NNDC Progress Report

(NRDC Meeting, Oct 8-10, 2007)

Pavel Oblozinsky
National Nuclear Data Center
Brookhaven National Laboratory

oblozinsky@bnl.gov

NNDC Staff Changes

- Marco Pigni
  - Joined the NNDC in January 2007 (PhD from TU Vienna)
  - Covariance postdoc
- Manojeet Bhattacharya
  - Joined the NNDC in April 2007 (PhD, came from NASA)
  - Replacement for Dave Winchell
  - NSR compilations + structure evaluations
- Dimitri Rochman
  - Left the NNDC in August 2007 (moved to NRG Petten)
  - EXFOR compilations + ENDF evaluations
  - The position is currently vacant, replacement in ~1/2 year
  - Stanislav Hlavac (Bratislava) is taking care of EXFOR

EXFOR Compilations

New compilations in FY07 (Oct 1, 2006 – Sep 30, 2007)

Neutrons:	36 entries,	174 subentries
Charged particles:	100	392
Gammas:	0	0
Total	**136**	**566**

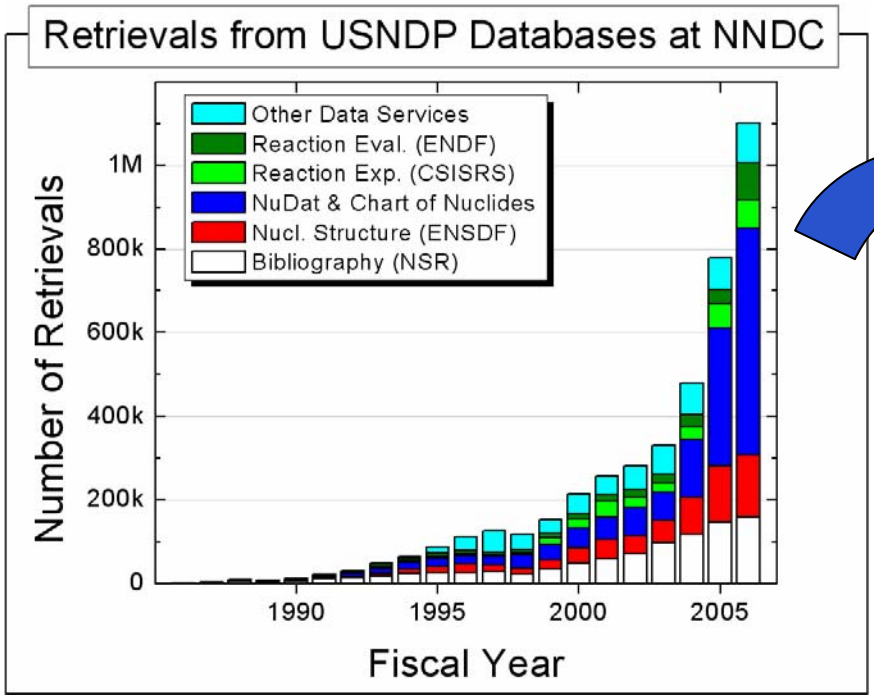
Compilations in FY06

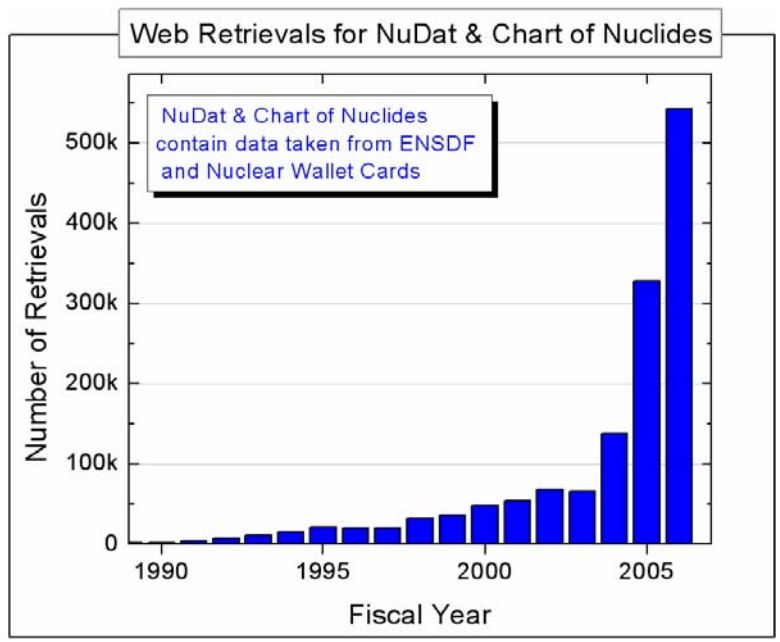
Total 179 entries, 708 subentries

Scope of compilation

- All new papers are compiled regularly
- Old papers as time permits (~150 neutron, ~350 charged particle still un-compiled, remaining part of the collection by V. McLane)

Data Services: 1 Million Retrievals in FY2006





- ~1.1M retrievals, 40% up compared to FY2005
- ~50% from NuDat & Chart of Nuclides

Data Services in FY2007

Data retrievals increased by 26% compared to 2006

Data retrievals in 11months of FY07

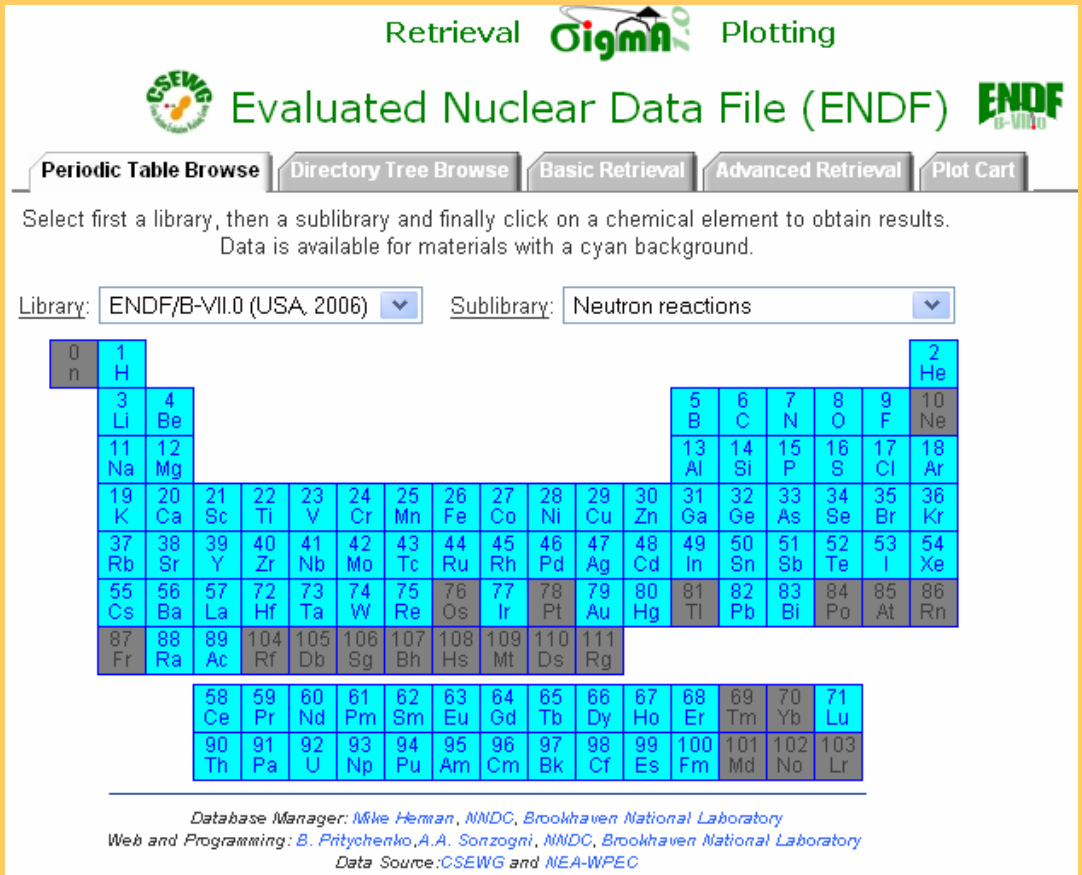
Total 1,256,000 projected increase 26%

Reactions 195,000

- CINDA 6,500
- EXFOR 98,500
- ENDF 90,000

Sigma interface for ENDF

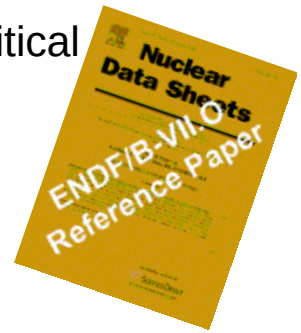
- NuDat-like interface
- Launched in April 2007

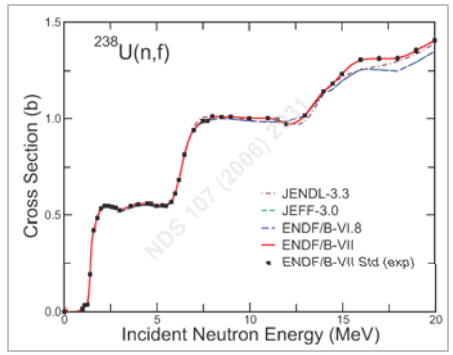


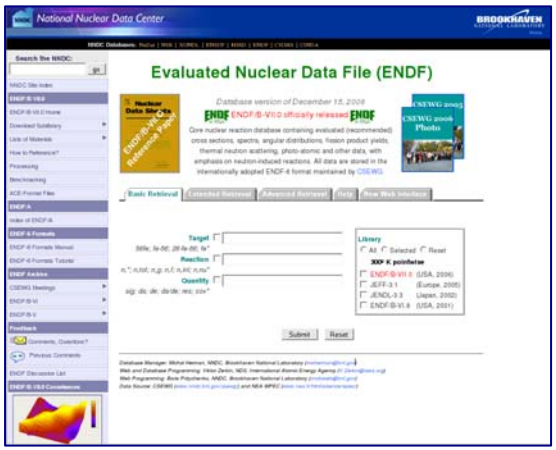
Release of the ENDF/B-VII.0 library

The first major release since 1990

- The ENDF/B-VII.0 has been developed by CSEWG with a significant contribution from several labs (LANL, BNL, NIST, LLNL) – critical support for AFCI, GNEP, Gen-IV!

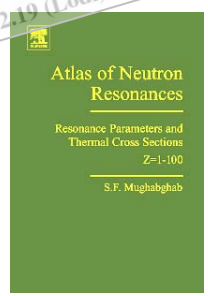




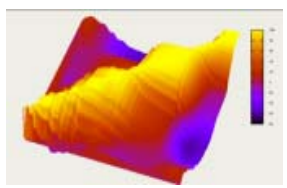


Principal advances over ENDF/B-VI library

- Many new cross sections for major actinides
- New set of fission product evaluations (BNL)
- Improved thermal neutron scattering
- More precise standards
- New radioactive data (BNL)
- Photonuclear reactions
- β-delayed photon decay spectra
- New methods for uncertainties and covariances (BNL,…)



Validation carried out in US and Europe (hundreds of integral experiments) proved absolute superiority of the ENDF/B-VII.0 over precedent libraries



ENDF/B-VII.0 Library Contents

14 sublibraries, many additions and improvements

New sublibraries: Neutron standards cross sections, photonuclear
Large improvements: Neutron reaction sublibrary, charged particles, decay data, thermal neutron scattering sublibrary
No changes: Fission yields, atomic data (taken over from ENDF/B-VI.8)

No.	NSUB	Sublibrary name*	Short name	VII.0	VI.8	
1	0	Photonuclear	g	163	-	LANL, IAEA
2	3	Photo-atomic	photo	100	100	
3	4	Radioactive decay	decay	3838	979	BNL
4	5	Spont. fis. yields	s/fpy	9	9	
5	6	Atomic relaxation	ard	100	100	
6	10	Neutron	n	393	328	LANL, ORNL, BNL
7	11	Neutron fis.yields	n/fpy	31	31	
8	12	Thermal scattering	tsl	20	15	LANL
9	19	Standards	std	8	8	IAEA-NEA-NIST-LANL
10	113	Electro-atomic	e	100	100	
11	10010	Proton	p	48	35	LANL
12	10020	Deuteron	d	5	2	LANL
13	10030	Triton	t	3	1	LANL
14	20030	^{3}He	he3	2	1	LANL

ENDF/B-VII Validation, Case Study:
Lady Godiva - well characterized critical assembly

- Highly enriched **uranium** sphere, first built at Los Alamos in ~1950s
- Bare assembly
- Pure
- Object of beauty!

Lady Godiva rode naked through Coventry, England, in the 11th Century, following a wager with her husband whereby he agreed to reduce taxes on the poor!

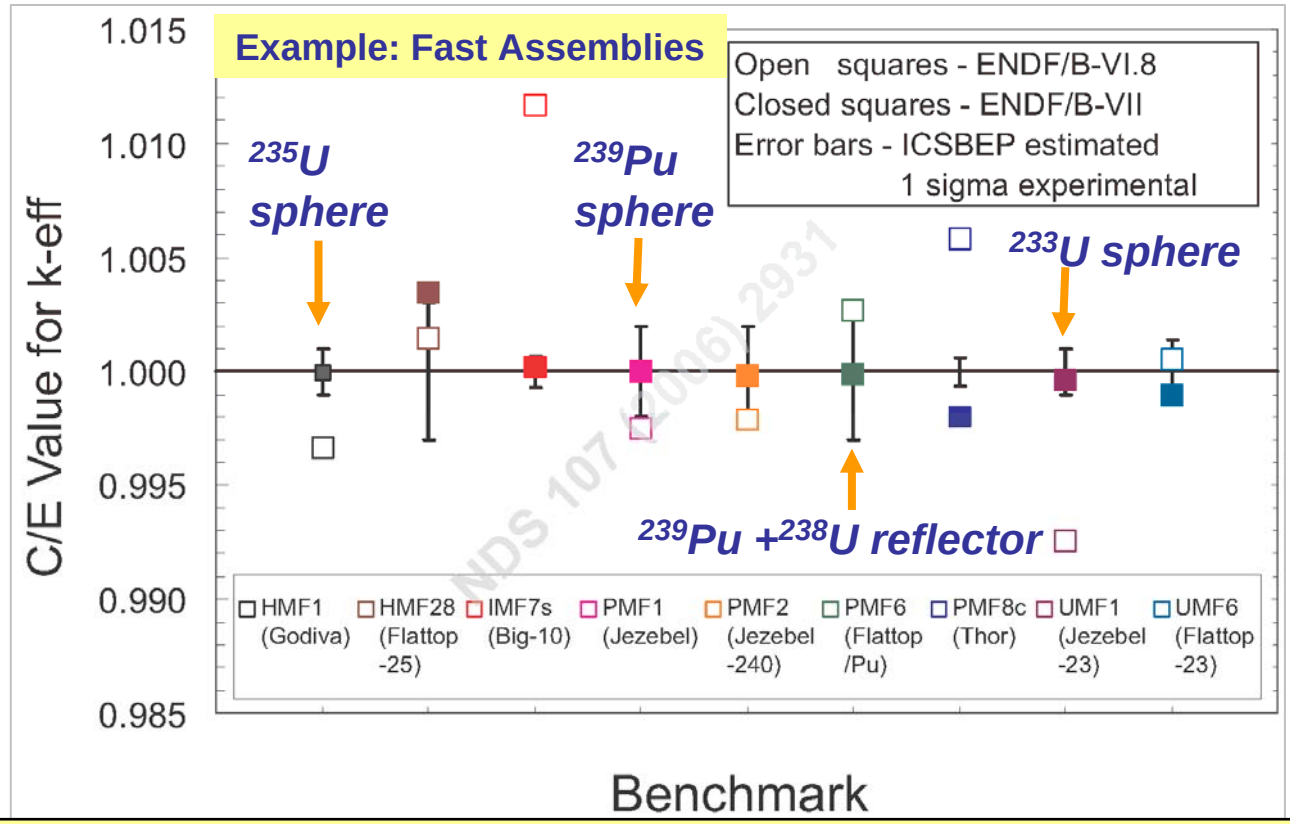
Lady Godiva by John Collier, ca 1897

Integral Critical Assembly Data Validation

Excellent ENDF/B-VII Performance

Critical assemblies:
C/E values of k-eff

Data testing against > 800 assemblies:
-Fast assemblies
(Godiva, Flattop, Big10, Jezebel)
- Reflected assemblies
- HEU
- LEU
- Pu solutions
- Np, ^{233}U,…
etc.



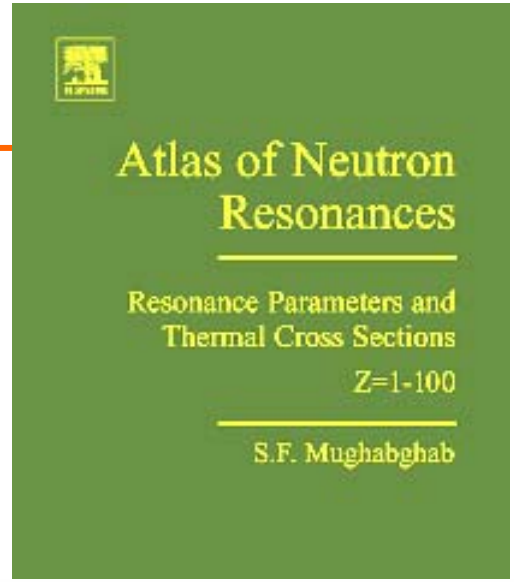
ENDF/B-VII not an "adjusted library". Some evaluation-choices were made to optimize agreement with critical assembly data - but physics motivated & within uncertainties

Major Publications

Atlas of Neutron Resonances

S.F. Mughabghab

Elsevier, April 2006

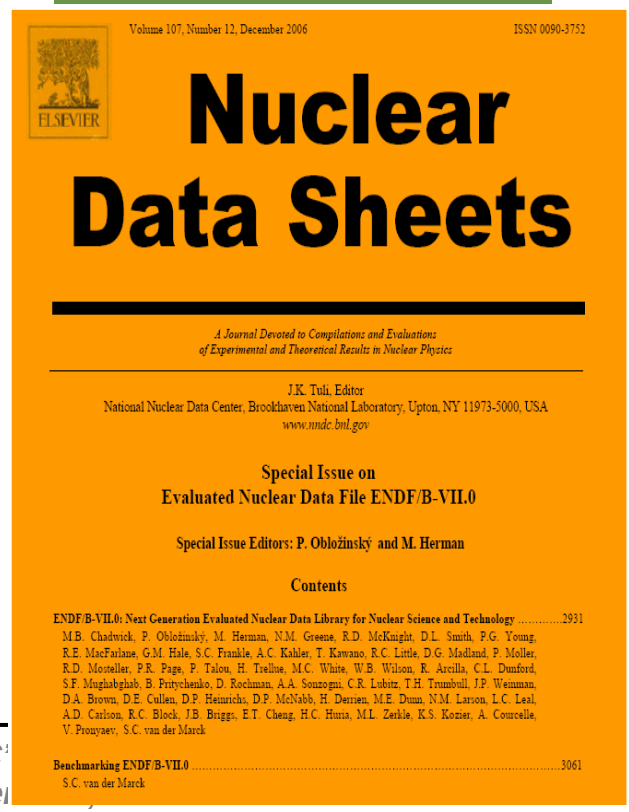


"Big Paper" on ENDF/B-VII.0

M. Chadwick, **P. Oblozinsky, M. Herman** *et al*

Nuclear Data Sheets, Dec 2006

Reference paper



EMPIRE: Nuclear Reaction Model Code System for Data Evaluation

M. Herman, R. Capote, B. Carlson *et al*

Nuclear Data Sheets, Dec 2007