☛ ***Status of ORNL Nuclear Data Project Plan for FY2000***

Work Plan for the Nuclear Data Project for FY2000

I. Nuclear Structure Evaluation

Our program for nuclear structure evaluation meets the present needs and interests of the nuclear research community, as stated in the 1998 Parker Report and rated highest priority:
(b) the properties of exotic nuclei and their production cross sections (especially as related to radioactive beam facilities).

A study on the systematic behavior of nuclear states and other nuclear properties in the heavy-mass region provides needed systematics of evaluated data to use for searches of superheavy elements, a field of high current interest in the community. This survey should serve as the basis for expectations of these properties in this region, and it should help the exploration of new regions. Such studies will also be valuable for contemplated experiments in the development of neutron-rich radioactive beams and in plans to study new nuclei with the use of radioactive beams, as well as stable beams. Most of the structure information in ENSDF for nuclei in the $A \geq 248$ region is not adequate for such a study, because much of the information has not been updated since 1989. During the last two years, the evaluations of the odd-mass nuclei and five of the even-mass nuclei in the $248 \leq A \leq 265$ region have been completed. The remaining nuclear-structure data evaluations (evaluations of nuclei with mass 250, 254, 258, 262 and 266) are expected to be completed in FY2000, bringing the structure information for the heavy elements in the $A \geq 248$ region up-to-date which is one of the high priorities set by USNDP. It is anticipated that completion of the systematics work will extend to FY2001.

☛ ***Evaluations of nuclei with mass numbers A=262 and 266 are completed.***

☛ ***Evaluations of A=258 nuclei are in progress.***

☛ ***The evaluation of $A \geq 267$ nuclei are reviewed.***

II. Nuclear Reaction Evaluations for Astrophysics

Our program for nuclear reaction evaluations for astrophysics also meets the present needs and interests of the research community, as stated in the 1998 Parker Report and rated highest priority *(a): the rates of nuclear astrophysics reactions.*

We plan to continue our evaluating of nuclear reactions of vital importance for studies in nuclear astrophysics. These reactions will help address some of the most fundamental questions in nature: What are the origins of the elements that make up our bodies and our world? How did the solar system, the sun, the stars, and the galaxy form, and how do they evolve? Progress in many such fundamental problems in nuclear astrophysics can be significantly aided by improvements in nuclear data. Our evaluation work in FY2000 will focus on: (1) capture reactions on radioactive isotopes on the proton-rich side of stability such as ^{18}F - reactions that are important for understanding the element synthesis and energy generation in stellar explosions; (2) capture reactions that are important for understanding Red Giant Stars, such as reactions on ^{17}O; and (3) reactions important for understanding the nuclear burning in the interior of our sun. These reactions will be studied over a variety of energy ranges as required for applications in astrophysics. All cross sections that are evaluated will be provided in an ENDF-style format. All reaction rates determined will be disseminated on the WWW. Since many reactions are dominated by resonances, all recommended resonance parameters will be provided in ENSDF-style formats.

- ***Evaluations of the ^{18}F(p,α)^{15}O and ^{18}F(p,γ)^{19}Ne are underway. Resonance parameters in ^{19}Ne have been determined for all the known resonances, but are now being modified to take into account new results from a measurement at ORNL's HRIBF. Cross sections, rates, and rate para eterization will be determined for these reactions in the second half of FY00, as well as contributions from resonances missing in ^{19}Ne but present in the analog nucleus ^{19}F.***

- ***Evaluations of ^{17}O(p,α)^{18}F and ^{17}F(p,α)^{14}N are underway. Analysis of the contributions of the most important states in ^{18}F is completed, and minor contributions from some weaker states are currently being evaluated. Final cross sections, rates, and rate parameterization will be determined for these reactions in the second half of FY00.***

- ***A project examining the nuclear reactions important for understanding the nuclear burning in the interior of our sun was started in March 2000 and will continue through FY01. Relevant literature is currently being collected.***

III. Database and Web Interface Development; Experimental Nuclear Structure Data Compilation (XUNDF)

Our programs for nuclear structure database development and dissemination provide *a modern and efficient user access to the nuclear data*, as recommended by the Parker Report as second priority, and for semi-automatic conversion of journal articles and other data sources into ENSDF-format data sets.

Software for semi-automatic extraction of tabular level-scheme data contained in PDF manuscripts into ENSDF-format data sets has been developed over the past year, and is now in extensive use as a production tool for data to be included in XUNDL, at ORNL and McMaster. Documentation has been written, and is available at http//radware.phy.ornl.gov/t2e.html. Some further development of this tool will be done to extend its applicability, and to make it more robust and easier to use. During the course of this development, ENSDF-format data sets will be created from published papers for testing purposes, and for the XUNDL database. Other types of data that could be automatically or semi-automatically converted to XUNDL datasets will be investigated; these may include user-contributed level schemes in various formats.

The RadWare software package provides an extremely user-friendly graphic interface to the ENSDF files. Methods for incorporating such high-quality graphical output into web interfaces to the ENSDF database will be explored, possibly in collaboration with the groups at LBNL and/or BNL. The development of on-line extraction of ENSDF datasets in RadWare format will also be persued. Both of these efforts could build on a program for off-line conversion that already exists, but requires further development of the automatic graphical-layout routines.

The compilation and electronic dissemination of most recent data on reaction gammas will be done continuously throughout FY2000 as data become available. Upkeep of the RadWare database which is very much in accordance with the Steering Committee's recommendation for addressing the immediate needs of the main stream research community, will be continued. This effort requires only minimal effort, at the level of a few days per year.