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# Better MCMC for Nuclear Data using emcee and B-DJINN

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PLS/NACS

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LLNL-VIDEO-825370

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National Laboratory



# Nuclear Data Evaluation Pipeline: What is it?



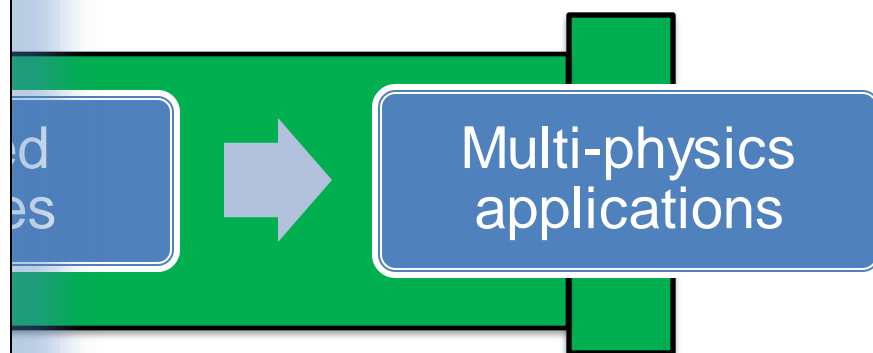
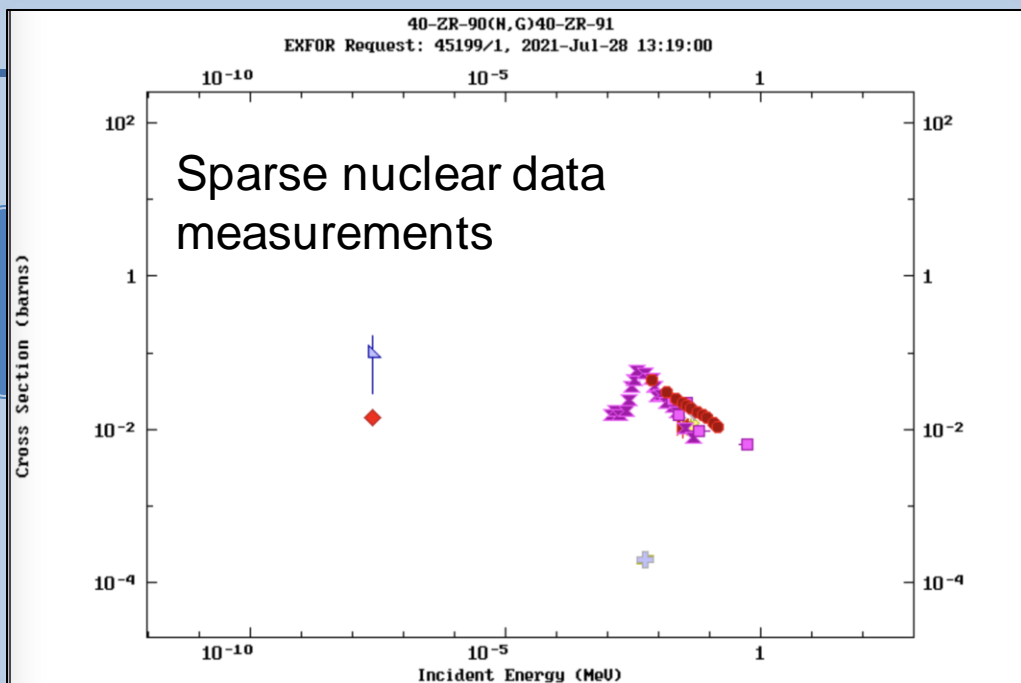
- Nuclear Energy Agency (NEA):

“Nuclear data evaluators ... ***craft*** databases of information for all of the elements and isotopes that may be required.”





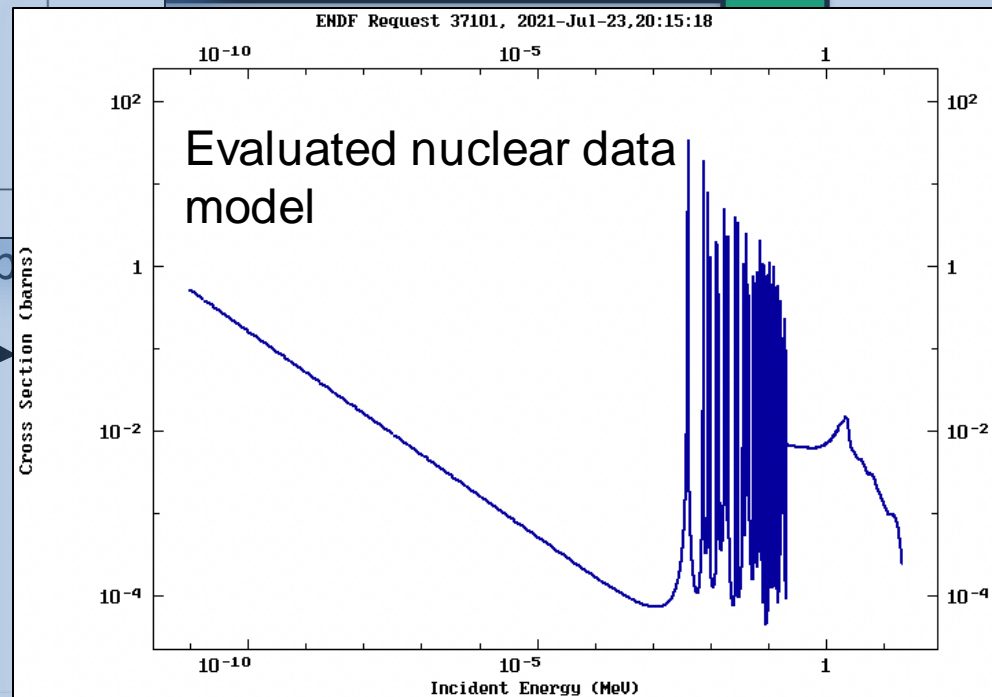
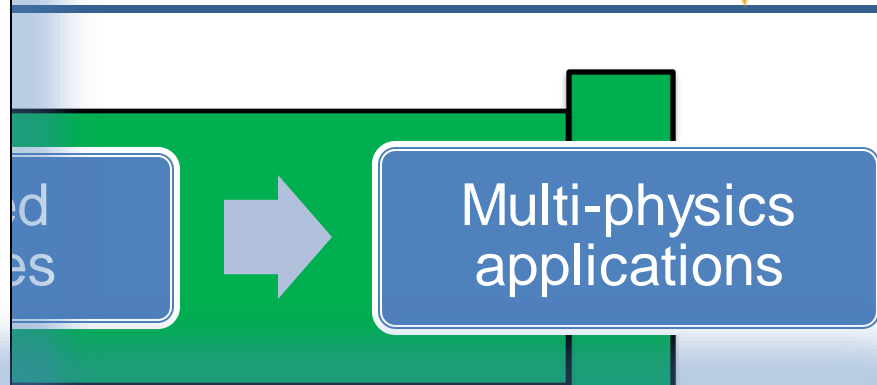
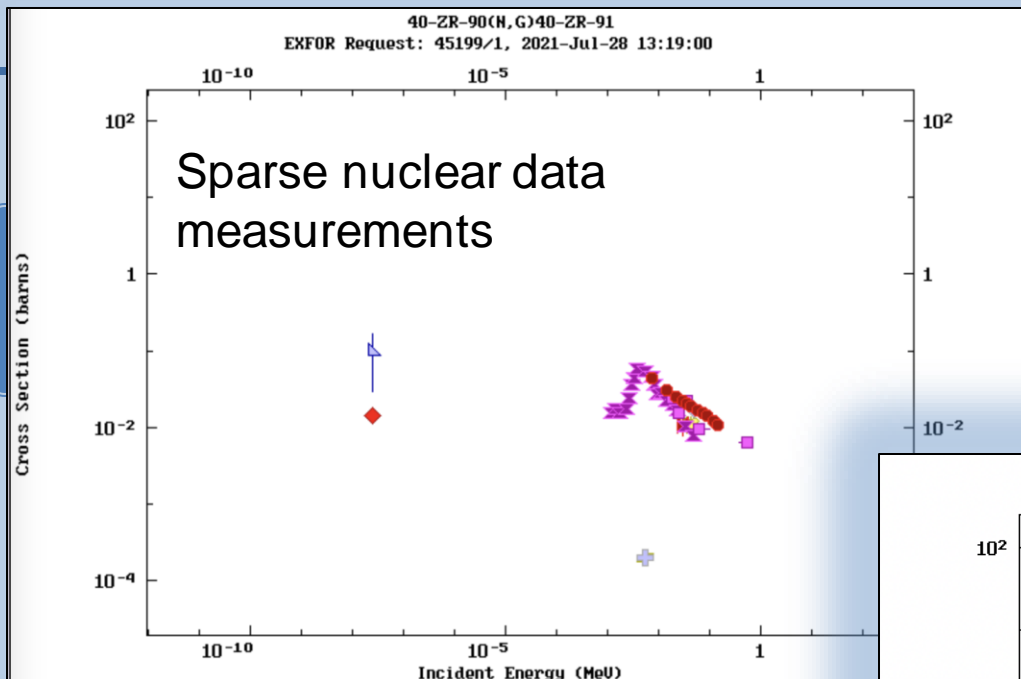
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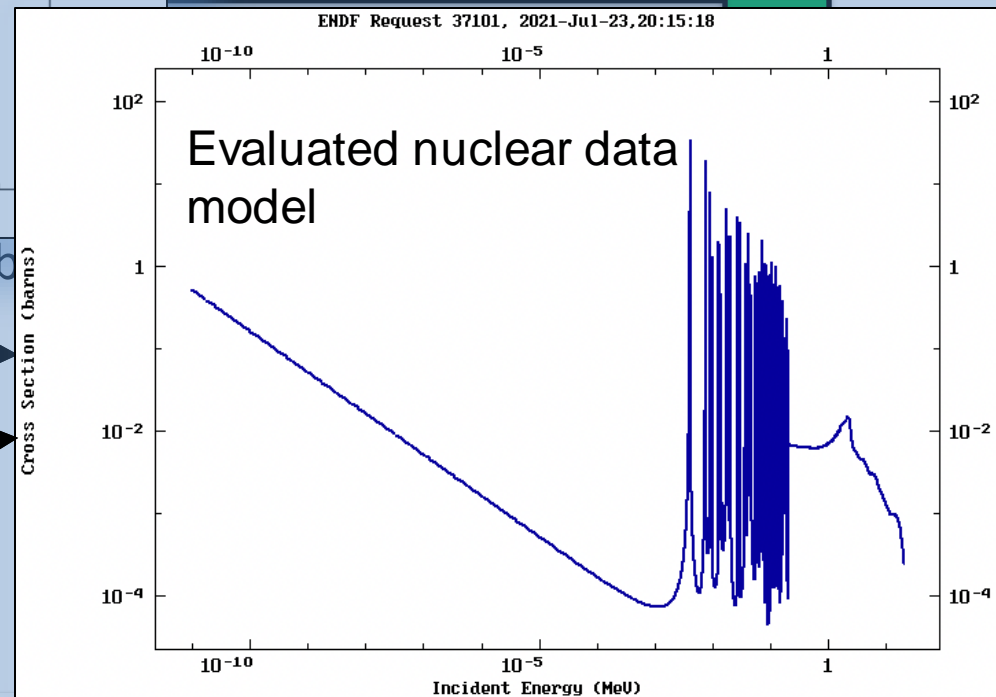
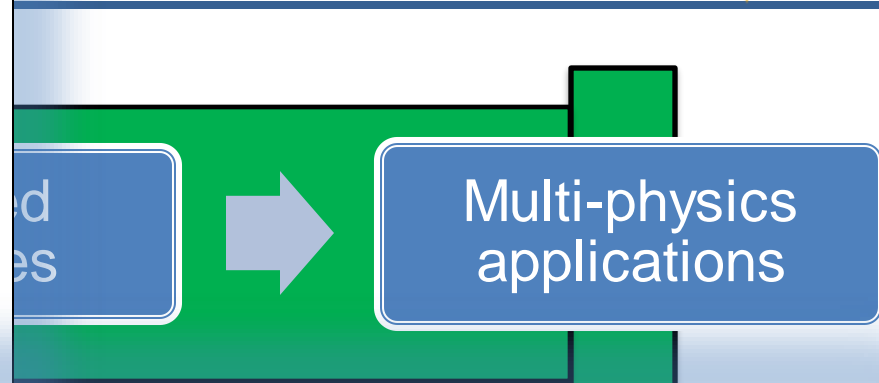
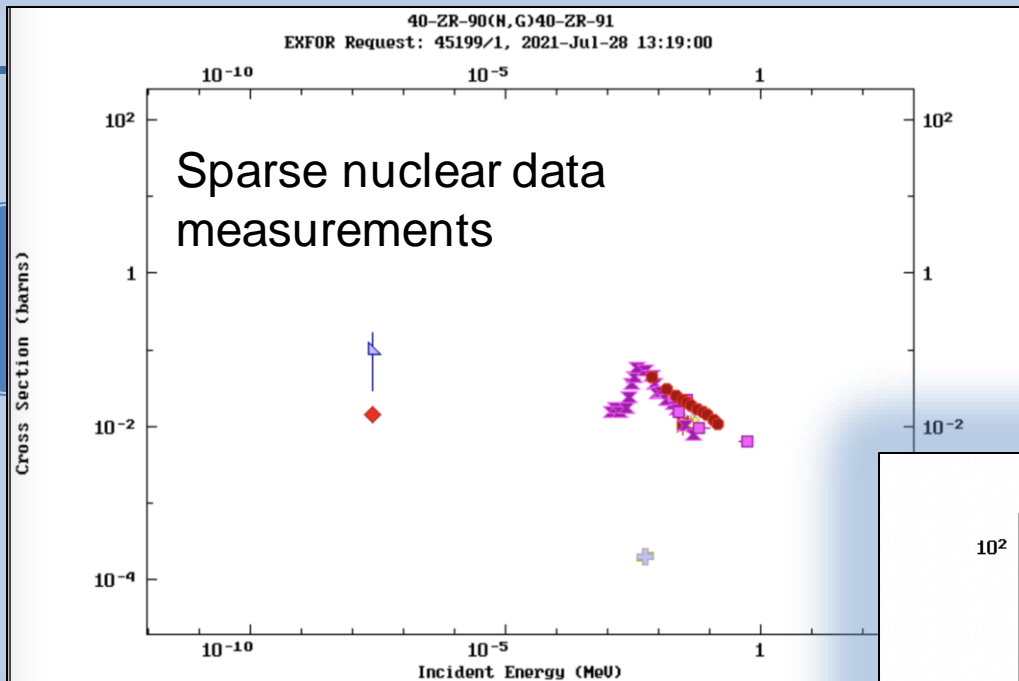
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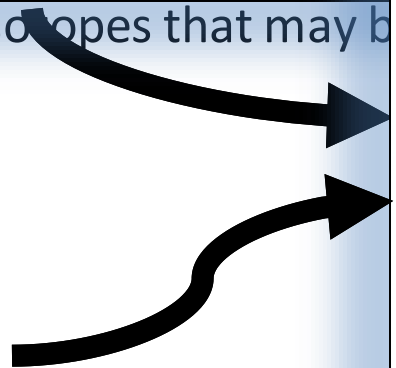
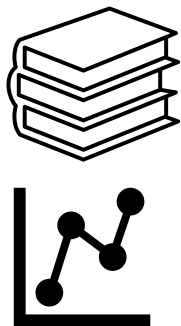
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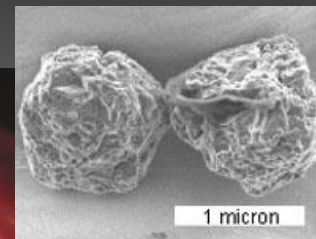
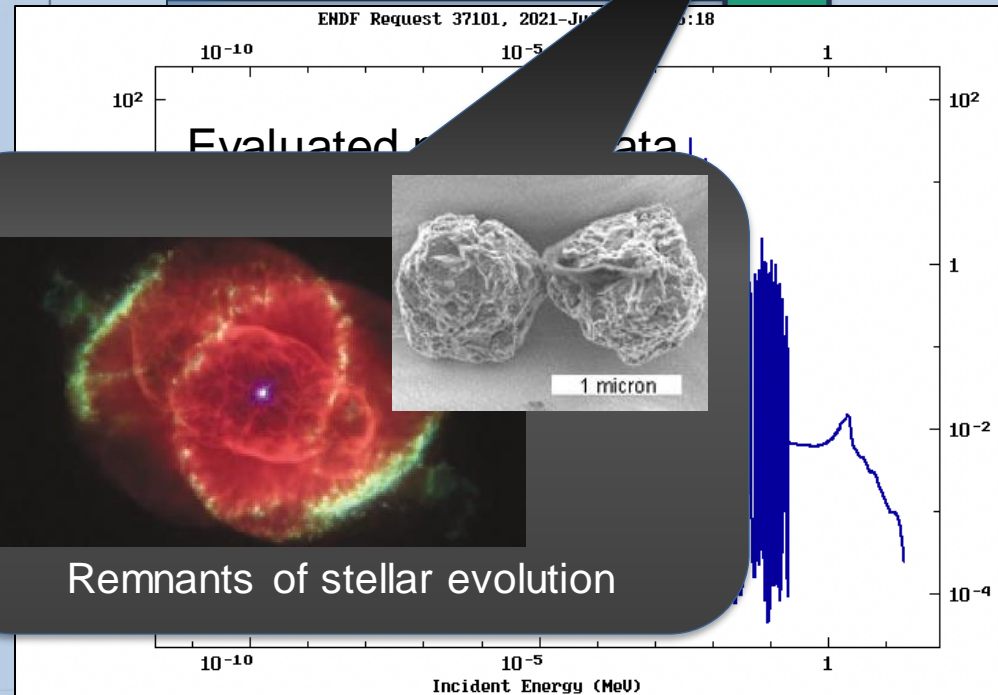
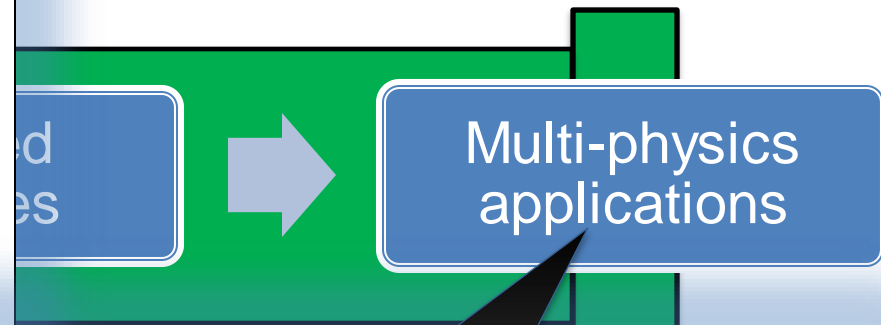
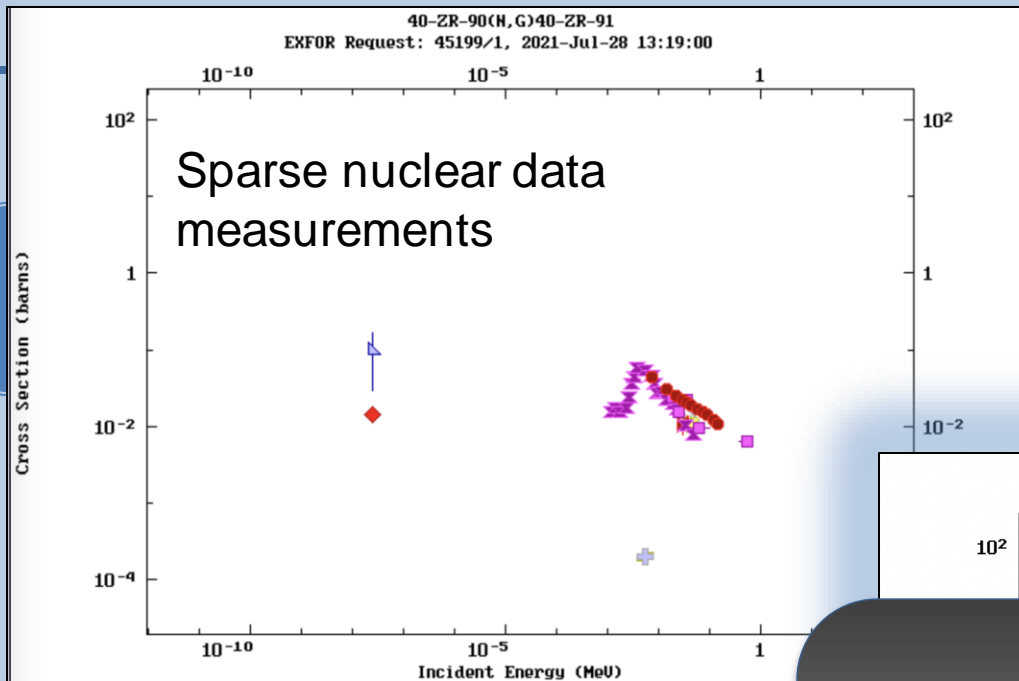


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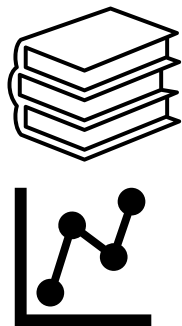




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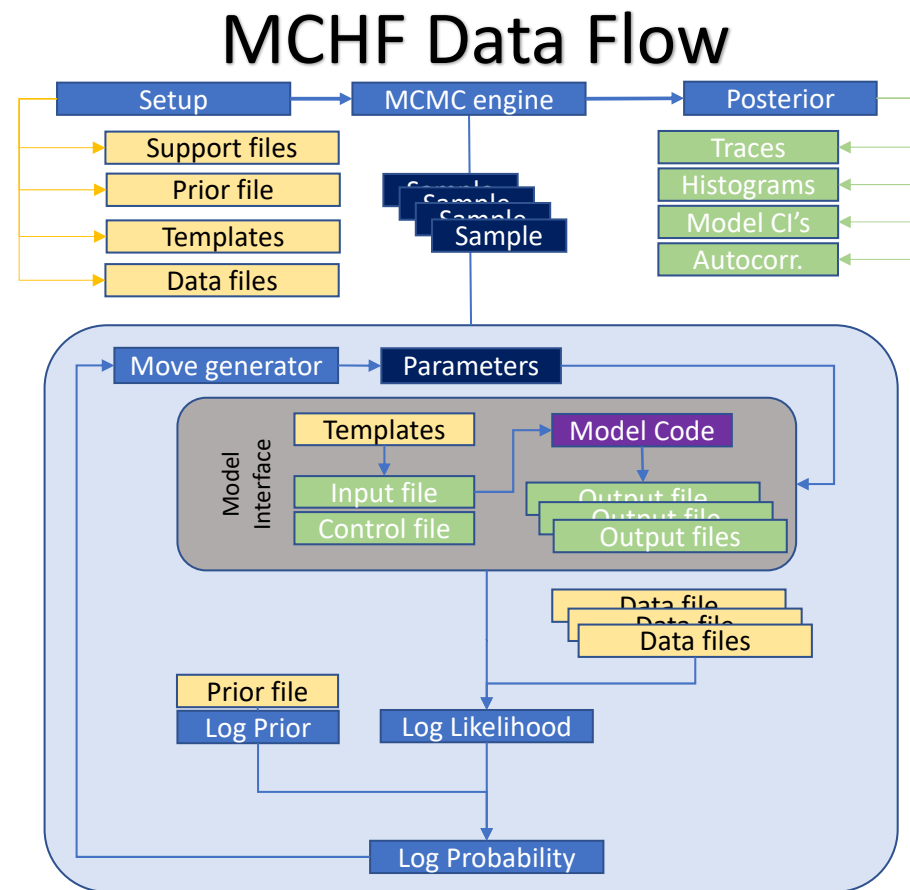
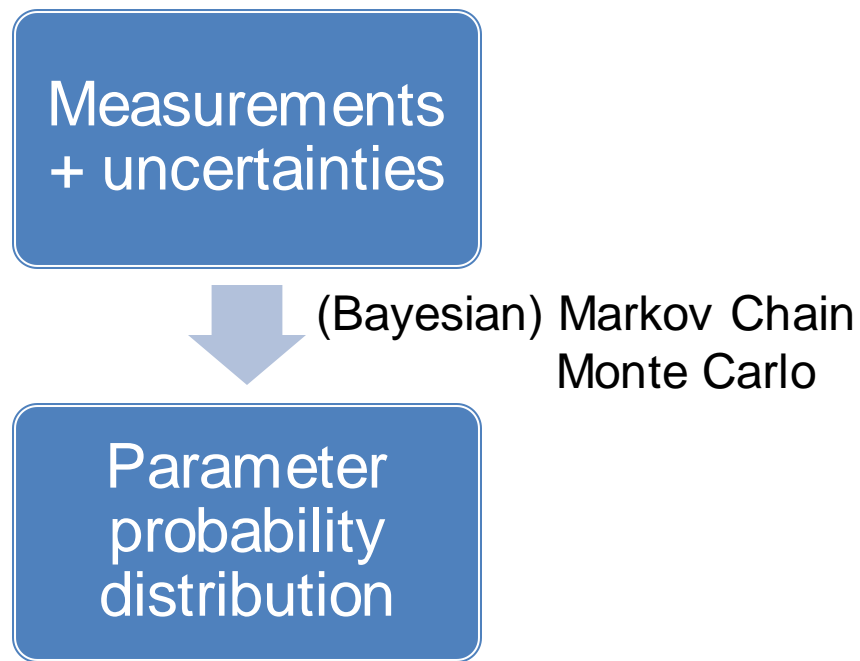


Remnants of stellar evolution





# I wrote MCHF in 2018: a Python suite for MCMC studies of Nuclear Reaction Parameters





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Publications which directly or indirectly used this code:



**O. Gorton and J. E. Escher**, in review at *Phys. Rev. C*.  
Pre-print available [arXiv:2102.03452](https://arxiv.org/abs/2102.03452).

O. Olivas-Gomez, A. Simon, **O. Gorton, J. E. Escher et al.**,  
Published November 2020 [Phys. Rev. C, 102, 055806](https://arxiv.org/abs/2011.05580)

**Gorton O., Escher J.E.** (2021) Springer Proceedings in Physics, vol 254.  
Springer, Cham. [https://doi.org/10.1007/978-3-030-58082-7\\_28](https://doi.org/10.1007/978-3-030-58082-7_28)

Log Probability

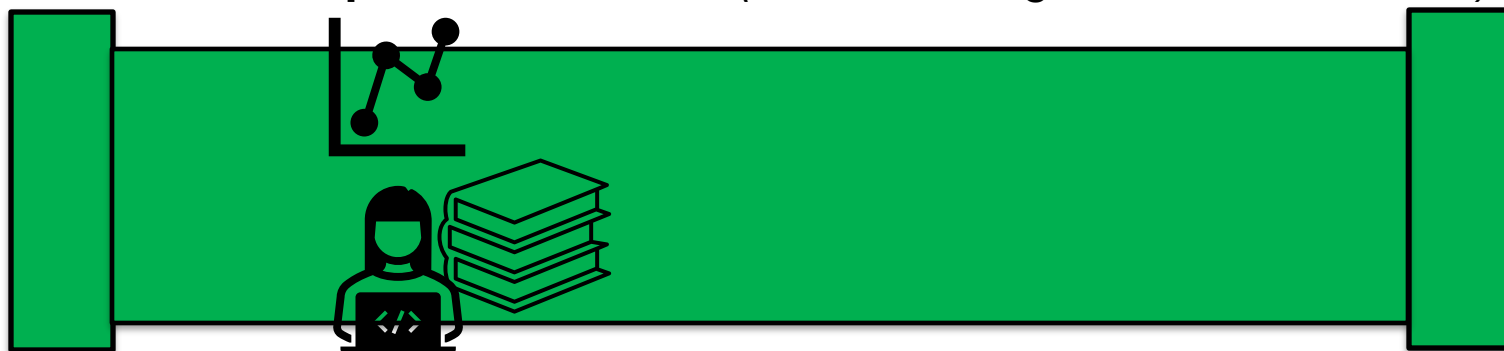


# New software features enable new capabilities for studying important physics



New features enabled by integrating emcee Python library

- ✓ **State preservation and restarts** (*save your work or lose it!*)
- ✓ **“Fancy” MCMC algorithms** (*faster convergence in large spaces*)
- ✓ **Multi-node parallel with MPI** (*take advantage of more resources*)



Ongoing work:

- Using machine learning (B-DJINN) to accelerate parameter searches (Kirana Bergstrom, HEDP summer grad student)
- Application to new experimental data

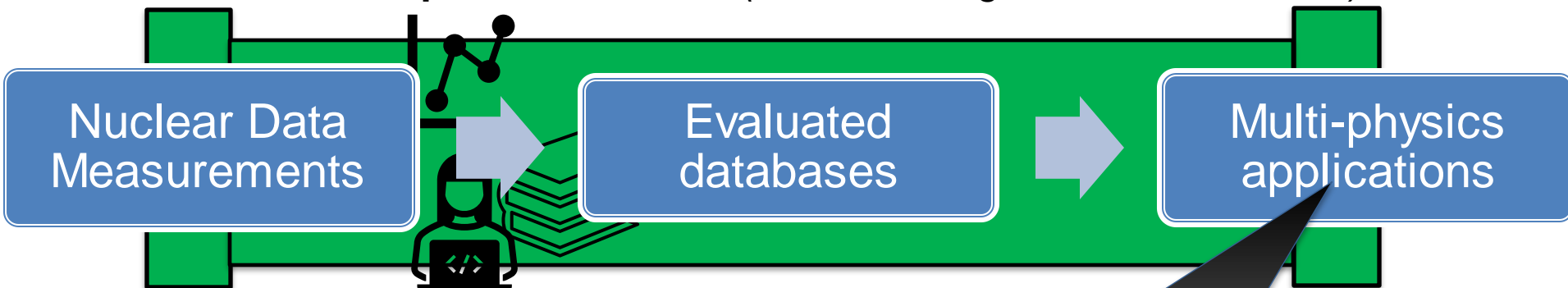


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