

History of JCPRG and JSPS Program

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Development Workshop

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Contents

1. Introduction

International Nuclear Reaction Data Center Network

2. Nuclear Reaction Data Center in Hokkaido University

Brief History of NRDF

3. Asian Nuclear Reaction Data Center Network

Asian Nuclear Reaction Data Collaboration

4. Summary

1. International Cooperation

Networks coordinated by IAEA :



- **Nuclear Reaction Data Centres Network**

Compilation (**EXFOR** and **CINDA**) and evaluation for nuclear reaction data (14 centres)

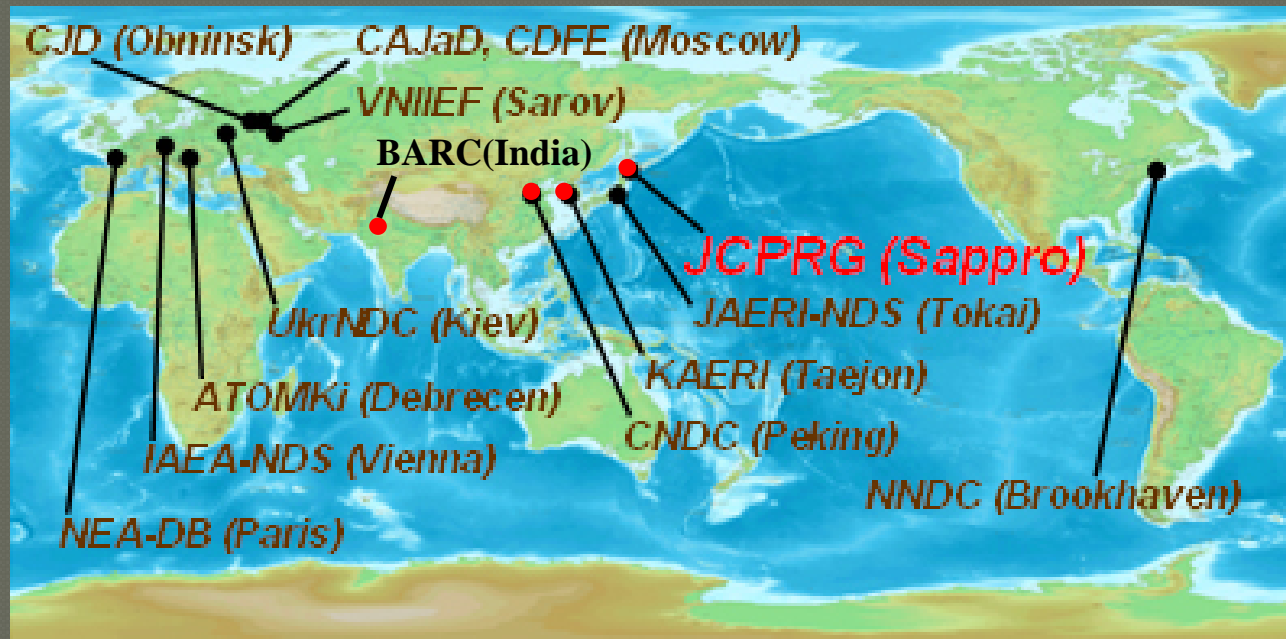
- **Nuclear Structure Data Centres Network**

Evaluation for nuclear structure data **ENSDF** (16 centres)

Nuclear Data Centre Networks

◎ Nuclear Reaction Data Centres (14)

NNDC (Brookhaven), NEA-DB (Paris), NDS (IAEA), CJD (Obninsk), JCPRG (Sapporo), JAEA-NDC (Tokai), ATOMKI (Debrecen), CIAE (Beijing), KAERI –NDEL (Taejon), CAJaD (Moscow), CDFE (Moscow), NPDC (Sarov), UkrNDC (Kiev), **BARC(India)**



NRDC 2010 at Sapporo (20-23 April, 2010)



2. Japanese Charged Particle Reaction Data Group: JCPRG

Hokkaido University Nuclear
Reaction Data Centre
(JCRDC) <http://www.jcrdc.hokudai.ac.jp/>

- 1) Brief History
- 2) Japan Nuclear Reaction Data Center at Hokkaido University

History of JCPRG

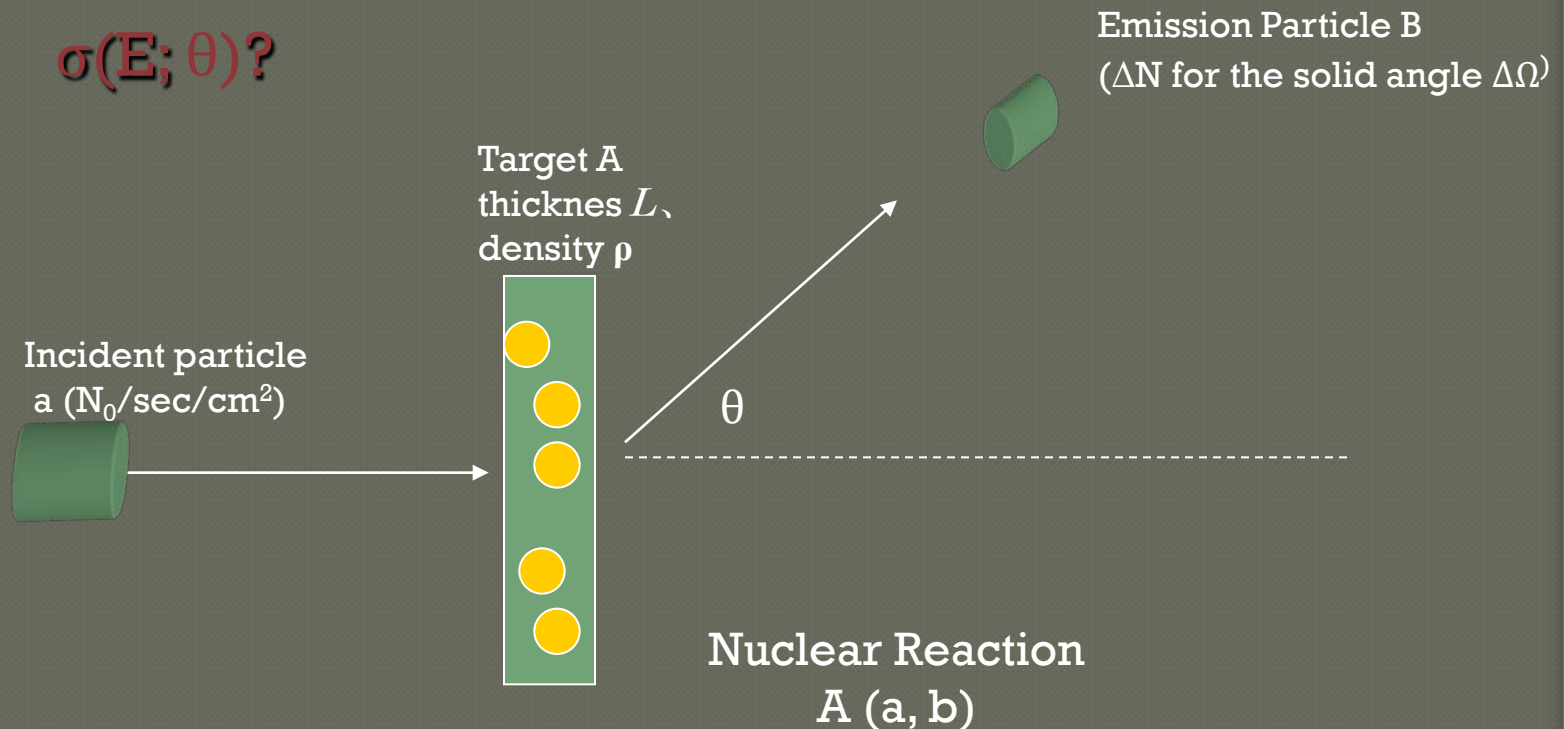
- 1974: “A Special Program” of Grants-in-Aid for Science Research by JSPS
“Advanced Procedure of Broad and Massive Information” (~1976.3)
Organized by Prof. Hajime Tanaka (Hokkaido University)
A new database of the charged particle induced nuclear reactions was discussed in collaboration with many nuclear physicists and information scientist in Japan
Original database NRDF was made by Dr. Togashi
- 1975: I (K.Kato) arrived to Hokkaido University and jointed to the activity of NRDF.
- 1976: “A Special Program” of Grants-in-Aid for Science Research by JSPS
“Development Process of Information System and Organization of Academic Data” (~1979.3),
Organized by Prof. Hajime Tanaka (Hokkaido University)

- 1980: “A Special Program” of Grants-in-Aid for Science Research by JSPS
“Study on Development of Academic Database in Japan” (~1981.3)
- 1983: “Pioneering Research” of Grants-in-Aid for Science Research by JSPS
“Utility of Charged-Particle induced Nuclear Reaction Data File”
(~1984.3)
- 1988.3: Prof. H. Tanaka retired
- 1987: Monbu-Sho Budget for Activity of Nuclear Reaction Data File
(~2001.3) Good financial support
- 2001: “Database” of Grants-in-Aid for Science Research by JSPS
“Charged Particle induced Nuclear Reaction Data File” (~2002.3)
- 2006: “A Special Program” of Grants-in-Aid for Science Research by JSPS
“Astro-nuclear Reaction Data File” (~2007.3)
- 2007: Foundation of Nuclear Reaction Data Centre in Hokkaido University

NRDF

- ◉ Scope: **Japanese charged-particle nuclear reaction data** (1973-present, mainly from Phys.Rev.C, Phys.Rev.Lett., Phys.Lett.B, Nucl.Phys.A and JPJ)
- ◉ **NRDF format** for various reactions and quantities
- ◉ **Translated to EXFOR** and distributed through IAEA (~5% of EXFOR entries)
- ◉ Development of retrieval and plot tools (collaboration with Meme media Lab., Hokkaido Univ.)
- ◉ Accessible at the JCPRG web server [Hokkaido University Nuclear Reaction Data Centre \(JCPRG\).htm](#)

Differential Cross Section (Angular Distribution)



Scattering Cross Section

for the angle θ

$$\sigma(E; \theta) = \Delta N / \Delta\Omega / L\rho N_0$$

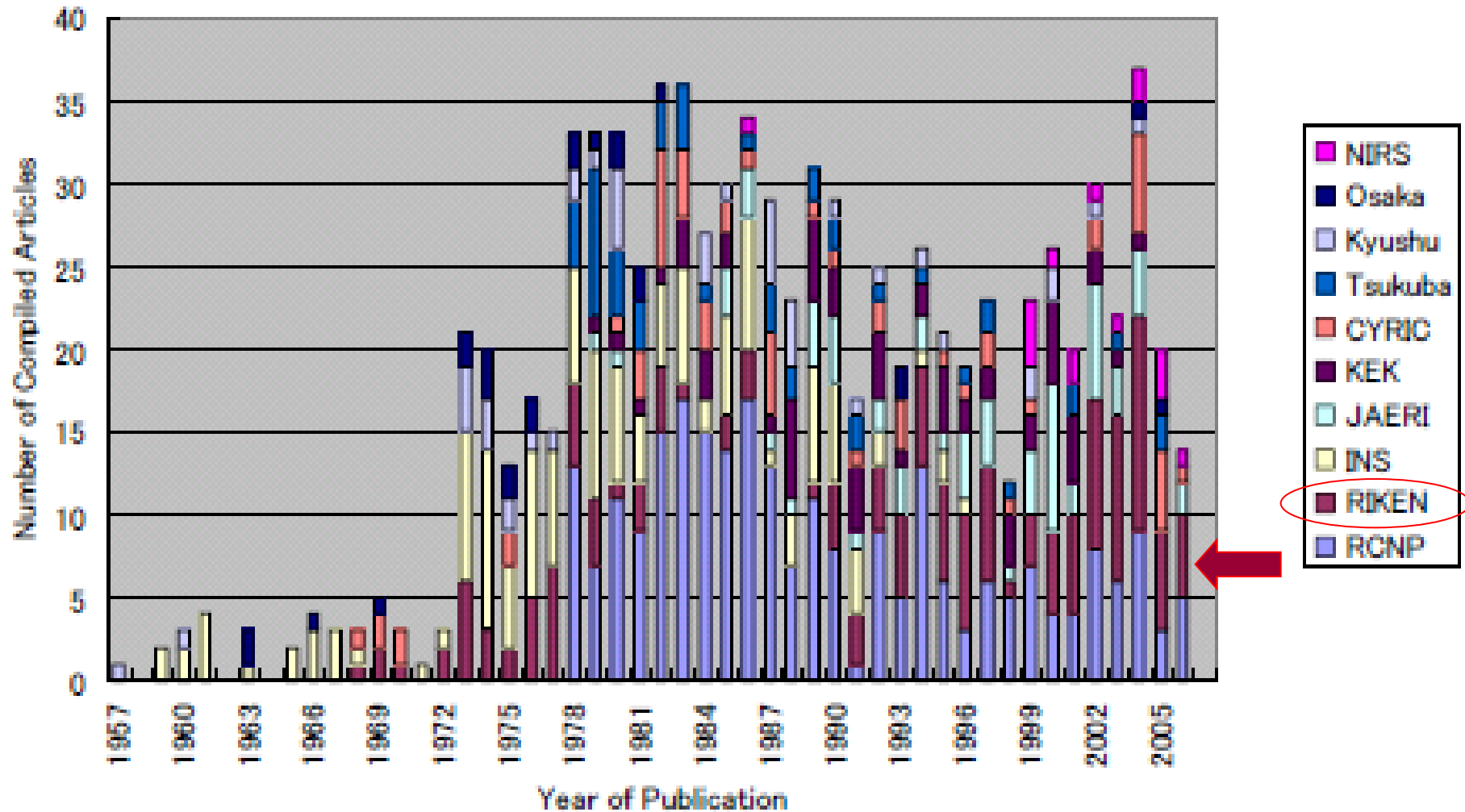
NRDF: Nuclear Reaction Data File

- It has a strong flexibility because it was designed without any special application orientation:
 - available for any kind of nuclear reaction data
 - Nuclear Engineering and Medical data: $(\sigma(E))$
 - Differential cross sections concerning with the final state
 - Nuclear Physical Data
 - Differential Cross section for various parameters
 $\sigma(E; \theta), \sigma(E; \theta, E'), \sigma(E; \theta_1, \theta_2), \dots$
- It is an own database with the original specs:
 - available for including new physical quantities and developing new computer systems

Physical Quantity in Basic Criteria

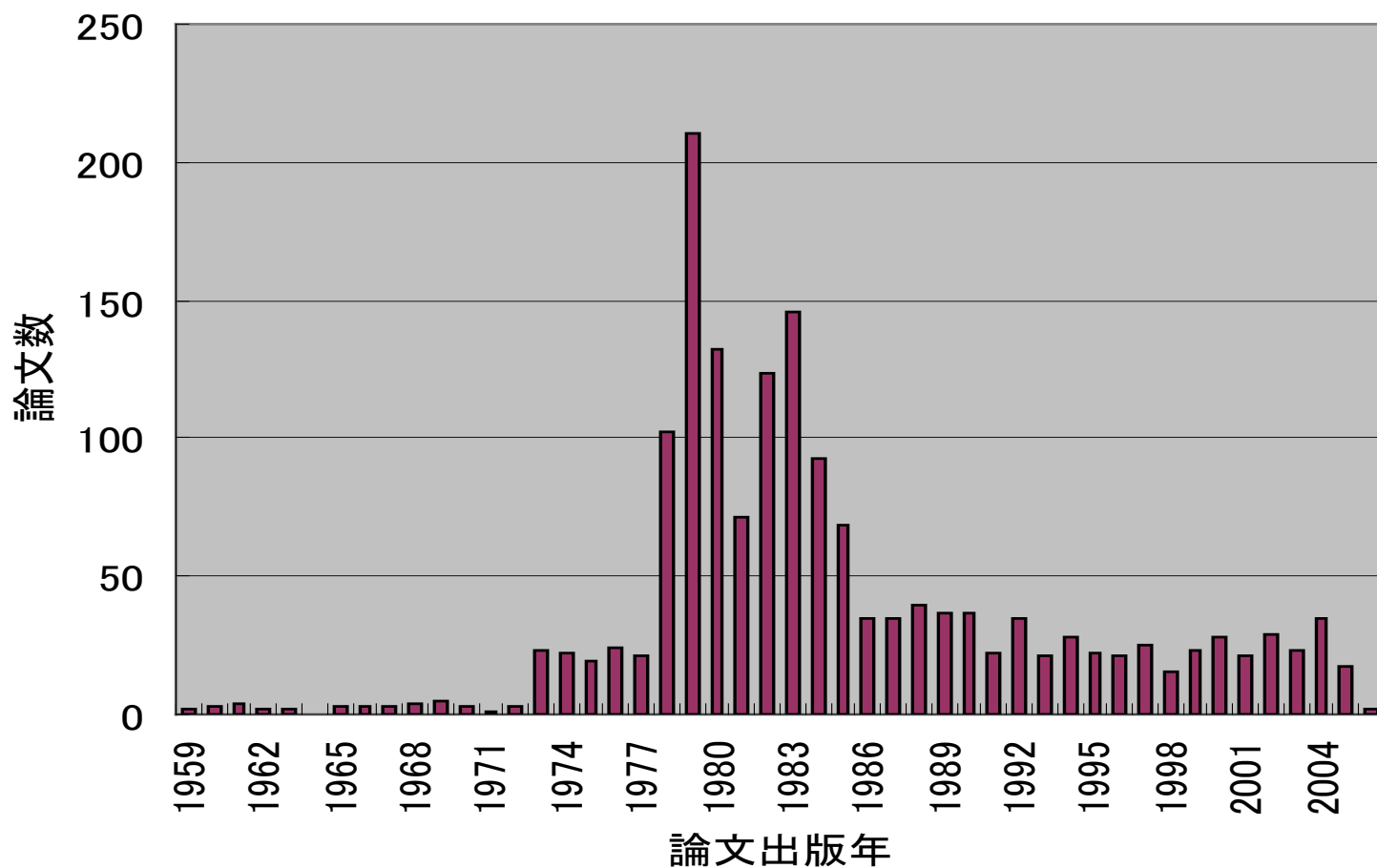
- ◆ Cross section
- ◆ Diff. data with respect to angle ($d\sigma/d\Omega$)
- ◆ Diff. data with respect to energy ($d\sigma/dE$)
- ◆ Double diff. data with respect to angle and energy ($d\sigma/d\Omega/dE$)
- ◆ Polarization data
- ◆ Product yields
- ◆ Fission product yields
- ◆ Thick target yields
- ◆ Differential thick target yields
- ◆ Resonance integrals
- ◆ Resonance parameters
- ◆ Reaction rates
- ◆ Gamma spectra
- ◆ ...

Compilation Statistics (Japan, CPND)



Stored Papers in NRDF

NRDF蓄積論文数分布



~30 Papers
/Year

Problems in NRDF

- ◎ Large ambiguity in format and code systems due to its flexibility

not easy to make retrieval system of the data

- ◎ Weak uniqueness of coding

different codes for the same quantity

For example, ANGL-DSTRN,

DSIGMA/DOMEGA, ...

- ◎ Only Japanese data

Transform to EXFOR

EXFOR: **EX**change **FOR**mat
between Data Centers

SCISRS



NEUDADA



DASTAR



EXFOR

NRDF



Every center receives EXFOR data and distributes by own database

History of Data Exchange

Neutron Data compilation

1961: Sigma Center (USA • Brookhaven)

1963: Information Centre on Nuclear Data (Russia • Obninsk)

1964: Centre de Compilation de Données Neutroniques (France, Saclay)

1964: IAEA Nuclear Data Unit (Austria • Vienna)

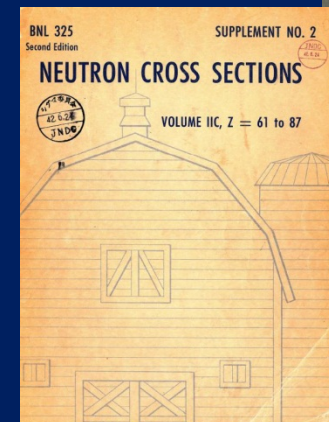
Neutron Data Exchange

1964: Exchange between Sigma Center and CCDN

1965: IAEA involvement in Data Exchange

1966: Start of Four Center Network

1969: Format for exchange (EXFOR) agreed among
four core (neutron) centres



中性子断面積データ集BNL325

いわゆる「バーンブック」

History of Data Exchange

Charged particle and Photo Nuclear Reaction Data

19??: KFK Charged Particle Data Group (Germany , Karlsruhe)

1973: Centr Atomnykh i Jadernykh Dannyykh (Russia, Moscow)

1974: Japanese Study Group (Japan): - Data compilation project of JCPRG approved by Theoretical Nuclear Physics Society and the Experimental Nuclear Physics Society in Japan

Consultant meeting for extension of 4 centres to neutron, charged-particle nuclear data (**CPND**) and photonuclear data (**PhND**) centres (Karlsruhe, Kurchatov)

1975: Consultant meeting for CPND compilation (Karlsruhe, Kurchatov, JCPRG)

Nuclear Reaction Data Center Network (NRDC)

1976: Start of Nuclear Data Centre Network

1980: Photo Nuclear Reaction Experimental Data Center (CAJaD) jointed (Russia, Moscow)

1981: Karlsruhe Group closed (KaChaPaG)

1983: RIKEN joined to the network (~2000)

...

Domestic Data Centres

◎ JCPRG (Compilation Centre, since 1974)

- Compilation of Japanese charged-particle nuclear reaction data for **NRDF** and **EXFOR**
- Dissemination of **NRDF** and **EXFOR** files
- Compilation of bibliography for charged-particle reaction works for **CINDA**
- Compilation of Japanese photo-nuclear reaction data (2006?-)

◎ JAEA-NDC (Evaluation Centre, since 1964)

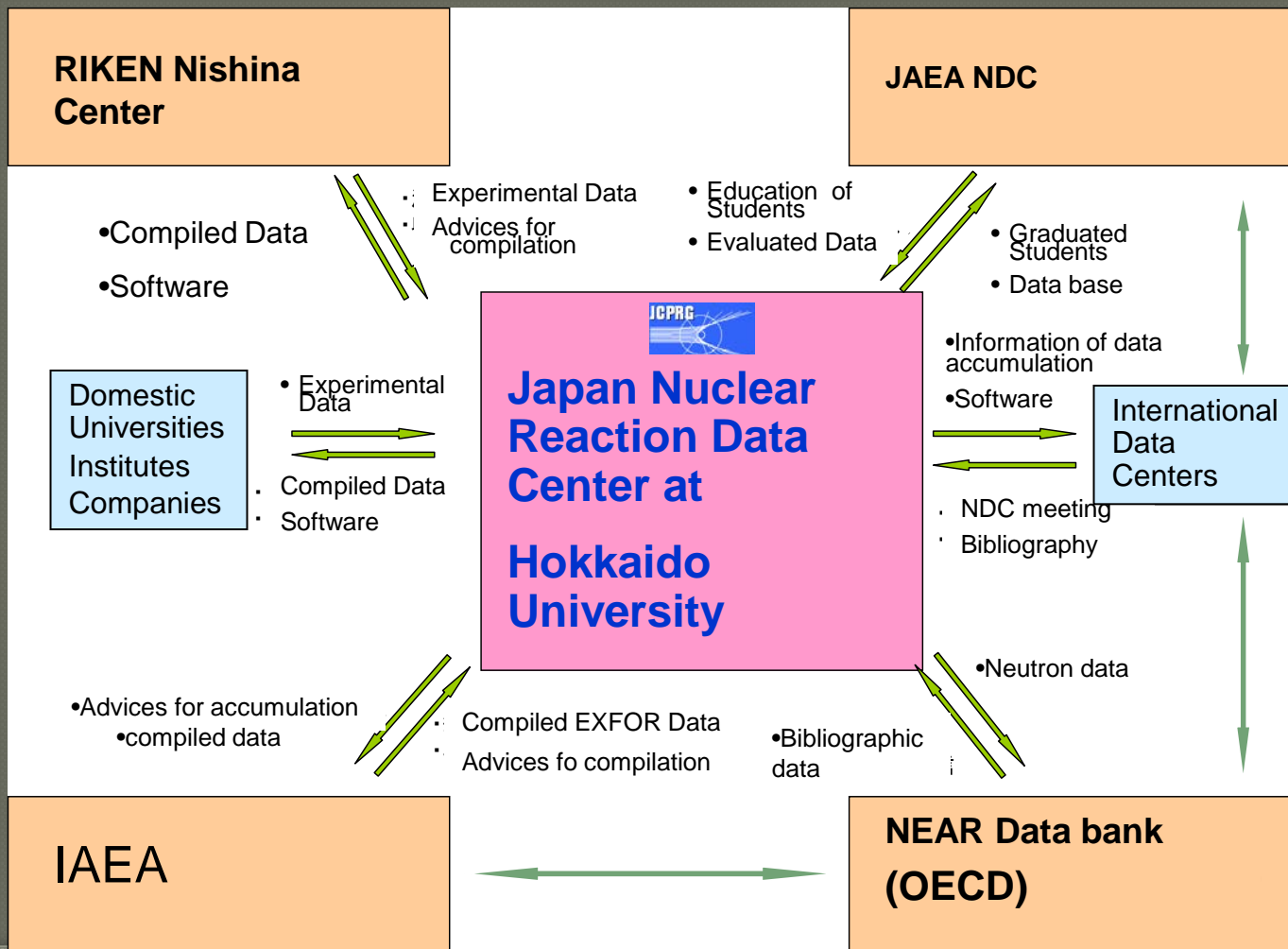
- Evaluation of neutron-induced nuclear reaction data for **JENDL**
- Evaluation of nuclear structure for **ENSDF** (A=118-129)
- Compilation of bibliography for neutron reaction works for **CINDA**)

◎ RIKEN (Compilation + Evaluation, 1983-2000)

- Compilation of charged-particle nuclear reaction data for EXFOR
- Evaluation of nuclear structure for ENSDF with JAEA
- Compilation of bibliography for Japanese secondary references for NSR

Japan Nuclear Reaction Data Center at Hokkaido University

From April 1, 2007



3. Asian Nuclear Reaction Data Center Network

Proposal of Asian Nuclear Data Collaboration

JSPS Asia and Africa Science Platform Program

**“R&D Platform Formation of Nuclear
Reaction Data in Asian Countries”
(2010-2012)**

Asian Nuclear Experiment Facilities:

China

- ◆ China Institute of Atomic Energy, DNP, Beijing
Beijing Tandem Acc. Lab.
- ◆ Chinese Academy of Sciences, IMP, Lanzhou
HIRFL
- ◆ Chinese Academy of Sciences, SIAP, Shanghai
SLEGS (in planning)

Asian Nuclear Experiment Facilities:

India

- ◆ New Delhi University Grants Commission of India,
New Delhi
Inter-University Accelerator Center
- ◆ Variable Energy Cyclotron Center, Kolkata
VECC

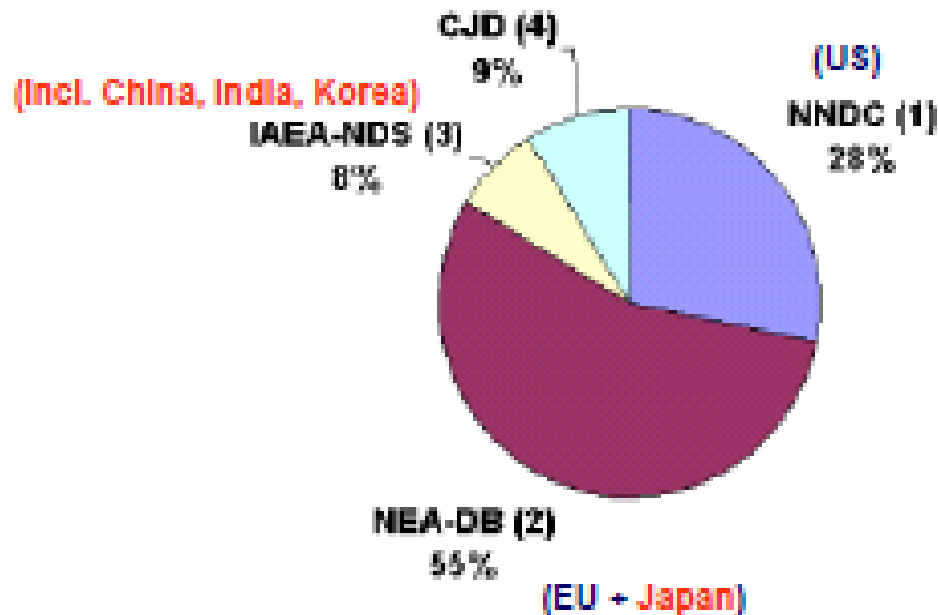
Asian Nuclear Experiment Facilities:

Korea

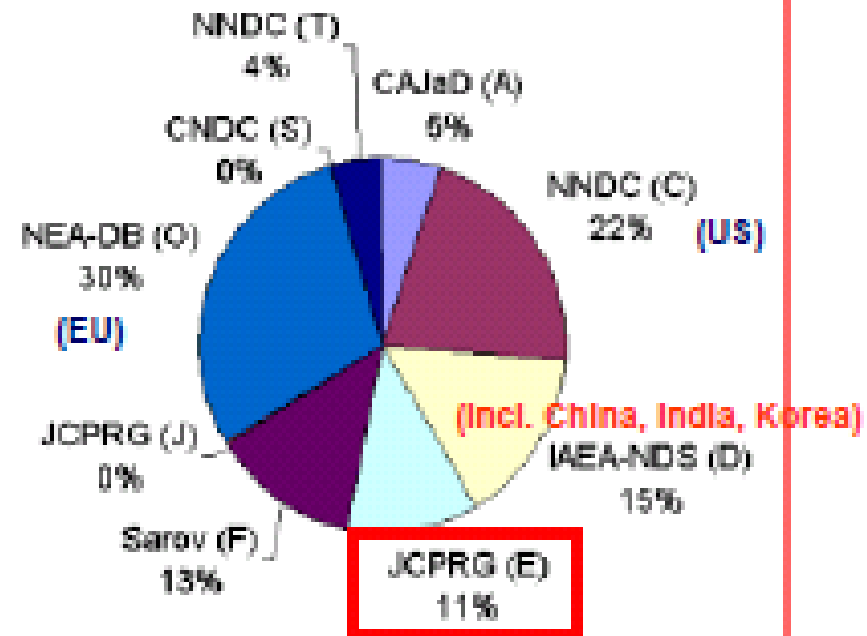
- ◆ Korea Institute of Geoscience and Mineral Resources, Daejeon
Ion Beam Application Group (Tandems)
- ◆ National Cancer Centre, Goyang
Center for Application Group (Cyclotron)
- ◆ National Centre for Inter-Universities Research Facility, Seoul
Electrost. Ion Acc./AMS Fac. (Tandem)

Tri-Polar Structure of Data Production (US, Europe, Asia)

Compilation Statistics (Neutron)



Compilation Statistics (CPND)



- USA → National Nuclear Data Center (NNDC)
- Europe → OECD NEA Data Bank (NEA-DB)
- Asia → ??

Collaboration between Asian Countries for Nuclear Reaction Database

- ◆ Compilation of the data in own countries
- ◆ Training and /or workshop of compilation
- ◆ Exchange of techniques and software for data compilation

Sapporo Nuclear Data Workshop

“The 1st Asian Nuclear Reaction Database Development Workshop”

25-29 October 2010, Hokkaido, Sapporo

- **CHINA**

China Nuclear Data Center China Institute of Atomic Energy (Ge Zhigang)

- **KOREA**

Nuclear Data Evaluation Laboratory, Korea Atomic Energy Research Institute (Young-Ouk Lee)

- **INDIA**

Nuclear Data Section Reactor Physics Design Division
Bhabha Atomic Research Centre (**S. Ganesan**)



1st International Conference on the AA Science Platform
The 1st International Conference on the AA Science Platform

The 1st International Conference on the AA Science Platform
Mokkaido University
Sapporo, Japan
October 10-12, 2018
The purpose of this meeting is to bring together researchers from different countries and disciplines to discuss the latest research results in the field of AA Science Platform. The meeting will be held in a friendly and relaxed atmosphere, and it is expected to be a successful one. The meeting is organized by the Japan Society for the Promotion of Science (JSPS) and the AA Science Platform. The meeting is held at Mokkaido University, Sapporo, Japan. The meeting is held from October 10 to 12, 2018. The meeting is held in a friendly and relaxed atmosphere, and it is expected to be a successful one. The meeting is organized by the Japan Society for the Promotion of Science (JSPS) and the AA Science Platform. The meeting is held at Mokkaido University, Sapporo, Japan. The meeting is held from October 10 to 12, 2018.

アジア・アフリカ
学術基盤形成事業
AA Science Platform
Program



独立行政法人
日本学術振興会
Japan Society
for the Promotion
of Science

4. Summary

1. International Nuclear Reaction Data Center Network
2. Brief History of JCPRG and NRDF
3. Asian Nuclear Reaction Data Collaboration