

JINALIB: A new resource for nuclear astrophysics computation

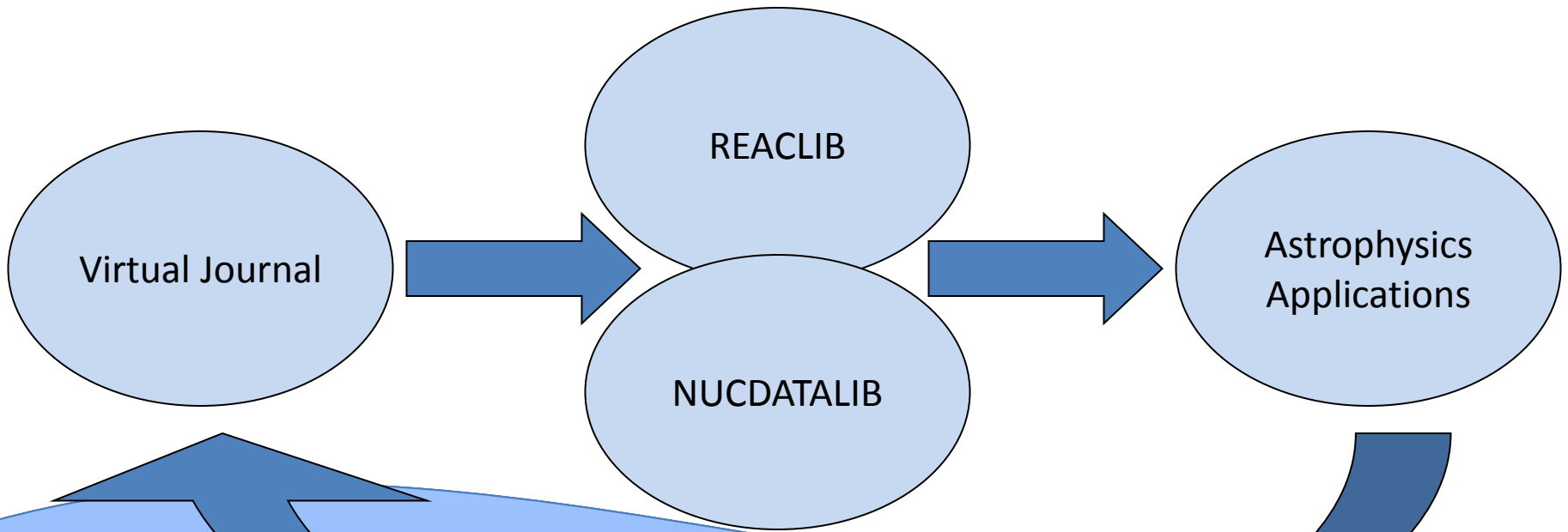
Richard H. Cyburt

David Stygstra

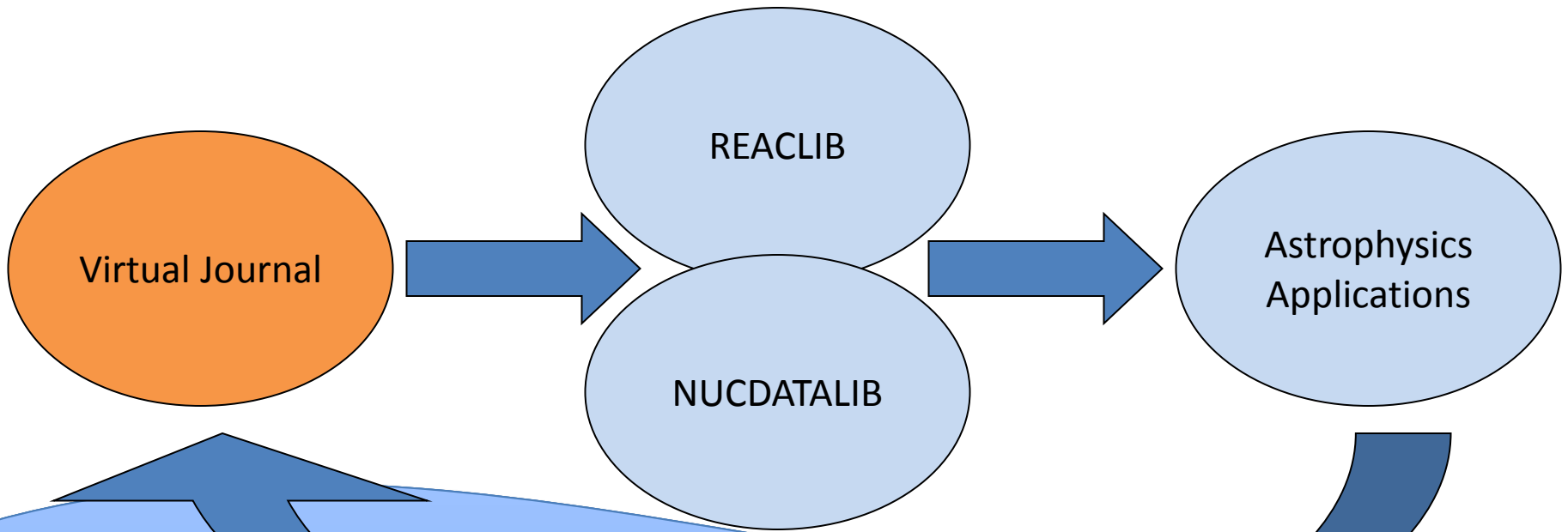
Nuclear Input

- Nuclide Properties
 - nuclear masses
 - ground state spins
 - Nuclear structure
- Reaction Rates
 - Thermonuclear reaction rates
 - Ground state weak decay rates
 - T & ρ dependent weak rates

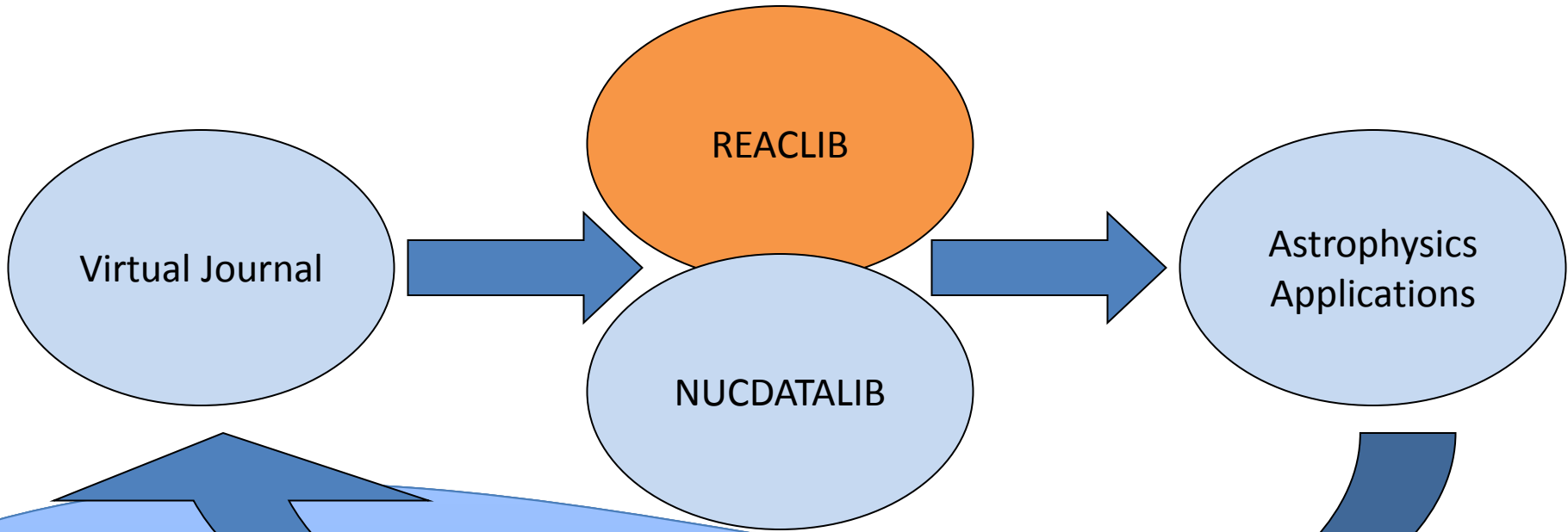
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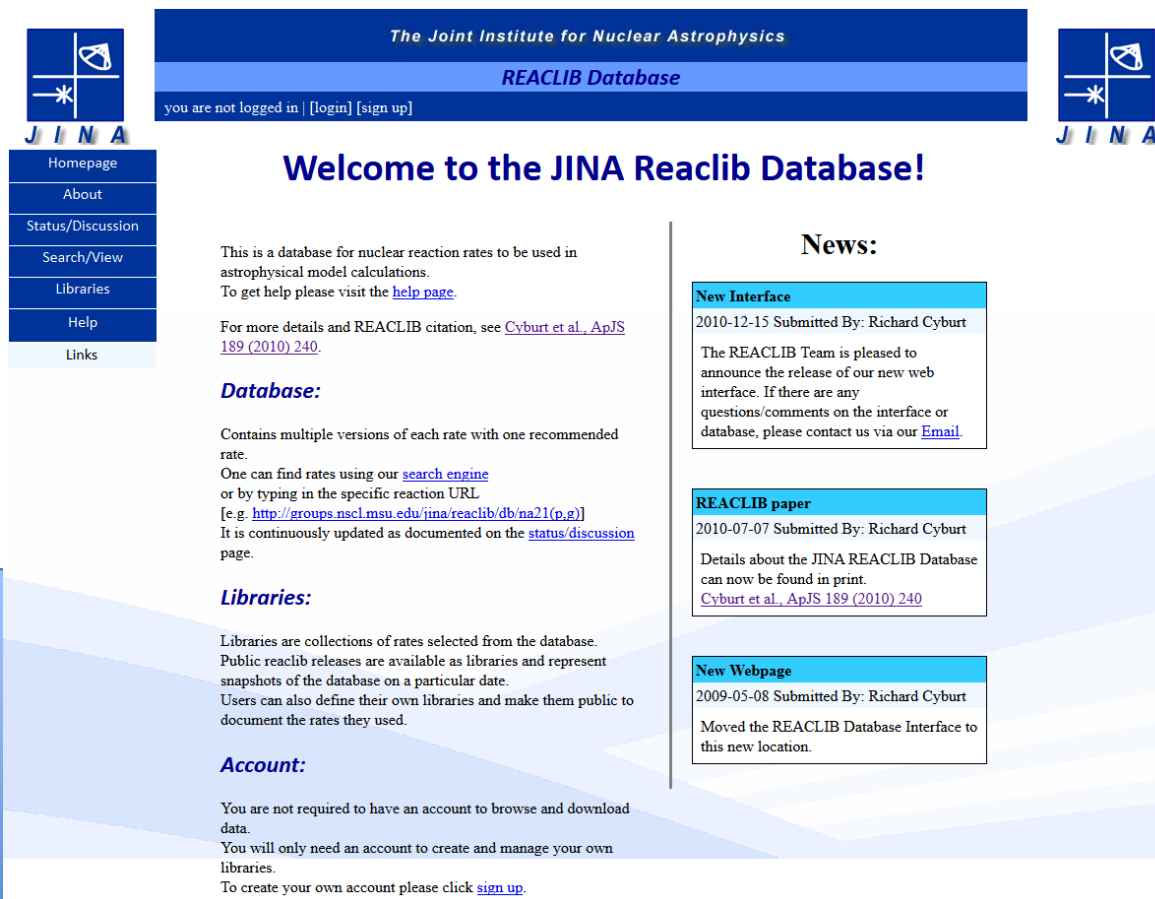
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REACLIB

- Continually updated
 - JINA VJ
 - KADONIS
 - STARLIB
 - Nucastrodata.org
- Rates verified
- Version tracking
- Search capabilities
- User-defined libraries
 - 84 registered users
- Different formats
 - REACLIB
 - KEPLER BDAT
 - Webnucleo.org XML

<http://groups.nsl.msu.edu/jina/reactlib/db/>



The screenshot shows the REACLIB Database website interface. At the top, there is a navigation bar with the JINA logo on the left and the NSF logo on the right. The main header contains the text "The Joint Institute for Nuclear Astrophysics" and "REACLIB Database". Below the header, there is a login status: "you are not logged in | [login] [sign up]". A vertical menu on the left side includes links for "Homepage", "About", "Status/Discussion", "Search/View", "Libraries", "Help", and "Links". The main content area features a large heading "Welcome to the JINA Reaclib Database!". Below this, there are several sections: "Database:" which explains the database's purpose and provides a link to the help page; "Libraries:" which describes how libraries are used and how to create them; "Account:" which explains the account requirements for browsing and downloading data. On the right side, there is a "News:" section with three entries: "New Interface" (2010-12-15), "REACLIB paper" (2010-07-07), and "New Webpage" (2009-05-08).

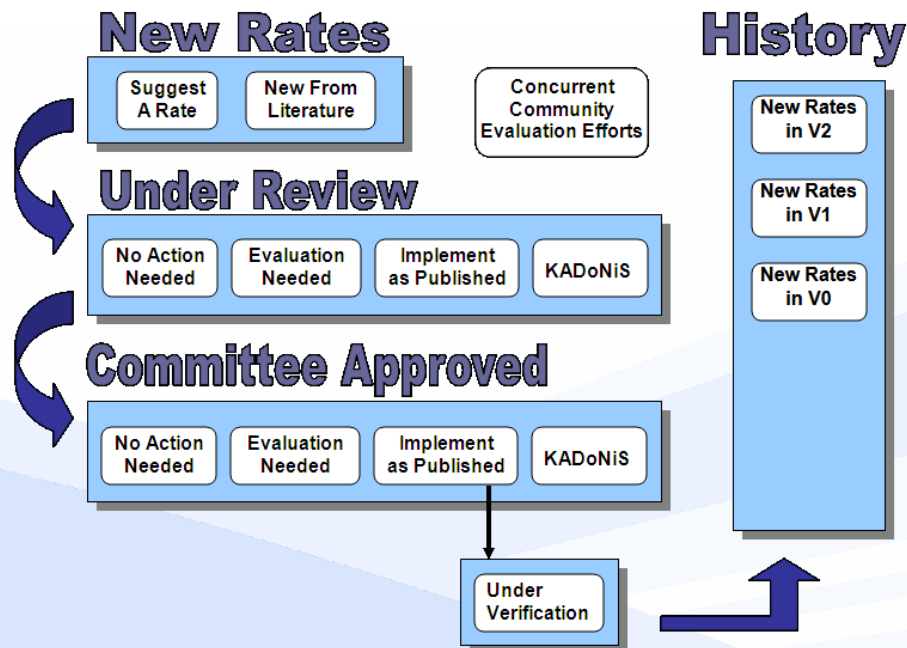
REACLIB Workflow

Intl. Advisory Com.

Update Status & Workflow

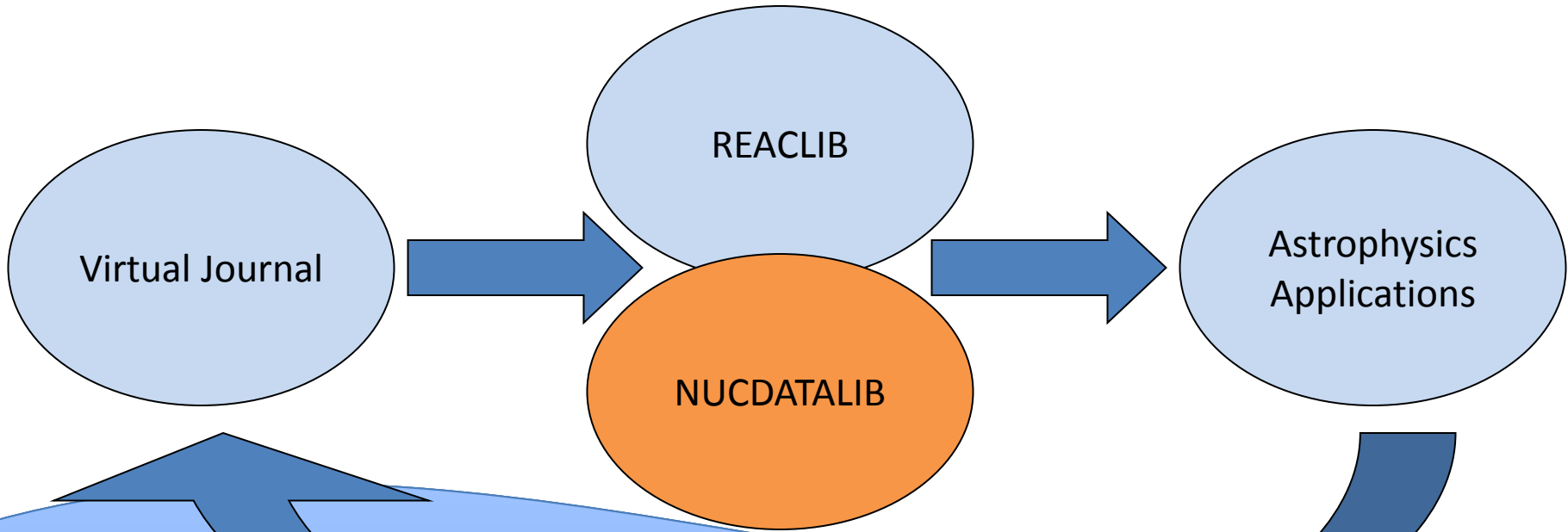
This page shows the workflow of potential reaction rate updates to the database. Click on a section of the diagram to view the rates it contains. [Help](#)

- Homepage
- About
- Status/Discussion
- Update Status
- Recent Discussions
- Known Problems
- Search/View
- Libraries
- Help
- Links



- Heide Costantini (LUNA)
- Barry Davids (TRIUMF)
- Iris Dillmann (Munich - KADoNIS)
- Michael Heil (GSI)
- Falk Herwig (Keele)
- Rob Hoffman (LLNL)
- Christian Iliadis (UNC)
- Franz Kaeppler (Karlsruhe)
- Karlheinz Langanke (GSI)
- Gabriel Martinez Pinedo (GSI)
- Brad Meyer (Clemson)
- Karl-Ludwig Kratz (Mainz)
- Thomas Rauscher (Basel)
- Ernst Rehm (ANL)
- Michael Smith (ORNL)
- Kerstin Sonnabend (Darmstadt)
- Friedel Thielemann (Basel)
- Michael Wiescher (Notre Dame)
- Stan Woosley (UCSC)

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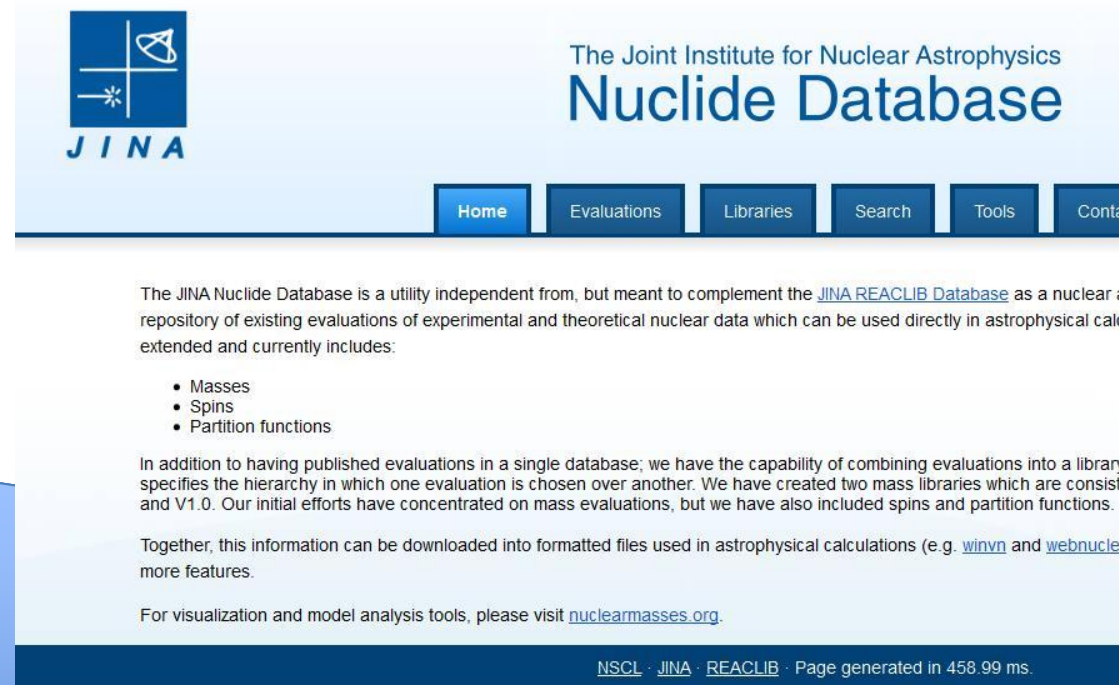


NUCDATALIB

Nuclide Properties DB

<http://groups.nscl.msu.edu/jina/nucdatalib/>

- Accessible online
- Nuclide Properties
 - Masses
 - gs spins
 - Partition functions
- Search capabilities
- User-defined libraries
 - Define hierarchy
- Different formats
 - REACLIB winvn
 - Webnucleo.org XML
- Needs more Data



The screenshot shows the JINA Nuclide Database website. At the top left is the JINA logo. To its right, the text reads "The Joint Institute for Nuclear Astrophysics Nuclide Database". Below this is a navigation menu with buttons for "Home", "Evaluations", "Libraries", "Search", "Tools", and "Cont". The main content area contains the following text:

The JINA Nuclide Database is a utility independent from, but meant to complement the [JINA REACLIB Database](#) as a nuclear repository of existing evaluations of experimental and theoretical nuclear data which can be used directly in astrophysical calculations. It is extended and currently includes:

- Masses
- Spins
- Partition functions

In addition to having published evaluations in a single database; we have the capability of combining evaluations into a library which specifies the hierarchy in which one evaluation is chosen over another. We have created two mass libraries which are consistent with V1.0. Our initial efforts have concentrated on mass evaluations, but we have also included spins and partition functions.

Together, this information can be downloaded into formatted files used in astrophysical calculations (e.g. [winvn](#) and [webnucleo](#)) and more features.

For visualization and model analysis tools, please visit [nuclearmasses.org](#).

At the bottom of the page, a footer reads: "NSCL · JINA · REACLIB · Page generated in 458.99 ms."

NUCDATALIB

Library

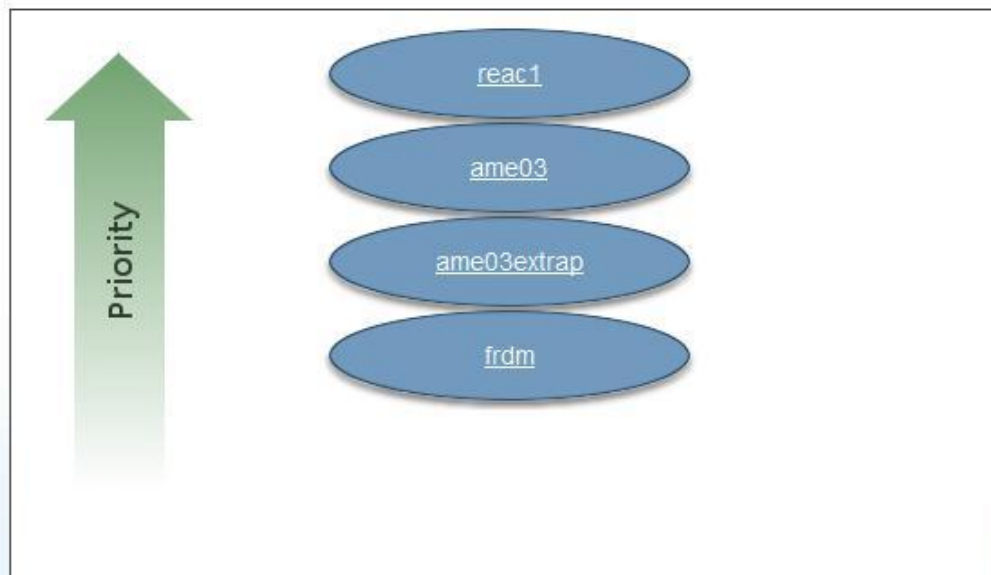
Summary

Library	Reacli V1.0 Masses
Description	Mass data used by Reacli V1.0.
Maintainer	stygstra

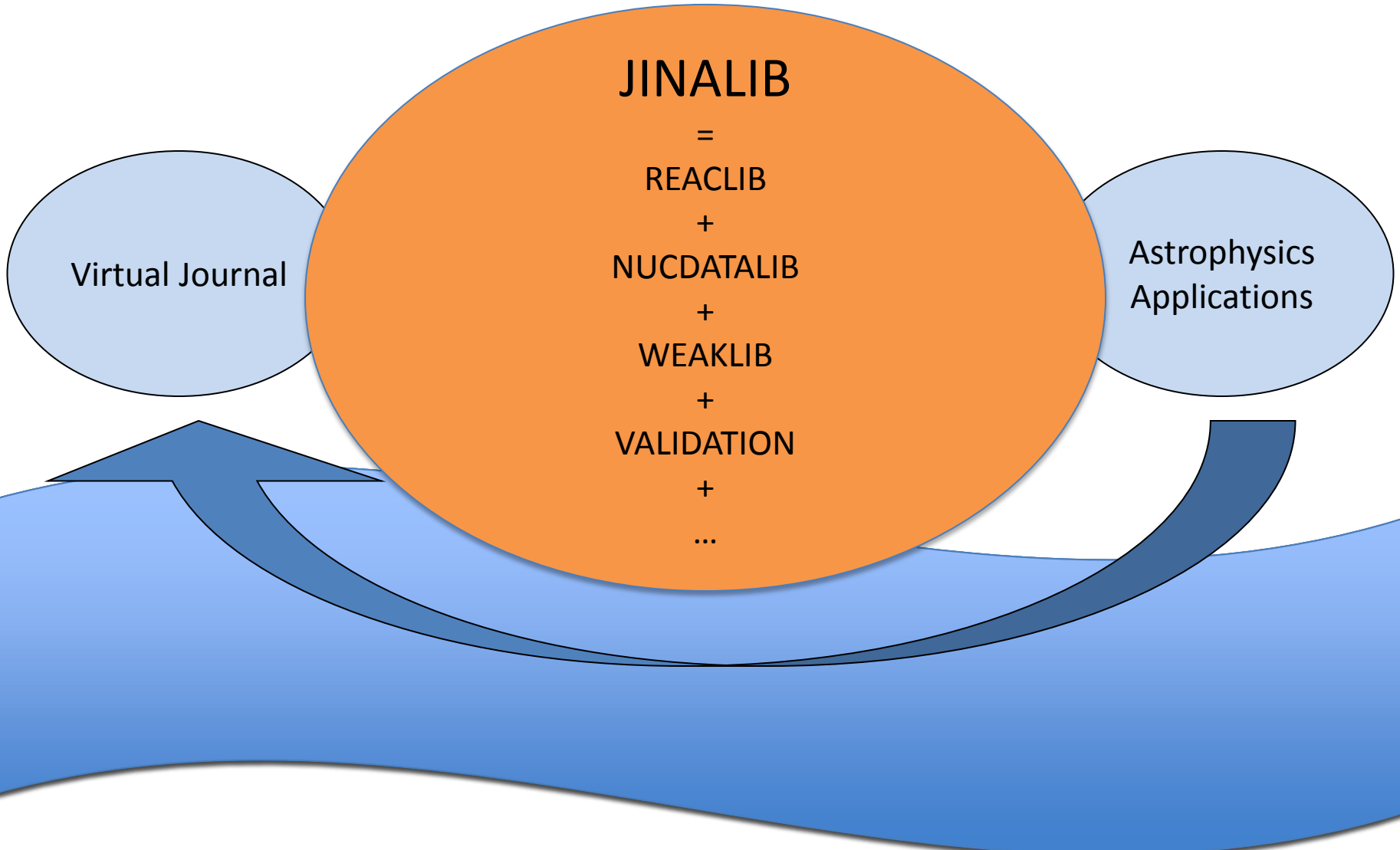
Included Evaluations

These are the mass evaluations present in this library. Evaluations higher in the list take priority over evaluations lower in the list. For example, if the first and second evaluations both have an entry for ^3He , the entry from the first evaluation will be used.

Click on an evaluation to view more information about it.



THE FUTURE



JINALIB

- July 27th
 - JINALIB = REACLIB + NUCDATALIB
 - Db structure in place
 - Rough offline web interface in place
 - MySQL database with python-driven web interface
 - Capabilities on par with current 2 databases

JINALIB

- Now to August 31-September 15
 - Develop new admin/worker interface features
 - Upload tabular rate tables (baseline for all rates)
 - Fit rates to several forms
 - REACLIB: unconstrained
 - REACLIB: constrained with physical low T9 behavior
 - JINALIB: (constrained REACLIB with $T9^{7/3}$ and $T9^3$ terms)
 - Woosley, Fowler, Holmes, Zimmerman (ADNDT 22 (1978) 371)
 - » 4 fit forms with physical low T9 behavior

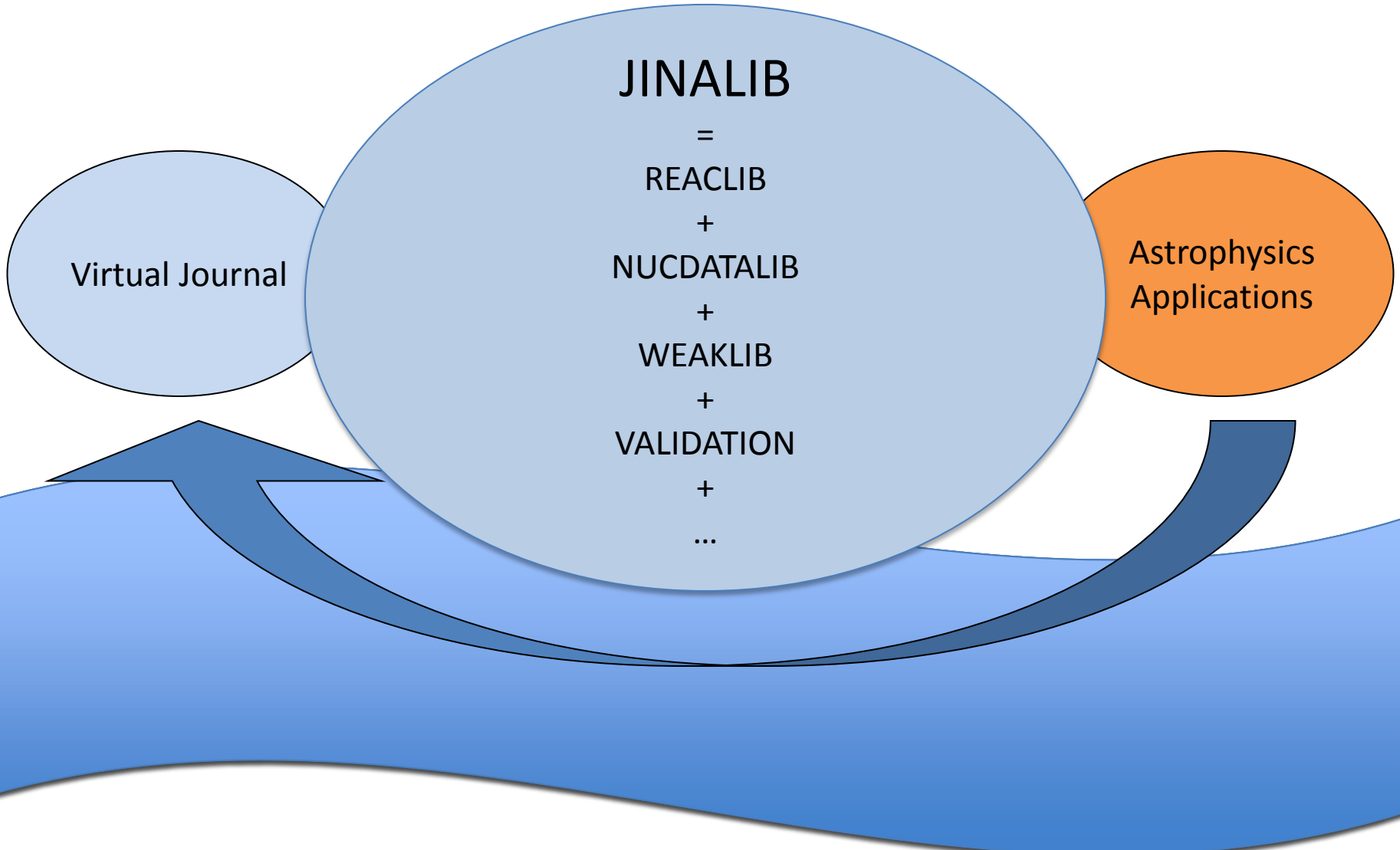
JINALIB

- Now to September 28
 - Develop new user interface features
 - Adapt tabular upload into a temporary space
 - Reformulating fitting features for users (no login!)
 - Current plan is to limit to single rates
 - Astrophysics-ready files for download
 - REACLIB= reaclib + winvn (or winvne) + sunet?
 - WEBNUCLEO.org XML files
 - Kepler BDAT
 - JINALIB

JINALIB

- October 2012
 - Release of JINALIB nuclear physics input library
 - 3 month probation period to tweak out bugs
- Comments/suggestions are very welcome!!!!

www.jinaweb.org



Astrophysics Applications

<http://mesa.sourceforge.net/>

<http://www.astro.keele.ac.uk/nugrid>

MESA
Modules for Experiments
in Stellar Astrophysics

MESA home

getting started

how to use MESA star

mailing lists

mesa logo

MESA Council
Bill Paxton
Lars Bildsten
Aaron Dotter
Falk Herwig
Frank Timmes
Ed Brown
Rich Townsend



Welcome

... to the homepage of **MESA**, modules for experiments in stellar astrophysics.

Why A New 1D Stellar Evolution Code?
What Can It Do?
Instrument Paper (arXiv:1009.1622)
Manifesto
Download, install, and run
MESA C++ Interface and Interactive Python Drivers
How do you say that?
What does thread-safe mean?



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navigation

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- Meetings
- Publications
- Releases and

NuGrid project

The Nucleosynthesis Grid (NuGrid) project develops and maintains tools for large scale post-processing nucleosynthesis simulations, and apply these to complete sets of quiescent and explosive nuclear production environments.

Science

The NuGrid collaboration works actively since fall 2007 to create a framework for massively parallel thesis simulations with up-to-date and flexible nuclear physics input.

- Collaborative Projects
- Transparency
- Consistency
- Workshop/Schools



Webnucleo.org

Clemson Astronomy | Physics & Astronomy | Engineering & Science | Clemson University

Home

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Online Tools
Modules
Papers
Movies
Tutorials
Contact Us

Welcome!

This is the official web site of the nuclear astrophysics group at Clemson University. Please navigate by using the panel on the left. We hope you enjoy your visit.

We are the nuclear astrophysics group at Clemson University. We study the nuclear transmutations that occur inside stars and their implications for nuclear physics, stellar evolution, gamma-ray astronomy, and extinct radioactivities and presolar grains in meteorites. To derive insights into nuclear and stellar astrophysics, we make calculations with our large computer codes and compare our results to data provided by our astronomer and cosmochemist colleagues. You may find a number of our results at this web site by viewing our publications and our movies pages. In addition, you can run some of our codes by visiting our online tools page.

Web Nucleo .ORG

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Page last modified on 2009/02/25 13:40

Science Goal

The science goal is to provide a complete set (Set 1) of stellar evolution sequences for low-mass and stars with compatible input physics, including simple synthetic explosion simulations for metallicity 0.02, and calculate the complete nucleosynthesis with the same post-processing code. In this way we will obtain a high degree of internal consistency. Eventually we plan to generate yield sets covering a wide range of mass and metallicity space, in collaboration with teams working in galaxy chemical evolution and cosmology.

Research Areas

The primary goals of the collaboration facilitate projects (in varying degrees of completion) in the following research areas (in no particular order). If you like to get in touch with NuGrid members participating in any of these projects, please get in touch with the present PI (see below).

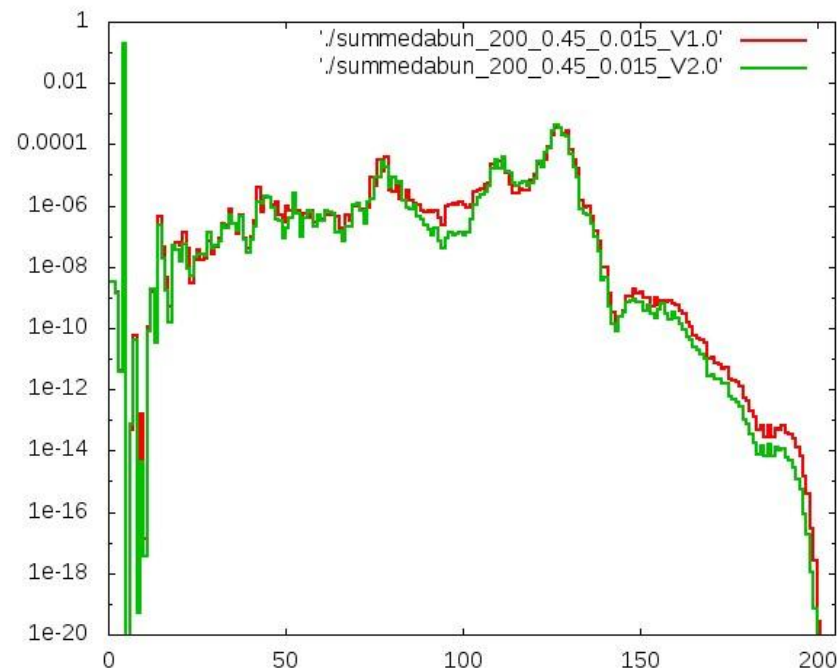
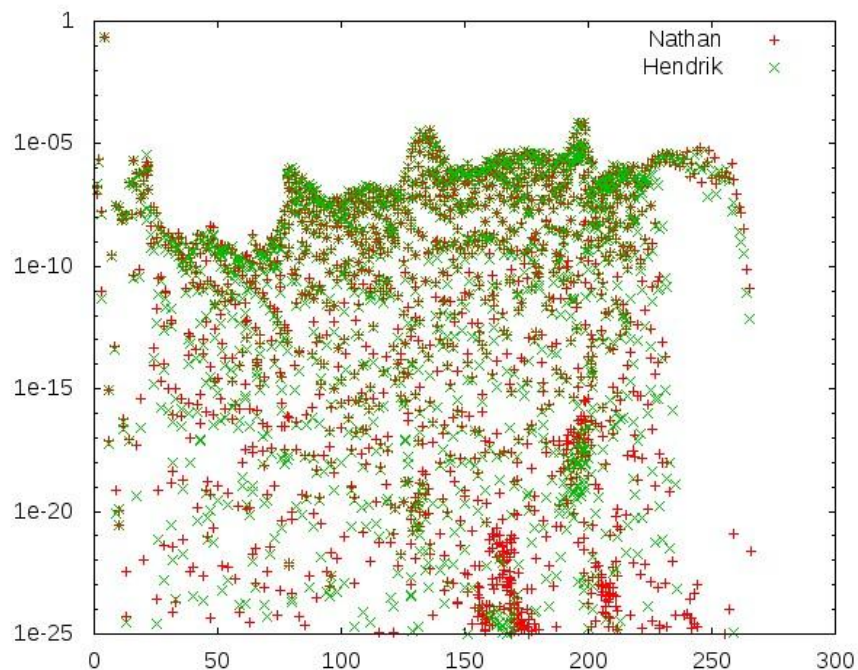
- Removal of stellar evolution
- Supernova explosions, explosive nucleosynthesis SN type II and Ia
- Stellar populations and their implication for nucleosynthesis in stellar evolution

- Code Validation
- Identical input
- Identical output
- Standard examples

JINALIB Validation: RPROCESS example

Nathan Parzuchowski (WEBNUCLEO)
vs Hendrik Schatz (REACLIB)

REACLIB V1.0 vs REACLIB V2.0



Summary

- JINALIB well-underway
- Unifying nuclear physics input
- Expect new database to be available October
- Important Validation can be defined
- Fission, spontaneous and delayed particle emission to be included in database
- JINALIB network reader/solver being developed
- Community feedback is most welcome!!!!