National Nuclear Data Center

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Brookhaven Science Associates
U.S. Department of Energy

Mission

The National Nuclear Data Center (NNDC) collects, evaluates, and disseminates nuclear physics data for basic nuclear research and for applied nuclear technologies. The NNDC is a worldwide resource for nuclear data.

History

Nuclear Data activities started at BNL in 1952 under the Brookhaven Neutron Cross Section Compilation Group, changed to the Sigma Center in 1961, which became the National Neutron Cross Section Center in 1967 and finally NNDC in 1977, providing a half-century of data and expertise to the world community.

Heads of NNDC were Sol Perlstein (1977-1990), Charlie Dunford (1991-2001) and Pavel Oblozinsky (2002-).

Organization

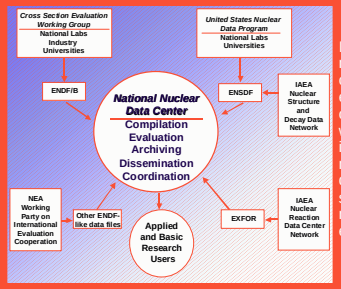
The NNDC specializes in the following areas:

- Nuclear structure and low-energy nuclear reactions,
- Nuclear databases and information technology,
- Nuclear data compilation and processing.

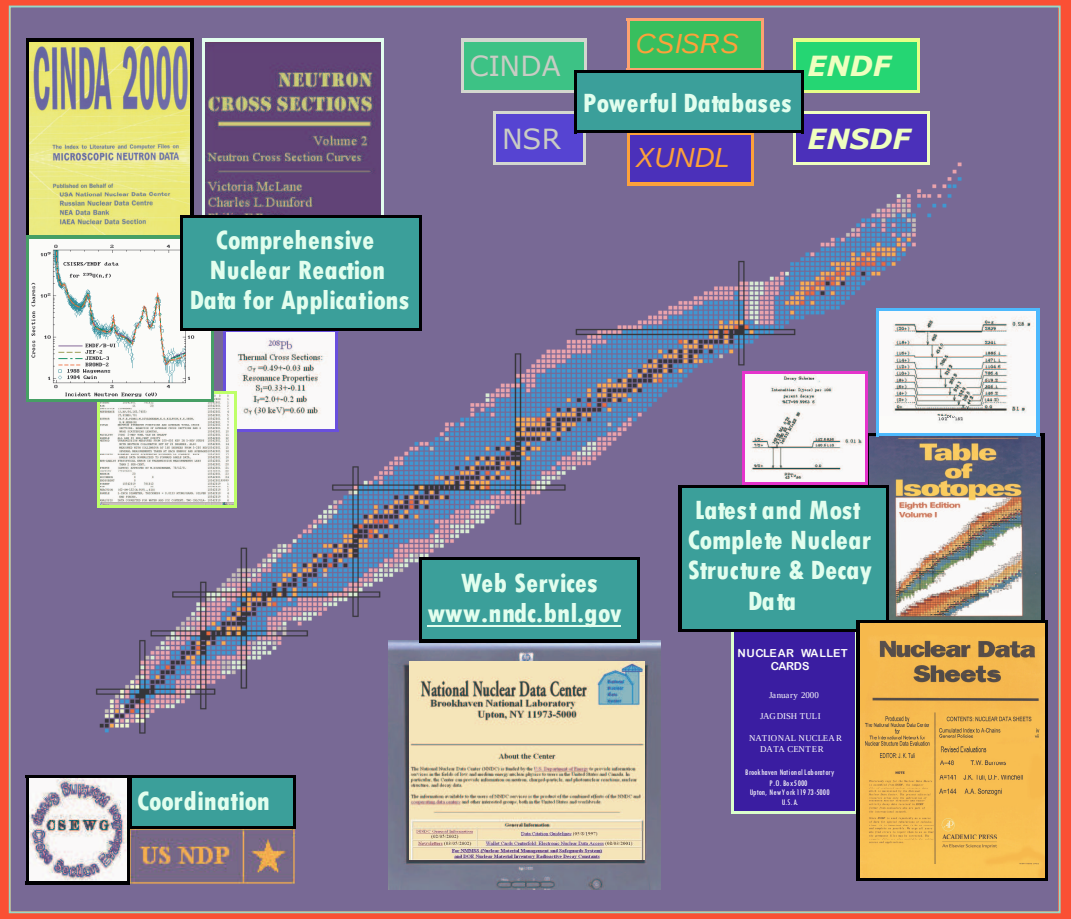
The current staff size of NNDC is 13, including 7 with a Ph.D degree. The group includes scientific, professional, and support staff. In addition, NNDC normally hosts 2-3 regular guest scientists and 1-2 short-term visiting scientists

Coordination and Collaboration

NNDC is the focal point for US nuclear data activities. On national level, it coordinates the Cross Section Evaluation Working Group (CSEWG) and the United States Nuclear Data Program (USNDP).



International nuclear data community is extremely well organized, with NNDC involved in all major nuclear data networks: structure, reactions and evaluations.



Nuclear Databases: National Resource

Nuclear databases consists of carefully organized scientific information that has been gathered over 50 years of low-energy nuclear physics research worldwide. These powerful databases have enormous value and they represent a genuine national resource. Six core nuclear databases fall into 3 categories:

CINDA: 265,000 neutron references.
NSR: Keywords describing contents of 168,000 articles from 75 journals.

CSISRS alias EXFOR: Nuclear reaction data from 12,700 papers.
XUNDL: Nuclear structure data from 870 papers.

ENDF/B: Nuclear reaction cross sections of all practically important 325 nuclei, mostly with neutrons up to 20 MeV, and partly up to 150 MeV.
ENSDF: Nuclear structure and decay properties for 2,898 nuclides.

Publications

- Nuclear Data Sheets, journal published by Academic Press and edited by NNDC, devoted to structure evaluations and bibliography, 12 issues a year.
- Nuclear Wallet Cards, popular pocket size book, nuclear properties of all known nuclides, 6th edition published in 2000, in March 2002 adopted as the standard for radioactive decay data by DOE Office of Security, Nuclear Materials Management & Safeguards System.
- Manuals and formats for ENDF database.
- Manuals and formats for ENSDF database.
- Neutron Cross Sections, also known as BNL-325.

Supernova SN1987A as seen by the Hubble telescope. These stellar explosions are sources of heavy elements. The Nuclear Astrophysics community relies on nuclear data for their research.

Nuclear Reactions

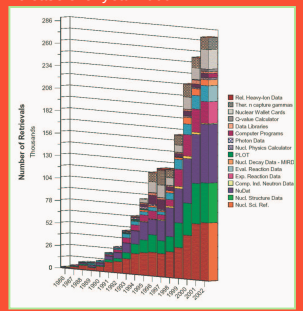
Evaluated Nuclear Data File (ENDF/B)

This database contains evaluated nuclear reaction cross section data for all nuclei relevant for applied technology. It covers 325 target materials (nuclides), interacting mostly with neutrons; however, interactions with protons and other light charged particles are also included. Incident energies up to 20 MeV are mainly covered, but important cases with energies up to 150 MeV are also included.

The last release of ENDF/B-VI was issued in 2001. The database provides input for neutronics calculations, such as the design of reactors, weapons, accelerators, as well as radiation shielding and protection. It is produced by the US CSEWG, coordinated by the NNDC. It is maintained and distributed by the NNDC.

Services

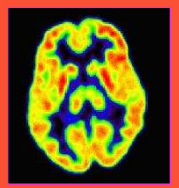
NNDC has provided remote electronic access to its databases and other information since 1986. Access *via* the Web started in 1994. During 2001, users from about 10,800 organizations visited the NNDC's Web site. They made 258,000 retrievals of data, a 14% increase over year 2000.



Statistics of NNDC services – Web, Telnet and FTP retrievals in 1986-2002 (year 2002 extrapolated).

In addition to remote electronic access of information, the NNDC provides other services including:

- Telephone "help desk" accessible Monday through Friday from 8:30 am to 5:00 pm ET.
- Specialized retrievals and access to unique library of nuclear reaction, structure and decay data publications.



PET study of a brain. Data from the NNDC is used in Nuclear Medicine for diagnosis, radiotherapy and research tools.

Nuclear Structure

Evaluated Nuclear Structure Data File (ENSDF)

This database is the worldwide resource for nuclear structure and radioactive decay data. ENSDF is produced by the US Nuclear Data Program, coordinated by the NNDC, in cooperation with the international structure network. The database is maintained and distributed by the NNDC.

As of June 2002, ENSDF contained nuclear structure properties for all known 2,898 nuclides, covering among others, information for 130,605 nuclear levels and 187,506 gamma transitions. Additionally, it included 3,575 decay schemes and 7,744 level schemes populated following nuclear reactions.

Nuclear Wallet Cards

This derived database combines information from several other databases. It carries selected ground- and isomeric-state nuclear properties for all known nuclides. It is published regularly every 4 years, with more than 10,000 copies distributed to variety of users.