advanced Materials Design at X-ray and Neutron Facilities

and another one from the **3rd RACIRI summer school on Rügen (2015)**

RACIRI SUMMER SCHOOL 2015
Advanced Materials Design at X-ray and Neutron Facilities

and an outlook to the **5th RACIRI summer school in Ronneby (19.-26.8.2017)**

RACIRI SUMMER SCHOOL 2017

Advanced Materials Design at X-ray and Neutron Facilities

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