



International Atomic Energy Agency

INDC-39/U

INDC

INTERNATIONAL NUCLEAR DATA COMMITTEE

MINUTES

OF THE THIRTEENTH INDC MEETING

Rio de Janeiro

16-20 May 1983

Compiled by

J.L. Rowlands

Winfrith Atomic Energy Establishment

Dorchester, United Kingdom

January 1984

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

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THIRTEENTH INDC MEETING

Rio de Janeiro

16-20 May 1983

LIST OF PARTICIPANTS :

MEMBERS

L T Auler	Brazil
J Boldeman	Australia
H Condé	Sweden
W G Cross	Canada
K Harada	Japan
S S Kapoor	India
E Menapace	Italy
A Michaudon	France
H Motz	USA
B Patrick	United Kingdom
J J Schmidt	IAEA (Scientific Secretary)
D Seeliger	GDR (Chairman)
G B Yankov	USSR

ADVISERS

H Derrien	France
R Haight	USA
B D Kuzminov	USSR
J I. Rowlands	United Kingdom (Executive Secretary)

OBSERVERS

J Csikai	Hungary
A Deruytter	CEC/BCM Geel
A Gerbasi da Silva	Brazil
R P Kesavan Nair	Brazil
O F Lemos Jr	Brazil

Meeting Summary, Conclusions and Recommendations

Following the invitation by the Brazilian National Nuclear Energy Commission, the Thirteenth Meeting of the INDC was held in Rio de Janeiro from 16 - 20 May 1983. This was the first meeting of the Committee in its three year period 1983/85. The meeting was attended by 12 Committee members and one alternate member (Motz) (members from the Federal Republic of Germany and the USA excused) plus four advisers and five observers from 13 Member States and two international organizations.

The meeting was opened by the President of the Brazilian National Nuclear Energy Commission (CNEN), Dr R N Alves. In his opening remarks he underlined the need for increased international co-operation, of which INDC was a living example. The meeting was held in the Hotel Gloria, where all meeting participants were accommodated. The local staff of CNEN, in particular the local secretary, Dr L T Auler of the Institute of Nuclear Engineering of CNEN, are to be highly commended for their excellent preparations and assistance, which secured a smooth running of the meeting throughout.

On the Tuesday afternoon, 17 May, a topical meeting was held on "Nuclear Physics and Data Research Activities in Brazil", with the participation of scientists from six major Brazilian research institutes and industrial firms. Thursday afternoon, 19 May, was devoted to a visit of the cyclotron and research reactor facilities of the Institute of Nuclear Engineering of CNEN in Rio de Janeiro.

The Committee reviewed the nuclear data activities of the IAEA, in Member States and of the nuclear data centre networks during the 1 year period since its Twelfth Meeting in Vienna in October 1981. It also gave detailed advice on the Agency's future nuclear data programme until 1985/86. The Committee congratulated the IAEA Nuclear Data Section (NDS) for its excellent work and for following so closely the recommendations of INDC.

The minutes include summaries of the meeting discussions, full reports of the Subcommittees, lists of actions, participants and subcommittee membership. The main conclusions and recommendations of the 13th INDC Meeting are as follows:

The Committee

1. Supported the increasing engagement of IAEA/NDS in assistance to developing countries and in this context welcomed the change in professional qualifications of NDS staff towards enhanced experimental expertise since the last INDC Meeting;
2. Noted the satisfactory progress of the Interregional Project TC/INT/1/018 during the past 18 months and recommended, over the next two years, to consolidate the work initiated by this project, to concentrate the support essentially on the presently participating laboratories, and to strengthen the collaboration between them, with continuous control of assistance supplied and evaluation of results achieved, and in close co-ordination with other relevant Sections of the Agency;
3. Endorsed the continuation of the follow-up programmes of the two Coordinated Research Programmes (CRP), devoted to the improvement of actinide nuclear data, until the end of 1984, supported the CRP on the measurement and analysis of 14 MeV neutron data as an important

complement to and means of co-ordination of work under the Interregional Project, approved in principle a new CRP on Methods for Calculation of Fast Neutron Nuclear Data for Structural Materials, and requested that more substantial background information be provided, before endorsing the proposal for a new CRP on the measurement and analysis of (p,n) and (α ,n) cross sections and emission spectra;

4. Regretted again the discontinuation of the Agency's very useful Symposia on "Physics and Chemistry of Fission" and, in view of the extended ongoing activities in this field of both fundamental and applied importance, strongly recommended revival of these meetings;

5. Recommended to change the sequence of international nuclear data conferences in principle from annual to biennial intervals, thus bringing them in line with the rate of evolution in this field;

6. Endorsed the programmes for the Interregional Technical Co-operation Training Course (ITC) and Study Tour on Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors, USSR, 1983, and the planned ITC on Methodology of Evaluation and Processing of Nuclear Data for Reactor Applications, Vienna, 1984, supported the Italian proposal for an ITC on Utilization of Low-Energy Accelerators in Applied Nuclear Physics, to be held at Legnaro National Laboratories near Padua, Italy, in 1985, and recommended, in view of the growing number of neutron generators in developing countries, that IAEA hold another ITC on the Utilization of Neutron Generators in 1986;

7. Approved the programme of the joint IAEA/ICTP Workshop on Nuclear Model Computer Codes to be held at the ICTP in January/February 1984, and supported the plan for an ICTP Course to be jointly prepared by IAEA/NDS and the IAEA Division of Nuclear Power and to be oriented towards nuclear energy applications, with "Fuel management and its associated data base" as a possible topic;

8. Recommended, that the IAEA Advisory Group Meeting (AGM) on Nuclear Standard Reference Data planned to be held at Geel, Belgium, in 1984, be co-sponsored by OECD/NEA and be convened only after the release of the US ENDF/B-VI Standards File expected for Autumn 1984;

9. Endorsed the proposals for AGM's on Nuclear Data for Medical Therapy, in 1985, and on Nuclear Data for Fusion, tentatively in 1986, and proposed to re-examine the suggested AGM on Neutron Source Properties, possibly to be held in Leningrad in 1986, at the next INDC Meeting;

10. Noting the nuclear data deficiencies in existing handbooks designed mainly for the use of safeguards inspectors, strongly recommended a revision of the nuclear data used by the IAEA Safeguards Development Division and national safeguards development programmes and supported the proposal to prepare a comprehensive and up-to-date handbook on nuclear data for safeguards, mainly designed for scientists working on the development of safeguards methods and on the analysis and evaluation of safeguards data. The suggested Consultants Meeting on Nuclear Data for Safeguards for 1984 to review the contents of this handbook, was not endorsed by the Committee, but instead it was recommended to proceed with this review by correspondence and, in addition, to arrange for a review talk by a speaker from the IAEA Safeguards Development Division on

nuclear data used and/or needed for safeguards techniques at the next INDC Meeting:

11. Discussed the suggestion to hold a Consultants Meeting on Nuclear Data for Nuclear Safety in 1985 and proposed that INDC participants, before the end of 1983, give further thought to the requirement and suitable selection of coherent topics for this meeting, before a final decision is taken;

12. Reviewed the recommendations of the 1981 Advisory Group Meeting on Nuclear Data for Radiation Damage Assessment and Related Safety Aspects and recommended, that the primary involvement of IAEA-NDS should be to distribute accepted standard radiation damage files and to follow up on the REAL-80 intercomparison of computed atomic displacement data with the objective to improve the assessment of the accuracy of radiation damage predictions;

13. Recommended to continue the coordination of work between the nuclear data centres and, to this effect, endorsed the Consultants Meetings of the Nuclear Reaction Data Centres for 1984 and 1985 respectively;

14. Actioned NDS to produce a list of the important requirements for charged particle nuclear data, and Committee Members, to encourage more compilation efforts in this data field;

15. Supported the recommendation of two recent Consultants Meetings on the U235 neutron fission cross section and the Cf252 fission spectrum and recommended in particular the continuation of the fission foil comparison between the USA and the USSR;

16. Noted the large and increasing interest in the Progress Report on Fission Product Nuclear Data published annually by NDS and strongly supported its continued production;

17. Commented in detail on the contents and presentation of the new Handbook on Nuclear Activation Data currently under preparation by NDS and recommended that it be subjected to technical peer review before publication;

18. Recommended that after the present 1983/84 edition, a four-year cycle be adopted for the future publications of the Agency's World Request List for Nuclear Data WRENDA;

19. Recommended that a five-year issue of CINDA be published in the spring of 1984;

20. Recommended that the ENDF/B-V format (with possible extensions) should be adopted as the format for the international exchange of evaluated neutron nuclear data;

21. Strongly recommended the continuation of the NDS programme of work on the validation of codes for the processing of evaluated nuclear data, which is considered to be of high importance in ensuring the integrity of nuclear data in applications;

22. Recommended that efforts be made by the Committee members to have

the unit 'the barn' for nuclear cross sections transferred to the list of non-SI units approved for permanent use with the SI system.

23. Concerned that some recent IAEA/NDS-sponsored technical specialist's meetings had not only made technical, but also policy recommendations to the IAEA, urged NDS to ensure that future such meetings confine their conclusions and recommendations to technical issues only.

Detailed documentation of the conclusions, recommendations and actions arising from the 13th INDC Meeting are included in the body of the minutes. The next meeting of the Committee is suggested to take place in Vienna from 24 - 28 September 1984.

I Introductory Items

I.A Opening of the Meeting

Dr R N ALVES, President of the COMISSÃO NACIONAL DE ENERGIA NUCLEAR (BRASIL) opened the meeting by saying that it was a pleasure to welcome everyone to the 13th Meeting of the International Nuclear Data Committee. He continued:

"I am lucky I do not have to lecture to such a select audience about the importance of nuclear data in many fields of human endeavour, ranging from biology to engineering, since it has been already quite some time since I left, with regrets, the field. Back in '67, '68 when I had the privilege to work on cross section measurements in the resonance energy region I remember we were using recently developed experimental tools to get the maximum amount of data with the best possible resolution. However, not only the neutrons but time flies too. It was a time when many laboratories around the world were contributing strongly to nuclear power development and scientists were in demand. Money was not a big problem and a healthy international competition could be afforded. Today, due to the economic problems which we all face, we must rely more and more on international co-operation, of which this INDC is a living example. Sooner or later the energy crisis will force us again to nuclear power and then your recommendations for improving and distributing data files and codes, which are each time better than the preceding ones, will be of extreme value. The convening of this meeting in Rio de Janeiro, besides providing the atmosphere few other places in the world could match, is timely in showing you part of the efforts we make to keep up with the field. The topical discussion to be held tomorrow will show you the many fields of research we are involved in. It is not exhaustive in the sense that not all groups will be present, but it is wholly representative of nuclear physics and data activities in Brazil these days. Although I can see from your agenda that this is going to be a very busy meeting, let me invite you to visit some of our research institutes in Rio at your convenience. Also, let me wish that you will find a way to know what is one of the most beautiful cities in the world, at least in our opinion. Again I welcome you and wish you a most profitable meeting. Thank you."

Dr J J Schmidt thanked Dr Alves for his remarks and opened the meeting on behalf of the Director General of the IAEA. He thanked the CNEN for making the meeting in Rio de Janeiro possible. Brazil had been chosen because it is one of the most advanced "developing countries". He particularly wished to thank Dr Auler

for the efficient arrangements he had made. A major aim of the meeting was to review the work of the IAEA Nuclear Data Section and to advise on its future programme. Coordinating the work in member states was also an important objective which would receive more emphasis in the present meeting.

Dr Seeliger, the new Chairman of INDC, added his welcoming remarks and said that he looked forward to a profitable meeting.

Dr L T Auler, the INDC member from Brazil and local secretary for the meeting, also welcomed the meeting participants and said that he hoped that their meeting in Rio de Janeiro would be both enjoyable and successful. A Topical Meeting on Nuclear Physics and Data Research Activities in Brazil had been arranged for the afternoon of Tuesday 17 May. (A report on this Meeting is included in Appendix 2.)

1.B Proposal to Introduce a Rapporteur System for Writing the Minutes

Rowlands (Executive Secretary) said that the Directorate of his Establishment were reluctant for him to take on the job of Executive Secretary because of the time involved in producing the minutes. However, the UK Authorities recognised that their representatives should play a full part in the work of the committee. The Nuclear Energy Agency Committee on Reactor Physics (NEACRP) had encountered the problem of finding a member with time to take on the job of secretary and the solution which they had adopted was for each member of the committee to take responsibility for writing the minutes for one session of the meeting. These reports were written and typed during the week of the meeting and approved on the final day. Thus the minutes were essentially completed during the week of the meeting. Rowlands asked the committee to consider adopting the same approach for the INDC Minutes. In particular, he would like to ask if rapporteurs could be appointed for sessions IV, V, VI and VII. The arrangement he preferred was for one person to take overall responsibility for a session but with the work being shared with additional rapporteurs, where appropriate. He also asked that anyone making a statement to be included in the minutes should provide this in writing. (This particularly relates to highlights and recent developments in national progress reports.) The committee agreed to try this approach for the present meeting and a rapporteur schedule was drawn up.

II Committee Business - 1

II.A Adoption of the Agenda of the 13th INDC Meeting

The tentative agenda was approved.

II.B Attendance of Observers and Meeting Participation

Attendance of the proposed observers was approved.

The list of participants and observers is given on page 6. Apologies for absence were received from F Froehner (Fed. Rep. of Germany) and A B Smith (USA). B Patrick replaced A T G Ferguson as the UK member.

II.C Review of Actions Arising from the 12th INDC Meeting

All actions were considered to be effectively completed (either as defined in the action or in an equivalent way).

Actions discussed in some details were:

Action 6, relating to the publication policy of the IAEA and the specification of criteria for technical INDC reports. These are described in INDC/P(83)-33.

Action 51, relating to reviewing procedures for INDC technical documents.

Michaudon expressed concern that a general reviewing procedure had not been adopted for INDC technical documents. Schmidt said that the IAEA Technical Report Series would be used for the principal technical documents, such as the planned Report on Nuclear Data for Standards. This had effectively been reviewed by members of the INDC and NEANDC Standards Subcommittees. The IAEA provides additional review and editing for documents in this series. The INDC could be asked to review other documents sponsored by INDC.

II.D Standing Subcommittees

It was agreed to make the Subcommittee on Meetings and Future Nuclear Data Programmes a standing subcommittee. This brings the total number of standing subcommittees to 6. These are:

Subcommittee A	Chairman	Rowlands
Subcommittee B	Chairman	Haight
Standards Subcommittee	Chairman	Condé
Discrepancies Subcommittee	Chairman	Motz
Meetings Subcommittee	Chairman	Michaudon
Transfer Subcommittee	Chairman	Seeliger

The full name of this last subcommittee is Subcommittee

on the Transfer of Nuclear Data Technology to Developing Countries (it replaces the Subcommittee on the Interregional Project). Members of the subcommittees are given in Appendix 5.

Condé said that he did not wish to continue as Chairman of the Standards Subcommittee after the present meeting and it was agreed that Deruytter would take over Chairmanship at the next meeting.

II.E Scope and Agendas of the Subcommittees

The proposed agendas (part of which had been prepared by NDS in advance of the meeting) were adopted for the purpose of defining the broad terms of reference and referred to the subcommittees for their consideration.

II.F Ad-Hoc Subcommittees

It was agreed that efforts should continue to have the unit, the "barn", adopted for permanent use, with the S.I system. The ad-hoc Subcommittee on the Barn, Chairman Cross, was asked to consider ways of achieving this.

II.G Co-ordination of INDC Technical Subcommittees with the NEANDC

Michaudon (Chairman designate of NEANDC) said that there was close collaboration between the Standards and Discrepancies Subcommittees of the INDC and NEANDC. A publication policy had been agreed. The 1982 Joint INDC/NEANDC Standards File would be published by the IAEA and the NEA would publish the Joint NEANDC/INDC Discrepancies File. The next publications after this would be the (INDC) Discrepancies File and the (NEANDC) Standards File. About a 4 year cycle was proposed for both files the publication of each alternating between IAEA and NEA.

Michaudon described two "Task Forces" which had been set up by NEANDC, one on the uranium 238 capture cross-section and resonance parameters in the keV energy range (Chairman Sowerby) and the other on the parameters of the 1.15 keV resonance in Iron 56 (Chairman Perey).

II.H Report from the INDC Secretariat

Schmidt drew attention to the document INDC (NDS)-142, Report of the NDS to the INDC (September 1981 to February 1983). He said that sections of this report would be discussed under other items of the Agenda.

At this point he would mention only that he had been endeavouring to improve the liaison officer represen-

tation from developing countries. The Interregional Project had helped to establish appropriate contacts and improve the representation.

Kapoor and Michaudon raised the question of the continuation of the series of Symposia on the Physics and Chemistry of Fission. They emphasised the value of the symposia and importance of the series continuing. Schmidt said that he had brought this to the attention of the Physics Section of IAEA but it had not been possible to find an alternative sponsor.

Michaudon asked if information on budget and personnel could be provided. Schmidt replied that staff responsibilities are given in INDC/P(83)-44. It was not usual to provide detailed budget information, although some information could be given during the Meeting.

III IAEA Nuclear Data Programme

III.A Review of the Recommendations to the IAEA/NDS from the 12th INDC Meeting

Schmidt reported that all recommendations had been implemented. In particular he wanted to mention that it had been possible to increase the experimental expertise in the Section. This had been recommended by INDC to improve the effectiveness of the Section in connection with the Interregional Project.

III.B Review of Recommendations Concerning Nuclear Data from Past IAEA/NDS and Other Meetings

INDC/P(83)-6 contains a list of meetings held and summaries of recommendations. These recommendations would be discussed under other Agenda items and in the Subcommittees. Schmidt said that not much progress had been made in establishing a file of nuclear data for radiation damage computation (requested by the AGM on Nuclear Data for Radiation Damage Assessment and Related Safety Aspects, Vienna, October 1981).

Michaudon expressed concern that some technical meetings were making policy recommendations and not confining recommendations to technical aspects. Following discussion Recommendation 1 was adopted.

Recommendation 1

While recognising the fact that IAEA/NDS is following the INDC recommendation that planned new activities of IAEA in the nuclear data field should first be considered by the INDC, the Committee is concerned that some recent IAEA/NDS-sponsored specialists meetings (advisory group and consultants meetings) have not only made technical, but also policy recommendations to the

IAEA, which should be reserved to the INDC in accordance with its mandate. The Committee recommends that the scientific secretaries of future IAEA/NDS - sponsored specialists meetings ensure that the conclusions and recommendations issued by those meetings be confined to technical matters.

III.C Status of the IAEA Nuclear Data Programme and Presentation of NDS Activities

Schmidt drew attention to the Programme Summary in INDC(NDS)-142. The NDS had continued to orientate its programme towards the Agency's high priority areas:

Safeguards, Safety and Technical Co-operation with Developing Countries.

The main change in emphasis of the programme was the strengthening of the assistance to, and co-operation with developing countries. One-half to two-thirds of the manpower and budget were now connected with this aspect of the programme. In the 1960's the emphasis had been on establishing the data centres network and in the 1970's on co-ordinating nuclear data activities in developed countries: in the 1980's it was on well chosen and well co-ordinated programmes for the developing countries. Technical assistance had a priority in the Agency comparable to Safeguards.

Concerning personnel, there was now a better balance in the section. Dr Lorenz had been made Head of the Section's Atomic and Molecular Data Unit. This had freed a position and the NDS had been fortunate to recruit Dr Mehta from BARC Bombay. His expertise with accelerators would be particularly valuable. Dr Kocherov had returned to Leningrad and had been replaced by Dr Piksaikin from Obninsk, an expert on fission physics measurements. Dr Mehta and Dr Piksaikin have responsibilities for the Transfer Programme.

The Agency was being encouraged to recruit more staff from Developing Countries and they now comprise 20% of the staff of NDS (one from Cuba, one from Kenya and Dr Mehta from India). The potential for increasing this proportion is limited because more than 40% of the professional staff are on long-term contracts. It is just possible to meet the Section's responsibilities with the existing staff. There is very little prospect of increasing the size of the Section; in fact, there is a danger of staff complement being reduced because nuclear data is not a high priority topic.

Seeliger congratulated Schmidt on behalf of INDC for the excellence of the work of the Section and for following so closely the recommendations of INDC.

Haight asked Schmidt if the Section was keeping up-to-date with compilation activities. Dr Schmidt said that there had been a problem during the year when the Section was one member under complement but that the situation was now satisfactory. Compilation of charged particle nuclear interaction data was a matter of increasing importance which the committee should consider.

IV IAEA/NDS Nuclear Data Services and Support of Research in Developing Countries

IV.A Technical Co-operation Interregional Project for Training in Nuclear Data Techniques and Instrumentation (TC/INT/1/018) Summary of Current Status

The status of the Interregional Project (IP) was considered in great detail. The discussion was led by Schmidt and included the Progress Report by Schmidt et al on the project (INDC/P(83)-8) and contributions from the reports of expert missions submitted by Okamoto (INDC/P(83)-9), Mehta (INDC/P(83)-10) and Boldeman (INDC/P(83)-11), together with a report by Csikai of an ad-hoc meeting of the CRP on 14 MeV Nuclear Data convened during the Antwerp Conference (INDC/P(83)-2). The excellent progress of the IP in Brazil was noted. However, the termination of the IP in Chile was regretted. (The cyclotron neutron data project under the IP could be revived during a visit by Schmidt subsequent to the INDC Meeting.)

Concern was expressed that the Agency ensure that equipment which was supplied under the IP would be used effectively. This concern was based on the occasional observation by experts that expensive equipment which had been supplied to some laboratories by Agencies other than IAEA was not being used and was unlikely to be used. Also in some cases equipment was being paid for by Agencies, before it was examined, and was subsequently found to be defective. Radiation safety training in connection with the use of equipment and materials should also be a requirement, in some cases, before these are provided. Schmidt said that these points would be taken into account in the future conduct of the IP by the Agency.

Recommendation 2

- (a) Noting the satisfactory progress of the Inter-regional Project (IP), TC/INT/1/018, the Committee recommends, over the next two years, to continue and consolidate the work initiated by the IP, to concentrate the support on the laboratories presently participating in the IP, and to streng-

then the co-operation and co-ordination of work between these laboratories. At present it is considered more important to ensure the effectiveness of the work of the currently participating laboratories, including a critical review of the results obtained, than to increase further the number of participating laboratories (with the exception of some laboratories in Africa). Also ways should be considered of exercising more control over projects under the IP funded by the Agency.

- (b) The Committee acknowledges the positive start of the NDS in co-ordinating the activities and assistance provided under the IP with other relevant Sections of the Agency, particularly with the Physics Section, and urges NDS to strengthen this co-operation in the future.
- (c) The Committee endorses the following recommendations of experts from missions which they performed under the IP to laboratories in developing countries.
 - (i) The Agency should ensure the correct functioning and appropriate utilisation of equipment provided under the IP, thus avoiding the problems occasionally encountered by other agencies, arising from the non-utilisation of expensive equipment supplied by them.
 - (ii) Before purchase of any particular electronic equipment, the Agency should enquire into the availability of local maintenance and repair services, the applicable warranty conditions, and the need for prior acceptance tests.
 - (iii) Considering that radiation safety in the use of equipment supplied under the IP is of paramount importance, the Committee stresses that measures be taken to ensure that all participating laboratories are adequately equipped and their personnel trained in this respect.
 - (iv) The value of regional meetings to allow participants in the IP to discuss problems and to present results is strongly emphasised. The issuing of an interlaboratory report to strengthen the coordination of work between the participating laboratories is also favoured.

- (d) Considering the value of expert missions, as demonstrated by the experts' reports, the Committee recommends that such missions should continue to be undertaken in the framework of the IP.

Schmidt said that the objective of short-term expert missions was to assess the local situation and these assessments would be followed up, when appropriate, by the NDS. Long-term expert missions had the objective of helping to set up local facilities or programmes of work. Nine fellowships had been provided and others were being arranged. Laboratories with potential for self-reliance could benefit most from the CRPs.

Schmidt agreed to provide additional information, as far as possible, on the costs of equipment and services provided by the Agency in connection with the IP.

ACTION 1 Schmidt

It was agreed that the expert missions were serving a very valuable purpose. The IP was working successfully and many laboratories have the potential to make a valuable contribution towards meeting nuclear data requirements. It was recommended that the project should continue (more detailed discussions were held in the Transfer Subcommittee).

IV.B Interregional Training Courses (ITC)

Introducing this item, Schmidt said that it was planned to hold one ITC each year.

1 ITC on Utilisation of Neutron Generators, Debrecen, Hungary (7 June to 9 July 1982)

Csikai summarised the evaluation of the IAEA Technical Co-operation Interregional Training Course on the Utilisation of Neutron Generators held in Debrecen, Hungary, 7 June to 9 July 1982 (see working paper (INDC/P(82)-5). This training course provided the 24 participants from 23 developing countries with a wealth of advanced up-to-date information and experience in the utilisation of neutron generators, supported by a number of well selected full-scale laboratory experiments. The Laboratory Manual prepared by the staff of the host institute and distributed to all participants before the course turned out to be a very useful guide for the participants in their laboratory exercises. Csikai recommended that the Agency adopt this practice for all its training courses which involve experimental laboratory work. Since the number of neutron generators in developing countries is growing, Csikai recommended that IAEA hold another Interregional Training Course on the Utilisation of Neutron Generators in 1986. The Debrecen Institute would be pleased

to accept the next course.

- 2 ITC and Study Tour on Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors, USSR (September 1983)
[INDC/P(83)-12 & -47]

Yankov said that the Training Course would comprise a series of lectures, practical work and visits to several laboratories in the USSR. It is open to 20 participants from developing IAEA Member States in all geographical regions.

During the first two weeks in Tashkent there will be lectures and practical exercises on the cyclotron and research reactor.

Various areas in neutron physics will be covered, such as nuclear fission, neutron scattering, (n,α) and (n,p) reactions, pre-equilibrium neutron emission, applications of polarised neutrons, as well as nuclear spectroscopy of actinides, neutron activation analysis and other nuclear methods for technological applications. The participants will also be made familiar with neutron cross-section measurements at 2.5 and 14 Mev neutron energy, the determination of spontaneous fission neutron spectra and the work of the Nuclear Data Centre at the Kurchatov Atomic Energy Institute.

After the two-week Training Course in Tashkent the participants will go on a study tour to laboratories in several USSR cities to get a detailed knowledge of the installations described during the course and the equipment currently used for measurements at these installations.

- 3 ITC on the Methodology of Evaluation and Processing of Nuclear Data for Reactor Applications, Vienna (1984) (INDC/P(81)-17)

Schmidt said that this course would provide instruction for a limited number of participants in the processing of data into multi-group forms for reactor applications and other application-orientated topics.

- 4 Proposed ITC on the Utilisation of Low Energy Accelerators for Applied Purposes, Legnaro, Italy (1985)

Menapace reported that a training course in Applied Nuclear Physics is proposed to be held at Legnaro National Laboratories, Padua (Italy) in 1985. This training course is intended for experimental nuclear scientists from developing countries, with the aim of improving their knowledge about techniques involved in designing and carrying out experiments in the field of

applied nuclear physics. The participants will make a choice between two classes of exercises:

- (i) Neutron data measurements (neutron spectrum with time of flight technique; flux determination by associated particle technique; total neutron cross-section measurement; neutron dosimetry with γ -discrimination);
- (ii) Non-neutronic radiation applications (trace elements analysis for biology, medicine, agriculture, by proton induced X-ray fluorescence; Rutherford backscattering spectrometry for thin film and thick target analyses and analysis of implanted layers; channelling of positive ions in single crystals; nuclear reaction analysis for isotopic tracing experiments, light isotope profiling and surface contamination).

To carry out the experiments a 7 MV VdG accelerator is available. Special emphasis will be given to the automatic acquisition of data and their processing by computers widely used in the scientific community. The participants should be organised in 2-3 groups each with a maximum of 5 persons and 2-3 teachers. Participants should have post-doctoral or equivalent educational career in nuclear measurements.

IV.C Joint IAEA/NDS-ICTP Trieste Courses on Nuclear Theory for Applications

1 Evaluation of 1982 Course and Future Courses (INDC/P(82)-3)

Schmidt said that the courses in 1978, 1980 and 1982 concluded a first cycle of courses. The benefit of these to the participants would be assessed via the planned 1984 Workshop on Nuclear Model Codes and the CRPs. The courses had stimulated many requests for codes and data. The next course was proposed for 1986 and would be organised with the collaboration of IAEA Nuclear Power and Fuel Cycle Division. To make the courses more effective improved computing facilities were needed in Trieste and these were being provided. ICTP Trieste is now also again involved in fundamental nuclear physics. Some INDC members thought that the courses were partly at too high a level for the participants and should be more applications oriented.

2 1984 Workshop on Nuclear Model Codes (INDC/P(83)-13)

Menapace described the plans for this Workshop. It should be considered as a complement to the Winter Colleges on Advances in Nuclear Theory and Nuclear Data for Applications held at ICTP in 1978, 1980, 1982 and

is designed to familiarise participants with nuclear model computing codes widely used for calculating nuclear data needed for nuclear technology applications. The Workshop is intended for theoretical and experimental nuclear physicists working in applied and basic research and for nuclear data evaluators with a post-doctoral or equivalent educational career in one or several topics of the Workshop. In accordance with the mandate of the ICTP, it is mainly oriented towards the needs of nuclear scientists from developing countries.

The Workshop will consider nuclear model codes with practical calculations of nuclear data:

- (i) without fission (i.e. concerning optical model, statistical model, direct reaction models, pre-equilibrium decay models, intranuclear cascades);
- (ii) including fission (i.e. fission widths and level density for fission channels; inclusion of the fission process in nuclear model codes).

Schmidt was asked to enquire whether the NEA-Data Bank would make available benchmarks, results and analyses from the recent international intercomparison of nuclear model codes organised by NEA-DB.

IV.D IAEA Junior Trainee Programme, NDS Participation

Schmidt reported that this training programme for young scientists from developing countries currently involved 15 trainees, 11 in Safeguards, 1 in NDS and 3 in other departments. In NDS a trainee from Nigeria had been engaged for 1 year, from September 1983 onwards. It was expected that he would then become the technical liaison officer for Nigeria.

IV.E IAEA/NDS Nuclear Data Services to Developing Countries

Referring to the statistics of services in INDC(NDS)-142, Schmidt said that there had been a large increase in the number of requests for reports, data and computer codes over the past years reflecting the steadily growing interest of developing countries in nuclear technology and applications of nuclear techniques.

The targets and samples programme had been continued with an annual allocation of \$10,000.

For CRP research contracts (with developing countries) and meetings and some additional individual research and technical contracts \$70,000 had been allocated to NDS both in 1982 and 1983, but somewhat more money

could be spent due to underexpenditure in other parts of the Division. A considerable fraction of the money goes into the funding of CRP meetings.

V IAEA/NDS Coordinating Activities and Meetings

V.A WRENDA 83/84 and Future WRENDA Publications

Schmidt reported that a late contribution to WRENDA 83/84 from one country had delayed publication, which was now scheduled for this summer. After discussion it was agreed that changes in requirements and the rate of meeting them were such that a 4 year cycle for new issues of WRENDA should be adopted.

Recommendation 3

A 4 year cycle should be adopted for the future publication of WRENDA.

V.B IAEA/NDS Co-ordinated Research Programmes (CRP)

These were discussed in more detail by the sub-committees. The objectives are to coordinate activities and to provide training to scientists from developing countries. This is done by making research agreements and contracts with participants and by holding coordination meetings. There is a ceiling on the funds available for CRPs. CRPs which have been completed, are in progress and have been proposed are:

1 Intercomparison of Evaluations of Actinide Neutron Nuclear Data

This was completed at the end of 1982. A follow-up CRP with more limited objectives has been proposed (INDC/P(83)-30). This was discussed by Subcommittee A.

2 Measurement and Evaluation of Transactinium Isotope Decay Data

This was extended, for a second 2 year period, at the end of 1982.

3 Measurement and Analysis of 14 MeV Neutron Cross-Sections (INDC/P(83)-15)

This was initiated in 1982.

- 4 Proposed New CRP on Methods for Calculation of Fast Neutron Nuclear Data for Structural Materials (INDC/P(83)-39)

This was discussed by Subcommittee A and the Subcommittee on Meetings.

- 5 Proposed New CRP on the Measurement and Analysis of (p,n) and (α ,n) Reaction Cross-Sections (INCD/P(83)-41)

Schmidt reported that the AGM on Basic and Applied Problems of Nuclear Level Densities had recommended investigations of (p,n) and (α ,n) reaction data. The results of nuclear level density calculations are not yet completely satisfactory.. High energy resolution measurements of nuclear reactions which resolve separate resonances, together with information on the angle and energy distributions of the particles emitted in the reactions, provide the possibility to determine nuclear level densities in a wide energy range and to analyse on this basis phenomenological and microscopic models of nuclear level densities. The (α ,n) reaction is also of importance as a source of neutrons at different stages of nuclear reactor fuel cycles. The INDC agreed that the (p,n) and (α ,n) reaction mechanism is an interesting and important scientific problem. However, approval of the CRP should await a more detailed analysis of the value of the information on nuclear level densities extracted from (p,n) and (α ,n) reaction measurements. Schmidt agreed to distribute appropriate material. The CRP will then be discussed at the next INDC Meeting.

ACTIONS 32, 33 and 34

V.C Nuclear Data for Radiation Damage and Nuclear Safety

- 1 The International Reactor Dosimetry File (IRDF)

The status is described in INDC(NDS)-142, Section C.6.2. Benchmark testing of the file had essentially been completed and the results would be distributed. For some reactions and spectra the agreement was good, for others there were discrepancies of 10%. The file is under continuous review by NDS.

- 2 International Nuclear Data File for Radiation Damage Estimation (INDC/P(83)-31)

Progress in setting up a file is slow. The SOURCE code has been obtained from Saclay and this can be

used to calculate damage cross-sections. ENDF/B-IV or B-V data files would be used with this code. The DAMSIG library has been obtained and it is hoped that the ENDF-A file will be made available.

3 REAL-80 and Follow-up Activities (REAL-84)

A meeting would be held in June 1983 to review the results of the REAL-80 programme and consider the need for a follow-up exercise (REAL-84). This was discussed briefly by Subcommittee A.

4 Proposal for a Consultants Meeting on Nuclear Data for Safety (1985)

There are important nuclear data requirements for safety assessments, but these cover a diverse range of applications and items of nuclear data. A meeting which considered a selected range could be fruitful. This was considered further by Subcommittee A.

V.D Nuclear Data for Safeguards

Discussions had been held between NDS and representatives of Safeguards Development Division. They had agreed that a Handbook of Nuclear Data for Safeguards would be valuable for both the users and developers of safeguards measurement techniques. It might be necessary to get outside help for preparing some sections. There was potentially a large sale for such a Handbook. This was discussed by Subcommittee B.

V.E Standards

1 Publication of the INDC/NEANDC Standards File

The INDC Technical Report INDC-36/LN, after updating, was approved at the 23rd meeting of the NEANDC in October 1982. It is now in its final form at the Publication Division of the IAEA for printing and distribution. The IAEA has scheduled to have it available in July-August 1983. The INDC participants were invited to publicise the availability of this Technical Report and to encourage purchases in their respective countries.

2 Report on the CSEWG Standards Sub-Committee Meeting (May 1983)

Condé reported on paper INDC/P(83)-54 on possible cooperation between INDC/NEANDC and CSEWG on standards data. The US delegation at NEANDC offered the Subcommittee chairman the opportunity to explore the possibility for cooperation in a Meeting with the CSEWG Standards Committee at

Brookhaven on May 10-11 1983.

Complete new evaluations are underway for all major standard cross-sections including the thermal constants. A positive attitude towards international cooperation was noted. Because of the tight time-schedule for the ENDF/B-VI standards, the contributions from the INDC/NEANDC activities can only have a limited impact. However a general comment was given concerning needs for specific information on experimental details of several measurements made outside the US and which are a part of the data base of the evaluations within ENDF/B-VI. Also a revision was offered of the distribution for CSEWG Standards Data documents to improve exchange of information. It was recognised that the IAEA Meeting on Standards in Autumn 1984 at CBNM Geel could be well timed to screen ENDF/B-VI and give recommendations for future measurements.

With ENDF/B-VI available and the recommendations of the Geel Meeting the updating of the INDC/NEANDC Standards file could be started.

3 International Exchange of Standard Reference
U235 Fission Foils

Yankov enquired about the progress being made in the preparation of these foils in the USA. Motz reported that the foils would be sent from Argonne to NBS late in 1983 and will then be sent to the USSR via Vienna. Yankov said that they would like the exchange to be extended to foils of other materials.

4 Consultants' Meeting on the U235 Fast Fission
Cross Section (March 1983, Bratislava)

The status of the U235 fission cross section between 100 KeV and 20 MeV had been discussed and a summary of the discussions presented to the INDC meeting as Paper INDC/P(83)-19. The highest accuracy to which the cross-section needs to be known is dictated by its use as a standard and it had been concluded that a target of $\pm 1\%$ (1 standard deviation) is a reasonable aim. The meeting assigned uncertainties to the cross-section, concluding that the requirements are probably met at 14 MeV only. Most of the discussions concentrated on the main factors which affect the accuracy of experimental measurements and on what might be done to reduce the uncertainties. Recommendations, on the steps which need to be taken to produce cross sections to the required accuracy, were made.

The results of measurements performed at ANL, as part of an intercomparison of fission foils supplied by a number of different laboratories, were given in an Appendix to the summary of the working group.

5 Consultants' Meeting on the Cf252 Fission Neutron Spectrum (March 1983, Bratislava)

Paper INDC/P(83)-20 contained the conclusions and recommendations of the meeting on the current status of the Cf252 fission neutron spectrum. Measurements of the spectrum now cover the energy range from 1 keV to 28 MeV and the shape between 1 and 8 MeV is confirmed by determination of cross-sections averaged over the spectrum. It was strongly recommended that a new evaluation of the spectrum should be carried out but in the meantime it was agreed that the NBS segmented fit is a satisfactory representation between 1 and 20 MeV, while a Maxwellian distribution with $T = 1.42$ MeV is a suitable description (to within an accuracy of $<10\%$) between 1 keV and 6 MeV.

Although there have been a number of theoretical approaches to the calculation of the fission neutron spectrum, it is quite clear that these are not yet of sufficient accuracy to contribute to the determination of the spectrum as a standard. However, if these attempts can give results close to the measured spectra, then they can be used to provide data over neutron energy regions not covered by measurements and for the spectra of other nuclides.

Fluctuations in the ratio of measured values to a calculated Maxwellian distribution (with $T = 1.42$ MeV) (INDC(CCP)-195) may be due to the requirement for a correction for the effect of U235 fission in the neutron detectors. (Boldeman stated that he observed no deviation from a Maxwellian spectrum within the accuracy of his experiments in the range from 6 to 14 MeV (INDC/P(83)-59).)

6 Advisory Group Meeting (AGM) on Standard Reference Nuclear Data Planned for Autumn 1984 at CBNM, Geel, Belgium (INDC/P(83)-21)

This Advisory Group Meeting will take place at Geel in late Autumn, the exact date depending on the availability of the CSEWG END/B-VI Standards evaluations.

The INDC (Schmidt) will approach NEA for co-sponsoring of the meeting in view of the interest

shown by the NEANDC Standards Subcommittee in this Advisory Group Meeting and the common INDC/NEANDC Standards File.

The Committee welcomes the participation of scientists also from countries not having a member on the INDC.

7 New Edition of the IAEA "Nuclear Activation Data Handbook"

Schmidt said that plans are well underway and he invited the INDC to discuss the proposed contents in detail and to propose possible contributors. This was discussed in Subcommittee B.

V.F Nuclear Data File for the INTOR Project

This subject was discussed briefly in the plenary session and in more detail in Subcommittee B. Schmidt said that the first version of this file, INDL/F-83 (INDC/P(83)-32) had been compiled from ENDF/B-IV and ENDL data. These data would then be improved using nuclear model codes. Seeliger mentioned that current data files for Pb were found to be unsatisfactory for fusion applications. Haight expressed concern at the proliferation of evaluated data files of different types. This one would not have been used before (for fission reactor applications for example) and therefore would require substantial testing against benchmarks and checking for consistency. The proliferation is contrary to the approach of most countries to provide one file for general use and then modify it if necessary for specific applications.

V.G Conclusions and Recommendations from Other Recent IAEA/NDS Meetings

1 AGM on Nuclear Structure and Decay Data, (May 1982, Netherlands) (INDC(NDS)-133)

Schmidt reported that the work of the NSDD network is progressing well.

2 AGM on Basic and Applied Nuclear Level Densities (April 1983, USA) (INDC/P(83)-22,23)

Menapace and Haight had attended the meeting and considered it to have been worthwhile. Particular points mentioned were:

- (a) The Porter-Thomas distribution might not be valid.

- (b) Calculations based on a fundamental approach (rather than a phenomenological approach) were possible but required a lot of computing time.
- (c) Further measurements and analysis of the data on (p,n) and (α ,n) reactions will be useful for obtaining information on nuclear level densities. This requirement gave rise to the proposal of a new CRP.

Kapoor commented that the analysis of the data, to obtain level density information, is an important problem which should be tackled by the proposed CRP. New measurements may be less important for this purpose than the analysis of existing data.

V.H Other Meetings Planned by IAEA/NDS

1 Consultants' Meeting on Nuclear Data for Structural Materials, Vienna, November 1983

Schmidt reported that an Organising Committee had been established and the scope defined (INDC/P(83)-24). It was proposed that Froehner, Derrien and Seeliger should be included on the Organising Committee. The meeting would last for 3 days and involve 10 to 15 participants.

2 Consultants' Meeting on Nuclear Data for Bore-Hole and Bulk-Media Assay to be Held in Krakow 14-18 November 1983

Csikai referred to INDC/P(83)-29 and commented that the proposed agenda covers the most recent techniques used in this field both in developed and developing countries. The IAEA will invite observers from developing countries to get familiar with a number of new techniques and those nuclear and atomic data which are needed to improve the accuracy of these methods. It is suggested to ensure the participation of experts among the data users and producers. Considering the importance of this topic and the lack of the nuclear (and atomic) data in this field, Csikai recommended that IAEA should hold another meeting in 1986, if the evaluation of the Krakow Meeting also supports this proposal.

3 AGM on Transactinium Isotope Nuclear Data

The Committee approved the proposed AGM meeting on TND data. An invitation was forwarded to the IAEA/NDS by Condé to hold the meeting at Uppsala, Sweden on May 21-25, 1984 and the invitation was accepted.

It was pointed out that considerable progress had been made in both measurement and evaluation of nuclear data for actinide isotopes since the Aix-en-Provence meeting in 1979. Further discussions concerning the organising committee and the programme were referred to Subcommittee A.

4 Proposal for an AGM on Nuclear and Atomic Data for Medical Diagnostics and Therapy, 1985

Schmidt, referring to INDC/P(83)-28, outlined the proposal for this Advisory Group Meeting. He emphasised that the meeting would not include cross sections for radioisotope production, which will be covered in the proposed new edition of the IAEA Neutron Activation Cross Section Handbook. The proposed meeting had received strong support from people associated with radiotherapy who were contacted, as shown in INDC/P(83)-42.

Cross urged caution in interpreting the enthusiasm of these correspondents. As a result of neutron/gamma therapy comparisons at Edinburgh there is now less optimism on neutron therapy than there was a few years ago, although favourable results are apparently being obtained with higher energy neutrons. There is fairly general agreement on what data are needed but, since such data do not have high priority among those funding radiotherapy, the main problem is to persuade experimenters to make the required measurements. The proposed atomic data (e.g. stopping powers) would overlap the current work of the International Commission on Radiation Units and Measurements (ICRU).

Several participants suggested that the scope of the meeting be more limited than that described in INDC/P(83)-28, with the emphasis on nuclear data for radiotherapy, particularly that required for dose determinations. It was felt that most neutron production data had been covered at recent meetings. Details on the scope were left for discussion in Sub committee B.

5 Proposal for an AGM on Nuclear Data for Fusion
(Rescheduled, tentatively, for Julich in 1986)

Schmidt said that he would like to see the progress of the CRP on 14 MeV Cross-sections before final plans are made for this meeting. Menapace supported deferral to 1986, since the EURATOM effort would have been terminated by that time.

6 Proposal for an AGM on Properties of Neutron
Sources (Leningrad? 1986) (INDC/P(82)-9)

Yankov said that he would have discussions and report to the next INDC meeting.

Seeliger pointed out that 14 MeV sources will be discussed at the Gaussig Meeting in November 1984.

Csikai said that he would like to recommend an AGM on Nuclear Data needed for Agriculture. This would consider, for example, determination of trace elements. Further discussion of this proposal was referred to Subcommittee B.

V.I Non-OECD Participation in NEANDC/NEA-DB Nuclear
Data Projects

1 Nuclear Model Code Comparisons

Patrick summarised the Nuclear Model code comparisons organised by NEANDC/NEA-DB. Coupled-channel optical model code calculations have been compared and the results are in good agreement. Exercises on preequilibrium model codes are underway and the results are expected for the end of 1983.

Schmidt reported that a few non-OECD countries were participating in these exercises (for example, India and Brazil). Menapace said that it could be helpful to have the benchmark specifications, results and analyses available for the 1984 Nuclear Model Code Workshop in Trieste. An action was placed on Schmidt to enquire if the results of the exercise could be made generally available to non-OECD countries.

ACTION 2. SCHMIDT

VI Nuclear Data Centres

VI.A Status Reports and Future Activities of Nuclear Reaction Data Centres and Groups

1 Neutron Data

Kuzminov reported that the Obninsk Nuclear Data Centre (CJD) had upgraded its computer and all their nuclear data libraries had been transferred to the new system. The centre currently satisfies 120 requests/year for measured and evaluated data. A new evaluation on Cr has been produced and this will be made generally available through IAEA-NDS. Some intercomparisons of processing codes have been performed on the codes NJOY, GRUCON and RECENT.

Harada reported that, in Japan, JENDL-2 was completed and released at the end of 1982. Work on JENDL-3 began in April 1982 and it is hoped to finish in 1985.

Motz said that the 4th edition of BNL 325, Vol 1, Part A Z=1-60 was published in 1982 by the US National Nuclear Data Center at Brookhaven and Part B Z=61-80 is expected to be issued this year. Motz reported that parts of ENDF/B-V are being revised and will be re-issued as a modification to version V. Work has begun on the standards file to be included in ENDF/B-VI, the current target date for completion being the Spring of 1984, although it seems possible that it might be delayed by 6 months. As it is felt important to have the ENDF/B-VI standards file available at the time of the proposed Advisory Group Meeting on Nuclear Standard Reference Data to be held in 1984, Motz agreed to enquire about the expected date for release of the standards file and to inform Deruytter and Conde.

ACTION 19. MOTZ

In the absence of a representative from the NEA Data Bank, Schmidt reported on the work of that centre during the last year. Full details are contained in INDC/P(83)-38. The main work of the centre covered three topics (1) computer program testing (2), compilation of experimental and evaluated data and (3) the Joint Evaluated File (JEF). The Data Bank answered 176 requests for neutron data and 108 programs were master-filed, while 1135 program packages were sent out (246 of these to non-OECD countries). The first phase of JEF had ended in 1982 and resulted in the JEF-1 file for 275 nuclides. Phase 2 of the project

will extend from 1983-85 and will comprise benchmark testing of JEF-1 and the assembly of a new file, JEF-2, containing both revised and new evaluations. The Scientific Co-ordinating Group, which oversees the JEF project, has not yet made a decision about the release of JEF-1. This question will be considered again once the quality of the file has been ascertained by the benchmark testing.

Schmidt reported on the relevant work of the Nuclear Data Section. The EXFOR system for data exchange is working well and CINDA has been published routinely. WRENDATA 81/82 had been issued and it was expected that WRENDATA 83/84 would be published this summer. The number of requests for neutron and other nuclear data (including reports and data processing codes) received by NDS had risen dramatically in recent years, from 269 in 1979 to over 700 in 1982. This was mainly a result of the growing nuclear power programmes and increasing applications of nuclear techniques in developing countries. The ENDF/B-V format has been adopted as a standard for transmission of evaluated data to users and the INDC members of the UK and Federal Republic of Germany were asked to inform NDS which of the files in their respective data libraries merit conversion to ENDF/B-V format.

ACTION 3. FROEHNER and PATRICK

2 Charged Particle Nuclear Data

Yankov noted the work on nuclear structure and decay data and on the compilation of charged particle reaction data at the Atomic and Nuclear Data Centre (Kurchatov Institute). Evaluations of the properties of mass chain $A=240$ nuclei had been carried out, completing the work on even actinides. During this year, evaluations of $A=164$ and 166 nuclei will be performed. Estimations of (α, n) yields from oxygen and fluorine were completed and it was observed that the main contribution to the uncertainty in the neutron yield arises from the rate of energy loss in matter and not from the nuclear cross-sections. Since the Karlsruhe Charged Particle Group (KaChPaG) ceased data compilation activities, the Atomic and Nuclear Data Centre (ANDC) has begun to compile charged particle data produced outside the USSR.

Harada said that charged particle data produced in Japan have continued to be compiled at the University of Hokkaido, and there is some interest

at the Institute for Physical and Chemical Research, Wako-Shi Saitama-ken, in further activities in this area.

Schmidt gave brief details of other work in the charged particle field. He noted with regret that the NNDC had discontinued the publication of the Bibliography of Integral Charged Particle Nuclear Data. The closing down of the KaChaPaG Centre, due to a change of emphasis at the Institute, has resulted in a very considerable decrease in charged particle compilation work as a whole. It is to be hoped that ways can be found to ensure that such activities are continued so that data are available to users and not lost. Schmidt agreed to contact users of charged particle data to inform them of the loss of compilation effort and to ask them, if they feel sufficiently concerned, to make out a case for the continuation of this work. Only in this way can the INDC give full support to the users.

ACTION 4. SCHMIDT
ACTION 5. ALL MEMBERS

VI.B Future CINDA Publication Schedule

The INDC agreed to a proposal (INDC/P(83)-36) that a five-year cumulative archival issue designated CINDA-B, supplementing CINDA-A, should be published covering the period 1977-81. This would be followed by smaller issues and supplements as is the current practice.

Recommendation 4

For future publications of CINDA the second publication scheme proposed in INDC/P(83)-36 (a five-year issue in the Spring of 1984) is recommended.

VI.C Current Status of Evaluated Neutron Data

Schmidt reported that the Neutron Nuclear Data Evaluation Newsletter, which is produced by the NEA Data Bank, now includes contributions from non-OECD countries. The current issue, NNDEN/33 (February 1983) includes contributions from six non-OECD countries and from the IAEA. INDC wished to record their thanks to the NEA Data Bank and the NEANDC for making this possible.

It was agreed to recommend that the ENDF/B-V format be adopted as the international exchange format for evaluated nuclear data. However, it was noted that some modifications are foreseen for ENDF/B-VI and several participants considered that improvements could be introduced into the format, such as extension to

include the Reich-Moore resonance formalism. It was considered by some members that the absence of this formalism would be a serious handicap for the exact representation of cross-sections in the resonance region. Schmidt said that a distinction could be made between an international exchange format and formats for internal use. What is being proposed is an exchange format. It was proposed that the format should be discussed at the next Nuclear Reaction Data Centres Meeting in Moscow in fall 1983, and, if required, a small specialists meeting should be arranged to discuss the detailed specification of the exchange for evaluated nuclear data.

A recommendation concerning the use of the ENDF/B-V format as an international exchange format was adopted.

Recommendation 5

It is recommended that the ENDF/B-V format (with some possible extensions) should be adopted as the format for international exchange of evaluated neutron nuclear data. This proposal should be discussed at the next Nuclear Reaction Data Centres Meeting. Possible extensions or modifications could be the subject of an NDS-sponsored specialists meeting in 1984.

VI.D Verification of Neutron Cross-Section Processing Codes

The code verification project organised by Dr D E Cullen (NDS) was described. This project is using a step by step approach to verifying the accuracy of neutron cross-section processing codes and has the co-operation of the NEA Data Bank. Comparisons between ENDF/B-V Dosimetry Reaction Files processed into group cross-sections at Petten, Brookhaven and NDS had shown large differences and it was this observation that led to the proposal to carry out the code verification. The first stage had involved the intercomparison of the group averaged cross sections obtained using different codes for 0°K infinite dilution cross-sections. Large differences had been obtained particularly in resonance regions and threshold regions. These differences had been analysed. The next stage of the exercise involved the treatment of Doppler broadening and resonance shielding. The committee strongly supported the continuation of this verification project and asked to be kept closely informed of the results and progress.

Recommendation 6

The NDS programme of work on validation of codes for processing evaluated nuclear data is considered to be of high importance in ensuring the integrity of nuclear data in applications. Continuation of this programme of work is strongly recommended.

ACTION 6. SCHMIDT

Patrick described an intercomparison which he had made using UK codes (which read resonance parameter data in a UK format) and codes by Cullen and the Bologna group for an evaluation of Am243 which had been produced in UKNDL, ENDF/B-IV and B-V formats. All point cross-sections agreed closely at 0°K but differences appeared following Doppler broadening. These differences were associated with interpolation to intermediate points for which the cross-sections were not calculated directly.

VI.F Status of Mass Chain Data Evaluation (NSDD Network)

A memorandum from Dr M R Bhat (BNL) was distributed as INDC/P(83)-27. This gives the projected completion dates of mass chains $A > 45$ for 1983,84. Limitations in ENSDF files which prevent the automatic processing of files for some applications were discussed by Subcommittee A and resulted in an action being placed on NDS.

ACTION 8. SCHMIDT

VII Progress Reports

Members described highlights of national progress reports. These are summarised in Appendix 3. Members are reminded that there is a standing action to distribute progress reports as INDC documents, to distribute additions to the progress reports in the INDC/P series and to provide the Executive Secretary with written notes on highlights which are to be included in the minutes.

VIII Reports of Technical, Policy and Ad-Hoc Subcommittees

These reports were discussed and agreed by the committee. They resulted in a number of recommendations and actions. The reports are included as Appendices to the minutes. Points discussed in detail include:

- (i) INDC responsibilities for policy decisions, and, in particular, responsibilities for approval of CRPs before they are initiated.

- (ii) Funding of NDS coordinated activities and the responsibilities of INDC in relation to funding and the budget.
- (iii) The funding of and justification for the proposed Handbook of Nuclear Data for Safeguards Applications.
- (iv) The requirement for proposals to be supported by thorough scientific documents justifying them.
- (v) Need for assessments of the value and effectiveness of meetings and other activities.

The following specific recommendations were approved:

Recommendation 7

A CRP on Methods for Calculation of Fast Neutron Nuclear Data for Structural Materials is approved in principle, subject to final approval by INDC participants of the detailed proposals to be formulated at the planned Consultants' Meeting on Nuclear Data for Structural Materials (November 1983).

Recommendation 8

A limited follow-up CRP on Actinide Neutron Nuclear Data Evaluations is approved. This would involve only one meeting (immediately prior to the planned AGM on Nuclear Data for Actinide Isotopes in 1984).

Recommendation 9

Efforts should be made to have the unit "the barn" transferred to the list of non-SI units approved for permanent use with the SI system.

Recommendation 10

Every introduction of a new CRP should be supported by sound scientific documents and be officially approved at an INDC Meeting. This recommendation should be applied to the proposed CRP on the Measurement and Analysis of (p,n) and (α ,n) Reaction Cross-sections.

IX Committee Business - II

Actions, conclusions and recommendations were reviewed and agreed. The actions are listed in Appendix 1. Conclusions and recommendations are summarised in the introductory section preceeding the main minutes and are also given in subcommittee reports.

It was agreed that the technical content of INDC meetings should be increased. Proposals should be made by participants for subjects for a Topical Meeting to be held during

the next INDC Meeting well in advance of the next meeting.

ACTION 56. ALL PARTICIPANTS

Concern was expressed about late distribution of documents and the NDS and participants were urged to distribute these well in advance of the meeting.

**ACTION 57. NDS AND ALL
PARTICIPANTS**

There was also concern that the agenda was too full to permit sufficient time for discussion. The Chairman and Scientific Secretary agreed to consider ways of dealing with some items more expeditiously.

**ACTION 58. SCHMIDT AND
SEELIGER**

It was proposed to hold the next meeting in Vienna during the week 24-28 September 1984, (subject to agreement by members before the end of 1983)*.

ACTION 59. ALL PARTICIPANTS

* The proposed date of the next meeting is now 1-5 October and this has been agreed by all members.

ACTIONS ARISING FROM 13TH INDC MEETING

No	Session	Person	Action
1	IV A	Schmidt	To provide to the INDC additional information, as far as possible, on major equipment (associated with the use of neutron generators) provided by the Nuclear Data and other Sections of the Agency through the Agency's Technical Co-operation programme.
2	V I	Schmidt	Ask the NEA-DB if the results of the nuclear model code intercomparisons can be made available generally to non-OECD countries.
3	VI A.	Froehner Patrick	Because of the NDS proposal to co-ordinate conversion of files to ENDF/B-V format inform Schmidt which files in UKNDL and KEDAK merit conversion (taking into account files already available in ENDF/B-IV or B-V format).
4	VI A	Schmidt	Produce a list of the important requirements for charged particle nuclear data after consulting the users requiring these data.
5	VI A	All members	Draw to the attention of national nuclear data committees the reduced effort on charged particle reaction data compilation and encourage more efforts in this field.
6	VI D	Schmidt	Make widely available the results of the NDS data processing code validation exercises.
7	S.C.A.	Schmidt	Arrange publication of the final report of the CRP on Transactinium Isotope Decay Data in the IAEA Technical Report series.

No	Session	Person	Action
8	S.C.A.	Schmidt	Arrange for the next meeting of the CRP on Transactinium Isotope Decay Data to consider ways in which ENSDF files could be improved so as either to make them suitable for automatic processing for direct use in applications or to indicate when the file for an isotope requires further evaluation before use, either because it is not complete or not fully consistent. The CRP should be asked to make recommendations to the ENSDF project.
9	S.C.A. S.C.B.	Schmidt	Make provisional plans for a CRP on Methods for Calculation of Fast Neutron Nuclear Data for Structural Materials.
10	S.C.A. S.C.B.	Schmidt	Arrange for the planned Consultants Meeting on Structural Materials Nuclear Data to formulate detailed proposals for the above CRP.
11	S.C.A. S.C.B.	Schmidt	Distribute these proposals to INDC participants.
12	S.C.A. S.C.B.	All participants	Write to Schmidt and Seeliger, before the end of 1983, saying if the proposals are acceptable.
13	S.C.A.	All participants	Make recommendations on the value of a Consultants Meeting on Safety and, if supported, propose topics and speakers by the end of 1983 (taking into account the outline proposals contained in the report on Sub-Committee 'A').
14	S.C.St.	NDS	Announce the Technical Report on Standards by a 'U-Distribution' and the NDS Newsletter.
15	S.C.St.	All participants	Advertise the Technical Report on Standards and encourage purchases.
16	S.C.St.	Motz	Report to the Standards S.C. Chairman appointment of reviewer for H(n,n)cross section.

No	Session	Person	Action
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17	S.C.St.	Deruytter	Enquire about the possibility and report on appointment of reviewer for low energy cross section dependence of the principal fissile isotopes to Standards S.C. Chairman.
18	S.C.St.	Motz	Confirm appointment of reviewer for ^{252}Cf Nu-bar.
19	S.C.St.	Motz	Communicate planned date for completion and availability of the ENDF/B-VI standards file to Deruytter, Conde and NDS.
20	S.C.St.	S.C.S. Chairman	Enquire about exp. error information requested by CSEWG and report to NNDC.
21	S.C.St.	Deruytter	Contact G Hale about discrepancy in the $^{10}\text{B}(n,\alpha)$ cross section.
22	S.C.St.	All participants	Screen CSEWG distribution list for standards documents and report proposed changes to NDS.
23	S.C.St.	NDS	Send revised distribution list for CSEWG standards documents to NNDC.
24	S.C.St.	NDS	Encourage W Mannhart to undertake an evaluation for the ^{252}Cf spectrum.
25	S.C.B.	Schmidt	Send the list of authors and contents of the new 'IAEA Nuclear Data Activation Handbook' to INDC participants for suggestions of reviewers.
26	S.C.B.	All participants	Respond to the preceeding action and suggest reviewers to Schmidt.
27	S.C.B.	Schmidt	Ensure that the 'IAEA Nuclear Data Activation Handbook' is subjected to thorough peer review.

No	Session	Person	Action
28	S.C.B.	Schmidt	Arrange for a speaker from the Safeguards Department of IAEA to review at the next INDC meeting the nuclear data used for safe-guards analytical techniques.
29	S.C.B.	Schmidt	Report at the next INDC meeting on INTOR-NDS interactions.
30	S.C.B.	Csikai	Find an expert to prepare a working paper on agricultural needs for nuclear data for presentation at the next INDC meeting.
31	S.C.B.	Patrick	Inquire and then report to the NDS on what group structure, format etc. are required if the INDL/F-83 file is to be processed into group averaged cross sections.
32	S.C.B.	Schmidt	Submit to INDC participants before Autumn 1983, in a better, more-clear cut way, the scientific basis and scope for the proposed CRP on 'Measurement and Analysis of (p,n) and (α ,n) Reaction Cross Sections and Emission Spectra'.
33	S.C.B.	All participants	Approve, disapprove or comment on the proposal for a CRP on Measurement and Analysis of (p,n) and (α ,n) Reaction Cross Sections and Emission Spectra in writing by the end of 1983, to Schmidt and Seeliger.
34	S.C.B.	Seeliger	Schedule discussion of this CRP at next INDC Meeting.
35	S.C.B.	Schmidt	Distribute to INDC participants the conclusions of the Consultants' Meeting on Radiation Damage of Structural Materials before the next INDC Meeting.
36	S.C. Barn	Cross and Michaudon	Provide INDC members with back-ground material on the defense of the barn.
37	S.C. Barn	Michaudon	Provide INDC members with a list of members of the CCU and CIPM.

38	S.C. Barn	Michaudon	Approach the Comité de Co-ordination Scientifique et Technique informally and request their support for having the barn put on the 'permanent' list for use with the SI.
39	S.C. Barn	Chairmen of INDC and NEANDC	Present a case to the BIPM on the transfer of the unit 'the barn' to the list of non-SI units approved for permanent use with S.I. on behalf of the INDC and NEANDC.
40	S.C. Barn	All members	Present arguments for the permanent retention of the barn to national members of the CCU and CIPM. Obtain the support of national nuclear data committees (where appropriate).
41	S.C.M.	Motz & Yankov	Supply NDS and INDC with long term plans of their respective countries for major regional conferences.
42	S.C.M.	Yankov	Make all possible efforts to hold a Soviet Union Conference in 1986 or later (but not in 1985).
43	S.C.M.	INDC members	Approach their SAC National representatives and ask them to reconsider their position regarding symposia on Physics and Chemistry of Fission and report informally about their response to NDS before the end of November, 1983.
44	S.C.M.	Schmidt	At the next Nuclear Reaction Data Centre Meeting: i) put the item 'Format for exchange of evaluated data' on the agenda and ii) solicit recommendations as to usefulness and scope of a Specialist Meeting on this subject.
45	S.C.M.	Schmidt	Submit to INDC participants the recommendations of the Nuclear Reaction Data Centre Meeting and, if necessary, ask their approval for holding a Specialists Meeting on 'Evaluated Data Exchange Format'.

No	Session	Person	Action
46	S.C.M.	Schmidt	Supply INDC participants with a detailed chart with two entries (type of meeting and date) for proposed NDS meetings before the next INDC meeting. For each meeting give references to relevant papers.
47	S.C.M.	Deruytter	Make proposals to IAEA/NDS, in close cooperation with NEANDC, about the date of the 'AGM on Nuclear Standard Reference Data' taking into account the date of release of the ENDF/B-VI Standards File
48	IX D	Schmidt	Write a paper describing the various sources of funding for nuclear data-related programmes and the general funding policies within the Agency.
49	S.C.D.	NDS	Inquire of Vonach why $Rh(n,n')$ should be retained as a discrepancy.
50	S.C.D.	Boldeman	Ask Musgrove to review his analysis of ^{91}Zr resonance parameters and inform NDS.
51	S.C.D.	Michaudon	Transmit USSR paper on ν ^{237}Np to Fréhaut and request response.
52	S.C.D.	Motz	Inquire if Dabbs can provide Γ_f values for ^{241}Am .
53	S.C.D.	Condé	Report on resonance data for ^{243}Am to verify if only one set is common to all calculations.
54	S.C.D.	Standing. All participants	Transmit new information on discrepancies to the Chairman of the Subcommittee.
55	IX	Schmidt	In connection with the proposed Workshop on Nuclear Model Codes at ICTP Trieste (1984) investigate with NEA-DB the possibility of utilising their benchmarks and intercomparison results.
56	IX	All participants	Propose subjects for Topical Discussions at future INDC meetings to the Chairman and Scientific

No	Session	Person	Action
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57	IX	NDS and All participants	Distribute all pertinent documents well in advance of meetings.
58	IX	Schmidt and Seeliger	Because of the length of the Agenda consider ways of dealing with some items more expeditiously. For example, for some items, information would be provided in advance in a form which could be approved by participants prior to the meeting.
59	IX	All participants	Inform Schmidt before the end of 1983 if the proposed date for the next INDC meeting (Vienna, Sept. 24 - 28, 1984) is suitable.

REPORT ON THE TOPICAL MEETING ON NUCLEAR PHYSICS
AND DATA RESEARCH ACTIVITIES IN BRAZIL

Afternoon of Tuesday 17 May, 1983

The first talk was a presentation by Dr J M A Forman, Director of the Brazilian State owned NUCLEBRAS, describing in a broad sense the aims and goals of this industrial company which has the responsibility of conducting the Brazilian nuclear power plants programme, as well as the exploration of Brazilian resources of uranium ores.

Dr Solange de Barros, Professor at the Federal University of Rio de Janeiro, presented an up-to-date report on the work her group is doing in co-operation with the cyclotron group of IEN in Rio on isomeric fission studies. Recent results were presented on new shape isomer fissioning nuclei obtained among the actinides as well as on data so far obtained on the excitation functions that are being measured.

The programme of the Nuclear Data Center at CTA São José dos Campos was presented by Dr Kesavan Nair, manager of the center. The status of this programme was emphasised during the talk and future plans presented.

The next presentation by Dr João Arruda Neto, group leader at USP Linac, was on photofission work that is being conducted at the electron linear accelerator of São Paulo University. Cross sections for ^{233}U photofission as a function of energy were shown. The work that is being done in co-operation with the Livermore Laboratory on photoneutron cross sections was also presented. Data so far obtained were compared to values of experiments performed at Saclay and differences were emphasized and an explanation advanced.

A very complete presentation of nuclear physics and data activities of IPEN, São Paulo, was given by Dr Laercio Vinas, head of Nuclear Physics Division. All the parts of what is a very broad programme of research were mentioned.

Dr G Lucki head of the Cyclotron Project at IPEN, presented details of his investigations of radiation damage on nuclear materials. Plans for future use of IPEN's cyclotron for this type of work were outlined.

The last talk by Dr L T Auler, head of Nuclear Physics Division at IEN, was a presentation of past, present and future works on nuclear data done at the physics department of IEN. Emphasis was given to the different types of work pursued before and after the cyclotron installation.

List of Abbreviations

IEN	- Instituto de Engenharia Nuclear, Rio de Janeiro
IPEN	- Instituto de Pesquisas Energéticas e Nucleares, São Paulo
CTA	- Centro Tecnológico de Aeronáutica, São José dos Campos
USP	- Universidade de São Paulo
NUCLEBRAS	- Empresas Nucleares Brasileiras

HIGHLIGHTS FROM NATIONAL PROGRESS REPORTS

A. Highlights of and additions to submitted progress reports

Dr. Yankov presented paper INDC/P(83)-51 giving details of neutron physics and nuclear data research carried out in the USSR. Studies of the interaction of neutrons with nuclei in an excited state have shown that the excitation energy can be transferred to a neutron in a scattering reaction, the scattered neutron then having higher energy than the incident one. Measurements with thermal neutrons on ^{180}mHf give a cross-section of 52 ± 13 barns for this reaction, in satisfactory agreement with theoretical calculations. At the Kurchatov Institute of Atomic Energy, measurements have not confirmed the emission of ^{10}He in the spontaneous fission of ^{252}Cf reported by Czechoslovakian physicists. Details of additional nuclear data activities in the USSR were given by Dr Kuzminov in paper INDC/P(83)-48.

Dr Kapoor reported that the Department of Atomic Energy, Government of India, holds annual symposia on Nuclear Physics and Solid State Physics. The proceedings of these symposia are published in three volumes and are available on request. These contain papers on the research work being done in the country in the broad area of Nuclear Physics and can be considered as additions to the submitted progress report on nuclear data activities.

Full details of nuclear data activities in France during 1982 are to be found in the Progress Report INDC(FR)-58/L. At Bruyères-le-Châtel, improvements have been made to the detectors used in elastic and inelastic neutron scattering studies to reduce the time resolution to 0.5 ns to take advantage of narrower beam bursts. Measurements have been carried out on nuclei in the s-d shell and on ^{169}Tm , and further measurements on ^{238}U and ^{232}Th at 5 MeV are planned. Fast neutron capture measurements have been performed on ^{139}La , ^{165}Ho and ^{209}Bi between 0.5 and 3 MeV. Studies of the $^{232}\text{Th}(d, pf)$ reaction, in co-operation with Saclay, indicate the presence of a rotational-like band structure as already observed for the $^{230}\text{Th}(n, f)$ reaction. A complete evaluation of ^{169}Tm has been carried out in co-operation with LANL. Theoretical studies of the potential energy surface of strongly deformed actinide nuclei provide an interpretation of the so-called "cold fragmentation" in fission as

being a shape transition between the fission and fusion valleys. These studies may give another explanation of the structure observed in the fission cross-sections of thorium isotopes, without the need for a third well in the fission barrier. Evaluation work at Cadarache has concentrated on ^{58}Ni and the thermal values and resonance parameters of Ni isotopes. A new evaluation of the ^{239}Pu resonance region is in progress.

Progress on nuclear data activities in Italy was presented in paper INDC/P(83)-62. In the evaluation area, a code has been written for automatic translation of KEDAK into ENDF/B-IV or -V format. Tests have been made on theoretical scattering kernels for H_2O by comparing calculated and measured spectra of neutrons emerging from a large volume of water. A discrepancy between Γ_n values for ^{91}Zr measured at Oak Ridge and at Geel (by a combined Bologna-Geel group) appears to be mainly due to the use of an incorrect resolution function when analysing the Oak Ridge data.

The highlights of work related to nuclear data in Sweden are to be found in paper INDC/P(83)-57. The extensive measurement programme at the isotope separator on-line facility OSIRIS on short-lived neutron-rich nuclides has continued. A new 150 ps bunching system has been installed on the Van de Graaff accelerator at Studsvik and will be used for high resolution measurements of neutron elastic and inelastic scattering around 20 MeV.

At CBNM, Geel, measurements of the capture cross-section and alpha of ^{235}U have been made between 2 and 85 keV. The capture data are on average about 10% lower than the ENDF/B-V values. Average neutron capture measurements up to 600 keV on the fission products ^{105}Pd and ^{108}Pd agree with ORNL data for ^{105}Pd within $\sim 10\%$, but for ^{108}Pd , the Geel data are 40% higher than the ORNL values below 15 keV and 20% higher at higher energies. Dr Deruytter also reported that the pulse compression system on the linac was working extremely well, giving a 50A peak current in a pulse width less than 2 ns. A time resolution of 150 ps has been measured on the 7 MV Van de Graaff following the installation of a post bunching system. A multiparameter fit to the thermal constants of the fissile nuclides has been performed by Mr E J Axton, during a period spent at Geel, using a full covariance matrix for the input data. The effect of the inclusion of correlations produced higher uncertainties in the fitted parameters and a larger χ^2 .

In Japan, the new JAERI tandem was accepted last August and has given excellent running. The first experiments are underway.

Highlights from the UK nuclear data progress report for 1982 were given in paper INDC/(83)-55. Simultaneous fits to five sets of transmission data on the 1.15 keV ^{56}Fe resonance has given a Γ_n value closer to the 50 meV found in earlier measurements than to the ~ 80 meV obtained recently by Rohr and by Macklin. Work on the $^{93}\text{Nb}(n,n')^{93m}\text{Nb}$ reaction has continued on the Birmingham Dynamitron with measurements between 3 and 6 MeV. Integral measurements of the $^{93}\text{Nb}(n,n')$ reaction have been carried out in the Zebra assembly at Winfrith, and the results appear to agree with the Strohmaier evaluation.

For Australia, Dr Boldeman drew attention to paper INDC/(83)-59 which described measurements of the ^{252}Cf fission neutron spectrum. Between 1 and 14.6 MeV, the results showed the spectrum to be consistent with a Maxwellian distribution with $T = 1.424 \pm 0.013$ MeV. More recent measurements using a ^6Li glass scintillator indicate that the Maxwellian dependence holds down to at least 300 keV. Studies of 250 MeV ^{19}F ions on ^{189}W resulted in a ν value for pre-scission neutrons of 0.43 neutrons/fission.

Progress in nuclear data activities in Canada was described in paper INDC(CAN)-22/G. Measurements have been made of the temperature dependence of the thermal neutron cross sections for fission of ^{233}U , ^{235}U and ^{239}Pu and for capture in ^{238}U at temperatures from -200°C to $+300^\circ$. The results agree with the cross-section shapes given in ENDF/B-V. This suggests that the discrepancy noted between the measured Maxwellian-averaged cross-section for ^{235}U fission and that derived from the 2200 m/s cross-section and the Westcott g-factor is not due to the shape of the cross-section. High resolution photofission measurements on ^{238}U have resulted in the observation of 8 peaks, in addition to steps in the cross-section, between 5.9 and 6.4 MeV. This structure has been tentatively interpreted as vibrational resonances in two additional shallow wells in the fission barrier.

The progress report for 1982 on nuclear data activities in the USA was expected to be distributed in about 2 months.

The progress report from the German Democratic Republic was presented by Prof. Seeliger as paper INDC(GDR)-24/G. The programme of absolute fission cross section measurements has continued at 8.5 MeV using the time correlated associated particle method. A new study of fission neutron spectra over the energy range 1 to 11 MeV has begun and will include angular distribution measurements. It is hoped to present new results on crystal and chemical binding effects on cross-sections at the next Kiev Conference.

B. Activities in countries not represented on INDC

Prof. Csikai reported on work at four Hungarian institutes. Studies of excited states in neutron and charged particle induced processes have been carried out, as well as excitation function measurements for neutron induced threshold reactions mostly in the range 13.5 to 14.7 MeV. Fission fragment angular distribution measurements have been performed on ^{235}U , ^{238}U and ^{237}Np near the $(n, 2nf)$ thresholds. A simple method has been developed for neutron energy determination in the energy region 12.2 to 15.5 MeV using the ratio of the $^{90}\text{Zr}(n, 2n)$ and $^{93}\text{Nb}(n, 2n)^{92m}\text{Nb}$ cross-sections. A compilation and evaluation of (n, t) cross-sections has been carried out as part of fusion oriented research.

C. New or projected large experimental facilities

In the USSR, the IBR-2 pulsed fast reactor reached the 2 MW power level (50% of design power) in 1982 and Dr Yankov distributed an article (INDC/P(83)-56) describing the reactor and associated experimental equipment. At the Kurchatov Institute, a synchrotron radiation source is under construction and eventually it is hoped to construct a second storage ring to increase the electron energy from 450 MeV to 2.5 GeV.

The variable energy cyclotron in Calcutta has been in operation for one year and is being used to charged particle reaction studies. A new 14 MV Pelletron heavy ion accelerator is being constructed in Bombay, with the first beam expected in 1985.

In France, two major heavy-ion facilities have begun operation, SARA at Grenoble and GANIL at Caen, and experiments have started. The Saclay Tandem Van de Graaff will be upgraded for heavy-ion work by the addition of

superconducting cavities. A buncher has been installed on the Tandem Van de Graaff at Bruyeres-le-Chatel to give improved pulsing characteristics of the beams. Bursts of 0.5 ns have been obtained and widths down to 0.3 ns are possible with reduced current

A superconducting cyclotron is being installed in Milan.

Dr Conde reported that the reconstruction of the synchrocyclotron at the University of Uppsala is well underway: the machine will operate in two different modes, as (i) a frequency modulated cyclotron and (ii) an isochronous cyclotron. A storage ring with electron cooling will be added to the cyclotron, the system being named the CELSIUS project.

Work is progressing on the Spallation Neutron Source at the Rutherford Appleton Laboratory in the UK. In the past year, the H^- source has been successfully commissioned and a 10 MeV beam accelerated through the first resonator tank of the linac. It is still hoped that the first neutrons will be produced in the middle of 1984. Commissioning of the Nuclear Structure Facility at Daresbury has continued successfully and the first experiments, on rapidly rotating nuclei, have begun.

In Australia, it is intended to install a superconducting linac with a 100 ps pre-buncher on the tandem Pelletron at Canberra. A proposal has been made for the construction of an 8 UD Pelletron or FN Tandem at Lucas Heights and there are also suggestions for a 100 - 150 MeV cyclotron at a Sydney Hospital.

In the USA, the WNR facility at Los Alamos is being upgraded by the addition of a proton storage ring which will greatly increase the neutron flux for nuclear data measurements. The first experiments with this upgraded system are scheduled for the spring of 1986.

A heavy ion superconducting cyclotron at Chalk River, Canada, is under construction. It is planned that the tandem beam will be put into the cyclotron about April 1984 and a beam from the cyclotron obtained later that year.

A time-of-flight spectrometer has been installed on the 300 ns pulsed neutron generator at the Institute of Experimental Physics, Debrecen, Hungary. Work on the construction of a cyclotron is still continuing at the Institute of Nuclear Research, Debrecen.

List of INDC/P Working Papers considered at this MeetingINDC/P(82)-

<u>No.</u>	<u>Date</u>	<u>Author</u>	<u>Subject</u>
1.	19 Jan	J.J. Schmidt	NDS Meeting Schedule for 1982
2.	19 Jan	A. Lorenz	Meeting Announcement
3.	21 Jun	J.J. Schmidt	Report on the Course on Advances in Nuclear Theory and Nuclear Data for Reactor Applications, ICTP, Trieste, 25 Jan - 19 Feb 1982
4.	13 July	D.E. Cullen	Announcement of IAEA Consultants Meeting on U-235 Fast Fission Cross Section, Bratislava, CSSR
5.	16 Aug	N. Kocherov	Report on the IAEA TC Interregional Training Course on the Utilization of Neutron Generators, Debrecen, Hungary, 7 June - 9 July 1982
6.	Oct	K. Okamoto	Travel Report to the Nuclear Institutes in Beijing, Shanghai and Lanzhou, in the People's Rep. of China
7.		N. Kocherov	IAEA Technical Co-operation mission of NDS staff member N. Kocherov to Greece
8.	10 Dec	A. Lorenz	Meetings scheduled for 1983 and 1984
9.	23 Dec	K. Okamoto	Proposal for an IAEA AG Meeting on Properties of Neutron Sources, Leningrad, 1985 or 1986

<u>No.</u>	<u>Date</u>	<u>Author</u>	<u>Subject</u>
1.	Jan	K. Okamoto	IAEA Consultants' Meeting on Nuclear Data for Bore-hole and Bulk-media Assay Using Nuclear Techniques, Krakow, Poland, November 1983
2.	13 Jan	J.J. Schmidt	Coordinated Research Programme (CRP) on 14 MeV Neutron Cross Sections
3.		K. Okamoto	Report on TCM on Research Reactor Production of Radioisotopes, Vienna, 15-18 November 1982
4.	26 Jan	A. Lorenz	Compilation of National Nuclear Data Committees
5.	31 Jan	J.J. Schmidt	The $^{93}\text{Nb}(n,n')^{93\text{m}}\text{Nb}$ Reaction
6.	17 Mar	A. Lorenz	Reference to and Summaries of Recommendations from Past IAEA/NDS Meetings and other Meetings on Nuclear Data
7.	10 Mar	A. Lorenz	Forecast of IAEA/NDS Meetings: 1983, 1984, 1985
8.	27 Apr	J.J. Schmidt M.K. Mehta N. Kocherov V. Piksaikin	Progress Report on the Technical Co-operation Interregional Project on Nuclear Data Techniques and Instrumentation TC/INT/1/018
9.	22 Apr	K. Okamoto	Travel Report - Visits to Hong Kong, Republic of Korea, Philippines, Singapore and Burma under INT/1/018
10.	11 Apr	M.K. Mehta	Report on Expert Mission to Department of Nuclear Engineering, Seoul National University, Republic of Korea under the Interregional Project INT/1/018
11.	5 Apr	J.W. Boldeman	Summary of a report on an Expert Mission to Thailand, Bangladesh, Malaysia and Indonesia under INT/1/018
12.	18 Mar	V. Piksaikin	Prospectus - Interregional Training Course and Study Tour on Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors
13.	10 May	J.J. Schmidt	Information on the objectives and content of the Workshop on Nuclear Model Computer Codes which will be held at the ICTP Trieste from 16 January - 3 February 1984

14.	May	H.D. Lemmel	IAEA Coordinated Research Programme (CRP) on the "Intercomparison of Evaluations of Actinide Neutron Nuclear Data"
15.	18 Apr	M.K. Mehta J.J. Schmidt	Current Status of the Co-ordinated Research Programme on Measurement and Analysis of 14 MeV Neutron Nuclear Data Needed for Fission and Fusion Reactor Technology
16.	28 Mar	D.E. Cullen	Current Plans for Follow-up Activities of REAL 80 (REAL-84)
17.	28 Mar	D.E. Cullen J.J. Schmidt	Proposal for Consultants' Meeting on Nuclear Data for Nuclear Safety, 1985
18.	25 Apr	M. Lammer	Handbook on Nuclear Data for Safeguards
19.	20 Apr	D.E. Cullen	Summary of the IAEA Consultants' Meeting on the ^{235}U Fast Neutron Fission Cross Section, Smolenice, CSSR
20.	20 Apr	H.D. Lemmel	IAEA Consultants' Meeting on the ^{252}Cf Fission-Neutron Spectrum
21.	29 Mar	K. Okamoto	Advisory Group Meeting on Nuclear Standard Reference Data in 1984
22.	20 Apr	V. Pronyaev	IAEA Advisory Group Meeting on Basic and Applied Problems of Nuclear Level Densities, Brookhaven National Laboratory, USA
23.	May	V. Pronyaev	Preliminary Summary Report of the 1983 AGM on Basic and Applied Nuclear Level Densities, Brookhaven, April 1983
24.	28 Mar	D.E. Cullen J.J. Schmidt	Preliminary Information on the Planned Consultants' Meeting on Nuclear Data for Structural Materials, Vienna, November 1983
25.	22 Mar	A. Lorenz	Preliminary Information Sheet on the Planned 1984 Advisory Group Meeting on Transactinium Isotope Nuclear Data, Sweden, 21-24 May 1984
26.	25 Mar	H.D. Lemmel	Specification of Data Uncertainties in EXFOR
27.	1 Feb	M.R. Bhat	Projected Compilation Dates of Mass Chains $A > 45$ for 1983, 1984
28.	29 Mar	K. Okamoto	Proposal for an Advisory Group Meeting on Nuclear and Atomic Data for Medical Diagnostics and Radiotherapy in 1985

29. 29 Mar K. Okamoto Proposed Agenda of IAEA Consultants' Meeting on Nuclear Data for Bore-hole and Bulk-media Assay using Nuclear Techniques, Krakow, 14-18 November 1983 (Reference INDC/P(83)-1)
30. May H.D. Lemmel, J.J. Schmidt Revised Proposal for a Coordinated Research Programme (CRP) on "Validation and Benchmark Testing of Actinide Nuclear Data"
31. 22 Apr D.E. Cullen, V. Piksaikin International Nuclear Data File for Radiation Damage Estimation
32. 18 Apr V. Pronyaev, D.E. Cullen, P. McLaughlin INDL/F-83 - Evaluated neutron reaction data library for INTOR fusion neutronics calculations (1983 version)
33. 15 Apr M.K. Mehta, A. Lorenz Specification of Criteria for Technical INDC Reports
34. 9 May V. Piksaikin $^{103}\text{Rh}(n,n')^{103\text{m}}\text{Rh}$ Cross Section
35. 20 Apr K. Okamoto Summary of Nuclear Data Requirements for the Production of Radioisotopes for Medical Applications
36. 25 Mar H.D. Lemmel CINDA Publication Schedule
37. 14 Apr H.D. Lemmel Status of the Thermal Cross-Sections and Neutron Yields of U-233, U-235, Pu-239, Pu-241 and ^{252}Cf
38. 18 Apr NEA NEA Data Bank Progress Report Submitted to the 13th INDC Meeting in Rio de Janeiro, 16-20 May, 1983
39. 11 May V. Pronyaev, H.D. Lemmel, D.E. Cullen, J.J. Schmidt Proposal for a Coordinated Research Programme (CRP) on "Methodology of the Neutron Cross Section Evaluation for Structural Materials"
40. May D.E. Cullen IAEA Cross Section Processing Code Verification Project as it applies to Shielding Data
41. 11 May M.K. Mehta Proposal for a Co-ordinated Research Programme on the Measurement and Analysis of (p,n) and (α ,n) Reaction Cross Sections
42. May J.J. Schmidt Correspondence on Biomedical Nuclear Data Needs
43. 12 May H.D. Lemmel Status of Charged Particle Nuclear Data (CPND) Compilation

44.	12 May	H.D. Lemmel	Responsibility Assignments in the Nuclear Data Section
45.	9 May	R.C. Haight, H.T. Motz	Nuclear Data Needs for Inertial Confinement Fusion (ICF)
46.	16 May	E. Menapace	Proposal for a Training Course in Applied Nuclear Physics to be held at the Laboratori Nazionali di Legnaro, Padua, Italy.
47.	16 May	G. Yankov	List of Scientific Problems to be considered during the IAEA Interregional Course on Neutron Physics and Nuclear Data
48.	May	B. Kuzminov	Review of work of Soviet specialists in the field of neutron nuclear data
49.	May	A.N. Davletschin et al.	About the discrepancy between two groups of experimental data of the ^{236}U fast neutron capture cross section
50.	May	V.V. Malinovskiy et al.	The influence of incomplete registration of fission events on the experimental determination of $\bar{\nu}_p$
51.	May	G.B. Yankov	Some Researches into the Neutron Physics and Nuclear Data carried out by Soviet Scientists
52.	1 April	JAERI Nuclear Data Centre	Activities of JAERI Nuclear Data Center and Japanese Nuclear Data Committee from April 1982 to March 1983
53.	6 May	J.W. Boldeman	Charged Particle Reaction Data for Ion Beam Analysis
54.	May	H. Condé	Report to INDC on Cooperation between INDC/NEANDC and CSEWG on Standard Data
55.	May	B. Patrick	Highlights from UK Nuclear Data Progress Report 1982
56.	May	G. Yankov	The IBR-2 Reactor as a Pulsed Neutron Source for Scientific Research
57.	May	H. Condé	Highlights from Progress Report Sweden, 1982
58.	May	W.G. Cross, J.S. Merritt	Half-Lives of Isotopes for Commercial and Biomedical Applications, 1983 (revised)
59.	6 May	J.W. Boldeman	Fission Neutron Spectrum from Spontaneous Fission of ^{252}Cf

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|-----|---------|------------------------------|--|
| 60. | May | L.T. Auler | Programme of the Topical Meeting on Nuclear Physics and Data Research Activities in Brazil |
| 61. | May | A.G. da Silva,
L.T. Auler | Nuclear Data Activities at IEN |
| 62. | May | E. Menapace | Progress Report on Nuclear Data Activities in Italy to the 13th INDC Meeting |
| 63. | 30 June | J.J. Schmidt | Updating of CSEWG distribution list for standard data documents, Reference: Actions 22 and 23 from the 13th INDC Meeting |
| 64. | May | A.J. Deruytter | Highlights of and Additions to INDC(EUR)-017/G |
| 65. | May | Michaudon | Additions to Progress Report - France |

MEMBERSHIP OF SUBCOMMITTEES

Subcommittee A

Chairman - J L Rowlands

Auler, Condé, Derrien, Kuzminov, Motz, Schmidt.

Subcommittee B

Chairman - Haight

Boldeman, Cross, Csikai, Deruytter, Harada, Kapoor,
Menapace, Michaudon, Patrick, Schmidt, Seeliger, Yankov.

Subcommittee on Standards

Chairman - Condé

Boldeman, Cross, Csikai, Derrien, Deruytter,
Kapoor, Kuzminov, Motz, Patrick, Schmidt.

Subcommittee on Discrepancies

Chairman - Motz

Boldeman, Derrien, Harada, Kuzminov, Patrick, Schmidt

Subcommittee on Transfer of Nuclear Data Technology

Chairman - Seeliger

Auler, Boldeman, Condé, Cross, Csikai, Haight, Harada,
Kapoor, Menapace, Michaudon, Schmidt, Yankov.

Subcommittee on Meetings and Future NDS Programme

Chairman - Michaudon

Auler, Condé, Csikai, Deruytter, Haight, Kapoor,
Menapace, Rowlands, Seeliger, Schmidt, Yankov.

Ad-hoc Subcommittee on the Barn

Chairman - Cross

Michaudon, Patrick, Yankov

Report of Subcommittee A

Participants: H Conde
H Derrien
B D Kuzminov
H Motz
J L Rowlands (Chairman)

The Subcommittee met on Tuesday 17 May, 1983

1 International Cooperation in the Production of Evaluated Nuclear Data Files

The present restrictions on the availability of the North American evaluated nuclear data library, ENDF/B-V and the "NEA Data-Bank Participating Countries Joint-Evaluated-File" (JEF) limit the possibilities for timely international collaboration on evaluation. These restrictions are considered by the subcommittee to be unfortunate at a time when the methods involved in producing the required improved evaluations have become much more sophisticated and when collaboration could be much more valuable. However, the restrictions must be taken into account when considering the likely participation in Coordinated Research Programmes on evaluation and the forms which such CRPs should take to be most effective (both for coordinating efforts and for training scientists from developing countries).

2 Fuel Handling, Preprocessing and Waste Management

2.1 Proposed Advisory Group Meeting on Nuclear Data for Actinide Isotopes (Upsaala, May 1984)

There has been considerable progress, in both measurement and evaluation of cross-sections of secondary actinide isotopes, and decay data for both primary and secondary actinide isotopes, since the Cadarache meeting. A review meeting in 1984 would be timely. Proposals were made for membership of the organising committee and for the programme.

Proposed membership of the organising committee:

Conde	(Chairman)
Lorenz	(IAEA-NDS)
Lemmel	(IAEA-NDS)
Derrien	(France)
Kuesters	(FRG)
Menapace	(Italy)
Patrick	(UK)
Reich	(USA)
Kuzminov	(USSR)*

Proposed programme outline:

- (i) Review paper on the requirements and status for cross section data.
- (ii) Review paper on the requirements and status for decay data.
- (iii) Progress in measurements.
- (iv) Progress in evaluation.
- (v) Benchmark testing of evaluated data.
- (vi) Report on the CRP on the intercomparison of evaluations of actinide neutron nuclear data and the follow-up CRP.
- (vii) Report on the CRP on the measurement and evaluation of transactinium isotope nuclear decay data.
- (viii) Workshops

(1) Cross Sections

- 1a. Requirements for further measurements
- 1b. Requirements for evaluations or nuclear model calculations.

(2) Decay Data

- 2a. Requirements for further measurements
- 2b. Requirements for further evaluations.

*It is with deep regret that we note that the previously proposed member from the USSR, Dr Usachev, died in June, 1983.

2.2 Proposed follow-up to the CRP on the Intercomparison of Actinide Neutron Nuclear Data Evaluations.

Proposals have been outlined in INDC/P(83)30. The subcommittee recognised the value of the proposed follow-up activities.

Briefly these are:

- (a) to convert those files in INDL/A which are not already in ENDF/B-V format and ensure that the files satisfy format and physics consistency checks,
- (b) make improvements to files, such as extending partial energy range files to full range files and extending to more reactions, so as to make the evaluations complete,
- (c) make benchmark tests of the files.

The subcommittee recommended that these activities should be pursued in the form of a CRP with contractual arrangements between IAEA-NDS and individual evaluators to carry out this work. A single research co-ordination meeting is proposed by the subcommittee to review the work of this CRP immediately prior to the proposed AGM on Nuclear Data for Actinide Isotopes (in May 1984). It was considered that the detailed intercomparison work proposed for the first CRP has now been completed.

2.3 CRP on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data

The subcommittee considered that this CRP is serving a valuable purpose and should continue until the end of 1984. It is recommended that the results of this CRP be published by the Agency as a Technical Report. It was noted that members of the CRP have commented on limitations in the ENSDF files. The subcommittee proposed that an action should be placed on the NDS to ask members of the CRP to consider whether ENSDF evaluations can be improved so that they either meet the requirements for applied purposes or give a clear indication when a file does not achieve the required completeness and consistency. An action should be placed on participants in the CRP

to make specific proposals for consideration by the coordinators of the NSDD Network.

2.4 Fission product nuclear data

The subcommittee noted the large and increasing interest in the annual progress report (published as INDC (NDS) Report "Progress in Fission Product Nuclear Data") and strongly supported its continued production.

3 Nuclear Data for Structural Materials

3.1 Planned Consultant's Meeting on Nuclear Data for Structural Materials (Vienna, November, 1983)

The subcommittee supported this planned meeting, proposing that the objectives should include:

- 1) Status of measured data
- 2) Plans to resolve discrepancies
- 3) Evaluation methodology and the role of nuclear models
- 4) Objectives of a CRP on methods for the calculation of fast neutron nuclear data.

There are significant discrepancies between measurements and a need to improve the evaluations for the principal structural materials Fe, Cr, Ni, and Zr.

It was proposed that Derrien, Froehner and Seeliger should be added to the organising committee for this meeting. Both experimentalists and nuclear model theory experts should participate in the meeting.

3.2 Proposed new CRP on methods for the calculation of fast neutron nuclear data for structural materials

The subcommittee supported this proposal in principle. Proposed objectives should be defined by participants during the planned Consultants Meeting. These should be limited to the most important structural materials (e.g. Fe, Cr, Ni) and the neutron cross sections of highest importance (inelastic scattering, elastic scattering anisotropy, (n,p) and (n, α) reactions). The proposed objectives should then be distributed by NDS to INDC participants who should reply saying whether they support the proposals before the end of the year.

4 Radiation Damage, Nuclear Safety and Dosimetry

4.1 Review of 1981 Advisory Group Meeting on Nuclear Data for Radiation Damage Assessment and Related Safety Aspects

The subcommittee noted the large number of recommendations (summarised in INDC/P(83)-6 Annex 2). Concerning those which propose activities to be initiated by IAEA-NDS the following recommendations were made:

(a) Review of dosimetry reaction data.

The IAEA-NDS should distribute the ENDF-A file of integrally adjusted dosimetry cross-sections when it becomes available.

New evaluations should only be adopted in the International Reactor Dosimetry File when a complete up-date of the whole file is released (so as to ensure international standardization). Such new evaluations must be well documented and reviewed and include covariance data. They should also be benchmark tested and shown to be a significant improvement over the present evaluation in IRDF (or in the ENDF-A file).

(b) Covariance data for dosimetry reactions and benchmark fields.

The IAEA-NDS should distribute data files as they become available. Concerning methods for generating covariance data and transforming between group structures, this might be a suitable subject for a specialist meeting.

(c) International Nuclear Data File for Radiation Damage Estimation.

The primary involvement of the IAEA-NDS should be to distribute accepted standard radiation damage files (or atomic displacement cross-section files), such as the ASTM-Standard E 693-79 library, the DAMSIG-81 data library and the new library currently being established in the USA. Extension of the files to 40 MeV is thought to be a requirement specific to experimental facilities in the USA and the work should, therefore, be undertaken there.

The extension to additional materials should also only involve the IAEA-NDS if there is a requirement by several countries.

- (d) Kerma-factor library with covariance information.

The IAEA-NDS should distribute a Kerma-factor library when this has been developed by member states. It could be appropriate for the IAEA-NDS to co-ordinate activities if several countries are involved in producing the library.

- (e) Measurements of cross-sections to 40 MeV.

This is thought to be a requirement for the USA only.

Requests for new measurements should be approved by national nuclear data committees for inclusion in WRENDA.

- (f) REAL-80 and the proposed follow-up activity, REAL-84.

A small IAEA Consultants Meeting will be held in June 1983 to review the REAL-80 project and consider the requirements for further work (which could constitute the REAL-84 project).

Any follow-up activity should be clearly justified in relation to the objective of improving the accuracy of radiation damage prediction (or improving the assessment of this accuracy).

4.2 Proposed Consultants Meeting on Nuclear Data for Nuclear Safety

Possible topics for this meeting are listed in INDC/P(83)-17. It is suggested that cross-sections in the thermal and resonance regions relevant to the prediction of the following safety related properties might be a suitable selection of topics

- (i) thermal reactor reactivity coefficients, (excluding Doppler effects).
- (ii) criticality predictions (for fuel storage, transport and reprocessing)*

*Note: An International Seminar on Criticality Studies, Programs and Needs will be held in Dijon (19 - 22 September, 1983).

- (iii) the induced radioactivity of coolant circuits and reactor components
- (iv) prediction of the release of radioactivity in accidents
- (v) waste management

It is proposed that an action be placed on INDC participants to consider whether such a meeting would be worthwhile and to write to Dr Schmidt before the end of 1983 if there is support for the meeting, proposing possible contributions.

5 Verification of Nuclear Data Processing Codes

The intercomparison of processing codes, which is being organized by Dr Cullen of the IAEA-NDS, is considered to be of high importance and is strongly supported.

J L ROWLANDS

REPORT OF SUBCOMMITTEE B

1. Participants

J. Boldeman
W. Cross
J. Csikai
A. DeRuytter
R. Haight - Chairman
K. Harada
S. Kapoor
E. Menapace
A. Michaudon
B. Patrick
J. Schmidt
D. Seeliger
G. Yankov

2. Scope of the Subcommittee

The Subcommittee reviewed the scope and the specific items to be covered at this meeting. It was agreed that the scope includes nuclear data necessary for fusion reactor development, biomedical application, safeguards, and analysis.

The plenary session asked the Subcommittee to discuss several topics in each of these areas. In addition the Subcommittee was asked for advice on several proposals by the Nuclear Data Section on meetings and research programs that have relevance to but extend well beyond the aforementioned applications.

Because of the exceptionally large number of topics to be covered and because there was less time to do so than in previous meetings, the Subcommittee could not discuss technical matters much at all. In past meetings this technical exchange has been valuable. Its loss at the present meeting suggests that a reorganization of this Subcommittee structure should be considered.

At the past meeting, the need was recognized for a core group to give continuity and leadership to the discussions. These persons have the responsibility for keeping abreast of the nuclear data developments in certain areas between INDC meetings. They then serve as informed witnesses at the meetings. The following core was assigned to continue beyond this meeting:

Nuclear data for fusion	- A. Deruytter
Analysis	- J. Csikai
Biomedical	- W. Cross
Safeguards	- M. Lammer

3. Medical Applications

The current trends in therapeutic uses of neutrons and pions were reviewed. Dr. Cross reported that neutron therapy for cancer is not so popular in the medical community as it was a few years ago. The reason is not that the results from neutron therapy are any worse, but rather that there is now more success with gamma-ray therapy with which the former must be compared. Dr. Seeliger reported that at Rossendorf the medical results of neutron irradiation from a low energy cyclotron and gamma irradiation were about the same. Dr. Cross said that at Fermilab irradiation with neutrons of higher energy was viewed with optimism. Dr. Deruytter said that in

Western Europe the emphasis was more on direct measurement of the dose from neutron irradiation of tissue than on the microscopic nuclear data. The therapists prefer a direct measurement in the environment of the tissue to be irradiated. Dr. Boldeman reported on new activities in boron-cancer-therapy where the patient is given a boron compound that will preferentially reside in the (melanoma) tumor. That area is then irradiated with thermal neutrons from a reactor.

Pion therapy is used only at two laboratories and it was suggested that their data needs could be discussed more effectively on a laboratory-to-laboratory basis.

The nuclear data areas highlighted at this discussion were then: neutron interaction data used for correcting the dose indicated by measurement instruments to the dose received by tissue; data used by a few researchers for calculating the microscopic dose at neutron energies up to about 60 MeV; and neutron and photon interaction data used to assess the prospects of mixed neutron and gamma-ray irradiation. The major interest is in dose to tissue, an area treated in detail by another international committee, the ICRU.

A proposed advisory group meeting in 1985 was discussed. After many suggestions, the following title was recommended by the Subcommittee: "Nuclear Data for Medical Therapy". This meeting would discuss nuclear data for calculating dose; medical neutron sources including collimation, filters, and resulting neutron spectra; and other necessary neutron data. Dr. Yankov suggested that the organizing committee of the meeting also discuss including data for positron-tomographic use. Dr. Schmidt indicated that radioisotope production would not be included in this meeting and the Subcommittee concurred.

The "IAEA Nuclear Activation Data Handbook", discussed in the next section, will contain charged-particle-induced cross section data and yields for the production of medical radioisotopes.

4. Nuclear Data for Analysis:

The Subcommittee addressed three issues in this area: the new edition of the IAEA "Nuclear Activation Data Handbook", the planned 1983 Consultants Meeting on Nuclear Data for Bore-Hole and Bulk-Media Assay, and uses of nuclear data for analysis in agriculture.

Dr. Schmidt described the new edition of the IAEA Nuclear Activation Data Handbook which is planned for completion in 1984. Authors for many of the sections have been identified and the remaining authors are currently being selected. The contents will include standard reference data, monitor reactions, source standards, activation data (including thermal data, resonance integrals, and excitation functions), and charged-particle activation cross sections and thick target yields for the production of medical radioisotopes by accelerators. In a departure from the previous Handbook, most of the data will be evaluated data and will be based on experiment and/or nuclear model calculation.

The Subcommittee members made several comments on the new Handbook. The question of peer review was brought up. An action was placed on Dr. Schmidt to send the list of authors and contents to the INDC members who then would suggest reviewers for the various sections. This should take place near the end of 1983. The Subcommittee felt that an indication of the reliability of the evaluations be given, for example by uncertainty estimates, shaded areas on figures, and so forth. The production of radioisotopes from conventional targets was suggested for inclusion. The

size of the Handbook may be large in which case two or even three volumes may be necessary. It was emphasized that one large volume is cumbersome and is more likely to fall apart after repeated use. The details of publication will be investigated by the NDS and reported to the INDC for discussion at the next meeting.

The Consultants' meeting on Bore-hole and Bulk-Media Assay planned for November 1983 in Krakow, Poland, was discussed. The planning is nearly complete and much interest has been shown in the meeting. Dr. Cross noted that this speciality as practiced has a significant empirical orientation. Consequently that aspect should be addressed and workers in the field should participate actively in the meeting.

The use of nuclear data for agricultural analysis was brought up by Dr. Csikai. Although this area could perhaps have been included in the above Consultants' meeting, the program for that meeting is essentially complete already. An action was placed on Dr. Csikai to assemble the nuclear data needs for agricultural analysis by contacting experts in the field. (e.g. Dr. A. Nagy).

5. NUCLEAR DATA FOR SAFEGUARDS

The NDS proposes to prepare an "IAEA Handbook of Nuclear Data for Safeguards". The Subcommittee noted that in the handbook for inspectors (MLM-3009) many of the nuclear data were out of date and some quantities were obviously incorrect. A revision of the nuclear data used by the Safeguards Development Division of the IAEA and national safeguards development programs was therefore strongly recommended.

The proposed Handbook, together with the computerized data base, would not supplant MLM-3009 but rather be a reference source for safeguards applications. The Subcommittee endorsed the proposal to prepare this Handbook.

The proposed 1984 Consultants Meeting on nuclear data for safeguards was discussed. Inasmuch as its function would be to review the contents of the Handbook, it was decided not to hold this meeting and to proceed with the review through another channel, i.e. by mail.

It was recommended that Dr. Schmidt contact the Safeguards Development Division to suggest that a session devoted to the Nuclear Data needs in the development of safeguards techniques be incorporated in the next appropriate meeting on safeguards technology.

An Action was placed on Dr. Schmidt to arrange for a speaker from the Safeguards Development Division of IAEA to review at the next INDC meeting the nuclear data used and/or needed for safeguards.

6. NUCLEAR DATA FOR FUSION

The development of fusion energy requires accurate nuclear data for both magnetic and inertial confinement schemes. Although the principal challenges today are in plasma confinement, the ultimate engineering goals will require a continuing commitment on the part of the nuclear data community to providing data on neutron transport, neutron heating, radioactive decay, and so forth.

The Subcommittee reviewed the proposed nuclear data file now called INDL/F-83, for the INTOR project. Dr. Patrick noted that several INTOR materials were not included, namely ^1H , ^2H , Si, and Zr. He also asked if a processed library could be generated. An action was placed on him to

find out what group structure, format, etc. are required if this library is to be processed into group-averaged cross sections. Another action was placed on Dr. Schmidt to report at the next INDC meeting on the INTOR-NDS interactions. It was noted that the present INDL/F-83 file is new, needs testing, and will most probably require improvements. Dr. Haight said that this proliferation of data files puts additional demands on data testing and consistency checks.

The rescheduling to 1986 of the Advisory Group Meeting on Nuclear Data for Fusion was approved.

Specific data were considered: the ${}^7\text{Li}$ (n,n't) cross section discrepancy has largely gone away and has been removed from the discrepancy list by the Discrepancy Committee (see report of that Subcommittee). The desired accuracy has not been obtained for all fusion applications, however. Integral experiments ("pulsed-sphere" experiments) are planned on multiplying materials at Dresden and Livermore. Neutron-emission measurements on lithium are underway at Geel for incident neutrons between 2 and 15 MeV.

Nuclear data needs for inertial confinement fusion were summarized by Drs. Haight and Motz in working paper INDC/P (83)-45 (UCRL-89160).

7. NUCLEAR DATA FOR APPLICATIONS

Under this title are diverse topics, some of which have a broad range of application.

The proposed 1986 Advisory Group Meeting on the Properties of Neutron Sources (Leningrad) requires further discussion in the host country. Because of the Advisory Group Meeting on Nuclear Data for Radiotherapy recommended for 1985 which will include biomedical neutron sources, the

Subcommittee recommended that the biomedical applications be omitted from the Leningrad meeting.

The proposed co-ordinated research program on the "Measurement and Analysis of (p,n) and (α ,n) Reaction Cross Sections" was reviewed. The Subcommittee recommended adding the words "and Emission Spectra" to the title. The proposal (INDC/P (83)-41) was found to lack a good focus although there were many aspects worth pursuing. An action was placed on Dr. Schmidt to define in a better, more clearcut way, the scientific basis and scope of the proposal, and to submit it to INDC members before autumn, 1983. An action was then placed on the members to approve, disapprove, or comment on this proposal in writing to Dr. Schmidt and Dr. Seeliger by the end of 1983. If there is not clear-cut approval, the matter is deferred. In any case an action is placed on Dr. Seeliger to schedule a discussion on this CRP at the next INDC meeting.

The Subcommittee also discussed the proposed 1983 Consultant's Meeting on Methods for Calculating Fast Neutron Nuclear Data for Structural Materials. Several suggestions were made to take advantage of the current state-of-the-art. The 1977 and 1979 meetings in Geel on nuclear data for structural materials were suggested as extensive references. The inclusion of experts such as Drs. Derrien, Froehner, and Seeliger was also recommended. At the conclusion of this Consultants' Meeting, the scope of a proposed CRP on the same subject should be better understood. Actions were placed first on Dr. Schmidt to circulate the scope of the CRP at that time to INDC members and then on INDC members to respond by approving, disapproving, or commenting on the proposal by the end of 1983.

The proposed REAL-84 exercise was briefly treated. Dr. Seeliger suggested that a fusion-reactor spectrum be included in this exercise and the Subcommittee endorsed this suggestion.

The International Nuclear Data File for Radiation Damage Estimation, recently considered by the NDS, would provide data for radiation damage assessments for fission and fusion reactors. This topic is scheduled for a Consultants' Meeting in 1984, preceding the next INDC meeting. An action was placed on Dr. Schmidt to distribute the results of the Consultants' Meeting before the next INDC Meeting so that this topic can be discussed further by the INDC.

A recommendation to nuclear data centers to compile proton resonance data was made at the recent advisory group meeting on Basic and Applied Problems of Nuclear Level Densities. The Subcommittee concurred in this recommendation but realized that such data are not of highest priority. The Subcommittee recommends that this topic be discussed at the next NRDC meeting.

INDC STANDARDS SUBCOMMITTEE

Report to the 13th INDC Meeting, May 16-20, 1983

1 Subcommittee Membership

H Condé (chairman)
W Cross
H Derrien
A Deruytter
S Kapoor
H Motz
B Patrick
J Schmidt
B D Kuzminov

2 Publication of the 1982 Version of the INDC/NEANDC Standards File

The Subcommittee was informed that the publication of the INDC/NEANDC Standards File as an IAEA Technical Report was foreseen within 2-3 months time.

It was believed essential to use all means ensuring a wide spread and use of the handbook. The Subcommittee proposed that an announcement will be sent out by NDS with a "U-distribution" and with the NDS Newsletter. INDC members should also be urged to advertise the publication.

3 Coordination with NEANDC

The Subcommittee was informed about the endorsement by NEANDC to publish the current version of the NEANDC/INDC Standards Data File. It was also informed about the agreement by the NEANDC Standards Subcommittee to undertake the next publication of the Standards Data File within about four years time.

The review mechanism of the INDC Standard Subcommittee was discussed in view of the updating responsibility of NEANDC. It was decided to keep the review mechanism to ensure a technical input, in particular from the reviewers not participating in the corresponding activity within NEANDC. The time and the emphasis of the reviews will be decided when the NEANDC Standard Subcommittee has made up the time schedule for the updating procedure.

4 Review Responsibilities

The review responsibilities, which have been effective during the preparation of the 1982 Standards File, were screened. A new item was introduced, namely the low energy neutron cross sections for the main fissile isotopes. These cross sections have a mayor impact on the evaluation of the thermal parameters.

Following appointments were made. Changes are underlined:

<u>H(n,n)H</u>	USA	(appointment to be made by H Motz)
${}^6\text{Li}(n,t){}^4\text{He}$	USA	A Smith/G Hale
${}^{10}\text{B}(n,\alpha){}^7\text{Li}$	BCMNI	E Wattecamps
$\text{C}(n,n)\text{C}$	USA	A Smith
${}^{197}\text{Au}(n,\gamma){}^{198}\text{Au}$	BCMNI	F Corvi
<u>${}^{235}\text{U}(n,f)$</u>	USSR	V Konchin
${}^{235}\text{U}$ fiss fragm anisotropy	INDIA	S Kapoor
${}^{238}\text{U}(n,f)$	USA	A Smith
${}^{27}\text{Al}(n,\alpha)$	AUSTRIA	H Vonach
Neutron Energy Standards	UK	G D James
Actinide Half- lives	IAEA/BCMNI	A Lorenz/R Vaninbroukx
Thermal Parameters	IAEA/USA	H Lemmel/N Holden
<u>Low Energy Cross Section Dependence</u>	BCMNI	(Appointment to be made by A Deruytter)
<u>${}^{252}\text{Cf}$ Fission Spectrum</u>	IAEA/USSR	H Lemmel/M Blinov
<u>${}^{252}\text{Cf}$ Nu-bar</u>	AUSTRALIA	J W Boldeman (to be confirmed by H Motz)
Neutron Flux Comparison	FRANCE	A Michaudon/G Grenier
Gamma-ray Standards	FRANCE/IAEA	J Legrand/A Lorenz

5 **Coordination with the CSEWG Standard Subcommittees Work on
ENDF/B-VI**

Through actions taken by the US delegation of NEANDC the Subcommittee Chairman, who also at present chairs the NEANDC Standard Subcommittee, was invited to participate in the CSEWG Standard Subcommittee meeting at BNL on May 10-11, 1983.

The outcome of this meeting as reported by the Chairman in INDC/P(83)-54 was discussed.

It was concluded that timing of the ENDF/B-VI activity by CSEWG, the IAEA AGM Standard Meeting and the second edition of the Standards Handbook by INDC/NEANDC was of main importance. If these three activities follow in the above order they could to a large extent benefit of each other.

The Chairman reported about a possible delay in the release of ENDF/B-VI Standards from Spring 84 to Autumn 84. The changed time-schedule for ENDF/B-VI should be communicated to the Organizing Committee Chairman of the AGM on Standards Data as soon as it has been confirmed, so that the time can be fixed for this meeting.

Certain specific requests put forward at the CSEWG Meeting and related to deficiencies in the experimental data base for ENDF/B-VI Standard evaluations were discussed by the Subcommittee.

It was agreed that the Subcommittee Chairman should request experimental error information from a number of named experimentalists outside the US and forward the information to NNDC.

Furthermore, Deruytter accepted an action to contact G Hale about re-measuring the $^{10}\text{B}(n, \alpha_0)$ cross section in the energy region 100 keV-1 MeV. Earlier measurements are discrepant.

To improve exchange of information the NNDC offered a revision of the distribution list of their documents on standards. The Subcommittee recommends that an action is placed on all members to communicate to NDS any changes they like to see in the list (P(83)-63). Subsequently NDS is asked to forward the information to NNDC.

6 Results of March 83 Consultants' Meeting

6.1 ^{235}U fast fission cross section

The Subcommittee supports the recommendations from the meeting. It is noted that the meeting also suggested there is a need for compilations and evaluations of fission fragment ranges. Significant differences were reported of the adopted ranges by different groups in making calculations of corrections. Consistent values should be used.

The Subcommittee also supports the continuation of the fission foil comparison between USA and USSR.

6.2 ^{252}Cf fission neutron spectrum

The subcommittee support the recommendation of a new evaluation of the Cf fission neutron spectrum. The intention by W Mannhart, PTB, Braunschweig to undertake this evaluation should be strongly encouraged by the NDS.

The Subcommittee also support the interim adoption of a Maxwellian distribution with $T=1.42$ MeV.

An extension of an earlier measurement of the ^{252}Cf fission neutron spectrum to lower energies between 0.2 and 2.0 MeV was presented by Boldeman for the Subcommittee (P(83)-59). The measurement had been made using ^6Li glass scintillators and the result was consistent with a Maxwellian dependence above 300 keV. At lower energies further correction of the data had to be applied before release.

7 The Advisory Group Meeting on Standard Reference Data, Geel, Late Autumn 84

The Subcommittee propose that this meeting should be held at a time following the release of the ENDV/B-VI Standards File. Furthermore, the meeting should be sponsored by both IAEA and OECD/NEA.

Proposals were made for membership of the Advisory Committee and for the programme.

Proposed membership of Advisory Committee:

A Deruytter	(Chairman)
A Carlsson	(CSEWG/USA)
A B Smith	(USA)
M Blinov	(USSR)
M Sowerby	(UK)
A Michaudon	(FRANCE)
S Igarasi	(JAPAN)
H Condé	(SWEDEN)
H Lemmel	(IAEA)
D Seeliger	(GDR)

Proposed Programme Outline:

- 1 State of evaluated data
 - 2 Requirements of standard data
 - 3 Progress in measurements, instrumentations, techniques and calculations
 - 4 Workshops to recommend further activities
-
- 8 **Review of Standards**

Because of limitation in time the Subcommittee was not able to review new measurements and evaluations of standard data.

However, a document was presented for the Subcommittee about two recent evaluations of the thermal constants (P(83)-37 and addendum) made at BNL and BCMN. While the evaluation made at BNL includes both thermal and Maxwellian average data, the BCMN evaluation uses a full covariance matrix to the input data, Maxwellian data are not included. The results are for this reason different but not discrepant. An extension of the BCMN evaluation to include Maxwellian average data would be valuable.

Deruytter reported about the on going program on low energy cross section measurements at BCMN.

At low moderator temperatures there is a difference in the temperature coefficient of thermal reactors as calculated from microscopic data on one hand and as obtained from integral experiments on the other. Since a long time this difference was attributed to the shapes of the low energy cross section of ^{235}U and ^{238}U .

To solve this discrepancy BCMN plans a measurement of the shapes of the capture cross section of ^{238}U , the fission cross section of ^{235}U and possibly η of ^{235}U , in the neutron energy range from 2 meV to 1 eV. Accuracy requirements are 4 % for η of ^{235}U , 10 % for σ_c of ^{238}U and 1 % for σ_f ^{235}U . This better accuracy is also requested in view of the evaluation of thermal constants.

Report of the Discrepancy Subcommittee

J. Boldeman, H. Derrien, K. Harada
B. Kuzminov, B. Patrick, H. Motz

The subcommittee discussed the recent summaries forwarded by the NEANDC. Brief descriptions of most of these items included in this report. The NEANDC Report will be published in 1983.

Late information on the 60 Ni resonance parameters, 93Nb, the 241 Am fission resonance integral and the nuclear structure of 236 Np, related to the 237 Np(n,2n) cross section, are included in this report.

Two previous discrepancies, ^7Li (n,n' α) T and the 2 KeV Sc minimum cross section are recommended for removal.

Three new discrepancies are recommended to be added: $^{91,96}\text{Zr}$ resonance parameters, ^{236}U fast capture, and ^{243}Am resonance integral.

INDC DISCREPANCY LIST
MAY 16, 1983

CONTINUING

Cr, Fe, Ni capture
95, Ni total and inelastic
95Nb (n,n')
103Rh (n,n')
235U and 239Pu resonance parameters
237Np (n,2n)
237Np $\overline{\nu}$
238U capture
238U (n,n')
241Am fission
Pu decay power

INDC (NEANDC)
ASSIGNMENT

Germany (CEC).
U.S.
NDS
NDS
France
France
U.S.S.R.
U.S.
U.S.
Germany (U.K.)
U.S.

REMOVED

^7Li (n,n' α) T

Sc minimum-2 KeV

NEW

$^{91,96}\text{Zr}$ resonance parameters
 ^{236}U fast capture
 ^{243}Am fission resonance integral

Italy
U.S.S.R.
Sweden

Fe, Ni, Cr capture

For Ni isotopes the situation has greatly improved. Neutron widths and capture widths have been obtained for 30 s-wave resonances and 227 p- or d-wave resonances for ^{60}Ni in the energy range up to 450 keV from the analysis of ORNL transmission and capture data. Similar analysis is underway for ^{58}Ni and should be published in 1983. Experimental capture data are also foreseen for $^{61,62,64}\text{Ni}$ at ORNL and at BCMN. The capture widths of s-wave broad resonance have also been obtained at Karlsruhe, in excellent agreement with these ORNL results. As a consequence, the high values of the s-wave radiation widths reported in the past for ^{58}Ni and ^{60}Ni should be replaced, whereas the capture results characterized by low Γ have gained in respectability.

Concerning the Fe isotopes, the situation is also improving. Accuracy of 7% has been achieved at Karlsruhe for the radiation width of the 27.7 keV s-wave resonance. High resolution measurement of $^{54,56,57}\text{Fe}$ have been performed at Geel and the results have been published at the Antwerp conference. Work is also underway for ^{50}Fe at ORNL. It is expected that the task force set up by NEANDC should resolve the discrepancy for ^{50}Fe - 1.15 KeV s-wave resonance.

Experimental work has been performed at ORNL and at BCMN on Cr isotopes and resonance parameters will be obtained from scattering, capture and transmission data.

Cr and Ni Total/Inelastic

Results for total, elastic and inelastic cross sections for natural chromium have been published by the ANL Group: Guenther, Smith and Whalen, Nuclear Science and Engrg. 82, 408-415, 1982. Experimental and calculational results are presented for average inelastic excitation energies for which several isotopic assignments are made. An inelastic group at 1433 KeV is assigned to 52-Cr and a combination of calculated and observed values indicates that the cross sections given in ENDF/B-V are significantly low from threshold to about 2.3 MeV. Similar results are obtained for groups at higher excitation.

Work on 58-Ni has also been published by the ANL Group: Budtz-Jorgensen, et al., Zts.f. Physik 306, 265-272, 1982. A combination of calculated and observed cross sections indicate differences of up to 30% from the prominent inelastic group from the 1458 KeV level from those given in ENDF/B-V. The measurements for higher levels show reasonable agreement with ENDF/B-V.

^{93}Nb (n,n')

A status summary has been provided by Vonack (INDC/P(83)-5). Differences persist between (n,n') observations, non-elastic cross-sections, and calculations. Measurement in the 1-6 MeV range are recommended.

Work at the Birmingham Dynamitron is underway at 3 to 6 MeV and might be extended to below 1 MeV. Integral activation measurements in the ZEBRA reactor at Winfrith have been made and show good agreement with the higher evaluation of Strohmaier rather than that of Hegedus (Ref: INDC/P(83)-55).

$^{103}\text{Rh}(n,n')^{103m}\text{Rh}$

NDS has provided a new status review of this cross section (Piksaikin, INDC/P(83)-34). This report confirms the earlier version by Kocherov (INDC/P(80)-15) and no new data are available. The nature of the discrepancy is apparently that the evaluation of B. Strohmaier (Physics Data 13, 2, 1980) has renormalized the experimental data of Butler and Santry between 6 and 12 MeV by a factor of 0.75 in order to allow better agreement with calculations.

The discrepancy is, therefore, limited to a 25% difference of experimental data with a calculation and the resulting evaluation. Since the Subcommittee knows of no reason to question the Butler and Santry data, it is not felt that this should be retained as a discrepancy. In order to verify this understanding, an action is requested of NDS to enquire of Vonach, whose group performed the evaluation, why the item should be retained as a discrepancy.

Note: 96% of the fission neutron induced reactions occur between threshold and 5.5 MeV and are thus not effected greatly by data above 6 MeV.

^{235}U and ^{239}Pu Resonance Parameters ^{235}U

Recent data presented by Adamchuk at the Antwerp Conference give alpha values 20% below those of Gwin (ORNL) in the 2-32 eV range. In the energy range 6-140 eV Corvi gives alpha values 10% lower than those of Gwin.

The ENDF/B-V evaluation still contains the Smith-Young parameter set (1971) and uses the single level formalism associated with a fluctuating background. A similar, modified analysis is used in JENDL-2 SOKRATOR incorporates more recent spin assignments, but not all resonances are included. Cullen has made a numerical comparison of evaluations: large differences, e.g. 1-2 15 eV, of 25% for fission are seen. Experimental data are, on the average, far better than this, being within about 5% since 1972. Thus available evaluated files do not allow the calculation of fission cross sections to approach the accuracy of the experiments. A new, multilevel evaluation for ENDF/B-VI will attempt to attain a fully coherent set of widths.

^{239}Pu

A few experiments have been reported since the 1973 Saclay work. ENDF/B-V will be up dated by a more complete evaluation for ENDF/B-VI. JENDL-2 is based on Ribon et al. (1971) and SOKPRATOR is similar to this French evaluation. Multilevel analysis is not used for any of these evaluations.

Cullen has made comparisons of these evaluated files, including KEDAR. Capture calculations vary from 10-50%, fission varies about 7% on the average. Experimental consistency is better. Cadarache plans to do a new evaluation.

²³⁸U Resonance Parameters and Capture Cross-Sections

A task force was setup by the NEANDC to undertake a coordinated programme of work and analysis aimed at solving the discrepancies; 1) in the neutron widths of the resolved resonances above 1.5 keV; 2) in the capture cross-sections in the 4 to 100 keV energy range. The work of the task force, has begun at the end of 1982. New measurements, reanalysis of existing data and careful study of codes suitable for resonance analysis have been proposed. It is likely that the new analysis which could be undertaken by several members of the task force on existing transmission data, should resolve the discrepancies in the neutron widths; the systematic deviations which are as large as 40% at 4 keV should fall to less than 10% only by considering background errors and asymmetric shape of the resolution function.

Am-241 Fission Resonance Integral

A measurement of the Am-241 fission cross-section at ORELA, extending from 0.02 eV to 20 MeV, has recently been published by Dabbs et al. (Nucl. Sci. Eng. 83 (1983)22). The fission resonance integral derived from this measurement is 14.1 ± 0.9 barns for a cut-off energy of 0.5 eV. This value is significantly lower than results obtained from measurements in reactor (typically $\int \sigma_f \sim 22 \pm$ barns) but still higher than values estimated from resonance parameter data (typically 8 - 10 barns). It appears therefore that there is still a discrepancy. It would be useful if Dabbs et al. could analyze their measurement to produce fission widths for a few resonances above 0.5 eV (assuming $g\sigma_n$ values obtained from published transmission measurements) so that they can be compared with existing values of $\int \sigma_f$.

²³⁷Np

Although the NEANDC has not retained this discrepancy, it appears that there remains an important difference between the measurements made in France and in the U.S.S.R.. A paper from the 5th Research Co-ordination Meeting on the Intercomparison of Evaluations of Actinide Neutron Nuclear Data by Frehaut was made available; this paper discusses a number of details of the three available measurements: BRC, Los Alamos and Obninsk. A response concerning aspects of the Obninsk work which were addressed in this paper by Frehaut have been made in a paper by V. V. Nalinovsky, et al, who made the measurements at Obninsk. Since it is appropriate that these experimentors communicate directly on these matters, Michaudon was asked to transmit the Nalinovsky paper to Frehaut.

$^{237}\text{Np} (n,2n)$

The data for formation of ^{236}Pu are sparse-one value at 9.6 MeV and some at 14 MeV, but there is insufficient information to perform a reliable evaluation. Present evaluations differ by a factor of two and more data are needed.

COMMENTS CONCERNING THE NEANDC/INDC DISCREPANCY FOR THE PRODUCTION OF ^{236}Pu FROM THE $^{237}\text{Np}(n,2n)$ REACTION.

E. Fort states in his summary of November, 1982, page 4:

To solve the discrepancies it is suggested:

"A confirmation of the spin assignment of ^{236}Np two first levels given by Schmorack (NDS 1977). Since the calculated values for $(n,2n)$ cross section just above the threshold are sensitive to an exact description of low lying levels of the residual nucleus, extension of level spectroscopy to higher excited states would be highly desirable."

Although better detail of excited states might assist in $(n,2n)$ calculations, properties of the first two states are well known and have recently been confirmed.

The attached summary quotes references which indicate that the spin of the short-lived (22-hour) ^{236}Np is well known and consistent with the assigned spin of 6- for the long lived (10^{+5} year) state of ^{236}Np . These spins cannot be altered without dire consequences.

However, it is not known for certain which of these states lies above or below the other since no experimental information seems to be accurate enough to place them with respect to one another. The placement of the short-lived state above (or below) the 10^{+5} year long state would not seem to be of great consequence to the discrepancy since the neutron binding energy, or $n,2n$ threshold, is not known that accurately anyway and is not of first-order importance in calculating the fission activation cross-section at this time. The persistent problem involved in the evaluation is how well one can calculate the near-threshold $n,2n$ cross section to the 1- short lived state.

^{236}Np DECAY AND NUCLEAR PROPERTIES

^{236}Np is known to exist in two unstable states:

Long (L): $1.55 \times 10^{+5}$ years

Short(S): 22.5 hours

The L-state decays by both EC to ^{236}U and beta decay to ^{236}Pu .
The S-state decays by both EC to ^{236}Pu and beta decay to ^{236}Pu .

In considering the production of ^{236}Pu in fuel elements, it is only necessary to know in detail the branching ratio of the S-state. The L-state properties are now fairly well known and help to verify the properties of the S-state.

The following are the references to the latest available information:

	SPIN	EC Branch	BETA Branch	REFERENCE
L-state	6-	87%	13%	Phys. Rev. 27C,2239, May 1983
S-state	1-	52%	48%	Nuclear Data Sheets 36, 367, 1982

It is not known for certain which of these two states is lower in energy, but they are believed to be within 50 keV of each other. (This would appear to be of negligible consequence as compared to the 6.8 MeV n,2n threshold).

The detailed decay schemes quoted in the above references leave very little doubt that the spin assignments quoted correspond to the half-lives as listed. Any change in these spin assignments would require very drastic reinterpretations of the ^{236}U and ^{236}Pu level schemes and have serious consequences to a very large area of data.

The Gallagher-Moskowsky rules indicate that the L-state is "ground" and the S-state is an isomer of about 50 keV. Lacking any better information concerning this, it would appear to be the best assumption.

REMOVED DISCREPANCIES

${}^7\text{Li} (n, n'\alpha)T$

Recently completed measurements at ANL and at Geel-Julich are in agreement, but about 15% above the values of Swinhoe. Qaim has summarized this situation, and believes that the cross section is known to about 6 to 7%. This is probably sufficiently accurate for most fusion blanket and breeding calculations, but some improvement is required for some special blanket models.

${}^{45}\text{Sc}$ Minimum Cross Section

The low absorption of scandium at 2 KeV allows its use as a transmission filter to produce a clean, reasonably monochromatic neutron beam. Measurements of the minimum in the USSR and Japan, using USSR material, indicate a minimum of about 250 mb, whereas U.S. samples have indicated minima of 360-710 mb. It is believed that Ta and possibly H and O cause this difference. Although this difference could be important to efficient design criteria, it is not felt to be sufficiently important to be retained as a discrepancy.

NEW DISCREPANCIES

${}^{243}\text{Am}$ Capture Resonance Integral

Measured integrals have consistently yielded values of about 2300 barns for six experiments over a period of 20 years. Evaluations, on the other hand, are in agreement but give a value of 1820-1850 barns. It is not obvious that whether a new measurement or a new evaluation will help this long-standing difference, unless some decay modes are missed or misunderstood. A new, improved measurement of resonance parameters was suggested, since this might be the common source of the calculations. Conde has provided a summary of the data and evaluations, and was asked to inquire about the possibility that all evaluations are based on a single measurement of resonance parameters.

${}^{91}\text{Zr}$ Resonances

Work has been done by Bologna/Geel which yields different spin assignments and much higher $2g/n$ values than the previous analysis of the ORELA/Australian experiments by Musgrove for the dominant 182 and 292 eV resonances. A possible solution to this discrepancy seems to be in the original analysis of the ORELA data performed by Musgrove, which has been studied in some detail at Bologna. It is recommended that Musgrove be asked to review his analysis of the ORELA data, especially taking into account more detailed information on the resolution function. This could be extended to the analysis of the total cross section of ${}^{90,92,94}\text{Zr}$ performed with the same method if a problem were detected.

${}^{236}\text{U}$ Fast capture

Recent (n, γ) measurements for ${}^{236}\text{U}$ (Davletshin et al. - INDC/P(83)-49) give a value which is about 40% lower than the value from Stupigia et al. (Jour. Nucl. Energ. 1961, A/B 15, 200) and Barry et al. (Proc. Phys. soc. 1961, 78 N503, 801). The theoretical calculations, caused on a realistic value of parameter $D=15$ eV, are in accordance with the experimental results of Davletshin. A recommendation should be made for careful analysis of the older Stupigia's and Barry data.

REPORT OF THE SUBCOMMITTEE ON MEETINGS

Chairman : A. MICHAUDON

The Subcommittee did not pay any attention to past meetings but rather considered future meetings up to about 1986.

In order to facilitate the discussion, these meetings were grouped into the following categories :

- A - Major Regional Nuclear Data Conferences ;
- B - Symposia ;
- C - INDC Meetings ;
- D - Consultants Meetings ;
- E - Advisory Group Meetings ;
- F - Training Courses ;
- G - CRP Meetings.

In what follows, each category is discussed separately. A few general remarks are made in (H) after this presentation and lastly a chart summarizing the meeting situation according to type and date is given in the appendix at the end of this report.

A - Major Regional Nuclear Data Conferences :

- Kiev (USSR) (October 10-14, 1983). The organization is now finalized and invitations have been sent out to laboratories concerned.

- Santa-Fe (USA) (May 13-17, 1985) - This conference was initially planned for 1984 but seems now firmly decided by the USA authorities for 1985 at the given date.

The 3-year cycle of these major conferences, started several years ago, is now difficult to maintain because these meetings would be too frequent compared to the evolution of the work in this field. Rather, 2-year intervals between subsequent meetings are now recommended, as discussed informally at Antwerp (1982) between representatives of several countries.

A rigid planning of these meetings is delicate to monitor because of constraints at national levels. In particular, more information concerning plans of the USSR and USA on this matter would be necessary. In any case, unnecessary overlap, such as having two major conferences the same year should be avoided. In this respect, it would be highly desirable to hold the next (after 1983) Soviet Union Conference in 1986 rather than in 1985.

This would bring a conference in Europe - Japan area around 1988, i.e. 6 years after the Antwerp Conference.

B - Symposia.

1 - Fission :

Many members expressed strong concern that the IAEA no longer supports Meetings on the "Physics and Chemistry of Fission". These Meetings were of a high level and very useful not only from a fundamental point of view (for which they were held) but also for their indirect applications to nuclear data. It is recalled that the Fission Meetings are organized by the Physics Section of the IAEA, not by NDS. Consequently, the NDS and the INDC as such have little power to ask the IAEA to reconsider its position regarding such Meetings. If the

Committee is really interested in having another Meeting on Fission, the most appropriate way would probably be through direct contact between the INDC members and their national representatives at the "Scientific Advisory Council" (SAC).

2 - "Significance and Impact of Nuclear Research in Developing Countries" :

This Symposium was originally scheduled for 1984 but is now postponed and may be eventually cancelled. The subject itself is important, especially for NDS and INDC in view of the growing role of the Inter-regional Project (I.P.). But it was also felt that the help to developing countries in the field of nuclear data, would probably be assessed more efficiently and on a more scientific basis through the I.P. itself. Therefore, the Subcommittee does not recommend any action about this Symposium.

C - INDC Meetings :

The 18-month intervals between subsequent INDC Meetings, in alternance with those of NEANDC, are now well established. This cycle works satisfactorily and it is therefore recommended to maintain it. This results in the following dates for the next INDC Meetings :

Autumn 1984 (Vienna)

Spring 1986 (Vienna)

Autumn 1987 (outside Vienna). This last location will be discussed in due time.

D - Consultants Meetings

- Nuclear Reaction Data Centre (NRDC) Meetings.

The sequence of such meetings is also well established and should be maintained.

The next NRDC Meeting will take place in Moscow (3-7 Oct. 1983). It would be quite appropriate on this occasion to examine the question of a common format for the exchange of evaluated nuclear data, as close as possible to that of ENDF/BV, as discussed in the plenary session. It is therefore requested that this item be put on the agenda of this Meeting with the objective of making recommendations as to the usefulness and scope of a possible specialists Meeting on this subject in 1984. The decision to hold this last Meeting would be taken shortly after the NRDC Meeting, subject to the approval of INDC.

- "Real-84" - Paper P(83)-16 - (Vienna, June 1983).

Approved by the Subcommittee. This Meeting is cost free to NDS.

- "Bore-Hole and Bulk-Media Assay" - Paper P(83)-1 - (Krakow, Poland, November 1983).

Approved by the Subcommittee. The proposal to add an item on Nuclear Data for Agriculture was not retained as being too remote from the scope of the Meeting.

- "Structural Materials" - Paper P(83)-24 - (Vienna, November 1983).

This Meeting replaces the one on "Radiation Damage in Structural Materials" approved at the 1981 INDC Meeting but now delayed until 1984.

One of the tasks of the Meeting is to make technical proposals for the scope of the CRP on Structural Materials (CRP-4) discussed in G.

- "Safeguards" :

This Meeting was already considered at the 1981 INDC Meeting. In view of the greater importance of other subjects, the Subcommittee felt

that the objectives of the Meeting could be accomplished by other means (See report of Subcommittee B). For example the "Handbook on Nuclear Activation Data" could be reviewed by competent referees without a Meeting. Also the subject of Nuclear Data for Safeguards could be presented as a Review Talk at the next INDC Meeting. Consequently, the Meeting on Safeguards is not recommended for the near future by the Subcommittee.

- "Radiation Damage on Structural Materials" - Paper P(83)-31.

Already approved by INDC in 1981, this Meeting is just postponed by one year.

- "Format for the Exchange of Evaluated Data" (1984).

Holding this Meeting is subject to recommendations of the next NRDC Meeting and subsequent approval by INDC.

- "Nuclear Structure and Decay Data" (1984).

Already approved at the last INDC Meeting. No further comments.

- "Nuclear Reaction Data Centers" (1985).

Approved by the Subcommittee.

- "Safety" (1985).

Tentatively scheduled for 1985. The approval of this Meeting is subject to more precise proposals from INDC members and NDS and to further examination by INDC at its next Meeting.

E - Advisory Group Meetings (AGM) :

- "Actinide Data" - Paper P(83)-25 - (Uppsala, May 21-25, 1984).

Approved by the Subcommittee. This meeting was already considered at the 1981 INDC Meeting as a follow-up of the 1979 Cadarache Meeting.

- "Nuclear Standard Reference Data" - Paper P(83)-24 - (Geel, late Autumn 1984).

Approved by the Subcommittee. This Meeting was already approved at the 1981 INDC Meeting. Yet, great care should be taken in choosing the date such that the ENDF/B-VI Standard File can be available at least two or three months prior to the Meeting. Deruytter is asked to determine this date after enquiry about the time schedule of the ENDF/B-VI Standards File.

- "Nuclear Data for Medical Therapy" - Papers P(83)-28-42 - (1985)

Approved by the Subcommittee with a reduced scope as reflected in the new title (See report of Subcommittee B).

- "Nuclear Data for Fusion".

Originally envisaged for 1985 at the 1981 INDC Meeting, it is now proposed to wait for the results of the CRP on 14 MeV neutrons (CRP-3) before taking a decision. This case should be examined again at the next INDC Meeting bearing in mind the possibility to hold this Meeting in 1986 as proposed by Subcommittee B.

- "Neutron Sources" - Paper P(82)-9 - (Leningrad, 1986).

In view of the late proposed date, it is suggested to reexamine this case at the next INDC Meeting.

F - Training Courses :

1 - Trieste Winter Courses.

Comments made in the plenary session about the scope and scientific level of these courses should be taken into account for future courses. Two of them are planned for the near future :

i) "Nuclear Model Computer Codes" - Paper P(83)-13-(Jan. 16-Feb. 3, 1984)

This workshop is funded by ICTP and its scope is clearly related to nuclear data activities. Approval from the Subcommittee.

ii) "1986 Winter Course".

The scope is not defined yet but it will be closely connected to nuclear energy applications. Possible topic : Fuel management and its associated data base.

2 - "Interregional Training Courses" (ITC).

- "Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors" - Paper P(83)-12, 47 - (Moscow-Tashkent, USSR, Sept. 4-30, 1983).

No more than five groups of participants will be formed with an expected total of 20 to 25 participants. Concern was expressed that only five applications have been received so far though the deadline for applications is May 31, 1983*.

- "Methodology of Evaluation and Processing of Nuclear Data for Reactors Applications" - Paper P(81)-17 - (Vienna, 1984).

Approved by the Subcommittee. This Course was already considered at the 1981 INDC Meeting.

A10.7

* The situation has changed after the INDC Meeting since 37 applications were received and 21 applicants were selected.

- "Applied Nuclear Physics" - Paper P(83)-46 - (Legnaro, Italy, 1985).

This Course would accept up to 3 groups of at most five participants each. With these conditions and proper guidance, approval from the Subcommittee.

- "Regional Conference" - Paper P(83)-11 (1985 or later).

Such a conference would gather participants mainly from developing countries in a given area. Many advantages are expected as explained in the P(83) paper mentioned above.

If such a conference is too ambitious, a workshop may be sufficient.

The date for holding this conference (or workshop) is difficult to decide now. A convenient time would probably be between two major conferences. Since 1984 is too early, 1987 might be a better choice. This could be also the occasion of a CRP Meeting. This case should be considered at the next INDC Meeting.

G) Meetings of coordinated Research Programmes (CRP).

The following CRPS in the nuclear data field have been identified and discussed :

CRP-1 "Intercomparison of actinide Neutron Nuclear Data Evaluations"

This CRP was terminated in 1982. A short follow-up was approved by Subcommittee A and will take the form of a single CRP Meeting to be held immediately prior the actinide AGM at Uppsala (May 1984).

CRP-2 "Measurements and Evaluation of Transactinium Isotope Nuclear Decay Data".

This CRP is scheduled to be terminated in 1984.

CRP-3 "Measurements and Analysis of 14 MeV neutron cross-sections".

Approved at the 1981 INDC Meeting. A first informal Meeting took place in Antwerp (1982).

CRP-4 "Methods of calculations of fast neutron cross-sections for structural materials".

This CRP was extensively discussed at this INDC Meeting. The final decision should be taken before the end of 1983 after proposals from NDS and approval from INDC.

CRP-5 "Measurements and analysis of (p,n) and (α ,n) reaction cross-sections and emission spectra".

The decision to launch this CRP is subject to a more scientific description of its scope and goals and to subsequent approval from INDC.

The Meetings envisaged for these various CRPS are the following :

CRP-1 Follow-up Meeting in Uppsala in May 1984, just before the Actinide AGM.

CRP-2 Proposals : 1983 (June 21-24, Idaho Falls, USA)
1984 (Autumn, Vienna)

APPENDIX

MEETINGS SPONSORED BY IAEA/NDS
AS OF MAY 1983

Year Categories	1983 (after May)	1984	1985	1986 (and after)
A) Major Regional Nuclear Data Conferences (partly with IAEA/NDS cooperation)	Kiev (Oct. 10-14)		Santa-Fé (May 13-17)	Kiev (?)
B) Symposia				
C) INDC Meetings		14th Meeting (Vienna, Oct.)		15th Meeting (Vienna, Spring)
D) Consultants Meetings	<ul style="list-style-type: none"> . "Real 84" (Vienna, June 13-15) . "Bore-Hole and Bulk-Media Assay" (Krakow, Nov. 14-18) . "Structural Materials" (Vienna, Nov. 2-4) . "NRDC" (Moscow, Oct. 3-7) 	<ul style="list-style-type: none"> . "Radiation Damage in Structural Materials" . "Format for the Exchange of Evaluated Nuclear Data" . "NSDD Network" 	<ul style="list-style-type: none"> . "Nuclear Reaction Data Centre" . "Safety" (?) 	
E) Advisory Group Meetings		<ul style="list-style-type: none"> . "Actinide Data" (Uppsala, May 21-24) . "Standards" (Geel, late Autumn) 	. "Medical Therapy"	"Neutron Sources" (?) (Leningrad) "Fusion" (?)

A10.11

Year Categories	1983 (after May)	1984	1985	1986 (and after)
F) Training Courses	<ul style="list-style-type: none"> ITC "Neutron Physics and Nuclear Data..." (Moscow-Tashkent, Sept. 4-30) 	<ul style="list-style-type: none"> "Nuclear Model Computer Codes" (Trieste, Jan. 16 - Feb. 3) ITC "Methodology of Evaluation and Processing of Nuclear Data" (Vienna) 	<ul style="list-style-type: none"> ITC "Applied Nuclear Physics" (Legnaro, Italy) 	<ul style="list-style-type: none"> ITC "Neutron Generators" (?) Regional Conference (?) (1987)
G) CRP Meetings	<ul style="list-style-type: none"> CRP - 2 (Idaho Falls, June 27-30) CRP - 3 (Gaussig, Nov. 21-25) 	<ul style="list-style-type: none"> Follow-up of CRP - 1 (Uppsala, May) CRP - 2 (Vienna, Autumn) 	<ul style="list-style-type: none"> CRP - 3 	<ul style="list-style-type: none"> CRP - 3 (?)
(A + M) Meetings	<ul style="list-style-type: none"> CRP - Plasmas Diagnostics (Nagoya - Japan, Aug. 30 - Sept. 2) 	<ul style="list-style-type: none"> (A + M) CRP - Plasmas Diagnostics (Vienna) (A + M) Data Centre Network (Austria, June 18-20) IFRC Subcommittee (Austria, June 21-22) 	<ul style="list-style-type: none"> AGM (A + M) Data IFRC Subcommittee (A + M) Data Evaluation (A + M) Data Centre Network 	

REPORT OF THE SUBCOMMITTEE ON
"TRANSFER OF NUCLEAR DATA TECHNOLOGY
TO THE DEVELOPING COUNTRIES"

13th INDC MEETING

Rio de Janeiro, 16 - 20 May 1983

Seeliger (Chairman)

Auler

Boldeman

Csikai

Conde

Cross

Haight

Harada

Kapoor

Menapace

Michaudon

Schmidt

Yankov

1. Interregional Project TC/INT/1/018

The Subcommittee acknowledged the activities by the NDS in connection with the "Interregional Project on training in nuclear data techniques and instrumentation" TC/INT/1/018, as reviewed in the report INDC/P(83)-8. The close cooperation between the Nuclear Data Section and the IAEA Division of Technical Assistance and Co-operation which had been recommended by the 12th INDC meeting, was particularly welcomed as enabling an effective transfer of the technology and know-how required for nuclear data measurements and techniques to the participating laboratories in developing countries.

The present status and future development of the Interregional Project (IP) was considered in detail. The discussion was led by Dr. Schmidt and included contributions from the reports of experts missions submitted by Okamoto (INDC/P(83)-9), Mehta (INDC/P(83)-10), Boldeman (INDC/P(83)-11) as well as a report by Csikai on an ad-hoc meeting of the 14 MeV CRP convened during the Antwerp Conference (INDC/P(83)-2).

The excellent progress of work under the IP in Brasil and several other countries was noted. However, the termination of the so far successfully progressing neutron data project in Chile was regretted and the Subcommittee urged the IAEA to make every effort to ensure continuation of this project (This project could meanwhile be revived during a visit by Dr. Schmidt to Chile subsequent to the INDC meeting).

The conclusions and recommendations from the Subcommittee's discussions can be summarised as follows:

- (1) The Subcommittee supported the intentions of NDS, over the next two years to consolidate the work under the IP and to concentrate the support on the laboratories presently participating in the IP and to strengthen the co-operation and co-ordination of work between these laboratories. At present it seemed to be more important to ensure an effective work of the presently participating laboratories, including a critical review of the results obtained, than to increase further the number of participating laboratories (except for a few in Africa).

- (2) The Subcommittee acknowledged the positive start of the NDS in co-ordination of the activities and assistance provided under the IP with other relevant sections of the IAEA, particularly with the Physics Section, and urged NDS to strengthen this co-operation in the future.
- (3) Radiation safety in the use of equipment supplied under the IP is of paramount importance and it was stressed that measures should be taken to ensure that all participating laboratories were adequately equipped and their personnel trained in this respect.
- (4) The value of regional meetings to allow participants in the IP to discuss problems and present results was strongly emphasized. The issuing of an interlaboratory report was also favoured.
- (5) The contractual arrangements for the supply of equipment under the IP were not clearly stated and the Subcommittee concluded that these arrangements should be clearly established and possibly strengthened.

2. CRP on Measurement and Analysis of 14 MeV Neutron Nuclear Data needed for Fission and Fusion Reactor Technology

The Subcommittee acknowledged the introduction of the CRP by the NDS reviewed in the document INDC/P(83)-15, following the recommendations of the 12th INDC meeting and considered it a major step towards the consolidation and co-ordination of the efforts under the IP.

The scientific scope of this CRP comprises the measurement and analysis of scattering and reaction cross sections and of secondary particle energy and angular distributions for DT-neutrons, based on the IAEA's WRENDA list.

Beyond the nuclear data measurements a second equally important goal of the programme is to transfer expertise and methodology from advanced groups in developed countries to groups in developing countries participating in this programme.

The scientific scope and research work for every laboratory should be carefully discussed at the first CRP meeting in Gaussig, Nov. 83. The Subcommittee recommended also the following steps for the further work:

- (1) To work out a set of guide-lines for standard measurements and to publish them as an INDC report (including activation cross sections, neutron and charged particle spectra);
- (2) To provide experimentalists with the same activated samples at different laboratories for comparison of the methods used;
- (3) To publish the results obtained in the framework of this CRP as INDC reports or in suitable journals;
- (4) To convene CRP meetings every 1 - 1.5 years to ensure close contacts between the participating laboratories. From time to time these CRP meetings should be connected with larger regional conferences or meetings on this subject (so in 1985);
- (5) To maintain close connections between the CRP and the Programmes in the framework of the IP.

3. Interregional Training Courses (ITC)

3.1 ITC on the Utilization of Neutron Generators

(Debrecen, Hungary, 1982)

Csikai summarised the evaluation of the IAEA Technical Co-operation ITC on the Utilization of Neutron Generators held in Debrecen, Hungary, 7 June to 9 July 1982 (see working paper INDC/P(82)-5). This training course provided the 24 participants from 23 developing countries with a wealth of up-to-date information and experience in the utilization of neutron generators, supported by a number of well selected full-scale laboratory experiments.

The Laboratory Manual prepared by the staff of the host institute and distributed to all participants before the course turned out to be a very useful guide for the participants in their laboratory exercises. The Subcommittee recommended that the Agency adopt this practice for other training courses which

involve experimental work. Since the number of neutron generators in developing countries is growing, it is recommended, that the IAEA hold another ITC on the Utilization of Neutron Generators in 1986. The availability of well-working experimental equipment and broad expertise at the Debrecen host institute was a precondition for the success of this course; this consideration should be taken into account in the selection of the host institute for the 1986 ITC to be discussed at the next INDC meeting.

3.1 ITC and Study Tour on Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors
(Moscow-Tashkent, USSR, 1983)

The Subcommittee was informed about the status of preparation for the Study Tour on Neutron Physics and Nuclear Data Measurements with Accelerators and Research Reactors, USSR, Sept. 1983, which had been recommended and approved by the INDC at its 12th meeting. The Training Course and Study Tour envisages a series of lectures, practical work and visits to several laboratories of the USSR. The Subcommittee endorsed this programme.

3.3 ITC on Methodology of Evaluation and Processing of Nuclear Data for Reactor Applications
(Vienna, 1984)

The Subcommittee supported this ITC with the scientific scope as discussed at the 12th INDC meeting. The number of participants should be limited to about 15 - 20.

3.4 ITC on the Utilization of Low Energy Accelerators for Applied Purposes
(Legnaro, Italy 1985)

An ITC in Applied Nuclear Physics is proposed to be held at Legnaro National Laboratory, Padua (Italy) in 1985. This training course is intended for experimental nuclear scientists from developing countries with the aim of improving their

knowledge about problems involved in designing and carrying out experiments in the field of applied nuclear physics. The participants will have the choice between two classes of exercises:

- Neutron data measurements (neutron spectrum measurements with the time-of-flight technique, flux determination by the associated particle technique, total neutron cross section measurement, neutron dosimetry);
- Non-neutronic radiation applications (trace element analysis for biology, medicine, agriculture, by proton induced X-ray fluorescence; Rutherford Backscattering Spectroscopy for thin film and thick target analysis of implanted layers; channeling of positive ions in single crystals; nuclear reaction analysis for isotopic tracing experiments; light isotope profiling and surfaces contamination).

To carry out the experiments a 7 MeV Van de Graaff accelerator is available. Special emphasis will be given to the automatic acquisition of data and their processing by computers widely used in the scientific community. The participants should be subdivided into 2-3 groups each with a maximum of 5 persons and 2-3 teachers. Participants should have post-doctoral or equivalent educational career in nuclear measurements.

The Subcommittee supported this ITC if an intensive tutorship of the participants, including experimental exercises by small groups of participants, can be provided by the host institute.

4. Joint IAEA/NDS - ICTP Trieste Workshop on Nuclear Model Codes
(Trieste, Italy, 1984)

The Subcommittee endorsed the proposal to organize a Workshop on Nuclear Model Computer Codes at ICTP Trieste, from 16 January to 3 February 1984 and approved the programme as described in paper INDC/P(83)-13.

This workshop has to be considered as a complement to earlier Winter Colleges on Advances in Nuclear Theory and Nuclear Data

for Applications held at ICTP in 1978, 1980 and 1982. It is designed to familiarize participants with nuclear data needed for nuclear technology applications.

The workshop is intended for theoretical and experimental nuclear physicists working in applied and basic research and for nuclear data evaluators with a post-doctoral or equivalent educational career in one or several topics of the workshop. In accordance with the mandate of the ICTP, it is mainly oriented towards the needs of nuclear scientists from developing countries.

REPORT OF THE AD-HOC SUBCOMMITTEE ON THE BARN

Participants

W Cross (Chairman)
A Michaudon
B Patrick
G B Yankov

The subcommittee, while believing that the barn is not in immediate danger of being removed from the list of units approved for temporary use with the SI, considers that an attempt should be made to ensure the long-term survival of the barn by having it transferred to the list of non-SI units approved for permanent use with the SI. The subcommittee recommends that the INDC and NEANDC should together present a case for this transfer to the Bureau International Des Poids et Mesures (BIMP), using primarily the arguments developed previously by the INDC and NEANDC. In parallel with this approach, the INDC should informally seek the support of the Comité de Coordination Scientifique et Technique of the EEC, and members of the INDC and NEANDC, with the help of their national nuclear data committees should seek the support of national representatives on the CCU and CIPM.