Panel on Basic Nuclear Data Compilations

✓ ASSESSMENT OF THE CURRENT STATUS OF BASIC
NUCLEAR DATA COMPILATIONS

441 5000

MASTER

INTRODUCTION

The Panel met for the first time in about two years on April 6, 1979, at the National Academy of Sciences in Washington to review the present status of nuclear data compilations. The Panel formerly operated under the Committee on Nuclear Science of NRC. Since the demise of that committee, the Panel was in limbo for about two years. It is now functioning under the NRC Numerical Data Advisory Board chaired by R. F. Taschek.

The Panel membership is given in Appendix I. For a variety of reasons, including the airline strike, only Burman, Gove, and Schiffer were able to attend. All or part of the one-day meeting was also attended by R. F. Taschek (Los Alamos Scientific Laboratory, LASL), G. L. Rogosa and S. Whetstone (Department of Energy, DOE), H. Pugh (National Science Foundation, NSF), L. Gevantman (National Bureau of Standards, NBS), and G. C. Carter (NRC).

The Agenda for the meeting is given in Appendix II. The Panel received comprehensive reports on the present status of the national and international efforts, Nuclear Data Sheets, Recent References, Evaluated Nuclear Structure Data File (ENSDF), Nuclear Structure Reference Files, Handbook of the Nuclides, and Charged Particle Nuclear Data from S. Pearlstein (Brookhaven National Laboratory-National Nuclear Data Center, BNL-NNDC), N. E. Holden (BNL-NNDC), and W. B. Ewbank (Oak Ridge National Laboratory-Nuclear Data Project, (ORNL-NDP)). These are summarized below.

A-Chain Situation

The foreign involvement in A-chain compilations for Nuclear Data Sheets has increased considerably. The situation is summarized in Table 1. Although the USA/Foreign ratio for the number of A-chains for which each is responsible is about 2, the manpower ratio is about equal. This reflects

DISCLAIMER
This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

the fact that much of the foreign involvement is relatively new. The committee was shown two graphs that indicated the projected mass-chain evaluation status (i. e., a plot of the expected number of mass chains to be published each year against the year in which they were expected to be published) as it was at the end of 1978 and as it is expected to be at the end of 1979. The first histogram had a width of about eight years, and the second, six years, so progress is being made, but the goal of four years is still somewhat remote. The Panel is pleased with the increasing foreign involvement but concerned at how slow the progress has been to reach the goal of a four-year cycle. Perhaps as the foreign participants gain more experience the pace will increase. The Panel notes that the ORNL group is responsible for 103 A-chains at present, but only 3.5 full-time employees (FTEs) are involved. Because even skilled people in this field can be expected to produce only four A-chains a year, the manpower situation at ORNL will only, eventually, be able to handle about 60. The situation is not immediately serious because most of their A-chains have been recently compiled. It will be serious in a year or so. Either ORNL must farm out more A-chains, or it must increase the size of its staff. From many points of view, the Panel believes the latter to be preferable, but it may not be realistic.

One potential problem that was mentioned relates to referees for A-chain compilations. At present, the first one or two compilations by a new compiler are refereed by someone in the ORNL group, and that will continue. Those by experienced compilers are sent to external referees - at present, only ones who have volunteered to do so. There are not enough such people, however. The Panel suggests that it is not necessary to use people who have volunteered. The compilations should just be sent to appropriate experimenters who are known to have interests in a particular region of A and assume they will serve as referees.

ENSDF, Nuclear Structure Reference Files and Recent References

The Evaluated Nuclear Structure Data File (ENSDF) as of March 30, 1979, contained 290,000 data sets (a data set is the information obtained from

any one reaction including radioactive decay as a reaction). The files allow the construction of three-dimensional graphical displays [e.g., the ratio of $E(2^+)$ to $E(2^-)$ for even-even nuclei as a function of N and Z]. Such displays can reveal subtle structure that may have important consequences. The availability of such horizontal compilations should not only be more widely known but more widely used by the nuclear science community. Nuclear Data Sheets are produced directly from ENSDF as are other products of use to specific segments of the nuclear community. The Panel was told that data sets are still being inserted into ENSDF from some sources outside refereed journals. This is of some concern since an author is likely to stand behind data he submits to a refereed journal in a way that he may not if it is in the Bulletin of the American Physical Society (APS) or in a progress report. Since Nuclear Data Sheets are refereed, unreferenced data automatically get a refereed status bestowed upon them.

The Nuclear Data Project's Nuclear Structure Reference (NSR) file from which Recent References is compiled continues to grow at the rate of about 5000 indexed new research works each year. The third annual volume of Recent References is now cumulative.

Handbook of the Nuclides

The Handbook of the Nuclides, which will be the successor to the Table of Isotopes, is well along in the planning stages. The last Table of Isotopes has recently been published (Seventh Edition, 1978). The Handbook is being tailored for the applied community and will have an information content somewhere between the Chart of the Nuclides and Nuclear Data Sheets. The first Handbook will be published in about three years and on a four-year cycle time thereafter. It was suggested that the proposed contents be circulated to potential users for feedback. The degree of detail needed may be less than currently proposed.

Charged Particle Nuclear Data

A Bibliography of Integral Charged Particle Data is published once a year. The third edition has recently appeared (T.W. Burrows and J.S.

Burt, BNL-NCS-50640, March 1978). Angle-integrated cross sections for the production of a given residual nucleus (not a specific final state unless an isomer) are at present stored on tapes at BNL-NNDC. Again, this data file is tailored for use in applied areas. Work in the charged-particle cross-section compilation field is also under way at Karlsruhe, Kurchatov, and Japan (angular distributions) as well as at BNL. The Bibliography produced at BNL required the following manpower: 1/4 m.y. (computer), 1/4 m.y. (physicist) and 3/4 m.y. (physicist evaluator).

At present, there is no provision for computer storage of charged-particle angular-distribution data, but that could be arranged. The problem is how to get such data. The best arrangement would be for authors to provide such data to BNL in a format suitable for computer storage at the time they submit the paper containing such information to a journal. Pearlstein has written to the editors of several journals asking them to request authors to do this; so far there has been no response.

Remarks and Recommendations

Before making its recommendation, the Panel wishes to highly commend the work of the National Nuclear Data Center at BNL and the Nuclear Data Project at ORNL during the past two years. The efforts of the heads of these projects, Drs. Sol Pearlstein and Bruce Ewbank, are particularly praiseworthy. The gradually increasing foreign participation in nuclear data compilation efforts is not only welcome but essential. The Panel believes that the reorganization of the U.S. nuclear data compilation effort that occurred in 1976 has now shaken down and is working well.

The Panel makes the following recommendations:

1. The eight-year cycle time of a few years ago for A-chain compilations appears now to be reduced to six. The goal should still be four and should be pursued with vigor.
2. The 3.5 FTEs at NDP-ORNL available for A-chain compilations very soon will be unable to handle the one hundred or so A-chains for which

NDP is currently responsible. Either the manpower will have to be increased at NDP (which the Panel favors but about which it is not sanguine) or NDP will have to farm out about forty additional A-chains. The Panel believes that there is a real danger to the whole nuclear data compilation effort if the NDP-ORNL staff falls below a critical level.

3. NDP-ORNL should send out A-chain compilations for review by competent referees whether the individuals have volunteered to do so or not.
4. The nuclear science community is insufficiently familiar with the horizontal compilation graphs and charts available from ENSDF. The Panel Chairman on behalf of the Panel will recommend to the Nuclear Physics Division that an invited paper on the subject be scheduled for the next Washington meeting of the APS. He was unsuccessful at this for the last such meeting.
5. The fact that some data sets from sources other than refereed journals are still being added to ENSDF continues to concern the Panel. In our last assessment report on nuclear data compilations (May 10, 1977) we recommended against this practice. As stated above, the Panel notes that an author is likely to stand behind data published in a refereed journal in a way he may not if it is in a nonrefereed source. Furthermore since Nuclear Data Sheets is refereed, unrefered data contained therein will automatically achieve a refereed status. The Panel strongly recommends against data from unrefered journals being inserted in ENSDF.
6. The proposed contents and format of the Handbook of the Nuclides should be checked out by potential users to discover if it meets their needs. In particular, they should be asked whether there is material included that is of little or no use to them.

7. Charged-particle differential cross-section data continue to be an unsolved problem. Computer storage could be arranged at NNDC-BNL, but the question of how to get authors to provide them remains. Clearly, cooperation from journal editors is required. The Panel recommends that Pearlstein continue his efforts to obtain such cooperation. The Panel Chairman on behalf of the Panel would be happy to take whatever action Pearlstein feels would be helpful.
8. The Panel notes that there is no involvement in the nuclear data compilation effort by nuclear scientists in Canada, France, or Italy. Efforts should be made to rectify this situation.
9. The Panel would prefer to see any possible manpower increase be at NDP-ORNL in A-chain compilations rather than at NNDC-BNL in the area of Integral Charged Particle Nuclear Data and so recommends to DOE.
10. The funding for nuclear data compilations should be proportional to the funding for basic nuclear science research.
11. The Panel discussed the inclusion of quantities like spectroscopic factors and reduced electromagnetic matrix elements in ENSDF and thus in the Nuclear Data Sheets. It is recommended that Ewbank set up a task force to advise him on this question.
12. Replacements are being sought for three members of the Panel prior to their next meeting.
13. The next meeting will be held in the spring of 1980.

TABLE I
A-CHAIN RESPONSIBILITY

LABORATORY	A-CHAINS ASSIGNED	NO. OF A CHAINS	NO. OF PEOPLE (FTE)
BNL	136-145	10	1.5
Daresbury (Kuwait)	65-80	16	2.0
INEL ¹	153-162	10	1.0
JAERI ²	118-129	12	1.0
KARLSRUHE	81-100	20	3.0
LBL	146-152	39	2.8
	163-194		
KURCHATOV } LENINGRAD }	{ 1-4 130-135 } { 238,240,242,244 }	14	2.0
PENN	5-20	16	1.0
UTRECHT	21-44	24	1.5
ORNL (Lund)	{ 45-64, 101-117 } { 195-237, 239, 241 } { 243, 245-263 }	102	3.5-4.0*
USA		177	9.8-10.3
FOREIGN		86	9.5
TOTAL		263	19.3-19.8
RATIO USA/FOREIGN		~2	~1

* Includes 0.5 FTE at Lund

1 INEL Idaho National Engineering Laboratory

2 JAERI Japan Atomic Energy Research Institute

APPENDIX I

NRC Ad Hoc Panel on Basic Nuclear Data Compilations

Dr. Harry E. Gove, Chairman
Nuclear Structure Research Laboratory
University of Rochester
Rochester, New York 14627
Telephone: 716-275-4943 or 4570

Nuclear Physics

Dr. Monte Blau
VA Medical Center
3495 Bailey Ave.
Buffalo, New York 14215
Telephone: 716-834-9200 x583

Nuclear Medicine

Dr. Robert L. Burman
MP-Division
Los Alamos Scientific Laboratory
Los Alamos, New Mexico 87544
Telephone: 505-667-5574

Medium Energy Physics

Dr. Herman Feshbach
Department of Physics
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
Telephone: 617-253-4801 or 4821

Medium Energy and
Nuclear Physics

Dr. William C. McHarris
Department of Chemistry
Michigan State University
East Lansing, Michigan 48823
Telephone: 517-353-0817 or 5961

Nuclear Chemistry

Dr. J. Rand McNally, Jr.
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830
Telephone: 615-574-1351 or 0988

Astrophysics and CTR

Dr. John P. Schiffer
Physics Division
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Telephone: 312-972-4066 or 4000

Nuclear and Medium
Energy Physics

THE UNIVERSITY OF ROCHESTER
RIVER CAMPUS STATION
ROCHESTER, NEW YORK 14627

DEPARTMENT OF PHYSICS
AND ASTRONOMY

March 5, 1979

Panel on Basic Nuclear Data Compilation
National Academy of Sciences, Washington, D.C.
April 6, 1979

AGENDA

9:00 a.m.	Executive Session	H.E. Gove
10:00 a.m.	Overview of Cooperative Effort	S. Pearlstein
10:15 a.m.	National and International Effort Status	N.E. Holden
11:00 a.m.	Nuclear Data Sheets, Recent References, ENSDF and Nuclear Structure References Files	W.B. Ewbank
11:45 a.m.	Handbook of Nuclides Planning	N.E. Holden
12:30 p.m.	Lunch	
1:30 p.m.	Charged Particle Nuclear Data	S. Pearlstein
2:15 p.m.	Discussion	All
3:00 p.m.	Executive Session	H.E. Gove

The room for the meeting at the National Academy is room 200B
in the Joseph Henry Building.