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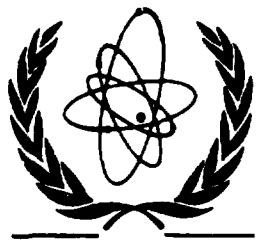

International Atomic Energy Agency

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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Report on the

FIFTH IAEA CONSULTANTS' MEETING OF NUCLEAR REACTION DATA CENTERS

Brookhaven National Laboratory, Upton, N.Y.

29th September - 2nd October 1980

Including

the 16th FOUR-CENTERS MEETING

of THE NEUTRON DATA CENTERS

AND

the 6th MEETING ON CHARGED PARTICLE NUCLEAR DATA COMPILATION

NRDC-Meeting Brookhaven 1980

June 1981

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

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Abstract

This report summarizes the 1980 coordination meeting of the national and regional nuclear reaction data centers, convened annually by the IAEA. The main topics are

- the international exchange of nuclear reaction data by means of the "EXFOR" system,
- the further development of this system,
- the sharing of the workload for speedy and reliable data compilation,
- the exchange of specialized and evaluated data libraries,

with the goal of rendering data center services to data users, by means of computer retrievals and printed materials.

Edited by

G. J. Wyant
A. M. Daly

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List of Participants

NNDC	(National Nuclear Data Center, Brookhaven, U.S.A.)
	M. R. Bhat (Part-time)
	T. W. Burrows
	A. M. Daly (Asst. to Meeting Secretary)
	C. L. Dunford (Chairman)
	M. F. Fanelli (Part-time)
	B. Magurno (Part-time)
	V. McLane
	S. Pearlstein (Center Head)
	D. W. Swinford (Part-time)
	G. J. Wyant (Meeting Secretary)
NEADB	(OECD, Nuclear Energy Agency Data Bank, Saclay, France)
	P. Johnston
	N. Tubbs (Center Head)
NDS	(IAEA Nuclear Data Section, Vienna, Austria)
	H. D. Lemmel
	J. J. Schmidt (Center Head)
KaChaPaG	(Karlsruhe Charged Particle Group, Fed. Rep. of Germany)
	H. Klewe-Nebenius
	H. Muenzel (Center Head)
NBS PDC	(N.B.S. Photonuclear Data Center, Washington, D.C.)
	E. Fuller (Part-time)
	Additional participants in a follow-up meeting at the IAEA, Vienna, 16-17 December 1980:
CJD	V. M. Bychkov
	V. N. Manokhin

Minutes

Note: Working papers are not, in general, included in this document. In the cases where they are included, they are referred to by the appendix in which they appear.

The Actions, Conclusions and Recommendations are given in a separate section following the minutes.

Agenda Item 1. Opening, Election of Chairperson, Adoption of Agenda

The meeting was opened by J. J. Schmidt on behalf of the IAEA. The disappointing absence of representatives from CJD and CAJaD was noted. J. J. Schmidt commented that he hoped to arrange a later meeting with the USSR Center representatives in Vienna to discuss the NRDC meeting's conclusions.

S. Pearlstein welcomed the meeting participants on behalf of Brookhaven National Laboratory.

C. L. Dunford was elected as chairman of the meeting.

The tentative agenda was discussed and adopted with one modification (see page i).

Agenda Item 2. Brief Status Reports from the Centers

H. Lemmel and J. J. Schmidt presented the NDS Status Report (see Appendix B). The move of the IAEA to the Vienna International Center caused a short interruption to some ongoing projects, and a substantial backlog in CINDA coding.

H. Lemmel remarked that EXFOR programs seem to produce too many extraneous error messages and perhaps checking codes should be relaxed. He re-emphasized the importance of receiving new EXFOR dictionary codes in CP-Memos, prior to receiving the transmission tape in which the new codes occur.

In discussing customer services it was noted that evaluated data requests far outnumber requests for experimental data. The status of the NDS computation format was brought up. All center representatives present agreed to exchange documentation on their computation formats.

The Japanese charged particle effort has fallen behind due to unfortunate circumstances. A search is still underway for an appropriate location for their CPND data center.

H. Muenzel and H. Klewe-Nebenius presented the KaChaPaG Status Report (see Appendix C). The progress of the "Book of Diagrams" was discussed. J. J. Schmidt raised the question as to whether or not errors would be included in the book. H. Muenzel replied in the

negative, giving two reasons: it would be difficult to view the data graphically if all errors were included, and the errors given by authors are not always of the same type. Users will be encouraged to look to the Karlsruhe Charged Particle Data Compilation (Physics Data Series 15) for tabulation of errors.

The development of KARDIF, a program to extract data from the EXFOR data base, was discussed and a document was distributed describing the output structure (see Appendix C).

The status report of FIZ was presented to the meeting (see Appendix D). Recent publications relevant to nuclear physics in preparation (within the Physics Data Series) were summarized.

N. Tubbs and P. Johnston presented the NEA-DB Status Report. (See Appendix E). The switchover to the PDP-11/70 computer and the adaptation of the Integrated Data Base Management System DBMS-11 was successful. The conversion of NEUDADA into EXFOR format was reported to be complete. The "ENDF/B-4/5 History Status Listing" and an "Index of Evaluated Nuclear Data Files Available at NEA Data Bank" were distributed (working papers 6 - 7).

S. Pearlstein presented the NNDC Status Report (see Appendix F). NNDC has assumed responsibility for compilation of the nuclear structure reference bibliography. The dosimetry and fission product files for ENDF/B-V have been released. An updated set of processing codes for the ENDF/B data base has been distributed. The meeting was informed that the BNL-325 recommended resonance parameters ($Z \leq 60$) are currently available on tape.

Agenda Item 3. Review of Actions from the Previous NRDC Meeting

The actions of the 1979 NRDC meeting were reviewed. All continuing Actions are included in the list of actions for this meeting.

Agenda Item 4. Implications from Other Meetings

P. Johnston discussed the recent NEA Committee on Reactor Physics (NEACRP) meeting. The Committee addressed itself to several concerns of increasing complexity.

The calculations for lattice fuel rods in water will be finished by April. There was interest in the data and codes used in calculations for the study of criticality in reprocessing plants. Concern was expressed about consistency problems with different Pu data sets.

With regard to the LMFBR benchmark, a proposal was made to do a burn-up calculation which will involve more nuclear data than were used in previous benchmark studies. There was particular concern about fission product multi-group data sets and the higher actinide data that will be used. The production of a comparison of one-group cross section sets for all of the relevant nuclides should result from this work. This data will come from Germany, the United Kingdom,

France, Japan and the U. S.

The Committee received a letter from the NEANDC commenting upon the lack of uniformity in representing uncertainties in the data files. The Committee agreed with the NEANDC and replied that it supported the NEANDC recommendation to adopt a uniform procedure. It was recognized that evaluators may have to depart from this procedure for users with particular needs, i.e., the need for a high degree of confidence in defining the bound in which a particular item of data lies. The increasingly common practice of quoting uncertainties as covariances will meet the requirements and therefore, the problem will subside with time. If evaluators and requesters inform the Committee of more specific practices which they would like to see adopted, the Committee would be pleased to comment upon a more specific proposal.

The Committee discussed the situation of nuclear data evaluations in Europe. P. Johnston remarked that it was timely for the Committee to do this, as the new version of the UK files was received this year. There was very strong support from France, Germany and the United Kingdom for a more coordinated approach towards data evaluation in Europe. The Committee proposed that the NEA should hold a meeting about the second half of November, 1980 to which a few NEACRP and a few NEANDC members be invited, including the chairperson of the NEA-DB management committee (Appendix G). The stated objectives listed in this working paper were agreed upon by the entire NEACRP, although representation was restricted to France, Germany and the United Kingdom. It was believed that representatives from other European countries would wish to participate at a later time.

In a summary of the above meeting objectives, P. Johnston stated that the NEACRP sees as its ultimate objective, one European evaluated data file, which all the NEA member countries would be encouraged to use. The meeting showed a willingness on the part of reactor physicists to work toward common procedures and perhaps even common programs, by condensing evaluations into their multi-group sets, as well as considering more collaboration in the adjustment procedures applicable to these multi-group sets. The NRDC participants considered these developments reported by P. Johnston to be very encouraging.

J. J. Schmidt asked if any suggestions were made as to possible improvements in the data centers. P. Johnston replied that reactor physicists do not seem to deal directly with the data centers, since they concentrate on adjusted multi-group data sets and rarely go back to look at the differential data. There is more involvement on their part in code exchanges, which seem to work well, except in areas where the codes are of commercial origin.

J. J. Schmidt reported on recommendations made at two recent (1980) meetings (see Appendix B). The Neutron Source Properties meeting, held at Debrecen in March 1980, recommended that the data centers compile neutron source properties. The same conclusion was offered by the Standard subcommittee of the INDC meeting in June of 1980. All the NRDC members present agreed (see Action 43).

In regard to the Euratom Working Group on Reactor Dosimetry (EWGRD)

Meeting, J. J. Schmidt reported that although normally WRENDA input comes from the individual countries, in this case the WRENDA input was assembled by this working group, and it also wished to supply the updated list for the next edition of WRENDA.

J. J. Schmidt also mentioned that the participants in the Advisory Group Meeting on Nuclear Data for Fusion Reactor Technology, which took place in Vienna in 1978, were aware of the need to have the uncertainties associated with evaluated data. They recommended that the data centers discuss this topic.

H. Lemmel had several comments to make in regard to the meetings listed in Attachment 2 of the NDS Progress Report (see Appendix B). He noted that one continuing NDS project is the compilation of radiation damage and dosimetry reaction data. He urged that the compilation of these data be given top priority, and suggested that actinide data are also of great importance. Both the Reactor Dosimetry Meeting and the NEACRP Meeting on Intercomparisons of Evaluations of Actinide Neutron Nuclear Data stressed the importance of (alpha,n) cross sections. At the actinides meeting, a quite interesting study by B. Patrick was reported, describing the effect of data uncertainties on the calculation of certain properties. It was also reported at this meeting that the half-life of Pu-241 may be affected by chemical binding. This has engendered a greater awareness of the need for a more accurate measurement of the Pu-241 half-life.

The International Fusion Research Council (IFRC) Meeting made the general comment that there was a need for examination of fusion data, but no details were given. J. J. Schmidt commented that the Fusion Council was very concerned with the Li-7(n,n't) reaction discrepancy. A request was made that the NRDC meeting participants communicate this concern to evaluators.

Agenda Item 5. Topical Discussions on Error Analysis and Error Correlations and Their Impacts on Data Compilation

M. Bhat presented a paper "Proposal to Include Detailed Information on Systematic Errors in the International Data Exchange Files" (working paper 10). This paper resulted from talks with experimentalists and evaluators at the Workshop on Evaluation Methods and Procedures held at Brookhaven National Laboratory during September, 1980. Each item of the proposal was explained by M. Bhat in detail.

J. J. Schmidt said it was not clear what the users of evaluated files wanted, in terms of content and covariances. M. Bhat replied, saying that there are three problem areas where systematic error information would be valuable, as follows:

1. Standards: In this area, it is felt that the evaluations should be "gold-plated", but many times they aren't even "tin-plated", due to problems.

2. Dosimetry Reactions: Unfolding (as it used to be done) was an under-determined problem. Under-determined problems in chi-square minimization are fraught with hazard. One way to get around this is to use prior information with variance and covariance information.

3. Available Data: Unless all available information is used, including the evaluations and the data uncertainties with their covariances, it is not believed possible to arrive at accurate answers. In these cases, generalized least-squares fits are used, which require a complete variance-covariance matrix for input.

H. Lemmel asked where the responsibility for meeting these needs should lie - with the experimentalists or with the data centers? Would evaluators trust the data center files, or go back to the original references in any event? M. Bhat replied that when evaluators go back to the original references, as they must, the needed information is often not there. If the data centers required experimenters to supply the needed information, the data available to the evaluators would be more complete.

T. W. Burrows expressed concern that biased results would be produced if only the neutron portion of the data was considered. M. Bhat replied that the first concern should be to start a system with a set of minimum requirements, so that methods and formats would be ironed out. Fine tuning of the system would come with time.

J. J. Schmidt moved that the meeting adopt the proposal to include detailed error information in the data files for the case of an agreed-upon set of standards and dosimetry reactions. The NRDC participants agreed to use the NEANDC standards (H(n,p), He-3(n,p), Li-6(n,a), B-10((n,a), C-12(n,n'), Au-197(n,g), U-235(n,f)) and the reactions included in the International Reaction Dosimetry File. H. Lemmel asked if the Cf-252 neutron spectrum should be included amongst the standards. B. Magurno commented that a National Bureau of Standards Meeting would be held at the end of November, 1980, at which the CSEWG Standards Subcommittee would discuss this question. J. J. Schmidt requested that the conclusions and recommendations resulting from the NBS meeting be distributed to all NRDC members (Action 2).

A question was then raised as to whether the proposal should be implemented retroactively. It was agreed to implement the proposal for new entries, and that data centers would improve older entries as time permits. S. Pearlstein suggested that each data center complete a sample compilation in the near future and exchange it with the other centers.

The agreements reached concerning this session (worked out in detail by the Working Group on Technical Matters) are summarized in Conclusion 1 and Actions 17 and 27 - 30.

Agenda Item 6. Data Center Services, Data Processing and Computation Formats

6.a. Data Center Services, Computation Formats

V. McLane opened the discussion on data center services and computation formats by directing attention to two working papers submitted to the meeting. The first, "NNDC Products and Services" (working paper 11), delineates the products and services offered to the scientific community by the NNDC. The second, "CSISRS Library Retrievals - Computation Formats", (working paper 12) describes the computation formats available at NNDC. Additional enhancements were made as a result of a discussion last year between V. McLane (NNDC) and P. Johnston (NEA-DB), where it was decided to attempt to make their respective computation formats as compatible as possible. Except for a few minor differences (mainly standard and data errors), the line computation formats are essentially identical. A joint NNDC/NEA-DB fission product yield computation format was developed as a result of those discussions.

N. Tubbs proposed extending the current 132-character record format to some larger number (perhaps 160 characters), in order to allow greater freedom and make possible genuinely compatible formats. S. Pearlstein commented that if ninety-five percent of the data can be represented in a 132-character record format, which most people find convenient, then the data centers have done their job. In other cases, applications programs could be written to manipulate the EXFOR format itself. C. L. Dunford warned that the data centers should be aware of the possibility of future changes, and the danger of restricting EXFOR explicitly to a 132-character format. An attempt should be made to minimize any problems that might result from any future expansion to a record containing more than 132 characters, wherever feasible. The participants agreed that, at this time, customer requests for most data still fit into a 132-character record, and there is no reason to change.

H. Lemmel and J. Schmidt stated the particular attributes that they believed the computation format should have. C. Dunford was concerned that Vienna was just beginning to work on their computation format and he hoped they would look at the NNDC and NEA-DB formats and try to make their formats compatible. J. J. Schmidt and H. Lemmel assured the meeting that the Vienna program developers would study the NEA-DB and NNDC formats.

V. McLane mentioned that several enhancements were planned for the NNDC computation format. Ratio data will be added, and there are plans to normalize data to the latest ENDF/B-V standards in the near future.

P. Johnston commented that, recently, the effort was made to handle automatic renormalization of cross sections. It was hoped this information could be easily accessed and updated with the latest standard cross sections. It was found that under 'MONITOR' and 'STANDARD' there were reactions and values given that are not simple factors, but are used in a more complex fashion. H. Lemmel stated

that only such reactions and values which are really used as a factor should be coded under 'MONITOR'. (see Conclusions 9, 10).

C. Dunford queried whether KaChaPaG had any problems with computation formats. H. Muenzel replied that he felt uneasy about giving data to users in a computation format as detailed error information was lost. H. Klewe-Nebenius remarked that KaChaPaG is not really a service center. Their main interest is not the dissemination of data, and their computation format is used only internally, for their own purposes. C. Dunford and P. Johnston pointed out that NNDC and NEA-DB provide the users of the computation format with a separate file containing the important BIB material, e.g., monitor, error analysis information.

N. Tubbs observed that the direction of the development of the computation formats at each center would be dictated by the needs of the users. H. Lemmel suggested that it would be useful to bring center personnel together after feedback had been received from the users, to coordinate their efforts. C. L. Dunford noted that such discussions might also include interchanges on developing other processing codes to use the format, as well as determining exactly what is needed, and, perhaps, dividing the work among the interested centers.

6.b. Data Processing

N. Tubbs distributed a paper by NEA-DB (Appendix H) describing their experience in converting to DBMS simultaneously with a computer change and the consequent rewriting of all their data handling software. He cited the advantages and disadvantages of DBMS, as he saw them. He stated that their software under the new DBMS system would remain completely useable.

C. L. Dunford remarked that the NNDC philosophy about DBMS has differed from that of NEA-DB for various reasons. At NNDC, DBMS was developed as an option, as opposed to NEA-DB, where it was decided to implement it within a certain time frame. NNDC has separate, non-interactive data bases for the center's separate systems.

J. J. Schmidt reported the revision of the request and dissemination log. There were also efforts made in programming evaluated data processing checking codes.

H. Klewe-Nebenius reported the development of a publication-quality program and programs for expanding EXFOR entries.

V. McLane discussed future plans for improvements in the CSISRS system. Storage and retrieval programs, currently based on the ISO-QUANT formalism, will be rewritten to take advantage of the features of the REACTION formalism. D. Swinford presented a paper, "CODES, the CSISRS On-line Dictionary Exchange System" (working paper 14) concerning the dictionaries and related user-code packages currently in use at NNDC.

Agenda Item 7. Heads-of-Center Discussion

The meeting of the Center Heads took place in a parallel session to the subgroup on EXFOR concerns.

No formal statements were prepared, but several topics were discussed, some of which were:

- the problems of maintaining continuing center activities in the face of escalating costs,
- the desirability of increased intercenter contact among staff at the technical level, to supplement the combined technical and heads of center discussion that takes place at NRDC meetings,
- the frequency of NRDC meetings

Although the resolution of problems occurring in the exchange of information among the centers is proceeding smoothly, the number of problems to be resolved still requires that NRDC meetings be held at regular intervals.

In the future, NRDC meetings will be scheduled adjacent to IAEA Specialists' Meetings in related areas such as nuclear structure and decay data because of overlapping center personnel and responsibilities. The next meeting will be held in Vienna.

J. J. Schmidt reviewed the Nuclear Data Meetings planned for the next three years (see Appendix B, Attachment 2). These are subject to approval.

S. Pearlstein discussed with the participants mail delays between the centers. The centers agreed to record the postmark date and the arrival time of correspondence and transmissions (see Action 3).

J. J. Schmidt directed attention to an action from the June, 1980 INDC meeting regarding evaluated file formats for double-differential data (Appendix I). C. Dunford stated that the CSEWG Subcommittee on Codes and Formats was considering the matter (see Conclusion 14 and Action 4).

Agenda Item 8. Technical Matters (EXFOR, etc.) of Interest to all Data Centers

A working group was formed consisting of T. W. Burrows, P. Johnston, H. Lemmel, H. Klewe-Nebenius and V. McLane. The group discussed technical matters dealing with EXFOR and CPND (working papers 15 - 19). The results of these discussions appear under EXFOR Actions 16 - 27, EXFOR Conclusions 1 - 11 and EXFOR Recommendations 51 - 53.

T. W. Burrows submitted a paper describing the NNDC Charged Particle "Barn" Book (Appendix J). This book is directed primarily at the biomedical and fusion communities. The scope of the book and its sources of experimental and evaluated data were described. Sample plots from the current version of the publication package were shown.

H. Muenzel expressed concern about possible duplication of effort by KaChaPag and NNDC in the future. Although he did not share this perception, S. Pearlstein assured H. Muenzel that he would be sent sample plots as the "Barn" book developed.

Agenda Item 9. Photonuclear Data

E. Fuller of the National Bureau of Standards reported on the U. S. Photonuclear Data Center. At present, the center is behind in its compilation effort due to personnel losses. The data for carbon, nitrogen and oxygen is undergoing final editing and will be published soon. Some of the inherent problems in the analysis of photonuclear data were discussed. Next year (1981), an updated version of the photonuclear index will be available covering publications through 1980.

A brief status of photonuclear experiments being done in the U. S. was given. The gradual closing down of the "big machines" in the U. S. has caused a decrease in the amount of classical photonuclear work (i.e., incident photons). Experimenters are switching to using virtual photons. As a result, some data in the current NBS photonuclear review can never be confirmed.

He reported that the production of photonuclear data peaked in the 1970's, with an average of 170 works reported per year. In contrast, the number of new works reported in the last three years has averaged 120 per year. Main reference sources consist of nine "core" journals and preprints received directly from authors. Inverted keyword indices from the Nuclear Structure Reference File have been supplied in the past by the Nuclear Data Project at Oak Ridge National Laboratory. S. Pearlstein noted the transferral of the Recent References work from Oak Ridge National Laboratory to NNDC. C. L. Dunford proposed to supply retrievals to the photonuclear data center on a monthly basis.

S. Pearlstein asked H. Lemmel to investigate the kind of searches possible on the INIS tape for photonuclear data. H. Lemmel inquired about photonuclear data users, and E. Fuller replied that the Photonuclear Data Center supplied references, plots and data listings to users, who range from the scientific community to the oil industry. There are occasional requests from other areas.

H. Lemmel summarized a recent memo (CP-M/1) from the Center for Photonuclear Experimental Data (CDFE), which gave its major aims, future plans, staff and computer capabilities. The CDFE center publishes annual information bulletins on photonuclear experimental data appearing in Soviet and other journals. A tape was sent by CDFE to Vienna in early August, 1980. The copy received by NNDC was unreadable. NDS will send NNDC a good copy of the tape (Action 47).

E. Fuller remarked that the U. S. Center has data of probable interest to the USSR. S. Pearlstein said NNDC would offer the NBS Center assistance and advice in converting their files into EXFOR format. Discussions will take place between NNDC and NBS on this subject at a

later date. Sample EXFOR data entries were given to E. Fuller. NNDC agreed to send E. Fuller a copy of the CDFE tape when it is received, as well as copies of any memos received from other photonuclear centers (Actions 48, 49).

Agenda Item 10. Nuclear Structure and Decay Data

C. L. Dunford remarked that nuclear structure and decay data were really in the realm of another nuclear data network. The discussion centered on the areas where neutron data overlaps nuclear structure data. H. Lemmel observed that decay information, fission neutron spectra and nuclear temperatures are compiled in EXFOR. The CJD transmitted decay gamma spectra in the EXFOR format, he reported, although the centers had agreed many years earlier that EXFOR was not the proper place. H. Lemmel requested that the CJD set up a separate series for this compilation. C. L. Dunford suggested that the "V" transmission series might be used.

H. Lemmel reported the start of a primitive half-life file by the actinide working group at NDS. The half-lives from the group's evaluations and new half-life measurements were entered into this file in EXFOR format. ENSDF was considered to be too complex for their use. Experimental and evaluated data are flagged appropriately in the file.

C. L. Dunford reported that delayed neutron yields from fission precursors, spontaneous fission and level density information (all items closely tied into theoretical neutron calculations) will continue to be included in EXFOR. S. Pearlstein noted that ENSDF was an important source for extensive nuclear structure compilation. He wanted the nuclear community to be aware of the existence of this option. The meeting agreed that any purely nuclear structure data should be compiled in ENSDF format and forwarded to NNDC (Recommendation 54).

In regard to inquiries as to whether any work was being done on the compilation of capture-gamma spectra, it was agreed that NNDC will investigate the status of the last Bartholomew-Groschev compilation (Action 15).

Agenda Item 11. Neutron Nuclear Data

11.a. Neutron Data EXFOR

Participants reviewed the items remaining from working papers 15 - 19 concerned with neutron data. The results of these discussions are found in Actions 31 - 39 and Conclusions 12 - 13.

11.b. CINDA

A CINDA memo dealing with the consistency of CINDA coding was submitted by G. Wyant (Appendix K). The results of these discussions are found in Conclusions 15 - 21.

Concern was expressed about the late arrival of the semi-annual CINDA editions, some centers experiencing up to a five-month delay. Printing and shipping problems for this publication were recently compounded by the move of IAEA to the Vienna International Center. Since the timely reception of CINDA is essential to its usefulness, the meeting participants jointly formulated a recommendation to the IAEA requesting that CINDA printing and distribution be expedited (Recommendation 55). NDS was requested to investigate means of expediting CINDA shipments to the Centers (Action 45). NNDC also requested from NDS a copy of the direct mailing list for this publication (Action 46).

11.c. WRENDA

J. J. Schmidt initiated the discussion on WRENDA by informing the meeting of actions decided upon at the June, 1980 INDC Meeting (Appendix I). It was recommended that all national WRENDA requests should be thoroughly reviewed. In addition, contributors should:

- be informed that standard accuracy requirements should be stated with a one-sigma error or otherwise specified in the comment portion of the request,
- state explicitly when the average value of the cross section in a typical spectrum is needed (in the comment),
- state explicitly the energy resolution requirements for covariance assumptions, if any.

M. Bhat informed J. J. Schmidt that changes have been made in the method of assembling the the U. S. request list. Selective retrievals have been made and forwarded to the data evaluators for review and comment. The designated representatives for each laboratory have also, as in the past, received retrievals of the requests originating at their facilities for review. All comments and new requests will be coordinated at NNDC and assembled for further comment by the CSEWG Subcommittee on Data Status and Requests. It is hoped that this procedure will result in a more meaningful list.

M. Bhat questioned whether or not requests for electron-induced reactions should be included in WRENDA. It was agreed that they should not be included (Conclusion 22).

11.d. Evaluated Data

P. Johnston requested information about the evaluation procedures used at NNDC and C. Dunford gave an overview. In the near future, NNDC will provide pointwise data from ENDF/B-V, where possible, to NDS and NEA-DB (Action 5). NDS and NEA-DB were asked to supply NNDC with corrections and additions to the ENDF/B mailing list (Action 6).

H. Lemmel related the NDS experience with trying to enter data into the ENDF/B format, and the subsequent problems. S. Pearlstein suggested that if he wished to propose specific additions to the Formats and Procedures Manual, he write NNDC and the information would be passed along to CSEWG. A request was made to all centers and their

users for feedback to NNDC regarding the ENDF/B-V Manual. In regard to the problem of entering data from spontaneous fission into ENDF/B, C. Dunford distributed a proposal made to the CSEWG Formats Subcommittee by L. Stewart, "Formats for Representation of the Prompt and Delayed Nu-bar and Spectra for Spontaneous Fissioning Targets" (working paper 25).

C. L. Dunford informed the participants that the CSEWG Charged Particle Subcommittee was working on an interim format for the exchange of evaluated charged-particle data. The centers would be kept informed of any progress in this endeavor (Action 1).

Agenda Item 12. Miscellaneous Items

An updated version of "A Short Guide to EXFOR" (working paper 23) was submitted by H. Lemmel and the new additions were summarized. V. McLane distributed the table of contents for the "CSISRS Users Manual" (working paper 24). H. Lemmel stressed the need for the centers to warn their users not to use outdated EXFOR retrievals, as the data may have undergine significant revision.

The list of actions, recommendations and conclusions resulting from the meeting were reviewed and corrected by the participants.

Conclusions regarding EXFOR

1. To permit more detailed specification of errors, the following data headings were added:

ERR-1,ERR-2, etc.	Systematic errors
ERR-S	Statistical errors
ERR-T	Total error

These are for use with one-sigma errors only.

2. The keyword CRITIQUE is to be added to Dictionary 2. This keyword will allow comment on the quality of the data.

3. Centers will continue to transmit superseded data. The decision to keep transmitted superseded data is left to the receiving center's discretion.

4. The proposed LEXFOR entry on particles, Section 2, is adopted as it stands.

5. The proposed LEXFOR entry on partial reactions is adopted as it stands.

6. The proposal in Memo CP-D/100 (multiplicity) is adopted. Appropriate rewording will be added to the LEXFOR entry on particles, Section 4.

7. The proposal of Memo CP-A/23 (EXFOR keyword E-EXC) was discussed at the last NRDC meeting. The arguments in EXFOR Conclusion 15 of the 1979 minutes still stand.

8. Items one and two of Memo 4C-3/241 (fission asymmetry and ternary fission) are adopted with the light particles defined as having a nuclear charge of less than seven.

9. Under the keyword MONITOR, only that monitor data to which the DATA given are proportional, will be coded. Other information should be entered under the keyword ASSUMED.

10. Data measured as consistency checks should not be coded under MONITOR. They should, however, be entered in a separate subentry if the data are available.

11. The indication of free text layout is adopted as specified in Memo CP-B/32.

12. The total element yield is to be coded as submitted in Entry 21641.

13. Memo 4C-2/112(a) (coding of fission product yields), incorrectly states the valid ways to code a metastable state. The metastable state for a fission product may not be defined using the DECAY-DATA keyword. It must be defined in Reaction SF4 or by using the data heading ISOMER.

General Conclusions

14. Evaluated file formats for double differential data is not a responsibility of the NRDC Centers, at this time. The CSEWG subcommittee on codes and formats is considering this matter. H. Lemmel (NDS) will supply the subcommittee with a memo (NRDC 1980 meeting Action #25).

Conclusions regarding CINDA

15. General reviews will be entered in CINDA under the lab of the reviewer.

16. If, in a review, there are informative comments on an individual experiment, the review should be entered in CINDA with the block of the experiment.

17. Works in progress may be coded into CINDA, but not "planned works" mentioned in review articles.

18. Borderline cases relative to Conclusions 15 - 17 above, regarding review articles, will be left to the compiler's discretion.

19. In the case where parts of an experiment are done at several labs, the compilation in CINDA and EXFOR should be equivalent.

20. As the centers become aware of an experiment performed and/or reported by more than one lab, they should reach an agreement as to which center is responsible for both EXFOR and CINDA entries.

21. The transmission of CINDA lines for entries being compiled into EXFOR, before the EXFOR transmission of the data, is acceptable provided the EXFOR transmission follows shortly.

Conclusions regarding WRENDA

22. Electron induced reactions will not be included in WRENDA.

GENERAL Actions

1.	NNDC		Provide all centers with information about the proposed CPND interim evaluation format.
2.	NNDC		Distribute to the other centers the results of the Nu(bar) Symposium to be held in Washington, D. C., November 20-21, 1980.
3.	ALL		Compare postmarks against time-of-arrival for communications between centers. Notify the originating center if there has been an inordinate delay.
4.	NDS		Transmit a memo to CSEWG on the INDC concerns regarding double-differential ENDF formats.
5.	NNDC		Transmit, where possible, point-wise data of ENDF/B-V to NDS and NEA-DB.
6.	NDS NEA-DB		Supply NNDC with corrections and additions to the ENDF mailing list.
7.	ALL	(14)	When Center staff attend specialists meetings, collect and distribute papers relevant to the other Centers' interests.
8.	ALL	(17)	Inform the other Centers about the documentation of evaluations, and about evaluations and comparisons of available evaluations in progress within the Center's area.
9.	ALL	(18)	Try to obtain feedback from users about the status and quality of evaluated data files.
10.	ALL	(19)	Provide other Centers with information about types of data - that should be assigned priority, - and those that are rarely or never requested.
11.	ALL	(20)	Inform other Centers when initiating a data review or special purpose compilation, so that appropriate data may be transmitted with priority.

12.	ALL	(21)	Notify the other Centers of the existence of specialized compilations in any format.
13.	ALL	(32)	Each Center should try to make completeness checks on those data considered important by the Center, and report the results to the other Centers.
14.	ALL	(33)	Give high priority to compilation of data relevant to proposed Specialists' meetings.
15.	NNDC		Investigate status of last Bartholomew-Groschev compilation of gamma-ray energies, and see whether the latest version is available in a computerized format, or any other format. (Chalk River Laboratory)

EXFOR Actions

16.	NDS	Supply KaChaPaG with a laboratory-sorted version of Dictionary 3.
17.	ALL	Implement EXFOR Conclusion 1 (see minutes) where feasible for standard data and dosimetry data for radiation damage in new entries and retransmitted data. When the required error information is not contained in the publication, the author(s) should be contacted.
18.	NDS	Review and clarify with the CJD the use of SUPERSEDED in EXFOR.
19.	NDS	Inspect data sets 30319.002, 30328.011 and 30395.002 to see if limiting the number of EXFOR data fields to 18 is reasonable.
20.	ALL	Review references for charged particle reactions that have equivalent neutron fission reactions, such as (d,pf) and (t,df), and decide whether or not to compile them in EXFOR. The retroactive cut-off date is 1965.
21.	ALL	Implement checking programs to verify that compilers observe the LEXFOR rule concerning particles in reaction sub-field 7 (SF7).

22.	NEA-DB	Distribute a list of entries not complying with the LEXFOR particle rule.
23.	ALL	Correct entries not complying with the LEXFOR particle rule and retransmit.
24.	NDS	Include all relevant flags, when a nucleus is entered in Dictionary 27.
25.	ALL	Investigate evaluators' needs for delayed neutron emission probabilities for fission products and report the necessity for compilation in EXFOR.
26.	NEA-DB	Submit proposals for coding ion-charges of fission-products that NEA-DB has compiled.
27.	NNDC	Update the "Proposal to Include Detailed Information on Systematic Errors in the International Data Exchange Files" for distribution. Forward copies to INDC, NEANDC and other interested scientists for their comments.
28.	ALL	Supply NNDC with a list of parties interested in the entry of systematic data errors into the EXFOR file for the purpose of reviewing the proposal in Action 26 (above).
29.	NNDC	Analyze responses to the proposal of Action 26 and circulate the results to the network. At that time an update to EXFOR and LEXFOR will be supplied.
30.	ALL	Do a trial EXFOR compilation of an experimental data set, using the new format for entering experimental errors, and transmit it to the other centers.
31.	ALL	Review new LEXFOR entries submitted by V. McLane and send comments immediately.
32.	NDS	Write a LEXFOR entry for Thermal Neutron Data.
33.	NNDC	Update LEXFOR chapters proposed in Memos CP-C/75 (polarization memo) and CP-C/76 (fitting coefficients) and retransmit.

34.	NNDC NDS		Review the "to be superseded" data sets in EXFOR and replace, where feasible, with more current data, as per P. Johnston letter of 26 August 1980.
35.	NDS		Add 'CHG' to Dictionary 31 and 'CHG,FY' to Dictionary 36, as per Memo 4C-2/112(a).
36.	NNDC		Update LEXFOR entry for fission yields, to add charge distribution as per Memo 4C/112(a).
37.	ALL		Review earlier EXFOR entries for elemental yields and update in accordance with Actions 34 and 35.
38.	KaChaPaG		Send a list of references currently being compiled of (d,pf) and (t,df) data.
39.	ALL		Disseminate to each center the experiences and difficulties encountered in converting EXFOR data to a computation format.
40.	ALL	(69)	Send to the other Centers representative samples of their special formats derived from EXFOR, i.e. edited format, computation format, format with data points merged by energy.
41.	Neutron Data Centers	(81)	Compile fission spectrum data in EXFOR with priority.
42.	NEA-DB	(89)	Send to NDS a list of quantities found missing in Dictionary 41 (see 1979 EXFOR Conclusion 34). (Note by H. Lemmel in 1979 NRDC minutes: Partly done in January 1980 letter.)

CPND Actions

43.	ALL		The Nuclear Data Reaction Centers should compile the properties of basic monoenergetic neutron sources.
44.	KaChaPaG	(47)	Make the results of INIS cross-checking for CPND available to the other Centers, when ready.

CINDA Actions

45.	NDS		Investigate means of speeding CINDA shipments to the centers.
46.	NDS		Provide NNDC with a copy of the mailing list used to send out direct CINDA copies, for comment.

Photonuclear Data Actions

47.	NDS		Transmit a copy of the photo-nuclear tape received from CDFE (Moscow photonuclear data center) to NNDC.
48.	NNDC		Send a copy of the Moscow photo-nuclear tape to E. Fuller of NBS.
49.	NNDC		Send E. Fuller (NBS) copies of all memos received from photonuclear centers (series CP-M/, CP-U/).
50.	NNDC	(51)	Transmit the new Berman library, when it becomes available, in EXFOR format to the other centers.

EXFOR Recommendations

51. Global error specifications, such as a percentage error for the entire measurement, should be included under COMMON and not coded for each data line.

52. All centers will continue to compile fission product yield data with high priority.

53. All centers shall discontinue compilation of capture gamma spectra until a need is demonstrated for such compilation.

54. Any pure nuclear structure or decay data should be compiled in ENSDF format and forwarded to NNDC.

CINDA Recommendations

55. IAEA is urged to expedite the printing and distribution of the semi-annual CINDA editions.

GLOSSARY of Abbreviations

CAJaD	Center for Nuclear Structure and Reaction Data, Kurchatov Institute, Moscow, USSR
CDFE	Centr Dannykh Fotojad. Eksp., Moscow State University, USSR
CINDA	A specialized bibliography and data index on neutron nuclear data operated jointly by NNDC, NDCC, NDS and CJD.
CJD	USSR Nuclear Data Center at F.E.I., Obninsk, USSR.
CPND	Charged-particle nuclear reaction data.
CSISRS	Cross-Section Information Storage and Retrieval System, the EXFOR-compatible internal system of NNDC.
ENDF	US Evaluated Nuclear Data File.
ENSDF	Evaluated Nuclear Structure Data File
EXFOR	Format for the international exchange of nuclear reaction data.
FIZ	Information Center of the Fed. Rep. of Germany for energy, physics, mathematics, Karlsruhe, Fed. Rep. of Germany.
IAEA	International Atomic Energy Agency.
INDC	International Nuclear Data Committee.
INIS	International Nuclear Information System.
KaChaPaG	Charged particle nuclear data group, Karlsruhe, Fed. Rep. of Germany.
LMFBR	Liquid-Metal Fast Breeder Reactor
NDS	IAEA Nuclear Data Section, Vienna, Austria
NEA	Nuclear Energy Agency of the OECD, Paris, France.
NEACRP	Nuclear Energy Agency Committee on Reactor Physics.
NEA-DB	NEA Data Bank, Saclay, France.
NEANDC	Nuclear Data Committee of the OECD Nuclear Energy Agency.
NND	Neutron Nuclear Data.
NNDC	National Nuclear Data Center, Brookhaven National Laboratory, U.S.A.
NRDC	the Nuclear Reaction Data Centers.
OECD	Organization for Economic Cooperation and Development, Paris, France.
WRENDA	World Request List for Nuclear Data.

APPENDICES

See Table of Contents for a list of Appendices included in this document.

APPENDIX A

List of papers submitted to the meeting

Note: The papers marked with an asterisk (*) are included in the appendices of the present document. Copies of the others can be obtained, upon request, from the originator or from NDS.

1. *NDS Status Report (Appendix B)
   - Attachment 1: request statistics
   - Attachment 2: meeting summaries
2. *KaChaPaG Status Report (Appendix C)
3. Structure of KARDIF (in German) (H. Muenzel)
4. *FIZ Status Report (H. Behrens) (Appendix D)
5. *NEADB Activity Report (NEACRP-A-402) (Appendix E)
6. ENDF/B-4/5 History Status listing (P. Johnston)
7. Index of Evaluated Nuclear Data files available at NEA Data Bank (P. Johnston)
8. *NNDC Progress Report (Appendix F)
9. *Draft Objectives of the Proposed NEACRP/NEANDC Working Group Meeting on European Evaluation Procedures (Appendix G)
10. Proposal for Inclusion of Detailed Information on Systematic Errors in the International Data Exchange Files (M. Bhat)
11. NNDC Products and Services (V. McLane)
12. CSISRS Library Retrievals - Computation Formats (V. McLane)
13. *Application of a DBMS at NEA Data Bank - Problems and Experience with a Large Data Base on a Small Computer (N. Tubbs, et al) (Appendix H)
14. CODES - The CSISRS On-Line Dictionary Exchange System (D. W. Swinford)
15. Comments on various matters and two proposals (Memo CP-B/32) (H. Munzel)
16. Multiplicity (Memo CP-D/100) (H. Lemmel)
17. Pending EXFOR matters (H. Lemmel)

APPENDIX A

18. New proposed LEXFOR entries (V. McLane)

19. LEXFOR entries (CP-C/78) (V. McLane)

20. *Actions arising from the 11th INDC Meeting, Vienna. (J. J. Schmidt) (Appendix I)

21. *NNDC Charged Particle "Barn" Book (T. W. Burrows) (Appendix J)

22. *CINDA memo dealing with consistency in coding (G. Wyant) (Appendix K)

23. Short Guide to EXFOR (A. Calamand, et al) (IAEA-NDS-1 Rev.1)

24. Table of Contents for CSISRS Users Manual (V. McLane)

25. CSEWG formats for the representation of prompt and delayed nubar and spectra for spontaneous fissioning targets (CSEWG Memo)

In a follow-up meeting at the IAEA, Vienna, 16-17 December 1980, V.N. Manokhin submitted the following papers:

26. Progress Report of CJD (Appendix L)

27. Activity Report of CAJaD (Appendix M)

28. The CDFE Status Report (Appendix N)

Appendix B

NDS Status Report to the 1980 NRDC Meeting

H. D. Lemmel Sept. 1980

1. Staff

The organization of the Section as of August 1980 is shown on the next page. During the last year D. Muir left the Section, who had mainly dealt with WRENDA, provision of targets and samples and research contracts to developing countries, etc.

G. Lammer, who had worked on CINDA and on the Progress Report in Fission Product Nuclear Data, was replaced by M. Lammer who had occupied this post already years ago. In summer 1980, V. Pronyaev coming from F.E.I. Obninsk, joined the Section and started work by converting USSR evaluated data to ENDF/B format.

Head of the Programming and Data Processing Unit is now D.E. Cullen as successor for P.M. Attree. Another new programmer is M. Seits who has been with NDS already years ago and had worked, in the meantime, in the IAEA Computer Section.

One professional post continues to be vacant. As responsibilities within the Section are shifted according to staff available, shortcomings due to this vacant post may show up in different activities.

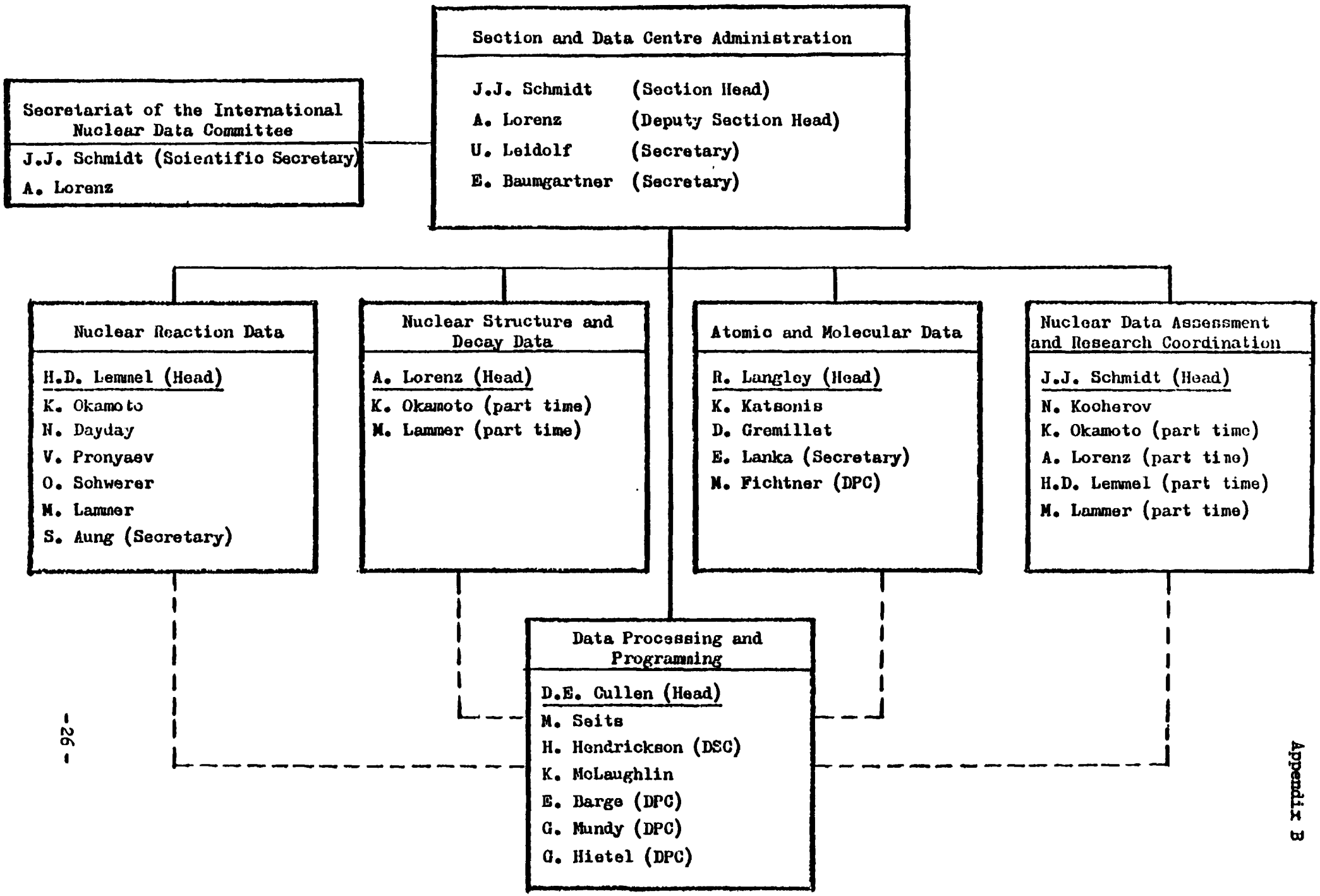
2. Move to the new building

The move of the IAEA to the Vienna International Centre took place in October 1979. In general, the move caused only rather short interruption of work. There was however a disturbingly long interruption of the IAEA Library services, from which our CINDA work suffered noticeably.

3. Budget and administration

Due to increasing stringency in the budget, several IAEA programmes including the activities of NDS were critically reviewed in 1979/1980. As a consequence, significant amounts of manpower had to be used for administrative matters, for providing input and output statistics, and for various presentations of the NDS program. The result of the review was, that the nuclear data programme should be maintained at its present level. However, in order to allow, within this ceiling, coping with the increase in services requested by area 3 countries, several program items dealing with the review and co-ordination of fission-reactor related data including the review of thermal fission data, had to be dropped. The budget situation in general remains very tough with respect to meetings and travel.

ORGANIZATION CHART OF THE NUCLEAR DATA SECTION AS OF AUGUST 1980



4. CINDA work at NDS (ML)

In January 1980 CINDA work was taken over by M. Lammer, replacing G. Lammer. As M. Lammer was familiar with CINDA operations, the work is continuing smoothly as far as NDS internal cooperation, book production and coverage of scientific journals are concerned.

The installation of the library at the new Headquarters (VIC) took longer than expected. Consequently, the prompt provision of new journal issues and technical reports was temporarily interrupted and delayed. These facts caused a considerable backlog in the coverage of reports and some of the journals. Particularly affected were the translation series of USSR journals. Not all of this delay will be overcome for the CINDA80 supplement, but hopefully for CINDA81.

For the same reason the coverage control entries from areas 3 + 4 are partly incomplete. The filling of the gaps in the coverage is presently in good progress.

An improvement was achieved in the layout of the CINDA80 book by introduction of upper and lower case in the computer-printed tables 3 (REF-codes) and 4 (LAB-codes). Further improvements in the text and tables part of the book are envisaged for future issues.

The program package processing the booktape as received from the NEA Data Bank to the input to the photo-typesetting was left unchanged, and we hope that this can remain unchanged.

The number of CINDA entries for each book sent to NEA Data Bank, including revisions and CJD entries, is given in the following table:

Summer 1976	2523 entries	
Winter 1976/77	2030	
Summer 1977	2166	
Winter 1977/78	3586	
Summer 1978	7077	preparation for the thoroughly completed
Winter 1978/79	8867	and revised archival issue "CINDA-A"
Summer 1979	4176	
Winter 1979/80	1809	move to VIC, interruption of library
Summer 1980	ca 5000	expected

Appendix B

5. EXFOR compilation (KO)

5.a EXFOR 3-series (Experimental Neutron Data)

Between June 1979 and July 1980, we compiled in EXFOR data from about 60 papers, originating from the following countries:

	EXFOR-entries
India	30 *
Australia	13
Poland	5
Yugoslavia	3
China (People's Rep.)	3
Hungary	2
Romania	2
German Dem. Rep.	1
Pakistan	1
Bangladesh	1
Iraq	1
Taiwan	1
Saudi Arabia	1
	64

* The high number from India includes some backlog compilation

5.b EXFOR V-Series (Evaluated neutron nuclear data)

Important evaluated neutron data, which are not available in ENDF/B, UKNDL or KEDAK format, are compiled at NDS but not systematically. Some of the more important data are:

- revisions of the complete evaluations of the neutron reaction data of P-31 and Ba isotopes by an Austrian group;
- delayed neutron spectra by Saphir et al. from Israel;
- partial evaluations on U and Pu isotopes from the People's Republic of China.

It should be noted that NDS has started to compile such evaluations in ENDF/B format instead of EXFOR. However, as the Austrian P and Ba evaluations show, there exist evaluated data for some partial reactions that are not defined in ENDF/B so that, in this case, the more flexible EXFOR format was preferred.

EXFOR-V data transmitted in 1980 (Jan.-June) are summarized in the following table

V0012 (Revised) "Neutron Nuclear Data Evaluations for $^{134-138}$Ba Using Statistical and Optical Model Calculation"
B. Strohmaier + ; Nucl. Sci. Eng. 65 (1978) 368

V0015 "$\bar{\nu}$ Evaluation for Heavy Isotopes (Z > 90)"
F. Manero, V.A. Konshin; Atom. Energy Rev. 10 (1972) 637

V0016 "Neutron Nuclear Data Evaluation for ^{31}P Using Statistical Model and Coupled Channel Optical Model Calculation"
B. Strohmaier + ; Priv. Comm. (1980)

V0017 "Delayed Neutron Spectra"
D. Saphier + ; Nucl. Sci. Eng. 62 (1977) 660

V0018 "$\bar{\nu}$ of Pu-239"
Liu Tsu-hua; HSJ-75007 (1976)

V0019 "Fission Cross Section of U-235"
Liu Chi-tze; HSJ-77061 (1978)

V0020 "Fission Cross Section of Pu-239"
Liu Chi-tze; HSJ-75005 (1976)

V0021 "(n,2n) and (n,3n) Cross Section of U-238"
Chou You-pu; HSJ-77091 (1978)

V0022 "$\bar{\nu}_p$ of U-235"
Chang Huan-qiao; HSJ-76041 (1978)

5.c EXFOR D-Series (Charged-Particle Nuclear Reaction Data)

The EXFOR-D tape was revised with respect to the flags in the ENTRY and SUBENT records as agreed at the Karlsruhe Meeting. The entire D-file was retransmitted, omitting the D6-series of trial compilations of half-lives.

The following entries have been made until now:

D0001 "Evaluation of ^{9}Be(α,n) Cross Section"
K.W. Geiger + ; NRCC 15303

D0002 "Evaluation of ^{3}H(p,n) Cross Section"
M. Drosg + ; Nucl. Sci. Eng. 67 (1978) 190

D0003 "Evaluation of ^{2}H(d,n) Cross Section"
M. Drosg + ; ibid

D0004 "Evaluation of ^{3}H(d,n) Cross Section"
M. Drosg + ; ibid

D0005 "Measurement of ^{3}H(p,n) Cross Section"
M. Drosg + ; ibid

D0006 "Measurement of ^{2}H(d,n) Cross Section"
M. Drosg + ; ibid

D0007 "Measurement of $^{3}H(d,n)$ Cross Section"
M. Drosg + ; ibid

D0008 "Measurement of $^{3}H(d,n)$ Cross Section"
D.K. McDaniels + ; Phys. Rev. 7C (1973) 882

and

"Measurement of $^{3}H(p,n)$ Cross Section
D.K. McDaniels + ; Phys. Rev. 6C (1972) 1593

(both were renormalized by M. Drosg)

D0009 "Measurement of $^{2}H(d,n)$ and $^{3}H(p,n)$ Cross Section"
N. Jarmie + ; Phys. Rev. 16C (1977) 15

D0010 "Measurement of $^{3}H(p,n)$ Cross Section"
R.G. Allas + ; Phys. Rev. 9C (1974) 787

(renormalized by M. Drosg)

D0011 "Measurement of $^{3}H(d,n)$ Cross Section"
J.E. Simmons + ; Bull. Am. Phys. Soc. 13 (AG4) (1968) 564

(renormalized by M. Drosg)

D0012 "Measurement of $^{3}H(d,n)$ Cross Section"
O.D. Brill + ; Atom. Energiya 16 (1964) 141

(renormalized by M. Drosg)

D0013 "Measurement of $^{3}H(p,n)$ Cross Section"
M. Drosg; Priv. Comm. (1979)

D0014 "Evaluation of $^{3}H(d,n)$, $^{3}H(t,2n)$ Cross Section"
L. Stewart; LA-5828-MS (1975)

D0015 "Measurement of $^{3}H(t,n)$ Cross Section"
N. Jarmie + ; Phys. Rev. 111 (1958) 1121

D0016 "Calculated Reaction Rate for $^{3}H(d,n)$, $^{3}He(d,p)$, $^{2}H(d,p)$, $^{2}H(d,n)$, $^{3}H(t,2n)$ and $^{3}H(^{3}He,X)Y$"
B.H. Duane, BNWL-1685 (1975)

D0017 "Evaluation of $^{11}B(p,3\alpha)$ Cross Section"
G.M. Hale; Priv. Comm. (1979)

D0018 "Calculated Reaction Rate for $^{3}Li(p,\alpha)$, $^{6}Li(^{6}Li,X)$"
L. Ruby + ; Nucl. Sci. Eng. 69 (1979) 107

D0019 "Evaluation of $^{3}H(t,2n)$ Cross Section"
G.M. Hale; LA-7722-PR, LA-7596 (1978)

(with the author's private communication, 1979)

D0020 "Measurement of $^{24}Mg(\alpha,n)$, $^{25}Mg(p,n)$, $^{27}Al(p,n)$ and $^{28}Si(\alpha,n)$ Cross Sections"
C.W. Cheng + ; Can. J. Phys. 58 (1980) 697

Note that some incidental duplications with NNDC entries are still to be deleted.

Appendix B

5.d EXFOR H-Series (Half-Life Data, trial entries)

This series were previously coded as D6000. There are 2 entries made by NDS so far:

H6001 "The recommended half-life of Pu-239, Pu-238"
W.W. Strohm; Int. J. Appl. Radiat. Isotopes 29 (1978) 481

H6002 "Proposed half-life values for the isotopes in the element range ^{90}Th to ^{98}Cf"
Edited by A. Lorenz; INDC(NDS)-96 (1978)

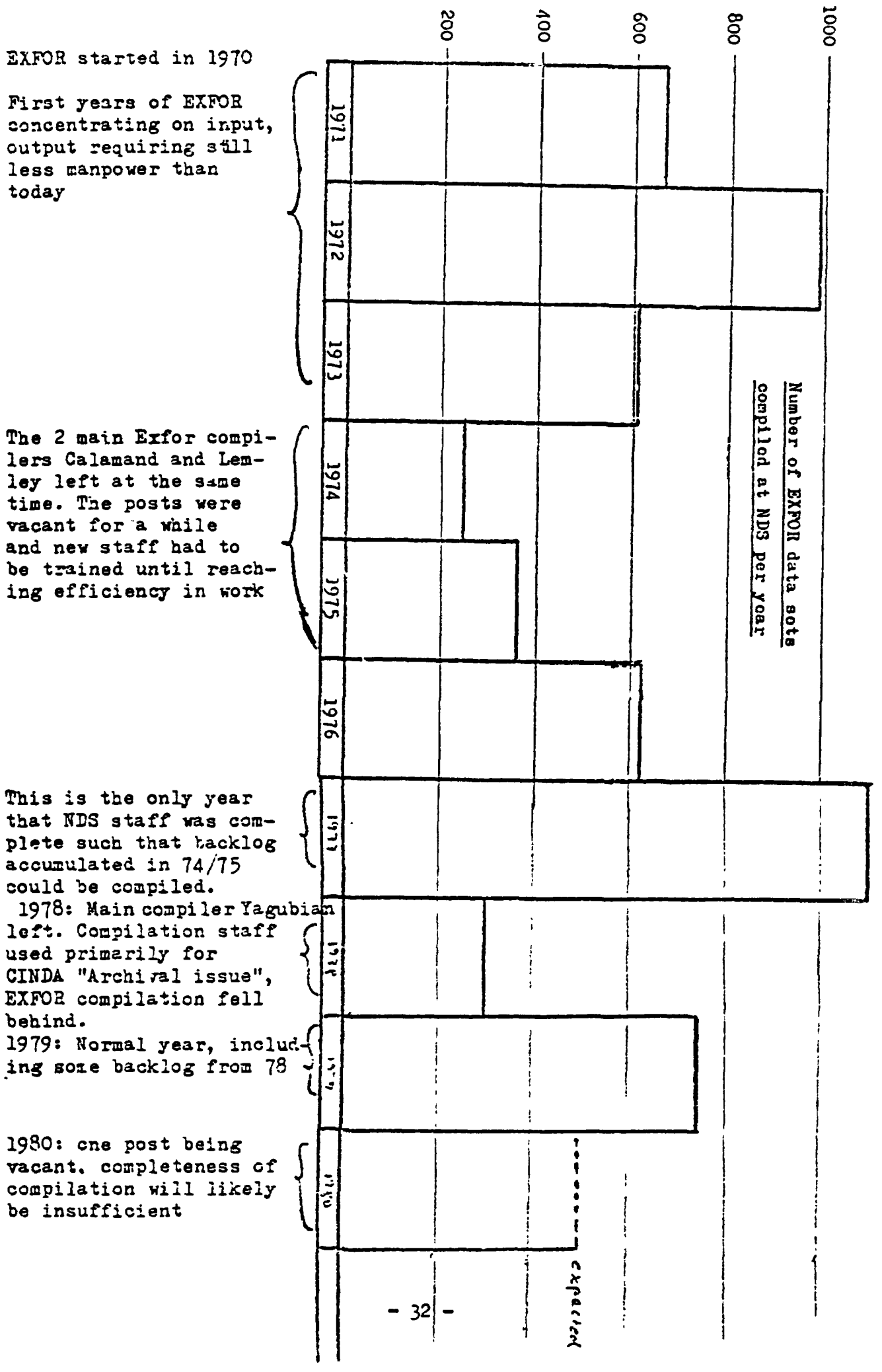
(Note: Data are superseded by revised values to be issued by the IAEA Coordinated Research Programme on Actinide Decay Data.)

There is no intention to continue this series more systematically. However, for half-lives of basic relevance to important neutron data (such as the Pu-239 half-life basic to the Pu-239 fission cross-section) Exfor and in particular its BIB-Section provides a convenient tool for compiling half-life information.

5.e Statistics

The figure on the next page illustrates the number of EXFOR subentries transmitted by NDS per year, including new data, older data and revisions. The figures indicate that the number of data compiled is limited not by the number of data received but rather by the manpower available.

Number of EXFOR subentries transmitted by NDS per year (including revisions)



EXFOR started in 1970

First years of EXFOR concentrating on input, output requiring still less manpower than today

The 2 main Exfor compilers Calamand and Lemley left at the same time. The posts were vacant for a while and new staff had to be trained until reaching efficiency in work

This is the only year that NDS staff was complete such that backlog accumulated in 74/75 could be compiled.

1978: Main compiler Yagubian left. Compilation staff used primarily for CINDA "Archival issue", EXFOR compilation fell behind.

1979: Normal year, including some backlog from 78

1980: one post being vacant, completeness of compilation will likely be insufficient

Appendix B

6. The EXFOR System

We were very happy to realize that during the past year the EXFOR System remained stable, as indicated by the small number of CP-Memos exchanged.

Present Contents

The content of EXFOR is given in the table on the next page. Please note that the statistical figures are subject to some uncertainty in definition of terms. The term "data set" as given in the present table corresponds to an entry in the NDS EXFOR Index. Usually an index entry corresponds to an EXFOR Subentry excluding subentry 001. Often however, an EXFOR Subentry produces several data index entries.

Compared to the last year's statistics it is interesting to see that for neutron data the number of data sets slightly decreased but the number of data records increased. This results partly from the finished NEUDADA conversion and the consequent deletion of the 60 000 series, and partly from the continuing contraction of old multi-dimensional tables from many subentris into a single one.

Percentagewise, the most significant increase occurred in the number of data records for

- charged particle data : factor 4.5
- nuclear quantities (i.e. that part of the neutron EXFOR file where the incident particle is zero: nuclear temperatures, spontaneous fission, etc) : factor 2.5

The table, retrieved in July 1980, does not yet include the first "EXFOR-M" tape received from CDFE.

EXFOR TRANS tapes received (OS)

The number of Exfor TRANS tapes received from the other centers continues to be most satisfactory:

	1978	1979	1980 Jan.-June
EXFOR tapes received from other centers	48	30	22

All incoming Exfor TRANS tapes are run through the NDS Exfor check program and disturbing errors are corrected as far as possible. A list of the error messages with explanatory comments is sent to the originating center. When important errors cannot be corrected by NDS, retransmission is requested. For the NND centers, a list of still pending retransmissions requested by NDS has been distributed in Memo 4C-3/239 of 1980-04-23. We appreciate that NEA-DB promptly retransmitted most of the subentries requested in this Memo. For Areas 1 and 4 Memo 4C-3/239 is mostly still valid.

Content of EXFOR as of July 1980

	Data sets (EXFOR subentries)	Numerical data records	total records (data + text)
neutron nuclear data, experimental	40 900	2 570 000	3.28 million
neutron nuclear data, evaluated	604	39 400	45 000
charged particle nuclear data	2 730	49 900	135 000
photonuclear data (see note 3.)	425	27 600	32 800
nuclear quantities and decay data (nuclear temperature, spontaneous fission spectra, etc)	869	13 000	24 600
	45 500	2.70 million	3.52 million

Notes:

1. A "data set" is usually defined as an "EXFOR subentry" containing for one nucleus a certain cross section type as a function of energy resulting from one experiment. The size of a data set varies between one single and several thousand data records. For certain data types, in particular double differential data, resonance-parameters, etc., the definition of a "data set" varies as different arrangements in EXFOR are possible. Actually, the figures given under "data sets" are the number of index lines in the NDS EXFOR Index. The first subentry of an entry containing text only, is excluded from the count.

2. The statistics exclude superseded data sets. Data once compiled and transmitted, are often subsequently revised by the author. The data are then retransmitted, whereby the superseded data are erased at all centres automatically. Compared to the figures of February 1980 submitted by NDS to INDC there is a small decrease for experimental neutron data in the figure of data sets but an increase in the number of data records. This is due to the revision of the "EXFOR-6" series and due to the contraction of double differential data from many interrelated subentries into a single subentry.

3. The figures for photonuclear data do not yet include the first "EXFOR-M" tape received from Moscow containing 93 subentries, 6200 numerical data records and a total of 7900 records.

7. EXFOR Dictionaries (OS)

Since the last Nuclear Reaction Data Centers' Meeting in October 1979, 4 dictionary transmission tapes have been sent out (9037 through 9040). On an average 3 interim dictionary updates are made between any 2 tape transmissions.

Requests for dictionary updates related to an Exfor TRANS tape are very often received at NDS only after the TRANS tape has been received and processed. This leads to many unnecessary error messages and additional work in clarifying and correcting them.

In the cases of Dict. 27 (Nuclides) and 36 (Quantities) we can usually update the dictionaries without an information from the originating center. But when new codes are introduced we would very much appreciate receiving the related CP-Memo before receiving the TRANS tape where the new codes occur.

8. Customer Services (ND)

Most of the data libraries existing at NDS were documented within the scope of the "IAEA-NDS-..." documentation series. These reports were widely distributed with the corresponding data library or separately upon request.

Nuclear Data Newsletter no. 1 was given a very wide distribution. The announcement of the release and the availability of ENDF/B-IV General Purpose File and ENDF/B-V data files gave rise to large number of requests for these libraries.

Availability of ENDF/B-V Processing codes was announced by a circular letter sent to all recipients of the ENDF/B-V data files. This action prompted a large number of request for these codes.

Nuclear Data Newsletter issue no. 2 is in preparation, after regrettable delays due to our move to the new building.

We encountered increasing demand for general-purpose multigroup libraries. We intend to distribute only those multigroup libraries which are of general interest similar to a point data library. Typical examples are those libraries which are issued by the originator in two versions: as point data and as group data; or the dosimetry reaction libraries which are often issued in group structure (e.g. SAND-II).

Requests for nuclear calculation computer programs and associated multigroup data libraries are referred to the IAEA Liaison Officer at the computer program library of the NEA Data Bank.

9. Request Statistics

See Attachment 1 for detailed statistics. The tables given originate

- partly from NDS reports to IAEA and to INDC; these cover the period up to the end of 1979.

- partly from the Request Log as retrieved for the present Meeting.

Some conclusions are:

The number of countries from area 3 requesting nuclear data information from NDS is increasing slowly but continuously. At present, it is 30 countries.

The number of requests received per year shows, due to special events (Trieste course, announcements of important new libraries received), some fluctuations but is generally increasing. The number of data sent out per request is significantly increasing.

On a long term, requests for evaluated data show a steeper increase than requests for experimental data.

10. Meetings

Summaries of NDS Meetings held in 1980 are given in Attachment 2. This includes also a list of meetings tentatively planned in the period 1981-1983.

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11. INDC reports

Please refer to INDC(SEC)-76 giving an index to all INDC reports. Due to financial limitations the number of copies to be printed and distributed, had to be reduced. However, some copies to be distributed upon individual request, are available.

11.a WRENDA (ML)

WRENDA 79/80 was published in October 1979. Details on requests contained in this issue were reported at last year's NRDC Meeting in Karlsruhe.

Before his departure in June 1980, D.W. Muir issued a "WRENDA Input Guide" for the use of data centers. This guide describes in detail the different formats used within the WRENDA system as well as the input of new requests and the modification of requests existing already in the file. Abbreviations to be used when coding requests, are tabulated.

In June 1980, the WRENDA operations were taken over by M. Lammer. The publication of WRENDA 81/82 is planned for Summer 1981. The WRENDA update cycle was initiated in July 1980 by sending out "country retrievals" to INDC-members and INDC liaison officers in areas 3 + 4 and Canada. NNDC/Brookhaven and NEA-DB/Saclay received tapes containing all requests from their respective service areas. The deadline for the receipt of updated requests at NDS is February 1981.

The recommendation of the INDC, that all WRENDA request lists be printed as a single combined list with each request identified as associated with a specific application (e.g. fission, fusion etc.), has now been fully implemented (see WRENDA 79/80). Minor improvements continue in the programmes, particularly with respect to sort orders and retrieval criteria.

11.b Fission Product Nuclear Data (FPND) (ML)

The report series "Progress in Fission Product Nuclear Data" is published annually, starting with issue no. 1 in November 1975. Up to December 1979 the information about activities in the field, measurements and compilations/evaluations of FPND, contained in this series, was collected by G. Lammer.

Issue no. 6, published as INDC(NDS)-113/G+P in June 1980, was edited by M. Lammer. The number of contributions to the series could be increased. For the first time contributions from USSR could be included, thanks to the personal effort of F.E. Chukreev from CAJaD.

12. Programming and Systems Development (DEC)

General

Since the last meeting the EXFOR system of programmes was improved and may now be considered up-to-date, including documentation. The Data Index System, described below, is now operational for all of our data files. The request and dissemination log systems are currently under review and will be re-designed and implemented in the near future. In addition, the utility of the EXFOR will be improved by providing a computation format for experimental data described below.

During the latter portion of 1979 and throughout 1980 there will be major changes in the computer resources available to NDS. The NDS presently has a remote job entry system, which allows jobs to be initiated and computer output listings to be obtained locally. In addition the NDS now has three visual display units which can be used for programme development, maintenance of request and dissemination logs, as well as on-line input and correction of data. During 1980 the present card-based operation will be phased out and keypunches and verifiers replaced by remote data entry system including visual display units.

12.a EXFOR Programming

The system of EXFOR programmes for file maintenance may now be considered up-to-date. This includes: a thorough checking code, file management programmes, indexing and retrieval programmes and output editing programmes (the latter to improve readability of EXFOR output). All of these programmes are systematically documented (for internal NDS use) to improve utility and simplify maintenance.

A major new project will be the implementation of a computation format. The computation format will be designed to allow EXFOR data to be put into a form which is easy to read and analyse using a computer. For example, reducing all physically comparable data to the same set of units (e.g. all total cross-sections to barns) and a common format (e.g. energy followed by cross-section), simplifies comparison of two or more measurements. The computation format will facilitate future graphical output.

Implementation of the new computation format will draw heavily of the experience gained at Livermore in translating EXFOR data to the ECSIL computation format (see: UCRL-50400, Vol1, part B). During the last five year all EXFOR data has been routinely translated to the ECSIL format. During these five years almost one million data points have been successfully translated and a great deal of experience has been accumulated on how to translate EXFOR data to any computation format.

12.b 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.

The entire request and dissemination log system has been reviewed with the objective of improving and expanding the information stored in the system in order to improve the types of statistics which may be obtained from the system; in particular usage patterns by isotopes, country, type of data (experimental vs. evaluated), etc. Analysis indicated that the data base management system ADABAS and its associated programming language NATURAL can be used to store and retrieve information. The Statistical Analysis System, SAS is used to prepare meaningful statistics.

The request log data base is currently being expanded to include the required dissemination statistics, and computer programmes to update and retrieve the information will be written. Currently existing computer runs which are used to fulfill requests will be expanded to produce most of the required information that is to be added to the dissemination log.

SAS (Statistical Analysis System Program) has been used extensively in the past 6 months to produce detailed statistics of information from the request data base and will also be used to produce statistics from the dissemination log information.

An interface with the "Profile System" (see below) is planned which will automatically retrieve names and addresses of persons in the profile data base.

12.c 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 which contains indexes to 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; this facility will be extended when data requests indicate a need for further detail.

12.d Profile System

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

There are currently more than 4000 names and addresses stored in the profile system master file; last year approximately 400 names were added and 150 per month changed. At present about 90 'profile codes' are used which serve various purposes to produce reports and mailing labels, e.g. for distribution of INDC documents, for retrieving lists of members of National Nuclear Data Committees and other affiliations, for retrieving meeting participants to include their names and addresses in the proceedings and to produce mailing labels, etc.

The profile system has been converted to use the Data Base Management System, ADABAS. At the same time the capabilities of the system have been expanded and an interface to the request and dissemination system has been made possible.

12.e 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.

12.f 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, these programmes must be 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.
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.

For comparison to experimental data in the new computation format, a series of programmes have been implemented to process evaluated data in the ENDF/B format: this series includes reconstruction of energy dependent cross sections from resonance parameters, Doppler broadening of cross sections, reconstruction of angular distributions from Legendre coefficients and a plotting programme for cross sections, angular distributions and secondary energy distributions. As soon as experimental data is available in the new computation format it will be interfaced to the plotting code for comparison purposes.

NDS has started to compile and check evaluated data in ENDF/B format. This has become essential within the program components on actinides, dosimetry resp. radiation damage, as well as conversion of selected important evaluations into ENDF/B format.

Request Statistics

A. Period 1979/80

1. Data Libraries most frequently requested
2. Countries of area 3 that requested numerical data
3. Number of requests by request category and area

B. Period 1965/1979

4. Requests received and data disseminated by year (table)
5. Nuclear data requests received per year
6. Numerical data sets distributed per year

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Data Libraries most frequently requested

1978 - August 1980

Figures include selective retrievals and copies of entire library

EXFOR		326
ENDF/B-4		39
ENDF/B-5	Standards	27
	Actinides	22
	Dosimetry	39
	Fis. Prod.	19
ENDL78		52
JENDL1		18
UKNDL		40
French Evaluations		6
KEDAK4		7
SOKRATOR		7
Australian Fis. Prod.		9
Various group data		35
ENSDF		18
Jülich gamma lines		14
CINDA Retrievals		31
Recent References		13

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Nuclear Data Requests Received from Countries of Area 3

Figures include only requests for numerical data, experimental or evaluated. A "request" is an incoming letter. (Note: in earlier statistics an incoming letter could correspond to more than one "request" if several unrelated items for different purposes were requested in the same letter.)

	1979	1980 Jan.–June
Algeria	0	1
Argentina	2	2
Australia	1	0
Bangladesh	0	1
Brazil	5	4
China, People's Rep.	0	1
Colombia	1	1
Czechoslovakia	3	5
Egypt	3	2
German Democratic Rep.	8	3
Hungary	6	5
India	16	8
Indonesia	1	0
Iraq	1	1
Israel	5	2
Jordan	0	1
Korea, Rep. of	4	3
Kuwait	1	0
Mexico	2	0
Pakistan	5	4
Poland	4	7
Romania	1	3
South Africa	5	1
Taiwan	0	1
Yugoslavia	3	4
	77	59

Additional countries that requested data in 1978 were:

Cuba
Ghana
Guatemala
Iran
Peru
Sierra Leone

Number of incoming requests by area and request type

Figures are given for 1979/1980 Jan.-June

Request recieved from	Evaluated Data	Experimental Data	Documents and Reports	Bibliographic	Computer Codes	Total
Area 1	1/0	1/2	12/13	0/0	0/0	14/15
Area 2	13/4	7/4	23/21	3/1	0/1	46/31
Area 3	65/49	44/19	53/69	7/5	8/10	177/152
Area 4	5/2	7/0	4/7	0/1	1/0	17/10

In this table a "request" corresponds to an "incoming letter". The size of request may vary between a single document and several magnetic tapes full of data.

Data Request and Distribution Statistics 1965 - 1979

Year	Request Statistics						Combined Experimental and Evaluated Data Distribution	
	Experimental Data	Evaluated Data	Documents	Other	Totals per year	Totals Cumulative	Data Sets per Year	Data Sets Cumulative
1965	3	-	-	-	3	3	73	73
1966	40	-	-	5	45	48	138	211
1967	118	-	9	8	135	183	474	685
1968	119	-	16	9	144	327	560	1 245
1969	48	15	25	5	93	420	403	1 648
1970	95	20	34	8	157	577	857	2 505
1971	76	33	43	8	160	737	2 308	4 813
1972	48	23	60	8	139	876	7 274	12 087
1973	43	22	54	6	125	1 001	8 081	20 168
1974	49	24	61	6	140	1 141	5 427	25 595
1975	43	49	114	3	209	1 350	8 472	34 067
1976	34	43	153	9	239	1 589	14 533	48 600
1977	45	49	232	3	329	1 918	15 100	63 700
1978	78	88	177	39	382	2 300	23 691	87 391
1979	63	93	95	18	269	2 569	36 807	124 198

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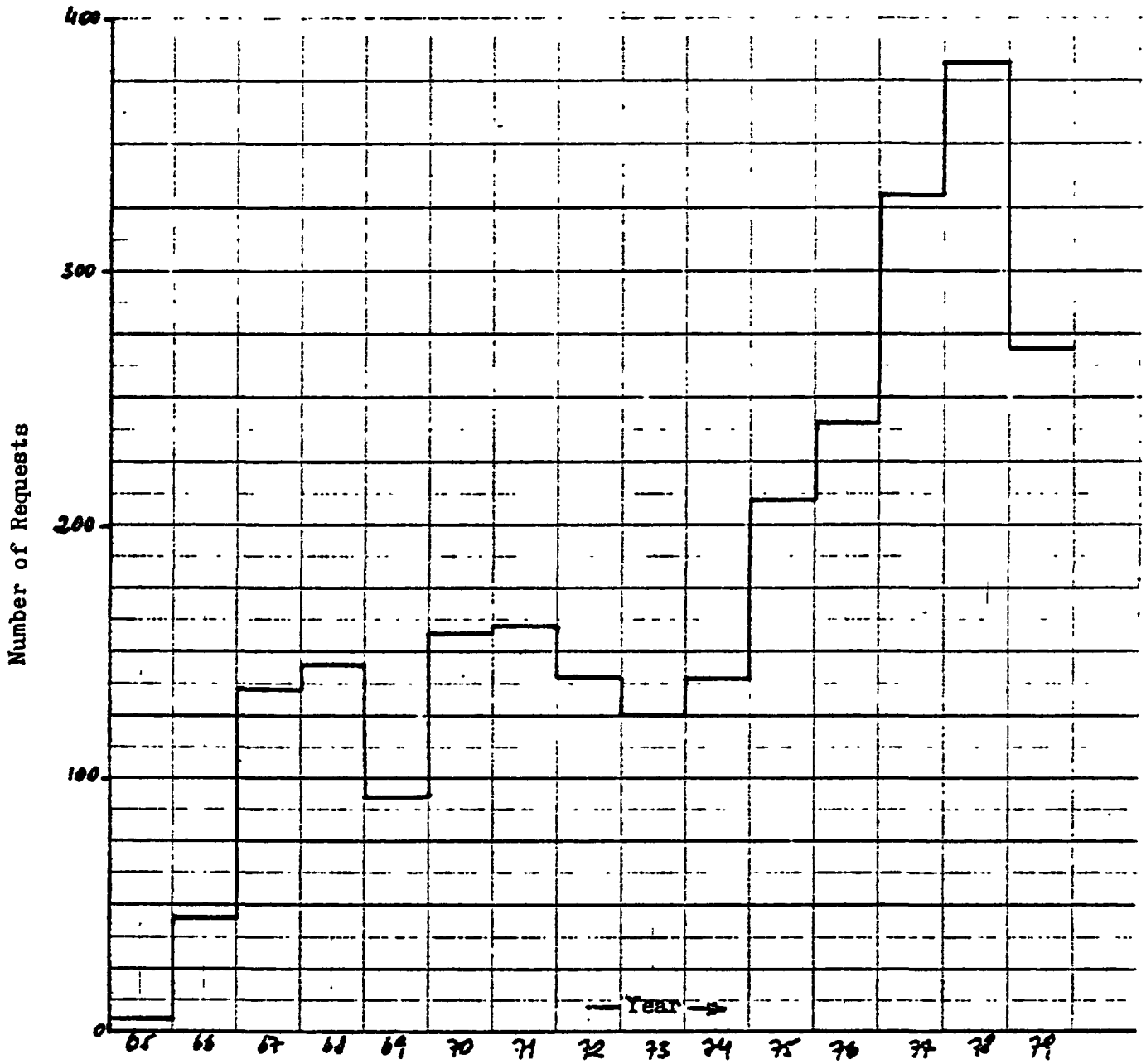
Nuclear Data Request Statistics

Annual total 1965 - 1979



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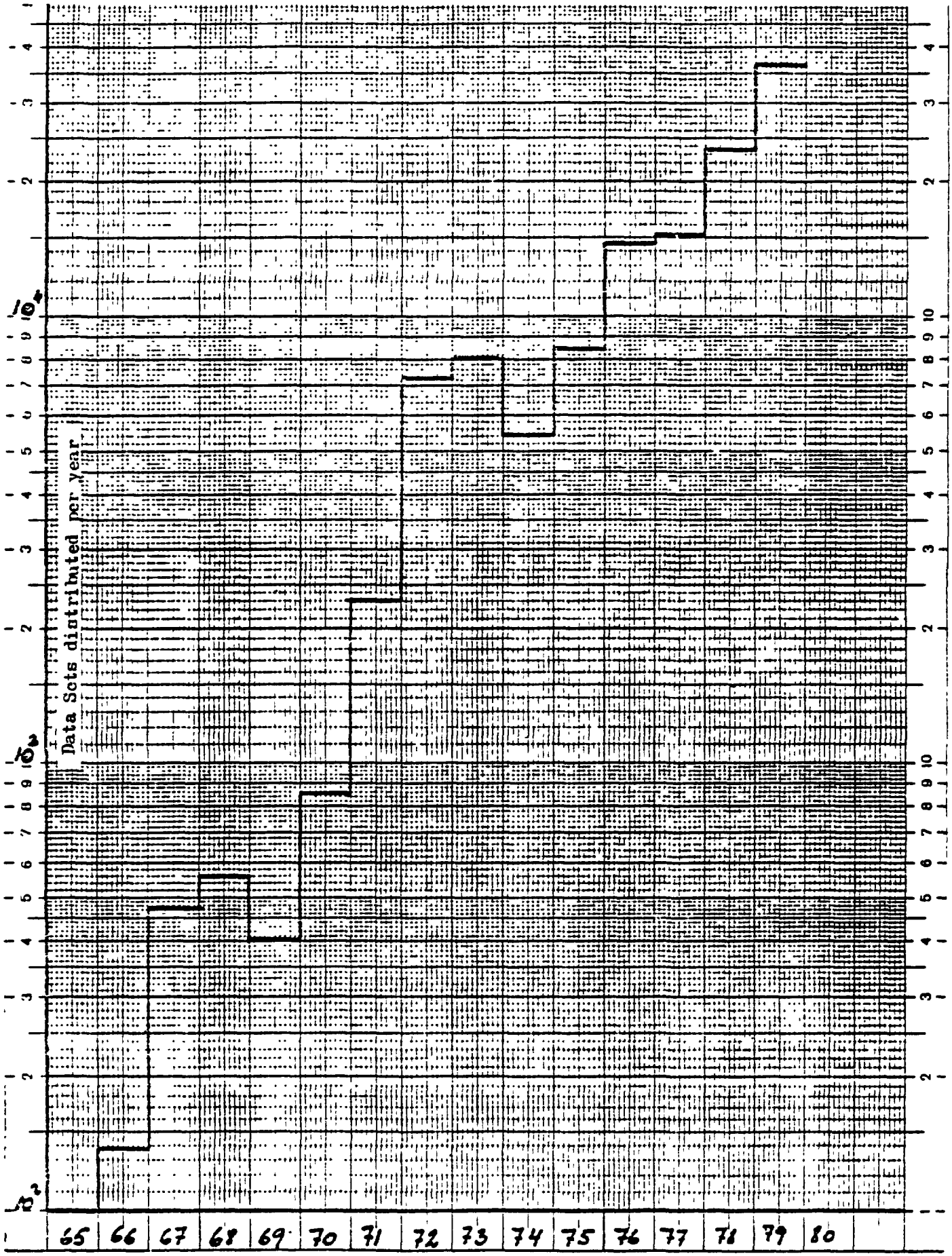
Numerical Nuclear Data Sets Distributed per Year

(including experimental and evaluated data)



Meetings

Attached are summaries on the following meetings:

1. Training Course on Nuclear Theory, Trieste, February 1980
2. Neutron Source Properties, Debrecen, March 1980
3. Nuclear Structure and Decay Data (NSDD), Vienna, April 1980
4. Reactor Dosimetry, Petten, April 1980
5. CRP Meeting on Intercomparison of Evaluations of Actinide Neutron Nuclear Data, Vienna, June 1980
6. CRP Meeting on Measurement and Evaluation of Transactinide Isotope Nuclear Decay Data, Vienna, June 1980
7. IFRC Meeting, Brussels, July 1980
8. List of NDS Meetings planned for 1981-1983, subject to approval

Interregional Advanced Training Course on Applications of Nuclear Theory to Nuclear Data Calculations for Reactor Design, International Centre for Theoretical Physics (ICTP), Trieste, 28 January - 22 February 1980

Summary

This course, a follow-up of a similar course held in 1978, was jointly organized by the IAEA Nuclear Data Section and the International Centre for Theoretical Physics (ICTP) within the framework of the 1980 nuclear physics activities of the ICTP and held at the ICTP in Trieste from 28 January - 22 February 1980, funded predominantly by the Technical Assistance Department of the IAEA. It was directed by J.J. Schmidt from the IAEA Nuclear Data Section and Dr. M.K. Mehta from the Bhabha Atomic Research Centre, Bombay, India, with the assistance of a local Organizing Committee headed by Prof. L. Fonda from the ICTP Trieste.

The four weeks programme of invited lectures (mornings) and workshops (afternoons) included a detailed review of recent advances in the theoretical understanding of fast neutron nuclear reaction mechanisms and of neutron-induced nuclear fission and training in the applications of nuclear models to the computation of neutron cross sections for nuclear reactor design, a broad introduction into the generation and processing of evaluated neutron cross-sections, a detailed review of experimental and theoretical methods used in the generation of 14 MeV neutron data, and, most importantly, the development of a proposal for the scientific programme of a planned IAEA Interregional Technical Co-operation Project for Training in Basic Techniques for the Generation of Nuclear Data Required for the Development and Applications of Nuclear Science and Technology.

The course was attended by 70 participants from 24 developing and 8 participants from 5 developed countries.

Compared to the course in 1978, this course achieved a better balance between lectures and workshops, with stronger motivation of the participants in an active co-operation in the workshops. Though due to limited funds the attendance at this course was not quite as large as at the 1978 course, the qualification of the participants was better than in 1978 and enabled strong and useful interaction with the throughout excellent lecturers and workshop leaders.

Because of their high up-to-date scientific and educational value the lectures presented at the course are planned to be published in the IAEA-Seminar series with a distribution preferentially to the developing countries.

The excellent collaboration of the ICTP and of the Agency's TA Training Section were very helpful for the successful organisation and conduct of this course and are most gratefully acknowledged.

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FOREWORD

In view of the considerable improvement in the accuracy and consistency of the properties of neutron sources relevant to neutron metrology achieved in recent years, the International Nuclear Data Committee at its recent meetings*) recommended that a meeting on Neutron Source Properties be held in 1980. In response to this recommendation, the IAEA Nuclear Data Section, with the support of the Hungarian authorities, in co-operation with the Institute of Experimental Physics of the Kossuth Lajos University acting as the host, convened a Consultants' Meeting on "Neutron Source Properties" during the week 17-21 March 1980 in Debrecen, Hungary.

The meeting was attended by 29 scientists and more than 10 observers from 13 Member States.

The main objectives of the meeting, in addition to high-lighting current important developments in this field were:

- to review the requirements and status of all properties and data on neutron sources such as 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 epi-thermal pile neutron beams. The neutron energies to be covered extend from thermal to 40 MeV and above. Plasma neutron sources are not to be included,

- 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 its coordination.

The proceedings contain the review papers, the abstracts of the contributed papers presented at the meeting as well as the introduction and report on the summary conclusions and recommendations of the meeting related to the following subjects:

1. Radioactive Be(α,n), photoneutron and spontaneous fission sources;
2. White neutron sources and filtered beams; and
3. Mono-energetic neutron sources from charged particle reactions.

The proceedings, of which the foreword (above) and the table of contents (following pages) are reproduced here, will be published soon.

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ABSTRACTS OF CONTRIBUTED PAPERS

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NSDD Meeting, Vienna, 21-25 April 1980

Summary of the Meeting

A. Introduction

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 meeting was conducted in two separate sessions; the morning sessions, devoted to the coordination of the NSDD network of centres and groups were chaired by Dr. J.J. Schmidt, the afternoon sessions, devoted to physics questions related to the evaluation of NSDD, were chaired by Dr. C. van der Leun.

B. Objectives

The international NSDD Network, consisting presently of 16 evaluation groups in 11 Member States and 2 international data service centres, aims at a complete and continuous nuclear structure data evaluation of all isobaric mass-chains on a four year cycle, the continuous publication of these data, and their dissemination to the scientific community. This international cooperative effort is coordinated by the Nuclear Data Section of the IAEA in cooperation with the National Nuclear Data Centre (NNDC) in the US.

The periodic meetings of the international NSDD network, have the objective to maintain the coordination of all centres and groups participating in the compilation, evaluation and dissemination of NSDD, to maintain and improve the standards and rules governing NSDD evaluation, and to review the development and common use of the computerized systems and data bases maintained specifically for this activity.

C. Conclusions and Recommendations

While a more detailed account of the meeting proceedings will be published in INDC(NDS)-115/LN, the main achievements, summarized as conclusions and recommendations, are listed below.

Summary of Conclusions and Recommendations

- 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.

D. Next Meeting of the NSDD Network

Time and Place

At Utrecht, The Netherlands, during the week of either 3-7 May or 10-14 May 1982.

FROM: N. Kocherov Kocherov
Nuclear Data Section

SUBJECT: Report on the travel to the Euratom Working Group on Reactor Dosimetry (EWGRD) Meeting

Summary

The EWGRD annual meeting took place in Petten, The Netherlands, 28-29 April, 1980. 15 participants from 6 countries attended the meeting. I was acting as an observer for the liaison between the IAEA and the EWGRD.

The meeting actually consisted of two subgroups which discussed the following subjects:

1. nuclear data for reactor neutron dosimetry measurements
2. nuclear data for radiation damage calculations including a topical discussion on gamma ray nuclear heating.

During the meeting of the first subgroup the status of the World Request List of Nuclear Data (WRENDA), published biennially by the Nuclear Data Section (NDS) of the IAEA and the status of dosimetry files including the International Reactor Dosimetry File which is now under compilation in NDS were discussed.

During the second subgroup meeting the participants discussed the procedures and the agenda of the 4th ASTM-Euratom symposium which is scheduled to be held in March 1982 in Palo-Alto, USA. During the topical discussion of gamma-heating, four reports were presented on the techniques of nuclear heating measurements inside the core of fission reactors.

The subject meeting was attended by 15 participants from 6 countries and consisted of two sessions.

Session 1

The status of WRENDA was discussed. I informed the participants on the time schedule of future actions connected with the next issue of WRENDA. The participants decided to assign the responsibility for reviewing and updating the requirements for neutron dosimetry reaction data to Dr. W. Zijp, who will coordinate this activity inside the EWGRD. The participants requested NDS to stress the fact that the entries they are sending are in fact international requests and asked to reference them as follows: Dr. W. Zijp, EWGRD.

R. Dierckx (ISPRA) proposed to include requirements for D+Li source (FMIT facility) dosimetry measurements into the next edition of WRENDA. This would mean essentially an extension of the neutron energy range of interest up to 40 MeV and, possibly, an inclusion of one or two new reactions.

The status of dosimetry files was also discussed. I have reported on the status of IRDF and the participants showed their interest to have it as soon as possible. The format of the covariance matrix presentation was a matter of concern of the participants. Most of them do not have the possibility to use the 620 group format because of computer time limitations. An attempt to reduce the covariance information to 15 x 15 group format was reported by W. Zijp. The meeting agreed that a limited number of groups would at present be sufficient for all practical purposes, and also that an attempt to standardize a group structure would be difficult.

The EWGRD Nuclear Data Guide was discussed and the opinion was that a new edition should be issued in 1981 or 1982.

Session 2

The procedures and agenda of the future 4th ASTM-Euratom Symposium on Reactor Dosimetry and Radiation Damage were discussed. The participants proposed the following items to be discussed at the Symposium:

Damage correlations (changes of properties)
Uncertainties, adjustments, codes
Fuel dosimetry
LWR surveillance (including PV surveillance)
Fast reactor systems

The proposed agenda was sent to ASTM for consideration.

The plans for new measurements were considered. The points of major importance were updating of graphite irradiation data and new measurements of Nb(n,n') cross-section at spot neutron energies of 1, 2, 3, 4 and 5 MeV to be made in Birmingham, UK.

During the subsequent topical discussion four reports were presented on the techniques of measurement of nuclear gamma heating inside the cores of fission reactors.

Summary on the Third Research Coordination Meeting of the Coordinated Research Project (CRP) on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data

The Third Research Coordination Meeting of this Project took place in Vienna, 12-13 June 1980. For the 2nd Meeting in Aix-en-Provence, 30 April - 1 May 1979, see the Summary Report INDC(NDS)-104. An Abstract was included also in INDC(NDS)-111 pages 7 + 8.

Since then, Cadarache and Stuttgart became new participants of the CRP, which includes now 6 participants from West Europe plus 5 from India, Israel, Japan, Romania, USSR.

The evaluations performed by the participants were included on a tape "INDL/A" (IAEA Nuclear Data Library for Actinides). The present contents of this tape is documented in the report "IAEA-NDS-12" (see Appendix).

The work of the participants is part of their national programme. The purpose of the CRP is to stimulate critical intercomparison of the evaluations and scientific information exchange among participants, and to feed the results into a common file.

Whereas at the Aix-Meeting in 1979 guidelines for the methodology of intercomparison were designed, the Vienna Meeting 1980 was devoted very much to details of intercomparison, in particular concerning nuclear theory and statistical parameters. The meeting was chaired by F. Fröhner.

The participants presented progress-reports on their work, reports and intercomparisons of evaluations completed, as well as papers on specific topics, in particular about the application of nuclear theory. See the list of papers on page 9. These papers are not appended to this summary report but are available from the IAEA Nuclear Data Section upon request.

A summary of finished and planned evaluations and intercomparisons of actinide neutron nuclear data is given on page 23.

Some of the discussions that took place at the meeting are summarized in the following:

1. C. Lagrange: On the usefulness of coupled channel calculations for actinide nuclei.
   This paper was presented by J. Salvy. It demonstrates on several examples that noticeably better results can be obtained from deformed optical model calculations as compared to spherical optical model calculations. For the heavier actinides deformed optical model calculations appear therefore to be preferable, although the computer time involved is often considered prohibitively large. On the other hand, a work by U. Fischer, Karlsruhe (report KFK-2907, Feb. 1980) was available which claims that the spherical optical model is still satisfactory for U and Pu isotopes.

2. M.K. Mehta reported on calculations of (n,2n) and (n,3n) cross-sections based on statistical models. Above the (n,3n) threshold the Pearlstein theory (1965) underestimates the (n,2n) cross-section and overestimates

the (n,3n) cross section. Various calculations performed since then were reviewed and their merits discussed.

3. B.H. Patrick presented a summary of the document NEANDC(UK)-174 = INDC(UK)-34: An assessment of the accuracy requirements on higher actinide nuclear data for fast reactors, by B.H. Patrick and M.G. Sowerby. This paper considers for a specific fast reactor spectrum the production of six actinide isotopes, the α heat and total heat, the spontaneous fission rate, the (α,n) yield and the total neutron yield. It was found that the calculation of these data suffers mainly from the uncertainties in

Np-237 (n,2n)
Am-241 (n,γ) Am-242g
Am-243 (n,γ)
(α,n) cross-sections
Pu-241 half-life

The accuracy of fission cross sections was considered sufficient for this calculation. Similar calculations for other configurations may indicate insufficient accuracies also for other data. Among others, Dr. Bobkov stressed the need for more accurate U-234 (n,3n) data. Although Patrick's calculation was made with one group only, it was considered important and similar calculations should be encouraged, possibly with more groups, and for other reactor types.

4. H. Derrien intercompared the average resonance parameters for Am-241 as assumed in Cadarache, Bologna, Harwell and Karlsruhe. Similarly, the Pu-242 parameters assumed at Minsk and Karlsruhe were compared. It was concluded that the knowledge of level densities and in particular their variation over large energy ranges presents a problem, and better theories are required.

Mr. Fröhner emphasized the importance of more accurate knowledge of the average level densities and their dependence over large energy ranges. A specialists meeting on this topic seems to be desirable.

5. N. Kocherov presented a compilation of integral actinide cross-section measurements in facilities of which the spectrum was sufficiently well described, such that these measurements can be used as bench-mark tests for the actinides evaluations. Participants were encouraged to perform corresponding calculations to test their evaluations. The fact that for each facility the spectrum is described in a different group structure, will create some technical problems. Another limitation is, that none of these spectra was confirmed by experiment but only by calculation resp. evaluation.

6. H. Condé, as an observer from the Swedish Nuclear Data Committee, presented the report KDK-35 containing a voluminous numerical and graphical Compilation of Actinide Neutron Nuclear Data. This was considered as amost valuable contribution upon which the CRP participants can base future intercomparison work. It was recommended that this Swedish compilation work should possibly continue.

7. A.B. Smith, as an observer from the US, reported about some problems encountered in the field of actinides evaluations in the frame of ENDF/B-5.

He referred in particular to the reports

ANL/NDM-32 by Poenitz et al about U-238;
ANL/NDM-35 by Meadows et al about Th-232;
a paper to be published in Nucl. Sci. Eng. by Poenitz about total neutron cross-sections of heavy nuclei;
ANL/NDM-50 being in press about fission spectra of actinides;
BNL-325 resonance-parameters with a new edition being in print, and being also available on tape.

8. The need for critical intercomparison of different evaluations on the same nuclide was stressed again. Guidelines for the intercomparison were discussed and laid down at the previous CRP Meeting at Aix; see report INDC(NDS)-104. As not all of the evaluations are produced in ENDF/B format, there are some technical difficulties encountered. It was therefore highly appreciated that Mrs. Mattes from the University of Stuttgart joined the CRP with the intention of concentrating on intercomparison, format conversions and related problems.

Summary on the Third Research Coordination Meeting of the Coordinated Research Project (CRP) on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data

Appendix B

Introduction

The third meeting of the participants in the IAEA Coordinated Research Programme (CRP) on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data, was convened by the IAEA Nuclear Data Section on 12-13 June 1980, at IAEA Headquarters, Vienna. The meeting was chaired by A. Lorenz, IAEA Nuclear Data Section.

Main Objectives

The principal objectives of this meeting were to review the status of measurements performed by the participants in this programme, to review and extend the list of proposed half-lives, and to continue the review of the status and accuracy of gamma-ray and alpha emission spectra for the transactinium isotopes.

Conclusions and Results of the Meeting

The meeting reviewed the existing and planned programmes for the measurement and evaluation of transactinium isotope nuclear decay data of each participating research group. In particular, the meeting

- reviewed the decay data requirements defined at the second IAEA meeting on transactinium isotope nuclear data (Cadarache, May 1979), and identified the data for which the accuracy requirement 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 decided to release the new version of this list;
- 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 participants of this CRP agreed on the date of their next meeting: it was proposed to be on 17-18 September 1981 in Vienna, directly preceding the scheduled meeting of the International Nuclear Data Committee.

Extract from: DRAFT

Minutes of the 13th IFRC Meeting

Brussels, Belgium
30 June and 11 July 1980

2. Nuclear, Atomic and Molecular Data for Fusion.

The Council briefly discussed the current activity of the IAEA in the fields of Nuclear, Atomic and Molecular Data for fusion.

In connection with INTOR project the Council invited the Agency to discuss with the Workshop participants the specific A and M data necessary for the project. It recommended also to examine the needs in nuclear data that are important for the processes taking place in the blanket of the device.

The Council felt that all the above mentioned issues could be discussed between the Steering Committee to the INTOR Workshop and the people at the Agency involved in the field of Nuclear, A and M data.

NDS Meetings planned for 1981 - 1983, subject to approval

Nuclear Data Section Meetings

A. Planned for 1981

1. First Meeting of the IFRC Subcommittee on A+M Data for Fusion, IAEA, Vienna, 19–20 January . . . . . Lorenz
2. Specialists' Meeting on Uranium and Plutonium Resonance Parameter Data for Nuclear Reactor Safety, IAEA, Vienna, June . . . . . Schmidt
3. Meeting of the A+M Data Centre Network, IAEA, Vienna, May . . . . . Langley
4. Specialists' Meeting on Nuclear Data for Medical Radioisotope Production, IAEA, Vienna, April . . . . . Okamoto
5. Research Coordination Meeting on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data, Vienna, 17–18 September . . . . . Kocherov/Lemmel
6. Research Coordination Meeting on the Measurement of Transactinium Isotope Nuclear Decay Data, Vienna, 17–18 September . . . . . Lorenz
7. 12th Meeting of the International Nuclear Data Committee, Vienna, 21–25 September . . . . . Schmidt/Lorenz
8. Advisory Group Meeting on Nuclear Data for Radiation Damage and Safety, IAEA, Vienna, October . . . . . Kocherov
9. Sixth Annual Meeting of the Nuclear Reaction Data Centres, IAEA, Vienna, October/November . . . . . Lemmel
10. Research Coordination Meeting on A+M Data Evaluation . . Langley/Katsonis

B. Planned for 1982

1. Training Course on Nuclear Physics for Application . . . Schmidt/Pronyaev
2. Advisory Group Meeting on Nuclear Data for Biomedical Applications . . . . . Okamoto
3. Meeting of the Nuclear Structure and Decay Data Network, Utrecht, May . . . . . Lorenz
4. Specialist's Meeting on the U-235 fast fission cross-section . . . . . Schmidt

5. Meeting of the A+M Data Centre Network, IAEA, Vienna . . Head A+M Unit/Katsonis

6. Research Coordination Meeting on the Intercomparison of Actinide Neutron Nuclear Data Evaluations . . . . . Kocherov

7. Research Coordination Meeting on the Measurement and Evaluation of Transactinium Isotope Nuclear Data . . . . Lorenz

8. Research Coordination Meeting on A+M Data Evaluation . . Head A+M Unit/Katsonis

9. Seventh Annual Meeting of the Nuclear Reaction Data Centres, USSR . . . . . Lemmel

10. Second Meeting of the IFRC Subcommittee on A+M Data for Fusion . . . . . Lorenz

11. Interregional Project Meeting . . . . . Schmidt/Kocherov

C. Foreseen for 1983 (tentative)

1. 13th Meeting of the International Nuclear Data Committee

2. Advisory Group Meeting on Nuclear Data for Fusion

3. Advisory Group Meeting on Basic and Applied Nuclear Level Densities

4. Meeting of the NRDC Network

5. Meeting of the A+M DCN Network

6. CRP Meeting: TND Evaluation

7. CRP Meeting: TND Decay Data

8. CRP Meeting: A+M Evaluation

9. Meeting of IFRC A+M Data Subcommittee

10. Interregional Project Meeting Schmidt

KACHAPAG Status Report

1. Compilation

The master file of the charged particle reaction data compilation contains at present 169 entries with more than 2000 data sets, among these, 25 entries with 150 data sets originated from CAJaD. Moreover, we received 2 further tapes from CAJaD, one corrected and one new tape from NNDC, and one revised tape from NDS containing altogether about 600 data sets with integral charged particle data. These will be implemented during October and November. KACHAPAG itself added 39 entries with about 500 data sets since the last meeting, further ca. 150 data sets are under work. Now, all publications with ICPND from the years 1977 and 1978, which are contained in the Brookhaven bibliography, have been included - except of course those from the area of CAJaD.

Two transtapes have been sent out according to schedule, both containing only new and corrected entries as agreed upon at the last NRDC-meeting.

2. EXFOR

We are very glad that during this year the EXFOR situation was even more relaxed than in the previous period. From the charged particle point of view we see as a new topic only the problem of error-handling, which should be discussed here at the meeting.

3. Printed Version of KASCO

The second volume of the KARLSRUHE SIGMA COMPILATION KASCO, announced at the last meeting, became available in November 1979. In the meantime we are preparing Vols. 3 and 4 with the entries B81 to B110 and B111 to B145, respectively. A total of about 1300 sheets containing about 1750 data sets will be available in these 4 volumes. In addition, a new updated version of the registers will be provided, too. The edition of a volume with A-, C-, D-entries had to be postponed due to difficulties in getting the necessary program changes for the FIZ-conversion program in due time. Other changes - e.g. for handling the variable product nucleus formalism - are performed at present; thus, we hope to have the new volumes available by the end of 1980.

4. Book of Diagrams

We have continued the efforts in designing and preparing the planned "Book of Diagrams". After having tested several types of presentation we intend at the moment to combine a limited number of data sets for reactions of the same type in one plot using a semilogarithmic scale for lower projectile energies Ep, and a double-logarithmic scale for high Ep. In a first step predictions from excitation function systematics will be excluded. It is planned, however, to display cross sections for similar reactions with a wide variety of target nuclei versus the difference of projectile and threshold energy. In this way at least a first guess for excitation functions, which are not available, should become possible.

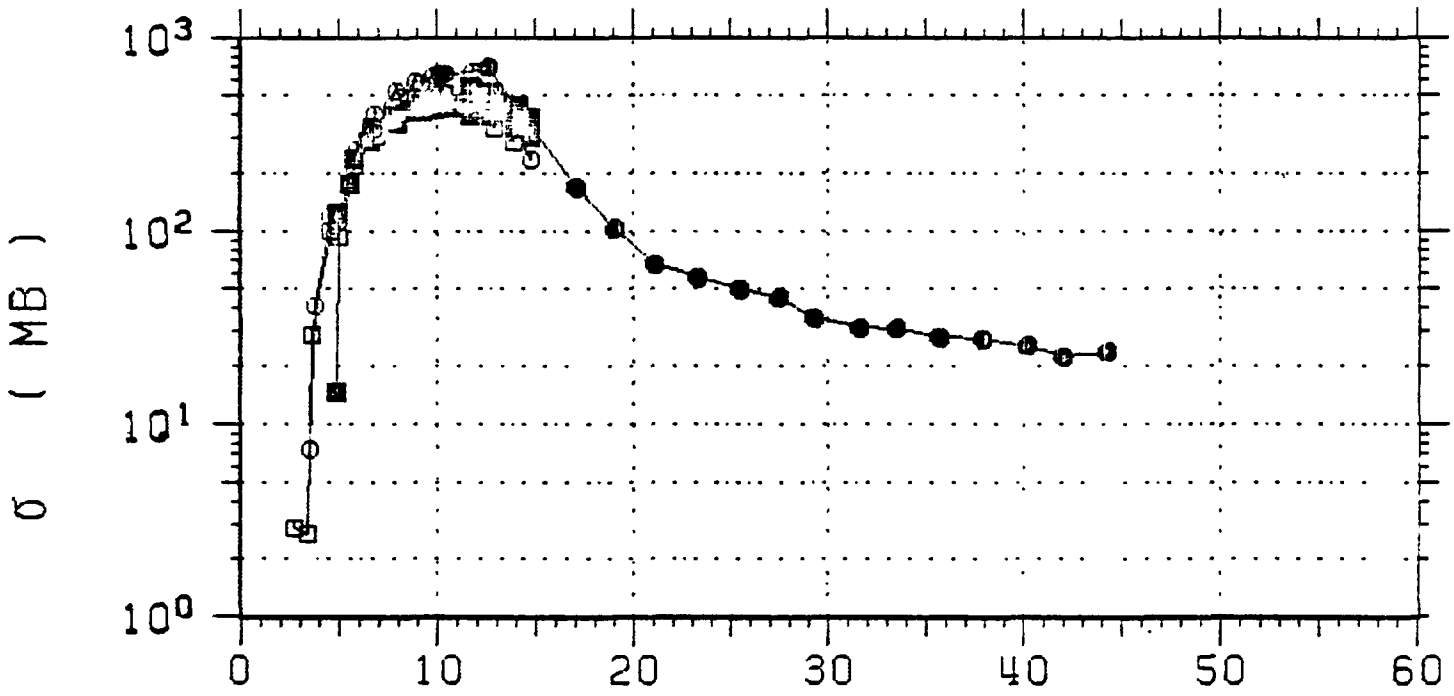
5. Systematics of Excitation Functions

In the course of testing theoretical models for predicting excitation functions we found that the results with Blann's code ALICE were not very promising, especially when comparing different reaction types. The validity of one parameter set proved to be restricted to very few reactions. The uncertainty of calculated data seems to be not much better than what one expects for the former heuristic systematics published in Landolt-Börnstein. At present we are testing a precompound model from Betak and the more microscopic approach of Grover and Gilat in the code GROGI.

6. Karlsruhe Reaction Data Information File KARDIF

It was found very cumbersome to extract numerical data from the EXFOR file for preparing plots, handling data requests or performing comparisons with calculated values. Therefore, we have developed a computational format and prepared the programs for the conversion of KASCO into KARDIF. In this shorthanded format only that additional information from KASCO is retained, which is necessary to classify and describe the data given and which is needed to prepare the registers.

In order to check the completeness of KASCO and to make the book-keeping of compilations easier, we plan to include all ICPND containing references extracted from the available bibliographies.

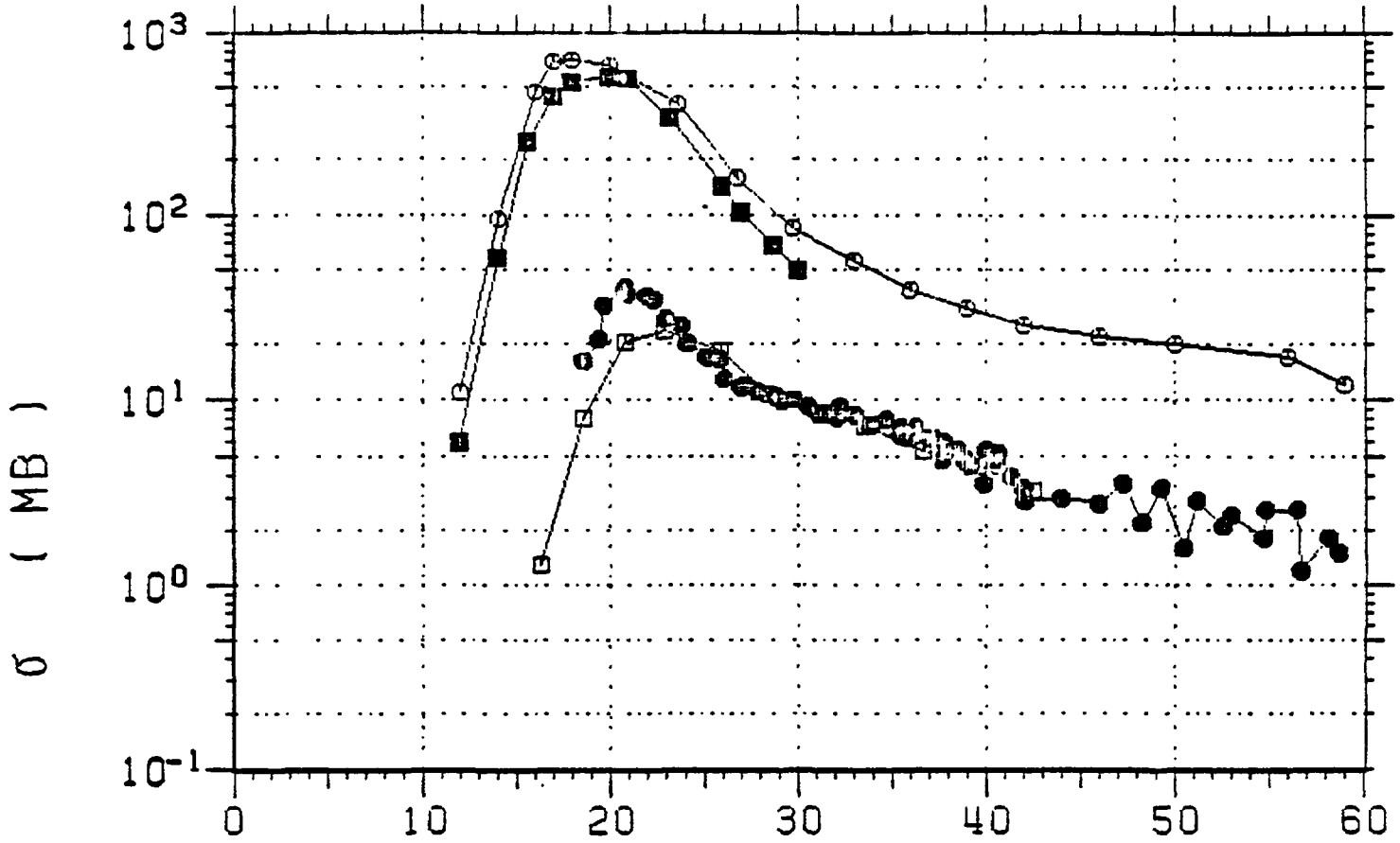


28-NI-61 (P,N) 29-CU-61,,SIG,,,EXP
S.TANAKA (J,JIN,34,2419,72)

28-NI-62 (P,N) 29-CU-62,,SIG,,,EXP
S.TANAKA (J,JIN,34,2419,72)

28-NI-64 (P,N) 29-CU-64,,SIG,,,EXP
S.TANAKA (J,JIN,34,2419,72)

29-CU-65 (P,N) 30-ZN-65,,SIG,,,EXP
E.GADIOLI (J,NC/A,22,547,74)

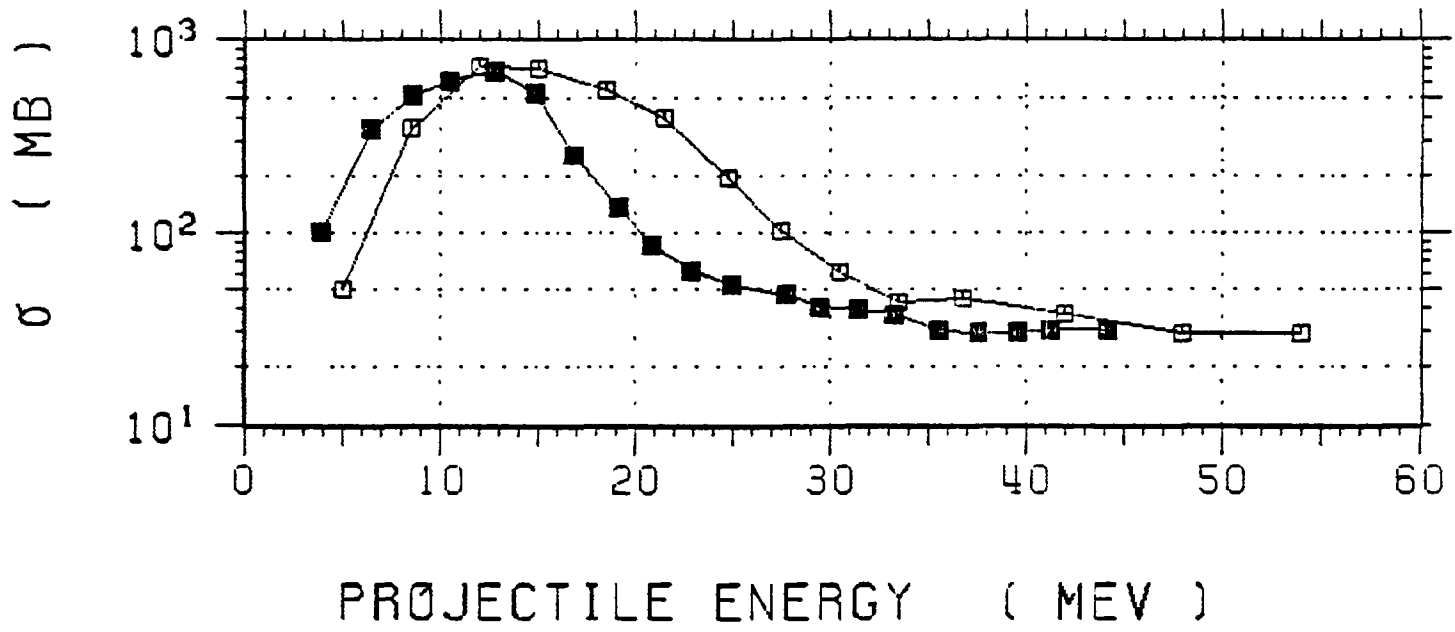


79-AU-197 (A,N) 81-TL-200,,SIG,,,EXP
H.E.KURZ (J,NP/A,168,129,71)

42-MO-92 (A,N) 44-RU-95,,SIG,,,EXP
H.P.GRAF (J,JIN,36,3647,74)

42-MO-94 (A,N) 44-RU-97,,SIG,,,EXP
H.P.GRAF (J,JIN,36,3647,74)

79-AU-197 (A,N) 81-TL-200,,SIG,,,EXP
F.M.LANZAFAME (J,NP/A,142,545,70)


σ (MB)
10³
10²
10¹
0
10
20
30
40
50
60
PROJECTILE ENERGY (MEV)
39-Y-89 (P,N) 40-ZR-89,M+,SIG,,,EXP
G.B.SAHA
(J.PR,144,962,66)
39-Y-89 (P,N) 40-ZR-89,M+,SIG,,,EXP
C.BIRATTARI
(J.NP/A,201,579,73)

APPENDIX D

Dr. H. Behrens

Fach-
informations-
zentrum
Energie Physik · Mathematik GmbH

26.9.8o

FACHINFORMATIONSZENTRUM ENERGIE PHYSIK MATHEMATIK
Karlsruhe, Federal Republic of Germany

Status Report

1. New Data Compilations

The following new issues, which are relevant for nuclear physics, in the series Physics Data were published in the meantime:

3-4 (1979): Datensammlungen in der Physik/Data Compilations in Physics
H. Behrens and G. Ebel
Supplement to No. 3-1, 3-2 and 3-3 containing about 42o further references to tables and compilations.

13-2 (198o): Evaluation of the cross-sections for the reactions ^{19}F (n,2n) ^{18}F, ^{31}P (n,p) ^{31}Si, ^{93}Nb (n,n') ^{93m}Nb and ^{1o3}Rh (n,n') ^{1o3m}Rh

B. Strohmaier, S. Tagesen and H. Vonach
Institut für Radiumforschung und Kernphysik der Österreichischen Akademie der Wissenschaften

In preparation:

17-1 (198o): Compilation of experimental values of internal conversion coefficients and ratios für nuclei with $Z \leq 6o$.
H.H. Hansen
CEC-JRC, Central Bureau for Nuclear Measurements, Geel, Belgien

15-3 (198o): Karlsruhe Charged Particle Reaction Data Compilation

15-4 (1981): Karlsruhe Charged Particle Reaction Data Compilation
H. Münzel, H. Klewe-Nebenius, J. Lange. G. Pfennig, K. Hemberle,
Loosleaf-Collection.

2. Bibliography of Existing Data Compilations:

As mentioned under 1 a new supplement Physics Data 3-4 (1979) has been issued to this worldwide survey of all existing physics data compilations.

3. The Evaluated Nuclear Structure Data File (ENSDF)

In the meantime 6 mass chains have been contributed to the international collaboration by the Fachinformationszentrum Energie Physik Matehmatik. 3 futher mass chains A = 93, 95, 96 are in preparation.

Appendix E

NEA DATA BANK

ACTIVITY REPORT

September 1980

Presented to the 23rd meeting of NEACRP and to the fifth NRDC meeting, September 1980.

I. INTRODUCTION

The period since October 1978 has been a critical one in the conversion work necessary to adapt the working methods taken over from CCDN and CPL to the new computing environment of the Data Bank. The conversion period came officially to an end in November 1979 with the return to the lessors of the IBM 370/125 computer used by CCDN and retained until reprogramming of CCDN's tasks were satisfactorily completed.

The twelve months since September 1979, when the full integrated neutron Data Base was loaded on the PDP 11/70 computer at the Data Bank, may be considered as a test period for full operation of the Data Bank. The 11/70 and its software have in general run very smoothly, so that on the nuclear data side, where the data base and other program development work had been concentrated during the conversion, full attention could be given to data compilation. Very good progress has been made using the new interactive software and the EXFOR-CINDA data base.

On the computer program side, working methods had been transferred from CPL with very little change, and program testing had benefitted from access to the CISI computers, but very little from the specifically data bank environment. As planned, development work is now in progress on a second data base integrating program inventory information, abstracts and corresponding administrative details. This work is expected to improve the quality and timeliness of abstracts and other information, possible including SECU data, which can be supplied automatically to customers.

II. NEUTRON DATA COMPILATION

Scanning and review of the nuclear physics literature shows a steady flow of reports of new measurements. The rate has remained constant at between 200 and 300 new publications per year since 1978. These references, because of multiple publication during the course of analysing experimental data, do not generate such a large number of separate compilations. However, revision of existing compilations in the light of reanalysed data presents a comparable amount of work for Data Bank staff to that involved in preparing a new compilation, and must be carried out in parallel.

The number of new or revised compilations to be transmitted to the other data centres, and stored in the Data Bank's EXFOR Data Base, can be estimated at 250/year. Over the past year, about 245 compilations were made of recent data, including about 70 revisions. Thus, as far as recent work is concerned, compilation is running level with the flow of new work.

NEUDADA-EXFOR Conversion

The European and Japanese data to be taken over from NEUDADA into EXFOR amounted to about 500 works from experiments made before 1970, many of which provide data which have either not been remeasured or, even if the measurement has been repeated, are still considered to be of high quality.

In addition to compilation of data from new measurements, about half a man-year, plus some 15 man-months work by consultants, has been devoted to checking and up-grading into the EXFOR format, the pre-1970 data that existed only in the NEUDADA file of the Data Bank. This effort was in response to pressure from the other data centres, and in the interest of having a single and verified collection at the Data Bank itself. All these recompiled data have been transmitted to the other centres.

New Data Measurements

There is currently a list of 216 identified reports of neutron data measurements awaiting compilation, of which 63 concern unanswered requests to authors for numerical data published only in graphs. Only 59 of the reports are from before 1979, and of these 33 are held up because the author has not released the numerical data, and 15 concern capture gamma spectra, a topic which has in the past been given low priority relative to neutron cross sections.

This situation is now close to our objective of compilation of data within a few months of the data being made available. There exists a "natural" delay between mention of an experiment in an activity report, and publication of results which may be considered as definitive (and appropriate for compilation). We estimate that this "natural" waiting list will be of about 150 works. We can confidently expect that this situation will be achieved by the end of 1980.

Customer Service for Nuclear Data

The number of requests is now running at about 400 per year (plus a further 10 per cent of requests for documents), double the rate received by CCDN before the conversion. The increase lies entirely in requests for evaluated data: on 1979 figures these made up two-thirds of the answers to requests for data (246 requests answered with evaluated data, 126 with experimental data). Request statistics have been kept in the present degree of detail since mid-1978 : as far as can be ascertained, the demand for evaluated data is spread evenly between large and small laboratories, but the new customers are mostly working in smaller laboratories and are asking for evaluated data.

The increase is tentatively put down to the much improved publicity for the files other than EXFOR numerical data available from the Data Bank, and to a greater facility in making selective retrievals by isotope and quantity from the main evaluated data files. While this increase in the number of requests is a very positive development, the number of requests producing very large quantities of data is worrying, especially where these data are to be sent out as listings. Every effort is made to check that the user really does want all the data he has asked for, and in many cases

better specification of the request following a discussion with the user allows the data output to be reduced to a more manageable volume. The basic problem is that EXFOR now contains 45,000 data sets ('sub-works'), and that the more important cross-sections have been the subject of many measurements. Possible solutions to this problem have been discussed and the programme of future work includes study and development of improved, and perhaps condensed, data presentation.

Continued improvements have been made in the presentation of other data: a special 'computation' formal for resonance parameters has been developed to supplement the standard format for point-wise cross-section data, and the CCDN 'improved' printout format for ENDF/B, UKNDL and KEDAK is now again available in conjunction with mixed selected retrievals from files in these formats.

The Data Bank maintains close links with all the major laboratories in Western Europe and Japan, and has collaborated in the provision of "computational format" data for evaluation purposes. There are currently five centres where a temporary secondary storage of "computational" format data is used for evaluation work; JNDG, JAERI; ECN, Netherlands; Bruyère-le-Châtel, France; CNEN, Italy; and KFK, F.R. Germany.

The ENSDF (Nuclear Structure) file and its corresponding selective retrieval and print programs have been implemented on the large IBM computer in the CISI Saclay site. Customers linked to the CISI network may retrieve these data on line; other NEA-DB customers are served by post in the usual way. Development of this service has not had the highest priority, during the conversion period, but retireval programs are now working well and adequate new user documentation is available.

III. COMPUTER PROGRAM TESTING AND CUSTOMER SERVICE

During 1979 a total of 117 programs were tested, some of which had been held over from 1978. In all, 137 programs were received in the course of the year, 97 of them from the United States. A total of 1,080 requests were answered, corresponding to 853 program packages sent out (the balance of requests was for documentation only). There were 1,027 tested programs in the Data Bank's collection at the beginning of 1980, of which 80 were variations on the original program, modified to run on a different computer.

Current rates of work can best be seen from the 3-month figures for the first quarter of 1980 : 40 programs received at the Data Bank, and 26 tested. A total of 239 requests were answered. The major short-term problem is to obtain a better response to requests for programs of origin other than U.S.: at present we have 101 requests for programs outstanding, and corresponding to 189 customer requests. Programs are normally received rapidly from NESC and RSIC, and interesting programs are frequently requested by the Data Bank in advance of individual requests, so that testing can be started as soon as a request is received from the NEA service area.

The dispatch of programs to non-OECD countries does not follow any clear trend : 129 packages were sent out in 1979, as against 160 and 179 in the two previous years. Current activity suggests that about 130 packages will be sent out to these IAEA countries in 1980. On the other hand, the number of visitors from these countries to the Data Bank is increasing.

Appendix E

Publications, SECU and Program Information

Now that the full rate of testing work has been re-established after the move of CPL personnel from Ispra, it was possible in 1979 to revive SECU activities : Newsletter No. 23, issued in November 1979, is an update of the SECU studies on Nuclear Data processing and shielding codes. In the same line, a seminar on experience with RELAP-IV is being organised at the request of CSNI (to be held in June 1980). However, the SECU effort cannot be expanded to its intended level until 1981, when the development programming for the reorganisation of internal working methods in the computer program services has been completed and the necessary manpower can be assigned to it.

Update information is being issued for all European and Japanese program abstracts, and a full new edition of the U.S. abstracts will be distributed during 1980. A major effort has been started to raise the information content and presentation of the European and Japanese abstracts to a level more nearly equivalent to that of the U.S. publication, and in preparation for a full reissue of these abstracts in 1981.

In order to promote interest in the United States and Canada for European and Japanese codes likely to fill a gap in the range of programs of North American origin publicly available, a presentation seminar was held in May 1980 at the National Energy Software Center, Argonne. Programs presented were WIMS, LAMP-B, SYNTH and FEM-BABEL. The Data Bank participated in a similar fashion in the presentation of TRIPOLI-II and KIM at the RSIC seminar on Monte-Carlo methods in April.

IV. USE OF THE PDP-11/70 COMPUTER

The IBM 370/125 was disconnected for return to the lessor at the end of October 1979, and since then the PDP-11/70 has carried the workload which had built up during the conversion period, plus the residual workload from the 370/125 and the further developments since the end of the conversion. Two further video screen terminals have been installed, bringing the total of user terminals up to seven. The terminals are intensively used for neutron data compilation, data base update and search operations (retrievals for customers and for internal use), program development and now for direct data entry (as a substitute for punched cards) and text editing.

Following some hardware and software problems at the end of the conversion period, the months since November 1979 have been remarkable quiet : difficulties in operation have been restricted to occasional saturation of the computer provoked by searches for very large quantities of EXFOR data or excessive use of the line printer, and to some minor problems in tape copying. Intensive use and some minor accidents have shown the need for self-discipline on the part of individual users, and carefully controlled work and work routines in the computer room : the computer is now run as a "closed shop" and work continues on developing and documenting procedures which are 'safe' against the accidental loss or corruption of PDP-11/70 files, data bases or applications programs. Attention is being paid to adequate documentation of the system and applications programs.

Appendix E

NEA Data Bank Program Information System

The Integrated Data Base Management System DBMS-11 for PDP-11/70 has been used to generate a data base to store all information related to the program exchange services of the NEA Data Bank. This data base replaces separate sequential files for the various operations such as administration, testing and despatch used in the past. It eliminates practically all redundant data inherent in simple sequential file systems. Also, by constructing appropriate entry points, most information is immediately accessible for specific queries or updating. Most applications run interactively, which means that data are entered from a terminal and after short waiting times the results are displayed.

The system has been specifically tailored to the following basic applications:

(1) Computer Program Abstracts and KWIC Index. The standard abstract books are directly printed from the Data Base. In addition, selective searches for full or abbreviated abstract descriptions can be made according to various criteria, e.g. by subject category or by combinations of index keywords.

(2) A detailed inventory of all program material (including availability status). This is an extension of the old List of Programs. Some of the shortcomings of the old system are now resolved, e.g. modular systems, may be identified under the general system-name as well as under the names of the individually-maintained and distributed program packages.

(3) Book-keeping of all program requests and movements of program material.

(4) List of names and addresses of all contact persons involved in the exchange of programs and of related information.

In order to improve the portability of programs, it is foreseen to store comments concerning implementation and adaptation to other computer systems or other observations made during the testing which might be useful for the final user. Also information collected in the context of SECU studies can be stored and again easily retrieved by establishing appropriate links in the Data Base.

To gain quick access to statistical data, e.g. number of programs requested by one country or frequency of request for a program, specific entry points have been defined.

Appendix F

National Nuclear Data Center

Progress Report
to the
Fifth Nuclear Reaction Data Centers Meeting

Brookhaven National Laboratory

September 29 - October 3, 1980

I. General

Since our last report to the Nuclear Reaction Data Centers Network, NNDC has assumed responsibility for the compilation of the nuclear structure reference bibliography. In connection with this effort, we have added one new staff member, Dr. S. Ramavataram, who was formerly at the Oak Ridge Nuclear Data Project.

In the past year we have acquired 12" and 36" Versatec printer/plotters, an additional 9-track tape drive, two additional 180-megabyte disc drives and an additional 256 K of memory for our PDP-10 computer, and have added a new wing to house the additional equipment. We have also increased our access capability with additional lines and terminals. Our plotting capability has been enhanced through the acquisition of the DISPLA software package.

II. WRENDA

The biennial review and updating of the United States Nuclear Data Request List is in progress. In an effort to improve the content, requests have been sent to evaluators for review.

III. Bibliographies (CINDA and CPBIB)

The normal CINDA and CPBIB compilation activity has continued. Three special indices were prepared for the Knoxville Conference on Nuclear Cross Section Technology, the Symposium on Neutron Data from 10 - 50 MeV and the 1980 DOE-NDC Status Reports. ENDL has been indexed for CINDA; the parts of ENDF/B which have been released for general distribution will be indexed in the coming year.

The CINDA library is now fully operational at NNDC and the data exchange with NEA-DB has been proceeding smoothly. Eight CINDA transmissions have been sent to NEA-DB since January.

The DBMS system for the CPBIB Library has been completed and is now operational.

A dictionary library system has been designed and implemented. Updates to the dictionaries may be done automatically or interactively. The system also includes a package of user codes for lookup and retrieval.

IV. Data Libraries

In the period from October 1979 through September 1980, 12 neutron data transmission tapes (TRANS 1103 - 1114) were sent out containing 68 new entries and numerous corrected entries. Three charged-particle transmission tapes (C001 - C003) were sent out containing 52 new entries.

An index has been created for the McGowen-Milner charged-particle data file and retrievals may now be done on that file.

V. Evaluated Data

The dosimetry and fission product files for ENDF/B-V have been released and an updated set of processing codes has been distributed.

A data base containing "the most wanted" information on nuclides is under development. For each nuclide the abundance, half-life, mass, spin and parity, modes of decay, primary radiation and energies, fission yields, etc. are combined into one data base. Information has been extracted from the major files of evaluated data that so far include BNL-325 (3rd Edition), Wapstra's mass tables, ENSDF, and ENDF/B-V. Teletype output is provided and various graphic options are being developed.

A CSEWG subcommittee on charged-particle data has been formed under the chairmanship of L. Stewart. The first meeting of this subcommittee on May 14, 1980 included a dozen representatives from HEDL, LASL, LLL, ORNL and the NNDC. This subcommittee will be primarily concerned with evaluated data. General agreement was reached on the need for evaluated data for the fusion reactions, selected data for fission and fusion reactor applications, specific FMIT needs, mono-energetic neutron sources, and (α,n) reactions for fission reactor applications. Also discussed were alternative formats and representations for various types of data (e.g. elastic scattering).

The Hale evaluated charged-particle data library has been received and converted to an ENDF-like format.

VI. Customer Services

The request statistics for July 1, 1979 to June 30, 1980 are attached.

The computation formats for point-wise data and for resonance parameters have been implemented and are now in use. A format for fission-product yields has been developed in conjunction with NEA-DB but has not yet been implemented.

VII. Publications

The Proceedings of the Symposium on Neutron Cross Sections from 10 - 50 MeV is due for publication in October.

BNL-325, Vol. I, Part 1 (Z = 1 - 60) is completed and has been sent out for review. It is expected to go to the publisher by the end of the year. Work has begun on Part 2.

The 1980 edition of BNL-NCS-50640 (Charged-Particle Bibliography) has just been published and will be an archival edition.

The Minutes of the Panel on Reference Nuclear Data is due for publication in October.

VIII. Future Meetings

Panel on Nuclear Reference Data, BNL, Upton, N. Y. October 27 - 28, 1980.

Nu(bar) Symposium, Washington, D. C., November 20 - 21, 1980.

Fundamental Constants, N.B.S., Gaithersburg, Va., June 8 - 12, 1981.

REQUEST STATISTICS

TABLE I

1 JULY 1978 TO 30 JUNE 1980

AREA 1

NUMBER OF REQUESTS FOR DATA

Country Origin	Experimental Neutron and Charged Particle Data	Evaluated Neutron and Charged Particle Data	Bibliographic Neutron and Charged Particle Information	All Programs	All Documents	Total	Total 1/1/78 6/30/79
USA	107	168	20	24	267	586	1291
Canada	2	5	0	0	11	18	34
Foreign	-	-	-	7	150	157	306
Total	109	173	20	31	428	761	1591

REQUEST STATISTICS

TABLE II

1 JULY 1979 TO 30 JUNE 1980

AREA 1

NUMBER OF REQUESTS FOT DATA

Originating Organization	Experimental Neutron and Charge Particle Data	Evaluated Neutron and Charge Particle Data	Bibliographic Neutron and Charge Particle Information	All Programs	All Documents	Total	Total 1/1/78 6/30/79
Government Labs.(US)	51	62	8	8	89	218	568
Universities (US)	27	33	8	6	83	157	271
Industry (US)	29	73	4	10	95	211	412
Foreign	2*	5*	0*	7**	161**	175	340
Total	109	173	20	31	428	761	1591

*Canada Only

**All foreign request including Canada

Appendix F

REQUEST STATISTICS

TABLE III

1 JULY 1979 TO 30 JUNE 1980

AREA 1

NUMBER OF REQUESTS FOR DATA

Request Disposition	Experimental Neutron and Charge Particle Data	Evaluated Neutron and Charged Particle Data	Bibliographic Neutron and Charged Particle Information	All Programs	All Documents	Total	Total 1/1/78 6/30/79
Fulfilled	109	173	20	31	428	761	1591
Partially Fulfilled	0	0	0	0	0	0	0
Unfulfilled	0	0	0	0	0	0	0
Standing	0	0	0	0	0	0	0
Total	109	173	20	31	428	761	1591

REQUEST STATISTICS

TABLE IV

1 JAN. 1979 TO 31 DEC. 1979

AREA 1

EXPERIMENTAL NEUTRON DATA

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	OTHERS	TOTAL REQUEST
1-H	6	1	0	0	0	23	1	0	31
2-He	0	0	0	0	0	6	5	0	11
3-Li	4	6	5	8	21	27	25	5	101
4-Be	0	0	0	1	0	5	8	0	14
5-B	0	0	0	4	0	15	12	3	34
6-C	7	0	1	0	1	14	4	0	27
7-N	0	0	0	0	0	9	11	0	20
8-O	1	0	0	0	0	14	7	0	22
9-F	0	0	1	0	0	10	2	0	13
10-Ne	0	0	0	0	0	2	3	0	5
11-Na	0	0	0	0	1	23	4	0	28
12-Mg	0	0	0	0	0	31	16	0	47
13-Al	1	0	0	0	1	15	24	0	41
14-Si	2	0	0	0	0	28	14	0	44
15-P	0	0	0	0	0	10	5	0	15
16-S	1	0	0	0	0	27	11	0	39
17-Cl	0	0	0	0	0	21	4	0	25
18-Ar	0	0	0	0	0	9	5	0	14
19-K	0	0	0	0	0	20	19	0	39
20-Ca	1	0	0	0	0	34	12	0	47
21-Sc	0	0	0	0	0	13	6	0	19
22-Ti	1	1	2	0	0	41	37	0	82
23-V	0	0	1	0	0	22	11	0	34
24-Cr	1	0	0	0	0	40	26	0	67
25-Mn	0	0	0	0	0	24	6	0	30
26-Fe	5	3	4	1	32	55	65	3	168
27-Co	0	0	1	0	0	24	8	0	33
28-Ni	2	4	2	0	0	52	53	0	113

1979 (cont.)

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	OTHERS	TOTAL REQUEST
29-Cu	1	0	0	0	0	48	31	0	80
30-Zn	0	0	3	0	0	42	19	0	64
31-Ga	0	0	0	0	0	18	6	0	24
32-Ge	1	2	5	1	0	30	11	0	50
33-As	0	0	1	0	0	9	5	0	15
34-Se	0	0	7	0	0	43	11	0	61
35-Br	0	0	0	0	0	17	5	0	22
36-Kr	2	2	0	3	30	52	13	2	104
37-Rb	1	0	0	0	0	23	8	0	32
38-Sr	0	0	4	0	0	30	7	0	41
39-Y	0	0	0	0	0	18	4	0	22
40-Zr	0	0	2	0	0	37	25	0	64
41-Nb	0	0	1	0	0	13	8	0	22
42-Mo	0	0	0	0	0	49	15	0	64
43-Tc	0	0	0	0	0	12	5	0	17
44-Ru	0	0	0	0	0	37	12	0	49
45-Rh	0	0	2	0	0	14	13	0	29
46-Pd	0	0	0	0	0	33	16	0	49
47-Ag	3	3	4	10	0	49	15	1	85
48-Cd	0	0	7	0	19	53	22	0	101
49-In	0	0	3	0	0	35	7	0	45
50-Sn	0	0	13	0	70	72	23	0	178
51-Sb	0	0	0	0	0	30	2	0	32
52-Te	0	0	0	0	0	47	12	0	59
53-I	0	0	0	0	0	22	5	0	27
54-Xe	0	0	0	0	0	37	6	0	43
55-Cs	0	0	0	0	0	16	8	0	24
56-Ba	0	0	8	0	0	50	4	0	62
57-La	0	0	0	0	0	13	4	0	17
58-Ce	3	3	2	6	4	46	12	8	84
59-Pr	0	0	0	0	0	22	4	0	26
60-Nd	0	0	0	0	0	40	9	0	49

1979 (cont.)

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & CHARGED NEUTRON PARTICLE EMISSION (NG)	EMISSION (NX)	FISSION (NF)	OTHER	TOTAL REQUEST
61-Pm	0	0	0	0	0	20	0	0	0	20
62-Sm	0	0	0	0	0	54	8	0	0	62
63-Eu	0	0	0	0	0	19	3	0	0	22
64-Gd	0	0	0	0	0	35	6	0	0	41
65-Tb	0	0	0	0	0	8	3	0	0	11
66-Dy	0	0	0	0	0	33	7	0	0	40
67-Ho	0	0	0	0	0	7	2	0	0	9
68-Er	0	0	2	0	0	35	9	0	0	46
69-Tm	0	0	0	0	0	11	0	0	0	11
70-Yb	0	0	1	0	1	35	4	0	0	41
71-Lu	0	0	2	0	0	16	2	0	0	20
72-Hf	0	0	2	0	0	21	3	0	0	26
73-Ta	2	0	2	0	0	37	2	0	0	43
74-W	0	0	5	0	0	38	13	0	0	56
75-Re	0	0	0	0	0	19	4	0	0	23
76-Os	0	0	1	0	0	33	8	0	0	42
77-Ir	0	0	1	0	0	15	3	0	0	19
78-Pt	1	0	1	1	0	25	8	0	0	36
79-Au	2	0	1	0	0	28	5	0	0	36
80-Hg	0	0	1	0	0	32	12	0	0	45
81-Te	0	0	4	0	0	17	7	0	0	28
82-Pb	5	3	8	0	0	8	14	0	0	38
83-Bi	2	1	1	1	6	18	7	0	2	38
86-Rn	0	0	0	0	0	2	0	0	0	2
88-Ra	0	0	0	0	0	9	0	1	0	10
89-Ac	0	0	0	0	0	2	0	0	0	2
90-Th	2	0	0	0	0	18	0	7	0	27
91-Pa	0	0	0	0	0	6	0	0	0	6
92-U-000	0	0	0	0	0	2	0	0	0	2
92-U-230	0	0	0	0	0	0	0	0	0	0
92-U-231	0	0	0	0	0	0	0	0	0	0
92-U-232	0	0	0	0	0	3	0	0	0	3
92-U-233	3	1	0	1	0	6	0	4	1	16

1979 (cont.)

ELEMENT	TOTAL (TOT)	ELAS. SCAT. (EL)	INEL. SCAT. (INL)	OTHER SCAT. (C/S)	RES. PAR. (RES)	GAMMA & NEUTRON EMISSION (NG)	CHARGED PARTICLE EMISSION (NX)	FISSION (NF)	OTHERS	TOTAL REQUEST
92-U-234	0	0	0	0	0	2	0	1	0	3
92-U-235	2	1	1	2	0	13	1	36	0	56
92-U-236	0	0	0	0	0	4	0	1	0	5
92-U-237	0	0	0	0	0	0	0	7	0	7
92-U-238	2	0	0	2	0	22	3	14	1	44
92-U-oxi	0	0	0	0	0	0	0	1	0	1
92-U-239	1	0	0	0	0	0	0	2	0	3
93-Np	0	0	0	0	0	13	0	6	0	19
94-Pu-000	0	0	0	0	0	0	0	0	0	0
94-Pu-238	0	0	0	0	0	4	0	1	0	5
94-Pu-239	2	0	0	0	0	5	4	13	0	24
94-Pu-240	0	0	0	0	0	10	0	2	0	12
94-Pu-241	0	0	0	0	0	6	0	6	0	12
94-Pu-242	0	0	0	0	0	9	0	1	0	10
94-Pu-243	0	0	0	0	0	4	0	1	0	5
94-Pu-244	0	0	0	0	0	2	0	1	0	3
94-Pu-245	0	0	0	0	0	2	0	0	0	2
95-Am	0	0	0	0	0	27	0	6	0	33
96-Cm	0	0	0	0	0	9	0	0	0	9
97-Bk	0	0	0	0	0	2	0	0	0	2
98-Cf	0	0	0	0	0	15	0	3	0	18
99-Es	0	0	0	0	0	4	0	0	0	4
100-Fm	0	0	0	0	0	0	0	0	0	0
TOTAL	67	31	112	41	186	2436	889	114	26	3 902

APPENDIX G

Draft Objectives of the Proposed NEACRP/NEANDC Working Group Meeting on European Evaluation Procedures

(Nov. 1980)

1. Participation in the meeting will include a few European representatives of NEACRP and NEANDC, with also a representative from the NEA Data Bank management committee.

NEACRP	NEANDC	NEA-DB Management
Campbell (U.K.)	J.L. Rowlands	Patrick (Chairman, U.K.)
	E. Lynn/M. Sowerby	
Bouchard (France)	E. Fort	
Kusters (F.R.G.)	B. Goel/Froehner	

2. The prinicpal objective of the meeting is to investigate possibilities for greater uniformity and standardization among the western European neutron data evaluation work. This may cover:

   a. discussion of a common evaluated data format--there may be a role for the Data Bank in preparing and converting data into such a format,

   b. some agreement on common procedures in data evaluation; representation, and quotation of uncertainties, common standards, etc.,

   c. setting up a mechanism (working group, etc.) for the coordination and review of new evaluations,

   d. establishment of a European Data File.

APPLICATION OF A DBMS AT NEA DATA BANK
PROBLEMS AND EXPERIENCE WITH A LARGE DATA BASE ON A SMALL COMPUTER

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PART I THE BACKGROUND TO THE DATA BASE PROJECT

Data Base Management Systems (DBMS) are a development which would appear to be of interest to Data-Banks of any kind, but have been surprisingly slow to catch on with scientific users. Their full acceptance seems inevitable in the long term, as one aspect of the general trend towards freeing user programs and data from direct dependence on the users' hardware and operating system characteristics. Meanwhile, there are several papers at this conference from DBMS developers, but only about four by users of DBMS packages. It is interesting to ask why.

This paper tells of the NEA Data Bank's experience of DBMS use in the context of a change in computer manufacturer with the consequent need to rewrite all its data handling software.

The OECD Nuclear Energy Agency Data Bank

The Data Bank was founded in 1978, when it assumed the functions of two previous NEA information centres: the Neutron Data Compilation Centre (CCDN), housed in the present Data Bank building at Saclay, and the Computer Program Library then located at Ispra in Italy.

Sixteen European countries and Japan finance the Data Bank, while the United States and Canada contribute to a common pool of technological information through similar centres, as do the USSR and other IAEA member countries. Its 1980 complement is 14 professional and 13 supporting staff. It has access to the very large computer park at CEN Saclay, used for all heavy compute jobs, and its own PDP 11/70 satellite computer which provides remote access to the Saclay computers and carries the data base, computer program files and interactive terminal traffic needed for the Data Bank's operations.

Neutron and other nuclear data at the Data Bank: Neutron and other nuclear data, with bibliographic information about work in this field, are essential elements underlying the design, operation and control of nuclear installations. Their compilation and exchange with other centres provide access to a worldwide data resource from which needs may be satisfied by a single request to the Data Bank. The integrated data base discussed in this paper contains numerical data ('EXFOR') and linked literature references ('CINDA') for some 30,000 experiments in neutron physics. From these data are prepared the evaluated data files which are used throughout the world as the basis for nuclear reactor calculations. Fig. 1 shows the formal CODASYL "schema" (logical structure diagram) of the data base.

The Choice of Hardware and Software for Data Storage

It was evident that the IBM 370/125 computer previously used by CCDN had to be changed in 1978 with the formation of the Data Bank, when the workload of the in-house computer was expected to double.

The CCDN's data handling software was written in PL/1, but after some 5 - 10 years use was showing many signs of old age and excessive patching. A move away from IBM would deprive us of PL/1: none of the CCDN staff wished to take the step backward to FORTRAN, and the best available small-computer compromise appeared to be the use of COBOL for data handling with a DBMS. Most of the programs in a data centre bear a much stronger relationship to business programming (manipulation of text and figures with very little actual calculation) than they do to the scientific calculations for which FORTRAN may still be considered appropriate.

A DEC PDP 11/70 computer was chosen for its relatively high throughput and disc I/O capacity and the well-proven timesharing capabilities of the 11 series computers and their operating systems. Both TOTAL and the manufacturers' DBMS-11 CODASYL data base management packages could be implemented on the 11/70, while TOTAL and IDMS were available for the outgoing 370/125. Choosing either TOTAL or a CODASYL package would allow development work to be started on the existing computer, and data base programs transferred with few changes to the 11/70 when it was installed. DBMS-11 was chosen as more

directly able to represent the complex relationships between the neutron cross section data and the physical, bibliographic and administrative data elements describing and identifying the data tables.

Advance Reasons for deciding on DBMS Use

In order to reduce programming effort in transferring the CCDN data handling operations to the new Data Bank computer environment it seemed best to use a DBMS package for all the generalised data handling functions underlying our content-dependent applications programs. This would save time at the beginning of development work and transfer responsibility for maintenance of all these functions to the software vendor : the price seemed very reasonable in relation to the cost of writing similar software ourselves, and afterwards maintaining it.

Even with batch updating, it was felt that frequent updating of direct access disc files required good update logging procedures, with effective recovery for damaged files. This facility is offered only with DBMS and some advanced file management systems, and is not easy to program oneself where on-line updating is to be permitted. DBMS packages offer many further conveniences, such as separation from the programs of file record format descriptions, and a representation of logical relationships between data which has much more intuitive appeal than comparisons between serial files as a means of identifying these relationships.

The OECD/NEA Study on Generalised Data Management Systems and Scientific Information

In parallel with planning work on computer use in the Data Bank, an international specialist study was carried out to evaluate experience of the use of DBMS with scientific data. The study report was published by NEA in 1978. The study group identified criteria under which DBMS use should be considered: the NEA Data Bank project satisfied all of these. One such indicator was the intention to set up a second and subsequent data bases : our plans to set up other data bases in cooperation with other divisions of NEA made this an important point.

PART II EXPERIENCE ON THE DATA BASE PROJECT

Planning and Preliminary Work

The savings to be made by transferring the work of two data centres to NEA Data Bank and rationalising the pattern of computer use justified generous provision for specialist consultants to help during the planning of the data base and the initial running-in period of the 11/70. The different consultants provided no miracle solutions, but some essential ideas as to how to resolve difficulties and above all an extra informed voice in all major discussions.

Reanalysis of existing handling operations for neutron data had started in 1976 and yielded a relatively complicated IDMS logical schema (OECD/NEA study, p. 244). In parallel, performance benchmarks comparing the IBM 370/125 with IDMS and the PDP 11/70 with DBMS-11 were run on sections of the proposed schema in order to estimate the feasibility of mounting a data base of some 150 million characters on such small computers. It was established that in a 3000 record "hoes, rakes and shovels" data base (used for IDMS installation testing) basic loading operations ran about ten times faster on the PDP 11/70 than on the IBM 370/125.

Loading time was expected to be the limiting factor, and test batches of several thousand records were loaded on to appropriate sections of a partial schema (see fig. 1 for the full current DBMS-11 schema), yielding estimates which remained surprisingly constant over three years and two different computers :

1976	IBM 370/125	24 hrs CINDA	+	30 hrs EXFOR
1978	PDP 11/70	24 hrs CINDA	+	60 hrs EXFOR
1979	PDP 11/70	final load time		90 hrs overall

The irony of this is that we had also measured loading rates ten times faster for the PDP than for the IBM machine. Evidently the earlier estimate was a poor one : it is dangerous to extrapolate performance estimates from a simple small data base to a larger complex one. Where performance is critical, estimations should be based on the full schema and data samples as large as possible.

Constructing the Full Data Base

About eighteen months were available to finalise the schema, write the data base loading, update and retrieval programs, revalidate and load the data. Directly involved in data base programming as from April 1978 were the systems programmer and three programmers, with a project coordinator part-time and a consultant data base specialist for six months.

Refining the "schema": It soon became clear that the data base schema in the form originally planned in 1976 could not possibly be programmed in the time available, and the spring of 1978 was devoted to reanalysing the schema. Much time was spent in group discussions with the physicists, in an effort to redefine requirements so as to allow it to be simplified to its present form (fig. 1).

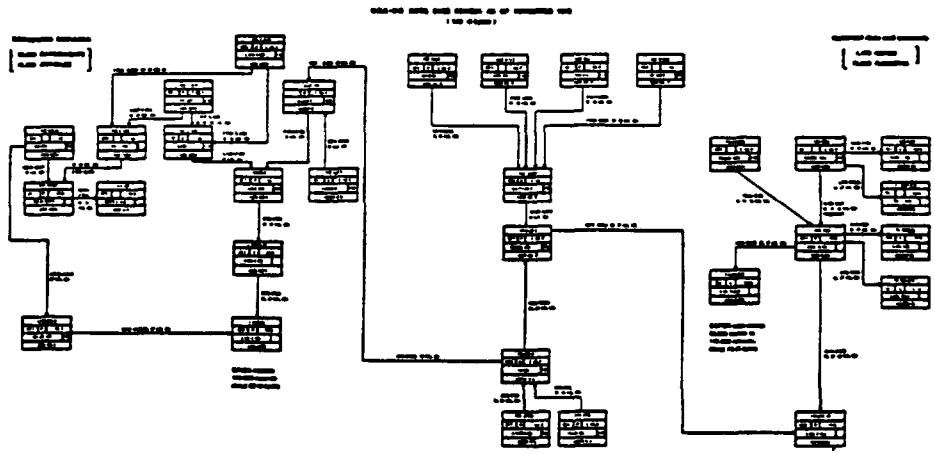


Fig. 1: CODASYL Schema for CINDA Bibliography and EXFOR Numerical Data Tables

The logical content of the schema was in fact reduced by about 30% (sets and record types). It seems very important that the schema, which affects all users, should be agreed on collectively, since major modifications to any explicitly structured data base (as compared to relational data bases) will impose corresponding reprogramming and probably a full reload. In this case the major simplifications were proposed by the physicist users.

The representation of logical structure: The network structures of a CODASYL DBMS appear to the users as a rather natural way of depicting the interlocking and overlapping logical hierarchies which characterise NEA-DB data files. The major compromise in logical structure to be seen in fig. 1 is the artificial split of EXFOR numerical data at the two hierarchical levels of 'work' and 'subwork' into several record types : X4WORK, COMBIB, COMDAT and X4SUBW, SUBDAT, SUBBIB and TABDAT. Data at each of these levels could logically have been entered in a single record type with a very wide variation in record lengths. A general peculiarity of CODASYL DBMS is that many-to-many correspondences can only be expressed by creating 'junction records' with as many occurrences as there are logical links in the correspondance. SAQSUB and ISOQNT are examples. ISOQNT exists solely for this purpose (see fig. 1).

Ease of programming: The Data Manipulation language, embedded in COBOL programs, represents a real increase in convenience as compared to normal file handling. All our programming experience so far had been in PL/1 and FORTRAN, but use of COBOL, seen initially as a serious step backwards, was found to be acceptable for this type of work despite its verbosity. The biggest disadvantage of COBOL for the NEA application was its lack of a floating point data type corresponding to the FORTRAN E-format in which numerical data is compiled. Structured programming conventions can be followed more naturally in COBOL than in FORTRAN. Interactive working from terminals on the PDP 11/70 speeded programming work considerably as compared to batch working on the 370/125.

Debugging: The "DBQ" interpreter for DML proved very useful for odd jobs in the loading phase of the NEA data base on the 11/70, and even more valuable for debugging the update and retrieval programs. Its potential for 'patching' a degraded data base seems clear: whether this is good practice in regular operation is of course another question. In this connection there is an important difference between program development using ordinary files, and work on an integrated data base. An ordinary file containing bad data can simply be overwritten when it is no longer wanted; bad records must be selectively deleted from the data base unless the whole 'area' is to be reinitialised.

Moreover, all logical relationships between different sections of the data base are expressed by pointers, and it is easy to forget that an 'area' logically linked to another cannot be independently reinitialised without leaving broken pointer chains in the second area. Another programmer working in that area may not realise that anything has changed until he finds execution errors he cannot explain. Just such an error cost several weeks' work before it was explained.

Preparation of data for loading: Any transfer of data from one program system to another will show up formal and logical errors in the data. A data base in which data is exposed to several different "logical views" is likely to show up a greater number of errors. Moreover, in a CODASYL data base the links between data items normally expressed implicitly by shared redundant data in a file-based system are expressed explicitly by data base pointers corresponding to set linkages. This implicit information must be extracted from the input files used to build the data base, completed by hand, and rewritten in a form convenient for extracting the structural information needed by the data base loading programs.

All the CINDA and EXFOR validation programs were rewritten (CINDA validation as part of the data base update programs, EXFOR data validation as an 8 man-month external project). Apart from this, cleaning and preparing the data for loading absorbed half the overall effort assigned to the data base project. Adequate time must be allowed to repeat the "final" data base load in case errors are found in either the data or the data base.

System software errors: Apart from irritating minor errors, the software used on the PDP 11/70 (DBMS-11 and a COBOL compiler) showed two major faults :

- errors in handling variable length records large enough to overflow the data base page'
- frequent system breakdown when DBMS-11 updates were run in parallel with other work.

These were resolved by the manufacturers, but cost perhaps three man-months' work at a critical time. The danger with frequent system software errors is that they may blind users to their own mistakes: this happened in the case discussed above. A year after the final data base load, breakdowns have become very rare, and overall system performance is good.

Update logging: The "journalling" (transaction logging) procedures provided by DBMS-11 are not in fact used on update. This was partly due to mistrust of automatic system procedures following the system errors discussed above, but more directly because they make heavy demands on machine facilities, and slow down the otherwise very efficient batch update process. This particular data base can be more quickly reconstructed from the usual father or grandfather disc dumps plus later update batches.

PART III PERSONAL REACTIONS TO THE DBMS

Programmers at the Data Bank have very much appreciated the high level approach to data handling provided by the two CODASYL systems we have used (and of course by other DBMS). The performance of our large nuclear physics data base (140 Mbytes of information spread over 250 Mb of disc space) on the PDP 11/70 is very adequate provided that data requests are selective and limited to reasonable quantities (say, less than 100,000 data points).

The DBMS has saved a fair amount of programming time, but does not relieve the programmers or the physicists of any of their responsibility for systems analysis. Introducing a CODASYL DBMS, with an overall schema to be defined before programming work can start, forces an analysis of all the activities to be covered by the data base, and of their interrelations; previously the major files were considered in isolation, and linked only later on an ad hoc basis.

The basic conventions of CODASYL data structuring are easily grasped by any scientist, so that all users can join in discussion of the programming objectives and the schema itself without experience of data base programming. We have found more resistance among programmers than users to detailed discussion of this or later projects: many programmers prefer to work alone, but this is dangerous in most applications projects, and particularly so for a data base.

Staff changes are relatively frequent, and in such a complex project it is essential that all pregrams are clear and well documented. We have been only partially successful in enforcing structured programming conventions and full documentation. Plans to develop a high degree of collective responsibility by having all programmers work on overlapping sections of the data base foundered on lack of time, partly due to systems software troubles during the development period. Likewise, regular planning meetings were held and a rolling work schedule maintained during the eighteen-month development period: nobody enjoys such regimentation and it is hard in a scientific environment to maintain it when the immediate need for it has gone.

PART IV CONCLUSIONS

So many changes were made in setting up the Data Bank that it is impossible to say whether the single change of introducing a DBMS would have increased programming efficiency. What we can say is that the data base project has proved successful in the new environment, and that overall throughput of compiled neutron data has much increased and is of better quality.

APPENDIX I.

Actions arising from the 11th INDC Meeting

(Vienna, 16 - 20 June 1980)

No	Session	Person	Action
1	III.B.	J.J. Schmidt	Policy recommendations made by specialist technical meetings should be sent to INDC participants for comments before IAEA takes action on them
2	IV.C.	J.J.Schmidt	Prepare evaluation of after-effect and impact of 1980 Trieste course and distribute to INDC participants
3	V.A.	J.J. Schmidt	Include in the introduction of the next WRENDA edition a note indicating that the accuracies appearing in the list correspond to 1-σ error except where noted otherwise
4	V.A.	All members	Ensure that national WRENDA requests are properly reviewed
5	V.A.	J.J. Schmidt	Distribute Standards & Discrepancies Subcommittees reports to requesters
6	V.A.	S. Yiftah	Include summaries of two CRP June 1980 meetings in INDC proceedings
7	VIII.A.	All Subcommittees Chairmen	Provide final Subcommittee Reports for official minutes within 30 days of 11-th INDC meeting
8	VIII.B.	A. Smith	Approach Macklin to ensure that he officially informs appropriate people or publishes his renormalised Th-232 capture data

9	VIII.B.	Frohner	Include specific references about factor-of-two discrepancy for Am-241 fission resonance integral
10	VIII.B.	J.J. Schmidt	Clarify whether requests in WRENDA 79/80 for Np-237 (n,2n) are for total (n,2n), for part leading to Np-276m or for part leading to Pu-236 (see INDC(UK)-33/G, p. 43)
11	VIII.C.	All members	Inform WRENDA contributors: standard accuracy requirements should be stated with 1-σ error. State explicitly if otherwise
12	VIII.C.	All members	Inform WRENDA contributors: state explicitly in comments section if average value of cross section in a typical spectrum is required
13	VIII.C.	All members	Inform WRENDA contributors: state explicitly energy resolution requirements or covariance assumptions, if any
14	VIII.C.	J.J. Schmidt	Review, in consultation with Safeguards experts, requirements and uses of nuclear data in analysis of safeguards measurements and issue report
15	VIII.C.	All participants	Comment and up-date list of sources suitable for radiation damage measurements given in INDC/P(80)-14
16	VIII.C.	All participants	Propose to NDS appropriate topics and speakers for meetings for nuclear data requirements for radiation damage predictions and selected safety-related topics
17	VIII.C.	All participants	Encourage sensitivity studies needed to assess nucleardata requirements for topics of previous action

18	VIII.C.	J.J. Schmidt	Ensure that adopted actinide evaluations arising from TND evaluations CRP are complete, include uncertainty estimates and are of attested quality
19	VIII.C.	J.J. Schmidt	Ensure that choice of data items for study within CRP on Actinide Decay Data relates to well Defined justified and documented needs. Recommended values should include uncertainties and be supported by appropriate documentation
20	VIII.C.	J.J. Schmidt	Ensure that evaluation documentation and intercomparisons are available well in advance of CRP Meetings
21	VIII.C.	J.J. Schmidt	Continue important work of the two TND CRP's on Evaluations and Decay Data and inform INDC members on developments
22	VIII.D	J.J. Schmidt	Ensure that members of subcommittee B are informed about the outcome of INTOR workshops as far as they are relevant to nuclear data and material choice
23	VIII.D.	J.J. Schmidt	Put evaluated file formats for double differential data on the agenda of the next NRDC meeting
24	VIII.E.	J.J. Schmidt	Inform INDC members outcome of Interregional Project Implementation discussions
25	VIII.E.	A. Smith	Dispatch new version of Report on NDS program for comments members of subcommittee, chairman,scientific secretary and executive secretary
26	X.A.	S. Yiftah	Dispatch corrected version of Actions for comments of INDC participants
27	X.C.	J.J. Schmidt	Inform INDC members final date of next INDC meeting as soon as possible

NNDC CHARGED-PARTICLE "BARN" BOOK

1.0 OBJECTIVE

The current objective of the planned Charged-Particle "Barn" Book is to provide in a convenient graphical format the integral data of interest to the fusion and biomedical communities. The data to be included would be excitation functions for the light-ion neutron source reactions, other reactions of interest to fusion, and other reactions of interest to the biomedical field.

2.0 LIMITS

Since the Karlsruhe Charged Particle Data Group has plans to produce a graphical publication of integral charged-particle nuclear data for targets with A approximately equal to 20 and greater, the NNDC publication would, in general, be limited to targets with A less than 20, with the possible exception of some selected reactions of interest to the above communities. The NNDC publication would probably be limited to incident particles between protons and alphas (except for exotic fuels of interest to the fusion community), to only the reactions of interest to the two communities, and to energy ranges from about 20MeV for neutron-source reactions to about 200 MeV for alpha-induced reactions of interest to the biomedical field.

3.0 SOURCES OF DATA

3.1 Experimental Data

The primary source of experimental data will be from EXFOR. Through the activities of KACHAPAG, CAJAD, and the NNDC, a significant portion of the data relevant to biomedical applications has already been entered into EXFOR. Additional work is required to complete the files for the biomedical data. CAJAD, NDS, and the NNDC have also been compiling neutron-source reaction data. The file is almost complete for the T+D reaction.

Other data files such as the McGowan data and the data compiled by Howerton in the ECSIL format will be scanned and appropriate data sets converted to the EXFOR format.

3.2 Evaluated Data

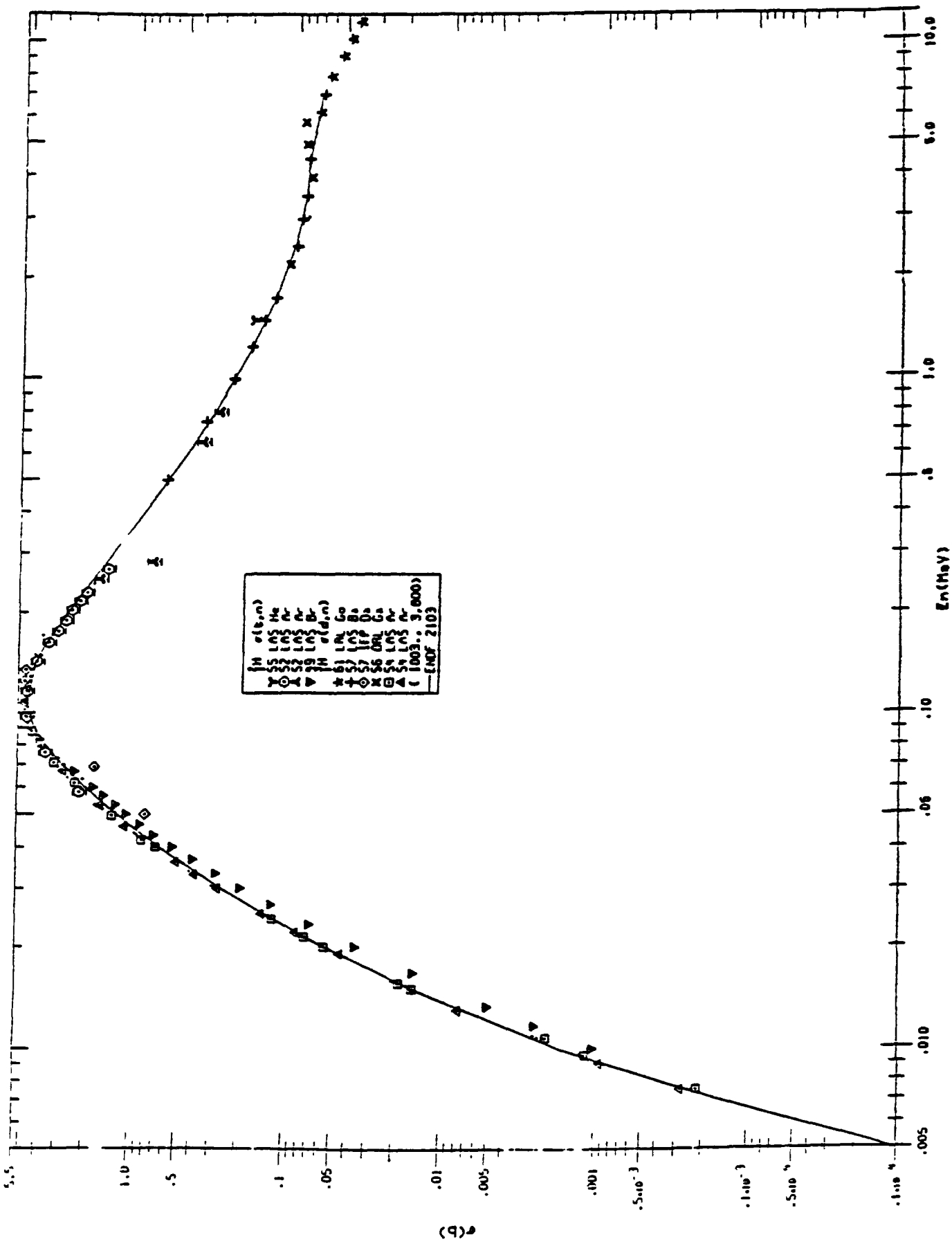
Whereever possible, existing evaluations will be used. Two primary sources of these data are G. Hale (Los Alamos), in an ENDF-like format, and R. Howerton (Lawrence Livermore Laboratory), in the ENDL format. It is anticipated that the newly-formed CSEWG Charged Particle Subcommittee will provide guidance and assistance in collating these files and suggesting an appropriate common

format(probably either ENDF/B or ENDF/C).

In the cases where no evaluations exist or where the evaluations are very old (e.g. the Cummings' evaluation from 1963 for positron emitters), some limited evaluations may be necessary. In the cases where the data sets are fairly complete over the energy range of interest, this may be done by the IGUIDE portion of the BNL325 plotting package, requiring little effort by an evaluator. Other cases would require more effort such as using systematics and the limited data available to produce a "recommended" curve. The NNDC does <u>not</u> plan any full-scale evaluations such as are performed to produce ENDF/B.

4.0 TOOLS

The primary tools for the production of the Charged-Particle "Barn" Book already exist. These include the CSISRS and ENDF retrieval programs and the publication package for BNL325. Some additional work on the BNL325 package is required to correctly handle the reaction formalism. However, this work will be done for the second volume of BNL325, so that by the time we are ready to produce the Charged-Particle "Barn" Book all tools will be ready. Sample plots from the current version of the publication package are attached.


En(MeV)
σ(b)

1. $T(d,n)^4He$ $\sigma(E)$

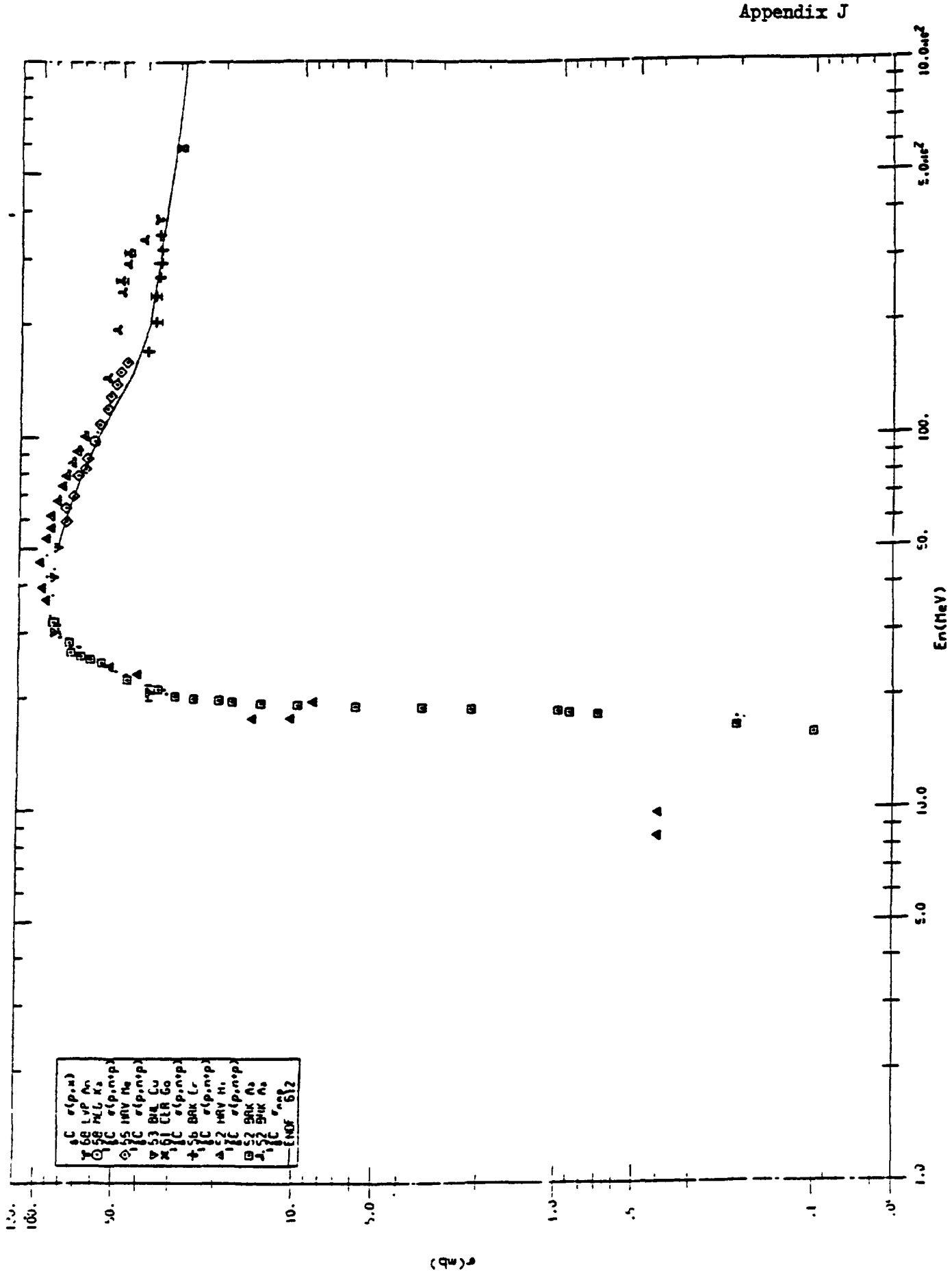
   Experimental data compiled by NNDC

   Evaluated curve from G. Hale (Los Alamos, 1979)

2. $^{12}C(p,x)^{11}C$ $\sigma(E)$

   Experimental data compiled by KACHAPAG and NNDC

   Evaluated curve from Cummings (Brookhaven, 1963)


En(MeV)
σ(mb)
ENDF 612

APPENDIX K

CINDA Coding

It is desirable for Cinda coding to be consistent and uniform from center to center. With this in mind, our center would like to have several vague areas of concern clarified:

1) Reviews:

When a review reference is compiled, should the coded lab reflect the origin of the reviewer or the origin of the work being reviewed?

Should works in progress, or work being planned, be included in Cinda?

What should be the blocking policy for these situations?

At the present time, we have not coded planned works. We have blocked entries with the original work (previously coded in Cinda), only when the review covers a single laboratory. For reviews of works that include several labs, the review entry stands alone in Cinda with the reviewer's lab code.

2) (d,p) and (d,pf) Reactions:

The Cinda manual states that for (d,p) and (d,pf) reactions, useful information can be deduced about the equivalent NG and NF reactions; entries should be made with an appropriate note in the comment field.

If authors do not explicitly refer to this equivalence of reactions, should the article be coded? Currently, only explicit references to the neutron reaction or fission yields have been compiled.

3) If several parts of an experiment are complete at different laboratories, we have compiled an entry for each lab. Should this practice be continued?

4) Is the current list of abbreviations for the comment field adequate?

5) We would like to include in Cinda, entries for EXFOR lines that will be transmitted in the near future. Does this present any difficulties for other centers?

Gail Wyant

APPENDIX L

PROGRESS REPORT OF CJD

V.N.Manokhin

1. Since 1979 CJD transmitted TRANS 4036-4039 with 40 works. 15 works are prepared for putting on magnetic tapes, 30 works are in process of compiling. The total number of works published by July 1980 and suitable for compiling into EXFOR is 560. 480 works from the number above mentioned has been entered the EXFOR library. Convertion of the most important 4-area works from NEUDADA format into EXFOR format has been begun recently. Now the works with data on the radiative capture cross sections of reactor structural materials are in process of converting.

2. At the present time the new computer EC-1033 with 29 Mb magnetic disk units is in process of installation. The computer will be put into operation by the end of this year. In this connection in 1981 we expect a lot of work on implementation of the service data libraries and data processing programmes, data calculation programmes using theoretical models and so on. At the time being the data exchange and the work with data libraries is carried out by CJD using the other computers.

3. CJD has completed the work on development of the evaluated data library of the threshold (n,p),(n,α),(n,2n) reactions for all stable isotopes in the incident neutron energy range from the threshold up to 20 MeV. The data of this library are in process of checking and testing on the basis of integral experiments.

4. Since the last NRDC meeting the issues of "Nuclear Constants" No. 35,36,37 have been published. During the period mentioned CJD answered about 130 requests on nuclear data.

THE ACTIVITIES OF CAJaD

N.V. Timofeeva, G.M. Zhuravleva and F.E. Chukreev

(Brief report for the Conference of Nuclear Reaction Data Centres at Brookhaven, USA, held in September-October 1980)

This report covers the period from October 1979 to August 1980.

1. Over this time CAJaD (Centre for Data on the Structure of the Atomic Nucleus and Nuclear Reactions) prepared the transfer of tapes A003 and A004 with numerical material from 30 articles.

2. During the compilation we have run into a number of difficulties due, in our opinion, to a certain lack of logic in describing a nuclear action by means of Generalized EXFOR. We strive, during compilation, for a description of the research results that is as unambiguous as possible and easily recognizable so that the users can find the data they require in the EXFOR library with a minimum of information noise. The importance of this aspect of the compiler's activities was pointed out at the last Conference in Karlsruhe.

It should be noted that for describing the formation of the ground and isomer states ($T_{\frac{1}{2}} > 1$ sec) we have an adequate method based on the use of the symbols -G and -Mn. But what do we have to describe reactions involving formation of a nucleus in a certain excited state? Nothing but a formalism using the PAR code, suitable for all processes except the formation of a radioactive nucleus in the final state.

Let us consider, for example, Ref. [1], which deals with the formation of millisecond isomers. It is only the formation of $^{109}In^{m}$ that can be described by the formalism now adopted. For the formation of the remaining six isomers it is not possible to have an adequate description. The possibility of an adequate description in the case of $^{109}In^{m}$ seems to have arisen by pure chance. And it comes about through the fact that ^{109}In has, apart from the millisecond isomer, another isomer $T_{\frac{1}{2}} = 1.3$ min.

Let us look at another example - Ref. [2] - in which the authors studied the formation of ^{94}Nb in excited states when irradiated by ^{94}Zr protons. The results of the work are useful for those who wish to take into account the effect of a zirconium backing on a neutron spectrum from the reaction, for instance, P+T or P+Li. Furthermore, by applying the data from this work we can arrive at the lower limit of formation for ^{94}Nb, which is not without interest, since Ref. [3] does not give any information at all on this reaction.

One could give many such examples. We could, of course, describe all these cases using the PAR code. But would it then be possible to find the reactions in the library? In MEMO CP-A/22 we suggest a modification of the existing formalism. The modification can be rejected or accepted, but if we keep only PAR, users of the data will not appreciate it since they will have considerable difficulty in finding the data they need in our libraries.

3. Column 25 of Glossary No. 27 shows the letter A [4], which indicates that the given nuclide has isomers with $T_{\frac{1}{2}} < 1$ sec. But these isomers have all nuclei except the lightest. If the letter A is to have any sense at all, we must indicate the lower, as well as the upper, half-life limit.

4. Over the period of the report CAJaD responded to roughly 70 requests for nuclear reaction data.

REFERENCES

[1] GONCHAROV, K.S., et al., Abstracts from the Thirtieth Conference on Nuclear Spectroscopy and Structure of the Atomic Nucleus, Nauka Press, Leningrad (1980) 394.

[2] FEDORETS, I.D., et al., Izv. Akad. Nauk SSSR, Ser. Fiz. 41, 8 (1977) 1665.

[3] MÜNZEL, H., et al., Physik Daten No. 15 - Index, Karlsruhe (1979).

[4] "EXFOR Manual" (1980) 7.

THE CDPHE STATUS REPORT.

B.S.Ishkhanov, I.M.Kapitonov, V.V.Surgutanov, V.V.Varlamov

In accordance with the plans outlined in Memo CP - M/1, the Centre for Photonuclear Experiments Data at the Institute of Nuclear Physics of Moscow State University is carrying out work along the following lines:

1. CDPhe prepares, publishes, and distributes yearly Informatiom bulletins "Photonuclear Data" containing information about the experimental studies of photonuclear reactions, inelastic electron scattering and radiative capture which have been published during a year in scientific journals in the USSR abd abroad. The published information cover the atomic nuclei excitation energy region between the nucleonic and mesonic thresholds. To date, bulletins 1, 2 and 3 have been published ("Photonuclear Data - 1977, -1978, -1979) and bulletin 4 is in preparation. CDPhE has received numerous requests from foreign and soviet scientists and organisations for the bulletins to be sent to them, which we endeavour to satisfy as soon as possible.

2. CDPhE compiles, in the exchange format "Generalised EXFOR", digital data from soviet works on photonuclear reactions, which are published in soviet and foreign journals. By now CDPhe has prepared and, via CAJaD, distributed the exchange tape M001, which contains over 6000 information points from 6 published works, with data from additional more than 20 works in preparation. In spite of the fact that the Centre has met with

certain difficulties in providing checks by authors of the data recorded in the Centre in format EXFOR, this activity will be carried on and expanded.

In exchange for information in format EXFOR from the works of soviet authors, the Centre hopes to receive similar information from works of foreign scientists.

3. CDPhE is developing special software for a unified - - series computer (EC ЭВМ), which will make possible a speedy and complete processing of nuclear data in format EXFOR.

So far, CDPhE has received and satisfied 37 requests from organisations and individual scientists for photonuclear data and data on nuclear structure and on reactions with charged particles.