

# **Empire-2.19 (Lodi)**

## **Advanced Tool for Nuclear Reaction Data Evaluation**

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***[www.nndc.bnl.gov/empire/](http://www.nndc.bnl.gov/empire/)***



# Developers

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- R. Capote (IAEA, Vienna)
- M. Herman (BNL, US)
- P. Oblozinsky (BNL, US)
- M. Sin (Univ. Bucharest, Romania)
- A. Trkov (IAEA, Vienna)
- V. Zerkin (IAEA, Vienna)



# Recent developments (2.19 Lodi)

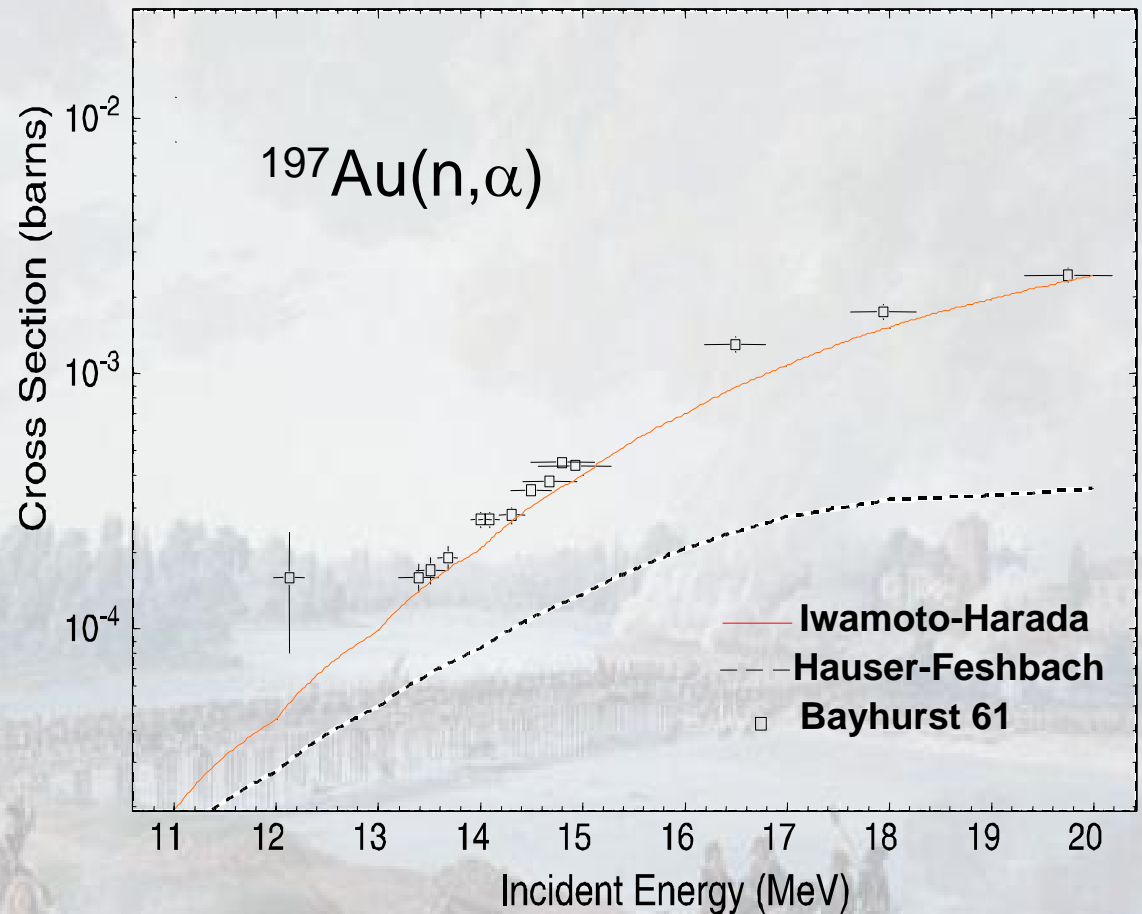
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- ✓ Merging resonance parameters into the final ENDF file
- ✓ Simultaneous CC and DWBA calculations
- ✓ Exciton model for cluster emission (Iwamoto-Harada)
- ✓ New algorithm for calculation of exclusive spectra
- ✓ New algorithm for calculation of recoils
- ✓ Multi-modal fission through multi-humped barriers
- ✓ Suite of  $\gamma$ -strength functions from RIPL-2
- ✓ Photonuclear reactions
- ✓ Reactions on excited targets



# Exciton model for cluster emission (Iwamoto-Harada)

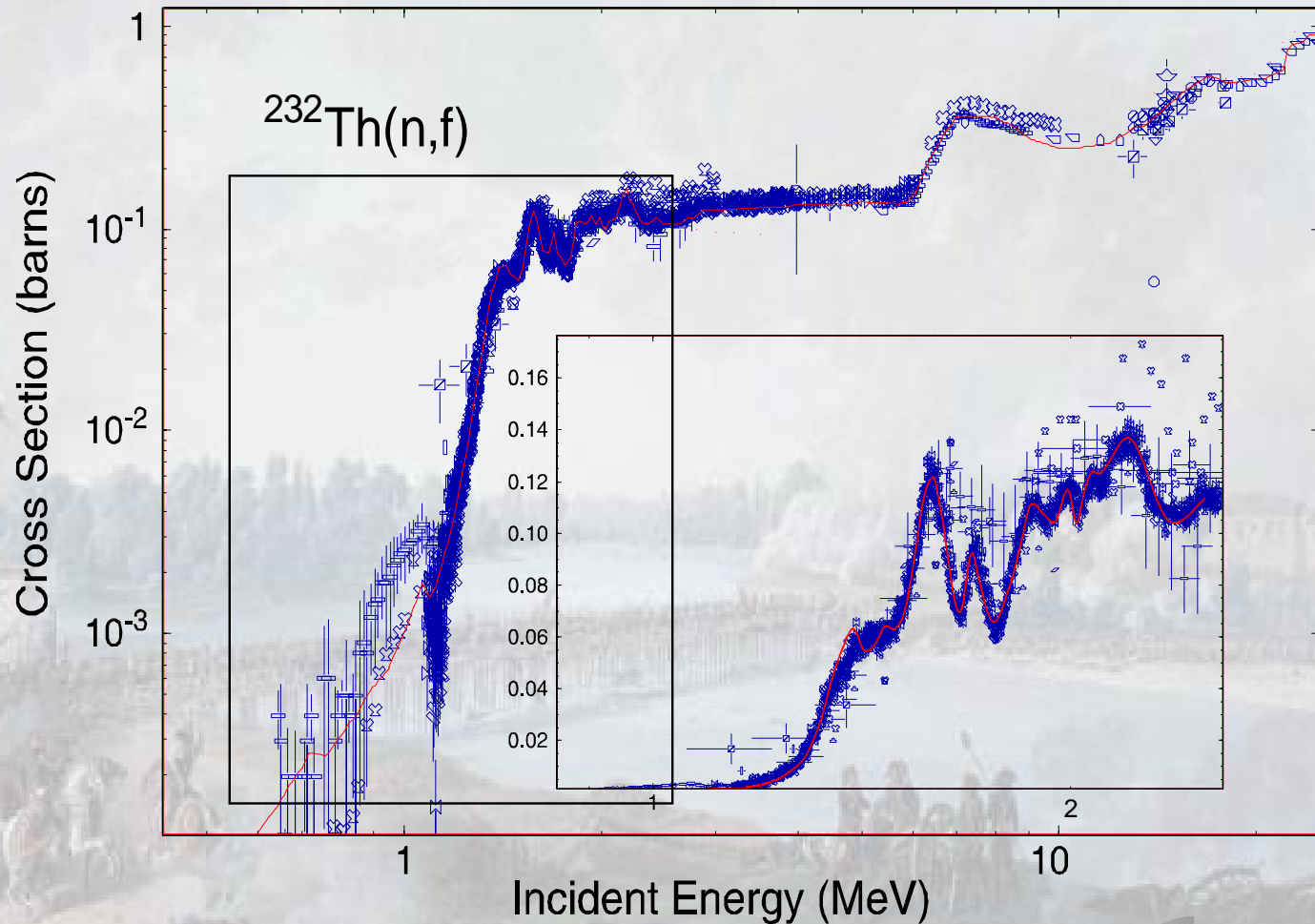
- ✓  $\alpha$ -particle formed from excitons above and below the Fermi surface
- ✓ no free parameters for cluster formation





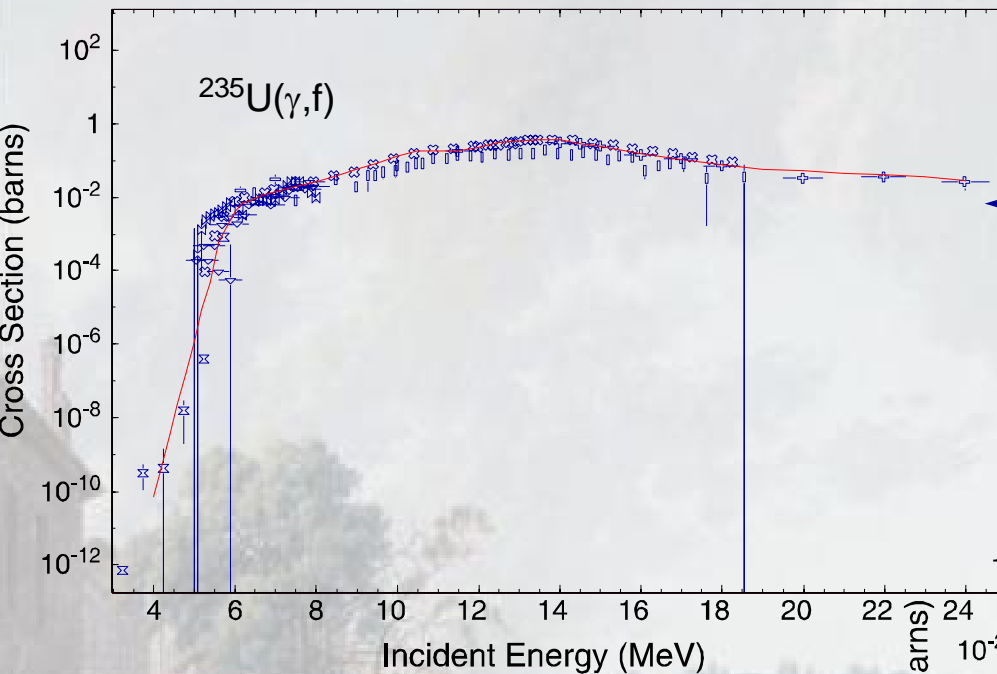
# Fission through multi-humped barriers

- ✓ Three-humped fission barrier
- ✓ Gross resonance structure – undamped vibrational states in the 3<sup>rd</sup> well



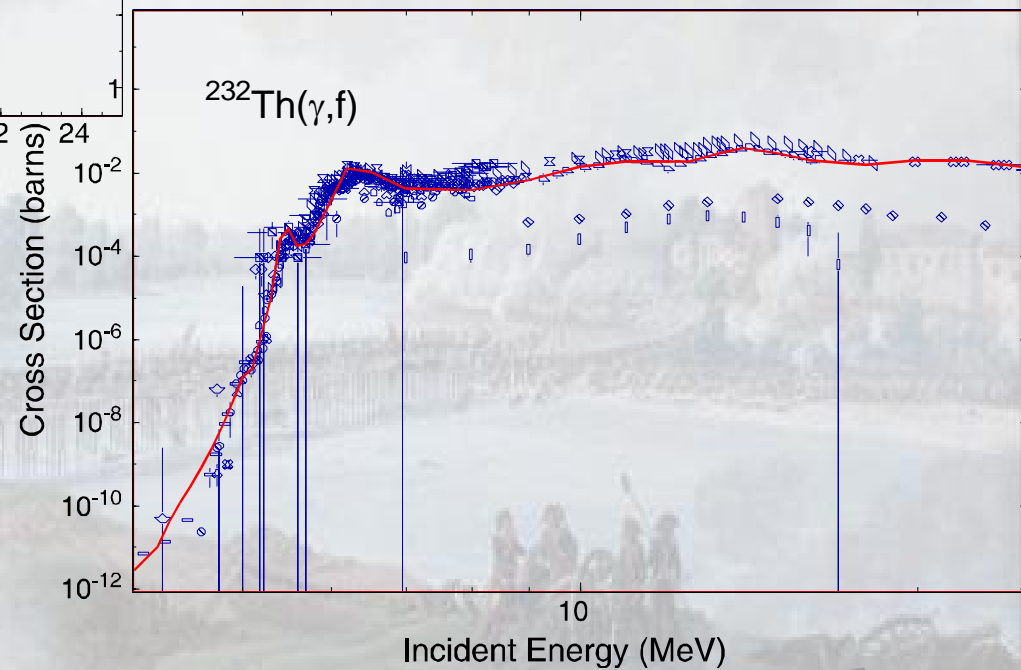


# Photonuclear reactions (photo-fission)



Modified Lorentzian v.1  
&  
two-humped fission barrier

Modified Lorentzian v.1  
&  
three-humped fission barrier





# Conclusions

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EMPIRE-2.19 is a comprehensive, easy to use, tool for evaluation of nuclear reactions.

**Release of the 2.19 version is expected in couple of months.**

Current version 2.18 (Mondovi) available from:

- ✓ [www.nndc.bnl.gov/empire/](http://www.nndc.bnl.gov/empire/)
- ✓ [www-nds.iaea.org/empire/](http://www-nds.iaea.org/empire/)