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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

REPORT ON THE TENTH FOUR-CENTRE MEETING

SACLAY/PARIS, 6-10 May 1974

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IAEA NUCLEAR DATA SECTION, KÄRNTNER RING 11, A-1010 VIENNA

REPORT ON THE
TENTH FOUR-CENTRES MEETING
6-10th May, 1974 - Paris

List of Appendices

I. Organisation and Announcements

1. Introductory remarks

F. Fröhner opened the meeting with words of welcome on behalf of the Nuclear Energy Agency of the OECD.

2. Election of Chairman and Secretary

L. Lesca (CCDN) was elected as Chairman of the meeting, and A. Schofield (CCDN) agreed to act as secretary. The other participants were S. Pearlstein and Mrs V. May from NNCSC, F. Fröhner (CCDN), J.J. Schmidt, H. Lemmel and M. Vlassov from NDS, and V. Manokhin (CJD).

A number of scientists from CCDN participated during various sessions : K. Okamoto, H. Potters, N. Tubbs and C. Rickeby.

3. Discussion and adoption of Agenda

After a short discussion of the Agenda (cf. Table of Contents), the Programme attached as Appendix A was adopted.

4. Review of actions from the Ninth Four-Centre Meeting

The participants reviewed the actions from the previous meeting on the basis of the report (INDC(NDS)-54G) on the Moscow 4-C meeting and on Memo. 4C-3/93. The status of the actions which are not completed is as follows :

1973 - Action No.	3	Cancelled.
	6	Not done - see Appendix B.
	8	"Delinquency list" : continuing as recommendation to all Centres.
	26	Done - see Appendix G.
	27	Done - see CJD report, Appendix F.
	28	See Minutes + 1974 actions.

1973 - Action No.	29	See Minutes + 1974 actions.
	30	" "
	31	" " + 1974 actions.
	32	" "
	33	" "
	35	" "
	40	" " + 1974 actions.
	43	Partially fulfilled - CJD agreed to send out Pu-239 evaluation on magnetic tape as soon as possible.
	44	Impossible to satisfy.

The continuing actions are transferred to the new list of actions, cf. Appendix

II. Centres' Activities

1. Progress reports

Progress reports were presented by the Heads of the Centres (Progress Reports for NNCSC, CCDN, NDS, and CJD including request statistics are attached as Appendices C, D, E, and F). The following points were raised in the ensuing discussion :

PEARLSTEIN brought up the problem of the continuing backlog of area 2 data to be transmitted in EXFOR. He stressed the awkward situation of NNCSC in regard to customers requesting these data in EXFOR format.

LEMMEL mentioned that the important U-235 and Pu-239 data available end of 1971, listed in 4C-3/48 (January, 1972), and which were agreed in the 1972 and 1973 Four-Centre meetings to be compiled with top priority, were still incomplete in EXFOR. Over 60% of the data sets listed were still missing, mostly from area 2.

SCHMIDT urged all centres to stick to the agreement to give priority in exchanging the data to those isotopes, quantities and references which appear, from the statistics, the most frequently requested, i.e. essentially those of technological importance (fissile, fertile, structural materials, etc.).

FROEHNER answered that the continuing difficulties with the EXFOR backlog at the CCDN are due to unforeseen staff changes and difficulties with preparing the centre's programs for the new computer to be installed this year. Under the circumstances speedy availability of new data in at least one machine-searchable file within the 4-centre network had to be given priority over availability in EXFOR, as explained in the CCDN progress report (Appendix D). Therefore data plus EXFOR comments were entered as quickly as possible into the NEUDADA file in order to keep at least this file complete and up-to-date. In fact, with a single exception, every one of the U-235 and Pu-239 data sets from area 2 listed by LEMMEL in 4C-3/48 were available in NEUDADA format already by the time the memo was written, as can be seen from newsletter CCDN-NW/13 (February, 1972). The format problem admittedly remains, although it should be realised that only the numeric data are affected (NEUDADA comments and EXFOR BIB sections being practically identical) and that the computation-oriented NEUDADA format is for many purposes more convenient than the compilation-oriented EXFOR.

Nevertheless, the CCDN has been trying hard to honour its commitments. The problem of the time delay between filing new data in NEUDADA format and transmittal in EXFOR will be solved hopefully before 1975 by the "mixed coding" procedure by which incoming data will be converted simultaneously to NEUDADA and EXFOR. In fact, two EXFOR tapes containing a sizable fraction of the backlog are nearly ready for despatch, and work on two more is in progress.

It was agreed that lists of compiled data available at each Centre and not transmitted yet in EXFOR would be sent to the other Centres.

(Action 1)

This should include in particular special-purpose compilations (e.g. Crouch's compilation of fission yields).

(Action 2)

CJD were commended for their EXFOR performance since the last 4-Centre meeting.

The question of the translation of nuclear data documents by IAEA was raised. IAEA used to provide English translations of Jaderno-Fizicheskie Issledovanija, of Jadernye Konstanty, and occasionally of other USSR papers and documents dealing with nuclear data. Since IAEA can provide this service only for the most urgent cases, it was suggested that the relevant USSR authorities consider attaching at least English language abstracts and keywords to all papers in the above-mentioned documents, in particular in conference proceedings. As far as possible, the USSR should provide complete English translations of important documents, which could, if necessary, be printed and distributed by IAEA. It was therefore agreed by the participants that :

a) the NDS would bring to the attention of the INDC the problem of translating voluminous nuclear data documents such as the CJD Bulletin (Jadernye Konstanty) into English;

(Action 3)

b) the CJD would investigate the possibility of including abstracts in English to articles in Jadernye Konstanty or to send them to the IAEA for translation, and provide number links between the abstracts and the Bulletin articles. Inclusion of English keywords using the Oak Ridge Nuclear Data Project system would also be considered.

(Action 4)

2. Common statistical presentation

The statistics showing the performance of the four centres are attached as parts of the progress reports (Appendices C to F).

3. Future plans

The main future developments considered were the impending transfer of North American CINDA operations from TIC Oak Ridge to NNCSC and the development with respect to non-neutron nuclear data. Both points were discussed in detail under the appropriate agenda items.

III. Policies and Co-ordination of Four-Centre Activities

1. Non-neutron nuclear data

SCHMIDT summed up provisional recommendations formulated at the IAEA Consultants' Meeting on Charged-particle and Photonuclear Reaction Data, and the IAEA Specialists' Meeting on Nuclear Level and Decay Data for Applications. A coherent international effort in the compilation and evaluation of such data is planned. Dissemination of the content of files resulting from this effort might be most conveniently achieved through well-established institutions such as the neutron data centres and other nuclear centres. In view of possible future contacts with compilation groups working in the fields of charged-particle data, photonuclear data and nuclear structure and decay data, the neutron data centres should keep abreast of the development of new formats and work on the extension of existing formats to non-neutron nuclear data (e.g. ENDF/B, WRENDA, EXFOR).

The participants agreed that the neutron data centres are interested in participating in meetings concerning the establishment of files of compiled and evaluated non-neutron nuclear data and are willing to act as distribution centres for complete files. This will centralize the availability of both neutron and non-neutron nuclear data as a benefit to users. These services however, should be provided only for whole files of compiled and evaluated data that are suitable for wide distribution, whereas special data questions should still be forwarded to the appropriate groups of experts preparing such compilations.

An action was put on all centres to initiate contact with groups compiling non-neutron nuclear data in order to investigate the possibilities of using existing formats for their compilations.

(Action 5)

2. EXFOR

MANOKHIN stated that CJD preferred receiving data in EXFOR. CJD is able to list NEUDADA tapes, but has no index to these tapes, and no intention of developing NEUDADA retrieval programs. This inability to retrieve from their collection of NEUDADA tapes is in fact the reason why CJD has repeatedly requested data from the CCDN which had been sent to Obninsk before on NEUDADA tapes. MANOKHIN asked that in such cases the data be sent again rather than a reply that they had been sent before. FROEHNER agreed to do this until the data are entered into the EXFOR exchange.

(Action 6)

An action was put on NNCSC to distribute to other centres lists of data sets required for the new edition of BNL-325 Vol. II .

(Action 7)

The other Centres should then include the above-mentioned data sets in EXFOR without delay.

(Action 8)

3. Transmission of old NNCSC data

NNCSC was asked to send the balance of the old SCISRS data (39 tapes in EXFOR-like format) to the other Centres. It was stated that most of the data sets are pre-1969. Some of the newer ones are already entered in the 1 to 4 series. Thus CCDN should have most of these data in the NEUDADA file. In addition NNCSC should send an index for these tapes so that the other centres can check what they have already in their files (see also Appendix G).

(Action 9)

4. Correspondence with CJD

MANOKHIN asked if CCDN could split up long NEUDADA tapes into shorter files by end-of-file tags. This would make it easier to deal with reading mistakes encountered fairly often at CJD. It was agreed that CCDN would comply with this request.

(Action 10)

Requests from KONSHIN (Minsk) for experimental data not available at CJD should be answered by the other centres as follows :

- tapes to be sent to CJD, for conversion to punched paper tape as used at Minsk;
- listings to be sent directly to Minsk.

(Action 11)

5. Evaluated data

Concerning availability of ENDF data, PEARLSTEIN said that the ENDF standards data have already been released and the release of other data such as the ENDF dosimetry file was under review. No assurances could be made at this time.

MANOKHIN reported on Soviet evaluation activities and mentioned work on :

D, O, Na, Fe, U-235, U-238, Pu-239, Am (σ_γ,σ_f), Cm (σ_γ,σ_f)

and other Pu isotopes. The general policy in the Soviet Union is to use unadjusted microscopic cross sections. Only the group constants are adjusted on the basis of clean integral experiments.

6. Heavy-ion data

PEARLSTEIN advocated definite proposals for iso-quant extensions to deal with heavy incoming particles. It was

stressed that this does not necessarily mean that the four Centres should also compile these data.

MANOKHIN pointed out that the use of an additional field for the incoming particles in the iso-quant as in WRENDA would help to keep dictionaries reasonably short.

No definite conclusions were reached on this point.

7. Integral data

NNCSC will publish CSEWG benchmark results as a BNL report with an ENDF number. Shielding benchmarks are also compiled, but only as reports. Since the shielding benchmarks generally are described in full laboratory reports, only an index to those reports will be published. PEARLSTEIN added that those data are usually obtained on a bilateral basis, and the need for the centres to computerize them would require review.

8. INIS and similar developments

N. TUBBS was asked to communicate any information he has about compatibility between CINDA and the Nuclear Data Project reference file, and about his INIS/CINDA comparison prepared for the Varna IAEA Symposium on Information Systems.

(Action 12)

9. CINDA

Although it was realized that CINDA operations are not in practice as symmetrical with respect to all four Centres as EXFOR is, it was agreed that after the transfer of U.S. CINDA operations from TIC Oak Ridge to NNCSC, CINDA is to be considered a regular 4-Centre matter.

Consequently similar procedures should be adopted for CINDA and EXFOR with respect to changes such as updating of dictionaries or input specifications. In particular non-trivial

changes, e.g. changes which affect other centres' programs, should not be made without 4-Centre agreement. Furthermore, such changes should be documented with the least possible delay in the form of new manual pages.

IV. EXFOR in detail

1. Implementation of actions initiated at the 9th 4-Centre Meeting

a) LEMMEL'S proposal for LEXFOR on references was discussed, and a final formulation agreed upon (cf. Appendix H).

b) Revisions and inclusion of items in LEXFOR and EXFOR Manual according to specifications in Memo. 4C-3/97 were discussed.

Entries on Wave Length, Percent, Fission Fragment Energy Spectra were revised. An action was put on NNCSC to distribute updated LEXFOR pages for these items and to revise also the entry on Polarization,

(Action 13)

whereas NDS should prepare a LEXFOR entry on the Experimental Determination of Fission Product Yields.

(Action 14)

Further discussion of entries for the RAW, REL, FCT modifiers led to a final formulation based on a LEXFOR entry proposed by POTTERS (Appendix I).

It was decided to abolish the modifier PAD.

The action put on NNCSC to prepare an entry on Independent Variables was considered obsolete in view of the following discussion on multidimensional tables.

c) Multidimensional Tables

EXFOR Manual revisions concerning more convenient rules for table coding were discussed. A review was made of the revised manual pages drafted by FROEHNER on the basis of a number of 4C memos dealing with this problem (4C-1/38, -2/41, -2/42, -1/39, -3/88, -4/23, -2/46 and -3/94) and a final version was approved for inclusion in the Manual.

(Action 15)

2. Further specifications concerning LEXFOR and EXFOR Manual

OKAMOTO was asked to formulate specifications concerning standards for Fission Yields and give an example of coding of delayed-neutron precursor data.

(Action 16)

NNCSC was reminded to prepare the long overdue LEXFOR entry on Multilevel Resonance Parameters.

(Action 17)

New procedures for updating the EXFOR Manual were defined. Updated pages should carry the date of update. Essential new pages should be distributed as soon as possible. Resulting changes to other parts of the Manual may be transmitted later on. Moreover, a complete Manual should be sent on request to each Centre.

3. Scheme for retransmitting groups of subentries

V. MAY proposed a scheme for retransmitting groups of subentries as one single subentry. This feature would be especially useful for handling groups of subentries to be grouped into one multidimensional table. The proposal was adopted and formulated as an addition to page IX.3 of the EXFOR Manual (cf. Appendix J).

4. Implementation of new EXFOR features

Feature 1. Multidimensional tables with all independent variables in data-section columns ("Vienna-Moscow compromise").

Feature 2. Multiple Iso-quants with pointers.

Feature 3. Two-dimensional tables with one of the two independent variables given in COMMON, use of pointers ("Pearlstein proposal").

Feature 4. Variable Z and/or A.

Feature 5. Extension to more than 10 columns.

LEMMEL said that NDS was ready to implement Features 1 to 5 as soon as it could use POTTERS' edition program. POTTERS stated that this program is available.

V. MAY said that NNCSC could implement immediately Features 1 and 5, and Feature 2 only for resonance parameters. Feature 3 could be implemented after some time. However no decision on implementation of Feature 4 could be taken or of Feature 2 for cases other than resonance parameters.

MANOKHIN said CJD had to rewrite programs, but would be willing to accept all EXFOR features, provided the data sets coded according to the new rules were not too large to be dealt with on an ad hoc basis.

POTTERS said that some reprogramming was necessary at CCDN, but that Features 1 to 3 could be handled at present, and Feature 5 in the near future.

It was finally agreed that Features 1 and 5, and Feature 2 for resonance parameters only, were acceptable for exchange between all centres.

V. MAY was asked to write up an implementation scheme for inclusion in the EXFOR Manual, and update the Manual.
(Action 18).

5. Completeness of EXFOR versus CINDA should be checked at all centres for important reactor material iso-quants. Gaps in EXFOR and CINDA should be filled with top priority.
(Action 19).

6. Extensions of EXFOR

a) Capture gamma-ray spectra

A proposal for storage and retrieval of neutron capture gamma-ray spectra by M.R. Bhat (Appendix K) was discussed. It was decided that this document would be used as a basis for proposing an extension of EXFOR. NNCSC is at present in communication with specialists on the subject, and will establish a list of EXFOR quantities corresponding to the quantities mentioned in Bhat's proposal, together with dictionary 14 additions, and data headings. The other centres were then asked to circulate Bhat's proposal to the specialists of their respective areas and to deal with the formal problems raised by the resulting suggestions. Examples of coding capture gamma-ray spectra shall be given using the possibilities of the 2-dimensional table layout.
(Action 20)

b) Simplified EXFOR

CJD expressed interest in a remark by FROEHNER that some of the difficulties in using EXFOR as a computation format could be eliminated by adopting a unique system of units (e.g. eV for all energies, b for all cross sections, etc.) and perhaps a rigid table structure in all cases where this can be easily done, similar to the approach in NEUDADA. Other centres disagreed, however.

c) Procedure to be followed by Centres for entire compilations

In order to distribute the workload in cases where a centre receives a big compilation with data from other service areas, it should split up this compilation according to service areas and distribute the parts to the respective centres for EXFOR coding. If automatic conversion to EXFOR is possible, however, then the receiving centre should convert, and involve the other centres only in checking the converted data belonging to their respective service areas.

V. CINDA in Detail

SCHMIDT opened the CINDA discussion by commending N. TUBBS and his co-workers at CCDN and TIC for their successful work to develop and implement the new CINDA direct-access storage and retrieval system. The improvements in operating efficiency and particularly in speed and quality of retrievals over the old system was clearly established. The fact that after the first year of experience with the new program system a number of technical points would have to be discussed should not obscure the basic success of the project.

A list of points still to be settled, and suggestions for their solution, was presented by TUBBS (Appendix L).

1. Update and feedback procedure

a) Operation codes 'A' and 'B'

The present CINDA system is designed to prevent any blocking of entries which is not explicitly indicated by the compiler. If a new block of n entries, say, is to be entered into the file the compiler must submit the corresponding n cards in sequence, each one containing operation code 'A' and also the number 'n' of entries in the block. A block number is then automatically assigned to this block. If, on the other hand, an entry is to be added to an already existing block,

the compiler must use operation code 'B' and give the block number on the input card. This implies that such an addition can not be made before the block number exists in the file and, moreover, before the compiler knows it.

LEMMEL said it was inconvenient for NDS to be obliged to submit cards for 'A' operations in sequence, or to wait until a 'B' operation could be made once an 'A' operation had created a new block in the file. Relying on the fact that the present CINDA system, as an exception for areas 3 and 4, allows for entering 'A' type records with block numbers '472', '473', etc. for references published in 1972, 1973, etc. he proposed a redefinition of the 'B' operation. Instead of the meaning "include this record in block specified by Z, A, Q, Lab, Block No." 'B' should mean "include this record in block specified by Z, A, Q, Lab, Block No. if found, otherwise enter as 'A'." This would enable NDS to submit all new entries with 'B' and to rely essentially on Z, A, Q, Lab, Year as an automatic blocking criterion.

It was pointed out that the implied programming changes would require an unreasonable effort on the part of the CCDN as compared to the effort necessary at NDS to organize their work so that blocked records are submitted in sequence. What is more, one would get an automatic blocking procedure which is precisely what the present CINDA system was designed to avoid. As V. MAY remarked there are instances, especially in areas 1 and 2, where the same Z, A, Q, Lab, Year should occur in different blocks.

LEMMEL then asked if CCDN could implement an automatic changing of 'A' to 'B' for matching records with the same Z, A, Q, Lab, Year just for areas 3 and 4. TUBBS conceded that CCDN could in fact overrule the rejection of successive 'A' entries carrying the same Z, A, Q, Lab, with a separate program which would automatically change 'A' to 'B' in such cases, but once again at the risk of introducing erroneous information into the file. CCDN would only do this under the responsibility of NDS.

After lengthy discussions the following conclusions were reached :

- NDS will take care that within one batch of new records those belonging to the same block are grouped together in the correct sequence.

- CCDN will continue to send feedback lists as soon as possible after each update so as to enable NDS to make subsequent additions to new blocks using the assigned block numbers.

- NDS assumes responsibility for the blocking of areas 3 and 4 'A' records with the same Z, A, Q, Lab, Year appearing in different batches. CCDN will implement this blocking by automatically changing 'A' to 'B' for the entries from the second batch. NDS claim that no errors will be introduced and many unnecessary rejections will be avoided by this procedure.

FROEHNER warned that the last rule constitutes a dangerous precedent. It means in effect an overriding of input checks just because certain compilers find them inconvenient and claim that they do not make mistakes anyway. NNCSC also objected.

b) Other input checks

LEMMEL pointed out that the checking criteria used in the CCDN appear to be too stringent and result in over-abundant rejection of input records. The matter was discussed in detail by LEMMEL, V. MAY and TUBBS. The outcome of this discussion was a new list of checking criteria.

c) Frequency of updates

It was once more reminded and strongly recommended by TUBBS that updates be sent continuously throughout the year to CCDN. One of the main features of the new CINDA system is to allow frequent updates with rapid correction and re-insertion of rejected information. This feature should be exploited in order to avoid the usual last-minute flood of entries to be processed at the CCDN.

2. Improvement in listings

a) Feedback Listings

LEMMEL criticized that NDS had, for 7650 entries submitted, to scan about 1500 pages of feedback listing to find about 100 mistakes for which NDS was responsible. During the past year LEMMEL had submitted various suggestions to improve the feedback mechanism. CCDN confirmed that some of his suggestions were impracticable because of the limitations of the present CCDN computer and programming manpower.

Changes to warning and error messages on the other hand are feasible. After some discussion a workable solution was found by omitting some, and revising other, warning and error messages.

(Action 21)

b) Other listings

TUBBS explained that the internal representation of energies (energy codes) cannot be modified as LEMMEL wishes without heavy reprogramming effort. Since these changes concern only rather rare and exotic cases such as double spectra which can easily be dealt with by making two entries CCDN will not change the energy codes at present.

Quantity sort changes requested by NDS will be made on the book tape, but not in the file. Consequently, retrieve listings will remain ordered as before.

An action was put on NDS to prepare a proposal on a new quantity sorting order.

(Action 22)

3. CINDA as a complete International Data Index

CINDA performs this function both through the use of flag '+' indicating that data are available at least at one centre, and by explicit reference to a data file through the inclusion of a data index line.

PEARLSTEIN was in favour of excluding index lines referring to EXFOR on the grounds that they would not accurately reflect the present status of the numeric files, and would contribute to increasing the size of the CINDA Book.

LEMMEL and FROEHNER reminded the participants that the appearance of index lines in CINDA is intended to replace the old newsletters such as CINDU, CCDN-NW/13, -NW/14, etc.

TUBBS pointed out that the cleaning up of CINDA with regard to the '+' flags would take at least one year given the present status of CINDA manpower at CCDN. It would therefore be useful to keep index lines in the file. It would always be possible to exclude index lines from the Book.

It was finally agreed that Centres would continue to include data flags and index lines in CINDA as before until a final decision is taken on the proposal to be submitted by NNCSC.

(Action 23)

4. CINDA Book

It was agreed that the four Centres are invited to send suggestions for a new introduction to CINDA's next supplement to LEMMEL.

(Action 24).

LEMMEL pointed out that the text pages consist of two parts : a brief introduction for the beginning of the book with just enough detail to enable a cursory user to understand the entries, and an Annex giving more details. It was agreed that this structure should be kept.

It was recognised that criteria for the reduction of the size of blocks of entries appearing in the CINDA publication will have to be defined. The consensus was that no valid entries should be deleted in the file but that the "no book" flag should be used more extensively. For CINDA75, all centres should remove "noise" from the file using the means currently available :

- making frequent use of the "no book flag"
- using the special compiler symbol for excluding certain (e.g. merely "cosmetic") revisions from the supplements
- searching for duplications and deleting them.

Any further suggestions should be sent to TUBBS.

(Action 25).

5. CINDA Manual

The present status of CINDA rules is given in the 1972 "Temporary Reader's Manual" and complementary information can be found in the 1968 Reader's Manual and also in an NDS internal manual prepared by LEMMEL. It was agreed that the responsibility of preparing and updating the CINDA Manual remains with NDCC. It was recommended that TUBBS make a comprehensive write-up of the CINDA rules, by the end of August, 1974.

(Action 26).

It was agreed that CCDN supply NNCSC with all necessary documentation giving the present rules compatible with the CINDA programs, including the results of decisions taken at this meeting.

(Action 27).

6. CINDA area coverage

The present method of coverage was discussed. It was agreed to continue with the present system of assigning journals and report series to specific CINDA readers.

7. Dictionaries

Concerning the relations between EXFOR and CINDA dictionaries, the following was agreed:

1) EXFOR and CINDA dictionaries for lab-codes and ref-codes (journals, reports, conferences, books) should be identical, except when restrictions in CINDA field lengths make this impossible. The so-called "EXFOR dictionaries" for the lab. and ref. codes are therefore joint CINDA-EXFOR dictionaries and binding for both systems. However, this statement does not affect any extra checks which may be performed in CINDA (e.g., lists of report codes for theses and conferences).
2) NDS volunteered to convert in CINDA the few remaining conference codes which are still different from the EXFOR codes.
3) The agreed rules for updating the dictionaries as laid down in the EXFOR Protocol and in the EXFOR Manual will also be applied to CINDA.
4) It is the responsibility of NDS to ensure that the EXFOR dictionaries are self-consistent and free of errors. CCDN should check that their internal dictionaries agree with EXFOR.
5) NNCSC volunteered to carry out a checking of the correspondence between EXFOR and CINDA lab. and ref. codes.

(Action 28).

The effect of changes in laboratory names (e.g., GA→GGA→GRT etc.) on existing CINDA entries was discussed but no procedure agreed on.

8. Physical content of CINDA

a) Ambiguities

VLASSOV pointed out some cases where misunderstanding arises concerning the quantities actually measured. The comments are often not explicit enough to clear up the misunderstanding.

OKAMOTO supported this statement, and subsequently provided some examples :

Scattering events, capture gamma counts or capture gamma yield/thickness and transmission data should be explicitly mentioned as such in the comments, so as not to be confused with scattering, capture and total cross sections.

b) Completeness

It was agreed that a detailed comparison with EXFOR as discussed under IV.5 was an efficient way to improve CINDA completeness. (See Action 19).

VI. WRENDA

Dunford's report on the present status of WRENDA is attached as Appendix M. The stylistic guidelines proposed in this document (on the layout of comments, use of EXFOR-CINDA lab. codes, representation of requestors' names and use of blanks in energy fields) were accepted. The participants also agreed that NDS should ask the INDC to support the recommendations in Dunford's report, i.e.

- that all requests from countries which do not review them for two successive years should be considered as withdrawn,

- that reviewers use the country retrievals for updates,

- that the distinction between fulfilled and withdrawn requests be dropped unless all countries specify which is the case when they delete requests.

(Action 32)

Various suggestions concerning the layout of the WRENDA report were made, for instance to give a less prominent place to the request numbers. NDS agreed to consider these suggestions for future editions.

(Action 33)

NDS intends to distribute WRENDA 74 to national governments, atomic energy commissions, nuclear societies and similar bodies who are in a position to promote data activities, and urge them to support work directed towards the fulfillment of WRENDA requests.

There was a short discussion on whether country retrievals for area 2 reviewers should be sent to CCDN as listings or whether they should be produced with a special program at Saclay. CCDN and NDS agreed to settle this matter among themselves with a view of adopting the most convenient procedure.

NDS confirmed that they are prepared to encode all new requests or modifications to old requests so that there is no need for the other centres to submit input in card form.

VII. Review of Other Meetings

The short review given by SCHMIDT on the IAEA Consultants' Meeting on Charged-Particle and Photonuclear Reaction Data and on the IAEA Specialists' Meeting on Nuclear Level and Decay Data for Applications was already mentioned under III.1 .

VLASSOV gave an account of the March meeting of the EURATOM Working Group for Reactor Dosimetry, mentioning new methods of obtaining high-quality benchmark data for threshold reactions in relatively clean fission neutron spectra. At present discrepancies between such measurements and calculations

based on microscopic cross sections exist which could be due either to subthreshold effects or - more likely - to residual thermal neutrons and sample impurities.

LESCA reported on the Ispra meeting on Integral Experimental Benchmarks for Shielding. He described plans to co-ordinate shielding work in the Euratom and NEA areas, in a first stage by the use of common computation codes and common sets of data for the interpretation of shielding benchmark experiments on iron.

VIII. Other Business

None.

IX. Conclusions

Pearlstein on behalf of NNCSC offered to host the next Four-Centres Meeting at Brookhaven. After discussing possible dates the participants agreed on the week after the planned 1975 Washington Conference on Neutron Cross Sections and Technology, i.e. the week beginning 10th March, 1975.

It was also agreed that centres should provide display boards (one each) explaining their services for exhibition at the Washington Conference.

(Action 34)

Appendix A

P R O G R A M

TENTH FOUR-CENTRES MEETING

6-10th May, 1974 - Paris (OECD)

Monday, 6th May at OECD (New Building)

9h30 - 12h30	Agenda* Items I and II
14h30 - 18h30	Agenda Item VII (part.)

Tuesday, 7th May at OECD (New Building)

9h30 - 12h30	Agenda Items III and IV (part.)
14h30 - 18h00	Agenda Item V (part.)

Wednesday, 8th May at CCDN, Saclay

9h30 - 12h00	Agenda Item IV (part.)
13h00 - 15h00	Lunch at Saclay
15h30 - 17h00	Agenda Item VII (part.)

Thursday, 9th May at OECD (New Building)

9h30 - 12h30	Agenda Items V (part.) and VI.
14h30 - 18h00	Agenda Items VII (part.), IV (part.) and V (part.)

Friday, 10th May at OECD (Château de la Muette)

10h00 - 12h30	Review of Recommendations and Actions. Conclusion of Meeting.

* For the agenda see page i.

(Statement proposed by J. R. Stehn for possible NNCSC explanation for not carrying out Action 6)

Action 6 arising from the Ninth Four-Centre Meeting (p. 97, Appendix S, of INDC(NDS)-54/G) was not carried out by NNCSC. This was to submit to NDS a revised recommendation to editors of journals, concerning presentation in their journals of information containing neutron data.

The single letter of comment received from the centers (suggested in Action 4) came from C. Dunford and expressed NDS opposition to additional communication with journal editors. This letter states:

> "We are not in favor of sending a letter to journal editors. We think that the general guidelines sent by IWGNSRD to many journals and published in several are adequate to give referees some basis for judging a submitted paper. Moreover we are not in favor of using journal editors and referees as a means of advertising the Four Neutron Centers' services. However we would be in favor of a direct mailing to experimentalists of an expanded version of your proposal as suggested by CJD and CCDN in discussions at the Four Center Meeting."

In view of the communications already received by journal editors on this subject, and the response made by seven journals (Appendix J), NNCSC tends to agree with the other Centers that the proposed letter (Appendix I) should not be sent to journal editors. The press of other business has kept us from considering the value of sending an expanded version directly to experimentalists.

Appendix C

NNCSC PROGRESS REPORT, May 1973 - May 1974

1. Data Libraries

We are now routinely servicing requests from the CSISRS Library. For the one year period ending May 1974 we filled 169 requests from our experimental library.

Since the last 4-Center meeting 8 EXFOR tapes (1016-1023) have been transmitted.

In the last year NNCSC has taken responsibility for the USNDC Request List, prepared the Library, completed the service programs, and sent a magnetic tape to IAEA to meet WRENDA obligation.

Announcement has been made that the U.S. CINDA responsibility will be transferred to NNCSC beginning 1 July 1974.

Related to the production of BNL-325 a library of over 150,000 experimental resonance parameter values has been created.

The compiling of new data into CSISRS continues with the addition of 48 new entries. In addition a program of "completeness" checking with the objective of filling in "gaps" has commenced. This survey, in part, employs an interleaved CINDA-CSISRS file and is being used to upgrade both libraries.

Intense activity in the last year has been directed to production and distribution of a new version of the evaluated library (ENDF/B-IV). The NNCSC effort involved coordinating the ENDF/B-IV effort, hosting Task Forces on the "Big 3 + 2", 2200 M/Sec values, fission product nuclei, standards, and CSEWG meetings dedicated to approving new evaluations. In addition NNCSC facilities were called upon to process the new evaluations for ENDF/B-IV and to extend to 20 MeV those ENDF-III materials being taken over directly into ENDF-IV. The above involved extensive checking, plotting, assembling, and editing of files.

Our staff has completed new evaluations this past year for Sc, Mn, Cr, Ni, Co, Eu isotopes, the resonance region of Pu-239(with J. R. Smith, ANC using our facilities), and the unresolved regions of U-235 and Pu-239.

Standard ENDF programs have been upgraded to handle Version IV formats and have been distributed. Distribution of ENDF/B-Version IV Library has begun (Tapes 401-403). Additions to the ENDF/A Library this last year include the libraries of Deviller (France, C.E.N.), ENDL(U.S., LLL), and U.K.(England,UKNDL).

The above efforts were demanding of NNCSC computer facilities. A batch processing capability has been implemented and allows for unattended evening and weekend operation. We have sustained as high as 90% of capacity for two-week intervals, evenings and weekends included.

2. Publications

BNL-325, Neutron Cross Sections, Third Edition Volume I has been published and distributed. This first volume consists of recommended resonance parameters, resonance properties, thermal cross sections, and bibliography.

A draft of a revision of ENDF-102, Formats and Procedures Manual for the Evaluated Nuclear Data File, has been written and is being circulated for comment. This has been distributed to those individuals with responsibility for ENDF/B Version IV program development.

Production of updates for ENDF- 201 for ENDF/B-IV materials has begun as these evaluations become finalized.

Library preparation and prototype copy generation has begun for BNL-325 Volume II production.

ORIGINATOR / REQUEST TYPE	INDUSTRY	NATIONAL LABS	UNIVERSITIES	GOVERNMENT AGENCIES	OTHER	TOTALS THIS YEAR	TOTALS LAST YEAR
EXPERIMENTAL DATA	26	73	33	13	24	169	138
EVALUATED DATA	88	103	43	31	17	232	162
CODES & DOCUMENTATION							

CCDN Report to 10th 4C-Meeting

May, 1973 - May, 1974

1. Staff

The staff situation was relatively stable. During most of the report period the centre worked with a full complement of 18 (8 physicists, 1 technical assistant, 2 programmers, 4 computer and key-punch operators, 3 clerical staff.) Claes Rickeby, the senior programmer, will leave at the end of May. Luigi Pellegrino from CPL (NEA Computer Program Library, Ispra) will be his successor.

2. CINDA

After file conversion and switch-over to the new CINDA program system in March, 1973 many updates were made and tapes supplied to NDS for production of CINDA 73, the 1973 Supplement, and CINDA 74. Many errors and omissions present in the old file were corrected, while entries distorted during conversion were restored. The TIC-CCDN exchange procedures were debugged, and work started on preparing the CINDA system to run under DOS/VS and the PL/I compiler of the new IBM 370/125 computer that will be installed at the CCDN in October. Index entries were prepared for all experimental data from areas 1 and 2 exchanged in EXFOR format and for Benzi and KEDAK evaluated data. With similar entries from areas 3 and 4 prepared by NDS a further important step has thus been taken in the development of CINDA as the international neutron data index. In April, 1974 CINDA contained 109 000 entries referring to more than 22 000 literature references.

3. Experimental Data

Although the number of bibliographic references compiled by CCDN per year shows a falling tendency the volume and the complexity of the data produced annually is growing. The NEUDADA file contains more than 2 million data lines now and grows with a doubling time of about 4 years. If only the CCDN area is considered, the doubling time is even smaller, namely about 3 years.

Although one physicist (A. Schofield) could be transferred from CINDA to EXFOR work after successful implementation of the new CINDA programs, so that now two physicists work full time on EXFOR, the EXFOR problem that existed at the CCDN one year ago could be solved only partially. Programs for the conversion of incoming EXFOR types to NEUDADA format now exist, and incoming data are entered quickly into the centre's internal file, but the backlog of CCDN-compiled data which should be converted from NEUDADA to EXFOR format is still not reduced to a tolerable level.

In view of the present and future manpower situation and the magnitude of the job *) a choice had to be made between two alternatives :

- either to improve the centre's EXFOR image at the price of reducing the data collection and compilation effort and/or leaving incoming EXFOR tapes unconverted, i.e. unavailable to requesters;
- or to give top priority to completeness and up-to-dateness of the centre's internal file and only second priority to EXFOR tape preparation and NEUDADA-to-EXFOR conversion of the backlog.

The first alternative would have resulted in incompleteness of both the NEUDADA file and the EXFOR exchange, and thus both the CCDN customers and the other centres would have been unhappy. The second alternative was adopted because it ensures at least completeness of the NEUDADA file, keeping the CCDN customers happy and the other centres (hopefully) not too unhappy since they could obtain the data in computerized form if not in EXFOR format.

Nevertheless, by mid-May two tapes with 104 + 89 EXFOR works will be despatched taking care of some 40% of the present backlog. Two more tapes with 99 + 45 works are in an advanced stage of preparation and should be ready a few weeks later.

4. Evaluated Data

CCDN's activity in the field of evaluated neutron data remains to be restricted to the collection and dissemination of such data. The main new acquisitions were a number of new and revised files from the UKNDL and the Bologna library, the fission product library of Devillers et al., point cross sections calculated from resonance parameters in ENDF/B-III format, and a first part of ENDF/B-IV. FORTRAN-IV indexing programs exist now for the three main libraries, and each requester of one of the libraries gets a listing of the index along with the tapes.

5. Request File

Co-operation with NDS concerning WRENDA was very smooth, country lists were distributed to reviewers and the modified lists sent back to Vienna to be included in WRENDA 74.

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*) After reduction of the backlog the CCDN will have contributed about 50% of all the EXFOR works and about 65% of all the data records to the EXFOR exchange.

6. Retrieval Statistics

During the 12-month period from 1st April, 1973 to 31st March, 1974 the CCDN received from outside customers :

- 150 requests for experimental data,
- 144 requests for evaluated data,
- 22 requests for bibliographic references,
- 23 requests for data handling codes,
- 27 requests for plots.

The number of requests for evaluated data is 27% and that for experimental data even 39% higher than during the preceding year.

The request statistics attached to this report show :

- that most of the requests are fulfilled,
- that the 150 requests for experimental data necessitated 1,520 specific retrievals from the files,
- that Japan was succeeded by France as the country from which most requests were received,
- that the centre's users are still mostly evaluators, reactor physicists and measurers in government laboratories, and
- that the cross section types requested are still mainly those with applications in fission reactor and related technologies (fission of U and Pu isotopes; total, scattering and absorption cross sections of structural materials such as C, O, Cr, Fe, Ni, Zr, Nb or absorbers such as Xe, Eu, Hf).

Interest in absorption and capture cross sections continues to be high. Demands for elastic and inelastic scattering, neutron emission and γ production cross sections have increased significantly.

7. Publications

During the period under review the CCDN published

- CCDN Newsletter No.73-2 (October, 1973);
- Neutron Nuclear Data Evaluation Newsletters NNDEN/11 (July, 1973), NNDEN/12 (Nov., 1973) and NNDEN/13 (March, 1974).

CCDN staff presented papers at a number of meetings, for example, at the

- Specialists' Panel on keV Capture of the Structural Materials Cr, Fe, Ni (Karlsruhe; May, 1973),
- CODATA Symposium on Man-Machine Communication for Scientific Data Handling (Freiburg i. Br.; July, 1973),
- Specialists' Panel on Fission Product Nuclear Data (Bologna; November, 1973).

A new edition of the threshold reaction compilation published in the past by Liskien and Paulsen was prepared directly from the NEUDADA file and will be distributed as document EANDC 95"U".

REQUEST STATISTICS

Table Ia

1.4.1973 - 31.3.1974

Area 2

Country Origin	Number of Requests for Data					Total Previous Years
	Experimental	Evaluated	Bibliographic	Codes, Documents	Total	
Austria	1	1			2	
Belgium	1	2		1	4	
Denmark		5			5	
Finland		1			1	
France	48	36	4	7	95	
Germany	20	21	1	1	43	
Italy	6	6		3	15	
Japan	14	6			20	
Netherlands	6	2			8	
Norway			2		2	
Spain	1				1	
Sweden	4	5	1		10	
Switzerland	8	6		1	15	
United Kingdom	12	14	4	1	31	
4-Centres	22	7	10	9	48	
Euratom	7	1			8	
NEA-CPL		1			1	
Total	150	114	22	23(a)	309	
Total Previous	108	~90	13			

(a) Codes only.

REQUEST STATISTICS

Table Ib

1.4.1973 - 31.3.1974

Area 2

Originating Organisation	Number of Requests for Data					Total Previous Year
	Experimental	Evaluated	Bibliographic	Codes, Documents	Total	
Government Laboratory	110	91	12	13	226	
University	15	7			22	
Industry	3	2		1	6	
Other	22(a)	14(b)	10	9	55	
Total	150	114	22	23	309	

(a) 4-C outside EXFOR

(b) 4-C : 7
Hospitals : 7

REQUESTS STATISTICS

Table Ic

1.4.1973 - 31.3.1974

Area 2

Request Disposition	Number of Requests for Data					Total Previous Year
	Experimental	Evaluated	Bibliographic	Codes, Documents	Total	
Fulfilled	143	114	22	23	302	
Partially Fulfilled						
Unfulfilled						
Standing	7				7	
Total	150	114	22	23	309	

DATA DISSEMINATION

Table II

1.4.1973 - 31.3.1974

Area 2

Date Type	Amount		
Experimental	16,000	Data Sets	containing 1,767,000 data points
Evaluated (total)	71,900	Data Files	
KEDAK	500	Data Files	
UKNDL	12,400	Data Files	
ENDF	26,500	Data Files	
Other	32,500	Data Files	
Bibliographic	28,000	CINDA Entries	
Codes and Documents			

REQUEST STATISTICS

Table III

Retrievals for experimental data sorted by Z, A, Q

1.4.1973 - 31.3.1974

Area 2

Z	S	A	all	σ_t	σ_{nn}	$\sigma_{nn'}$	n,γ	n.f	n,x	Res. Params.	Stat. Params.	Other *)	Total
	all			2	47	2	4		7		4	2	68
	all F.P.												
1	H		2	9	9		1		9			3	33
2	He			7									7
3	Li		1	3									4
4	Be		1				1						2
4	B			1		2	1		2				6
6	C			6	24	17	2		10			3	62
7	N			1	1	2	3		10			6	23
8	O		3	4	13	15	7		11			2	55
9	F		1	1			1		1			1	5
10	Ne												
11	Na		1	3	3	4	3		6			2	22
12	Mg			2		2	2		2			3	11
13	Al			5	3	6	3		7			3	27
14	Si			3	4	4	1		2				14

Z	S	A	all	σ_t	σ_{nn}	$\sigma_{nn'}$	n,γ	n,f	n,x	Res. Params.	Stat. Params.	Other *)	Total
15	P					1	1		2				4
16	S				6	8	1		10			2	27
17	Cl								5				5
18	Ar				2	3			2				7
19	K												
20	Ca			1	6	4							11
21	Sc			1			3						4
22	Ti						2		5			2	9
23	V			3	3	3	3		6			1	19
24	Cr		2	11	3	4	5		10			15	50
25	Mn			2	7	4	4		6			2	25
26	Fe		2	6	7	11	5		6	7	2	6	52
27	Co			3			3						6
28	Ni		1	3	3	4	5		11			20	47
29	Cu			2	4	4			3			4	17
30	Zn						3		6			2	11
31	Ga												
32	Ge						2						2
33	As						3		2			1	6
34	Se						3						3
35	Br						5					1	6
36	Kr						6					4	10
37	Rb						2						2
38	Sr						3					7	10

Z	S	A	all	σ_t	σ_{nn}	$\sigma_{nn'}$	n,γ	n,f	n,x	Res. Params.	Stat. Params.	Other*)	Total
39	Y			2	2	4	2		2		4	5	21
40	Zr						2			17			19
41	Nb		1	2			3			18		2	26
42	Mo			1		1	7		6	1	1	5	22
43	Tc			1		5	8			1	1		16
44	Ru			1		1	4			1	1		8
45	Rh			2		5	7		1	1	1	5	22
46	Pd						2						2
47	Ag			1	1	4	4					1	11
48	Cd			1	1	5	6					4	17
49	In				1	6	6					2	15
50	Sn				1	3	2						6
51	Sb				1	3	4		4			2	14
52	Te				1	5	8					2	16
53	I			1	1	10	8					7	27
54	Xe			1		6	15					10	32
55	Cs			1		5	7		3			5	21
56	Ba						4		2			7	13
57	La			2		5	5					2	14
58	Ce			1			4		4			8	17
59	Pr			2			2						4
60	Nd			2		3	6					4	15
61	Pm						2						2
62	Sm			2		3	7					6	18
63	Eu		1	1		7	10					12	31

Z	S	A	all	σ_t	σ_{nn}	$\sigma_{nn'}$	n,γ	n,f	n,x	Res. Params.	Stat. Params.	Other*)	Total
64	Gd			2		3	7					6	18
65	Tb						2						2
66	Dy			1		3	5					6	15
67	Ho			2									2
68	Er		1	2		1	3					2	8
69	Tm						1		2			3	6
70	Yb			1		2	2					4	9
71	Lu			1		2	6		4			6	19
72	Hf		2			2	8		4			6	22
73	Ta					2	3		2			6	13
74	W			3	4	4							11
75	Re												
76	Os												
77	Ir					1	1					2	4
78	Pt			2	3	1	1		4			2	13
79	Au			2	3	1	5		4			4	19
80	Hg					3	3					6	12
81	Tl												
82	Pb			3		1	2					1	7
83	Bi			2	3	1	1		4			2	13
84	Po												
85	At												
86	Rn												
87	Fr												
88	Ra												

Z	S	A	all	σ_t	σ_{nn}	$\sigma_{nn'}$	n,γ	n,f	n,x	Res. Params.	Stat. Params.	Other *)	Total
89	Ac												
90	Th		3	7	6	3	2	1	1			1	24
91	Pa			1			1						2
92	U		5	5	2	5	1	3				5	26
92	U	232	1	1			1						3
92	U	233		1				11					12
92	U	235		4			1	31					36
92	U	238		11	3	7	2	15		1	1	7	47
93	Np												
94	Pu		5			1		1				2	9
94	Pu	238	1					19					20
94	Pu	239		1			1	22				1	25
94	Pu	240	1	1									2
94	Pu	241		1	2	1	1	33		1	1	1	41
			35	155	180	225	283	136	188	48	16	254	1520

*) Other : mainly neutron emission cross sections, (n,2n),(n,3n) etc., and γ production cross sections.

REQUEST STATISTICS

Table IV

Requests for experimental data sorted by Requesters' Category

1.4.1973 - 31.3.1974

Area 2

Requesters' Category	N° of Requests	% of Known category
Experiment	16	18%
Evaluation	49	54%
Research	6	7%
Applied field	16	18%
Compilation, review	3	3%
Total known	90	100%
Unknown	60	
Total	150	

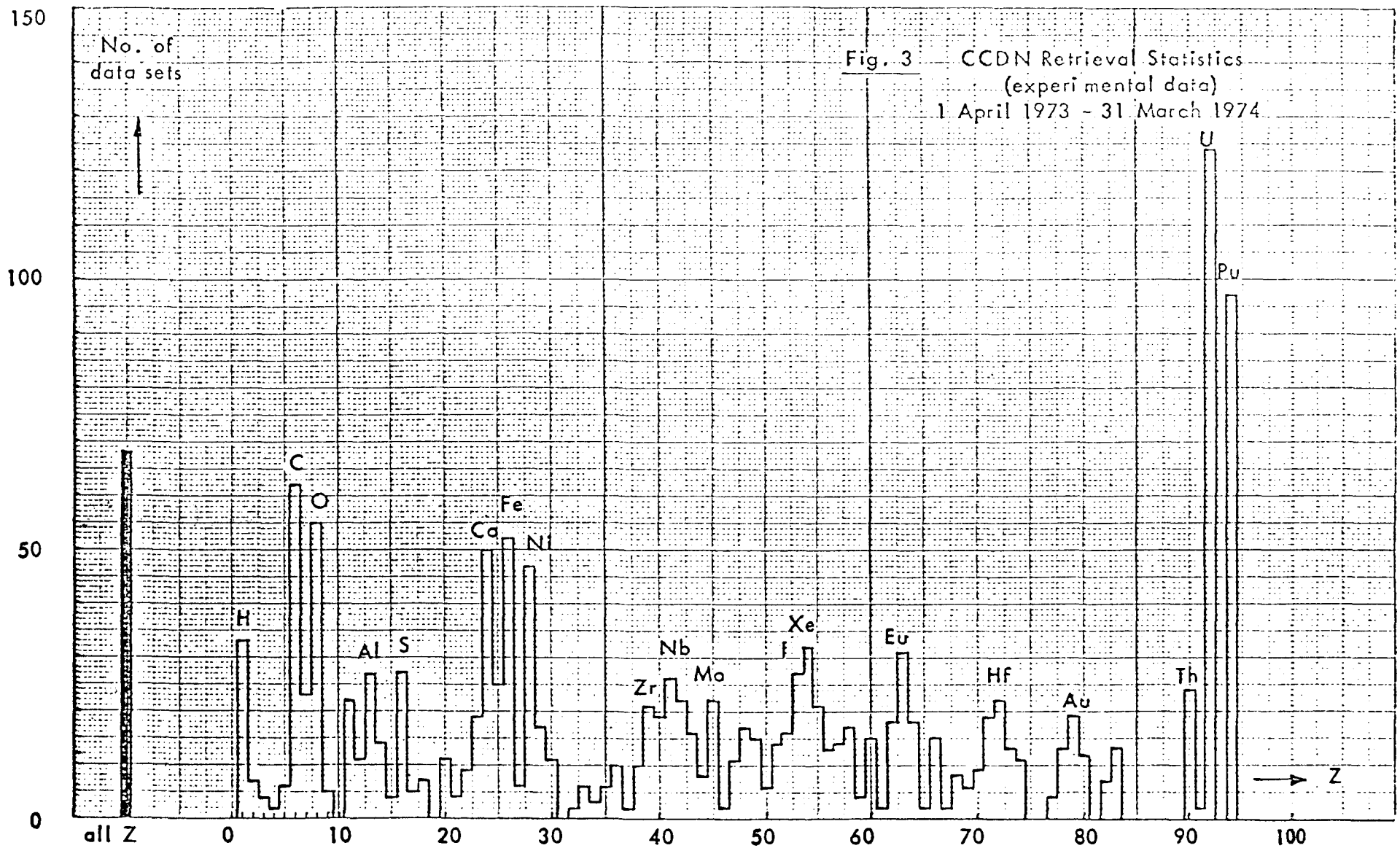

Fig. 3 CCDN Retrieval Statistics
(experimental data)
1 April 1973 - 31 March 1974

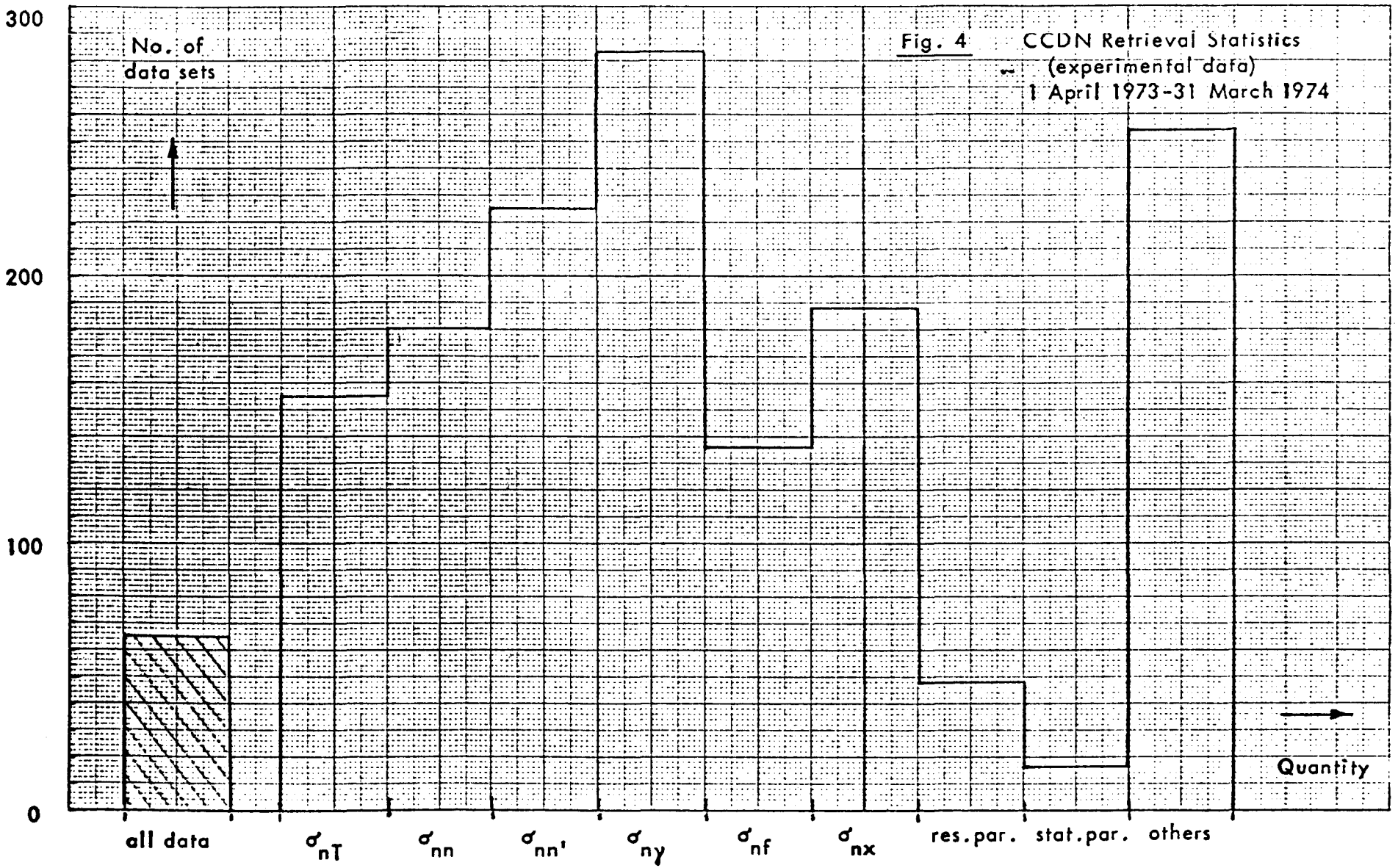

Fig. 4 CCDN Retrieval Statistics
(experimental data)
1 April 1973-31 March 1974

NDS Report to Tenth 4C-Meeting

1. STAFF

1.1 Since the last 4C-Meeting, Leif Hjärne and Peter Winiwarter left the Section in June 1974, and Francisco Manero in September. Charles Dunford is leaving beginning of May 1974. Alex Lorenz, who is well known to everybody joined the Section again in October 1973. He is deputy head of the Section and responsible for non-neutron nuclear data. Peter Smith from Canada joined the Section in November 1973. He is responsible for WRENDA. Mr. Khalil from Iraq is supposed to join the Section in July 1974. He will do compilation and data-request work. Meinhart Lammer, who was responsible for Cinda compilation, will leave the Section in summer 1974 and will be replaced by his wife Traudl Lammer.

1.2 One post was vacant throughout the report period, and for several months even two or three posts were vacant. As a result there was permanent shortage of manpower for compilation work.

2. CINDA

2.1 CINDA 74 is being published on schedule. For the first time, it will serve as a data index to the Exfor data exchanged by March 1974, to the Bologna library, and to some parts of the UK library. The completeness of Cinda-entries can be regarded as very good for the NDS area.

2.2 The NDS Cinda work suffered from the fact that some details of the NDCC Cinda system are not yet properly working. We hope that these items will be solved during this meeting.

2.3 The Cinda card-check program has been brought up-to-date with the input specifications of the new system. It will soon be linked directly to the Exfor dictionaries for ref-codes and lab-codes in order to avoid duplicate up-dating of dictionaries.

3. EXFOR

3.1 After finishing the conversion of old Dastar data into Exfor, Exfor compilation continued at a somewhat reduced rate.

3.2 The coverage of new data was fairly good in fall 1973, but due to the lack of manpower (see above), some backlog has developed since then.

3.3 Computer programs were written or improved for indexing incoming Exfor tapes in Cindu, and for indexing all area 3 + 4 Exfor entries in Cinda.

3.4 Great care has been given to the detailed discussion of the planned revision of Exfor to allow for more-dimensional tables.

4. EVALUATED DATA

4.1 A number of new or revised files from the UK-NDL were received.

4.2 The USSR Nikolaev library has been received on tape. This tape was not quite in order; a number of records in different parts were not readable. Since the tabular data were available, the tape could be prepared but not earlier than on 2 May 1974. Copies of the tape will be sent to NDCC and NNCSC.

4.3 The ENDL library from Livermore has been received.

4.4 Some supplementary files of the Bologna library were received.

4.5 Information about evaluated available data will be sent out to customers.

5. CUSTOMER SERVICES

5.1 The NDS statistics for the period 1 May 1973 to 30 April 1974 is submitted as a separate paper. The total number of requests received has slightly decreased, most likely due to lack of advertising. In the report period there was no advertising by a field trip nor by an issue of CINDU or a Newsletter. Due to lack of manpower, any advertising was postponed to a later date.

5.2 Customer services in the NDS area are still much hampered by the incompleteness of Exfor. We obtain much of the data missing in Exfor from Neudada retrievals provided by NDCC. But the inconvenience for data users to get data-retrievals in two different formats is obvious.

5.3 Requests for numerical data are usually supplemented by a Cinda retrieval provided by NDCC.

6. TRANSLATIONS

Translation of USSR documents continued as far as was possible with the translation manpower available at IAEA. In fact, the delay in translation of USSR progress-reports is such that the translations will be of limited value only at the time they come out. The situation must be reviewed.

7. DATA REVIEWS

7.1 The review by A. Calamand on the cross-sections for fission-neutron spectrum induced reactions was published in INDC(NDS)-55,Sept 1973. It will be included as one chapter in a data handbook for neutron activation analysis.

7.2 Work continues on the review of neutron dosimetry cross-sections. Part I,containing the first priority reactions, was published in October 1972, part II is in preparation.

7.3 The evaluation of the 2200 m/s and thermal neutron data of the fissile isotopes is continuing. It was much delayed by lack of manpower. An intermediate version was used, with some adjustments, for ENDF/B-4.

8. REQUEST LISTS

8.1 The re-programming for WRENDA has been completed, the documentation is being prepared.

8.2 WRENDA 74 was given to the printers on 15 April 1974 as scheduled.

9. RESEARCH SUPPORT

9.1 The target-and-samples program continues.

9.2 A cooperative research program has been started to measure the Rh-103(n,n')Rh-103m reaction in various energy-intervals from threshold to 20 MeV. Cooperating institutes are at Pretoria (South Africa), Sao Paulo (Brazil), Geel (Liskien), IAEA Seibersdorf lb (Czock, to supply Rh-103 samples), Mol (Fabry, for integral measurements).

10. NON-NEUTRON NUCLEAR DATA

10.1 A Questionnaire is being prepared, which is to have a very wide circulation, in order to find out which data are required in which presentation.

10.2 See also under meetings.

11. PAST MEETINGS

11.1 Consultants Meeting on Nuclear Data for Reactor Neutron Dosimetry, 10-12 September 1973, Vienna. See INDC(NDS)-56.

11.2 6th INDC-Meeting, 8-12 October 1973, Vienna.

11.3 Panel on Fission-Product Nuclear Data, 26-30 November 1973, Bologna. Proceedings are being prepared.

11.4 M. Vlasov attended the Euratom Working-Group on Reactor Dosimetry, 14-15 March 1974, Brussels.

11.5 Consultants Meeting on Charged-Particle and Photonuclear Data, 24-26 April 1974, Vienna.

11.6 Specialists Meeting on Nuclear Data for Applications, 29 April-3 May 1974, Vienna.

12. FUTURE MEETINGS

12.1 A. Lorenz will attend the CODATA Meeting, 24-27 June 1974, Erevan, USSR.

12.2 7th INDC-Meeting, 7-11 Oct 1974, Lucas Heights, Australia.

12.3 Specialists Meeting on Nuclear Data for Transactinides, March 1975, Karlsruhe or Paris.

12.4 Consultants Meeting on the Use of Nuclear Theory in Nuclear Data Evaluation, Fall 1975, Vienna.

12.5 The Third Nuclear Data Conference remains uncertain.

Requests for	Experimental Data		Evaluated Data		Documents		Cinda Retrieval		TOTALS	
request origin	Cumulat. Totals	1 May 73 -30 Apr74	Cumulat. Totals	1 May73 -30Apr.74	Cumulat. Totals	1 May 73 -30Apr.74	Cumulat. Totals	1 May 73 -30Apr.74	Cumulat. Totals	1 May 73 -30Apr.74
Incoming from area:										
1	26	2	1	0	42	9	0	0	69	11
2	39	4	4	2	93	28	1	0	137	34
3	91	10	64	11	85	14	16	1	256	36
4	44	1	16	0	14	2	7	0	81	3
Subtotal	200	17	85	13	234	53	24	1	543	84
Follow-up to area:										
1	66	2	2	1	0	0	0	0	68	3
2	65	3	15	0	2	0	20	4	102	7
3	50	2	2	1	1	0	0	0	53	3
4	37	1	1	0	3	0	0	0	41	1
Subtotal	218	8	20	2	6	0	20	4	264	14
NDS origin, sent to area:										
1	27	2	1	0	2	0	0	0	30	2
2	33	2	8	0	4	0	8	0	53	2
3	129	8	0	0	4	3	0	0	133	11
4	13	1	2	0	0	0	0	0	15	1
Subtotal	202	13	11	0	10	3	8	0	231	16
TOTALS	620	38	116	15	250	56	52	5	1038	114

* From NDS to other centres (or physicists in area 3) to help fulfil an incoming request.

Experimental D DLOG

AREA	No. of data sets		No. of data lines	
	cumulative	1May73-30Ap74	cumulative	1May73-30Apr.74
1	2 527	47	68 139	1 742
2	3 599	124	69 336	1 553
3	4 339	898	406 930	95 119
4	623	15	160 999	17 370
TOTAL	11 088	1 084	705 404	115 784
TOTAL		(7 877)		(254 387)
(previous period)		639		136 761

Evaluated data dissemination log

AREA	No. of data sets		No. of data lines	
	cumulative	1May73-30Ap74	cumulative	1May73-30Apr.74
1	1 172	403	228 099	935
2	1 096	200	246 156	2 596
3	5 395	1 936	2 196 437	446 862
4	1 798	309	739 091	83 484
TOTAL	9 461	2 848	3 409 783	533 877
TOTAL		(1 994)		(628 474)
(previous period)		1 379		578 831

Note: The figures in brackets are due to the dissemination of NDS data reviews of certain data types which have been retroactively entered in the logs for good order's sake; these reviews contain both evaluated and experimental data sets. The figures below are the statistics as they were given at the last 4-C-Meeting.

Dissemination from EXFOR files

Overall Period

Exfor data from area	no. of sub-entries	no.of lines
1	1071	58 901
2	672	174 636
3	474	4 688
4	136	1 569
TOTAL	2 353	239 794

Period May 73 - April 74

Exfor series from area	no. of sub-entries*	no.of lines*
1 + 5	120 + 238 = 358	13 749 + 8 085 = 21 834
2 + 6	131 + 99 = 230	67 078 + 792 = 67 870
3 + 7	132 + 3 = 135	381 + 20 = 401
4 + 8	52 + 59 = 101	763 + 596 = 1 359
TOTAL	435 + 399 = 834	81 971 + 9 493 = 91 464
TOTAL previous period:	563	84 747

* First figures refer respectively to the EXFOR data entries beginning with 1,2,3,4;
second figures to the EXFOR entries beginning with 5,6,7 and 8 (i.e. the older NNCSC files).

Sent to: East Germany (DDR), India, Israel, Poland, Romania, South Africa

Period 1 May 1973 - 30 April 1974

Quantities requested - Experimental data

(Figures in columns represent centers 1,2,4 and area 3) -
In general, each ZAQ indicated was requested only once -

Element	ALL/ MANY	SCATTERING													N,CHARGED P					FISSION					
		RIA	RES	LDL	T/T	SEL	DEL	SIN	DIN	DNC	SCT	TSL	SNE	ABS	NG	N2N	NP NNP	ND	NT	NA NHA	NF	ALF	ETA NU	NFY FRS	
01 H 003	3																								
01 D 002					3	3	3																		
04 Be 009			3		3	3	3	3	3							3			3	3					
06 C 012						3		3					3			3	3	3	3	3					
08 O 016					3	3	3																		
24 Cr															1										
25 Mn															1										
26 Fe					4																				
26 Fe 054					4																				
26 Fe 056			4																						
28 Ni															1										
33 As 075					3	3	3																		
45 Rh 103			3		3	3	3	3	3																
47 Ag															1										
49 In															1										
51 Sb															1										
79 Au															1										
90 Th 232						3	3	3	3																
92 U 233			3																						
92 U 235					3	3	3	3	3																
92 U 238			3			3	3	3	3																
94 Pu 239						3	3	3	3																

SOME COMMENTS RESULTING FROM COMPARING STATISTICS OF
MAY 72 - APRIL 73 and MAY 73 - APRIL 74

- The total number of requests (all types) has dropped.
  146 versus 114*.

- The number of follow-up requests has decreased.

  For 93 incoming requests, there were 26 follow-up requests made
  For 84* incoming requests, there are 14 follow-up requests made

  Among these 14 requests, there are:
  2 directed to NNCSC (1 for evaluated, 1 for experimental data)
  7 " " NDCC (4 Cinda retrievals, 3 for exp. data)
  1 " " CJD for experimental data.

As of today all these follow-up requests have been filled, except the one directed to CJD, where the data were announced to be on the way.

- Requests for experimental data have dropped by ≈ 45%:
  63 against 38.*

- From these 38 requests, one can see by the type of follow-up requests mentioned above that 33 could be satisfied at NDS from EXFOR and Dastar files.

- Referring to the experimental data dissemination log, the number of sets and lines dispatched reflect a somewhat constant volume of activity. This means that the number of data sent per request has increased.

- Requests for evaluated data are less numerous for the present period:
  21 against 15.*

  Here again, the evaluated data dissemination log shows a more or less constant volume of evaluated data sent out. This results from the fact that evaluated data are sent out either on a specific request, or automatically to interested recipients.

- Cinda retrievals remain constant: 4 against 5.

- Requests for documents remain more or less of the same amount:
  54 versus 56.*

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* First figure given = last period
  2nd " " = May 73 - April 74

- Filled and Unfilled Requests:

For a total of 114 requests:

9 document requests with 13 items,

11 experimental data requests with 13 items are unfilled.

- No other type of requests appear in these statistics.
- Note that the previous years contain no unfilled requests, so that the overall period (1033 requests) have the same 20 requests unfilled.
- Thus they may be called "stand-by" requests more than "unfilled".

NUCLEAR DATA CENTRE (CJD) PROGRESS REPORT

EXFOR. Nuclear Data Centre has sorted all the experimental works published during I970 - I973 years. Status of compiling the works which are to be compiled in EXFOR and have been published since introducing EXFOR - format is shown in the following table (by the first of March I974):

Year	Total number for compiling in EXFOR	Compiled in EXFOR	In process	Numerical data requested
I970	40	29	6	5
I97I	68	44	8	I6
I972	43	36	I	6
I973	35	7	8	20
I970-I973	I86	II6	23	47

During the period of I968-I969 years I50 experimental works were published. 43 from this number have been compiled in EXFOR. Now sorting of the works of the above-mentioned period is being completed.

Since the last four centre meeting the emphasis on compiling the works published during I970 - I973 years has been made. The tapes 40I4, 40I5, 40I6, containing 42 entries have been transmitted. The tape 40I7 is being prepored for sending. Considerable efforts have been spent in CJD to put into proper order the EXFOR library (rewriting old tapes, inserting corrections).

In the main this work has been completed. The cataloque on Z, A has been made. The work on programs relating to the EXFOR library is continued. We have put into operation the program which enables putting on a magnetic tape error detecting and error correcting codes and in this way to make more reliable reading of nuclear data information. This year CJD makes attempts to involve the measurers themselves in compiling in EXFOR their own works.

EVALUATED DATA. Nuclear Data Centre continues developing the full file for iron. Two programs for calculation of resonance neutron cross section are put into operation. It has provided

output of the results to the plotter. A number of programs relating to the evaluated data library has been put into operation at CJD (including programs of ehecking and converting the data from other formats to the soviet one).

DEVELOPMENT OF SOFTWARE AND HARDWARE OF M-222. FORTRAN has been put into operation in CJD on the computer M-222 and we began to use it. We also began the works on connection the new four 9-tracks magnetic tape units with the computer. It will be possible then to use a I/2 inch magnetic tape.

DETERMINATION OF REQUIREMENTS AND NUCLEAR DATA ADJUSTMENT. The work on a system of programs for general perturbation theory, planning of experiment and nuclear data adjustment has been completed. This permits CJD to use the evaluated integral experiment library for making nuclear data correction. On the basis of the above-mentioned system the requirements in nuclear data accuracy are being worked out taking into account integral experiments (priority I) and without their consideration (priority 2).

CJD EDITION. During the prévious period the Bulletin "Nuclear Constants No. I2 and collections of abstracts "Nuclear Physics Investigations in the USSR No. I5 and No. I6 have been issued.

REQUESTS. Nuclear Data Centre has received from institutes 76 requests:

documents	I7 requests
evaluated data	26 requests
experimental data	33 requests.

CJD have sent 43 documents to these requets. Of 59 requests on numerical data 49 requests have been fulfilled completely. In comparison witn the previous period the number of requests has increased twice.

The quota of the requests from measurers appreciably increased.

SCISRS-EXFOR Conversion

Among the preliminary EXFOR entries created automatically from the old SCISRS file, NDS found the following correspondences with final EXFOR entries. Thus, the preliminary EXFOR entries listed in the left-hand column below should be deleted.

Preliminary	Final
EXFOR-50084.003	= 10143.009
EXFOR-50084.004	= 10143.009
EXFOR-50915.002	= 10100.003
EXFOR-50915.004	= 10100.004
EXFOR-51674.003	= 10009.002
EXFOR-51739.003	= 10207.
EXFOR-51851.008	= 10040.
EXFOR-52070.002	= 10032.002
EXFOR-52070.003	= 10032.002
EXFOR-52070.004	= 10032.
EXFOR-52070.005	= 10032.002
EXFOR-60064.002	= 20025.002
EXFOR-60064.003	= 20025.003
EXFOR-60455.002	= 20129.008
EXFOR-60455.003	= 20129.006
EXFOR-60457.002	= 20117.
EXFOR-60457.003	= 20117.
EXFOR-60457.004	= 20117.
EXFOR-60686.002	= 20072.002
EXFOR-60688.002	= 20075.
EXFOR-60759.002	= 20139.003
EXFOR-60759.003	= 20139.005
EXFOR-60759.004	= 20139.004
EXFOR-61124.002	= 20024.007
EXFOR-61156.002	= 20142.005
EXFOR-70205.002	= 30046.002
EXFOR-70205.003	= 30046.004
EXFOR-70205.004	= 30046.005
EXFOR-72000.002	= 30111.003
EXFOR-80033.002	= 40055.003
EXFOR-80033.003	= 40055.003
EXFOR-80033.009	= 40055.002
EXFOR-80041.002	= 40021.002
EXFOR-80093.002	= 40074.004
EXFOR-80099.	= 40062.
EXFOR-80099.002	= 40062.
EXFOR-80099.003	= 40062.
EXFOR-80099.005	= 40062.
EXFOR-80099.007	= 40062.
EXFOR-80099.008	= 40062.004
EXFOR-80205.003	= 40077.002
EXFOR-80316.002	= 30209.002
EXFOR-80328.003	= 40132.002

Memo 4C-3/98, revised

To be entered in LEXFOR:

REFERENCE

Under the information-identifying keyword REFERENCE, not only should the reference from which the data was taken be mentioned, but also other important references such as journal articles, conference papers, and laboratory reports. Progress reports and abstracts may be excluded.

For the coding rules see pages VIII.6 to VIII.11 of the Manual.

The purpose of the bibliography is to help the compilers

- to avoid duplicate entry of data in EXFOR, and
- to help identifying a data set when data are requested by reference, and to help the users of EXFOR,
- to get easy access to any additional information he may wish to look up in the published references,
- to check whether a given reference has been considered by the compiler or not.

Therefore, the free text should indicate to the user of EXFOR :

* which is the main reference,
* the kind of information contained in each given reference, e.g. "instrumentation only, graphs only, no data, theoretical analysis, etc..."

When translations of references exist, these should be included also, for the convenience of the users of EXFOR.

Important references which are published only after the first compilation of the EXFOR entry, should be added subsequently and the entry be retransmitted according to page IX.2 of the Manual. Usually such a new reference will provide additional information on the experiment or the numerical data, which should be added and retransmitted simultaneously.

If data have been received by private communication, name and date of the private communication may be entered under "STATUS" or as a reference (see page VIII.10).

Note : NDS feel that a private communication should only be entered under REFERENCE if there is no other reference. If a published reference exists, a reference to a private communication seems usually redundant and of no use. NNCSC does not agree.

If the coding of the references in EXFOR is coordinated with the blocking of the same references in CINDA, both systems will benefit. Compilers at NDS should take care that the bibliography in EXFOR and CINDA is always identical.

LEXFOR ENTRY

GENERAL QUANTITY MODIFIERS

The general quantity modifiers are AV, SPA, FIS, MXW, FCT, REL and RAW. They can be added to any quantity without requiring an entry in dictionary 14. Some of them require clarification :

1. The RAW modifier is used for raw or uncorrected data such as transmission data, reaction yields, raw gamma spectra, etc. A centre is free to transmit or not to transmit this data but if it decides not to do so, a dummy entry with NODATA should be transmitted stating under STATUS under what reference the data is available at the centre (*). If applicable energy range and rough size of the data set should be mentioned. The RAW-modifier should always be explained in free text.

2. The FCT modifier is used if the data has been multiplied by a defined factor not containing another quantity (e.g. a mathematical factor, an abundance or a branching ratio). Explanatory free text is compulsory. If the factor contains another quantity, the appropriate ISO-QUANT combination is to be used, except in the case of a ratio of the same quantities (see REL-modifier).

3. The REL modifier is used in case of shape normalised data, i.e., data proportional to the quantity given. There are two cases :

   a. The normalisation factor is unknown. ARB-UNITS should then be used.

   b. The cross-section is divided by a cross-section at a certain energy or angle. In this case the units are left to the discretion of the compiler.

   Note : NDS will always use ARB-UNITS if the REL-Modifier is used.

   An exception to case b. is the ratio relative to the cross-section at 90 degrees, in which case the RSD modifier has to be used with units NO-DIM.

   The REL modifier always needs explanation in free text.

(*) This data should be made available in some format to the centres upon request.

Proposal for the retransmission of subentries which have been combined into one subentry

In the case of a retransmission of a series of subentries (x through y) which have been combined into one multidimensional table, the following simplified flagging system may be used:

1. Enter under history in the combined subentry:
   (yymmdd) Subentries x through y combined
2. For subentries x + 1 through y transmit NØSUBENT records containing the subentry number in the n_1 field and an * in Col. 80.

Appendix K

Storage and Retrieval of Neutron Capture Gamma-Ray Spectra

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1. Background

Recently, it has been suggested that neutron resonance capture gamma ray data should be stored in the CSISRS data files along with the neutron cross section data. Such information is needed for studying nuclear structure and for obtaining accurate values of neutron binding energies. In addition, the data are necessary for shielding and energy deposition calculations and "prompt" activation analysis. It is necessary to record the gamma spectra with the best possible resolution and supplement it with coincidence and angular correlation measurements and other data for the basic physics needs. However, for shielding applications the gamma spectra need by given in broad bands 0.5 MeV or so wide. For activation analysis a few of the more intense gamma rays are needed and it may not be necessary to catalogue every gamma transition observed. In storing the capture gamma rays, one is immediately faced with the enormous volume of the data. The data as recorded by a Ge(Li) detector may contain a few hundred gamma rays measured at thermal neutron energy and a few neutron resonances. Lower energy gamma rays measured with a crystal diffraction spectrometer have resolved thousands of gamma rays in a limited energy region ($E_\gamma < 1.5$ MeV) in the case of a few rare earth nuclei. A rough order of magnitude estimate indicates that the total data will be of the order of 5×10^6 data points. The size of the current CSISRS-2 library

is about 1.2 x 10^6 data points. Therefore, the capture gamma library could be handled by the existing programs and techniques. The entry of new data into the library could be further facilitated if the experimenter sends his data on magnetic tape in a standard format. However, one cannot help asking the question: is it necessary to store all the captute gamma ray data in all its detail? The following are a few alternate suggestions which should be considered.

One such suggestion is to leave out the weak gamma rays whose intensities are below a certain value. This would reduce the size of the data files. Besides, gamma rays which are very weak in all the resonances may be due to background, impurities or quirks of the fitting program so that no one would miss them. The immediate reaction to this proposal is that this implies an evaluation and that the data files should contain every bit of information the experimenter thought worth reporting.

Another suggestion that is usually put forth is to bunch the gamma rays into bins a few hundred keV wide. This proposal may be even more repugnent than the first one because it implies loss of information by degrading the experimental data to suit a particular application, e.g.: shielding calculations. Besides, this loss of information will be felt when more sophisticated future applications need the details.

An easy way out is to propose that every bit of detail in the measured data should be entered into the data files. These are needed of course for nuclear structure studies though coincidence measurements and other data are necessary to make use of them. Besides, one always has the feeling that if all such data are not available somewhere they are for ever lost to the scientific community and somehow the sum total of human endeavor would be the lesser for it. Besides, it is usually said that if thousands of gamma

lines were worth measuring then they are worth storing though some of the silent minority might wonder were they worth measuring?

Assuming that the proposal to store the detailed gamma spectra as reported by the experimenter is generally acceptable it appears necessary to decide what kind of primary and auxiliary information should be stored and the formats for doing it.

Some thoughts on the physics information of the data one should store are discussed in the rest of this memorandum. It seems more appropriate to go into the details of the format and the mechanics of storage and retrieval after the physics content has been agreed upon. Capture data can be coded within existing formats and more efficient formats are under development. Though one should mention again that it would very convenient if the data is available on a magnetic tape directly from the experimenter. This would obviate the need to code the data manually from the printed page with its attendent errors and delay.

A few enquiries at likely places have shown that at present capture data is not available on magnetic tape or any easily transmittable form. The only exception seems to be the one data set of Rasmussen et al. on thermal capture.

2. Introduction

This memorandum discusses the details involved in entering resonance neutron capture gamma ray data in the CSISRS data files and the exchange format. Such data used to be measured with NaI(Tℓ) detectors or with one of a group of magnetic spectrometers. With the advent of Ge(Li) detectors, the quality of the capture gamma ray data showed great improvement because of better detector resolution and appreciable efficiency. In the meantime, high resolution crystal diffraction spectrometers were also developed, spurring further improvements in the different types of magnetic spectrometers. The result of all these advances in experimental techniques has been the collection of large amounts of capture gamma ray data of excellent quality and very good energy resolution. Thus, it is not unusual to find publications reporting hundreds of well-resolved gamma rays measured over quite a few neutron resonances. With the development of more intense pulsed neutron sources and time-of-flight arrangements capable of better energy resolution, it is to be expected that one would be able to measure capture data in more resonances up to quite high energies. With such an enormous increase in the quantity of experimental data, it is very important to decide at the outset what different types of data are to be entered in the data files, at what stage of the analysis the experimental data is to be considered as primary data, and other related problems. Some of these questions are discussed in the following pages and a few answers suggested.

3. Experimental Data

The first question one should try to answer is whether the data entered in the files be in the form of say the pulse-height spectrum as recorded by a multi-channel analyzer. The answer is a definite no for the following reasons. Apart from the fact that such data tend to be very voluminous, (4096 channel analyzers are common these days) the main objection against such a procedure is that the raw data are very dependent on a particular experimental arrangement, and it would be very difficult to find a common basis for comparison between data from different sources. Thus, the raw data from Ge(Li) detectors is very dependent on all the different instrumental variables like the detector resolution, efficiency, background, scattering from the surroundings, data collection time, counting rate corrections, detector size and configuration, to name only a few. It would be almost impossible to list all the characteristics of the apparatus needed to analyze the data by suitable unfolding procedures. This confusion could be further compounded by the fact that data from different types of apparatus are available in different gamma energy regions and would have to be combined to give a composite picture of the whole gamma spectrum. Hence, it is evident that the data that are entered into the files should not be the raw data but the end product of a type of unfolding best done by the experimenter who is most familiar with his apparatus.

The result of such preliminary analysis is usually given as gamma ray energies and their intensities (photons/100 neutron captures) either for incident thermal neutrons or for capture in a specific neutron resonance. In addition, other auxiliary data like the spins of neutron resonances,

spin-parity of bound nuclear states, polarization data, (n,γ) and (d,p) corrélations and a number of different pieces of information are reported in the published literature. Therefore, the next question to be answered is which of these should be coded into the data files and which should be left out.

4. Specific Data Quantities

The choice of quantities for coding into the data files should perhaps be governed by their use in practical applications. This pragmatic view point does not make such a choice very easy because apart from a few obvious examples the data needed for practical use is limited only by the fruitfulness of ones imagination and how sophisticated the applications are. A list of these quantities is given below as a starting point. This choice was suggested by present applications or those expected in the near future. This list could be enlarged at a future date as dictated by new applications and the experience gained by entering the capture gamma data into the data files. It may be that the list is too long as it is.

For convenience, these quantities have been divided into two broad groups viz: those that belong to the DATA or CØMMØN subsections of EXFOR and those that correspond to auxiliary or supplementary information and should be given in the BIBLIOGRAPHIC section. They are listed on the left-hand side column of these tables and on the right-hand side are given comments either explaining or justifying their choice.

I. DATA or CØMMØN Sections

Quantity	Comments
E_R	Resonance energy.
$J_R^{\pi_R}$	Resonance spin-parity. Independently known or determined from capture γ angular distribution data, multiplicity or ratio of low energy secondary γ rays, or polarization experiments.

Quantity	Comments
ℓ_R	Resonance angular momentum.
$\Gamma_{nR}, \Gamma_{\gamma R}, \Gamma_{FR}, \Gamma_R$	Neutron, gamma, fission and total widths of the resonance.
E_{n_1}, E_{n_2}	Energy limits of the neutron beam. This would specify the range of neutron resonances covered as in the average capture measurements with an internal target. This could also define a filtered beam, e.g., the 24 keV beam with an Fe filter.
$E_{\gamma i}$	Energy of the i-th gamma-ray.
$I_{\gamma i}$	Intensity of the discrete gamma-ray, given as number of photons/neutron capture.
$E_{\gamma_1}, E_{\gamma_2}$	Energy limits of a group of unresolved gamma rays.
$\nu(E)$	Number of γ-rays per capture per unit energy interval in the continuum.
$\Gamma_{\gamma i}$	Individual γ-ray width in eV.
$\frac{d\sigma_{\gamma i}}{d\Omega}(E_n, \theta)$	Differential cross section for producing a gamma-ray $E_{\gamma i}$ at neutron energy E_n at angle θ.
$\frac{d\sigma_{\Delta E_\gamma}}{d\Omega}(\Delta E_n, \theta)$	Differential cross-section for producing a gamma continuum E_γ to $E_\gamma + \Delta E_\gamma$ by neutron of energy E_n to $E_n + \Delta E_n$ at angle θ. This quantity could also contain a mixture of discrete and continuum γ-rays.
$\nu_n(E) = \frac{\nu(E)}{\int_0^U \nu(E)dE}$	Normalized energy distribution of the whole γ spectrum where ν has been defined before and U is an upper limit of integration, usually $U = B_n$ (B_n = binding energy).

II. BIBLIOGRAPHIC INFORMATION Section

EL., ML	Multipolarity of the γ-ray.
δ_L	Mixing ratios of different multipoles.

Quantity	Comments
$J_i^{\pi_i}$	Spin-parity of initial state, which may be a bound state or a neutron resonance.
$J_f^{\pi_f}$	Spin-parity of final state.
$T_{1/2}$	Half-life of a bound state if it is an isomeric state.
T_{if}	Transition probability for a γ transition from initial state i to final state f.
α_{pair}	Internal pair formation coefficient (usually denoted by Γ), if experimentally determined.
α_K, α_L, α_M, etc.	Internal conversion coefficients for K, L, M, etc. shells if experimentally determined, for: (a) Primary γ-rays: These are of theoretical interest and are used to assign multipolarities for these transitions. (b) Low Energy Secondary γ-rays: These are important in practical applications involving calculations of energy deposition in moderately thin aggregates of matter. Because of this process, there is a decrease in intensity of the low-energy γ-rays as some of them are internally converted, depending on their multipolarity, etc., with the appearance of intense peaks of the characteristic x-rays. Such a softening of the γ-spectrum and a change in its energy distribution materially affects the amount of energy absorbed in a shield or a sample.
ω_K, ω_L, ω_M, etc.	Flourescence yields of K, L, M, etc. shells. These define the ratio of the number of photons emitted when vacancies in an atomic shell are filled to the number of primary vacancies in the shell. T ese are important as they determine the actual number of x-ray quanta emitted.
$\frac{\Gamma_\gamma}{\langle D \rangle}$	Photon strength function.
$\sigma_{\gamma Direct}$	Direct capture cross section, i.e., the capture cross section between resonances as calculated from off-resonance capture (valid for well separated resonances).

Quantity	Comments
B_n	Binding energy of the neutron in the nucleus (Z,A+1) where (Z,A) is the target.
$\overline{B}_n = \frac{\sum_i a_i \sigma_{ci} B_{ni}}{\sum_i a_i \sigma_{ci}}$	Effective binding energy of an element containing more than one isotope where a_i is the fractional abundance of the i-th isotope, σ_{ci} its thermal capture cross section, and B_{ni} its binding energy.
$S_n = \sum_i I_{\gamma i} E_{\gamma i} + \int_0^{B_n} E_\gamma \nu(E_\gamma) dE_\gamma$	This quantity, formed by summing over the discrete γ-rays and integrating over the continuum (after allowing for internal conversion etc.), may be called the "observed total γ-ray energy." It is sometimes called "observed binding energy," but this is not a good choice because B_n is the observed binding energy determined, e.g., by measuring the energy of a primary transition to the ground state of the nucleus (Z,A+1) in thermal capture. The ratio S_n/B_n gives a measure of the total γ-ray yield observed in an experiment. Because of missed γ-rays or because of the finite low-level bias of the measuring apparatus, this ratio may not be equal to one. In this case, the intensities are sometimes arbitrarily renormalized to make this ratio equal to one so as to have energy balance.
Polarization data	Results of measurements of either the circular or linear polarization of individual γ-rays, and the nuclear structure information derived from them.
Coincidence measurements	Results of such measurements on members of a cascade and information derived from them. For fissile nuclei, capture γ-rays are detected by measuring them in anti-coincidence with fission neutrons.
Ratios of low-energy secondary γ-rays	Resonance spins or nuclear level density parameters like σ, a, etc. determined from such data.
Angular correlation measurements	Perturbed or unperturbed angular correlation data and the nuclear structure information derived from them.
Conversion factor from intensities to widths	If this information is given by the author, it should be included. Usually it is based on thermal capture data.

Quantity	Comments
Neutron source	Type of neutron source, e.g., filtered beam, with its width and intensity distribution, or whether the target is inside a reactor as in the average capture technique, crystal spectrometer, etc. Also state of polarization of the neutron beam.
Target	State of polarization or of alignment of the target.
Detectors	NaI(Tℓ), Ge(Li) detectors. Crystal diffraction spectrometers: (a) curved crystal, (b) flat crystal. Magnetic spectrometers of various types.

5. Example of Coded Article

In this section an example of a coded article is given and some thoughts on the experience are expressed. The article is on thermal and resonance neutron capture in natural antimony. The experiment described in this article is a two parameter experiment, i.e., with the neutron and the gamma-ray energies as being independent variables. The exchange format is basically suited for accommodating the results of a one parameter experiment. Therefore, in coding the data of this experiment in the exchange format, one is immediately faced with its limitations and the tedium of repetition it imposes. In addition, a concise two dimensional table conveying a lot of information is broken into a number of disjointed columns of numbers. Therefore, it appears desirable to find a more efficient coding procedure.

There are two possible solutions to this problem. The first solution is to leave the exchange format unchanged and to strip the data tables to suit it. This could be done by a computer program which acts as a "compiler" and makes the coding of an article as it appears in the literature into the exchange format less painful. This has already been done at the NNCSC

by D. I. Garber who has a working program which does the conversion (private communication). The second solution is to change the exchange format so that it can contain a two dimensional table in a sensible, efficient fashion. If the coded information bears a one-to-one correspondence to the published data tables, it would be desirable but not necessary. There have been many suggestions as to how to implement these changes. A concentrated effort in this direction in the near future is indicated.

In concluding this section, an attempt is made to estimate the size of the capture gamma data library assuming the neutron and gamma-ray resolutions available now. Looking at some of the BNL fast chopper data the number of high energy primary gamma-rays observed per resonance varies from about 50 to 130. Let's assume an average of 100 for this number and a similar number for the low energy secondary gamma-rays. Further, if it is assumed that one can measure capture spectra in about 100 resonances per isotope with the best possible time-of-flight arrangement, for all the 300 or so stable isotopes available, one gets a grand total of 6×10^6 data points. This is perhaps an upper limit to such a number and as such may be considered to include more than one set of measurements available on an isotope.

```
ENTRY           12345                   5
SUBENT        12345001
BIB
INSTITUTE   (1USABNL)
REFERENCE   (J,PR/C,2,1115,70)
AUTHOR      (M,R,BHAT,R,E,CHRIEN,D,I,GARBER,O,A,WASSON)
TITLE        GAMMA RAYS FROM THERMAL AND RESONANCE NEUTRON CAPTURE
             IN SB-121 AND SB-123
FACILITY    (CHOPF) FAST CHOPPER AT THE BROOKHAVEN HIGH FLUX BEAM
             REACTOR, FLIGHT PATH 21.66M, CHOPPER RPM 10K, FOR
             THERMAL CAPTURE RUNS 1.5K,RPM
N-SOURCE    (REAC) REACTOR
METHOD      (TOF) TIME-OF-FLIGHT
SAMPLE      (POWDR) NATURAL ANTIMONY IN POWDER FORM, WEIGHT 854GM,
DETECTOR    (GELI) GERMANIUM LITHIUM DETECTOR 10C.C VOLUME ALSO A
             37C.C DETECTOR,
PART-DET    (G) GAMMAS
STATUS      (APRVD) APPROVED BY AUTHOR
HISTORY     (730401C)
ENDBIB
NOCOMMON
ENDSUBENT
SUBENT        12345002
BIB
ISO-QUANT   (51-SB-121,NG/WID,,PAR)
FLAG        (1,)  INDICATES UPPER LIMIT
COMMENT      BINDING ENERGY OF NEUTRON IN SB-122 IS 6806.6+-2.KEV
             FINAL STATE ENERGIES MAY BE OBTAINED BY SUBTRACTING
             PRIMARY GAMMA-RAY ENERGIES GIVEN BELOW FROM THIS.
ENDBIB
COMMON
EN-RES      SPIN J      MOMENTUM L
EV          NO-DIM      NO-DIM
6,24        3,          0,
ENDCOMMON
DATA
E           E-ERR       DATA        DATA-ERR    FLAG
KEV         KEV         EV          EV          NO-DIM
6806,6      2,0         0,1      -03               1,
6745,0      2,0         0,24     -030,03     -03
6726,4      2,0         0,1      -03               1,
6613,2      2,0         0,32     -030,03     -03
    .           .           .           .
    .           .           .           .
    .           .           .           .
    .           .           .           .
4331,3      2,0         0,42     -030,09     -03
ENDDATA
ENDSUBENT
    .
    .
    .       One Subentry/Neutron Resonance
    .
    .
SUBENT        12345003
BIB
ISO-QUANT   (51-SB-0,NG,INT,,PAR/SPA)
COMMENT      INTENSITIES NORMALIZED TO 1.18PHOTONS/PER 100 NEUTRON
             CAPTURE FOR THE 6523,6KEV GAMMA RAY AS GIVEN BY N,O,
             RASMUSSEN ET,AL, NUCL,DATA,VOL,A5,61,1968
ENDBIB
```

```
COMMON
EN=DUMMY
EV
0.0253
ENDCOMMON
DATA
E           E-ERR       DATA
KEV         KEV         PH/100
6806.6      2.          0.16
6745.6      2.          0.11
6728.9      2.          0.72
6716.8      2.          0.13
6524.7      2.          1.18
    .         .           .        Intensities Given as Photons/100 Captures
    .         .           .
    .         .           .
    .         .           .
4659.2      2.          0.25
4642.0      2.          0.20
4624.7      2.          0.14
4605.0      2.          0.15
4565.0      2.          0.17
ENDDATA
ENDSUBENT
    .
    .
    .        One Subentry/Neutron Resonance
    .
    .
ENDENTRY
```

CINDA: Points to be settled between NDS and CCDN

Report prepared by N. Tubbs for the meeting. It does not represent the conclusions of the meeting.

The list of points in dispute can be divided into two main sections : recriminations arising from disagreements, delays or misunderstandings during conversion to and start-up of the new system, and points which concern current running of the CINDA programs.

The first category is of largely historical interest, since nothing more can be done now. The current disagreements concern :

1. Matters of programming or operations procedure which have produced disagreement, but can be changed as soon as there is time and effort available. Here Centres need only agree on an order of priority, since no fundamental disagreement exists.

2. Matters in which a genuine disagreement of "principle" exists between NDS and CCDN. These questions may not be of very great importance in themselves, but sometime have very serious impact on the CINDA programs at CCDN.

In addition, a great deal of work has still to be done in consolidating the program system and operating procedures, and producing documentation. It is very difficult to foresee how much time will be taken up with transfer of CINDA to the new CCDN computer and in the U.S. with transferring the file and programs to NNCSC. As far as CCDN is concerned, help to NNCSC with the transfer, and safe transposition of our own system must have absolute priority. Effort required for solving problems currently in dispute must be weighed against the need to make progress with CINDA's more positive aims : improving the completeness and accuracy of the file, establishing permanent computer links to the experimental and evaluated data files, improving and extending service to customers and to compilers within the centres.

The present list is drawn from a study of CINDA correspondence between CCDN and NDS over the last two years, and is believed to be fairly complete. Other points may of course arise in discussion.

I. RETROSPECT

The three main causes of dispute have been the supply and checking of test material for the CINDA conversion, errors in the conversion itself and correction of these errors, and deadlines for despatch of CINDA entries, material for the CINDA foreword, and printed CINDA books. While some problems have caused rather bitter controversy, they are of little interest now that the system is running.

Points in this category which are not yet completely settled are :

1. **Corrections to entries with wrong authors or without authors, and other cosmetic corrections.**

2. Procedures for updating CINDA dictionaries, and the relation between CINDA and X4 dictionaries.

3. Distinction between entries with E min = 0 and E min = blank.

4. Transformation of remaining 'Reftype Z' entries to standard format.

5. Time lost in packing and transport of CINDA books between IAEA and CCDN.

II. PROBLEMS REQUIRING MINOR PROGRAM CHANGES

1. Size of CCDN feedback listings, and message content.

These two problems are linked, and may be solved easily. The size of the "errors only" listings sent to NDS is chiefly due to the number of warning messages. The circumstances giving rise to these warnings were decided at an early stage in programming, before any experience was available of the actual operation of the new system. In the light of experience it is clear that their rate of occurrence should be reduced. The content of messages is simply a matter of modifying a message table in the feedback program. Underlining errors requires more far-reaching program changes, impossible with the present CCDN computer because of limited time and memory size, and will not be attempted. For the same reasons, the choice of feedback format options available from CCDN can not be extended in the next year.

2. Quantity sort in the CINDA book.

Alterations to the quantity sort in the book can be made simply by changes to the CCDN booktape program. They cannot reasonably be made elsewhere without transforming the whole CINDA file to reflect the new order in the ISAM keys. In view of NDS' failure to obtain a consensus on this subject before conversion of the old file, we suspect that the matter is not widely considered as important enough to justify major changes in the file. We therefore prefer to leave the sort as it now is.

3. Coding rules for entries sent to CCDN

a. Leading zeros in energies : a minor point. We see no reason to forbid '0.5+6' for '1/2 MeV' since it is unambiguous and acceptable to CCDN programs.

b. Operations K and L to delete or link whole blocks : Other more urgent problems have held up programming and testing this option. Since Claes Rickeby is leaving the CCDN in May, it may be some time before they can be implemented.

c. Formats and coding rules for data lines : we believe that CCDN and NDS are now in agreement about EXFOR and evaluation index lines. Other possible types of data line remain in dispute, but none of these matters pose programming problems. Reftype 'N' for numerical is not yet implemented.

d. Checking of "reader vs. area" : CCDN is in strong disagreement with NDS' policy of hand assignment of block numbers, which made these checks necessary. However we have agreed to differ, and these checks have been effectively suppressed within (but only within) areas 3 and 4.

e. Some trouble has been caused in CCDN/US exchanges by entries corrected with operation M = Modify in which not all errors were corrected. This is a transient effect, and TIC, who were usually at the receiving end, modified their programs temporarily to accept such imperfect entries. We believe that it is agreed between all centres that in future all errors in an entry will be corrected.

f. Rejection of entries with unusual ZA or ZAQ : For historical reasons testing of Z vs. A is done by checking a dictionary of upper and lower A limits for a given Z, rather than against a (much larger) list of acceptable ZA combinations. ZA combinations outside these stability limits will be included in a supplementary dictionary or forced in by a special operation after checking. Similarly for some ZAQ (e.g. fission quantities for Z<82). This exception programming has not yet been done. Entries which fail the normal input tests will be sent back to NDS for checking before being forced into the file.

g. Underscores in modified entries : this requirement will be suppressed for references and comments, but retained for the energy field. The change is not yet made.

h. Reference coding formats : the most important change needed is to extend the testing of report codes to cover at least the whole generic code (rather than just its invariant root as at present) and if possible the whole report reference. While we can see a rather neat way of doing this, we have not yet had time, and may not have enough core space at present, to program it.

i. Effect of retroactive dictionary modifications on CINDA : a solution to the problem of changed laboratory and conference codes was presented in a recent letter to NDS. Briefly, where a few entries only are involved they should be modified individually, but where any large number if affected, the old abbreviation should remain in the file. Acceptable new codes would be transformed on input, while customer output would reflect the new name. Journal and report names may be modified without causing trouble, since such changes are not retroactive.

j. List of reference codes used in book-tapes : The present list contains a certain amount of redundant information : while its presentation can be improved, the program is used only twice a year and changes to it have low priority.

k. Elimination of cosmetic changes from CINDA supplements : The mechanism for distinguishing such changes is agreed, but the consequential changes to the request program have not yet been made.

l. We believe that a selection module must be included in the CCDN book-tape program in order to reduce the excessive size of some experiment blocks in the CINDA book. Suggestions for selection criteria have been made in letters to NDS and TIC.

m. Ordering of requests by ZA/Q/Publication date of main entry. Such a sort cannot be made directly on the normal CINDA records, but requires a special set of operations to find the main entry, add its date to all records in the block, sort as required, then to strip off this date before calling the standard print module. This has low priority.

III. PROBLEMS OF ORGANISATION

1. It is hoped to produce the new CINDA manual with a glued flexible binding so that leaves can be separated for inclusion in a looseleaf binder. CCDN do not wish to make continual modifications as is done in EXFOR, and for this reason the system is being allowed to settle down before the "definitive" manual is issued.

2. We do not think it appropriate to automatise production of the list of last issues scanned before a CINDA edition.

3. For as long as production of the CINDA books is not an entirely smooth and routine operation, it would be very helpful if NDS would keep open longer the possibility of last-minute modifications to introductory text, etc. Some imperfections could be avoided in this way.

4. From now on CCDN expects a period of extreme austerity as regards effort available for CINDA. NNCSC will have their hands full setting up their CINDA system. We would like to ask NDS and CJD for their co-operation in undertaking systematic corrections to and completion of the file, even as regards errors and omissions on which they would not normally expect to work.

IV. PROGRAM CHANGES DIFFICULT/IMPOSSIBLE FOR CCDN

1. Changes to feedback format other than to warning and error messages. We have now made all those changes requested by NDS which can be done reasonably easily within the structure of the CCDN system.

2. Alphabetic energy notation.

3. Changes to rules for update operations 'A' and 'B'.

4. The CCDN "internal" listing format, used also for communication with readers, cannot be altered, especially as regards presentation of neutron energies, due to lack of core space on the CCDN computer. We would expect this change to be relatively easy once CINDA is running adequately in a paged environment on the 370/125. This would perhaps make the feedback format more acceptable to NDS.

5. While an extra 14 characters is available within the CCDN programs for extension of comments within a single CINDA entry, overflow of the comment from one entry to the next cannot be handled.

V. MORE GENERAL PROBLEMS WHICH CANNOT BE RESOLVED QUICKLY

1. The very close relationship between the CINDA programs and the manual controlling the content and format of input makes it necessary to produce the two in parallel. Finalising (as far as such a thing is possible) the programs and the rules (manual) is necessarily a slow business and both need to be done by the same people. For this reason we have stressed the need for the two centres responsible for maintaining master files to have the last word in controversies about the coding rules, and in particular for CCDN to produce the manual for European readers. Because of manpower shortage, this process cannot be done rapidly, and readers will have to live with a temporary manual probably until the end of 1974.

2. For the same reasons, it is not always possible to give a rapid "yes-or-no" answer to NDS or other proposals.

3. In connection with maintaining the main CINDA file, CCDN has to do a great deal of work which may be invisible to NDS. NNCSC will shortly have similar difficulties of their own. We ask for understanding of delays in satisfying requests for even rather simple modification of programs : they will be made as soon as they get to the top of the priority queue which must exist for the programming effort available.

4. For reasons which have been discussed in correspondence, the computer coverage file lost towards the end of old system operations has not been incorporated in the new system, but a proposal has been made for a separate "light-weight" system, based on the references known to appear in CINDA and on what can be recovered from the old ZZ entries available in the U.S.

Report on WRENDA 74
Tenth Four Centre Meeting
Paris, 6-10 May 1974

by

Charles Dunford
IAEA Nuclear Data Section

We request that the Meeting make decisions on the starred items in this report.

I. General

WRENDA 74 was submitted to the printers, on schedule, on 15 April. NDS wishes to thank the other centers, especially CCDN, for their co-operation. Unfortunately schedules were extremely tight because of the delayed arrival of our staff member responsible for system development. Country retrievals were mailed to the centers only at the end of November. Despite this short period for review, most countries replied and submitted revised request lists. The countries not replying were Brazil, the German Democratic Republic, Hungary, South Africa, Denmark, Bangladesh, and India. Japan will review for 1975. We are not clear whether the USSR list was reviewed or not. Unfortunately NDS was informed by NNCSC only one month before the deadline that they had made no arrangements to contact Canada concerning their requests. This matter should be resolved. NDS made an EXPRESS mailing to Dr. Cross but received no reply. We intend to ask the INDC to endorse a policy of considering all requests from a country not responding to our request for review of their WRENDA entries for two successive years as withdrawn.

WRENDA 74 contains 1190 requests for nuclear data measurements for fission reactors for 632 data types from 21 countries and one international organization. The most significant changes to the list came

from the CCDN service area. Attached you will find the request compilation statistics prepared by CCDN. No new entries were made for countries in the NDS service area. No new entries were received from the US except for old requests which for various reasons were left out of previous editions of WRENDA. However, it should be noted that the US request list was completely revised for WRENDA 73. NDS made the entries for the UK and EURATOM in order to save time as these requests were submitted well past the CCDN deadline.

The WRENDA status file was completely rewritten by NDS so that only recently completed experiments and experiments in progress were mentioned. No "true" status reviews were prepared for this edition.

During 1974 the fusion and safeguards data measurement requests were encoded in WRENDA format by NDS from their previous publications. Revisions were made to the fusion file as a result of the recent publication of the UK Request List, and a few new French and West German requests were added. A revised safeguards list was to be published in 1974 but so far no revisions for that list have been received. No new fusion list is planned for 1974.

II. Technical Matters

A. CCDN - No basic problems were encountered in processing the entries prepared by CCDN. All questions of content of revised requests were clarified except for one KFK request. Some minor stylistic problems were encountered but as NDS had not suggested any uniform style for entering requestor-names and for text-comments, this was not surprising.

B. NNCSC - The problems encountered with the entries prepared at NNCSC were more serious. Several format errors occurred consistently throughout the file. The WRENDA 74 input from area 1 was produced by a computer programme, which contained some errors, from the NNCSC request format (which is similar to WRENDA). In addition, several special flags which contain useful information were not translated into comment cards.

Many requests were separated into several requests where multiple requestors or multiple accuracy ranges existed. We felt that if such requests remained separated there would be unwarranted repetition of information and an unjustified increase in the size of WRENDA.

For these reasons and because the style of the comments required rewriting in many cases, it was decided to update the entries in WRENDA 73 instead of replacing all US entries with the NNCSC transmission. The numbering of requests was changed to agree with the NNCSC identification numbers. Where multiple US requests were merged into one, the number corresponding to one of the separate requests (usually the first one on the transmission tape) was used.

C. CJD - No transmission.

Attached you will find the latest list of dictionaries not contained in the WRENDA 74 publication including the highest request ID numbers assigned by area and year (Attachment II).

III. Stylistic Matters

A. Since we are trying to introduce some editorial unity into the document we have eliminated all non-universal abbreviations particularly those of a computer-like nature; all statements should end with a period; all new statements should begin in column 20 and all continued statements in column 22.

B. We have used EXFOR-CINDA laboratory codes where they were available. The distinction between ACR, LMF and AEC has no meaning outside the US and so we have used AEC for all. Also the codes GE, WAR and LLL were converted to GEB, GEC, WEW and LRL, to agree with the EXFOR-CINDA codes.

C. We have included the initials of a requestor in his name as P.B.HEMMIG. In the future input will be checked against our address file.

D. We have used blanks instead of 0.00+0 in the energy fields.

* We request that the 4 Centers accept these four guidelines.

IV. Computer Programmes

In the past six months, we have completed several computer programmes to operate on the WRENDA file. Only a rather general retrieval programme remains incomplete. All programmes are written in PL1 for OS. Perhaps only CCDN is interested in receiving these programmes, however NDS is willing to supply them to anyone interested. The programmes are:

1.1 Edit input-cards for WRENDA Request File.
1.2 Update WRENDA Request File.

2.1 Edit input-cards for WRENDA Status File.
2.2 Update WRENDA Status File.

3.1 Merge Request and Status Master Files to produce listing for WRENDA book production.

4.1 Match Request and Status Master Files, producing an intermediate file.
4.2 Produce WRENDA Country Retrieval.

5.1 Prepare input-format records from Request File, for listing or copying to tape.
5.2 Prepare input-format records from Status File, for listing or copying to tape.

6.1 Modify the Request Master File (e.g. replace a lab-code consistently throughout the file).

7.1 Table-listing programme.

Note: A standard IBM Merge/Sort programme is used throughout the system.

For further details see the attached summary (III).

V. Future

A. Within the next few weeks NDS will send to all centers a tape containing the following six files in "input format":

1) WRENDA 74 request file
2) WRENDA 74 status file
3) Fusion request file
4) Fusion status file
5) Safeguards request file
6) Safeguards status file

* B. We recommend that NDS provide country retrieval listings only for countries in its own service area, the USSR and Canada in the future. Whether the present three copies or less are desirable should be decided at this meeting. It would seem unnecessary to give the US a country retrieval listing as they have their own internal file and review procedures. It also seems wasteful to have to transmit the masses of paper to CCDN who must in turn retransmit it. If our "country retrieval" programme can be made operational at CCDN and they are willing to prepare the "country retrievals" themselves, the operation would be more efficient. In any case if this suggestion is not acceptable, NDS will prepare whatever retrievals each center requires.

* C. It appears that we may have created a too cumbersome method for handling the annual update of the WRENDA file. Now that the long delayed review has been completed with the resulting large number of changes required, we expect that much less effort will be required to produce future editions of WRENDA. I suggest that NDS assume the responsibility for encoding all new requests or modifications to old requests. CCDN and CJD would transmit the modifications written on the country retrievals. New requests could be submitted on forms like attachment IV. NNCSC would send a list of all new or modified requests since the previous edition of WRENDA. In this way the workload for the other centers will be reduced and uniformity of style be assured.

* D. Several of the countries in the CCDN service area have failed to use the "country retrievals" for update of their WRENDA entries. This has added unnecessarily to the work required of that center. We shall mention this problem at the next INDC Meeting and suggest that in the future care should be taken to submit WRENDA requests in the agreed manner. If the "country retrieval" method is inconvenient, then the INDC might suggest an alternative method.

* E. Determination of the appropriate request "status" flag is often impossible with the information supplied by the countries. If the INDC wants a simple system then we should use only the following categories in the WRENDA book: no flag, revised or new.

The distinction between satisfied and withdrawn requests has not been consistently maintained. We shall suggest that all deleted requests be carefully categorized or we should drop the distinction.

I. WRENDA STATISTICS - CCDN AREA

	In WRENDA '73 (1)	Not altered	Altered	Ful-filled (2)	With-drawn (3)	New (4)	In WRENDA'74 (5) = (1)+(4)-(2)-(3)
Belgium	32	-	5	2	25	1	6
Netherlands	4	-	3	-	1	-	3
Italy	22	8	-	-	14	-	8
Switzerland	10	4	5	1	-	-	9
Finland	4	-	-	-	4	-	-
Germany	150	19	53	1	77	11	83
Sweden	46	11	8	-	27	11	30
France	289	11	136	-	142	160	307
U.K. *	67	51	11	3	2	7	69
EURATOM *	19	-	-	-	19	25	25
	643	104	221	7	311	215	540

* ENTERED BY NDS IN 1974.

II

Highest WRENDA File Request Numbers

As of the publication of WRENDA 74, the highest assigned request numbers by year and area are:

Year	Area: 1	2	3	4
1962	58	-	-	-
63	5	-	-	-
64	-	7	-	-
65	8	-	-	-
66	113	1	-	-
67	203	-	-	-
68	-	74	-	-
69	470	497	89	-
70	50	81	-	23
71	78	124	6	52
72	145	151	-	45
73	-	120	-	-
74	-	111	-	-

TABLE 1
PARTICLE TABLE 10 ENTRIES

(A)	(B)	(C)	(D)
000	SPONTANEOUS		0
001	GAMMA	GAMMA	G
002	NEUTRON	N	N
003	PROTON	P	P
004	DEUTERON	D	D
005	TRITON	T	T
006	HELIUM-3	HELIUM-3	3
007	ALPHA	ALPHA	A
008	LITHIUM-6	LITHIUM-6	LI6
999			MISC

(A): Internal numerical code

(B): This name is used when the projectile name appears alone in a report

(C): This name is used in the construction of certain well known quantity names, e.g. (N,P).

(D): Code used on input forms.

Also note:

Miscellaneous quantities like "decay heat". These are input simply as "MISC".

TABLE 2
QUANTITY TABLE 61 ENTRIES

(A)	(B)	(C)
0010	LEVEL DENSITY PARAMETERS	LDP
0020	DISCRETE LEVEL STRUCTURE (ENERGY, SPIN, PARITY)	LDN
0040	HALF LIFE	HL
0100	TOTAL CROSS SECTION	TOT
0200	ELASTIC CROSS SECTION	EL
0220	DIFFERENTIAL ELASTIC CROSS SECTION	EL,DA
0300	INELASTIC CROSS SECTION	INL
0320	ANGULAR DIFFERENTIAL INELASTIC CROSS SECTION	INL,DA
0340	ENERGY DIFFERENTIAL INELASTIC CROSS SECTION	INL,DE
0360	DOUBLE DIFFERENTIAL INELASTIC CROSS SECTION	INL,CA/DE
0400	THERMAL SCATTERING LAW	THS
0500	TOTAL SCATTERING CROSS SECTION	SCT
0520	DIFFERENTIAL TOTAL SCATTERING CROSS SECTION	SCT,DA
0600	NON-ELASTIC CROSS SECTION	NON
0650	ABSORPTION CROSS SECTION	ABS
1000	CAPTURE CROSS SECTION	G
1100	ENERGY DIFFERENTIAL CAPTURE CROSS SECTION	G,DE
1150	DELAYED GAMMA SPECTRUM	G,DE,DL
1200	PHOTON PRODUCTION CROSS SECTION IN INELASTIC SCAT.	ING
1900	TOTAL PHOTON PRODUCTION CROSS SECTION	GEM
1920	TOTAL GAMMA RAY YIELD	GEM,YLD
2000	*** ,N	N
2030	*** ,N NEUTRON SPECTRA	N,DE
2100	*** ,2N	2N
2200	*** ,3N	3N
2900	NEUTRON EMISSION CROSS SECTION	NEM
2920	TOTAL NEUTRON YIELD	NEM,YLD
2930	DELAYED NEUTRON YIELD	NEM,YLD,DL
3000	*** ,P	P
3030	*** ,P DELAYED NEUTRON YIELD	P,YLD,DL,N
3100	*** ,NP	NP
3900	TOTAL PROTON PRODUCTION CROSS SECTION	PEM
4000	*** ,D	D
4100	*** ,ND	ND
5000	*** ,T	T
5100	*** ,NT	NT
6000	*** ,HELIUM-3	3
7000	*** ,ALPHA	A
7100	*** ,NALPHA	NA
7130	*** ,N3ALPHA	N3A
7900	TOTAL ALPHA PRODUCTION CROSS SECTION	AEM
9000	FISSION CROSS SECTION	F
9010	SECOND CHANCE FISSION CROSS SECTION	NF
9100	CAPTURE TO FISSION RATIO (ALPHA)	ALF
9150	NEUTRONS EMITTED PER NEUTRON ABSORPTION (ETA)	ETA
9160	NEUTRONS EMITTED PER NON-ELASTIC PROCESS	NON/ETA
9200	NEUTRONS EMITTED PER FISSION (NU BAR)	NU
9220	DELAYED NEUTRONS EMITTED PER FISSION	NU,,DL
9230	PROMPT NEUTRONS EMITTED PER FISSION	NU,,PR
9240	INFORMATION ON NEUTRONS FROM A FISSION FRAGMENT	NU,,FF
9260	ENERGY SPECTRUM OF FISSION NEUTRONS	NU,DE
9280	ENERGY SPECTRUM OF DELAYED FISSION NEUTRONS	NU,DE,DL
9300	SPECTRUM OF PROMPT GAMMA RAYS EMITTED IN FISSION	F,DE,,G
9360	DELAYED GAMMA SPECTRUM FROM FISSION PRODUCTS	F,SPC,DL,G
9400	FISSION PRODUCT MASS YIELD SPECTRUM	F,YLD
9450	INFORMATION ON KINETICS OF FISSION FRAGMENTS	F,,,FF
9900	RESONANCE PARAMETERS	RES
9920	ABSORPTION RESONANCE INTEGRAL	ABS,RI
9940	CAPTURE RESONANCE INTEGRAL	G,RI
9960	FISSION RESONANCE INTEGRAL	F,RI
9999	MISC	MISC

(A): Internal numerical code

(B): Quantity name. For certain reactions, e.g. (N,P), the quantity name is constructed using the projectile name from table 1 column C, and this field. Such reactions are denoted by the three asterisks, i.e. "***".

(C): Code used on input forms.

Also note:

Nuclear structure reactions (reactions with a quantity internal numerical code of less than 100). These are input using a projectile code of "0".

TABLE 3
COMPOUND TABLE 7 ENTRIES

(A)	(B)	(C)
100	HYD	HYDRIDE
200	WTR	WATER
250	D2O	HEAVY WATER
300	CXX	ORGANIC
400	OXI	OXIDE
500	STX	STEEL
900	CMP	COMPOUND

(A): Internal numerical code

(B): Code used on input forms

(C): Compound name

TABLE 4
APPLICATION TABLE 15 ENTRIES

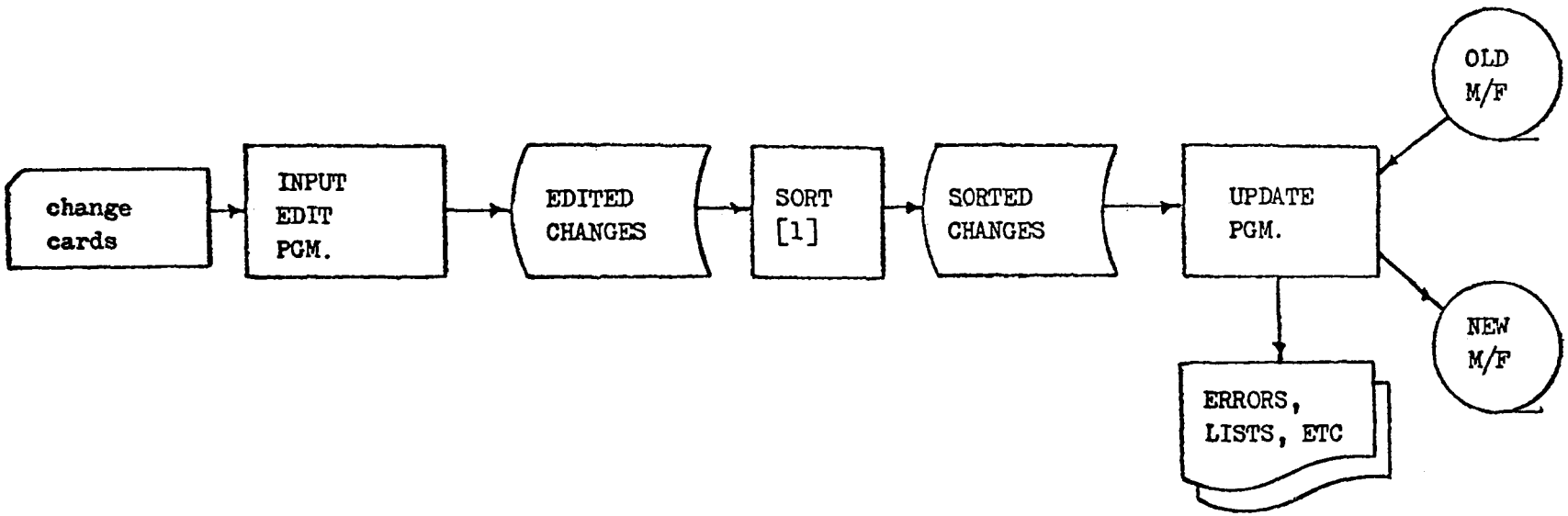
(A)	(B)
F	FUSION.
FA	FUSION. REACTOR PHYSICS.
FB	FUSION. SHIELDING.
FC	FUSION. RADIATION DAMAGE.
N	SAFEGUARDS.
NA	SAFEGUARDS. ACTIVE ASSAY.
NB	SAFEGUARDS. PASSIVE ASSAY.
NC	BURN UP DETERMINATION.
R	FISSION REACTORS.
RA	FISSION REACTORS. CORE PHYSICS.
RB	FISSION REACTORS. SHIELDING.
RC	FISSION REACTORS. DOSIMETRY.
RD	FISSION REACTORS. RADIATION DAMAGE.
RE	FISSION REACTORS. STANDARDS.
S	SPACE.

(A): Code used on input forms

(B): Application

III Summary of Current Wrenda Programs

Run 1: •Update Wrenda Request File



Note: [1] By Request number

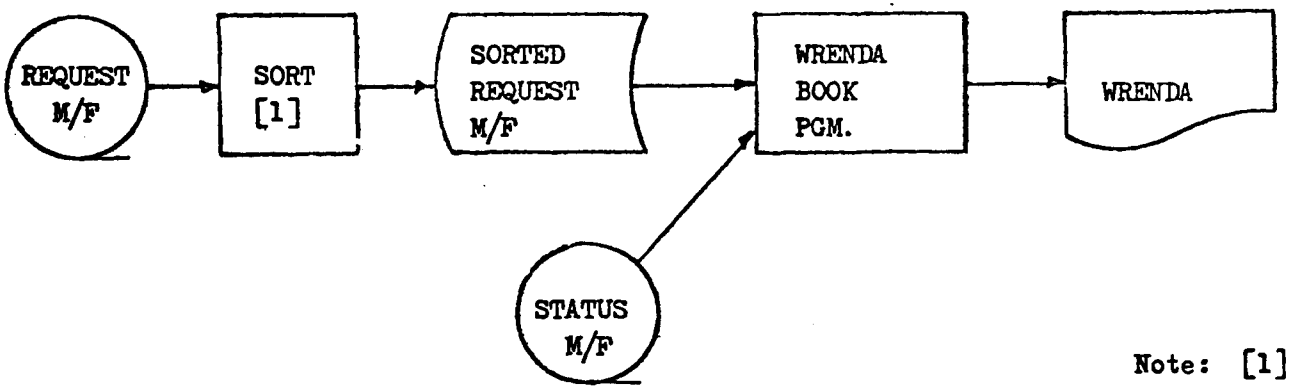
2 programs - Input Edit (can run alone as an input check program)
- Update

Run 2: Update Wrenda Status File

same as above except sort transactions by ZAQ

2 programs - Status Input Edit
- Status M/F Update

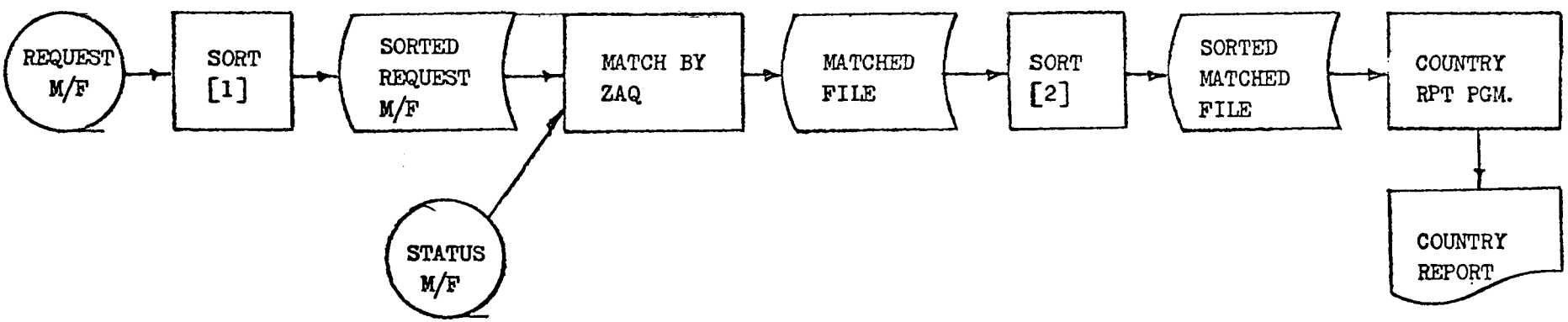
Run 3: Produce Wrenda Report



Note: [1] By ZAQ

1 program: - Merge Request and Status M/F's and produce WRENDA.

Run 4: Produce Wrenda Country Report



Notes: [1] By ZAQ
[2] By Country Code then ZAQ

2 programs - Match Request and Status M/F's
- Produce Country Report

IV Form for New WRENDA Requests

NUMBER: *

COUNTRY:

REQUESTOR(S):

TARGET:

INCIDENT PARTICLE:

QUANTITY:

INCIDENT ENERGY:

ACCURACY:

PRIORITY:

APPLICATION:

QUANTITY COMMENT(S):

ACCURACY AND RESOLUTION COMMENT(S):

OTHER COMMENT(S):.

* To be assigned by Data Centers only.

List of Actions Arising from the Tenth Four-Centres Meeting

Action No.	On	Text
1	All	Send before 31 July a list of experimental data compiled but not yet transmitted in EXFOR format to the other centres.
2	All	Centres having received specialised compilations in any format should signal their existence to other centres.
3	NDS	Bring to the attention of the INDC the problem of translating voluminous Soviet Nuclear Data documents such as the CJD Bulletin (Jadernye Konstanty) into English.
4	CJD	Investigate the possibility of including English abstracts to articles in CJD Bulletin, or of sending them to the IAEA for translation, and to include English keywords. Also provide number links between the Bulletin articles and their abstracts.
5	All	Initiate contacts with groups compiling non-neutron data in order to investigate the possibility of using existing formats for their compilation.
6	CCDN	Send data sets to CJD as often as requested if the data are only available in NEUDADA format.
7	NNCSC	Send to other Centres list of data sets needed for new edition of BNL-325, Vol. II.

Action No.	On	Text
8	NDS CCDN CJD	Include data sets to be used by NNCSC for new edition of BNL-325, Vol. II into EXFOR without delay.
9	NNCSC	Send remaining "SCISRS 1½" data converted to EXFOR, as well as index, to other Centres before 31 July.
10	CCDN	Subdivide long NEUDADA tapes for CJD into several smaller files in order to make read errors at CJD less troublesome.
11	NNCSC CCDN NDS	Requests from Konshin (Minsk) for experimental data not available at CJD should be answered as follows : tapes to be sent to CJD for conversion to punched paper tape as used at Minsk; listings to be sent directly to Minsk.
12	N. TUBBS	Communicate to all Centres findings on compatibility between CINDA and the Nuclear Data Project Reference File, and on INIS/CINDA comparison being prepared for the Varna IAEA Symposium on Information Systems.
13	NNCSC	Distribute final LEXFOR formulations of points mentioned in Memo. 4C-3/97, and revise LEXFOR entry on Polarization.
14	NDS	Prepare LEXFOR entry on experimental methods for determining Fission Product Yields.
15	NNCSC V. MAY	Prepare EXFOR manual pages for multidimensional tables before 31 July.

Action No.	On	Text
16	CCDN	Prepare LEXFOR entry on Standards for Fission Yields and an example of coding Delayed Neutron Precursor Data.
17	NNCSC	Prepare LEXFOR entry on Multilevel Resonance Parameters.
18	NNCSC V. MAY	Include an implementation scheme for new EXFOR features in the EXFOR manual.
19	All	Check the completeness of : a) EXFOR and CINDA b) EXFOR versus CINDA for important reactor material iso-quants. Gaps in EXFOR and CINDA should be filled with top priority, particularly those listed in 4C-3/48 (Jan. 1972).
20	All	Circulate Bhat's proposal for gamma-ray spectrum quantities to experts. Give examples of coding such data using extended EXFOR possibilities.
21	CCDN	Revise warning and error messages in CINDA feedback listings, and ensure that no undue rejection of input occurs, before 31 August.
22	NDS	Prepare a Four Centre proposal for a new quantity sorting order for the CINDA publication.
23	NNCSC	Submit a proposal on indexing numeric files in CINDA reflecting the discussions within the USNDC.
24	All	Send suggestions for Introduction to CINDA's next supplement to LEMMEL before 30 September. A brief introduction for the beginning of the supplement, further detail for the end.

Action No.	On	Text
25	All	Propose criteria for reducing the size of blocks in the CINDA publication.
26	N. TUBBS	Issue an updated CINDA Manual by end of August.
27	CCDN	Supply NNCSC with all documentation on CINDA necessary for their taking over U.S. CINDA operations before 30 June.
28	NNCSC	Check the correspondence of Lab. and Ref. codes in EXFOR and CINDA dictionaries.
29	ALL	Requests from other centres should be acknowledged within a few days of receipt giving a detailed status for each request including "no data available" if applicable (previous request No. 11*).
30	ALL	Inform the other centres when initiating a data review or special-purpose compilation, so that appropriate data may be transmitted with preference. (previous request No. 12*).
31	ALL	Prepare "delinquency lists" containing all authors who, after repeated request, do not submit their data to the data centre. These lists should be presented to appropriate bodies (national or international nuclear data committees)

*) cf. Report on the Ninth Four-Centre Meeting, INDC(NDS)-54/G, 1973, p.97

Action No.	On	Text
31(Cont/d)		who can stimulate the authors to release the data. Centres should continue to prepare "NODATA" EXFOR entries in such cases.
32	NDS	Ask the INDC to support Dunford's recommendations (Appendix M) that - all requests from countries which do not review them for two successive years should be considered as withdrawn, - reviewers should use the country retrievals for updates, - the distinction between fulfilled and withdrawn requests should be dropped unless all countries specify which is the case when they delete requests.
33	NDS	Modify WRENDA layout following suggestions received in time for WRENDA 75.
34	ALL	Provide display boards (one per centre) explaining available services for exhibition at the Washington Conference.