International Atomic Energy Agency

INDC(NDS)-54/G

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

REPORT ON THE NINTH FOUR-CENTRE MEETING

MOSCOW/OBNINSK, 4-8 JUNE 1973

September 1973

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

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Summary Minutes Ninth Four Centre Meeting

I. Organization and Announcements

a) Introductory remarks

1. Mr. Afonin opened the meeting with a speech of welcome on behalf of the USSR State Committee for the Utilization of Atomic Energy. His remarks were followed by a brief statement from Dr. Finkelstein, Deputy Director General of the IAEA.

b) Election of Chairman and Secretaries

2. Mr. Dunford of the IAEA was elected chairman of the meeting. Messrs Bychkov and Pronyaev of CJD were elected as secretaries. The other meeting participants were Mr. Pearlstein and Mrs. May from NNCSC, Messrs Fröhner and Potters from CCDN, Messrs Manokhin and Surgutanov from CJD and Mr. Schmidt, NDS.

3. The following scientists from FEI Obninsk participated on various agenda items: Prof. Usachev, Prof. Nikolaev, Dr. Abramov, Dr. Abagyan, Dr. Bobkov and Mrs. Tarasko.

c) Adoption of agenda

4. The proposed agenda was adopted without amendment (see Appendix B).

d) Review of actions from the Eighth Four Centre Meeting

5. The chairman reviewed the actions from the previous meeting. Incomplete items and those requiring further discussion were referred to the appropriate agenda item.

II. Center Activities

A) Progress Reports from the Four Centres

6. Each center gave a short progress report on their activities during the last eight months since the last meeting. These reports are attached: CJD - Appendix C, CCDN - Appendix D, NNCSC - Appendix E and NDS - Appendix F.

B) Data request profile reports

7. Attached to each centre's progress report is a summary of data requests and data distribution for that center during the preceding twelve months.

C) EXFOR compilation activities

8. NDS prepared a summary of the contents of "all" EXFOR data tapes exchanged since the last meeting. This summary is attached as Appendix G. After the preparation of this report, but before the beginning of the meeting the following tapes were received at NDS: 1015, 2011, 4004, 4006, 4008, and 4009.

9. The cumulative EXFOR statistics prepared by CCDN were also introduced at the meeting. These are reproduced in Appendix H. These statistics clearly illustrated characteristics of the data compiled in each service area. The large "system" to "data" record ratio for NDS shows the many works with few data points originating in their area whereas the small "system" to "data" record ratio for NNCSC and CCDN indicates many more data points per data set.

10. NNCSC Before the end of the summer NNCSC will transmit 56 data tapes in the 5000-8000 series containing the remainder of the contents of the SCISRS I data file for Z less than 90. These data have been converted to EXFOR format by computer and consist primarily of data produced before 1970 from all four service areas. During the discussion that followed, it was agreed that when data sets contained in the 5000-8000 series transmission are cleaned up and retransmitted by the responsible center in the normal EXFOR exchange (1000-4000 series), a list of corresponding accession and subaccession numbers in the two transmissions will be sent to each center. In this way there will be no question of duplicate information in the data files.

11. Concerning data produced since 1970, there was no backlog of available uncompiled data at NNCSC (see pages 6 and 7 for further discussion of this point). Tape 1016 will be transmitted shortly.

12. CCDN Little progress has been made in the last eight months to reduce the backlog of untransmitted data. Most of this data has been compiled in NEUDADA and is available on request in NEUDADA format from CCDN. However the CINDA conversion effort has caused a delay in the conversion of NEUDADA entries to EXFOR. The center plans to work now toward the removal of this backlog (50-60% of all data since 1970) by the end of 1973. Priority will be given to the conversion and transmission of important data sets and data from UK, France, and West Germany.

13. CJD By this time seventy post-70 works have been already compiled and transmitted. There are about 100 works from the period 1965 to 1969 which are not yet compiled in EXFOR. The work involved in compiling these data will be analyzed in the nearest future.

14. NDS All old DASTAR data sets from NDS service area have now been converted and transmitted in EXFOR. A slight backlog in new data has developed because of a lower manpower level assigned to new EXFOR compilation in recent months. This situation should be remedied by the fall of 1973.

III. Policies and Coordination of Four Center Activities

A. Recommendations to the Centers

15. NDS inquired about the receipt by the Centers of data presented at the IAEA Standards Panel as the panel had recommended that such data be sent to the centers. The only data compiled was that of Pönitz on U-235 fission and this was obtained by reading from a graph.

16. SCHMIDT described briefly the IAEA Symposium on Applications of Nuclear Data in Science and Technology. More details are given in INDC(NDS)-52/L. As a result of the recommendations of this symposium the NDS will begin an effort in the non-neutron nuclear data area. Initially this effort will be aimed at international coordination of compilation activities for nuclear structure data.

17. PEARLSTEIN mentioned a recent meeting held at NNCSC where interested scientists discussed the needs for non-neutron data primarily for the decay heat problem in fission reactors and for fusion reactor design. A summary from this meeting will be distributed to the other centers for their information.

18. The Centers agreed to discuss Stehn's proposed recommendation to editors of journals under this agenda item (Appendix I). Schmidt referred to recommendation to authors of papers on experimental data sent to most major journals publishing nuclear physics articles by the IWGNSRD (Appendix J). This recommendation was published in seven journals including Nuclear Physics and Physical Review Letters. He also mentioned a more general recommendation being prepared by Westrum for CODATA. NDS felt that any recommendation to editors representing such a narrow field would probably be ignored and that action should be taken only within a much larger context.

19. FROHNER suggested that it might be more appropriate to send the Stehn letter to the measurers directly with INDC approval. MANOKHIN felt that Stehn's proposal did not contain enough detail for a letter to the measurers.

He agreed to send a copy of information on this subject, which has already been distributed by CJD to USSR scientists, to NDS for translation and distribution.

20. PEARLSTEIN felt that the proposed letter would be extremely valuable for journal editors and would help to inform scientists of the services of the neutron data centers. All centers were asked to submit their comments to NNCSC so that a final proposal can be prepared for INDC consideration.

B. Improvement in operation of the Four Center Network

21. NDS raised the question of the completeness of the data transmitted in EXFOR. Two papers were presented for consideration by the meeting. The first surveyed the status of fission spectrum averaged cross sections in EXFOR (Appendix K) and the second, data for $\bar{\nu}$ (Appendix L). Additional surveys on completeness for six neutron dosimetry reactions, for σ_f for U-235, Pu-239 and their ratios, and for U-235 cross sections were also mentioned. The general conclusion from this evidence is that even for data measured since 1970, between 50 and 70 percent of the data are missing from EXFOR.

22. FROHNER stated that he had an impression similar to NDS's concerning the completeness of EXFOR. PEARLSTEIN said that the only uncompiled data from recent experiments are those data which are unobtainable from the authors.

23. The chairman asked each center to give a reply to the following four questions.

1) Importance of EXFOR completeness
2) Status of EXFOR completeness
3) Reasons for incompleteness
4) Steps for improving situation

24. NNCSC Brookhaven requires complete data files for its publications, for evaluation and for customer service. The main reason for the existing incompleteness is the failure of authors to send data to the centers. They have appealed to measurers directly but even these appeals

often fail. Perhaps the INDC could help.

25. CCDN agreed with the reasons why completeness in EXFOR data is required. They felt that the current completeness was not very impressive ($\sim$50%) whereas their own NEUDADA files are about 85% complete. There is sometimes a three year delay between completion of measurement and EXFOR transmittal to the other centers. This is in part due to the reluctance on the part of measurers to send any but "final" data to a center. Perhaps the measurers do not trust the data centers and fear the use to which the computer files are put. There seems to be much less reluctance to send preliminary data to other individuals. Subject to funding, CCDN often sends someone to the laboratory to get important data sets. Experience has shown that this is the most efficient if expensive approach.

26. NDS requires a complete EXFOR file for service to its customers and for its own data reviews. Unlike CCDN or NNCSC, NDS must rely almost totally on the contents of EXFOR. NDS studies as presented earlier show, for a broad range of neutron data surveys, the files are only 30-40% complete. In some cases they have noticed the same reluctancy as CCDN on the part of measurers to send their data. It was suggested that centers maintain a list of "unobtainable data" and that this list be sent to the INDC for its consideration.

27. CJD stated that for the data from their area, EXFOR was 30-40% complete. Their main need for completeness was the evaluation activities in USSR. They make an effort to get data before journal publication. More direct contact between the centers and the measurers is needed.

28. The meeting agreed that all centers should distribute to the other centers a "delinquency list" for data unobtainable from measurers in their area. This list would eliminate further inter-center requests for those data sets. Furthermore NDS will prepare a report summarizing the meeting's discussions on EXFOR completeness, attach the "delinquency lists" and present these to the INDC for their consideration.

29. NDS then mentioned answers to inter-center requests for data. They had experienced long delays or no answers at all to letters

requesting data from NNCSC during the past year. The comment also applied to NDS requests to CJD. NNCSC stated that their normal practice was to reply promptly to all inter-center requests. It was agreed that all centers should reply promptly and in detail even if no data is available.

30. NDS asked whether it was still necessary for NDS to serve as an intermediary between CJD and the other centers. MANOKHIN replied that CJD can correspond directly with CCDN and NNCSC in the future. When centers receive data requests from customers outside their normal service area, they may send neutron data from their files but will request that in the future, the requestor contact the appropriate data center. Copies of the correspondence should be forwarded to the responsible center.

31. CCDN introduced Memo 4C-2/38 for discussion. This memo contained a list of data sets which have been requested from other data centers but not received. The four centers agreed that periodic transmission of such information was useful. All centers were asked to inform the other centers when initiating a data review and to give its purpose. Additionally each center should inform the other centers of data missing from EXFOR especially those data found in the course of a data review.

C. Proposals for common service statistics

32. Two proposals for common 4-Center service statistics were presented for consideration. The proposal from NNCSC is given in Appendix M; that from NDS in Appendix N. The heads of the four centers agreed that statistics were important when reviewing a center's activities and when reporting to outside bodies such as INDC. For these purposes a common format and content is important.

33. NDS felt that the centers should agree on some common definition of the "unit" on which the statistics would be based. Otherwise they felt that inter-center comparisons would be meaningless. The NDS

proposal distinguished between a "request communication" and an "information request unit" which may be considered as a subunit to a "request communication" (see Appendix N).

34. All centers stated that they in fact used a quantity like the "information request unit" but each center had a different interpretation of what constitutes a unit. Items 1, 2, and 3 of Part II of the NDS proposal which describe a unit were generally agreeable. But all centers wanted to automate the keeping of statistics, so that a unit would be dependent on each center's retrieval programme. CCDN stated that they were considering adopting some quantity like the "request communication" for future CCDN statistics. No agreement was reached and each center was to review the two proposals and send comments to NDS who would try to prepare a compromise proposal.

35. The validity of breaking down requests by requesting organization type was discussed in the light of the different organization of nuclear research activities in the service areas of the centers. It was considered difficult to find one categorization valid for all four centers.

36. CCDN will continue to make their EXFOR transmission statistics for all four centers. They have agreed to separate NEW and REVISED transmissions in the statistics. CJD was interested in the NDS EXFOR compilation statistics and stated that they had a similar system.

D. Exchange of information on services to customers

37. CCDN has improved the plotting services and answered 40 requests for plots during the last 12 months. Better print formats are planned for customer use particularly for two- or more-dimensional tables. There is general satisfaction with the physics information contained in EXFOR. The center is considering the publication of a handbook for radiochemists containing thermal, spectrum averaged and 14 Mev cross sections.

38. NNCSC says that evaluators are happy with the EXFOR physics information. A computation format is now under development. Next year

the data profile system should be in operation so that new data can be immediately transmitted to scientists who may be interested. They are encouraging evaluators to come to Brookhaven to do evaluations so that the evaluators can take advantage of NNCSC's facilities especially the on-line computer graphics. NNCSC is planning a publication containing graphs of ENDF/B-III data.

39. NDS has made little progress in this area since the last meeting. Efforts on the production of plotting programmes have just begun. The NDS computational format is still being discussed. The Agency is planning to publish a handbook on nuclear data for activation analysis and NDS is preparing a chapter on fission spectrum averaged cross sections.

40. CJD The main customer service activity is the development of plotting programmes. Some efforts are needed in connection with the differences in I/O devices at the various institutes. The main customers at CJD in addition to the other neutron centers are in Moscow (IAE), Minsk and Obninsk. Some requests also come from ITEF (Moscow) and Dimitrovgrad (formerly Melekess).

E. Compilation of fission neutron spectra, fission product yields, and gamma ray spectra

41. NDS wished to emphasize the importance it placed on the compilation of fission neutron spectrum data since the mean spectrum energy problem is not yet resolved. The data to be compiled should include all data released since the Smith and the Koster reviews. NNCSC said that they will soon start compiling this data.

42. PEARLSTEIN expressed the desire for a single reference spectrum for comparison purposes. FRÖHNER felt that neither the Maxwellian or the Watt spectrum were sufficient. DUNFORD noted the continuing shape discrepancy between Harwell and Studsvik measurements. However all new measurements are indicating a higher mean energy.

43. NDS mentioned that the EXFOR/LEXFOR entries for fission product yields have been distributed. Meinhart Lammer has forwarded to NNCSC a description of experimental methods to aid them in preparing the LEXFOR entry. CJD has compiled and transmitted some fission product yield data. All centers were to investigate the possible use of existing compiling groups to supply references and data to the centers.

44. NNCSC initiated discussion on their proposal for the compilation of gamma-ray spectra data (Memo 4C-1/36). NDS felt that there was not a clear justification of the need for the types of data to be compiled and no attempt had been made to contact groups already compiling such data in order to prevent duplication of effort. NNCSC felt that the neutron data centers should compile such data whether or not other groups were compiling also.

45. Since there had been no previous recommendation to compile gamma-ray spectra data from the INDC, NNCSC was asked to revise their proposal taking into account the meetings discussion and send it to NDS for presentation at the next INDC meeting.

IV. EXFOR

A. Implementation of decisions of the 8th Four Centre Meeting

46. All but two actions from the previous meeting relating to EXFOR have been completed or cancelled. The two incomplete actions were carried forward for the next meeting.

47. NDS raised the general problem of the updating of the LEXFOR/EXFOR manuals which is the responsibility of NNCSC. Some decisions from the Seventh, the period between the Seventh and Eighth and all decisions of the Eighth Four Center Meeting have not been included with revised pages. NDS felt that an up-to-date manual is essential to prevent errors in compilation and offered to assume responsibility for EXFOR/LEXFOR in the future.

48. NNCSC regretted the delays and promised to try to clean the matter up this summer. They pointed out that the approved Minutes from the Eighth meeting had been issued only in April. NDS replied that manual updates should be made as soon as decisions are taken whether in meetings or by memo and can well be made immediately upon receipt of the draft minutes of a meeting.

B. Contents of data tape exchanges since the last meeting.

49. See II.C.

C. Proposed changes to Dictionaries, EXFOR, and LEXFOR

50. Hans Potters, Vicky May, Hans Lemmel and Pamela Attree met in Vienna on June 1 and prepared a series of proposals for consideration at the meeting. The proposals on BIB retransmission, PERCENT, and WAVELENGTH were agreed upon by the meeting. These proposals are given in Appendix ___. In addition, the proposal on HALF-LIFE presented to the Eighth Four Center Meeting (INDC(NDS)-51/G, pages 38-39) was also adopted.

51. The discussions on the coding of multi-dimensional tables were lengthy. A proposal by PEARLSTEIN (Memo 4C-1/33) was presented for the meeting's consideration. A counter-proposal prepared by the Vienna subcommittee was also offered.

52. PEARLSTEIN stated that any procedure adopted for compiling multi-dimensional data tables must be general enough to include all present and any future data types. On this point there was unanimous agreement.

53. The heart of the PEARLSTEIN concept was the use of a vector ISO-QUANT to handle multiple dependent variables and a vector COMMON for multiple independent variables. In the vector COMMON concept all values of one independent variable are given in common. The data columns then correspond to the COMMON vector components.

54. The Vienna subcommittee also proposed the use of a vector ISO-QUANT for multiple dependent variables but rejected the vector COMMON concept in favour of a linearized data table. By linearized data table one means that all independent variables are given in the data line along with the dependent variable(s) and the data lines are ordered such that the first variable changes most slowly, the second more rapidly, etc.

55. The discussion of the merits of each proposal naturally led to discussion of basic philosophy for EXFOR. Some felt that EXFOR was a compilation and transmission format and therefore programming considerations should not have a decisive influence on the format. This particularly referred to the limitation of 10 data columns per table and the introduction of the DATA-CONT system identifier so that a new subentry would not be required when this limit was exceeded. It was further stated that proposed format modification should be judged on how easy it was to compile in the modified format.

56. The matter was then referred to the subcommittee of POTTERS, MAY and BYCHKOV for further consideration. They then reported to the full meeting again recommending some modification to the Vienna subcommittee proposal and gave arguments to show that this proposal was the most general. POTTERS was asked to prepare a 4-C Memo based on the subcommittee's work for final consideration and action by the centers.

57. PEARLSTEIN initiated a discussion of providing a more general EXFOR which would be used for all kinds of nuclear data. The justification for the extension is to be able to compile inverse reactions such as (γ,n) and (α,n) used for neutron data evaluations. The primary difficulty with the present EXFOR structure is the ISO-QUANT code. Either one will have to develop an enormous dictionary of quantity codes or introduce an incident particle field in the ISO-QUANT. NDS mentioned that it faced this problem with WRENDA and introduced the incident particle field. It appears that the introduction of a WRENDA type quantity code will require the correction of all old EXFOR entries, a violation of one of the EXFOR ten commandments. All centers were to send their comments to NDS who will prepare a proposal on this subject.

D. Plans for EXFOR transmission of older data

58. See II.C.

E. Development and implementation of programmes associated with the data files

59. NDS mentioned improvements planned in the EXFOR check programme and in the printed output format. A brief description of the new data index and the associated data request and distribution logs was presented (Appendix Q). Included was a proposed quantity code system for data retrieval.

60. CCDN has similar plans for an index and associated data logs. NDS and CCDN agreed to exchange information and possibly computer programmes. An extended PL/1 compiler will be installed with the new 370/125 computer recently approved by the CCDN Center Committee. The computer will have larger memory, faster speed, improved disk storage and improved multi-programming capability. Work continues on the NEUDADA → EXFOR conversion programme.

61. NNCSC The PDP computer now has 80K words of fast storage and two new disk drives. The interactive graphics capability has been finished including the production of curves by light-pen.

62. CJD is completing computer programmes to retrieve from EXFOR by subaccession number and another programme to retrieve and plot data. A data index is now in preparation. A physics checking programme is planned.

V. CINDA

A) Coverage of present CINDA

63. A copy of the ZZ coverage control log has been supplied to CCDN by TIC but the new CINDA system has no provision to use these

entries. NDS stressed the importance of the ZZ log for coverage and control.

64. NDS stated that the US laboratory report coverage has not improved. PEARLSTEIN asked LEMMEL and TUBBS to prepare a report on the matter which he can bring to WHITEHEAD'S attention.

65. NNCSC now has the CINDA master file in the center and has written the necessary computer programmes for checking EXFOR against CINDA. They have used BNL-325 and output from HOREN's reference system as checks also. The results are communicated to WHITEHEAD at TIC (ORNL).

66. CJD has completed coverage to date on all DUBNA and FEI reports.

67. Both CCDN and NDS mentioned lack of communication between them and WHITEHEAD. Problems arose due to unanswered letters and unilateral system changes introduced by TIC.

68. PEARLSTEIN agreed to mention these matters to WHITEHEAD.

B) Implementation of new CINDA system

69. FRÖHNER reported that the conversion to the new CINDA system is complete. About 6000 entries could not be converted automatically; 4000 of these contained errors. The conversion process introduced (detected and corrected) errors in about 500 entries.

70. All errors introduced by the conversion will be corrected by CCDN. This work will not be completed until the publication of CINDA 74.

71. A report on the new system is being prepared by TUBBS. There is no intention to allow multiple comment lines per CINDA entry.

72. NDS asked about the action on TUBBS to produce a proposal on the

use of CINDA as an index to the experimental data. FRÖHNER said that no proposal had been prepared. However CCDN has plans to bring the "+" entries in CINDA up-to-date.

73. NDS stated that it had been agreed by LEMMEL and TUBBS nearly one year ago that lines containing the EXFOR subaccession number would be added to CINDA. They had expected a proposal on the implementation of this agreement. The entry of "+" is not adequate for NDS. FRÖHNER agreed to have TUBBS distribute a proposal as soon as possible.

C) Customer services

74. DUNFORD stated that NDS planned to send a CINDA retrieval with all replies to data requests. FRÖHNER stated that the introduction to CINDA 73 will contain information on the type of CINDA retrievals available from CCDN.

75. CJD has no need for CINDA retrievals at the present time.

VI. WRENDA

76. PROF. USACHEV led the discussion of the NDS proposals on WRENDA. He thought that the review of requests by evaluators was very important. He felt that if the accuracy quoted by the evaluators was larger than the requested accuracy, then measurements were required. An unequivocal definition of "accuracy requested" was also required.

77. DUNFORD stated that matters of content of WRENDA must be decided by INDC. However, he assured Prof. Usachev that the present WRENDA format in no way restricted the type of status reviews for requests.

78. There was no further discussion on the WRENDA report (Appendix R) except that the deadlines were all dependent on the arrival date of new NDS staff which was still uncertain.

VII. EVALUATED DATA.

79. Professors Usachev and Nikolaev participated in the discussions on this item. No progress has been made on the exchange of evaluated neutron data since the last Four Center Meeting. Therefore the discussion was primarily a progress report on USSR evaluation activities.

80. The SOKRATOR format has been approved by the USSR Nuclear Data Commission. Conversion programmes from KEDAK, UKNDL and ENDF are being written. The ENDF $\longrightarrow$ SOKRATOR conversion is very difficult. PROF. USACHEV feels that one should differentiate between evaluated data and recommended data (adjusted evaluated data).

81. FRÖHNER mentioned discussions going on between NEA and the USAEC regarding the compilation of clean integral data.

82. NIKOLAEV reviewed the FEI evaluation programme for the next two years. This includes evaluations of $\sigma(n,n)$, $\sigma(n,\alpha)$, $\sigma(n,p)$ and $\sigma(n,n')$ for many nuclides. A revised ^{238}U evaluation will be completed shortly. Work is being carried out to prepare full files for O and Na. The results will be sent to Vienna. Elastic angular distributions for 42 isotopes will be put on magnetic tape in June. σ_γ and σ_f evaluations for Pu-238, Cm-243 and Cm-244 are completed. An updated 26-group cross section library is being prepared and will be distributed.

VIII. OTHER BUSINESS

83. None.

IX. CONCLUSIONS

84. SCHMIDT discussed the Agency's plan to hold a Study Group Meeting on Non-Neutron Nuclear Data Compilation in Vienna in May 1974. It would be useful if some or all the neutron data center heads could

attend. Therefore the IAEA would like to schedule the next Four-Center Meeting immediately following the study group meeting.

85. FRÖHNER on behalf of the NEA and CCDN offered to host the next Tenth Four Center Meeting at Saclay or Paris and the meeting was provisionally scheduled for 6-10 May 1974.

Appendix A

Program

Ninth Four Center Meeting

Moscow, USSR, 4-8 June 1973

Saturday-Sunday 2-3 June	Arrival in Moscow of the meeting participants from USA, France, and Austria. Welcome at Sheremetyevo Airport.
Monday 4 June	At the USSR State Committee on the Utilization of Atomic Energy
9:30 AM - 12:30 PM	Agenda Items I and II
2:30 PM - 5:30 PM	Agenda Items II and III
Tuesday 5 June	At the USSR State Committee on the Utilization of Atomic Energy
9:30 AM - 12:30 PM	Agenda Item III
2:30 PM - 5:30 PM	Agenda Items III and IV
6:30 PM - 7:30 PM	Sightseeing tour
Wednesday 6 June	
9:30 AM - 12:30 PM	Travel to Nuclear Data Center (CJD) (Institute of Physics and Nuclear Power, Obninsk)
2:30 AM - 5:30 PM	Agenda Items IV - V
Thursday 7 June	At CJD Obninsk
9:30 AM - 1:30 PM	Visit to CJD and FEI
2:30 PM - 5:30 PM	Agenda Items V - VI
5:30 PM	Return to Moscow
Friday 8 June	At the USSR State Committee on the Utilization of Atomic Energy
9:30 AM - 1:30 PM	Agenda Items VII - IX
2:00 PM	Lunch with officials of the USSR State Committee and the Obninsk Data Center
Saturday-Sunday 9-10 June	Departure of the foreign delegations to the Ninth Four Center Meeting.

Ninth Four Centre Meeting

4-8 June, Moscow

AGENDA

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b) Election of chairman and secretaries

c) Adoption of the agenda

d) Review of actions and recommendations from 8th Four-Centre Meeting

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a) Progress reports from the four Centres

b) Data request profile report from each Centre

c) EXFOR compilation activities

1) New data

2) Conversion of old data

III. Policies and Coordination of Four-Centre Activities

a) Recommendations to the Centres from external bodies

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c) Proposals for common service statistics

d) Exchange of information on services to customers

e) Compilation of fission neutron spectra, fission product yields, and gamma ray spectra

f) Future developments

IV. EXFOR

a) Implementation of decisions of 8th Four-Centre Meeting

b) Contents of data tapes exchanged since last meeting

c) Proposed changes to Dictionaries, EXFOR or LEXFOR

d) Plans for EXFOR transmission of older data

e) Development and implementation of programmes associated with the data files

V. CINDA

a) Coverage of present CINDA

b) Implementation of new CINDA system and its function as EXFOR index

c) Customer services

VI. WRENDA

a) Final WRENDA formats for exchange

b) Coordination and responsibilities for annual WRENDA publication

VII. Evaluated Data

VIII. Other business

IX. Conclusion

a) Summary, recommendations and actions

b) Next meeting

NUCLEAR DATA CENTRE (CJD) PROGRESS REPORT

1. Introduction

The report made by L.N.Usachev on the Fifth INDC Meeting and included into the documents of the 8th Four Centre Meeting as an official report on CJD activity covers the period before June 1972. The present report covers the period from June 1972 till May 1973.

2. Compiling into EXFOR

Six physicists are engaged in EXFOR compiling (1/3 of full time) in Nuclear Data Centre that provides entering into EXFOR 20-25 works every three months. From last October Nuclear Data Centre began sending authors proof-copies. Since June 1972 Nuclear Data Centre has sent to other centres IOTRANS (Numbers 4004-40013) containing 79 entries. Corrected TRANS 4004 has been also sent.

During 1970-1972 210 works have been published which are to be compiled into EXFOR. Of this amount 70 works have been put on magnetic tapes.

In Nuclear Data Centre the work has been started on converting from DASTAR into EXFOR. Twelve of 65 Soviet works in DASTAR format have been converted into EXFOR. In accordance with previous decisions Nuclear Data Centre has started compiling works on fission product yields.

3. Programmes for EXFOR

Nuclear Data Centre continues the work on a system of programmes for EXFOR. There are programmes for reading putting on a tape inserting corrections and cataloguing EXFOR tapes. The programmes for formal checks on the format and keyword checks have been written and now are being tested. As far as Nuclear Data Centre stores all the experimental data in EXFOR some programmes have been written to retrieve necessary data from the EXFOR library.

4. Preparing CINDA entries

By this time the CINDA entries are prepared for all the works published in journals up to May 1973. The backlog in preparing CINDA entries for CJD bulletins and Collections of Abstracts has been eliminated. The CINDA entries have been prepared for all bulletins "Nuclear Constants" up to No.10 and all collection of abstracts "Nuclear Physics Investigations in the USSR" up to No.14 and also for available preprints of JINR (Dubna) and FEI (Obninsk).

5. Development of Software

The Nuclear Data Centre continues the work on development of M-222 Computer Software. The Format Statement in Algol translator (as the Format Statement in FORTRAN Translator) has been developed. The work on plotter programmes has been completed. The work on installation of FORTRAN Translator is in progress.

6. Activities on determing the accuracy requirements of data and on experiment planning

Nuclear Data Centre regards the determination of the accuracy requirement of data to be the most important part of its activities. During the period considered Nuclear Data Centre has put into operation the system of programmes for calculating sensitivity factors. There are programmes for determination of the accuracy required in microscopic constants on the basis of given reactor parameter uncertainty, for determination of the information capacity of an integral experiment, for planning an optimum set of microscopic and integral experiments, etc. The work in this direction is in progress.

7. Evaluated Data

At present in Nuclear Data Centre there are the following foreign evaluated data:

1. German library "KEDAK".
2. Italian fission product data.
3. Australian fission product library.

4. ENDF/B-111 files for six materials used as cross section standards.

5. One tape with English evaluated data received from IAEA.

KEDAK library has been provided by a programm which allows to retrieve necessary data. Nuclear Data Centre organizes the activity on development of its own evaluated data library. Now there exist U-238 file, U-235 fission cross section data in the energy range above 10 kev, angular distributions of elastically scattered neutrons for 44 isotopes. The work has been completed in Minsk on Pu-239 file, the work on development of U-235 is in progress. Nuclear data centre has completed the evaluation of Fe in the energy range above 2 Mev.

8. CJD Editions

During the period under consideration Nuclear Data Centre has issued 3 bulletins "Nuclear Constants" (Numbers 8, 9, 10) and 2 collections of abstracts "Nuclear Physics Investigations in the USSR" (Number 13, 14).

9. Response to requests

From the first of June 1972 Nuclear Data Centre has received 35 requests:

documents	15 requests
evaluated data	12 requests
experimental data	8 requests

Nuclear Data Centre have sent 60 documents to these requests (articles and preprints). Of 20 requests on data 11 requests have been satisfied completely, 9 of them only in part. The data have been sent on listings and tapes (two cases).

The request statistics on ZAQ is given in Appendix (without requests for the whole KEDAK library).

Reguest statistics on ZAQ

Element	A	All	TOT	SEL	DEL	SIN	NG	N2N	NA	NP	NF	ALF
I	2	3	4	5	6	7	8	9	I0	II	I2	I3
H		|										
D		|										
Li	6								|			
Be		|										
C		|										
N		|||										
O		||										
Na	23							|				
Mg		|										
Al		||										
Al	27								|	|		
Si		|||	|	|	|	|						
Si	28					|							
Ar		|											
Ca		||		|	|							
Ca	40			|	|							
Cr			|										
Mn							|	|		|			
Fe		|||	|		|			|				
Fe	54									|			
Ni		|											
Ni	58									|			
Ge		|											
Zr		|											
Ba			|	|		|	|						
Eu		||											
Gd		|											
Yb		|											
Pb	208		||	|	||								
Th	230											|	
Th	232		|				|					||||	
Pa	231											||	
U	233		|									|	

to be continued

I	2	3	4	5	6	7	8	9	I0	II	I2	I3
U	235	I	II	I			I				III	I
U	236										I	
U	238		I									
Np	237										I	
Pu	239										I	I

CCDN PROGRESS REPORT

October 1972 - May 1973

1. Introduction

During the period under review the activities of the CCDN - compilation and dissemination of bibliographic, experimental and evaluated neutron data - continued. After a number of vacancies could be filled by the beginning of 1973 the Centre works with a complete staff again : 8 physicists, 2 technical assistants, 2 programmers, 3 computer and key-punch operators and 3 secretaries.

2. CINDA

Considerable effort was spent to complete the new CINDA direct-access programme system in time to produce the book tape for CINDA 73, after nearly four months had been lost because of a hardware fault. Input formats were finally agreed between all co-operating centres, and a preliminary reader's manual was issued. The CINDA file was converted in March 1973 and several thousand entries corrected in the process. The first retrievals were sent out to customers and to CINDA readers for checking, in April. The new programme system is working and proved its usefulness and convenience already when the book tape for CINDA 73 was produced and corrected in close cooperation with NDS. The final book tape reached NDS on 17 May, four days ahead of schedule.

2. Experimental Data

The steadily continuing compilation of experimental data from the CCDN service area resulted in the incorporation of about 90 000 new data points and the associated non-numeric information into the centre's NEUDADA file. The size of this file has now reached about 1 900 000 numerical and bibliographic records. Among the more noticeable acquisitions were :

- the complete fission product library compiled by E.A.C. Crouch at the Compilation Centre for Chemical Nuclear Data, Harwell ;

- high-resolution capture and fission gamma-ray spectra measured at Karlsruhe with thermal neutrons for U-233, U-235, Pu-238, Pu-239 and Pu-241.

EXFOR is still a matter of concern at the CCDN. Work on a programme for automatic conversion of EXFOR data to NEUDADA format had to be postponed because of the CCDN's CINDA commitments. Nevertheless practically all the incoming EXFOR data were entered into the NEUDADA file and so are available for retrievals. The backlog of new data from the CCDN service area, however, is still quite large, although two EXFOR tapes with 23 works, 225 subworks and 70 023 records (excluding system records) were despatched since last October, and three more tapes are almost complete.

4. Evaluated Data

CCDN's activity in the field of evaluated neutron data continued to be restricted to the collection and dissemination of such data. The main new acquisitions are :

- the Swedish SPENG library (July 1972) ;

- additional ENDF/B-III data (tape 309, March 1973) and pointwise resonance cross-sections for heavy elements and structural materials ;

- a new version of UKNDL, updated mainly with respect to the structural materials, uranium and plutonium (May 1973) ;

- the evaluated fission product library compiled by C. Devillers at Saclay (May 1973).

The Neutron Nuclear Data Evaluation Newsletter started by P. Ribon is produced since November 1972 by the CCDN. Two regular issues were published so far (NNDEN 8, November 1972 and NNDEN 9, March 1973). A special issue (NNDEN 10, March 1973) devoted to manipulation codes for the various evaluated-data libraries was produced following a recommendation of the File Format Working Group which met in Bologna in June 1972.

5. Retrievals from the CCDN's Files

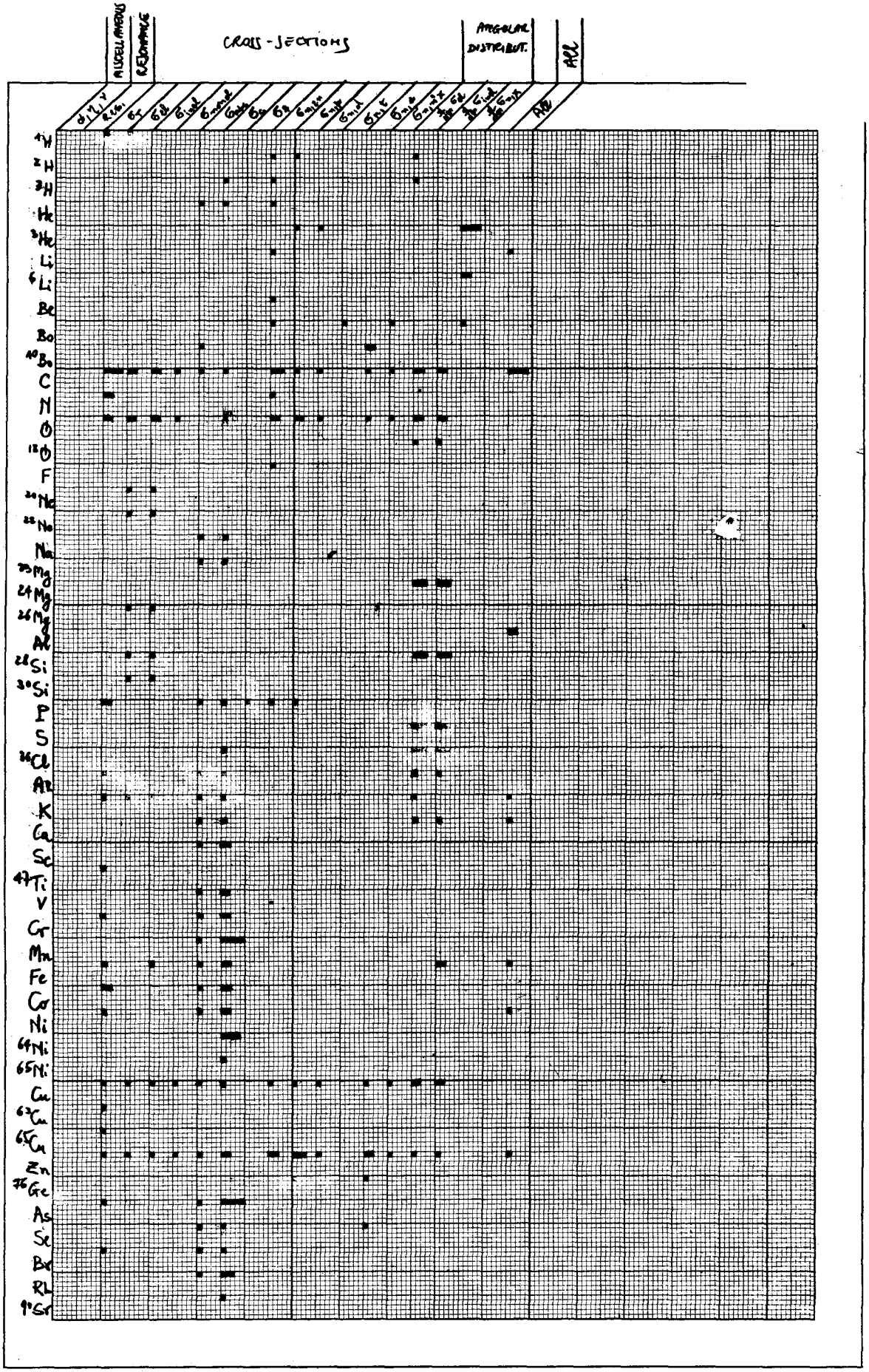
The last extensive retrieval statistics was prepared in April 1973. During the 12-month period beginning 1st April 1971, the CCDN received and satisfied :

- 210 requests for experimental data,
- 89 requests for evaluated data,
- 13 requests for bibliographic references,
- 40 requests for plots.

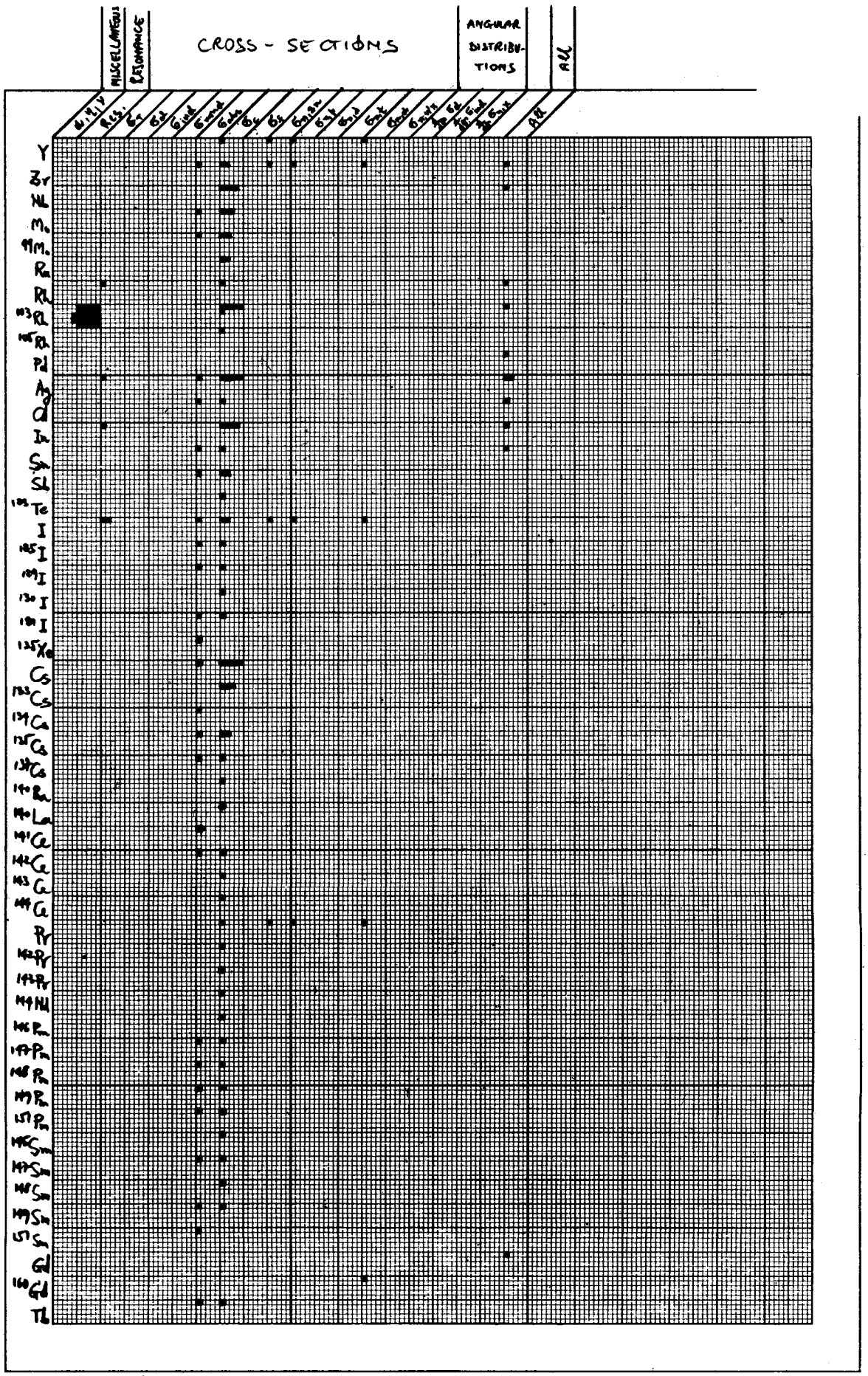
The number of bibliographic requests was about the same as during the preceding 12 months period. The requests for experimental and evaluated data, however, showed a significant increase - by 30% and 26%, respectively. The 209 requests for experimental data necessitated 870 specific retrievals, the corresponding Z-A-Q combinations are shown in the attached retrieval statistics. The data types most frequently asked were :

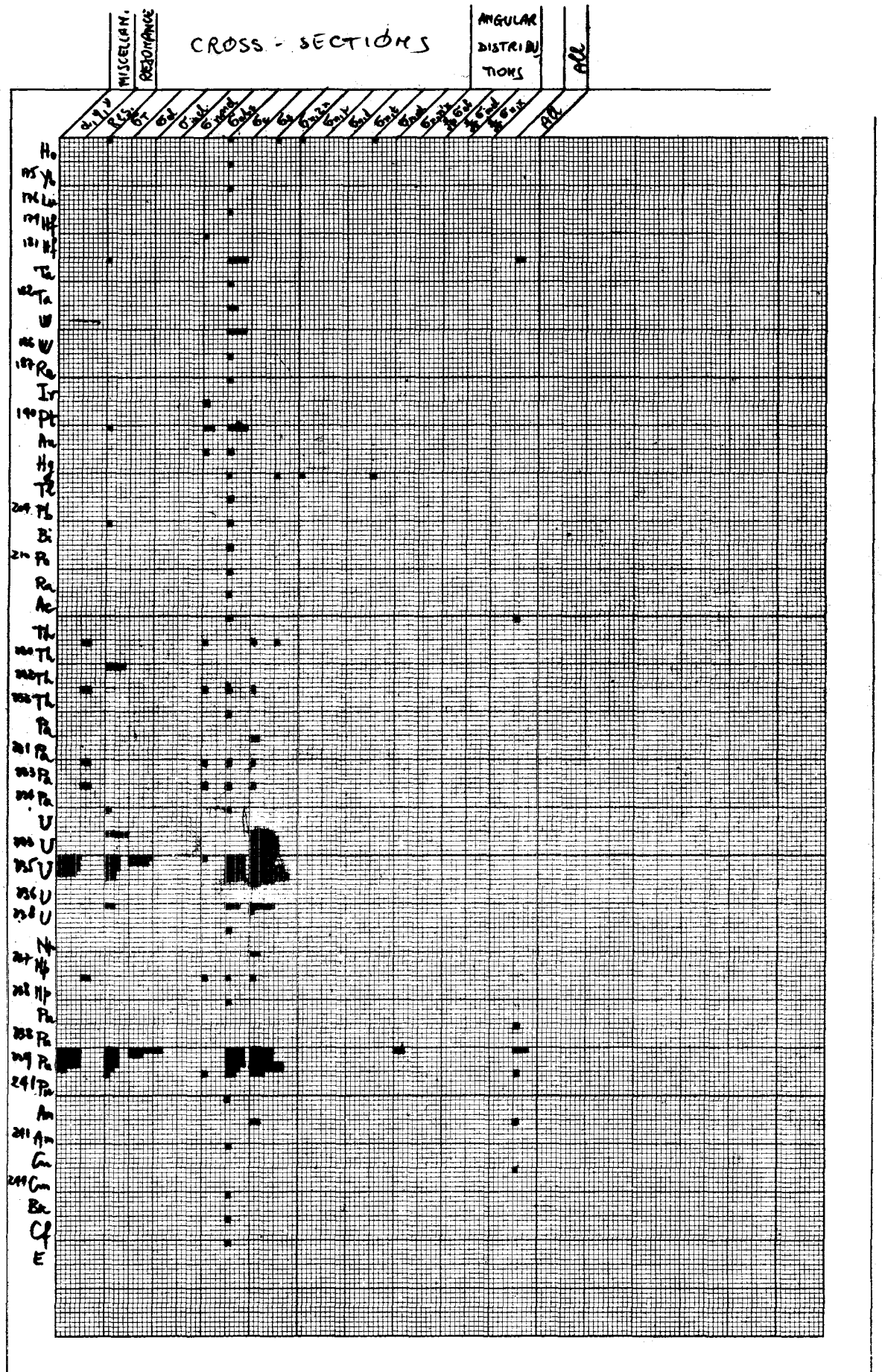
- capture cross-sections (and α values for fissile nuclides),
- elastic and inelastic scattering cross-sections,
- fission cross-sections, and
- total cross-sections.

The origin of the requests is shown on the last attached sheet. Comparison with the previous 12-month period shows that the increase in the number of requests is mainly due to a large number of Japanese requests for experimental data which were received from a number of Japanese Laboratories after the head of the centre had visited them and explained the capability and the services of the CCDN. An encouraging fact is the growing number of requests from universities and - as far as evaluated data are concerned - from industry. The centre tries to enhance this trend by various means ; for example a new brochure and panels showing its activities and services were produced and used already at a number of physics meetings and conferences. CCDN Newsletters listing newly available data sets were published in November 1972 and in April 1973.


ELASTIC ANGULAR
RESONANCE
CROSS-SECTIONS
ANGULAR DISTRIBUT.
ALL
d/t, γ
n, α₀
σ_T
σ_el
σ_inel
σ_n,n'
σ_n,2n
σ_n,p
σ_n,α
σ_n,n'γ
σ_n,n'α
σ_n,2n
σ_n,3n
σ_el
σ_inel
σ_n,2n
ANG
¹H
²H
³H
He
³He
Li
⁶Li
Be
Bo
¹⁰Bo
C
N
O
¹³O
F
²⁰Ne
²²Ne
Na
²⁵Mg
²⁴Mg
²⁶Mg
Al
²⁸Si
³⁰Si
P
S
³⁶Cl
Ar
K
Ca
Sc
⁴⁷Ti
V
Cr
Mn
Fe
Co
Ni
⁶⁴Ni
⁶⁵Ni
Cu
⁶³Cu
⁶⁵Cu
Zn
⁷⁶Ge
As
Se
Br
Rb
⁹⁰Sr

(Appendix D, page 5)




CROSS - SECTIONS
MISCELLAN.
RESONANCE
ANGULAR
DISTRIBU
TIONS
ALL

CCDN Request Statistics 1.4.72 - 31.3.73

Origin of Requests from CCDN Service Area

L : National Labs.
U : Universities
I : Industry
O : Others, e.g.Euratom

Country	Experimental Data				Evaluated Data				Literature Searches				
	L	U	I	O	L	U	I	O	L	U	I	O	
AUS	-	-	-	2	-	-	-	1	-	-	-	-	3
BLG	1	1	-	5	1	-	-	1	-	-	-	-	9
DEN	-	-	-	-	1	-	-	-	-	-	-	-	1
FR	21	-	4	5	17	3	3	-	1	-	-	-	54
GER	9	1	-	-	5	6	5	-	3	2	-	-	31
ITY	5	1	-	-	3	-	-	3	-	1	-	-	13
JAP	46	18	1	-	5	3	2	-	-	-	-	-	75
NED	1	2	-	-	5	2	-	1	1	-	-	-	12
NOR	-	-	-	-	1	-	-	-	-	-	-	-	1
SPN	-	-	-	-	3	-	-	-	-	-	-	-	3
SWD	-	1	-	-	1	-	-	-	1	-	-	-	3
SWT	-	3	-	-	2	1	-	-	-	-	-	-	6
UK	1	9	-	-	3	4	-	-	1	1	-	-	19
Others	-	2	-	-	-	1	-	-	-	-	-	-	3
	84	38	5	12	47	20	10	6	7	4	0	0	233

NNCSC PROGRESS REPORT, October 1972 - May 1973

1. Compilation

There are now 7 physicists compiling data on a part time basis. The CSISRS file contains approximately 1,200,000 data points at this time. Since the last 4-Center meeting 5 EXFOR tapes (1011-1015) have been transmitted. Tape 1015 contains only corrections. Tape 1016 will be sent shortly.

We have completed corrections to the old data translation from SCISRS to CSISRS. The portion of those data that originated in Area 1 are being sent out on separate EXFOR transmission tapes. The portions of the data that originated in Areas 2, 3, and 4 are being transmitted (not separated by Areas) on special tapes in EXFOR format. Each individual Center may then decide how much additional information to add to the data before inserting it in the usual way into the EXFOR system.

During the year ending March 30, 1973, we had 104 requests for blocks of data from our CSISRS experimental data file, these involved 871,000 data records. During the same period, there were 158 requests for sets of evaluated data from the ENDF files.

2. Evaluation

The ENDF/A file has been enriched by the addition of the Swedish Neutron Data Library, SPENG, for 28 elements, and also by the $^{235}U(n,f)$ cross section evaluation prepared by Konshin and Nikolaev. Data on 9 additional materials have been added to the ENDF/B-III file. The same Nation-wide Cross Section Evaluation Working Group (CSEWG) that prepared ENDF/B-III is now moving toward preparing a new version, ENDF/B-IV, of the Evaluated Nuclear Data File, to be ready early in 1974.

In addition to coordinating the varied efforts of CSEWG, NNCSC personnel have made specific evaluations for Cr, Ni, the isotopes of Kr, the isotopes of Ag, and the isotopes of Xe. We are building up our collection of nuclear model codes, adopting them for use with our PDP-10 computer, and using them in the evaluations we are carrying out.

3. Publications

BNL-17541 (ENDF-201), "ENDF/B Summary Documentation," assembled by O. Ozer and D. I. Garber, was prepared in May 1973. It is a 362 page summary of the physics reasoning and the more detailed documentation used in preparing most of the ENDF/B-III data files. The book is in a loose-leaf binder in order to enable additions, corrections, and up-dates as the files are improved and changed into ENDF/B-IV.

The Third Edition of BNL-325, Vol. 1 (Tables) is expected to reach completion this summer.

ORIGINATOR / REQUEST TYPE	INDUSTRY	NATIONAL LABS	UNIVERSITIES	GOVERNMENT AGENCIES	OTHER	TOTALS THIS YEAR	TOTALS LAST YEAR
EXPERIMENTAL DATA	17	75	37	3	6	138	143
EVALUATED DATA	38	61	33	15	15	162	142
CODES & DOCUMENTATION							

NDS Report to Ninth Four Center Meeting

I. STAFF. Since the last Four-Center Meeting Trevor Byer has left the section. He will be replaced by Peter Smith from Canada hopefully by August. Additionally we have had the services of Peter Winiwarter for eight months ending in June. He has been assisting primarily with CINDA and EXFOR work. During this period Vasily Manokhin from CJD spent about two weeks in Vienna to observe NDS operations and discuss common center problems.

II. CINDA. We are now in the process of preparing CINDA 73 from the tape supplied by CCDN. This book will be produced from the new file format. Due to the unfortunately short time between file conversion (old to new format) and book production we expect the book to suffer somewhat both in contents and in format. We hope these shortcomings will be speedily rectified.

III. EXFOR. The conversion of all old DASTAR data to EXFOR for region 3 data was completed by P. Winiwarter and the data transmitted. Some backlog of known new data had developed because of other tasks assigned to our compilers. This should be rectified during this summer.

IV. WRENDA. The Saclay RENDA file conversion to the new WRENDA format has been completed. Programming of the file handling system is awaiting the arrival of Peter Smith. This delay has caused some slippage in the WRENDA 74 deadlines.

V. DATA REVIEWS. The section has undertaken a review of fission spectrum average (n,2n), (n,p) and (n,α) cross sections. This work is nearly complete and will be used as a chapter in a data handbook for neutron activation analysis.

The review of the 2200 m/s fissile isotope cross sections is continuing. The discrepancy between the measured and the deduced Cf^{252} $\bar{\nu}$ still exists. Crucial new half life measurements from Geel are still awaited.

Work continues on the review of neutron dosimetry cross sections. A report on several more fast reactions will be issued this summer.

VI. RUSSIAN TRANSLATIONS. This has been a very busy period for receipt of documents from the USSR requiring translation to English. Seven documents (INDC(CCP)-27 thru -32) have been distributed and Nuclear Constants Vol.7, Vol.8 (4 Parts) and Vol.9 have been translated. They are now awaiting typing and reproduction.

VII. CUSTOMER SERVICE. The NDS statistics for the period MAY 1972 to MAY 1973 are appended. Past trends have continued but an increase in follow-up requests to the other centers should be noted as it indicates that the transmission of data thru EXFOR is still insufficient. NDS has begun planning for the automation of as much as possible of its data request services. A data index for machine retrieval has been designed to be closely linked to our Data Request and Distribution Logs. Improved output format will be designed and plotting capabilities introduced.

VIII. NON NEUTRON NUCLEAR DATA. The NDS organized a very successful Symposium in Paris concerning the needs for all kinds of nuclear data in applied science and technology. For the first time there was an extensive review of data needs outside the fission reactor, fusion reactor and safeguards applications. The NDS will gradually expand its activities in the non-neutron nuclear data area, at first primarily in a coordinating capacity.

IX. PAST MEETINGS.

A. Consultants' Meeting on the 2200 m/s Cross Sections for the Fissile Isotopes

The apparent discrepancy between Mn bath and liquid scintillator measurements of $\bar{\nu}$ (Cf^{252}) has been resolved but the discrepancy between the $\bar{\nu}$ (Cf^{252}) measurements and the value implied by eta and $\bar{\nu}$ ratio measurements remains serious. (Axton, Deruytter, Lemmel, Leonard, Story.)

B. Panel on Neutron Standard Cross Sections

New measurements and evaluations of standard cross sections were reviewed. Particular attention was paid to $Li^6(n,\alpha)$, $U^{235}(n,f)$ and $Cf^{252}(\bar{\nu})$. The Harwell-Cadarache disagreement on $Li^6(n,\alpha)$ measurements has been resolved. The resonance analysis of the 250 KeV resonance is being reviewed in an attempt to resolve the total vs.(n,α) discrepancy. (Byer, Lemley: Secretaries)

C. Consultants' Meeting on Fission Product Nuclear Data (FPND)

A group of experts was convened to plan the forthcoming Panel on FPND. The group defined the data types and areas of application of fission product nuclear data. This information was then organized into a program for the planned meeting. (Benzi, Bustraan, Flowers, Lammer, Schmidt, Valente)

D. Symposium on the Application of Nuclear Data in Science and Technology

See item VIII, Non Neutron Nuclear Data. (Hjärne, Schmidt: Secretaries)

X. FUTURE MEETINGS

A. Consultants' Meeting on Nuclear Data for Reactor Neutron Dosimetry (10-12 September 1973 in Vienna)

A specialist review of nuclear data for reactions used in neutron flux determination by foil activation techniques. (Dierckx, Dunford, Liskien, McElroy, Turi, USSR, Vlasov)

B. Sixth Meeting of the International Nuclear Data Committee (8-12 October 1973 in Vienna) (J.J. Schmidt, Secretary)

C. Panel on Fission Product Nuclear Data (26-30 November 1973 in Bologna)

The meeting will concentrate on the presentation of sixteen review papers covering all types of fission product nuclear data, the needs for these data in applied fields and integral experiments to test the microscopic data. (M. Lammer, J.J. Schmidt: Secretaries, V. Benzi: Local Chairman)

D. Study Group Meeting on Non Neutron Nuclear (early Spring 1974)

This meeting will convene representatives of various data centers and compilation groups throughout the world to define a cooperative program similar to the one now existing in the neutron data area. The prime emphasis will be on nuclear structure and decay data. (Hjärne, Schmidt: Secretaries)

E. Third Nuclear Data Conference

The conference was not recommended for 1974 by the Agency's Scientific Advisory Committee. Its future will be discussed again at the INDC Meeting this fall.

F. Nuclear Data Requirements for Shielding

The future of this meeting is uncertain at this moment. It may either be delayed to 1975 or cancelled. More definite guidelines will be required from the shielding community.

21 May 1973

Requests for → / ↓ request origin	Experimental Data		Evaluated Data		Documents		Cinda Retrievals		TOTALS	
	Cumulat. Totals	1 Oct 71 -1 Oct 72	Cumulat. Totals	1 Oct 71 -1 Oct 72	Cumulat. Totals	1 Oct 71 -1 Oct 72	Cumulat. Totals	1 Oct. 71 -1 Oct. 72	Cumulat. Totals	1 Oct 71 -1 Oct 72
Incoming from area:										
1	24	1	1	0	31	8	0	0	56	9
2	36	3	2	0	63	17	1	0	102	20
3	80	13	52	12	69	19	15	0	216	44
4	42	5	16	3	12	3	7	0	77	11
Subtotal	182	22	71	15	175	47	23	0	451	84
* Follow-up to area:										
1	64	9	1	0	0	0	0	0	65	9
2	62	11	15	1	2	0	16	0	95	12
3	48	2	1	0	1	0	0	0	50	3
4	31	2	1	0	3	1	0	0	35	2
Subtotal	205	24	18	1	6	1	16	0	245	26
NDS origin, sent to area:										
1	25	1	1	0	2	1	0	0	28	1
2	31	1	7	1	4	1	6	2	48	5
3	121	11	0	0	1	1	0	0	122	11
4	12	1	2	2	0	0	0	0	14	3
Subtotal	189	14	10	3	7	3	6	2	212	20
TOTALS	576	60	99	19	188	51	45	2	908	130

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

** The number of follow-up requests for experimental data has increased nearly to the double for the present period!

D DLOG - Experimental data dissemination

AREA	No. of data sets		No. of data lines	
	cumulative	1May72-30Apr73	cumulative	1May73-30Apr.73
1	531	0	34 921	0
2	254	0	15 639	0
3	1 812	617	285 227	102 474
4	169	22	136 207	34 287
TOTAL	2 766	639	471 994	136 761

EDLOG - Evaluated data dissemination

AREA	No. of data sets		No. of data lines	
	cumulative	1May72-30Apr73	cumulative	1May72-30Apr.73
1	603	2	213 810	4 040
2	622	5	221 474	10 100
3	3 321	712	1738 377	372 413
4	1 452	660	652 602	192 278
TOTAL	5 998	1 379	2826263	578 831

Comments on Data Dissemination

Experimental data	no. of data sets	no. of data lines
previous period (Oct.71-Oct.72)=	804	75 759
present " (May72 -Apr.73)=	639	136 761
Evaluated data:		
Previous period (as above) =	2418	617 404
present period (" ") =	1379	578 831

EXFOR DATA DISSEMINATION AT NDS

Overall Period

Exfor data from area	no. of sub-entries	no. of lines
1	277	26.579
2	442	106.766
3	339	4.287
4	25	210
TOTAL	1083	137.842

Period May 72 - Apr. 73

Exfor data from area	no. of sub-entries	no. of lines
1	243	26.541
2	229	55.259
3	81	2.822
4	10	125
TOTAL	563	84.747

sent to = Bulgaria, India, Israel, Pakistan, Romania, South Africa, USSR.

Contents of EXFOR Data Tapes

Since the last Four Centre Meeting the following data tapes were received by or dispatched from the NDS

1011	2010	3008	4005
1012		3009	4007
1013			
1014			

Table IVb-1 lists the number of works, subworks and data points as well as the date of transmission of each tape. From the 87 entries dispatches from the NDS, a total of 23 correspond to retransmission.

In Table IVb-2 are tabulated the year of publication of the main reference in the transmitted data. This table shows that, while most of the information contained in the tapes from NNCSC and CCDN correspond to measurements published after 1969, i.e. to recent measurement, the tapes from NDS include a large proportion of old data. This feature is a consequence of the fact that about 60% of the entries are conversions from DASTAR into EXFOR.

In Table IVb-3 the element and quantity distribution of the transmitted entries are given. For the sake of simplicity the data for all isotopes of each element have been grouped together, except for the fissile isotopes for which individual isotopes were considered. For the same reason we have decided not to give a frequency representation and, therefore, for some of the isotopes and quantities (in particular for the fissile isotopes) more than one entry from a given Centre was transmitted.

TABLE IV b-1

Contents of transmitted EXFOR TAPES

Area	Tape No.	Works	Subworks	Data Points	Date
NNCSC	1011	21	209	4244	2/11/72
	1012	21	165	9417	12/01/73
	1013	4	149	13948	4/05/73
	1014	15	316	12096	8/05/73
		Total= 61	Total 839	Total= 39705	
CCDN	2010	19	116	26250	12/03/73
NDS	3008	59	240	1793	11/12/72
	3009	28	243	4734	14/03/73
		Total= 87	Total=523	Total= 6527	
CJD	4005	7	51	611	9/11/72
	4007	9	73	757	5/02/73
		Total= 16	Total=124	Total = 1368	

Table IV b-2

Year of publication of transmitted data

Area \ Year	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
NNCSC											4	18	22	17
CCDN								1		5	2	5	3	3
NDS	1	2	1	3	4	4	8	9	19	13	5	6	4	8
CJD			1				1	1	3	2	3	2	2	1

TABLE-IV-b-3

	SCATTERING											N,CHARGED P						FISSION					
Element	RIA	RES	LDL	TØT	SEL	DEL	SIN	DIN	DNG	SCT	TSL	SNE	ABS	NG	N2N	NP	ND	NT	NA	NF	ALF	ETA	NU	NND	FRS
01 H				1	1	1						1													
01 T					1	1						1													
02 HE				1	1																				
03 LI													1				3	3							
04 BE					3														3						
05 B													1				3								
06 C				1	1,3,4	1,4	3	1																	
07 N															3			3	3						
08 O				1	1	1	1	1								3	3								
09 F															1,3		3	3							
11 NA					1	1	1	1						3	1										
12 MG					1	1	1	1						3		1									
13 AL				3	1	1	1,4	1						3											
14 SI				1	1	1	1	1		1				3		1			1						
15 P			3											3											
16 S					4	4										1,3			1,3						
17 CL	1													1		1	3		1						
19 K														1			3								
20 CA				3		3								1,3			3								
21 SC														3	3										
22 TI					4	4								3	3	3	3								
23 V														3											
24 CR					4	4	4																		
25 MN					4									3	1,3										

TABLE-IV-b-3 (Continued)

Element	RIA	RES	LDL	TØT	SEL	DEL	SIN	DIN	DNG	SCT	TSL	SNE	ABS	NG	N2N	NP	ND	NT	NA	NF	ALF	ETA	NU	NND	FRS
26 FE				1	1,4	1,4	1,4	1							3	1,3									
27 CO	3			1	1,4	1,4	1	1		1					1										
28 NI				1	1,4	1,4	1	1							3	1,3	1		1						
29 CU					4	4						3		3	1,3				1						
30 ZN	3			3								3		3	3	1,3									
31 GA														3											
32 GE	3			3			3							3											
33 AS				3					1					3											
34 SE	3			3										3	3										
35 BR	3													3											
36 KR														1											
37 RB	1,3									1															
38 SR	3													3	3										
39 Y							3							3	3										
40 ZR	3													3	1,3										
41 NB							1		1																
42 Mo	3														3				3						
43 TC														1											
44 RU	3																								
45 RH	3													3					3						
47 AG	3													1	3										
48 CD							3					3	3												
49 IN	3						3	1						1,3	1										
50 SN	3						3						3		3	3									

TABLE IV-b-3 (continued)

Element	RIA	RES	LDL	T⌀T	SEL	DEL	SIN	DIN	DNG	SCT	TSL	SNE	ABS	NG	N2N	NP	ND	NT	NA	NF	ALF	ETA	NU	NND	FRS
51 SB	3			3			3						3	3											
52 TE	3			3											3	3			3						
53 I	3						3							3	1										
55 CS														1	3										
56 BA	3													3											
57 LA	3				3	3	3							3											
58 CE	3													3											
59 PR				3	3	3		3		3				1,3											
60 ND		1																							
61 PM		1	1	1																					
62 SM		1,4	1,4	1									1	3	3										
63 EU														3											
64 GD														3											
65 TB	3													3											
66 DY	3	4	4	4	4								4	3											
67 HO		1	3							3				1,3											
68 ER														3											
69 TM				3						3				1,3											
70 YB	3			3						3				3											
71 LU		3		3						3				3											
72 HF														3											
73 TA	1						1		1					3	3										
74 W														3											
75 RE		1												3											

Table IV-b-3 (continued)

Element	RIA	RES	LDL	TØT	SEL	DEL	SIN	DIN	DNG	SCT	TSL	SNE	ABS	NG	N2N	NP	ND	NT	NA	NF	ALF	ETA	NU	NND	FRS
76 ØS		4	4	4										3											
77 IR				3										3											
79 AU				3			3								1										
81 TL	3																								
82 PB		1				4								3,4	3										
83 BI						4	4							3											
88 RA																				4					4
90 TH230		4	4	4	4								4												1
90 TH232						4														1,3					
91 PA	1													1						1					
92 U						4																			
92 U233		1			1															1,3,4	1		3		
92 U235		2,1		1,2	1,2									2						2,3,1	1,2		3		3
92 U236														1											
92 U238		1,2		1	2	2	2	2												1,4			2		
93NP237		2																		2,3					
94PU238																				4					4
94PU239		1,2		1	1,2	1,2	2	2												1,2			1,3		4
94PU240		2		2	1					2,1			1	1						3,4					4
94PU241		1																		3			3		
94PU242	1	1		1						1			1							1,4					4
94PU244																				1					
95AM241															2					4					4
95AM243		1		1																			3		

Table IV-b-3 (continued)

Element	RIA	RES	LDL	TØT	SEL	DEL	SIN	DIN	DNG	SCT	TSL	SNE	ABS	NG	N2N	NP	ND	NT	NA	NF	ALF	ETA	NU	NND	FRS
96CM244-8	1																			1					
98CF252												.		1				•		1					
CØMP				3							3														

1 = NNCSC
2 = CCDN
3 = NDS
4 = CJD

EXFOR TAPES OF ALL CENTRES, DATE 15/05/73

	CENTRE	NO TAPES	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE LAST TAPE
1	NNCSC	14	255	3156	11989	2203	152619	34628	201439	08/05/73
2	NDCC	10	145	1315	16561	535	365903	13263	398262	09/03/73
3	NDS	7	276	1863	15752	532	18980	17744	53008	14/03/73
4	CJD	5	45	367	2567	120	5507	3804	11998	05/02/73
TOTAL GEN.		36	721	6701	48869	3390	543009	69439	664707	

EXFOR STATISTICS CORRECTED FOR RETRANSMISSIONS

CENTRE	WORKS CORR.	SUBWORKS CORR.	SUBWORKS RETRANSM.
NNCSC	192	2920	236
CCDN	145	1315	0
NDS	220	1603	260
CJD	45	367	0
TOTAL GEN.	602	6205	496

EXFOR TAPES OF AREA 1, NNCSC DATE 15/05/73

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE
1001	17	99	618	9	11545	888	13060	22/06/71
1002	16	196	871	86	10763	2000	13720	19/07/71
1003	15	67	428	27	16975	660	18090	26/08/71
1004	9	30	194	6	26447	273	26920	24/09/71
1005	30	203	1335	144	10768	2243	14490	03/01/72
1006	27	752	2729	631	8142	8633	20135	18/04/72
1007	8	109	404	96	8278	1255	10033	15/05/72
1008	30	215	809	125	10215	2270	13419	21/06/72
1009	34	209	1021	98	7397	2121	10637	10/08/72
1010	9	435	1015	379	2351	5036	8781	06/09/72
1011	21	210	813	110	4277	2180	7380	02/11/72
1012	21	166	753	92	9417	1721	11983	12/01/73
1013	3	149	251	133	13948	1734	16066	04/05/73
1014	15	316	748	267	12096	3614	16725	08/05/73
14	255	3156	11989	2203	152619	34628	201439	

EXFOR TAPES OF AREA 2, NDCC DATE 15/05/73

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE
2001	9	228	4270	86	38462	2306	45124	18/11/70
2002	1	9	136	0	40317	93	40546	25/03/71
2003	1	7	113	0	35767	75	35955	26/03/71
2004	5	12	300	0	22478	112	22890	27/03/71
2005	97	733	9163	337	5688	7428	22616	08/09/71
2006	3	42	835	15	30335	431	31616	02/07/72
2007	1	8	200	3	39824	93	40120	03/07/72
2008	1	8	103	0	83154	84	83341	07/09/72
2009	8	155	1582	59	43628	1549	46818	08/09/72
2010	19	113	1859	35	26250	1092	29236	09/03/73
10	145	1315	18561	535	365903	13263	398262	

EXFOR TAPES OF AREA 3, NDS DATE 15/05/73

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	
3001									MISSING
3002									MISSING
3003	49	336	2542	87	1294	3185	7108	03/02/71	
3004	33	297	1910	41	1825	2737	6513	13/05/71	
3005	27	198	2112	94	4680	2018	8904	03/01/72	
3006	53	371	3185	103	3729	3524	10541	24/06/72	
3007	27	138	1461	35	918	1260	3674	26/09/72	
3008	59	280	2432	91	1792	2641	6956	11/12/72	
3009	28	243	2110	81	4742	2379	9312	14/03/73	
7	276	1863	15752	532	18980	17744	53008		

EXFOR TAPES OF AREA 4, CJD DATE 15/05/73

TAPE NO	WORKS	SUBWORKS	BIB REC.	COMM.REC.	DATA REC.	SYST.REC.	TOT.REC.	DATE	
4001									MISSING
4002	14	76	435	30	736	728	1929	23/12/70	
4003	8	59	685	12	1669	725	3091	10/09/71	
4004	7	108	513	37	1737	1142	3429	29/06/72	
4005	7	51	461	6	611	464	1542	09/11/72	
4006									MISSING
4007	9	73	473	35	754	745	2007	05/02/73	
5	45	367	2567	120	5507	3804	11998		

Recommendation to Editors of Journals

(Possible statement to be sent out by the INDC)

To Editors of Scientific Journals:

The Four Neutron Data Centers in the World wish you to know of a service that they are performing, which might enable you to shorten and at the same time improve the quality of articles that you publish on the effects of neutrons on atomic nuclei.

These Centers systematically acquire and compile all published experimental data on the likelihood of specific nuclear reactions initiated by neutrons. They make copies of such data available to any who request them. This means that lengthy and detailed data tabulations frequently might be deleted from an article submitted to you, when the only purpose of including them is to record the data for subsequent workers to examine. A statement such as this one, appropriate for a paper originating in one of the OECD nations, might be inserted instead:

"The neutron data obtained during this work have been submitted to the Centre AEN de Compilation de Donnees Neutroniques for world-wide distribution to the Four Neutron Data Centers. A copy of any or all of these data may be obtained from the Neutron Data Center that services your area:

For U.S.A. and Canada:	National Neutron Cross Section Center Brookhaven National Laboratory Upton, New York 11973 USA
For the OECD countries and Japan:	Centre AEN de Compilation de Donnees Neutroniques, B.P. 9 91190-Gif-sur-Yvette France
For the USSR:	Center Po Jadernum Dannym (CJD) Institute of Physics and Energy Obninsk, USSR
For all other countries:	IAEA Nuclear Data Section Kärntner Ring 11 11/13 A-1010 Vienna Austria"

The suggestion made here is not intended to remove from the article any numberical data that are discussed in the text, or illustrative material such as graphs; for these may be vital for the presentation.

The experimental neutron data currently being compiled and transmitted by the Four Centers are of five types, for any given target material.

1. The total neutron cross section, deduced from transmission measurements.

2. Neutron-induced reaction cross sections describable by

   (target nucleus)(neutron in; any 1,2,3, or 4 "particles" out)(residual nucleus), where "particle" can mean photon, neutron, ^{1}H, ^{2}D, ^{3}T, ^{3}He, or ^{4}He nuclei.

   Differential reaction cross sections with respect to angle of emission, and with respect to energy of particle emitted, are included in this category, as are partial cross sections to separate excited states of the residual nucleus. Integrals or averages of these reaction cross sections over various impinging neutron spectra are also included.

3. Resonance Parameters (energy, spin, widths) for each resonance in neutron interactions, averages thereof over many resonances, neutron strength functions.

4. The coherent and incoherent scattering cross sections and the coherent scattering amplitude.

5. The cross section for neutron-induced fission, the ratio α of this to the capture cross-section, the average number $\bar{\nu}$ of neutrons emitted during fission, and the quantity η defined as $\nu/(1 + \alpha)$.

   The manner of compiling data on more complex aspects of the fission process has not yet been agreed upon, so these aspects are not being compiled at present.

The Four Neutron Data Centers do much more than simply acquire and compile numerical data. They attempt to describe how the data were obtained and what reliability may be ascribed to them. The information necessary to do so is not always available in the articles that have been published in the past. Therefore we suggest that you endeavor to have every article containing neutron data include these four types of information, which are of value to the serious reader:

1. Description of and/or quantitatus characterization of the neutron source and of the intensities, energies, and polarization of the neutrons impinging on and leaving the target.

2 Quantitative characterization of the particles and radiations emitted from, or scattered by, the target.

3. Explicit statement of neutron cross-section values used, assumed, or deduced, and of the methods of analysis involved.

4. Discussion of uncertainties and possible systematic errors in the data and in the values deduced.

NOTE TO CONTRIBUTORS

OF PAPERS ON EXPERIMENTAL NUCLEAR PHYSICS

In March 1972 the IAEA organized the first meeting of an international working group on nuclear structure and reaction data.

As reviewers and compilers, the attendees of that meeting have to read more papers than most other physicists. Their common experience is that too often papers in experimental nuclear physics fall short of certain accepted standards. They feel that substantial improvement in papers would result if the old standards listed in the following recommendations would get extra attention.

The editor of Nuclear Physics urges the authors to keep these recommendations in mind while writing their papers. That would certainly also facilitate the task of referees and editors.

RECOMMENDATION TO AUTHORS OF PAPERS ON EXPERIMENTAL NUCLEAR PHYSICS

1) While brevity is a cardinal virtue, the description of the experiment should be in sufficient detail to enable the reader to judge the reliability of the data presented and of the precision claimed. Naturally a reference to such a description in an earlier publication would be equally acceptable.

2) A clear statement of the errors (systematic or statistical) of the result and how they are derived is essential.

3) If the results are relative to or depend on some other measured or calculated quantity this should be clearly indicated, its value(s) and its error given and its origin stated.

4a) Data should clearly stand out from the text, e.g. in tables.

b) Within tables, the authors' new measurements should be kept separate from values derived from other sources.

c) Experimental data should be distinguished from results derived using theoretical nuclear models.

5) If an extensive tabular presentation of the data does not form part of the published paper but is available in a laboratory report or from a data centre this should be explicitly brought out.

6) Previously published material, e.g. abstracts, laboratory reports, conference reports, etc., which are superseded by the paper presented should be explicitly indicated.

Test on CINDA and EXFOR Completeness

Taking advantage of the data review on fission spectrum averaged cross-sections, I have been able to test for this specific data field the (in)completeness of CINDA/U. 75 publications containing (n, p), (n, alpha) and (n, 2n) averaged cross-sections have been examined here. The table in appendix checks for each reference the status of CINDA, CINDU, CCDN-Newsletter 13. The EXFOR area number gives the geographical origin hence the center responsible for compilation.

The check was performed against the CINDA 72 book (+ supplement), the last version of CINDU (17 April 1973), the CCDN-Newsletter 13 (February 1972).

RESULTS

The following table summarizes the results of the check.

AREA	C I N D U		TOTAL	C I N D A	
	works indexed	works not indexed		references indexed	references not indexed
1	0	20	20	12	8
2	4	29	33	24	0
3	3	13	16	15	1
4	0	6	6	6	0
TOTAL	7	68	75	57	18

Remark:

The difference between "work" and "reference" is in most cases irrelevant since practically all the publications considered here report the final data from a given author on a particular work. This means that when a particular data set is not indexed in Cinda, it is not indexed at all, for example under other references possibly pertaining to the same work.

DISCUSSION

I - CINDA

1) 18 references are missing in CINDA (appr. 25%). If we consider only the pre-72 references for a fair comparison with the CINDA-72 book (+ supplement), this drops to still 15 misses (appr. 20%).

2) Only examination of the missing reference (name of the journal, where it is published, etc.) can reveal the Cinda center responsible for the miss.

3) The perfect score (0 miss) achieved for data from area 4 means:
   - either a perfect coverage (all the existing references are compiled)
   - or a possible loss (for the user) of reference(s) which should have been compiled in CINDA and live(s) unnoticed elsewhere.

4) This remark also applies to area 1,2,3.

II - CINDU

1) First an obvious remark: A missing Cindu entry either means a failure in our compilation (for data from area 3) or a failure in the transmission/compilation (for data from other service areas).

2) The figures tell everything about these failures. We have less than 10% of the data in EXFOR.

3) We can define for each Center a rough transmission (compilation) efficiency coefficient which is the ratio of the number of transmitted works to the total number of works. With our 19% (3/16) we come clearly ahead of CCDN with 12% (4/33). CJD and NNCSC are ex-aequo with 0%*.

4) In our case, this is clearly a failure of the compilation. In the case of CCDN, it is also a transmission failure since 9 out of the 29 missing works from area 2 are indexed in CCDN Newsletter 13.

5) CCDN has 3 times more data than we do (23 versus 7).

*) Is that a sign of East-West "detente"?

O = still gap on 1 Oct. 1974
V = entered before "

Reference	Area	Indexed in		
		CINDA	CINDU	CCDN-NW 13
AM64	3	yes	no	yes
BA68	2	no O	no	no
BO64	3	yes	yes	yes
BR67	2	yes	no	yes
BR70	2	yes	no	no
BU70	2	yes	no	no
CB57	4	yes	no	no
CE62	2	yes	no	no
CR66	4	yes	no	yes
CR67	4	yes	no	yes
CS67	2	no O	no	no
CU62	1	no	no	no
FA70	2	yes	no	no
FE66	1	no	no	yes
FH64	3	yes	no	no
FM69	2	yes	no	no
FR67	2	yes	no	no
GI66	1	yes	no	no
GN68	1	yes	no	yes
GO62	3	yes	no	no
GR67, 68	1	yes	no	no
HA72	2	no V	no	no
HE58	1	yes	no	no
HG66	2	yes	no	no
HO62	1	no	no	no
HP69	1	no	no	yes
HU53	1	no	no	no
JA64	3	yes	no	no
JD68	2	yes	yes	yes
KI71	2	yes	no	yes
KO65	2	yes	no	yes
KO66	2	yes	no	yes
KR65	1	yes	no	no
KU65	4	yes	no	no
LA65	2	no	no	yes
LE63	3	no	no	no
LW66	1	yes	no	no
LW69	1	no	no	yes
MA64/2	2	yes	no	no
MA64/3	2	yes	no	no
MA64/4	2	yes	no	no
MC72	1	no	no	no
ME58	2	yes	no	no
ME60	2	yes	no	no
MU61	3	yes	no	no
NI63	3	yes	no	no
NI64	3	yes	no	no
NI63/1	3	yes	no	no
NI65/2	3	yes	no	no
NJ70	3	yes	yes	no
NL63	2	no	no	no
NS68	4	yes	no	yes
OB67	1	yes	no	no
OB69	1	yes	no	yes
PA61	1	yes	no	no
PH58	2	yes	no	yes
QU71	2	no	no	yes
RA71/1	2	yes	no	yes
RA67/2	2	yes	no	yes
RC59	1	yes	no	no
RE67	3	yes	no	no
RG68	2	no O	no	no
RG72	2	no O	no	no
RR60	3	yes	yes	no
RV67	2	yes	no	no
RV58	1	yes	no	no
SC57	1	no	no	no
SC69	1	yes	no	no
ST67	2	yes	yes	yes
ST70	2	yes	yes	yes
WA62	3	yes	no	no
WA63	3	yes	no	no
WE70	2	yes	yes	yes
ZH63	4	yes	no	no
ZJ63	2	no	no	no

all Radiochim Acta checked

REFERENCES

1. AM 64 — S. AMIEL, J. GILAT
Nucl.Sci.Engng 18 (1964) 105.

2. BA 68 — H. BRAUN, L. NAGY
Radiochim.Acta 10 (1968) 15.

3. BE 57 — R.H. BETTS, O.F. DAHLINGER
Rep. AECL PR-CM-11 (1957) 12. (ref. quoted by STE 70)

4. BO 64 — J.W. BOLDEMAN
J.nucl.Energy A/B 18 (1964) 417.

5. BR 67 — A.M. BRESESTI, M. BRESESTI, R.A. RYDIN
Nucl.Sci.Engng 29 (1967) 7.

6. BR 70 — A.M. BRESESTI, M. BRESESTI, A. ROTA, R.A. RYDIN, L. LESCA
Nucl.Sci.Engng 40 (1970) 331.

7. BU 70 — A. BRUGGEMAN, D. DE SOETE, J. HOSTE
Radiochim.Acta 14 (1970) 147.

8. BY 65 — BYRNE
Private communication to N.J.FREEMAN,J.Nucl.Energy 23 (1969) 713.

9. DB 57 — B.G. DUBOVSKY, A.V. KAMAEV, E.F. MAKAROV
Atomn.Energ.2 (1957) 279. [Engl.transl.,J.nucl.Energy 6 (1957) 172.]

10. DE 62 — H. DEPUYDT, M. NEVE DE MEVERGNIES
Reactor Science and Technology (J.nucl.Energy) A/B 16 (1962) 447.

11. DR 66 — A.A. DRUZHININ, A.A. LBOV, L.P. BILIBIN
J.Nucl.Phys.(USSR) 4 (1966) 515 [Engl.transl.Soviet Journal of Nuclear Physics 4 (1967) 366]

12. DR 67 — A.A. DRUZHININ, A.A.LBOV, L.P. BILIBIN
J.Nuclear Phys. (USSR) 5 (1967) 18. [Engl.transl.: Soviet Journal of Nuclear Physics 5 (1967) 13]

13. DS 67 — M. DESCHUYTER, J. HOSTE
Radiochim.Acta 7 (1967) 198.

14. DU 62 — R.W. DURHAM, M.P. NAVALKAR, E. RICCI
Rep. AECL-1434 (1962)

15. FA 70 — A. FABRY, M. DE COSTER, G. MINSART, J.C. SCHEPERS, P. VANDEPLAS
Nuclear Data for Reactors (Proc.Conf.Helsinki,1970) 2, I.A.E.A., Vienna (1970) 535.

16. FA 72 — A. FABRY
Rep. BLG-465 (1972)

17. FE 66 — F.F. FELBER,Jr., D.R. FARMELO, V.C. VAN SICKLE,
Nucl. Sci.Engng 25 (1966) 1.

18. FH 64 — K. FÄHRMANN
Unpublished work quoted in Rep. ZFK-RN 23 (1964) 6.

19. FM 69 N.J. FREEMAN, J.F. BARRY, N.L. CAMPBELL
J.Nucl.Energy 23 (1969) 713.

20. FR 67 J.P. FRANÇOIS, D. DE SOETE, J. HOSTE
Radiochim.Acta 8 (1967) 192.

21. GN 68 L. GREEN
Nucl.Sci.Engng. 32 (1968) 30.

22. GI 66 GILLETTE
Rep. ORNL-4013 (1966) 7.

23. GO 62 K.P. GOPINATHAN
Proc. of the Nuclear Physics Symposium. Madras (1962) 97.

24. GR 68 J.A. GRUNDL
Nucl.Sci.Engng 31 (1968) 191.

25. HA 72 J.R. HANSEN, E. STEINNES
Radiochim.Acta 17 (1972) 46.

26. HE 58 W.J. HENDERSON, P.R. TUNNICLIFFE
Nucl.Sci.Engng 3 (1958)145.

27. HG 66 F. HEGEDUS
Helv.Phys.Acta 39 (1966) 179.

28. HO 62 C.H. HOGG, L.D. WEBER
Symposium on radiation effects on metals and neutron dosimetry (Proc.Symp. Los Angeles, 1962) American Society for Testing and Materials (1963) 133.

29. HP 69 H.B. HUPF
Rep. TID-24823 (1969) 46 and 52.

30. HU 53 D.J. HUGHES
"Pile Neutron Research", Chapter 4.
(Addison-Wesley Publishing Company, Inc. CAMBRIDGE 42, Mass). 1953.

31. JO 68 O. JOHANSEN, E. STEINNES
Radiochim. Acta 9 (1968) 47.

32. JA 64 K. JANTSCH
Unpublished work quoted in Rep. ZFK-RN 23 (1964) 6.

33. KI 71 I. KIMURA, K. KOBAYASHI, T. SHIBATA
J. Nucl. Sci. Technol. 8 (1971) 59.

34. KO 65 W. KOEHLER, K. KNOPF
Rep. EANDC (E)-57 (1965) 29.

35. KO 66 W. KOEHLER
Nukleonik 8 (1966) 9.

36. KR 65 H.H. KRAMER, W.H. WAHL
Nucl. Sci. Engng 22 (1965) 373.

37. KU 65 L.N. KURCHATOVA, V.I. LEVIN, L.N. MORDZOV
Radiokhimiya 7 (1965) 472 [Engl. transl., -]

38. LA 65 T. LAGERWALL
Zeitschrift für Naturforschung 20a (1965) 1583.

39. LE 63 W. LEONHARDT
Kernenergie 6 (1963) 45.

40. LL 65 LLORET
Private communication to H. Liskien, quoted in
J. of Nucl. Energy 27 (1973) 39.

41. LW 66 R.E. LEWIS, T.A. BUTLER
Nuclear Applications 2 (1966) 102.

42. LW 68 R.E. LEWIS
Rep. TID-24823 (1968) 49

43. MA 64/1 W.H. MARTIN, D.M. CLARE
Nucl. Sci. Engng 18 (1964) 468.

44. MA 64/2 D.M. CLARE, W.H. MARTIN, B.T. KELLY
Nucl. Sci. Engng 18 (1964) 448.

45. MA 64/3 W.H. MARTIN, D.M. CLARE
Nucl. Sci. Engng 19 (1964) 465.

46. MA 64/4 D.M. CLARE, W.H. MARTIN
J. Nucl. Energy A/B 18 (1964) 703.

47. MC 72 W.N. McELROY, R.J. ARMANI, E. TOCHILIN
Nucl. Sci. Engng 48 (1972) 51.

48. ME 58 C.E. MELLISH, J.A. PAYNE, R.L. OTLET
Rep. AERE I/R 2630 (1958).

49. ME 60 C.E. MELLISH
Rep. AERE-R3251 (1960) [See also Nucleonics 19 (3) (1961) 114]

50. MU 61 R. MUENZE, K. JANTSCH, O. HLADIK
Kernenergie 4 (1961) 293.

51. NI 63 S. NIESE, P. MORZEK, C.HEROLD
Kernenergie 6 (1963) 37.

52. NI 64 S. NIESE
Kernenergie 7 (1964) 105.

53. NI 65/1 S. NIESE
Kernenergie 8 (1965) 499.

54. NI 65/2 S. NIESE
Rep. ZFK-Rch 3 (1965) 23.

55. NJ 70 M. NAJZER, J. RÀNT, H. SOLING
Nuclear Data for Reactors (Proc. Conf. Helsinki, 1970) 2, I.A.E.A., Vienna (1970) 571.

56. NL.63 R. NILSSON
Neutron Dosimetry (Proc. Symp. Harwell, 1962) 2, I.A.E.A. Vienna (1963) 275.

57. NS 68 F. NASYROV
Atomn.Energ. 25 (1968) 437 [Engl. transl.,?]

58. OB 67 H.A. O'BRIEN, Jr. J.S. ELDRIDGE
Nucleonics 25 (2) (1967) 41.

59. OB 69 H.A. O'BRIEN, Jr.
Int. Journal of Applied Radiation and Isotopes 20 (1969) 121.

60. PA 61 T.O. PASSEL, R.L. HEATH
Nucl. Sci. Engng 10 (1961) 308.

61. PH 58 J.A. PHILLIPS
J. Nucl. Energy 7 (1958) 215.

62. QU 71 S.M. QUAIM, R. WOLFLE, G. STOCKLIN
Chem. Nucl. Data, Measurements and Applicat. (Proc. Conf. Canterbury, 1971) (1971) 121.

63. RA 67/1 G. RAU
Nukleonik 9 (1967) 228.

64. RA 67/2 G. RAU
Rep. EANDC (E) 89 (1967) 41.

65. RB 59 B.L. ROBINSON, R.W. FINK
Private communication to Rochlin, quoted by Rochlin in Nucleonics 17, no. 1 (1959) 54, ref. 14.

66. RC 59 R.S. ROCHLIN
Nucleonics 17, no. 1 (1959) 54.

67. RE 67 G.R. REDDY. M. SANKAR DAS
Rep. BARC-280 (1967)

68. RG 68 P. DE REGGE, R. DAMS, J. HOSTE
Radiochim. Acta 9 (1968) 57.

69. RG 72 P. DE REGGE, R. DAMS, J. HOSTE
Radiochim. Acta 17 (1972) 69.

70. RI 57 R. RICHMOND
quoted by ROCHLIN in Nucleonics 17 (1) (1959) 54, ref. 12.

71. RO 60 J.C. ROY, J.J. HAWTON
Rep. CRC-1003 (1960).

72. RR 60 D. RICABARRA, R. TURJANSKI, A.H.W. ATEN, Jr.
J. Nucl. Energy, Part A: Reactor Science 12 (1960) 177.

73. RV 57 J. RIVIER, J. BLACHOT, J.C. HOCQUENGHEM
Radiochim. Acta 8 (1967) 196.

74. RY 58 P.A. ROYS, KALMAN SHURE
Nucl. Sci. Engng 4 (1958) 536.

75. SA 59 E. SAELAND, K. SAMSAHL
quoted by R.S. ROCHLIN in Nucleonics 17, No. 1(1959) 54, ref.7.

76. SC 57 R.P. SCHUMAN, A.C. MEWHERTER
Rep. KAPL-1779 (1957).

77. SC 69 R.P. SCHUMAN, D.K. OESTREICH
Rep. WASH-1136 (1969) 55.

78. SI 67 E. STEINNES
Rep. KR-123 (1967)

79. SI 70 E. STEINNES
Radiochim. Acta 13 (1970) 169.

80. WA 62 K. WAGNER
Kernenergie 10/11 (1962) 790.

81. WA 63 K. WAGNER, H. POSER
Kernenergie 6 (1963) 177.

82. WE 70 J. WEITMAN, N. DAVERHÖG, S. FARVOLDEN
Trans. of Am. Nucl. Society 13 (1970) 558.

83. ZH 63 I.F. ZHEZHERUN, I.P.SADIKOV, V.A. TARABAN'KO, A.A.CHERNYSHOV
Atomnaya Energiya 15 (6) (1963) 485./ Engl.transl.: Soviet Atomic Energy 15 (1963) 1271./

84. ZJ 63 W.L. ZIJP
Neutron Dosimetry (Proc. Symp. Harwell 1962) 1, IAEA, Vienna (1963) 589.

Check on CINDA and EXFOR Completeness for $\bar{\nu}$.
(not including 5000-8000 series)

We have used the opportunity of the review carried out recently by Manero and Konshin [1] on the status of the energy dependent and spontaneous fission $\bar{\nu}$ values for the heavy isotopes ($Z \geqslant 90$), to check the completeness of CINDA and EXFOR for this specific data field. The check was made against CINDA-72 (including supplement), the last version of CINDU at the date when the review was completed (December 1972) and the CCDN Newsletter Bulletin 13 (February 1972).

Table 1 lists the references included and not included in each of the publications considered, together with the year of publication and the area where the reference was originated. The number of the reference corresponds to the number of the reference in the paper of Manero and Konshin [1] and we refer to this publication for identification.

Only experimental works. evaluations and reviews have been considered. In the case of evaluations and reviews, it was recognized that they must be included in CINDA but not necessarily in EXFOR, as shown in the different number of total references for CINDA and EXFOR.

Unpublished data, even if quoted in other publications were, in general, not considered, nor were private communications.

Table 2 summarizes the results of the check carried out. It shows that the coverage of EXFOR should be considered quite bad, but that of CINDA much better.

We have also examined the year of publication of the references missed in CINDA. The result is given in Table 3.

---

[1] F. Manero and V.A. Konshin - Atom. Energ.Review 10, 637 (1972)

Table n° 1

+ : yes , 0 = no

Reference		Area	Indexed in			Reference		Area	Indexed in		
No	Year		CINDA	CINDU	CCON-NW/13	No	Year		CINDA	CINDU	CCON-NW/13
1	1969	3	+			34	1970	4	+	+	0
2	1968	1	+			35	1970	1	+	0	0
3	1967	1	0			36	1970	4	+	0	0
4	1966	2	+			37	1958	4	+	0	+
5	1965	3	+			38	1958	4	+	0	+
6	1970	3	+			39	1966	1	+	0	+
7	1971	1	+			40	1967	2	0	0	0
8	1963	2	+	+	+	41	1972	4	0	0	0
9	1963	1	+	+	+	42	1957	1	+	0	0
10	1965	2	+	+	+	43	1952	1	+	0	0
11	1961	1	+	+	+	44	1952	2	0	0	0
12	1966	2	+	+	+	45	1954	1	0	0	0
13	1968	2	+	+	+	46	1957	2	0	0	0
14	1969	2	+	+	0	47	1960	4	+	0	0
15	1970	1	+	+	0	48	1971	1	+	+	0
16	1972	1	+	0	0	49	1956	1	+	+	0
17	1970	2	+	+	0	50	1952	1	+	0	0
24	1970	2	0	0	0	51	1971	2	+	+	+
26	1972	4	+	0	0	52	1959	4	+	0	0
27	1970	1	0	0	0	53	1960	2	+	0	+
28	1971	3	+	0	0	54	1963	2	+	+	+
30	1969	1	+	0	0	55	1956	1	+	+	0
31	1967	3	+	+	+	56	1946	1	0	0	0
32	1971	1	+	0	0	57	1951	2	+	0	0

Table 1. (continued)

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page 3

Reference		Area	Indexed in			Reference		Area	Indexed in		
No	Year		CINDA	CINDU	CCON/NW113	No	Year		CINDA	CINDU	CCON-NW/13
58	1953	1	o	o	o	94	1967	4	+	+	+
59	1954	1	o	o	o	95	1967	3	+	+	+
60	1955	2	o	o	o	96	1961	4	+	o	+
61	1956	1	o	o	o	97	1958	4	+	o	+
62	1956	4	+	o	o	98	1958	4	+	o	o
63	1956	2	o	o	o	99	1959	1	+	o	+
64	1956	1	+	+	+	100	1959	4	+	o	+
65	1961	1	+	+	o	101	1962	4	o	o	o
66	1966	1	+	o	+	102	1965	2	+	+	+
67	1968	3	+	+	+	104	1965	2	+	o	+
68	1971	4	+	o	o	105	1968	4	+	+	+
70	1968	4	+	o	o	106	1961	1	+	o	o
71	1955	1	+	+	o	107	1957	4	+	o	+
72	1964	4	+	+	o	108	1958	4	+	o	+
73	1970	1	+	o	o	109	1958	4	+	o	+
75	1956	1	+	o	o	110	1960	1	o	o	o
76	1971	1	+	o	o	111	1964	2	o	o	o
78	1960	2	+	o	o	112	1967	4	+	+	+
79	1958	4	+	o	o	113	1971	1	+		
81	1971	3	+	+	o	116	1958	4	+	o	+
82	1971	2	+			117	1960	4	+	o	+
83	1970	2	+			118	1962	1	+	+	+
92	1970	4	+	o	o	120	1964	2	+	o	+
93	1964	4	+	+	+	121	1961	2	+	o	+

Table n° 1 (continued)

Reference		Area	Indexed in			Reference		Area	Indexed in		
No	Year		CINDA	CINDU	CCDN-NW/13	No	Year		CINDA	CINDU	CCDN-NW/13
122	1965	2	+	+	+	159	1970	2	+	+	+
123	1967	1	+	o	+	161	1956	1	+	o	o
124	1969	2	+	o	+	162	1962	4	+	o	+
126	1970	2	+	o	o	163	1966	2	+	o	+
127	1970	4	+	+	+	164	1958	1	+	o	o
129	1970	3	+	+	+	165	1958	1	+	o	o
131	1963	1	+	o	o	166	1962	1	o	o	o
133	1954	1	o	o	o	170	1948	1	+	o	o
134	1954	1	o	o	o	173	1947	1	+	o	o
136	1955	1	+	o	+	175	1948	1	+	o	o
137	1955	1	+	o	o	176	1949	1	+	o	o
139	1957	1	+	o	+	178	1950	1	+	o	o
143	1958	1	o	o	o	179	1947	1	o	o	o
145	1961	1	+	o	o	180	1954	2	o	o	o
146	1964	2	+	+	+	181	1955	4	+	o	o
147	1957	2	+	o	o	186	1965	1	+	—	—
148	1960	1	+	o	o	189	1972	2	+		
149	1958	3	+	o	o	190	1969	1	+	o	+
150	1958	4	+	o	+	191	1970	1	+	o	o
151	1957	4	o	o	o	192	1972	1	+	o	o
152	1960	4	+	o	o	194	1959	4	+	+	o
153	1963	3	+	o	o	195	1960	4	+	+	o
154	1957	2	o	o	o	196	1963	4	+	+	+
157	1968	2	+	+	+	197	1965	4	+	+	+
158	1970	2	+	o	+	198	1967	4	+	+	+

Table 1 (continued)

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Reference		Area	Indexed in			Reference		Area	Indexed in		
No	Year		CINDA	CINDU	CCDN-NW/13	No	Year		CINDA	CINDU	CCDN-NW/13
200	1955	1	+	0	0	215	1972	1	+		
201	1957	2	+	0	+	216	1962	3	0	*	*
202	1958	1	+	0	0	217	1966	4	+	*	*
203	1960	1	+	0	0	220	1971	1	+	0	0
204	1961	4	+	+	0	222	1969	1	+	0	0
205	1961	1	+	+	0	223	1969	1	+	0	0
206	1966	4	+	+	+	229	1970	4	+	0	0
207	1968	2	+	0	0	233	1972	2	+	0	0
208	1972	2	0	0	0	234	1971	1	+		
209	1969	3	0	0	0	241	1971	2	+		
210	1969	1	0	0	0	243	1971	2	+		
211	1970	1	0	0	0	244	1971	2	0		
212	1971	2	+	0	0	245	1970	2	0		
213	1971	1	+	+	+	249	1969	4	+		

* Data not within the scope of EXFOR

Table 2

	C I N D A				C I N D U				CCDN-NW/13			
Area	Total	Works incl.	Works not incl.	% of losses	Works incl.	Works not incl.	% of losses	Total	Works incl.	Works not incl.	% of losses	
1	71	56	15	21.1	11	53	82.8	64	12	52	81.2	
2	46	34	12	26.0	12	24	66.7	36	16	20	55.5	
3	13	11	2	15.4	6	4	40.0	10	6	4	40.0	
4	44	41	3	6.8	16	27	62.8	43	22	21	48.8	
Total	174	142	32	18.3	45	108	70.5	153	56	97	63.3	

For all "new" data since EXFOR start the loss rate is 2/3.

Table 3

Missing CINDA References

Area	Year of Publication			Total missing	Total considered
	before 1960	1960-1970	after 1971		
1	10	5	0	15	71
2	6	4	2	12	46
3	0	2	0	2	13
4	1	1	1	3	44
Total	17	12	3	32	174

It shows that there is a large proportion of old references missed.

In the case of references not included in CINDU or/and CCDN-NW/13, it should be pointed out that, in general, these correspond either to thermal or spontaneous fission $\overline{\nu}$ values for the more "exotic" isotopes or to old references which, on the other hand, can be found in the several compilations, reviews or evaluations previously published.

On the other hand a CINDU entry means either EXFOR or DASTAR. In fact some of the CINDU are DASTAR entries made by F. Manero while doing his review and are not available from EXFOR.

Appendix M

Proposal for the Reporting of Four Center Statistics

I. All statistics should be presented for a 12 month period ending on (April 30) preceeding the meeting. When possible totals should be compared with the previous 12 month period. The statistics should include the total number of new references and total number of new data points obtained within the year.

II. Request statistics should differentiate between requests for:

a. Experimental data
b. Evaluated data
c. Computer codes or documentation

III. Request statistics should be presented in three sections:

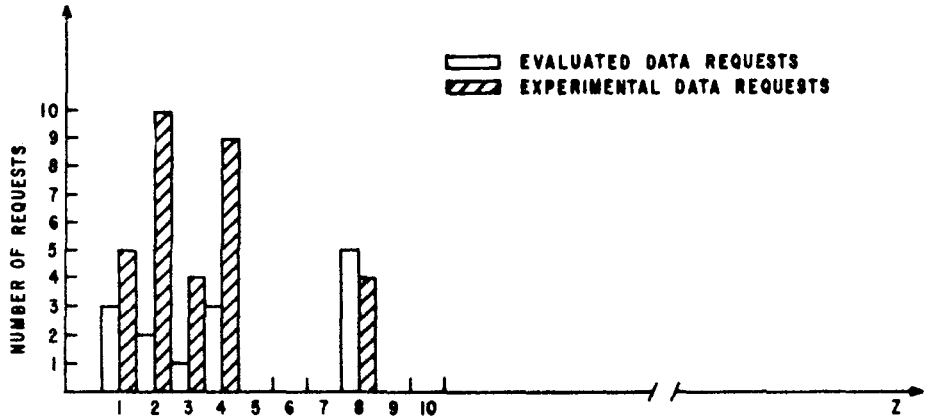
a. Request totals and their originators
b. Type of data requested
c. Continuing and/or outstanding requests

The following is an explanation of these three sections:

III-a Request totals and originators
These can be presented in a table of the following form:

ORIGINATOR / REQUEST TYPE	INDUSTRY	NATIONAL LABS	UNIVERSITIES	GOVERNMENT AGENCIES	OTHER	TOTALS THIS YEAR	TOTALS LAST YEAR
EXPERIMENTAL DATA							
EVALUATED DATA							
CODES & DOCUMENTATION							

III-b Type of data requested.
The most concise manner of representing this information seems to be a request frequency histogram with the abscissa representing the Z value vs. the number of requests for that particular Z.



III-c Continuing or Outstanding Requests.
These requests should be indicated with the greatest amount of detail. A possible tabulation would consist of:

Z	A	Proc. Param.	Auth.	Lab.	Reference if available	No. of Requests Waiting

Proposed Statistical Information on NDS Operations

I. INTRODUCTION

The following proposal has formed the basis for discussions within the Nuclear Data Section for the kind of statistics which we will keep in the future. Therefore you will note references to the Data Request and Data Distribution Logs. However, it is felt that the contents of this internal proposal would form a basis for discussion on Common Statistics at the Ninth Four Center Meeting.

The objective of keeping operational statistics is to help answer the following questions.

1) How is NDS serving its customers ?
2) How is NDS operating within the Four-Center Network ?

The statistical reports should be prepared as far as possible from computerized data files to minimize the effort of preparation. We visualize that the Data Request and Data Distribution Logs (as kept by NDS) should be able to provide most of the raw data at the present time with the remainder coming from the new EXFOR Compilation Control sheets used within NDS.

II. SOME DEFINITIONS

A common "report period" must be defined, particularly for joint statistics from the Four Data Centers. This will permit more meaningful intercomparisons. Additionally one can analyze trends more easily.

A "request communication" will consist of any letter, telephone call, cable or any other single communication mode which initiates a center-customer or center-center service action.

Each "request communication" will consist of one or more "information request units". The following would constitute a single unit for experimental or evaluated data requests.

1. Any single combination or range of the variables Z,A,Q,energy
2. a data file (evaluated, defined by Z,A) or data set (e.g. EXFOR sub-entry)
3. data from a given reference (e.g. EXFOR entry)
4. All data from a given LAB.

For bibliographic requests, Z,A,Q and energy range constitute a unit and for documents, each single document is a request unit, but several documents may constitute a unit if they relate to a single data information request unit.

Each "information request unit" would be represented by an entry in the Request Log all connected to a single "request communication".

III. REQUEST STATISTICS

A. The number of "request communications" can be used to give a breakdown

1) By country
2) By number of individuals.

All other request statistics should be reported in "information request units".

B. These request units should be broken down in the following way

1) Experimental Data
   Evaluated Data
   Bibliographic (CINDA)
   Document
2) Research Institutions
   Educational Institutions
   Production Organizations
   Administrative Organizations
   Data Centers

) Two dimensional table

The remaining statistics should be reported for customer-center communications only.

C. The request units for evaluated data should be broken down into file types i.e. UKNDL, ENDF, KEDAK, etc.

D. Request units should be broken into

1) Closed requests	2) Open requests
Filled	Standing
Partially filled	Partially filled
Unfilled	Unfilled

E. Some analysis of unfilled and partially filled requests is needed. (Why)

IV. DATA DISTRIBUTION STATISTICS

A. We should report the average number of data sets or files and data points distributed per information request unit for experimental and evaluated data sent to customers in service area.

B. For data distributed to customers in our service area (the Data Distribution Log) one should give the number of data points and the number of data sets for experimental and evaluated data separately. Also one needs the number of CINDA lines and the number of documents distributed.

C. Data distributed should be reported by Z and split into experimental data sets and evaluated data files, except for U and Pu which should be reported by Z and A. Trends should be stated verbally below the table as for example important Z,A and/or Q.

V. FOUR CENTER OPERATIONS

A. The requests from center to center should be broken into types as categorized in III.B.1.

B. EXFOR transmissions should be analyzed as presently done by CCDN. Supply separately for NEW and REVISED transmissions :

1) Number of works
2) Number of subworks
3) Number of system records
4) Number of bibliographic records
5) Number of common records
6) Number of data records

C. Completion rate of inter-center requests

(Why are some unfilled ?)

VI. EXFOR COMPILATION STATISTICS

A. The NDS EXFOR compilation statistics will operate on a data pool consisting of the following information.

1) EXFOR Accession number
2) New or revised compilation
3) Compiler name (code)
4) Reference-type (code)
5) Date of "publication" of compilable data
6) Date NDS becomes aware of data
7) Date numerical data requested from author
8) Date numerical data available at NDS
9) Date compilation begins
10) Date compilation complete
11) Date compilation entered into LIMBO
12) Date of transmission to other centers
13) Number of "check" passes before entrance to LIMBO

B. This information can be analyzed to give

1) The average time between any pair of events recorded in items A5 - A12 above.

2) Averages can be broken into NEW or REVISED compilations.

3) Time between "publication" and awareness (A5 and A6) can be separated by reference type.

4) Time between compilation completion and entry to LIMBO (A10 - A11) can be related to the number of passes in the check sequence.

5) It will be possible to identify "troublesome" compilations by accession number and compiler. "Troublesome" can be defined as those compilations containing step time(s) far from average.

6) Percent step completion within given time between any 2 pairs.

C. By date of "publication" of compilable data we mean for conferences, the date of the conference; for books, reports and journals, the date of publication; and for private communication, the date of transmittal of cover letter.

If there is no need to request numerical data from the author then items A7 and A8 may be left blank.

D. From the incomplete EXFOR Compilation Control Forms we can get

1) Number of possible works
2) " of compilations awaiting data from authors
3) " in compilation
4) " in checking
5) " awaiting transmission

EXFOR Format Modification Proposals Adopted

We think the problem is badly phrased, and should be "Re-transmission of a subentry without the data table". If we understand the problem correctly, some people object to retransmitting very long data-tables, when no change has been made in them. The BIB and COMMON sections are usually so small as to cause little trouble .

We therefore propose that when something in a subentry is altered, the following always be sent: -

1) BIB-section complete (or NOBIB, if applicable);

2) COMMON-section complete (or NOCOMMON, if applicable);

3) DATA-section complete (or NODATA, if applicable), if altered, OR if the DATA-section remains unaltered, then transmit:

```
XDATA          N1          N2
  Data-heading redord(s)
  Data-units record(s)
  First data-line
  Last data-line
ENDDATA
```

Where XDATA (meaning except data) obviously replaces DATA;
N1 and N2 are assigned the same as on the normal DATA record transmission. (i.e. N1 = no. of columns, N2 = 2).

(Note: if only 1 or 2 data lines, then transmit with normal DATA and ENDDATA)

4) Column-80 flags to be used as at present.

We feel that this will provide a consistent set of information. Important changes often involve the ISO-QUANT and with the above information it would be possible to check for consistency at transmission time. This information also facilitates indexing of TRANS-tapes.

NOTE: 1. This proposal will need changes in the EXFOR manual, and in existing programs.

2. An 'implementation date' should be agreed upon at the 4C-Meeting. This being the date on which all centres are prepared to receive data in this revised format. (1. March 1974 is envisaged.

Use of PER-CENT in units

PER-CENT is forbidden for use with the data-heading keyword DATA, DATA1, DATA2 etc., and RATIO, RATIO1, RATIO2 etc.

Data should be converted to NO-DIM by dividing the results by 100.

If the DATA (or RATIO) error is given in per-cent, this always means a percentage of the relevant DATA (resp RATIO).

Wave-lengths

Delete the data-heading keyword WVE-LN (wave-length). Wave-lengths will be entered with the data-heading keyword EN, E or derivatives of these, and with units-keyword ANGSTROM (or any other "length"). This formalism is restricted to neutron-energies.

EXFOR Format Proposals Requiring Further Study

We propose that a * be used in the 11th position of the data-heading keyword(s) in DATA or COMMON which define the independent variable(s). If there is no *, it will be assumed that there are no multiple representations of the same independent variable and that the data-table has only one independent variable which is in the first column, except in the case of one-line data tables, when the independent variable may be in COMMON.

It is expected that those centres compiling in an EXFOR-like format, will implement the use of * immediately even for 1-dimensional tables, and others will implement it as soon as programming permits.

Extension of FLAG usage

CCDN have experienced difficulties with only one FLAG data-heading keyword. We note that the data-heading keyword FLAG may be used more than once.

The numerical flags entered in these columns would have the same meaning in each column (eg. 3. would have the same meaning under first FLAG and second FLAG. In the BIB-section the keyword FLAG is used as at present.

This requires an entry in LEXFOR , for clarity.

2-dimensional tables, etc.

1) At the last 4-centre meeting (4CM/VIII/X4, Page 33, § 38B) it was decided that 2-dimensional tables for fitting coefficients be sent within one subentry, by repeating the Energy in the first column, putting the coefficient number in the 2nd column, followed by the data.
We propose that this concept be extended to all multi-dimensional tables (i.e. 2 or more independent variables) with no restriction on data-type. The column-order of the independent variable should maintain the monotonic increasing or decreasing rule for the first column. This is best represented visually by the attached appendix I. For an example see ENTRY 30I25 already transmitted by NDS.

2) We would like to propose a new scheme for transmitting Resonance Parameters, so that they can all be included in one subentry, instead of split up into many subentries as at present.
A new quantity code RP is needed (meaning Resonance Parameters). Under the keyword ISO - QUANT, this new code would be followed, each a new line, by the codes for the individual resonance parameters given in the table. An example is attached (Appendix 2).

3) We wish to retain the maximum limit of 10 columns, in the Data table. We can see that this could impede the implementation of the 2 proposals given above. We therefore propose a method of having sub-set tables within one DATA-section. This requires the introduction of a new systems-identifier keyword, DATA-CONT, to

be used only between DATA and ENDDATA (one or more times as needed). N1 on the DATA and DATA-CONT records will be the number of columns in the sub-set, N1 $\leq$ 10.

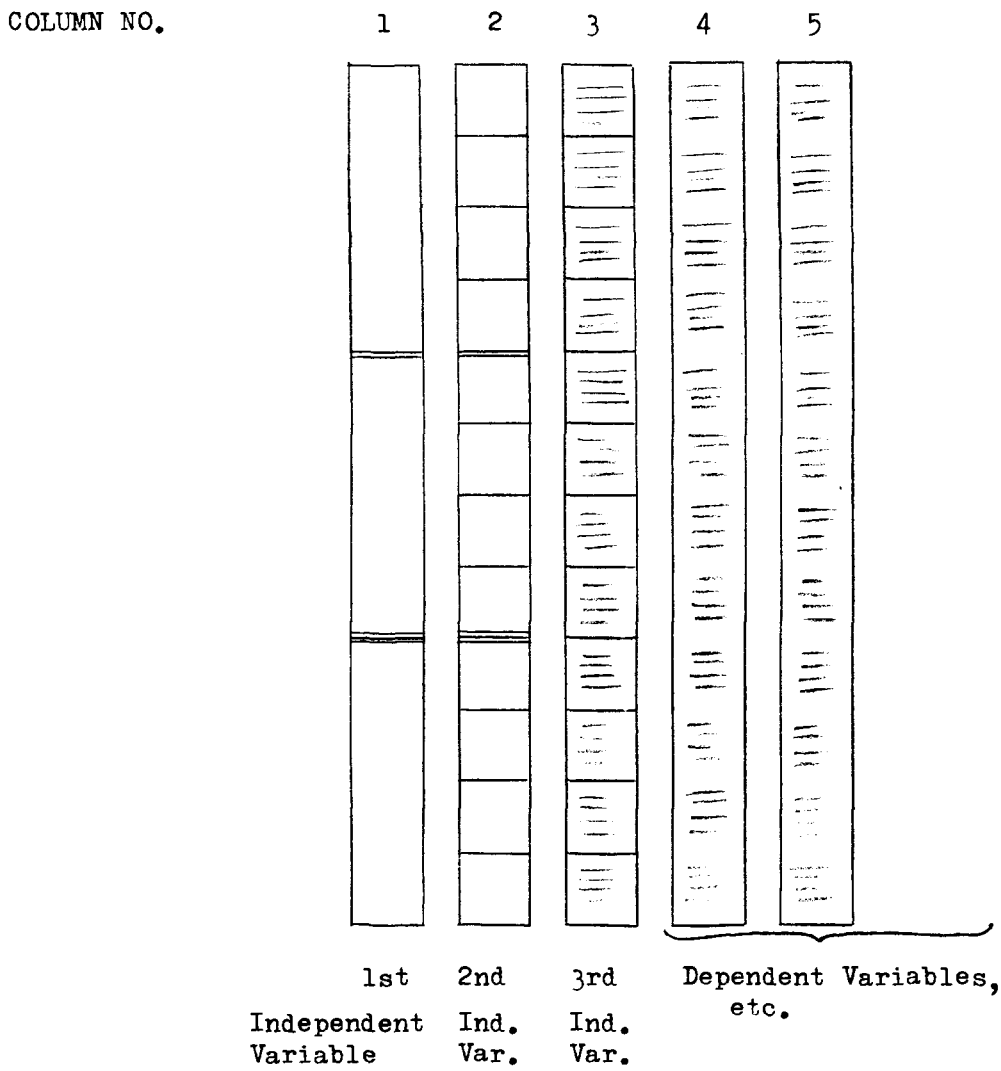
N2 on the DATA and DATA-CONT records will specify the number of data lines within the sub-set. An example is attached (Appendix 3).

This proposal should apply to any type of data, but will be particularly used in conjunction with proposal 1 and 2 above.

Note: When splitting tables with more than one independent variable into sub-set tables, the independent variables (and errors, if given) should be repeated in the sub-set.

4) All of these proposals require changes to the EXFOR Manual and to programs. An "implementation date" should be agreed upon at the 4C-meeting. This being the date at which all centres are prepared to receive data in these formats. (1 March 1974 is envisaged.)

Note: Although CCDN foresee no difficulty in receiving such data, it will be a very long time before they can send data in this format, and they will, in general, continue to send such data split into several sub-entries.


COLUMN NO.
1
2
3
4
5
1st Independent Variable
2nd Ind. Var.
3rd Ind. Var.
Dependent Variables, etc.

APPENDIX 2

EIB

ISØ - QUANT (Z - S - A, RP)

(DATA1) = (((EL / WID) * (NG/WID)) / (TØT/WID))

(DATA2) = (J, RES)

(DATA3) = (L, RES)

ENDBIB

NØCØMMØN

DATA

EN-RES	EN-RES-ERR	DATA1	DATA1-ERR	DATA2	DATA3
MEV	MEV	MILLI-EV	MILLI-EV	NØ-DIM	NØ-DIM
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

ENDDATA

APPENDIX 3


```
BIB
ISØ-QUANT      (Z-S-A, RP)
               (DATA 1) = (EL/WID, RED, 2G)
               (DATA 2) = (TØT/WID)
               (DATA 3) = (NG/WID)
               (DATA 4) = (NF/WID)
               (DATA 5) = (J, RES)
               (DATA 6) = (L, RES)
   -
   -
   -
ENDBIB
NØCØMMØN
DATA                    10      (N2)
 EN-RES      EN-RES-ERR   DATA1   DATA1-ERR   DATA2   DATA2-ERR
 DATA3       DATA3-ERR    DATA4   DATA4-ERR
 EV          EV           MILLI-EV  MILLI-EV  MILLI-EV  MILLI-EV
 MILLI-EV    MILLI-EV     MILLI-EV  MILLI-EV
   -
   -
   -
   -
 DATA-CØNT          4        (N2)
 EN-RES      EN-RES-ERR   DATA5   DATA6       FLAG
 EV          EV           NØ-DIM  NØ-DIM      NØ-DIM
  -
  -
  -
ENDDATA
```

N.D.S. Internal Customer Service System

There has been considerable discussion within NDS over the past several months on how we could improve our request servicing operations. Many points are still not clear but the overall conceptual plan now exists.

A new "one line" data index has been designed to give as a computer oriented index to all of the data available at NDS. In this index non-machine retrieval information will be minimized. The index called INDAC will replace CINDU when in full operation. In any case no more CINDU publications will be made. We are however considering a "NEWSLETTER" type publication to include listings of new accessions. This index will be updated automatically from incoming EXFOR tapes and hopefully also from tapes of evaluated data files received.

This index will contain sufficient information to permit automatic retrieval of data sets pertinent to a request in at least 90% of all requests. A separate entry will be made for each data type in an evaluated data file. In addition, a set of retrieval quantities (a fourth character added to CINDA quantities) has been designed. Each EXFOR quantity has been assigned to one of these gross categories (see attachment).

This index will be directly connected to the Data Request and Data Distribution Logs. One will be able automatically to compare new index entries with open requests in the Request Log and new data sets constituting replacements or important corrections to other data sets with data already distributed in the Data Distribution Log. The Data Request Log in combination with the Index will automatically update the Data Distribution Log. Finally the two logs will be used to generate automatically the NDS Service Statistics.

Proposed Index-quantity scheme for an internal retrieval system.

- The existing X4-quantities are too complex and therefore not suitable for direct retrieval.
- The existing CINDA-quantities are not specific enough for many retrieval purposes.
- The proposed Index-quantity scheme should make retrievals simple and efficient.
  The Index-quantity consists of 3 items:

X4-quantity
1. CINDA-quantity (3 char.)
2. Modifier
3. Flag

ad 1. The corresponding CINDA-quantity is assigned to the X4-Iso-quant.

e.g. X4-Iso-quant (EL,DA) ⟶ CINDA DEL

ad 2. A modifier is assigned to the CINDA-quantity.
The modifier breaks the CINDA-quantity up into the following subgroups:

Modifier	stands for
I	Integral and partial cross-sections
A	Angular distributions
E	Energy spectra of outgoing particles
D	Double differential cross-sections
G	Information about outgoing Gamma-quants (Intensities or spectra)
blank	garbage quantities not falling in one of the above groups.

e.g.

X4-Iso-quant	CINDA	Modif.
(EL,LEG,2L2)	DEL	A

ad 3. A flag is assigned to all data which are not straight forward cross-sections or their analytic equivalent.

Flag	stands for
R	relative or raw data
+	a sum of Iso-quants
/	a ratio of Iso-quants

REPORT ON WORLD REQUEST LIST FOR NUCLEAR DATA (WRENDA)

by

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I. Status of Conversion

The open question at the last Four Centres Meeting as to whether there would be any experts' review of the status of data requested in WRENDA has been resolved in the negative after further consultations with the INDC and EANDC. As a result of the decision, some minor changes in the previously agreed request exchange format were necessary. These changes were included in a revised WRENDA format description distributed by NDS as Memo 4C-3/77. The dropping of the experts' review has also led to the adoption of an annual publication schedule which we included in that Memo.

The Master File for RENDA as it appeared in WRENDA 73 was transmitted to NDS by CCDN in early December. A one-time conversion program was written to convert the entire file to the new WRENDA exchange format. Each request was then checked to determine what other changes were required which could not be done automatically. These included

1) Some corrections to reaction quantities and modifiers.

2) Combining some requests where appropriate.

3) Splitting requests where multiple requestors from different countries.

4) Organizing the C, D and E type cards.

The comments in the status file were edited so that multiple references were removed. No attempt has been made to check these comments for appropriateness or validity.

The conversion as described is now complete on schedule. However we have had long delays in obtaining a staff replacement who will do the computer system work on WRENDA. The earliest estimated start time is now mid-August, so our previous schedule for production of WRENDA 74 must be relaxed.

We now hope to send the country retrievals to the other centers by mid-November. We will further ask the INDC at or before its October meeting to designate the official contacts in each country. The country retrievals will consist of the following:

1) Data requests ordered by country, then Z,A,Q, one request per page with the complete status file for that Z,A,Q attached to each request. This will be sent in duplicate.

2) Each request will have comments and questions added which we feel should be answered in order to clarify or further justify the request. It has become clear that many requests are submitted and included in the files and then left "forever" or have no justification comments attached.

3) One complete listing of the status file for all Z,A,Q in a Z,A,Q sort.

4) A complete WRENDA file in exchange format sorted by request ID.

The centers will transmit so that we receive 1 March 1974:

1) Complete requests in exchange format for all requests modified or new.

2) A list of ID's of completely satisfied requests.

3) A list of ID's of withdrawn requests.

4) Corrections to the status file written by hand on the file copy described in item 3 of the previous paragraph.

Attached you will find the following:

1) A List of Compound Codes for WRENDA
2) A sample book page
3) A sample country retrieval page.

Compound Codes for WRENDA

Z for Fission Products is 126

Z for compounds will be
= 200 + Z

Z is determined according to the EXFOR rules for compounds.

A for compounds will be

HYD	Hydride	100
WTR	Water	200
D2O	Heavy Water	250
CXX	Organic	300
OXI	Oxide	400
STX	Steel	500
CMP	Compound	900

Sample book page

60 NEODYMIUM 143 NEUTRON CAPTURE

671025 MODIFIED (PARTIALLY FULFILLED)

1.00 MV 1.00 KEV 10% 1
USA BET R.T.BAYARD
USA GEC T.SNYDER
ENERGIES ABOVE 1 EV OF INTEREST.
ACCURACY 10 PERCENT IN RESONANCE INTEGRAL.
NEEDED FOR FISSION PRODUCT POISON CALCULATIONS.

692219 NEW

850. EV 10.0 MEV 10% 2
SWD AE R.HAKANSSON
ENERGY RESOLUTION 10 PERCENT OR BETTER.
NEEDED FOR FAST REACTOR CALCULATIONS.

692220

5.00 KEV 2.00 MEV 10% 2
GER KFK J.J.SCHMIDT
FISSION PRODUCT IMPORTANT IN FAST REACTOR BURN UP CALCULATIONS.

STATUS

CRC WALKER - AECL-3037(9/68) RECOMMENDS 325B FOR THERMAL, RESONANCE INTEGRAL = 60B.
GEL ROHR+ - 71 KNOX 743(3/71) RESOLVED RESONANCE REGION.

---

60 NEODUMIUM 143 NEUTRON RESONANCE PARAMETERS

etc. etc. etc.

REQUEST NUMBER: 671025 YEAR: 1967

COUNTRY: USA

REQUESTOR(S): R.T.BAYARD BET
T.SNYDER GEC

TARGET: 60 NEODYMIUM 143

QUANTITY: NEUTRON CAPTURE

INCIDENT ENERGY: 1.00 MV TO 100. KEV

APPLICATION: FISSION REACTORS, CORE PHYSICS

ACCURACY: 10 %

PRIORITY: 1

QUANTITY COMMENT(S):

ENERGIES ABOVE 1 EV OF INTEREST.

ACCURACY AND RESOLUTION COMMENT(S):

ACCURACY 10 PERCENT IN RESONANCE INTEGRAL.

OTHER COMMENT(S):

NEEDED FOR FISSION PRODUCT POISON CALCULATIONS.

STATUS:

CRC WALKER - AECL-3037(9/68) RECOMMENDS 325B FOR THERMAL, RESONANCE INTEGRAL = 60B.

GEL ROHR+ - 71 KNOX 743(3/71) RESOLVED RESONANCE REGION.

List of Actions Arising from the Ninth Four Centre Meeting

Action	Action on	Action
1	CJD	Add NNCSC and CCDN to the distribution list for "Nuclear Constants" and "Nuclear Physics Abstracts".
2	CJD	Send a copy of the CJD guide-lines for authors to NDS.
3	NDS	Translate and distribute CJD guide-lines for authors to other centres.
4	All centres	Send comments and suggestions for improvement for Stehn's recommendation to editors (4C/1/34) to NNCSC by July 15, 1973 with copies to NDS.
5	All centres	Submit to NDS the names of all journals in their area to which the recommendation should be sent by August 15, 1973.
6	NNCSC	Send revised recommendation to editors to NDS before August 15, 1973.
7	Schmidt	Submit the recommendation to INDC for approval.
8	All centres	Provide to NDS a list of data mentioned in the open literature but unobtainable by the data centres from the authors by September 1, 1973 ("delinquency list").
9	NDS	Summarize the meeting's discussion on the completeness of EXFOR, attach the "delinquency lists" and present to the INDC for their consideration.
10	All centres	Prepare for discussion of EXFOR completeness at next 4C-Meeting (including "delinquency" status).
11	All centres	Requests for data 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.
12	All centres	Inform the other centres when initiating a data review, so that appropriate data may be transmitted with preference.
13	All centres	When performing literature searches or data reviews, inform other centres of data missing from EXFOR.
14	NNCSC CCDN	All communications with CJD should be direct and not through NDS.

Action	Action on	Action
15	All centres	Provide information on definition of a "request information unit" and comments on the contents of the four centres "common statistics" to the other centres by July 31, 1973.
16	NDS	Prepare a revised "common statistics" proposal incorporating as far as possible the comments from all the centres by the end of 1973.
17	NDS	Submit LEXFOR entry on experimental methods for fission product yields.
18	CCDN	Send copies of the Crouch (sorted by region) and Devillers libraries to the other three data centres.
19	All centres	Investigate the possibilities of using compilers from outside the centres to supply at regular intervals lists of references for such data as fission product yields and γ-ray spectra.
20	NNCSC CJD CCDN	Provide NDS by August 15, 1973 with the following information on the compilation of γ-ray spectra: 1) data types needed and justification 2) compilations available 3) active compilers and what they are compiling.
21	NDS	Summarize the needs for γ-ray spectra compilation and present to the INDC for its consideration.
22	NDS	Discuss INDC recommendation on γ-ray spectra compilation and methods to implement it at the 1974 Study Group Meeting for Non-Neutron Data Centres.
23	Pearlstein	Send to NDS agenda proposals for 1974 Study Group Meeting on Non-Neutron Nuclear Data.
24	Schmidt	Prepare a list of non-neutron nuclear data types as an appendix to the provisional agenda for the 1974 Study Group Meeting on Non-Neutron Nuclear Data.
25	Pearlstein	Send to the other centres a list of non-neutron nuclear data which will be included in ENDF for decay heat calculation and for fusion reactors and proposed ENDF format extensions.
26	All centres	When transmitting EXFOR entries in the regular exchange which have already been transmitted by NNCSC in the "dirty" EXFOR series (5000-8000), send to all other centers the corresponding "dirty" and "regular" EXFOR accession and subaccession numbers.

Action	Action on	Action
27	CJD	Transmit to the other centres a status report on the entry of data since 1970 into EXFOR from their service area.
28	NNCSC	Issue as soon as possible revised EXFOR and LEXFOR pages to reflect all agreed system changes during the past two years.
29	NNCSC	Prepare EXFOR/LEXFOR entries for the five changes to EXFOR agreed at the meeting. 1) Bib-section retransmissions 2) Wavelengths 3) Percent 4) Fission fragment energy spectra 5) Half-lives
30	NDS	Submit LEXFOR revision to include warning about references which contain superseded data. 1/98
31	CCDN	Prepare final proposal on compiling multi-dimensional tables and circulate to all centers by July 15,1973.
32	All centres	Send comments on the use in EXFOR of WRENDA type iso-quants or of other suggested generalized iso-quants to NDS by October 1, 1973.
33	NDS	Prepare proposal for the generalization of EXFOR iso-quants and distribute by December 31, 1973.
34	NDS CCDN	Exchange information on an automated data request handling system and see if computer programme exchange is possible.
35	CCDN	Send before 31 July 1973 a proposal to all centres for making CINDA an index to experimental data available at the centres.
36	Lemmel, Tubbs	Send Sol Pearlstein detailed information about the question of completeness of CINDA coverage of US laboratory reports.
37	Pearlstein	Discuss the usefulness of CINDA and of a possible non-neutron CINDA with the USNDC.
38	NDS	Contact INDC concerning the official channels for communication of WRENDA requests from the various countries to the responsible data centre.
39	NDS	Recommend to national screening authorities submitting requests for nuclear data (WRENDA) that the required accuracy be expressed as one standard deviation.

Action	Action on	Action
40	Schmidt	Request the INDC to consider adding the subject of common evaluation procedures to the Agenda of their October 1973 Meeting.
41	CCDN	Transmit to NDS and CJD new UKNDL files that are freely exchangeable.
42	NNCSC	Transmit ENDF/B-IV Standards Data to the other centres.
43	CJD	Send to other centres the Pu-239, U-235(n,f), and $d\sigma/d\Omega$ evaluations as soon as they are available.
44	CCDN	Prepare to exceed the hospitality of all previous Four Centre Meetings during the Tenth Four Centre Meeting, May 6 - 10, 1974.