Investigation of Particle-Nucleus Optical Potentials for *p*-Process Nucleosynthesis

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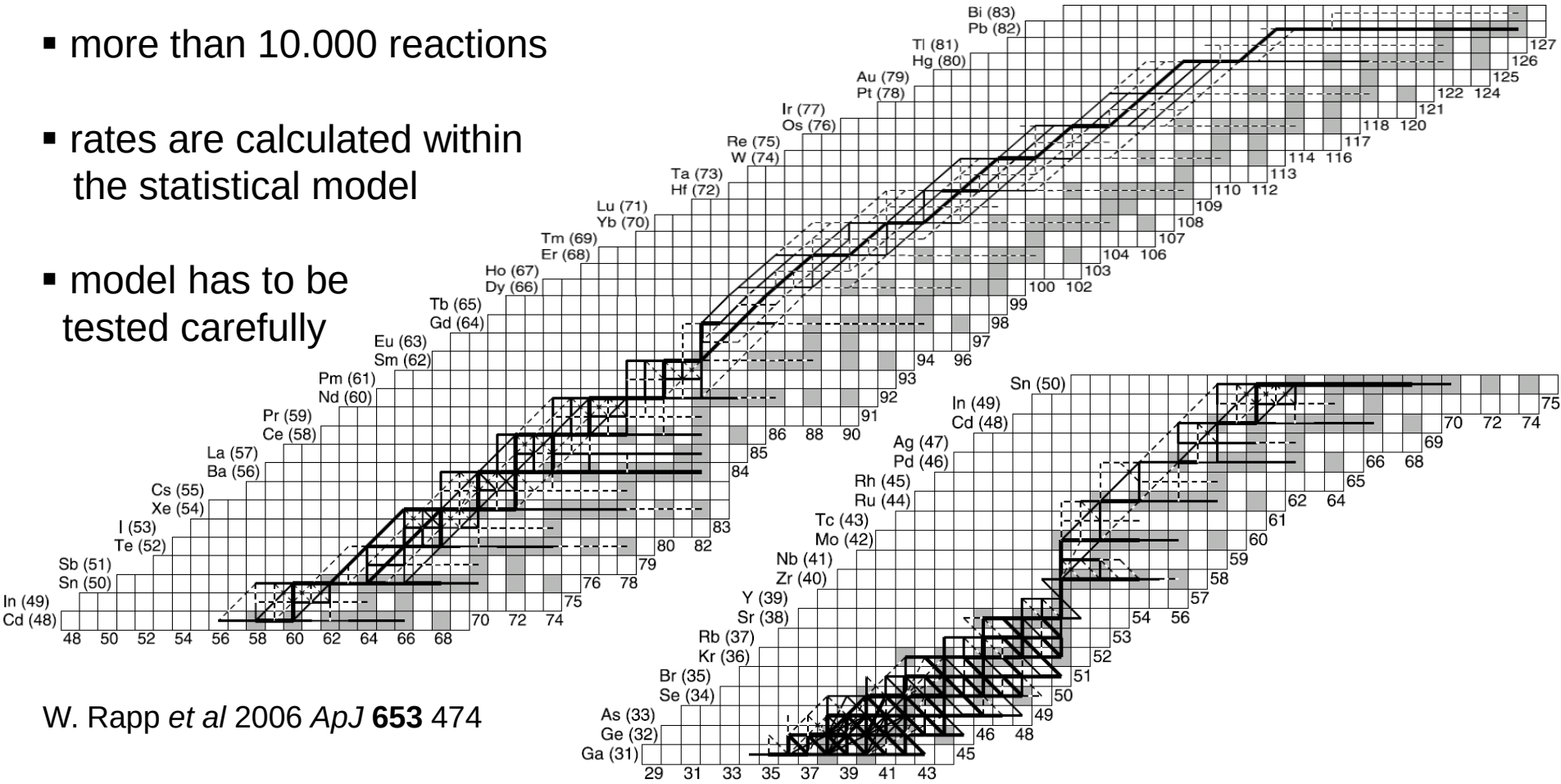
The *p*-process reaction network

- complex reaction network
- more than 10.000 reactions
- rates are calculated within the statistical model
- model has to be tested carefully



W. Rapp *et al* 2006 *ApJ* **653** 474

(α,n) and (p,n) reactions to test the statistical model

Why (α,n) & (p,n)?

- sensitivity to a single optical model potential
- valuabel information about special input parameter

studied reactions:

^{169}Tm(p,n)
^{175}Lu(p,n)

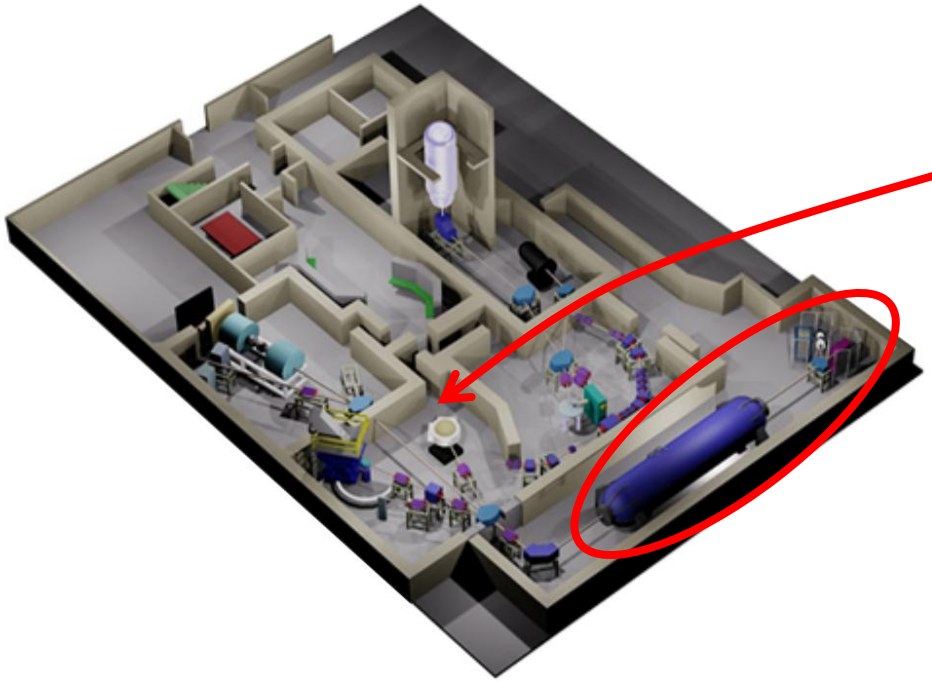
^{166}Er(α,n)
^{165}Ho(α,n)

Experimental technique

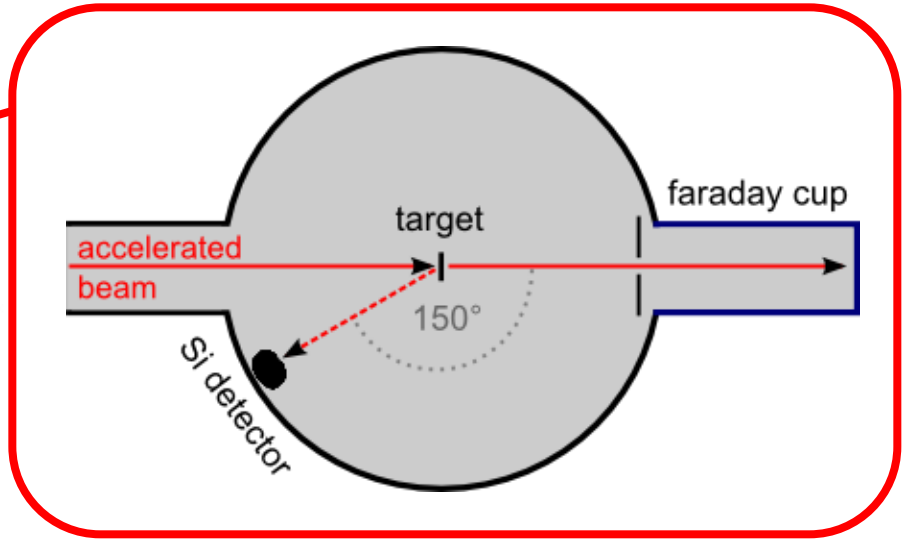
- activation method
  > stable target, unstable product
- thin target foils
  > good energy resolution ~100 keV
- decay counting with HPGe detectors
  > good resolution, efficiency & background conditions
- low reaction yields/cross sections measurabel

The setup at University of Notre-Dame, USA

Nuclear Stucture Lab



sketch of target chamber



FN Tandem Van de Graaff Accelerator
- 10 MV terminal voltage
- Sputter Ion Source
- Duoplasma Source (He ions)

- Si surface barrier detector @ 150°
  > monitoring target stability by RBS
- suppressed beam current measurment
- quick target exchange mechanism

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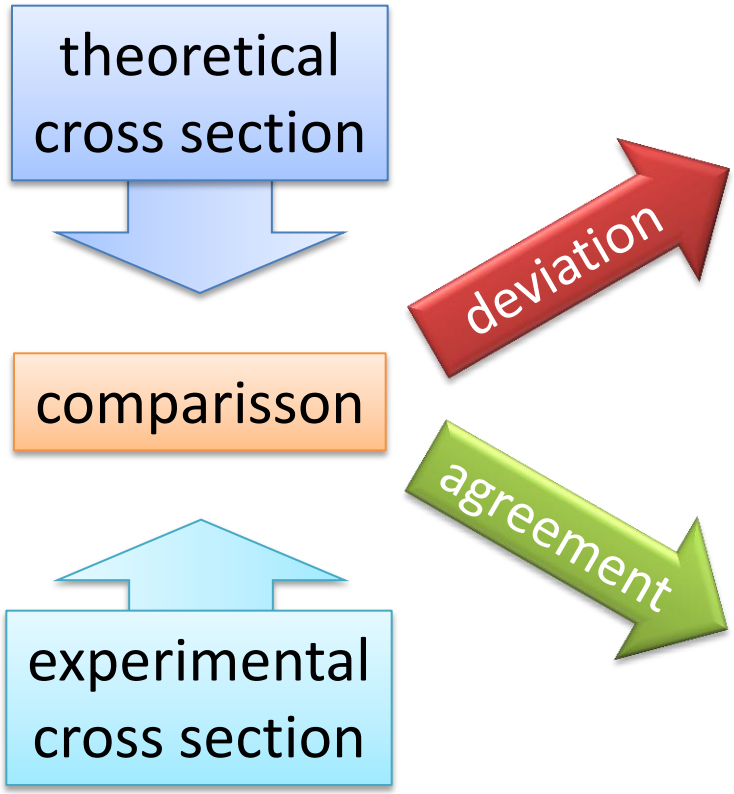
Testing the statistical model



Which input is responsible?
What has to be changed/improved?

- level density
- masses
- optical potentials for…
  … neutron interaction
  … proton interaction
  … alpha interaction
- giant dipole resonances

Is it really a good description?

Or just one bad parameter compensating another?

Selecting reactions

Which input parameter is important for which reaction?

important for all reactions:
- level density
- masses

depending on type of reaction:
- optical model potentials
- GDR

by choosing the studied reactions carefully one can reduce the number of parameters going into the theoretical value

The present study focusses on (p,n) and (a,n) reactions, because those are only depending on the proton or alpha optical model potential, respectively