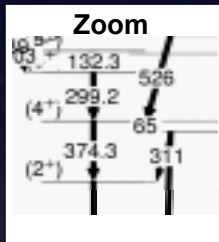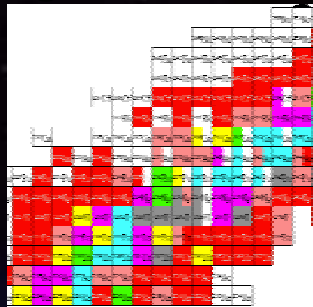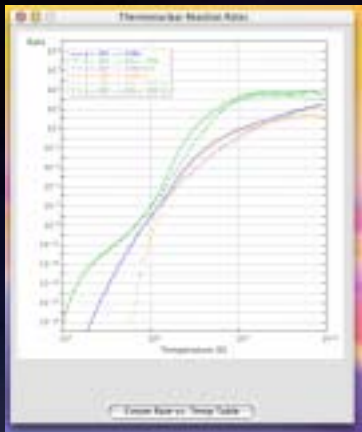# Recent Activities & New Initiatives in the ORNL Nuclear Data Program

Michael Smith
ORNL Physics Division

Activities

Nuclear Astrophysics Data

- Evaluation of Reactions critical for Stellar Explosions

- Development of a Computational Infrastructure for Nuclear Astrophysics Data

Nuclear Structure Data

- Actinide A-chain Evaluations

- Nuclear Structure Database Development - linking Radware and ENSDF

Long-Term Planning

- **Mentoring in Nuclear Information Technology** (MINIT) Initiative

Personnel

Nuclear Astrophysics Data

• Michael Smith	Staff	Evaluations
• Jeff Blackmon	Staff	Evaluations
• Zhanwen Ma	Grad Student	Evaluations
• Nengchuan Shu	Collaborator	Evaluations
• Andy Chae	Grad Student	Programming
• Eric Lingerfelt	Subcontractor	Programming
• Jason Scott	Subcontractor	Programming
• Richard Meyer	Consultant	Program Development

Nuclear Structure Data

• Yurdanur Akovali	Subcontractor	Evaluations
• David Radford	Staff	Databases

Actinide Evaluations

Long History of Excellence in Structure Evaluations

Specialization: Actinide Evaluations A > 213 (46 A-chains)

Personnel: Yurdanur Akovali

Progress 2000 - 2003

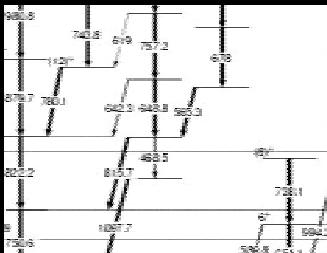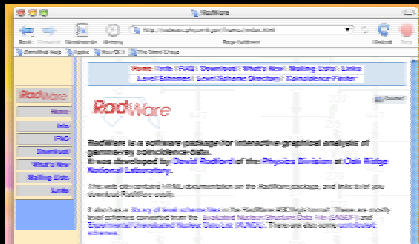|	
Published Evaluations	A = 217, 238, 242, 244, 254, 258, 262, & 266
Submitted Evaluations	A = 247
Evaluations in Progress	A = 243
Reviewed Evaluations	A = 235 & 239
Near Future Plans	A = 241 & 237

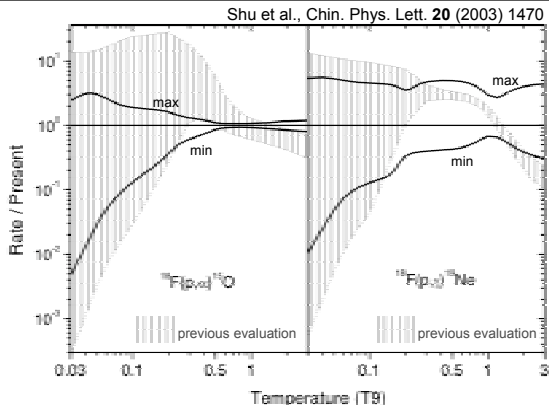# Nuclear Structure Databases: ENSDF and RADWARE

D. Radford

- ENSDF at NNDC: World's Best Nuclear Structure **Data Base**

- RADWARE: World's Best **Data Analysis Tool** in High Spin Nuclear Structure Physics

- **Combine** by converting ENSDF & XUNDL files into RADWARE format

radware.phy.ornl.gov

- Users can **display** & **manipulate datasets**, incorporate ENSDF information into ongoing analyses of experimental data, perform advance searches (coincidence gamma rays), generate high quality output

- Future: improved level diagram generation

Nuclear Astro Data Evaluations at ORNL

• Evaluations of reactions occurring in stellar explosions

• Closely coupled with ORNL radioactive beam measurements

• $^{14}O(\alpha,p)^{17}F$ & $^{17}F(p,\gamma)^{18}Ne$
  - novae & X-ray bursts

Shu et al., Chin. Phys. Lett. **20** (2003) 1470

(Plot: Rate / Present vs Temperature (T9), labeled "$^{17}F(p,\alpha)^{14}O$" and "$^{17}F(p,\gamma)^{18}Ne$", with curves max and min, and "previous evaluation" hatched regions)

• $^{18}F(p,\alpha)^{15}O$ & $^{18}F(p,\gamma)^{19}Ne$
  • novae & X-ray bursts
  • Recent Ph.D. thesis

• Other reactions in progress:
  • $^{30}P + p$
  • $^{33,34}Cl + p$
  • $^{17}O(p,\alpha)^{14}N$ & $^{17}O(p,\gamma)^{18}F$
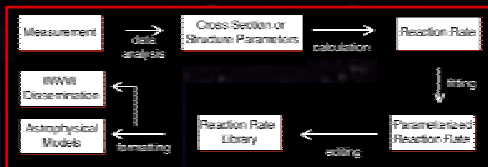 • BNL project on α-induced reactions

New Computational Infrastructure for Nuclear Astrophysics Data

- Problem: **no quick, easy way** to insert latest nuclear physics evaluations into databases used in astro simulations

- Multi-step process, no one existing code can do it all

- Bottlenecks:

  - **No standardization** of the procedure

  - **No user-friendly tool** ensuring quick, reliable results

→ Consequences

  - this vital processing not performed in **timely** manner

  - different researchers obtain **inconsistent** results

  - so difficult to create custom libraries that they are **not shared**

Proposed New Infrastructure

New Infrastructure - Sample Screenshots

E. Lingerfelt et al.

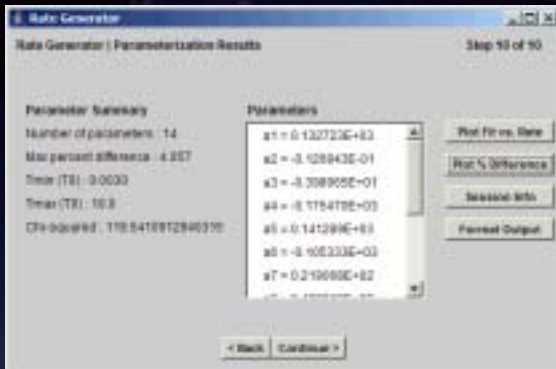# New Infrastructure - Sample Screenshots

New Infrastructure - Sample Screenshots

Status:

Development started August 2003

Release "zeroth-order version" in Early 2004

Accessible through **www.nucastrodata.org**

Mentoring in Nuclear Information Technology (MINIT) Program

M.S. Smith, R.A. Meyer

Issue

- USNDP evaluation manpower crisis
  - dropped 50% in 10 years, and 85 % of evaluators over age 55

MINIT - a proposed new approach

- A mechanism to bring young scientists into the USNDP and retain them

- Features the mentoring of young postdoc appointees - nuclear information technologists - by senior evaluators to transfer knowledge

- Uniform training at NNDC for 1 year, then coupling them to senior mentors at USNDP sites for 2 years of evaluation & research work

- Promotion to Staff for the best appointees after their third year

- NNDC provides oversight of this finite-lifetime program

- HOPE: MINIT initiative will spur community discussions & action to proactively resolve the evaluation manpower crisis

Summary

- Continued progress in Actinide Evaluations - 9 A-chains completed in 3 years- and Structure Database efforts

- Reactions needed to understand stellar explosions (novae & X-ray bursts) are being evaluated

- Exciting Development in Astrophysics Data:
  Constructing a long-needed **infrastructure** to ensure timely incorporation of nuclear data into astro models

- **MINIT Initiative** developed to address manpower crisis