

International Atomic Energy Agency

INDC(NDS)-124/LNA

---

**INDC**

**INTERNATIONAL NUCLEAR DATA COMMITTEE**

---

Report of the Nuclear Data Section

to the International Nuclear Data Committee

March 1980 - August 1981

A. Lorenz, Editor

July 1981

---

**IAEA NUCLEAR DATA SECTION, WAGRAMERSTRASSE 5, A-1400 VIENNA**

Reproduced by the IAEA in Austria  
August 1981  
81-3481

Report of the Nuclear Data Section  
to the International Nuclear Data Committee  
March 1980 - August 1981

Abstract

This progress report of the IAEA Nuclear Data Section covers the 18-months period March 1980 to August 1981. It describes past, current and planned activities of the Section and presents the status of its nuclear data centre services.

A. Lorenz, Editor

July 1981



Table of Content

	<u>Page</u>
Table of Content	i
List of Appendices	iii
List of Abbreviations	iv
List of INDC (NDS) documents published since last INDC Meeting	vii
List of INDC (SEC) documents published since last INDC Meeting	viii
List of IAEA Technical Reports on Nuclear Data during the period 1970 - 1978	ix
Programme Summary	x
A. <u>INDC Secretariat</u>	1
1. Liaison Officers	1
2. List of Correspondents	1
3. List of Documents	2
4. Translation of Documents	2
5. Compilation of National Nuclear Data Committees	2
B. <u>Meetings Sponsored by NDS</u>	2
B.1. <u>Past Meetings</u> (March 1980 - August 1981)	2
1.1. Consultants' Meeting on Neutron Source Properties, Debrecen, 17-21 March 1980	2
1.2. Advisory Group on Nuclear Structure and Decay Data, Vienna, 21-25 April 1980	3
1.3. Second Technical Committee on Atomic and Molecular Data for Fusion, Fontenay-aux-Roses, France, 19-22 May 1980	4
1.4. Second Atomic and Molecular Data Centre Network Consultants' Meeting, Fontenay-aux-Roses, France 23-24 May 1980	5
1.5. Third Research Coordination Meeting on the Intercomparison of Actinide Neutron Nuclear Data Evaluations, Vienna, 12-13 June 1980	5
1.6. Third Research Coordination Meeting on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data, Vienna, 12-13 June 1980	5
1.7. Eleventh Meeting of the INDC, Vienna, 16-20 June 1980	5

1.8.	Fifth Annual Nuclear Reaction Data Centre Meeting, Brookhaven, 29 September - 3 October 1980	5
1.9.	First Meeting of the IFRC Subcommittee on A+M Data for Fusion, IAEA, Vienna, 19-20 January 1981	7
1.10.	Consultants' Meeting on Nuclear Data for Medical Radioisotope Production, IAEA, Vienna, 13-15 April 1981	7
1.11.	Research Coordination Meeting on the Evaluation of Atomic Data Pertinent to Plasma-wall Interaction Processes, Vienna, July 1981	7
B.2.	<u>NDS Meetings Planned from September 1981 to the end of 1982</u>	8
C.	<u>Nuclear Data Assessment and Research Coordination</u>	9
1.	<u>Interregional Project</u>	9
2.	<u>Technical Assistance Mission to South America</u>	9
3.	<u>Research Contracts</u>	10
4.	<u>Targets and Samples</u>	11
5.	<u>Coordinated Research Programmes</u>	12
5.1.	Intercomparison of actinide neutron nuclear data evaluation	12
5.2.	Measurement and evaluation of transactinium isotope nuclear decay data	12
5.3.	Evaluation of atomic data pertinent to plasma wall interaction processes	13
5.4.	Atomic collision data for diagnostics of magnetic fusion plasmas	13
6.	<u>Nuclear Data for Radiation Damage, REAL-80</u>	14
7.	<u>Nuclear Data for INTOR</u>	14
8.	<u>Nuclear Data for Safeguards</u>	14
9.	<u>Fission Product Nuclear Data: Annual Progress Report Series</u>	14
10.	<u>WRENDA</u>	15
D.	<u>Data Centre Activities</u>	15
1.	<u>Nuclear Reaction Data</u>	15
1.1.	Experimental Data	
1.2.	Evaluated Data	

2. <u>Nuclear Structure and Decay Data (NSDD)</u>	16
3. <u>Atomic and Molecular Data</u>	17
4. <u>Data Centre Services</u>	18
4.1. Documentation and User Services	18
4.2. Data Request and Dissemination Statistics	18
5. <u>Programming and Systems Development</u>	19
5.1. General	19
5.2. EXFOR Programming	23
5.3. Request and Dissemination Log System	23
5.4. WRENDA	23
5.5. The Data Index System	23
5.6. Profile System	24
5.7. CINDA Programming	24
5.8. Evaluated Data Processing	24

List of Appendices

<u>Appendix A:</u> List of Liaison Officers to the INDC as of as of May 1981	26
<u>Appendix B:</u> Summary and Conclusions of the Firth Annual Meeting of the Nuclear Reaction Data Centre Network, Brookhaven, 29 September - 3 October 1980.	27
<u>Appendix C:</u> IAEA Technical Assistance - Interregional Project for Training of Nuclear Scientists in Developing Countries, using the Expertise available in the Nuclear Data Field	29
<u>Appendix D:</u> Index to the IAEA-NDS-Documentation Series	36

List of Abbreviations

A+M	Atomic and molecular
ADABAS	Data base management system in use at IAEA
CAJaD	Centre for Data on the Structure of the Atomic Nucleus and Nuclear Reactions of the USSR State Committee on the Utilization of Atomic Energy, located at the Kurchatov Institute
CBNM	Central Bureau for Nuclear Measurements, located at Geel, Belgium
CCDN	Centre de Compilation de Donnees Neutroniques, same as NDCC Neutron Data Compilation Centre of the OECD Nuclear Energy Agency at Saclay near Paris; now part of NEA Data Bank
CIAMDA	Computerized Index to Literature on Atomic and Molecular Collision Data Relevant to Fusion Research
CINDA	Computerized Index of Neutron Data, a specialized bibliography and data index on neutron nuclear data compiled jointly by NNCSC, NDCC, NDS and CJD
CINDU	A Catalogue of Numerical Nuclear Data Libraries available from NDS
CJD	Centr po Jadernym Dannym, the USSR Nuclear Data Centre at F.E.I. Obninsk
CODATA	Committee on Data for Science and Technology
CODEN	International code for the abbreviation of periodical titles used by ASTM, INIS and Chemical Abstracts
CPL	Computer Programme Library operated by NEA, and located at Ispra, Italy; now part of NEA Data Bank
CPND	Charged Particle Nuclear Reaction Data
CRP	Coordinated Research Programme
CSISRS	NNCSC' internal system for handling experimental data; the previous system was known as SCISRS
DASTAR	<u>D</u> ata <u>S</u> torage and <u>R</u> etrieval System used originally at IAEA/NDS
DBMS	Data Base Management System
EBCDIC	Extended Binary-Coded Decimal Interchange Code
EGAS	European Group for Atomic Spectroscopy



ENDF/B	Evaluated Nuclear Data File of the United States
ENSDF	Computer-based <u>E</u> valuated <u>N</u> uclear <u>S</u> tructure <u>D</u> ata <u>F</u> ile developed by US/NDP
EWGRD	European Working Group on Reactor Dosimetry
ESCAMPIG	Europhysics Study Conference on Atomic and Molecular Physics in Ionized Gases
EXFOR	Exchange Format, initially developed for the international exchange of neutron nuclear data, now being extended to charged particle nuclear data
FIZ	Fachinformationszentrum Energie, Physik, Mathematik GesmbH located at the Kernforschungszentrum Karlsruhe in the Federal Republic of Germany
FPND	Fission Product Nuclear Data
IAEA/NDS	Nuclear Data Section of the International Atomic Energy Agency, also NDS
ICPEAC	International Conference on the Physics of Electronic and Atomic Collisions
ICTP	International Centre for Theoretical Physics
IFRC	International Fusion Research Council
INDC	International Nuclear Data Committee
INDL/A	IAEA Nuclear Data Library for Evaluated Neutron Reaction Data of Actinides
INIS	International Nuclear Information System, a bibliographic system operated by the IAEA
IRDF	International Reactor Dosimetry File
IWGRRM	International Working Group on Reactor Radiation Measurements
JILA	Joint Institute for Laboratory Astrophysics
JINR	Joint Institute for Nuclear Research in Dubna, USSR
KACHAPAG	Karlsruhe Charged Particle Group
KEDAK	Karlsruhe Evaluated Neutron Data File
LIYaF	Leningrad Institut Yadernoy Fiziki: Leningrad Nuclear Physics Institute of the USSR Academy of Sciences
NDCC	Neutron Data Compilation Centre (Centre de Compilation de Donnees Neutroniques - CCDN) of the OECD Nuclear Energy Agency at Saclay near Paris; now part of NEA Data Bank

NDP	Nuclear Data Project located at the Oak Ridge National Laboratory (also referred to as US/NDP)
NDS	IAEA Nuclear Data Section, Vienna
NEA	Nuclear Energy Agency of the OECD
NEA/DB	Nuclear Energy Agency of the OECD Data Bank (previously NDCC)
NEACRP	Committee on Reactor Physics of the Nuclear Energy Agency of the OECD
NEANDC	Nuclear Data Committee of the Nuclear Energy Agency of the OECD
NNCSC	US National Neutron Cross Section Centre at the Brookhaven National Laboratory, Upton, N.Y. (now NNDC)
NND	Neutron Nuclear Reaction Data
NNDC	National Nuclear Data Centre of the United States
NSDD	NSD data = Nuclear Structure and Decay Data
OECD	Organization for Economic Cooperation and Development
RCN	Now ECN = Energy Research Foundation at Petten in the Netherlands
SCISRS	Sigma Centre Information Storage and Retrieval System
SOKRATOR	Soviet Evaluated Neutron Data File Format
TND	Transactinium Isotope Nuclear Data
UKNDL	UK Nuclear Data Library
WRENDA	World Request List for Nuclear Data published by the IAEA
ZAED	Zentralstelle fuer Atomkernenergie-Dokumentation: Nuclear documentation and information centre for the Federal Republic of Germany; now FIZ

INDC(NDS) Documents Published since last INDC Meeting

- INDC(NDS)-113/G+P      Progress in Fission Product Nuclear Data (No. 6)  
Information about Activities in the Field of  
Measurements and Compilation/Evaluations of Fission  
Product Nuclear Data (FPND)  
G. and M. Lammer, June 1980
- INDC(NDS)-114/GT      Proceedings of the IAEA Consultants' Meeting on  
Neutron Source Properties  
Debrecen, Hungary, 17-21 March 1980  
K. Okamoto, June 1980
- INDC(NDS)-115/NE      IAEA Advisory Group Meeting on Nuclear Structure and  
Decay Data - Summary Report  
Vienna, 21-25 April 1980  
A. Lorenz, October 1980
- INDC(NDS)-116/GP      Progress in Fission Product Nuclear Data (No. 7)  
Information about Activities in the Field of  
Measurements and Compilations/Evaluations of Fission  
Product Nuclear Data (FPND)  
M. Lammer, June 1981
- INDC(NDS)-117/GA      Second Meeting of the Atomic and Molecular Data  
Centre Network - Summary Report  
Fontenay-aux-Roses, 23-24 May 1980  
K. Katsonis, November 1980
- INDC(NDS)-118/NE      Third Coordinated Research Meeting on the  
Measurement and Evaluation of Transactinium Isotope  
Nuclear Data - Summary Report  
Vienna, 12-13 June 1980  
A. Lorenz, October 1980
- INDC(NDS)-119/G+      Third Meeting of the Coordinated Research Project on  
the Intercomparison of Evaluations of Actinide  
Neutron Nuclear Data - Summary Report  
Vienna, 12-13 June 1980  
H.D. Lemmel, August 1980
- INDC(NDS)-120/W      Second Technical Committee Meeting on Atomic and  
Molecular Data for Fusion  
Fontenay-aux-Roses, 19-22 May 1980  
Reports of the Working Groups  
K. Katsonis, October 1980
- INDC(NDS)-121/NE      Proposed Recommended List of Transactinium Isotope  
Decay Data  
Part I. Half-lives (December 1980 Edition)  
A. Lorenz, December 1980  
  
(Supersedes INDC(NDS)-108/N)

- INDC(NDS)-122/L                    Proposal for an IAEA-Sponsored Project of  
Interregional Co-Operation for Training of Nuclear  
Scientists in Developing Countries, Using the  
Expertise Available in the Nuclear Data Field  
N. Kocherov, J.J. Schmidt, July 1980
- INDC(NDS)-123/G+                  IAEA Consultants' Meeting on Nuclear Data for  
Medical Radioisotope Production - Summary Report  
Vienna, 13-15 April 1981  
K. Okamoto, June 1981
- INDC(NDS)-124/LNA                Report of the Nuclear Data Section to the  
International Nuclear Data Committee  
March 1980 to August 1981  
A. Lorenz, August 1981

INDC(SEC) Documents Published since last INDC Meeting

- INDC(SEC)-077/GA                  First Meeting of the IFRC Subcommittee on Atomic and  
Molecular (A+M) Data for Fusion  
Vienna, 19-20 January 1981  
Edited by A. Lorenz, February 1981
- INDC(SEC)-078/URSF                WRENDA 81/82 - World Request List for Nuclear Data  
N. DayDay, July 1981
- INDC(SEC)-079/UN                  INDC Correspondents for the Exchange of Nuclear Data  
Information, June 1981  
(Supersedes INDC(SEC)-75/UN)
- INDC(SEC)-080/UN                  List of Documents Received by the INDC Secretariat  
June 1981  
(Supersedes INDC(SEC)-76/UN)
- INDC(SEC)-081/LNQ                1981 Compilation of National Nuclear Data  
Committees, May 1981  
(Supersedes INDC(SEC)-74/LNQ)

IAEA Technical Reports on Nuclear Data Published During  
the Period 1970 - 1980

- IAEA-153            The Evaluation of Neutron Nuclear Data. Proceedings of a Panel held in Vienna, 30 August - 3 September 1971
- IAEA-169            Fission Product Nuclear Data (FPND), Vols. 1, 2 and 3. Proceedings of a Panel held in Bologna, 26-30 November 1973
- IAEA-186            Transactinium Isotope Nuclear Data (TND), Vols. 1, 2 and 3. Proceedings of an Advisory Group Meeting held at the Kernforschungszentrum Karlsruhe, 3-7 November 1975
- IAEA-190            Nuclear Theory in Neutron Nuclear Data Evaluation, Vols. 1 and 2. Proceedings of a Consultants' Meeting held at ICTP Trieste, 8-11 December 1975
- IAEA-208            Neutron Cross-Sections for Reactor Dosimetry, Vols. 1 and 2. Proceedings of a Consultants' Meeting held at IAEA, Vienna, 15-19 November 1976
- IAEA-213            Fission Product Nuclear Data (FPND) - 1977. Vols. 1 and 2. Proceedings of an Advisory Group Meeting held at ECN Petten, 5-9 September 1977
- IAEA-TECDOC-223    Nuclear Data for Fusion Reactor Technology. Proceedings of an Advisory Group Meeting held at IAEA, Vienna, 11-15 December 1978
- IAEA-TECDOC-232    Transactinium Isotope Nuclear Data (TND). Proceedings of an Advisory Group Meeting held at CEN-Cadarache, 2-5 May 1979
- IAEA-SMR/43        Nuclear Theory for Applications. Proceedings of a Joint IAEA/NDS-ICTP Trieste Course, held at ICTP, Trieste, 17 January - 10 February 1980

Programme Summary

J.J. Schmidt  
Head, Nuclear Data Section

This progress report on the activities and services of the IAEA Nuclear Data Section covers the eighteen months period from March 1980 to August 1981.

During this period NDS has had a relatively small turn-over of staff. Douglas Muir, who returned to the Los Alamos Scientific Laboratory in May 1980 after spending two years with the section, was replaced by V.G. Pronyaev from the USSR Nuclear Data Centre at Obninsk. In the A+M Unit, the post of the head of that unit was filled September 1980 by Robert A. Langley from the Oak Ridge National Laboratory, and Dominique Gremillet from the Paris University Laboratory of Plasma Physics at Orsay joined the Section in September 1980 to replace J. Rumble, Jr. who returned to the United States in January of that year.

In response to the recommendations of the Agency's Scientific Advisory Committee (SAC), at its January 1980 meeting, the Nuclear Data Section has given increasing attention to the growing nuclear data requirements of scientists in developing countries, and has adjusted its programmatic emphasis to satisfy the nuclear and atomic data needs in the specific areas of radiation damage, nuclear safety, nuclear materials safeguards, and fusion.

In fact, confirming the concern of the SAC regarding assistance to developing countries, the last few years have seen a distinct increase in the requests for nuclear data received by the Nuclear Data Section from developing countries. Thus, in response to 405 requests received in 1980, NDS distributed 37,568 numerical data sets, 69 processing codes, and 502 documents to scientists in Member States. These figures reflect a 39 % increase over the average of the preceding two years in the use of nuclear data services offered by the Agency.

In view of the extensive requirements for neutron nuclear data in the MeV range, the existence of appropriate measurement facilities in a number of developing Member States, and the considerable training value of nuclear data measurements, the Nuclear Data Section initiated a new interregional project for the training of nuclear scientists in developing countries, using the expertise available in the nuclear data field.

This project has been approved by the Technical Assistance Subcommittee of the IAEA Board of Governors in December 1980 and has been incorporated into the Regular Programme of IAEA Technical Assistance so far for the years 1981 and 1982 (official reference: Interregional Project TA/INT/1/018 "Nuclear Data Techniques and Instrumentation"). So far 21 developing countries have applied and requested IAEA support (fellowships, expert missions, targets and samples, auxiliary equipment) for participation in this interregional project.

This project is expected to have a significant long-term effect also on the activities of the IAEA nuclear data centre. In addition to the increased nuclear data production by the participants in the interregional project, which will put an additional load on nuclear data compilation, the growing awareness of the importance of accurate nuclear data is expected to lead to increased and more sophisticated and specialized services requested by developing countries.

On an IAEA Technical Assistance expert mission in the framework of the interregional project, J.J. Schmidt has visited the major nuclear scientific institutions in several South American countries in May 1981. The main purpose of this mission was to get acquainted with the scientific programmes and available facilities, particularly accelerators and neutron generators, of the major nuclear science institutions in Brazil, Argentina, Chile and Bolivia, to discuss and explore in detail their interests, capabilities and requirements to participate in the Interregional Project, and to renew or establish co-operation with these institutions. The second purpose of this mission was to assess the needs of these institutions for nuclear data, related documentation, data processing codes, and to provide information about the services offered by the Nuclear Data Section. A similar technical assistance expert mission was undertaken by N. Kocherov from the Nuclear Data Section to laboratories in Yugoslavia and Poland in May 1981. Details of these two missions are reported in INDC/P(81)-10 and 11.

In the period under discussion, NDS convened a few specialists meetings, following specific recommendations of the INDC. First, a Consultants Meeting on Neutron Source Properties was held in Debrecen, Hungary, in March 1980, to review the requirements and status of the properties and data of all neutron sources with energy-related applications. Secondly, in view of the rapidly increasing needs for radiopharmaceuticals and special medical radioisotopes, NDS convened a small meeting of experts in April 1981 to review the requirements of nuclear data for medical radioisotope production and to identify the gaps in the data for this application. While significant discrepancies or lack of data were not identified, the meeting did specify a limited number of isotopes for which the reliability and accuracy of the reaction and decay data could be improved.

As part of its data centre coordination activity, NDS convened representatives of the nuclear reaction data, nuclear structure and decay data, and atomic and molecular data centre networks at three separate meetings with the objectives to maintain and improve the availability and distribution of data to scientists in all Member States.

The activity of the two coordinated research programmes, currently pursued by the Nuclear Data Section, aiming at improving the knowledge of the nuclear characteristics of actinide isotopes required by nuclear technology, resulted in 1980 in the production of 15 selected evaluations of nuclear reaction data, and the release of an updated list of proposed recommended nuclear decay data for 128 heavy radioactive isotopes.

In a separate effort, in response to a specific request by the International Fusion Research Council (IFRC), NDS made an assessment of the nuclear data required in the current phase of the INTOR development.

The severe radiation environment in fission (particularly fast breeders) and fusion reactors is currently stimulating extensive studies of radiation effects in structural materials. Nuclear data and associated atomic and molecular displacement data are a basic component in radiation damage evaluation. In the course of the last year, the section has helped in the coordination of an international project for the intercomparison of radiation damage estimates in terms of displacements per atom (REAL 80), and has initiated the organization of an Advisory Group Meeting on Nuclear Data for Radiation Damage and Safety which is planned to be held in Vienna in October 1981.

The increasing demand for accurate nuclear technology design and for reliable assurance of nuclear safety requires nuclear data with a high degree of accuracy. The Nuclear Data Section, with the cooperation of NEANDC, plans a Consultants Meeting to be held in Vienna in September 1981 with the task to review the accuracy requirements of resonance parameters for reactor application for the major uranium and plutonium isotopes with an emphasis on nuclear safety coefficients.

In May 1981, an Advisory Group Meeting held in Paris reviewed the status and requirements for atomic and molecular data needed in nuclear fusion research and technology. The meeting identified in detail the current needs and priorities for atomic collision, atomic structure and plasma-surface interaction data for plasma modelling, diagnostics, heating, evaluation of impurity effects etc. in current fusion research.

The surface interaction data used by plasma modellers in their simulation calculations of fusion reactors has been inconsistent and sometimes based on very old and incorrect data. In order to alleviate this situation, a short-term coordinated research programme on the evaluation of atomic data pertinent to plasma-wall interaction processes was established by NDS in the beginning of 1981 with the primary objective to provide plasma modellers with a concise and timely reference report containing the best data available in this data field. The compilation of these data is planned to be submitted for publication before the end of 1981. Another coordinated research programme is currently being initiated on the subject of atomic collision data for diagnostics of magnetic fusion plasmas.

The first meeting of the IFRC Subcommittee on Atomic and Molecular Data for Fusion was convened in Vienna on 19-20 January, 1981. Members of this IFRC Subcommittee met to review the IAEA programme on A+M Data for Fusion and made specific recommendations regarding the aforementioned two coordinated research programmes and the required bibliographic and numerical data centre services to the fusion community.

In May 1980 NDS published CIAMDA, the Computerized Index to Atomic and Molecular Collision Data relevant to fusion research. This data index, which covers published literature from 1950 to 1979, contains about 13,000 references and 40,000 indexation lines. NDS also continued the publication of CINDA, the basic international index to neutron reaction data, and of the quarterly International Bulletin on Atomic and Molecular Data for Fusion, a publication designed to provide scientists and engineers in fusion research with a current awareness index to articles and references on atomic and molecular data pertinent to fusion.



## A. INDC Secretariat

### A.1. Liaison Officers of the INDC

The following changes in the membership of INDC Liaison Officers have occurred in the course of this reporting period:

Bolivia	<u>Dr. E. Ampuero</u> has replaced Dr. F. Mariaca
Brazil	<u>Dr. L.T. Auler</u> has replaced Dr. J.B. Martins
Bulgaria	<u>Dr. N. Janeva</u> has replaced Dr. E. Nadjakov
Chile	<u>Dr. R. Morales</u> has replaced Dr. P. Martens Cook
Hungary	<u>Dr. Gy. Kluge</u> has replaced Dr. L. Jeki
Republic of South Africa	<u>Dr. E. Barnard</u> has replaced Dr. D. Reitmann

The current list of INDC Liaison Officers comprises scientists from 40 IAEA Member States; the list is given in Appendix A.

As in previous years, INDC Liaison Officers have been requested to submit progress reports in time for distribution at the Twelfth INDC Meeting (October 1981).

### A.2. List of Correspondents

The list of INDC correspondents for the exchange of nuclear data information is produced from the files of the PROFILE system developed by IAEA/NDS (see Section D.5.6.). The current List of INDC Correspondents, which contains a total of 805 names, is to be distributed in June 1981 as INDC(SEC)-79/UN.

In addition to the formal INDC distribution codes G, L, N and U, IAEA/NDS uses additional distribution codes for the distribution of reports of interest to a limited number of people. The "special interest" distribution codes currently used for the dissemination of some INDC reports are:

A	-	A+M Data (limited distribution)
B	-	A+M Data (general distribution)
E	-	Nuclear structure and decay data (limited distribution)
F	-	Nuclear data for fusion
H	-	Transactinium isotope nuclear data
J	-	Neutron data evaluation
P	-	Fission product nuclear data
R	-	Radiation damage and neutron reactor dosimetry
V	-	Multi-group cross sections
X	-	Charged particle nuclear data

### A.3. List of Documents

The current list of INDC documents received and distributed by the INDC Secretariat is to be published as INDC(SEC)-80/UN in June 1981.

The INDC Secretariat is continuously concerned that many nuclear physics reports related to the measurement or evaluation of nuclear data, such as laboratory reports generated in participating Member States, do not get the adequate dissemination they should have. It therefore urges all those responsible for the dissemination of nuclear data information to distribute more documents through the established INDC channels (L, U and N distribution).

### A.4. Translation of Documents

Subject to available funds, the IAEA translates a limited number of INDC reports submitted by the Soviet Union in Russian. During the reporting period 12 nuclear data reports of Soviet Union origin have been translated by the IAEA into English and distributed as INDC documents. Their full titles are given in the latest List of INDC Documents, INDC(SEC)-80/UN.

### A.5. Compilation of National Nuclear Data Committees

The 1981 issue of the Compilation of National Nuclear Data Committees has been published as INDC(SEC)-81/LNQ and will be distributed in June 1981. It supersedes the 1980 compilation, INDC(SEC)-74/LNQ.

In view of the turn-over of national nuclear data committee memberships, INDC Members and Liaison Officers are urged to ascertain that all members of those committees are included in the list of INDC Correspondents (see A.2. above).

## B. Meetings sponsored by NDS

### B.1. Past Meetings

#### B.1.1. Consultants' Meeting on Neutron Source Properties, Debrecen, Hungary, 17-21 March 1980

The IAEA Nuclear Data Section, in co-operation with the Institute of Experimental Physics of the Kossuth Lajos University acting as host, convened a Consultants' Meeting on "Neutron Source Properties" during the week 17-21 March 1980 in Debrecen, Hungary. The meeting was attended by more than 40 scientists from 13 Member States.

In addition to highlighting current developments in this field, the main objectives of the meeting were:

- to review the requirements and status on neutron source properties including mono-energetic neutron-producing reactions, white source neutron spectra, spontaneous fission neutron spectra, gamma-neutron and alpha-neutron sources, filtered neutron beams and thermal and epithermal pile neutron beams. The neutron energies to be covered extend from thermal to 40 MeV and above (plasma neutron sources were not considered),
- to identify the uncertainties in the properties of neutron sources and the corrections needed to improve the accuracy and consistency of neutron measurements, and
- to formulate specific technical recommendations for future work and their coordination.

The proceedings of the meeting (INDC(NDS)-114) contain the review papers, the abstracts of the contributed papers presented at the meeting as well as the conclusions and recommendations related to:

- Radioactive  $\text{Be}(\gamma, n)$ , photoneutron and spontaneous fission sources;
- White neutron sources and filtered beams; and
- Mono-energetic neutron sources from charged particle reactions.

B.1.2. Advisory Group on Nuclear Structure and Decay Data, Vienna, 21-25 April 1980

The fourth Advisory Group Meeting on Nuclear Structure and Decay Data (NSDD) was convened by the IAEA Nuclear Data Section at IAEA Headquarters in Vienna, Austria, from 21-25 April 1980. The meeting was attended by 23 Scientists from eleven Member States and two international organizations, representing centres and groups concerned with the compilation, evaluation and dissemination of nuclear structure and decay (NSD) data. The "Summary Report" of this meeting was published as INDC(NDS)-115 in October 1980.

In summary,

- The meeting reviewed the status of the international NSDD Network, the progress of mass-chain evaluations, and the current mass-chain evaluation responsibilities. It concluded that even though a mass-chain evaluation cycle of four years has not yet been achieved, the overall progress was satisfactory.
- The meeting re-examined the NSDD mass-chain evaluation and review procedures, and accepted the "Normal Procedures for Mass-Chain Evaluation" as adopted at the November 1977 NSDD meeting.
- The meeting reviewed on-going and planned publications of NSDD, and recommended that new information contained in horizontal compilations be fed into the ENSDF file.

- The meeting reviewed the status of the Nuclear Structure Reference File, discussed its distribution and suggested ways to improve the quality of this file.
- The meeting reviewed the status of the Evaluated Nuclear Structure Data File (ENSDF) and its associated system, and adopted guidelines for referring to ENSDF as a reference in the open literature.
- The meeting discussed the physics of NSDD evaluation, came to a number of agreements with regard to terminology, and made substantial physics recommendations aimed at improving the standards and rules governing NSDD evaluation.

B.1.3. Second Technical Committee Meeting on Atomic and Molecular Data for Fusion, Fontenay-aux-Roses, France, 19-22 May 1980

The Second Technical Committee (TC) meeting on Atomic and Molecular (A+M) Data for Fusion was held at the Fontenay-aux-Roses Nuclear Fusion Laboratory. It was attended by 77 scientists, representing both the technical fusion and the academic atomic physics communities from 18 countries.

The objectives achieved by this meeting were:

- definition of the currently and potentially required A+M data and assessment of their availability,
- identification of research groups within fusion laboratories and universities which could contribute to the production, collection and critical evaluation of needed data,
- establishment of closer collaboration between data users and producers of A+M data, and
- formulation of specific recommendations on the current IAEA A+M data programme and on future international cooperation in this field.

The recommendations of the meeting, consisting of detailed assessments of the current A+M data needs in fusion technology and of recommendations regarding the IAEA A+M programme, and summarized in three Working Group reports, have been published in report INDC(NDS)-120 in October 1980.

The review papers prepared specifically for this meeting and selected contributed papers were published as a special issue of the scientific journal "Physica Scripta", Vol. 23 No. 2 in February 1981.

B.1.4. Second Atomic and Molecular Data Centre Network Consultants' Meeting, Fontenay-aux-Roses, France, 23-24 May 1980

The Second A+M Data Centre Network Consultants' Meeting was held at the Fontenay-aux-Roses Nuclear Fusion Laboratory. The meeting convened representatives of data centres and groups concerned with the coordinated international management of the atomic and molecular data field pertinent to fusion research and technology. This meeting was attended by 22 specialists, including representatives from eight A+M data centres.

The meeting consisted primarily of extensive discussions on the exchange of data between the members of the A+M Data Centre Network, on the evaluation of A+M data and its support and promotion by the IAEA, and on the establishment of an international file of evaluated A+M collision data.

The "Summary Report" of the meeting was published as INDC(NDS)-117 in November 1980.

B.1.5. Third Research Coordination Meeting on the Intercomparison of Actinide Neutron Nuclear Data Evaluations, Vienna, 12-13 June 1980  
..... (see Section C.5.1.)

B.1.6. Third Research Coordination Meeting on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data, Vienna, 12-13 June 1980  
..... (see Section C.5.2.)

B.1.7. Eleventh Meeting of the INDC, Vienna, 16-20 June 1980  
..... (see report INDC-35/L)

B.1.8. Fifth Annual Nuclear Reaction Data Centre Meeting, Brookhaven, 29 September - 3 October 1980

The main purpose of the annual meeting of the Nuclear Reaction Data Centre Network (NRDC) is to co-ordinate the activities devoted to the international nuclear data exchange between an increasing number of national or regional data analysis centres and to reach agreements in data compilation scope and policies and in data exchange procedures and formats (CINDA, EXFOR, WRENDA, ENDF/B etc.). The present network of nuclear reaction data centres and the scope of their activities are shown in Table I.

The Fifth Annual NRDC Meeting was hosted by the US National Nuclear Data Centre at the Brookhaven National Laboratory. It included the 16th "Four-Centre Meeting" of the four neutron data centres, the 6th "CPND" Meeting on Charged-Particle Nuclear Data Compilation, and a session on Photonuclear Reaction Data.

The three USSR centres for neutron data, charged-particle data, and photonuclear data, that participate in the EXFOR data exchange, were not represented at the Brookhaven meeting. This meeting was subsequently supplemented by a visit of USSR representatives at the Nuclear Data Section in Vienna, on 16-17 December 1980.

The Summary and Conclusions of this meeting are given in Appendix B.

Table I

The Nuclear Reaction Data Centres

The following data centres participate in the international data exchange developed and maintained under the co-ordination of the IAEA Nuclear Data Section:

NNDC	- US National Nuclear Data Centre, Brookhaven, USA
NEA-DB	- OECD/NEA Nuclear Data Bank, Saclay, France
NDS	- IAEA Nuclear Data Section
CJD	- USSR Centr po Jadernym Dannym (= Nuclear Data Center), Obninsk, USSR
KACHAPAG	- Karlsruhe Charged Particle Group, Karlsruhe, FRG
CAJaD	- USSR Centr po Dannym o Stroenil Atomnogo Jadra: Jadernykh Reakcih (= Nuclear Structure and Nuclear Reaction Data Center), Moscow USSR
CDFE	- Centr Dannykh Fotojad. Eksp. (= Center for Experimental Photonuclear Data), Moscow, USSR
PhDC	- Photonuclear Data Center, Washington, USA
FIZ	- Fachinformationszentrum Karlsruhe, FRG
JCPNDG	- Japanese Charged Particle Nuclear Data Group (about to join)

These data centres co-operate on the following projects:

1. Neutron Nuclear Data

- 1.a. Bibliography and Data Index "CINDA";  
Input prepared by NEA-DB, NNDC, NDS, CJD  
Handbooks published by IAEA
- 1.b. Experimental data exchanged in EXFOR format:  
Input prepared by NNDC, NEA-DB, NDS, CJD
- 1.c. Data Handbooks based on EXFOR published by NNDC
- 1.d. Evaluated data exchanged in ENDF/B format:  
NNDC, NEA-DB, NDS, CJD and others

2. Charged Particle Nuclear Data

- 2.a. Bibliography and Data Index published by NNDC
- 2.b. Numerical data exchanged in EXFOR format:  
Input prepared by KACHAPAG, CAJaD, NDS, NNDC, JCPNDG (about to join)
- 2.c. Data Handbooks based on EXFOR published by FIZ/KACHAPAG

3. Photonuclear Data

- 3.a. Numerical data exchanged in EXFOR format:  
Input prepared by CDFE, PhDC, NNDC, NDS

B.1.9. First Meeting of the IFRC Subcommittee on A+M Data for Fusion, IAEA, Vienna, 19-20 January 1981

The first meeting of the Subcommittee on Atomic and Molecular Data of the International Fusion Research Council (IFRC) was convened in Vienna, Austria, from 19-20 January 1981. Members of this IFRC Subcommittee met to review the IAEA programme on Atomic and Molecular (A+M) Data for Fusion, and made specific recommendations regarding the bibliographic and numerical data centre services to the fusion community.

The Summary Report of this meeting has been published in February 1981 as INDC(SEC)-77/GA.

B.1.10. Consultants' Meeting on Nuclear Data for Medical Radioisotope Production, Vienna, 13-15 April 1981

In response to INDC's recommendation, the Nuclear Data Section convened a consultants' meeting on "Nuclear Data for Medical Radioisotope Production" from 13 to 15 April at IAEA Headquarters in Vienna. The meeting was attended by 12 scientists from 8 Member States.

The main objectives of the meeting were:

- to review the current requirements for nuclear data for medical radioisotope production such as half-lives, gamma-spectra, excitation functions and other nuclear data,
- to identify the present status, survey the uncertainties and gaps in nuclear data in this field and to identify the required data and priorities, and
- to advise on the need for a larger IAEA Advisory Group Meeting on this topic.

With regard to specific nuclear data needs, the meeting identified a number of radioisotopes for which revision or extension of the existing decay data was deemed desirable, and recommended that IAEA, in collaboration with other nuclear data centres, compile cross-sections and thick-target yields for the production of the more commonly used radioisotopes and their contaminants. In connection with microdosimetry, the meeting recognized the lack of reliable information on the energies and intensities of Auger electrons and very low energy x-rays for some of the key radioisotopes.

The Summary Report of this meeting has been published as INDC(NDS)-123/G+ in July 1981.

B.1.11. Coordinated Research Programme (CRP) on the Evaluation of Atomic Data Pertinent to Plasma-Wall Interaction Processes  
.....(see Section C.5.3.)

B.2. NDS Meetings Planned from September 1981 to the end of 1982

- 2.1. Specialists' Meeting on Uranium and Plutonium Resonance Parameter Data for Nuclear Reactor Safety, IAEA, Vienna, 28 September - 2 October 1981
- 2.2. 12th Meeting of the International Nuclear Data Committee, Vienna, 5-9 October 1981 (E F R Interpretation)
- 2.3. Research Coordination Meeting on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data, Vienna, 12-13 October 1981
- 2.4. Research Coordination Meeting on the Measurement of Transactinium Isotope Nuclear Decay Data, Vienna, 12-13 October 1981
- 2.5. Advisory Group Meeting on Nuclear Data for Radiation Damage and Safety, IAEA, 12-16 October 1981
- 2.6. Course on Advances in Nuclear Theory and Nuclear Data for Reactor Applications, ICTP Trieste, 25 January - 19 February 1982
- 2.7. Seventh Annual Meeting of the Nuclear Reaction Data Centres, Vienna, 3-7 May 1982
- 2.8. Advisory Group Meeting on Nuclear Structure and Decay Data, Utrecht, Netherlands, 10-14 May 1982
- 2.9. Specialists' Meeting on U-235 Fast Fission Cross Section, 1982
- 2.10. Meeting of the A+M Data Centre Network, 1982
- 2.11. Research Coordination Meeting on the Intercomparison of Actinide Neutron Nuclear Data Evaluations, Antwerp, Belgium, September 1982
- 2.12. Research Coordination Meeting on the Measurement and Evaluation of Transactinium Isotope Nuclear Data, Antwerp, Belgium, September 1982
- 2.13. Research Coordination Meeting on A+M Data Evaluation
- 2.14. Interregional Project Meeting



## C. Nuclear Data Assessment and Research Coordination

### C.1. Interregional Project (IP) for Training of Nuclear Scientists in Developing Countries, using the Expertise available in the Nuclear Data Field

Following the support of the IP and the recommendations by the INDC at its 11th Meeting in June 1980, the IAEA Technical Assistance Department, towards the end of July 1980, has written official letters to a number of developing countries with a potential interest in participating in the IP, informing the pertinent atomic energy authorities in these countries about the Agency's intention to start the IP under the 1981 Regular Programme of Technical Assistance and asking them for official endorsement of the IP, for sending concrete applications for training and research work under the IP and specifying the support required. Following endorsement of the IP and applications received from a number of developing countries, the IP has been approved by the Technical Assistance Subcommittee of the IAEA Board of Governors in December 1980 and has been included into the Regular Programme of IAEA Technical Assistance so far for the years 1981 and 1982 (official reference: Interregional Project TA/INT/1/018 "Nuclear Data Techniques and Instrumentation").

The Information Sheet for this IP is given in Appendix C, and the description of the proposal for this IP has been published as INDC(NDS)-122/L. A Summary of the development of the IP since the 11th INDC Meeting in Vienna in June 1980, and of the applications and requests received from developing countries until February 1981 has been published as INDC/P(81)-6. More details on the first steps taken on the implementation of these applications will be provided to the forthcoming 12th Meeting of the INDC in Vienna in October 1981.

### C.2. Technical Assistance Mission to South America

On an IAEA Technical Assistance expert mission in the framework of the interregional project, J.J. Schmidt has visited the major nuclear scientific institutions in several South American countries in May 1981. The main purpose of this mission was to get acquainted with the scientific programmes and available facilities, particularly accelerators and neutron generators, of the major nuclear science institutions in Brazil, Argentina, Chile and Bolivia, to discuss and explore in detail their interests, capabilities and requirements to participate in the Interregional Project, and to renew or establish co-operation with these institutions. The second purpose of this mission was to assess the needs of these institutions for nuclear data, related documentation, data processing codes, and to provide information about the services offered by the Nuclear Data Section. The detailed results of this mission will be reported in INDC/P(81)-10.

### C.3. Research Contracts and Agreements

The following new nuclear data research contracts and agreements have been let in conjunction with programmes of the Nuclear Data Section:

Research Contract # 2657     Dr. G. Shami (Israel)

Measurement of (n,2n) reaction neutron spectrum after bombardment of several elements with 14 MeV neutrons.

Research Agreement # 2791     Dr. A.K. Petrzhak (USSR)

Calculation of integral fission cross sections of various actinides from differential measurements and a comparison of the results with direct integral measurements of fission neutron cross-sections from the  $^{252}\text{Cf}$  fission spectrum.

(Part of CRP on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data).

Research Agreement # 2328     Dr. V.A. Konshin (USSR)

Research within the framework of the coordinated research programme on the intercomparison of evaluations of actinide neutron nuclear data.

(Part of CRP on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data).

Research Agreement # 2829     Dr. R. Arlt (German Democratic Republic)

Absolute fission cross-section measurements on  $^{235}\text{U}$ ,  $^{238}\text{U}$ ,  $^{239}\text{Pu}$ ,  $^{242}\text{Pu}$ ,  $^{233}\text{U}$  and  $^{237}\text{Np}$  employing time-correlated associated particle method and data evaluation.

(Part of CRP on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data).

Research Agreement # 2363     Dr. E. Fort (France)

Evaluation of neutron nuclear cross-sections for  $^{241}\text{Am}$ ,  $^{237}\text{Np}$  and  $^{238}\text{Pu}$ .

(Part of CRP on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data).

Research Agreement # 2595

Mrs. M. Mattes (Fed. Republic of Germany)

Format conversion and intercomparison of different evaluations of actinide neutron cross-sections.

(Part of CRP on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data).

Research Contract # 2741

Dr. A. Marcinkowski (Poland)

Evaluation of  $^{46}\text{Ti}(n,2n)$  and  $^{107}\text{Ag}(n,2n)$  reaction cross-sections.

#### C.4. Targets and Samples

NDS solicits requests and provides assistance in the supply of accelerator targets and isotope samples required by developing countries for nuclear data measurements requested in WRENDA.

The following table summarizes the Target and Samples Contracts concluded during 1980.

<u>Contract</u>	<u>Country</u>	<u>Samples</u>	<u>Price (US \$)</u>	<u>Comments</u>
RC-NDS-735	Romania	$^{236}\text{U}$ , $^{241}\text{Pu}$ (10 mg each)	3 314.-	Delivered and payed
RC-NDS-543	India	Calibration of $^{57}\text{Co}$ , $^{152}\text{Eu}$ (5mCi each)	1 000.-	Delivered and returned to the Agency
RC-NDS-557	Bolivia	$^{238}\text{U}$ , $^{235}\text{U}$ , $^{232}\text{Th}$	3 312.-	To be delivered
RC-NDS-558	Pakistan	$^{237}\text{Np}$ , $^{241}\text{Am}$	<u>8 170.-</u>	$^{237}\text{Np}$ delivered
Total amount obligated US-\$			<u>15 796.-</u> =====	

## C.5. Coordinated Research Programmes

### C.5.1. Third Research Coordination Meeting on the Intercomparison of Actinide Neutron Nuclear Data Evaluations, Vienna, 12-13 June 1980

The Third Research Coordination Meeting of the participants in the IAEA Coordinated Research Programme (CRP) on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data was convened by the IAEA Nuclear Data Section on 12-13 June 1980 in Vienna.

Thirteen meeting participants from 11 countries submitted 31 working papers. The meeting discussed the status of ongoing evaluations, completed evaluations, details of intercomparisons with particular emphasis on nuclear theory and statistical parameters, and the formulation of the IAEA Nuclear Data Library for Actinides (INDL/A), presently containing 16 evaluations (see Appendix D).

A more detailed report containing the conclusions resulting from the intercomparison of the data available, has been issued as document INDC(NDS)-119.

The next CRP Meeting has been planned to take place on 12-13 October 1981 in Vienna.

### C.5.2. Coordinated Research Programme (CRP) on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data

This CRP aims at improving the accuracy of nuclear decay data of the transactinium isotopes, with the objective to arrive at a consistent set of transactinium isotope nuclear decay data and their uncertainties (including half-lives, branching fractions and gamma-ray and alpha emission spectra) which would satisfy the requirements identified by the community of data users.

The third meeting of this CRP was held at IAEA Headquarters in Vienna, 12-13 June 1980. At that meeting, the CRP participants

- reviewed the decay data requirements defined at the second IAEA meeting of transactinium isotope nuclear data (Cadarache, May 1979), and identified the data for which the accuracy requirements had not yet been met;
- updated and extended the list of proposed transactinium isotope half-lives published in INDC(NDS)-108/N (September 1979), and approved the release of the new version of this list; and
- continued the detailed review of the status and accuracies of the alpha and gamma radiation spectra ( $E_{\alpha}/I_{\alpha}$  and  $E_{\gamma}/I_{\gamma}$ ) emitted in the decay of transactinium isotopes.

The Summary Report of this meeting has been published as INDC(NDS)-118/NE.

The December 1980 edition of the Proposed Recommended List of Transactinium Isotope Half-Lives was published as INDC(NDS)-121/NE, and the first proposed recommended list of transactinium isotope alpha and gamma radiation spectra is planned to be released in 1981.

The next CRP meeting has been planned to take place on 12-13 October 1981 in Vienna.

C.5.3. Coordinated Research Programme (CRP) on the Evaluation of Atomic Data Pertinent to Plasma-Wall Interaction Processes

The purpose of this coordinated research programme is to provide plasma modellers with a consistent set of plasma-surface interaction data. The publication will provide, where possible, evaluated data but where little or not data exists, it will provide the best guess by an expert in the field. The topics addressed are:

1. Reflection
2. Trapping and Detrapping
3. Recombination and Accomodation
4. Desorption
5. Secondary  $e^-$  emission
6. Erosion (including arcing, chemical reactions, evaporation, sputtering, blistering and flaking).

A meeting of this CRP is planned to take place in Vienna in July 1981.

C.5.4. Coordinated Research Programme (CRP) on Atomic Collision Data for Diagnostics of Magnetic Fusion Plasmas

The objective of this CRP, which was initiated in June 1981, is to support the measurement, calculation and evaluation of selected atomic collision cross-section data required for the diagnostics, beam heating, and modelling of magnetically confined plasmas in fusion devices. The following collision reactions are proposed to be included in this programme:

- Electron impact excitation, ionization and recombination,
- Ionization, recombination and charge exchange in collisions between atoms and/or ions.

The first meeting of this CRP is foreseen for 1982.

C.6. Nuclear Data for Radiation Damage, REAL-80

At the beginning of February 1981, data for the first round of the REAL-80 project was distributed to some 25 participants. The first round of REAL-80 involved analysis of the ORR and YAYOI reactors. The initial report on the results of the first round of REAL-80 will be presented at the Advisory Group Meeting on Nuclear Data for Radiation Damage and Safety, 12-16 October 1981. Subsequently a complete report on the first round of REAL-80 will be presented at the fourth ASTM Conference, which will be held at the National Bureau of Standards, Washington D.C., March 22-26, 1982.

Emphasis of the first round of REAL-80 is focussed on calculating a limited number of integral quantities; e.g. nickel activation rate, iron displacement rate. Subsequent rounds of REAL-80 will concentrate on successively more difficult quantities for use in the unfolding codes; e.g. spatially dependent self-shielding factors.

C.7. Nuclear Data for the INTOR Fusion Reactor Project

In response to a request received from the International Fusion Research Council (IFRC), NDS in cooperation with members of the INTOR workshop, have prepared a draft report on the "Preliminary Survey on the Availability and Quality of Evaluated Nuclear Data Important for Fusion Reactor Technology". This draft report will be submitted to INDC for consideration at its October 1981 Meeting.

C.8. Nuclear Data for Safeguards

A first summary of methods applied in Safeguards using transactinium isotope nuclear data is included in the report of the INDC Subcommittee A (see official Minutes of the 11th INDC meeting, INDC-35). A more thorough review of safeguards' methods and of nuclear data uses and requirements in safeguards analytical methods is in progress. Specialists from the IAEA department of Safeguards are being contacted for further discussions. The findings of these activities will be summarized in a report for consideration at the forthcoming INDC meeting in October 1981.

C.9. Fission Product Nuclear Data (FPND): Annual Progress Report Series

News on activities in the field of FPND are continued to be published as INDC(NDS)-Reports "Progress in Fission Product Nuclear Data". In the 6th issue, INDC(NDS)-113, the number of contributions increased by about 70 % as compared to the 5th issue. For the first time contributions from USSR were received. The 7th issue, INDC(NDS)-116, is to be published in June 1981.

## C.10. WRENDA

NDS coordinates the compilation and publishes on behalf of the four neutron data centres WRENDA, the world request list for nuclear data needed for the development of fission and fusion reactors and of nuclear materials safeguard techniques.

WRENDA 81/82 which is planned to be issued in August 1981, reflects a number of changes since the publication of the previous edition: 437 requests were withdrawn, 331 were modified and 271 new requests added. The total number of requests related to fission reactor technology is 1352, very nearly unchanged, while the number related to nuclear fusion has increased from 449 to 594.

The issue of WRENDA 83/84 is planned for the summer of 1983. The data centres should therefore be receiving "country retrievals" in August 1981 to begin the next WRENDA update cycle.

## D. Data Centre Activities

### D.1. Nuclear Reaction Data

#### D.1.1. Experimental Data

EXFOR is now a comprehensive system for the international exchange of experimental nuclear reaction data including reactions induced by neutrons, charged particles, heavy ions, photons, as well as selected spontaneous fission data (e.g.  $\bar{\nu}$  of Cf-252).

Compilation of neutron data is comprehensive, compilation of the other data is selective. In the period 1980/81, NDS gave special emphasis to the compilation of neutron source reactions, and reactions for biomedical applications; both in connection with related consultants' meetings.

Data compilation continues in close cooperation with the authors who acknowledge the critical review of their data by NDS during compilation. Checking of EXFOR data compiled at NDS or received from other centres, is performed with the EXFOR checking programme.

#### D.1.2. Evaluated Data

The request statistics demonstrate that evaluated neutron data have a fast increasing importance in contrast to the experimental EXFOR data for which the demand remains about constant. (See Section D.4.2.).

Since recently the ENDF/B format appears to be the internationally most commonly used format for compilation and exchange of evaluated neutron data, NDS has therefore started to compile evaluated neutron data in ENDF/B format, implemented related computer programmes, and started the IAEA Nuclear Data Library INDL which contains

- a) the (INDL/A) file, comprising actinide evaluations considered in the framework of the Coordinated Research Programme on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data.
- b) the (INDL/V) file containing evaluations of varying origin, such as
  - data converted by NDS from SOKRATOR into ENDF/B format, and
  - dosimetry evaluations.

The EXFOR-V file, comprising evaluated data in the EXFOR format, contains, among others, complete evaluations for Ba isotopes and  $^{31}\text{P}$  performed by the Radiuminstitute Vienna, evaluated resonance parameters for structural materials from Karlsruhe, and others. In addition, it contains small partial evaluations for the fission-neutron yield, for the (n,2n) reaction, etc. for which the EXFOR format may be more convenient than the ENDF/B format.

Customers receiving evaluated data from NDS, receive format and content documentation for each library. A special report series ("IAEA-NDS-...") has been created for this purpose. (See Appendix D).

Evaluated data for charged-particle induced reactions are included in the EXFOR library, where NDS concentrates on a compilation of best available evaluations of neutron source reactions.

## D.2. Nuclear Structure and Decay Data (NSDD)

The general objectives of this component of the Nuclear Data Section programme are to review the requirements for NSDD of importance in applications of radiations and isotopes, to coordinate internationally the compilation, evaluation and dissemination of such data, to promote the measurement and evaluation of needed data, and to provide data centre services to NSDD users.

Since its inception in 1972, the main emphasis of this programme component has been the organization of an internationally coordinated network of data centres, research groups and individual scientists for the systematic compilation, evaluation and dissemination of nuclear structure and decay data. Four advisory group meetings (held in 1974, 1976, 1977 and 1980) have led to the adoption of computer-based systems for the exchange of bibliographic and numerical nuclear structure and decay data between the members of a network of data centres and groups, and to the organization of an international cooperative effort with the aim of achieving a continuous and complete evaluation of NSDD for all isotope mas chains on a four year cycle. See Section B.1.2. for the Summary of the NSDD meeting held in April 1980. The next meeting of the NSDD network is planned for 10-14 May 1982.



In the framework of the same programme component, IAEA/NDS has initiated in 1978 a coordinated research programme for the measurement and evaluation of transactinium isotope nuclear decay data (see Section B.1.6. and C.5.2.). The final objective of this activity is to publish an internationally recommended list of transactinium isotope decay data (e.g. half-lives and  $\alpha$  and gamma-ray spectra). A preliminary list of proposed half-lives for selected transactinium isotopes has been published in report INDC(NDS)-108/N.

In compliance with the request to update the gamma-ray standards, part of the INDC Standards File, IAEA/NDS in cooperation with LMRI at Saclay, has submitted to the INDC two proposed listings of recommended half-lives and gamma-ray  $E_{\gamma}/I_{\gamma}$  values for isotopes used as calibration standards.

### D.3. Atomic and Molecular Data

The publication "International Bulletin on Atomic and Molecular Data for Fusion" is in the process of being changed to reflect recommendations suggested by the IFRC Subcommittee on Atomic and Molecular Data and to make the publication more useable by the fusion community. The major changes are an expansion of the number of journals and reports searched and an expansion of the surface interaction area. A bibliographic listing is now regularly received from the Controlled Fusion Atomic Data Centre of Oak Ridge National Laboratory and the National Bureau of Standards which is used to provide a greater coverage of journals and reports and is also used to compare it with the IAEA input as a test of consistency.

One of the goals of the A+M Data Unit is to create a data base of evaluated data and to disseminate these data to the users. To this end a Coordinated Research Programme has been initiated to review, evaluate and publish pertinent data relating to plasma-wall interactions. A report resulting from this effort will be designed so as to provide plasma modellers with an easy access to the best available (evaluated) data (see C.5.4.).

A Coordinated Research Programme, aimed at the measurement and evaluation of most needed atomic collision cross-sections required in present magnetic confinement plasma devices, and needed for the design of future fusion reactors has been initiated (see C.5.4.).

A data storage and exchange format for numerical A+M data (limited to atomic reaction data) has been designed by the IAEA Atomic and Molecular Data Unit. The format is based on the EXFOR system used internationally by nuclear data centres for the exchange of nuclear reaction data.

#### D.4. Data Centre Services

##### D.4.1. Documentation and User Services

Since September 1979, NDS has issued the "Nuclear Data Newsletter" which has been distributed to all of its correspondents in its service area. This Newsletter is designed to expand contacts to data users in the NDS service area, advertise the services offered by NDS, to publicize news about additions and improvements to the data files available from NDS, and to inform the nuclear data community about activities and meetings sponsored by the IAEA/NDS. This Newsletter is aimed specifically at the nuclear data users in the NDS service area, and is normally issued two or three times a year. Subscription to receive the "Nuclear Data Newsletter" free of charge can be obtained by writing to the Nuclear Data Section.

Complementary to the Newsletter, NDS has instituted a new documentation report series, "IAEA Nuclear Data Services" with the report code "IAEA-NDS-...", which allows for the individual documentation (description of content and format) of each data library or data system. These documentation reports are normally included with the requested data library or systems, and are also distributed on request. The current Index of the IAEA-NDS Documentation Reports is given in Appendix D.

The combination of the widely distributed "Nuclear Data Newsletter" and the "IAEA Nuclear Data Services" reports replaces the previously issued CINDU catalogue.

##### D.4.2. Data Request and Dissemination Statistics

###### D.4.2.1. Data Request Statistics

In its function as a data centre, IAEA/NDS disseminates nuclear data in computerized form, data processing computer programmes, as well as reports and documents to Member States in the IAEA/NDS service area. This geographical area comprises most developing IAEA Member States. Over the last three years IAEA/NDS handled an average of 319 requests per year. This amounts to approximately one and a half requests per working day.

A "request", as interpreted in the statistics presented below, is defined as any query received by NDS for any one of the following specific categories of experimental data, evaluated data, bibliographic retrievals (e.g. from the CINDA master file), documents, and computer programmes. For example: one letter asking for experimental and evaluated data would count as two requests.

Averaged over the years 1978, 1979 and 1980, of the total number of 958 requests received by NDS,

43.4 % were for experimental (17.1 %) and evaluated (26.3%) data  
7.8 % for data processing codes, and  
48.8 % for reports and documents.

With regard to request origin,

71 requests ( 7.4 %) were received from area 1,  
217 requests (22.7 %) from 17 countries in area 2,  
606 requests (63.4 %) from 37 countries in area 3 (NDS service area),  
and  
62 requests ( 6.5 %) from the USSR (area 4).

Request statistics for each of the considered categories and statistics showing the total number of requests handled by NDS for each of the last 16 years are given in Table II and Figures 1 and 2. Figure 1 shows the request statistics since 1965 in terms of number of requests per year averaged over three-year periods (i.e. the number for 1980 is the average over the years 1978, 1979 and 1980).

#### D.4.2.2. Data Dissemination Statistics

Data dissemination statistics show what NDS has sent out as a result of requests received; numerical data are normally quantified in terms of "data sets".

A "data set" is defined as a set of numerical data of a given type for a given nuclide in a given energy range which resulted from a specific data measurement or evaluation. For evaluated data a data set comprises all data given under one "MAT" number in a given evaluated data library; for EXFOR, a data set comprises all data combined in an EXFOR sub-entry (excluding the first BIB subentry). Averaged over the years until 1979, and considering both experimental and evaluated data, a data set comprises 184 data points or data records. As shown on Figure 2, the number of nuclear data sets distributed per year (including experimental and evaluated data) has increased exponentially during the last 15 years.

#### D.5. Programming and Systems Development

##### D.5.1. General

During this period, the new request and dissemination log systems were designed and implemented. Also during the period an extensive system of programmes were implemented in order to improve the reliability of the evaluated data distributed by NDS; this included format and physics checking, graphic output, etc. Work is now underway on an index system for all of our evaluated data, in order to simplify information inquiries and to automate data retrieval. Work on the computation format for experimental data has continued. The production programmes for EXFOR, CINDA and WRENDA may be considered to be complete and require only minor maintenance and improvements.

Table II

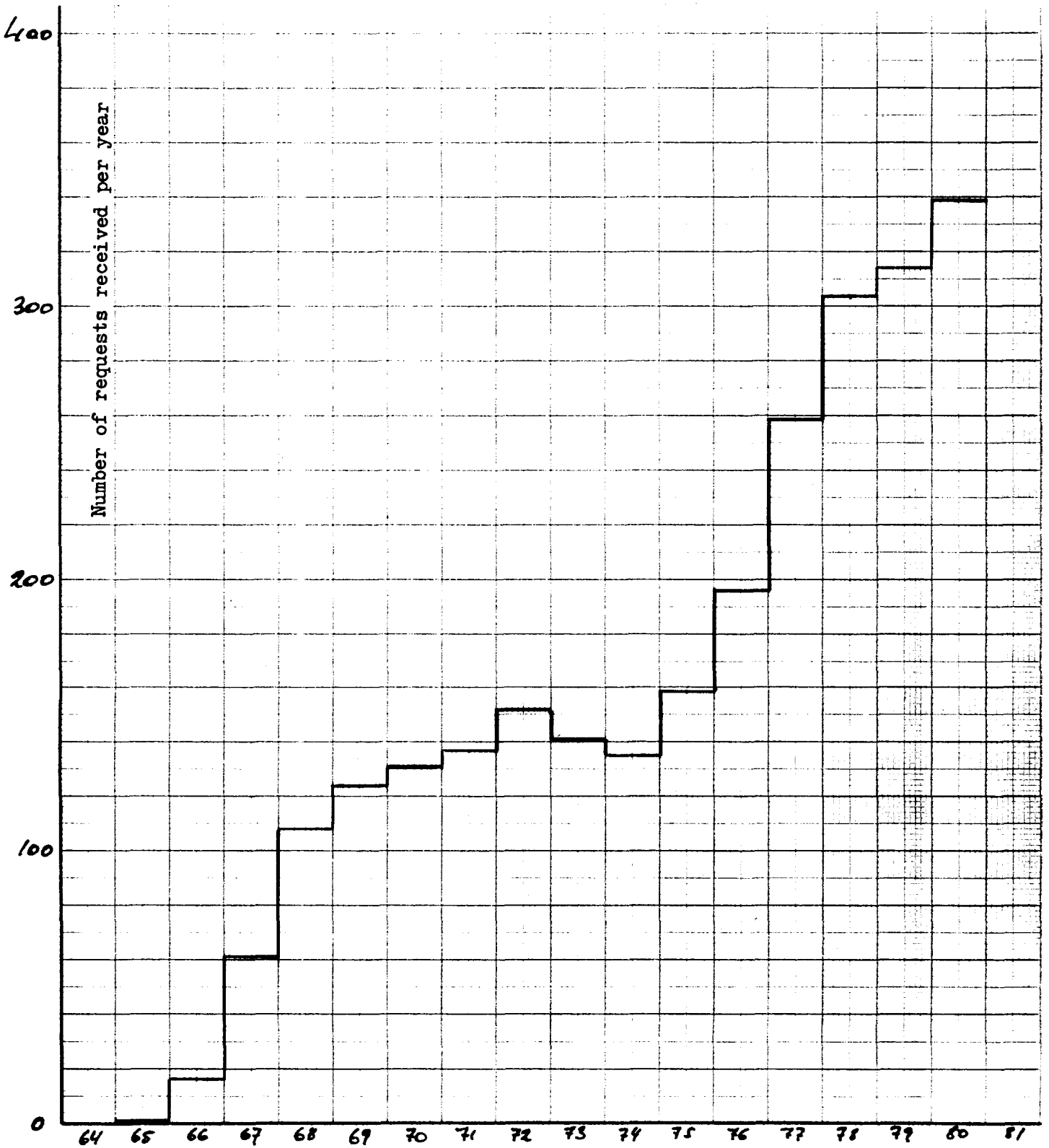
Data Request and Distribution Statistics 1965 - 1980

Year	Request Statistics (Number of Requests)								Combined Experimental and Evaluated Data Distribution	
	Experimental Data	Evaluated Data	Experimental and Evaluated Data	Documents	Other *	Totals per year	Totals (Averaged over three years)	Totals Cumulative	Data Sets per Year	Data Sets Cumulative
1965	3	-	3	-	-	3	1	3	73	73
1966	40	-	40	-	5	45	16	48	138	211
1967	118	-	118	9	8	135	61	183	474	685
1968	119	-	119	16	9	144	108	327	560	1 245
1969	48	15	63	25	5	93	124	420	403	1 648
1970	95	20	115	34	8	157	131	577	857	2 505
1971	76	33	109	43	8	160	137	737	2 308	4 813
1972	48	23	71	60	8	139	152	876	7 274	12 087
1973	43	22	65	54	6	125	141	1 001	8 081	20 168
1974	49	24	73	61	6	140	135	1 141	5 427	25 595
1975	43	49	92	114	3	209	158	1 350	8 472	34 067
1976	34	43	77	153	9	239	196	1 589	14 533	48 600
1977	45	49	94	232	3	329	259	1 918	15 100	63 700
1978	62	71	133	193	17	343	304	2 261	23 691	87 391
1979	63	93	156	95	18	269	314	2 530	36 807	124 198
1980	42	85	127	237	41	405	339	2 935	37 568	161 766

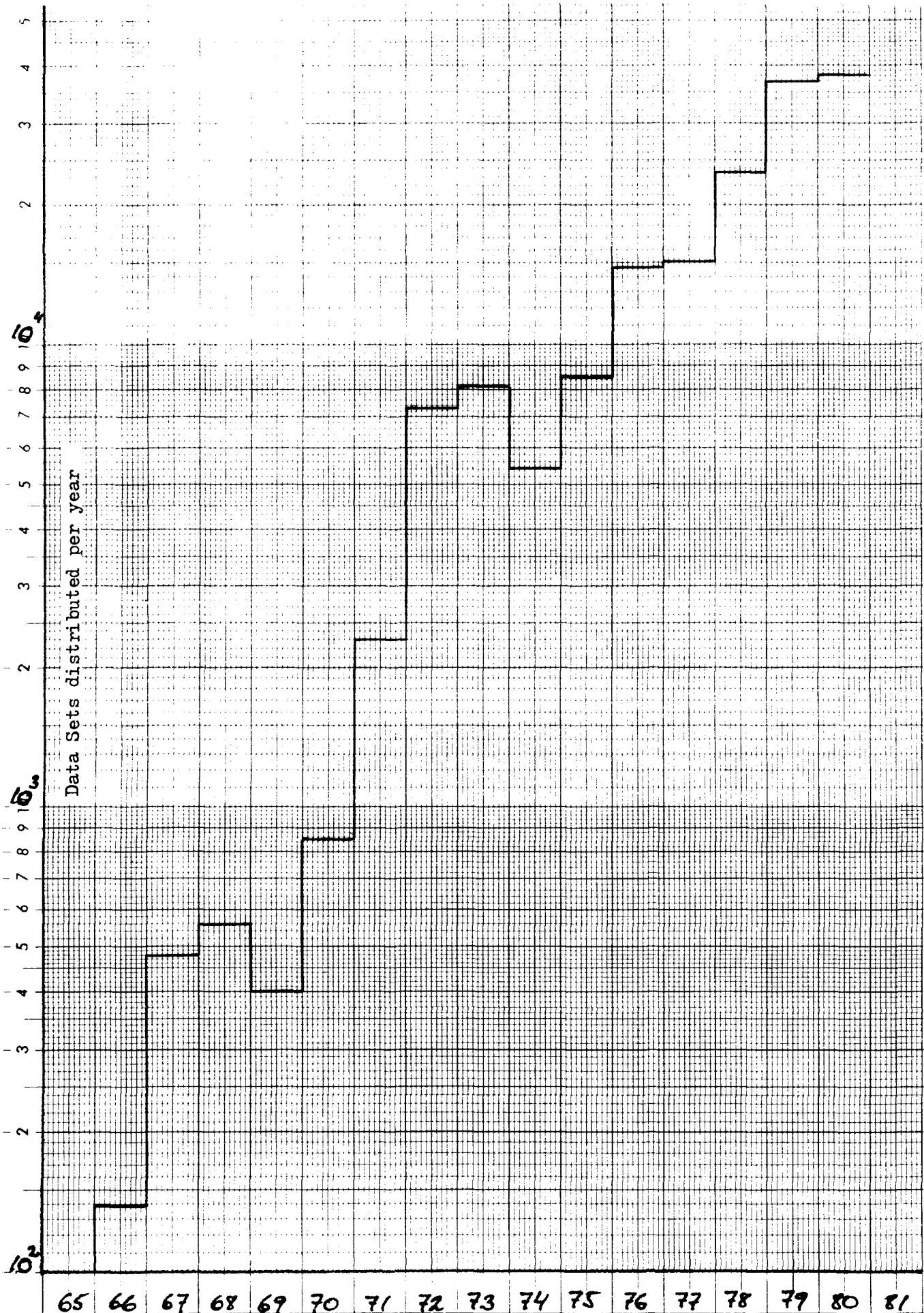
\* Since 1978 this category contains exclusively computer programmes, all others, including bibliographies, are included under documents.

Figure 1.

Nuclear Data Request Statistics  
(each step represents 3-year average)



Numerical Nuclear Data Sets Distributed per Year  
(including experimental and evaluated data)



The card based data entry was completely phased out as of January 1981 and has been replaced by an IBM-5280 remote data entry system. The NDS now has six video display units plus two remote data entry screens and a remote printer for output. Using this combination of resources, all programme development, data entry, data requests, on-line input and correction of data are performed remotely at NDS in a time sharing environment.

#### D.5.2. EXFOR Programming

The current EXFOR production programmes may be considered up-to-date and only require a minimum of maintenance. The implementation of the computation format for experimental data has been progressing. There remain no technical problems to implement the computation format; it is merely a matter of available manpower and priorities.

#### D.5.3. Request and Dissemination Log System

The request log is designed to monitor the arrival of requests at NDS as well as the processing of requests through NDS, in order to insure that each request is answered on a timely basis. The dissemination log is designed to monitor the flow of information out of NDS. Together, the request and dissemination logs allow us to determine what types of information are required by our users, and to quantify the output from our centre. (See Statistics, under Section D.4.).

During this period the entire request and dissemination log was re-designed in order to improve and expand the information stored in the system as well as to improve the types of statistics which may be obtained from the system; in particular usage patterns by isotope, country, type of data (e.g. experimental vs. evaluated), etc. The new system is now currently operational and it is meeting its original design objectives.

#### D.5.4. WRENDA

The WRENDA programme system is essentially complete; minor maintenance and improvements were performed during this period, in particular in order to improve retrieval criteria and output sort orders.

#### D.5.5. The Data Index System

Instead of searching the large data files at NDS, many requests can be more economically satisfied by searching relatively small data index files in order to determine which data satisfy a given request. A Data Index System which indexes all of NDS's data files has been implemented. At present entries into the Data Index System are performed automatically for all EXFOR data when a TRANS tape is merged into our EXFOR master file.

For EXFOR data it is possible to retrieve data by reaction (by each individual subfield), author, institute, energy range, etc. For the evaluated data, at present, retrieval is only possible for whole evaluations.

The index system is currently being extended to automate the handling of evaluated data and to allow retrieval of evaluated data by reaction.

#### D.5.6. Profile System

NDS maintains a PROFILE system, consisting of a computerized file of the names, addresses and the areas of interest for each of the centre's correspondents. Areas of interest are described by the use of one or more distribution/interest codes. This file is used routinely to produce reports, to selectively retrieve lists, or print address labels for the mailing of publications and correspondence.

There are currently more than 4 300 names and addresses stored in the PROFILE system master file; last year approximately 500 names were added, and about 200 corrections and/or changes per month were made.

During this period the PROFILE system has been extensively modified in order to improve our ability to classify areas of interest, as well as to improve the flexibility of the use of the address field.

#### D.5.7. CINDA Programming

The system of CINDA programmes that are operational at NDS are used to check new or revised entries, retrieve from the master library and produce the CINDA book. Production of the CINDA book requires two steps: format conversion to a form that is acceptable to the photo-type-setting process, followed by the actual photo-type-setting. This system of computer programmes has remained rather stable over the years and only minor improvements were done or are envisaged.

#### D.5.8. Evaluated Data Processing

The growing number of evaluated data libraries (e.g. UKNDL, KEDAK, ENDF/B etc.) requires that a growing number of programmes be maintained and operated at NDS in order to allow for file maintenance, retrieval and correction of evaluated data. In addition, in order to allow the evaluated data to be used by our customers, the data handling programmes are distributed with the data.

In order to avoid duplication of effort, programmes developed at other data centres are adopted for use at the NDS whenever possible. At present NDS maintains and distributes to customers only elementary file handling programmes. All requests for more complex programmes, such as multigroup processors, are referred to the IAEA liaison officer at the NEA Data Bank.



During this period a number of computer programmes were implemented at NDS. This has allowed us to start introducing procedures to improve the reliability of the evaluated data which is disseminated by NDS.

After these procedures have been fully implemented we shall be able to check all new evaluated data both for format and physical content, and to produce graphical output of cross sections, energy and angular distributions. When minor problems are encountered the format or data can be corrected on line and the action taken reported to the originating evaluator.

Appendix A

List of Liaison Officers to the INDC as of May 1981

Argentina	Ricabarra, G.
Austria	Vonach, H.K.
Bangladesh	Islam, M.
Belgium	Poortmans, F.
Bolivia	Ampuero, E.
Brazil	Auler, L.T.
Bulgaria	Janeva, N.
Chile	Morales, R.
Colombia	Director, Instituto de Asuntos Nucleares
Czechoslovakia	Rocek, J.
Denmark	Christensen, C.J.
Ecuador	Munoz, R.
Egypt	El-Nady, M.
Finland	Silvennoinen, P.
German Democratic Republic	Seeliger, D. (presently member INDC)
Greece	Dritsa, S.
Hungary	Kluge, Cy.
Iran	Etemad, M.A.
Iraq	Said, K.I.
Israel	Yiftah, S. (presently member of INDC)
Jamaica	Chen, A.A.
Kenya	Gacii, P.
Korea, Dem. Peoples Republic	Dzang, S.H.
Korea, Republic of	Cho, M.
Kuwait	Shihab-Eldin, A.
Mexico	Graef Fernandez, C.
Netherlands	Bustraan, M.
Norway	Andersen, E.
Pakistan	Gul, K.
Philippines	Navarro, Q.O.
Poland	Sujkowski, Z.
Portugal	Carvalho, F.G.
Romania	Rapeanu, S.N.
South Africa, Rep. of	Barnard, E.
Spain	Velarde Pinacho, G.
Switzerland	Widder, F.
Thailand	Boonkong, W.
Turkey	Ertek, C.
Uruguay	Lalanne, A.
Yugoslavia	Slaus, I.

Appendix B

Summary and Conclusions of the Fifth Annual  
Meeting of the Nuclear Reaction Data Centre Network  
Brookhaven, 29 September - 3 October 1980

The meeting participants discussed technical matters concerning

- new data types, formats and rules in the jointly operated data exchange systems, in particular EXFOR and CINDA,
- advances in data centre services to nuclear data users, by means of selective computer retrievals, conversion of EXFOR data files to user-oriented computation formats, and planned publication of handbooks, using new computer hardware which recently became available such as high-resolution matrix printer-plotters and direct computer output onto microfiche (COM).

The data centre heads met in a parallel session

- to review future trends and priorities in data centre activities in view of limitations in budget and manpower,
- to co-ordinate schedules and topics of scientific meetings in the field of nuclear data to be held by IAEA, NEA and in the USA.

Special topical discussions at this meeting were devoted to

- the treatment of data uncertainties and error correlations and their inclusion in the international exchange of standard cross-sections and other important reference data; this topic is of increasing importance to various data centre activities and user services;
- modern techniques of data processing including graphical plotting, demonstrated at the advanced data processing facilities at the NNDC.

The meeting was chaired by Mr. C. Dunford from the NNDC. NNDC is to be commended for excellent technical help in the conduct of the meeting and outstanding hospitality including an evening banquet for the participants.

The main conclusions on this NRDC meeting were:

1. The development of the EXFOR system, which was revised and supplemented continuously according to the growing scope of data covered, can be regarded as finalized. At the Brookhaven meeting an additional feature was introduced by which, at least for the more important experimental precision measurements in the field of standard and dosimetry reactions, specific data uncertainties (i.e. statistical error, total error, resp. different systematic error contributions) can be identified by computer programmes. This is in the interest of evaluators producing error correlation matrices. The meeting decided, after discussion of a topical talk by M. Bhat, that EXFOR does not require any further adjustment and that, in particular, a formalism for error correlation matrices need not be introduced in EXFOR.

2. Transmission of EXFOR data has become a smooth routine operation. Quality of compilation appears to be satisfactory. Formal errors in EXFOR have been significantly reduced as a result of more sophisticated check programmes. A high degree of completeness has been achieved for neutron reaction data. The files for charged-particle and photonuclear data are expanding.
3. CINDA is also a smooth routine operation.
4. A new issue of WRENDA is in preparation.
5. The ENDF/B format is developing towards an internationally recognized format for evaluated neutron data.
6. The meeting was informed that the EXFOR compilation of charged-particle reaction data, started in Japan by the Japanese Study Group for Information Processing, will be continued by the Japanese CPND Group at the Hokkaido University.
7. The meeting also acknowledged that the newly created USSR Photonuclear Data Centre (CDFE) has joined the EXFOR data centre network and appreciated the submission of a number of photonuclear data entries by that centre. NDS was asked to emphasize the EXFOR compilation and exchange of charged particle nuclear data used particularly in medical radioisotope production and nuclear material analysis and to ensure the cooperation of additional research groups (Harwell, Juelich, Hokkaido) in this effort.
8. The minutes of the meeting will be issued as an INDC report and will be available from the Nuclear Data Section. The next Nuclear Reaction Data Centre Meeting is planned to be held adjacent to the Advisory Group Meeting of the Nuclear Structure and Decay Data Network in the Spring of 1982.

IAEA Technical Assistance

Interregional Project for Training of Nuclear Scientists in Developing

Countries, using the Expertise available in the Nuclear Data Field

(IAEA Technical Assistance Project "Nuclear Data Techniques  
and Instrumentation" INT/1/018)

Information Sheet

I. Statement of problem

1. The peaceful applications of nuclear science and technology receive currently increasing attention in many developing countries. Some of these countries are interested in nuclear techniques because they already operate or plan to introduce nuclear power plants, while others need specialists in nuclear technology to determine their countries' future energy options. Nuclear techniques are now also widely used for medical applications, food preservation, radiological protection, geological exploration, industrial applications and many other vital purposes. To use these nuclear techniques with full benefit to the country, many specialists in these techniques are needed. Although some training in this respect has been provided partly with the support by IAEA, developing countries often do not have enough specialists with adequate training and experience.
2. A recent world-wide review and compilation of nuclear data requirements which was performed by the IAEA in the fall of 1979 (results published in the IAEA World Request List for Nuclear Data, WRENDA 79/80, IAEA document INDC(SEC)-73/URSP) has shown that many measurements of neutron nuclear data are still needed to improve the peaceful applications of nuclear technologies and to increase nuclear safety. Many of these requirements are not covered by the presently existing programmes and cannot be met without the organization of an internationally coordinated programme.
3. The methods and techniques used in nuclear data measurements and analysis are very wide spread (e.g. neutron, alpha, beta and gamma counting techniques, radiochemical methods, track detector techniques, electronics and vacuum technology, computerized data acquisition, processing and analysis) and apply to many other fields. They present an excellent training and educational tool for young nuclear scientists at universities, laboratories and other research institutes in developing countries and provide them with scientific background and expertise applicable to agricultural, medical, industrial and many other fields of application of nuclear techniques vital to developing countries.
4. The measurements of neutron nuclear data required are particularly suitable for laboratories in developing countries because many of them have already the basic experimental equipment (such as 14 Mev neutron generators) needed

for this purpose. However, the personnel of these laboratories often does not have enough training and experience for performing accurate and reliable nuclear measurements. IAEA has always been associated in these training efforts, but to fund on its own an integrated training and research programme of the size and magnitude as proposed hereby, would go beyond the financial capabilities of the IAEA.

## II. Proposed solution

To train young nuclear scientists in developing countries, on a broad scale, in nuclear techniques, IAEA, under its Technical Assistance programme, has initiated and started in the beginning of 1981 a wide international co-operation in the form of a multi-year Interregional Project for Training of Nuclear Scientists in Developing Countries using the Expertise available in the Nuclear Data Field (TA/INT/i/018) (short title: Interregional Project for Training in Nuclear Data Techniques and Instrumentation).

## III. Project origin and endorsement

The idea for this Interregional Project originated from numerous professional contacts with research groups in developing and developed countries, who strongly advocated IAEA support of training activities in nuclear data techniques and instrumentation. This was stressed at the Winter College on Nuclear Physics and Reactors jointly organized by the IAEA Nuclear Data Section and the International Centre for Theoretical Physics in January/February 1980 in Trieste by a Working Group with 37 participants from 19 developing and 5 advanced countries who worked out a detailed proposal for the organization and technical programme of this project. At its 11th Meeting at IAEA Headquarters in June 1980, the International Nuclear Data Committee (INDC), the advisory body to the IAEA in the field of nuclear data, fully endorsed this proposal and strongly recommended that the IAEA take the necessary steps for its implementation. On the basis of support and applications received from 20 developing countries, in December 1980 the Technical Assistance Committee of the IAEA Board of Governors approved the proposed Interregional Project including the funds to be provided by the IAEA under its 1981 Regular Budget of Technical Assistance (experts and equipment).

## IV. Project objectives

The primary objective of this Interregional Project is to train young nuclear scientists at universities, research laboratories and other research institutes in developing countries in measurements and analysis methods, techniques and instrumentation used in the field of nuclear data. The project should twin research groups from developing and developed countries in common research work and in the transfer of techniques and expertise required for nuclear data measurements and analysis, should give developing countries an opportunity to participate in an internationally coordinated effort and to do necessary and useful measurements using up-to-date methods. In this way the project should significantly contribute to the formation of nuclear scientists in developing countries whose expertise gained during work for the project can usefully be employed in various fields of nuclear science and technology (nuclear techniques in agriculture, medicine and industry, nuclear reactor planning, operation and safety) of vital importance to developing countries.

## V. Project scope

The technical scope of the Interregional Project should basically conform to the needs (particularly training needs) of the developing countries and comprize the following areas of expertise in the nuclear data field:

- (i) Measurements of microscopic neutron nuclear data;
- (ii) Development and applications of neutron sources;
- (iii) Development and calculations of radiation detector systems and associated nuclear instrumentation;
- (iv) Measurement of macroscopic cross-sections and integral experiments and their interpretation, e.g. in terms of group cross-sections;
- (v) Theory of neutron-nucleus interactions, the development of codes and their use in calculations of neutron cross-sections;
- (vi) Use of neutron sources, accelerators, detectors, etc., developed for nuclear data measurements in areas of applications of interest to developing countries.

## VI. Project operational methods and organization

### 1. Activities of the IAEA

The Interregional Project is being co-ordinated by the IAEA. This entails the following activities concerning only those laboratories participating in the project:

- (i) Scientific and technical co-ordination of the project work by the Nuclear Data Section of the IAEA;
- (ii) Provision of fellowships and scientific visits from the less advanced laboratories in developing countries to more advanced laboratories;
- (iii) Provision of missions and experts from the more advanced laboratories and from the IAEA to less advanced laboratories in developing countries;
- (iv) Provision of high purity materials and isotopes (on loan) and parts of auxiliary equipment to research groups in developing countries participating in the project;
- (v) Provision of research contracts and research agreements to, and organisation of research coordination meetings of representatives of, selected research groups participating in the project with the objective to review the results of work done as part of the project and to determine future work needed;

- (vi) Organisation of training courses, if the project activities indicate a need for them;
- (vii) Incorporation of the results of the project into the IAEA international nuclear data libraries, their publication on behalf of the participating research groups, and their dissemination to the nuclear community in all IAEA Member States.

2. Activities of the participating research groups

- (i) The research groups participating in the Interregional Project will perform specific research work commensurate with the scope of the Project (see point V) and will report to the IAEA on the results and progress of this research in regular intervals. This will ensure continued and effective evaluation of the progress of the project work.
- (ii) Several advanced laboratories have expressed their willingness to co-operate with the less advanced or beginning research groups in common areas of project research, by sending experts for advice to, and accepting fellows for training and scientific visits from, such research groups, and, in the limit of their capabilities, by assisting the IAEA in supplying needed components of auxiliary equipment and technological documentation to such research groups. They may be in a position to provide also other services, such as instrument testing and calibration, and evaluation of project results, if and when required by the project.

VII. Project starting date: 1 January 1981

VIII. Estimated project duration: five years

IX. Countries participating in the project (status 1 January 1981)

1. Developing countries

26 scientific institutions in the following 20 developing countries have so far applied officially (o) or inofficially (i) for participation in the Interregional Project:

South and Central America

Bolivia (i), Brazil (o), Chile (o), Costa Rica (o), Mexico (o)

Africa

Morocco (o), Nigeria (o)

Eastern Europe and Near East

Czechoslovakia (i), Hungary (i), Poland (i), Romania (o), Turkey (i), Yugoslavia (i)



Asia

Bangladesh (o), Indonesia (o), Korea, Rep. of (o), Malaysia (i), Mongolia (o), Pakistan (o), Philippines (o).

The full list of presently interested institutes in developing countries is given in the attachment.

2. Advanced countries

Informal contacts indicate that several nuclear research institutes in the following advanced countries are interested to participate in the Inter-regional Project:

Austria, Canada, Federal Republic of Germany, German Democratic Republic, Italy, Netherlands, Sweden, UK, USA and USSR.

List of nuclear research institutes in developing countries interested  
in participating in the Interregional Project (Status 1 January 1981)

South and Central America

Bolivia	COBOEN, Centre for Nuclear Research, CIN Viacha
Brazil	1. National Nuclear Energy Commission, Nuclear Engineering Institute, Rio de Janeiro 2. National Nuclear Energy Commission, Institute of Energetic and Nuclear Research, Sao Paulo 3. Centro Tecnico Aeroespacial, Advanced Nuclear Power Division, Sao José dos Campos
Chile	University of Chile, Dept. of Physics, Santiago
Costa Rica	University of Costa Rica, Research Centre
Mexico	Centro Nuclear, Instituto Nacional de Investigaciones Nucleares, Mexico

Africa

Morocco	Mohammed-V-University, Dept. of Nuclear Physics, Rabat
Nigeria	University of Ife, Dept. of Physics, Ile, Ife

East Europe and Near East

Czechoslovakia	1. Inst. of Physics, Slovak Academy of Sciences, Bratislava 2. Institute of Nuclear Research, Rez near Prague
Hungary	1. Eötvös Lorand University, Laboratory for Neutron Physics, Budapest 2. Kossuth University, Inst. of Experimental Physics, Debrecen
Poland	University of Mining and Metallurgy, Krakow
Romania	Institute of Nuclear Power Reactors
Turkey	Cekmece Nuclear Research and Training Centre, Physics Dept., Istanbul
Yugoslavia	1. Ruder Boskovic Inst., Zagreb 2. Jozef Stefan Inst., Ljubljana

Asia

- Bangladesh
1. University of Chittagong, Physics Dept., Chittagong
  2. University of Dacca, Physics Dept., Dacca
- Indonesia
- National Atomic Energy Agency, Research Centre for Nuclear Techniques, Bandung
- Korea, Republic of
- Seoul National University, Dept. of Nuclear Engineering, Seoul
- Malaysia
- School of Physics, University of Science of Malaysia, Minden, Penang
- Mongolia
- Mongolian State University, Nuclear Research Laboratory, Ulan Bator
- Pakistan
- PINSTECH, Pakistan Inst. of Science and Technology, Nilore, Rawalpindi
- Philippines
- National Atomic Energy Commission

Index to the IAEA-NDS-Documentation Series

H.D. Lemmel

This index lists the current versions of the IAEA-NDS-documents which summarize contents and formats of nuclear data libraries available from the IAEA Nuclear Data Section.

<u>#</u>	<u>Rev.</u>	<u>Date</u>	<u>Title</u> <u>Author or Editor</u>
0	81/6	81/6	Index to the IAEA-NDS Documentation Series H.D. Lemmel
1	2	81/1	Short Guide to EXFOR A. Calamand, H.D. Lemmel (Rev. 0 of 1974 in INIS 79/8)
2	81/2	81/2	EXFOR Dictionaries Edited on behalf of the cooperating data centres by O. Schwerer P.M. Attree, H.D. Lemmel, P.M. Smith (Rev. 79/6, 154 pages, available as microfiche, in INIS 79/8)
3	79/6	79/6	NDS EXFOR Manual H.D. Lemmel, ed. (302 pages, available as microfiche, INIS 79/8. Incl. Upd. 9)
4	0	79/7	System Specification for the NDS EXFOR System P.M. Attree, P.M. Smith (INIS 79/8)
5	0	79/9	System Specifications for the NDS Dictionary System P.M. Attree, P.M. Smith (INIS 79/9, 59 p.)
6	0	79/9	System Specifications for the NDS Data Index System P.M. Attree, P.M. Smith (INIS 79/9, 68 p.)

6	0	79/9	System Specifications for the NDS Data Index System P.M. Attree, P.M. Smith (INIS 79/9, 68 p.)
7	0	81/7	Index of Nuclear Data Libraries available from the IAEA Nuclear Data Section H.D. Lemmel
8	81/6	81/6	Index of Microfiches available at NDS containing nuclear data libraries and related documentation H.D. Lemmel
9	0	80/6	CINDA formats (22 p.) H.D. Lemmel
10	0	75/1	ENDF/B Format, brief summary M.A. Khalil (INIS 79/9, 13 p.)
10/102	0	81/1	Microfiche of ENDF/B-5 Formats Manual ENDF-102, Oct. 1979
10/201	0	81/1	Microfiche of ENDF/B-5 Summary Documentation ENDF-201, July 1979
11	1	80/4	ENDL-78, LLL Evaluated Nuclear Data Library 1978, Contents and Documentation O. Schwerer (Rev. 0 in INIS 79/8, 7 p.)
12	4	81/6	INDL/A - IAEA Nuclear Data Library for Evaluated Neutron Reaction Data of Actinides. Contents and Documentation. H.D. Lemmel
12/1	0	79/2	INDL/A: JAERI evaluation of Am-243 and Cm-244. Microfiche
12/2	0	79/6	INDL/A: JAERI evaluation of Cm-242. Microfiche
12/3	0	78/6	INDL/A: JAERI evaluation of Cm-245. Microfiche
12/4	0	79/2	INDL/A: Bologna evaluation of Pu-241. Microfiche
13	1	81/1	ENDF/B-V Actinides, Contents and Documentation N. Kocherov, H.D. Lemmel (89 p.)
14	0	79/5	BIBFP and BIBGRFP, the Czechoslovakian Fission-Product Library, cross-sections and group data N. DayDay

15	1	80/10	ENDF/B-5 Standards Library, Contents and Documentation N. DayDay, H.D. Lemmel
15/300	0	81/1	Microfiche of ENDF-300 (Dec. 1979) Standard reference and other important nuclear data
15/300	Suppl. 1	81/6	Additions to ENDF-300 as distributed 81/3/5
16	0	78/5	ENDF/C Format C.L. Dunford
17	0	79/8	BLA-78, Blachot's Library of Fission-Product Decay Data, Contents & Documentation N. DayDay (12 p.)
18	0	79/9	JENDL-1, the Japanese Evaluated Nuclear Data Library, Contents and Documentation N. DayDay
19	2	80/7	JUEL GAM-79, Juelich Decay-Gamma Data File 1979 Summary Documentation N. DayDay (JUEL GAM-78, Summary Documentation by C.S.A. da Silva and R. Paviotti Corcuera, see IAEA-NDS-19 Rev. 0, 79/2)
20	2	79/80	UKNDL format NDS staff
21	1	1978	Quick guide to KEDAK Library M.A. Khalil
22	0	79/82	PNESD - Proton Nucleus Elastic Scattering Data H. Leeb, Vienna, Jan. 1978 Edited by N. DayDay
23	0	80/3	ENDF/B-4 General Purpose File 1974 Summary of contents and documentation O. Schwerer
24	0	80/4	ENDF/B-V Dosimetry Files 1979 Contents and Documentation N. DayDay
25	0	80/4	ENDF/B-5 Fission Product Files Summary Documentation H.D. Lemmel (101 p.) Rev. 1 by O. Schwerer in preparation

26	0	80/6	DAMSIG77 - Radiation Damage Cross- Section Library from ECN Netherlands (SAND-II format) N. DayDay
27	0	80/6	DOSCROS77 - Dosimetry Cross-Section Library from ECN Netherlands (SAND-II format) N. DayDay
28	0	79/2	RESPAR3 and RESPAR3ED Libraries, Resonance Parameters from BNL-325 (3rd ed. 1973) C.S.A. da Silva, R. Paviotti Corcuera
29	0	80/7	ENDF/B-V Processing Programs N. DayDay
30	0	80/12	UKNDL-80, Contents and Documentation O. Schwerer
31	1	81/6	INDL/V - IAEA Nuclear Data Library for various neutron reaction evaluations in ENDF/B-5 format Contents and documentation V. Pronyaev, D. Cullen, H.D. Lemmel, O. Schwerer (Revision "0" of IAEA-NDS-31 contained BOSPOR-78 only which is included in INDL/V)
32	1	81/3	NDS Multigroup Libraries Contents, Summary, Documentation N. DayDay
33	0	81/2	Summary of ORR and YAYOI data for the REAL-80 Project D D.E. Cullen (52 p.)
34	0	81/6	EXFOR-V ("VIEN" file) IAEA Evaluated Nuclear Data File for various neutron data evaluations, in EXFOR format K. Okamoto, O. Schwerer, H.D. Lemmel

Subseries "IAEA-NDS-AM..."

issued by the Atomic and Molecular Data Unit

<u>#</u>	<u>Rev.</u>	<u>Date</u>	<u>Title</u> <u>Author or Editor</u>
AM1	0	79/5	Description of Card Input and Format to the International Bulletin on Atomic and Molecular Data for Fusion K. Katsonis, F.J. Smith (INIS 79/9, 40 p.)
AM2	0	79/7	Procrustes - A criterion used to determine the relevance to fusion of atomic and molecular data K. Katsonis, F.J. Smith (INIS 79/9, 18 p.)
AM3	0	79/9	Record Format - Variable Length record format used to store the index to atomic and molecular data for fusion R.E. Seamon, F.J. Smith, J. Rumble (INIS 79/9, 73 p.)
AM4	0	79/9	Compendium of structure and collision data in the first 8 issues of the International Bulletin on Atomic and Molecular Data for Fusion K. Katsonis, F.J. Smith (INIS 79/9, 165 p.)
AM5	0	79/12	VDU Input - A description of VDU input data and formats to the International Bulletin on Atomic and Molecular Data for Fusion F.J. Smith
AM6	0	79/12	Programs - A description of the programs used to print the International Bulletin on Atomic and Molecular Data for Fusion J. Rumble and F.J. Smith