Closing Remarks

- **Sunniva has asked me to give some closing remarks**

- **This has absolutely terrified me for the following reasons:**

1. **I'm not a theorist!**

This field of study has grown and thrived at least in part due to these workshops and the collaborations that have grown out of them

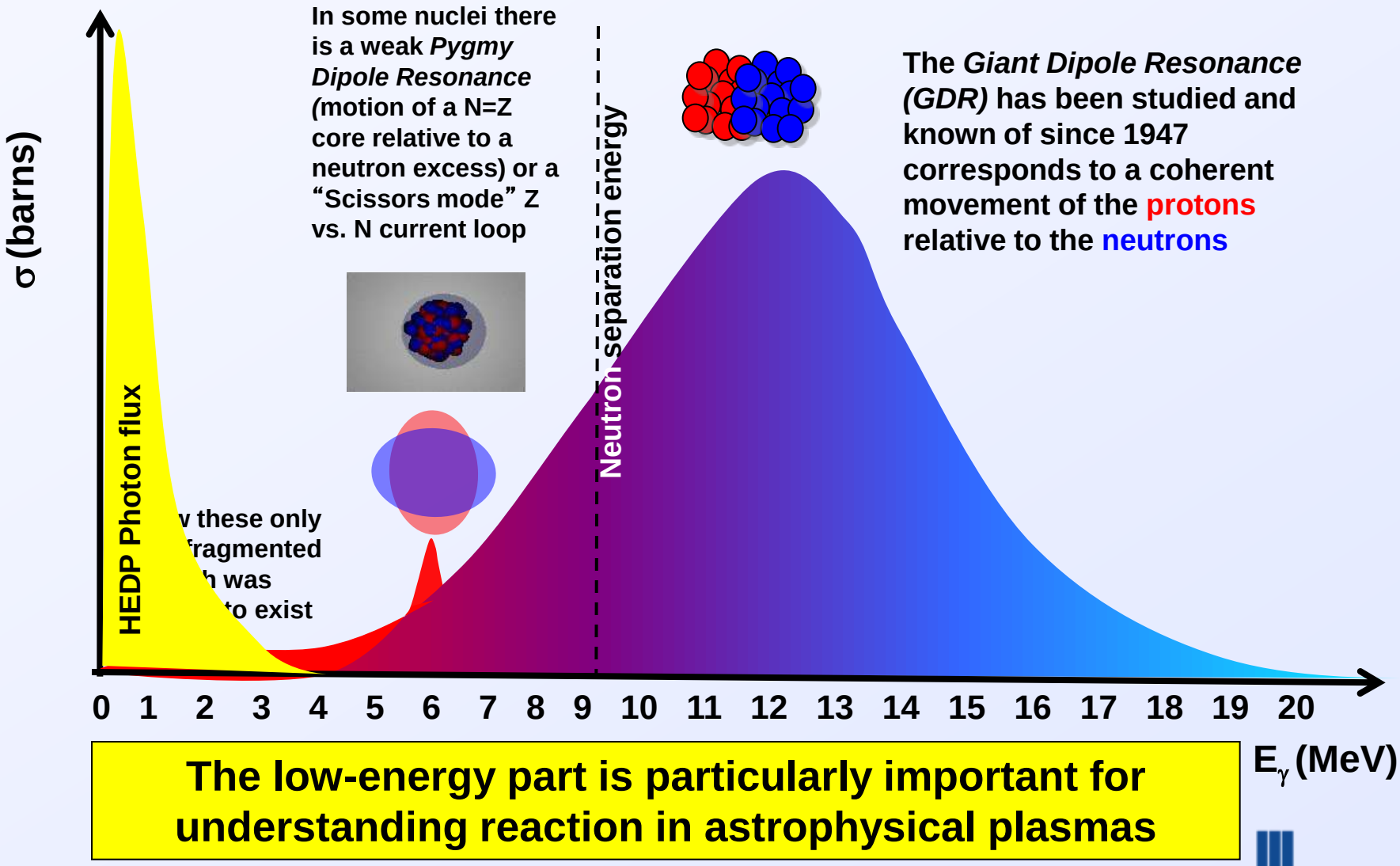
And now for a case study: The low-energy enhancement

Why is Nuclear Matter so Red?

L.A. Bernstein
D.L. Bleuel, D. Sayre (PD), M. Wiedeking[1],
S. Siem[2], A. Görgen[2],
Budget: $180k (FY13) and $174k (FY14)

Lawrence Livermore National Laboratory

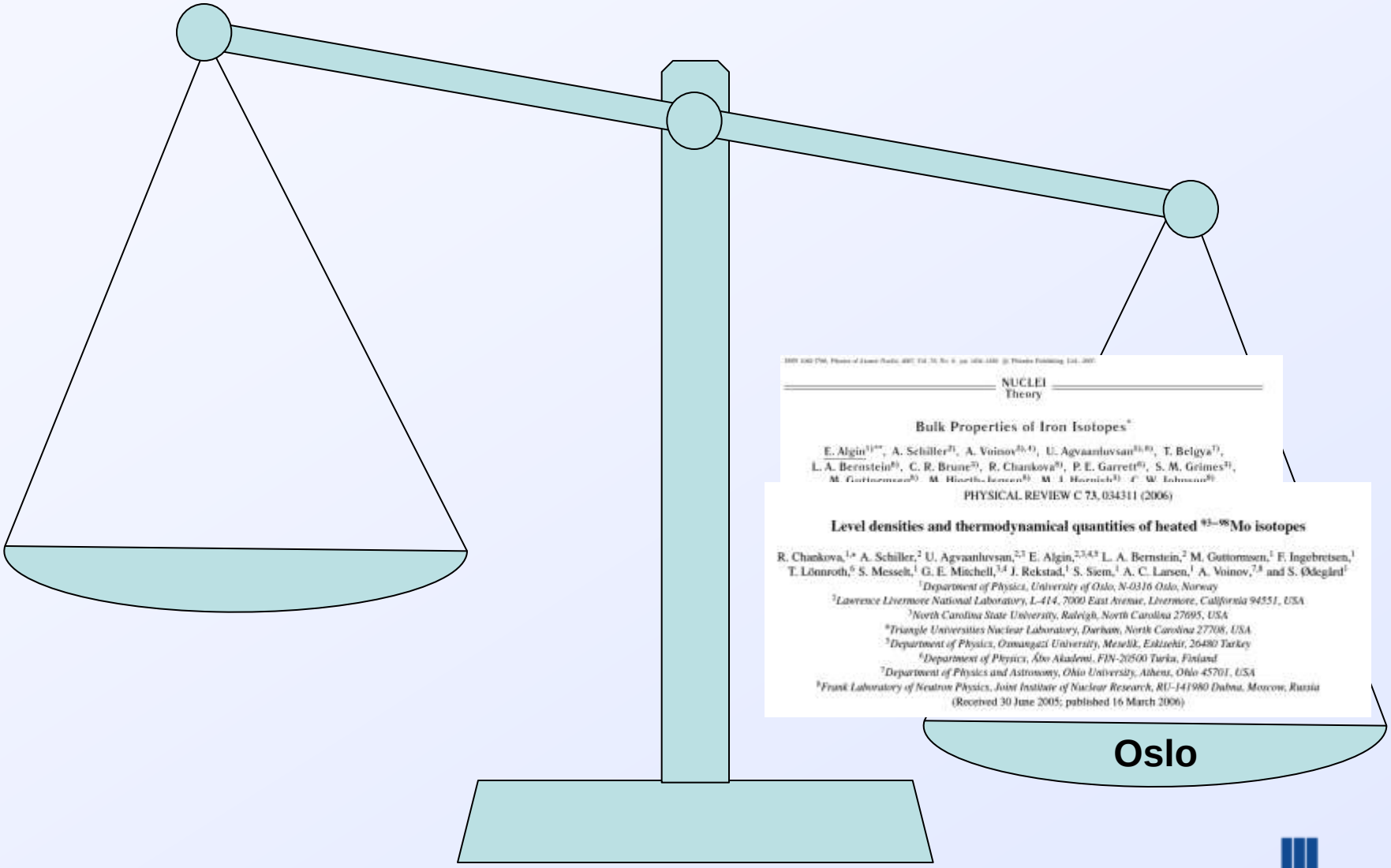
The ability of nuclei to emit and absorb photons (e.g., its "color") is referred to as the *Radiative Strength Function – $F(E_\gamma)$*



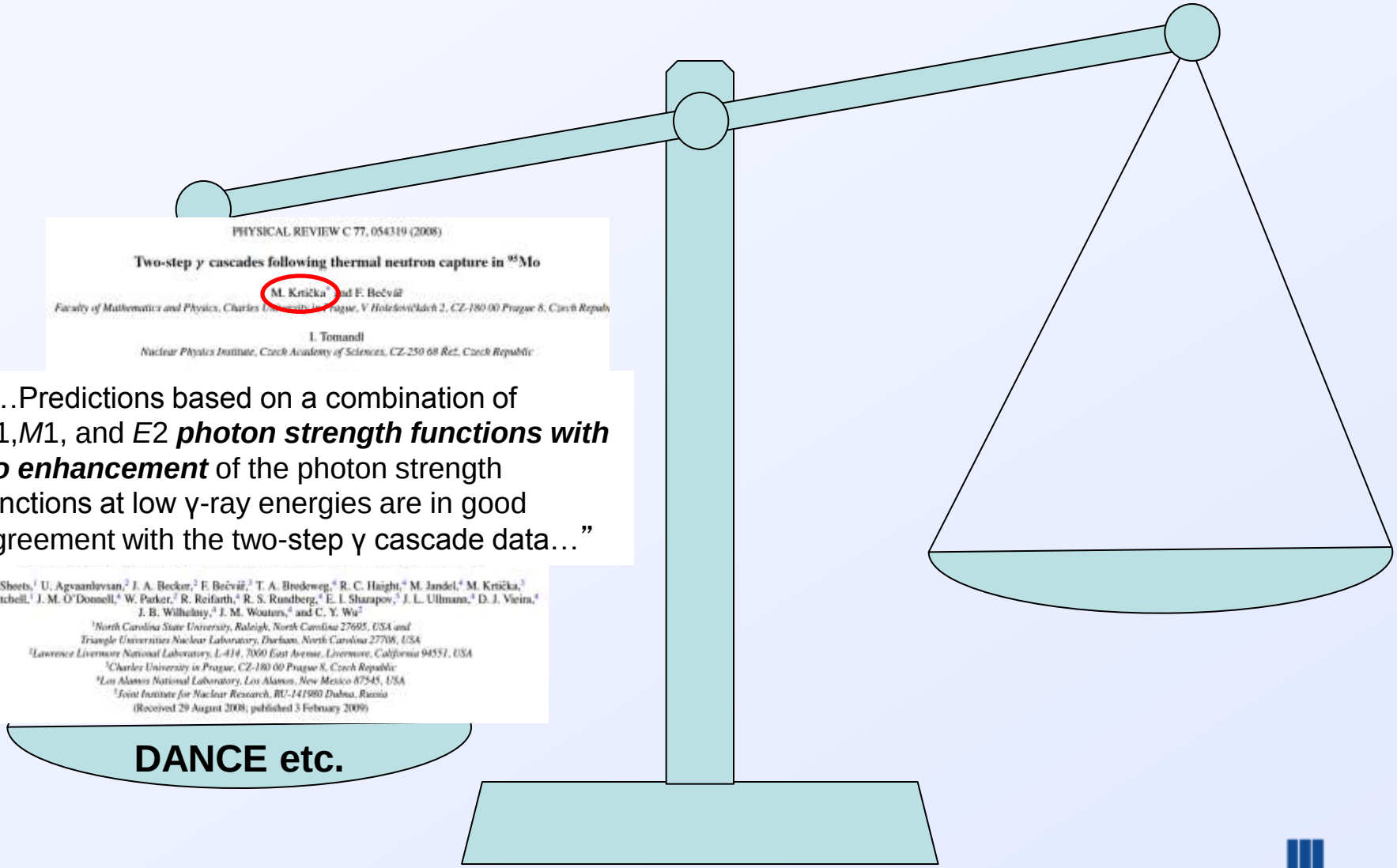
The low-energy part is particularly important for understanding reaction in astrophysical plasmas

*S. Goriely, Physics Letters B 436 1998. 10–18

Over the next 7 years we had evidence for an enhancement in *some* nuclei and not in others using the Oslo approach



But all non-Norwegian data (+ our best theoretical understanding) said there was little or no low-energy enhancement



PHYSICAL REVIEW C 77, 054319 (2008)

Two-step γ cascades following thermal neutron capture in ^{95}Mo

M. Krtička and F. Bečvář

Faculty of Mathematics and Physics, Charles University in Prague, V Holešovičkách 2, CZ-180 00 Prague 8, Czech Republic

I. Tomandl

Nuclear Physics Institute, Czech Academy of Sciences, CZ-250 68 Řež, Czech Republic

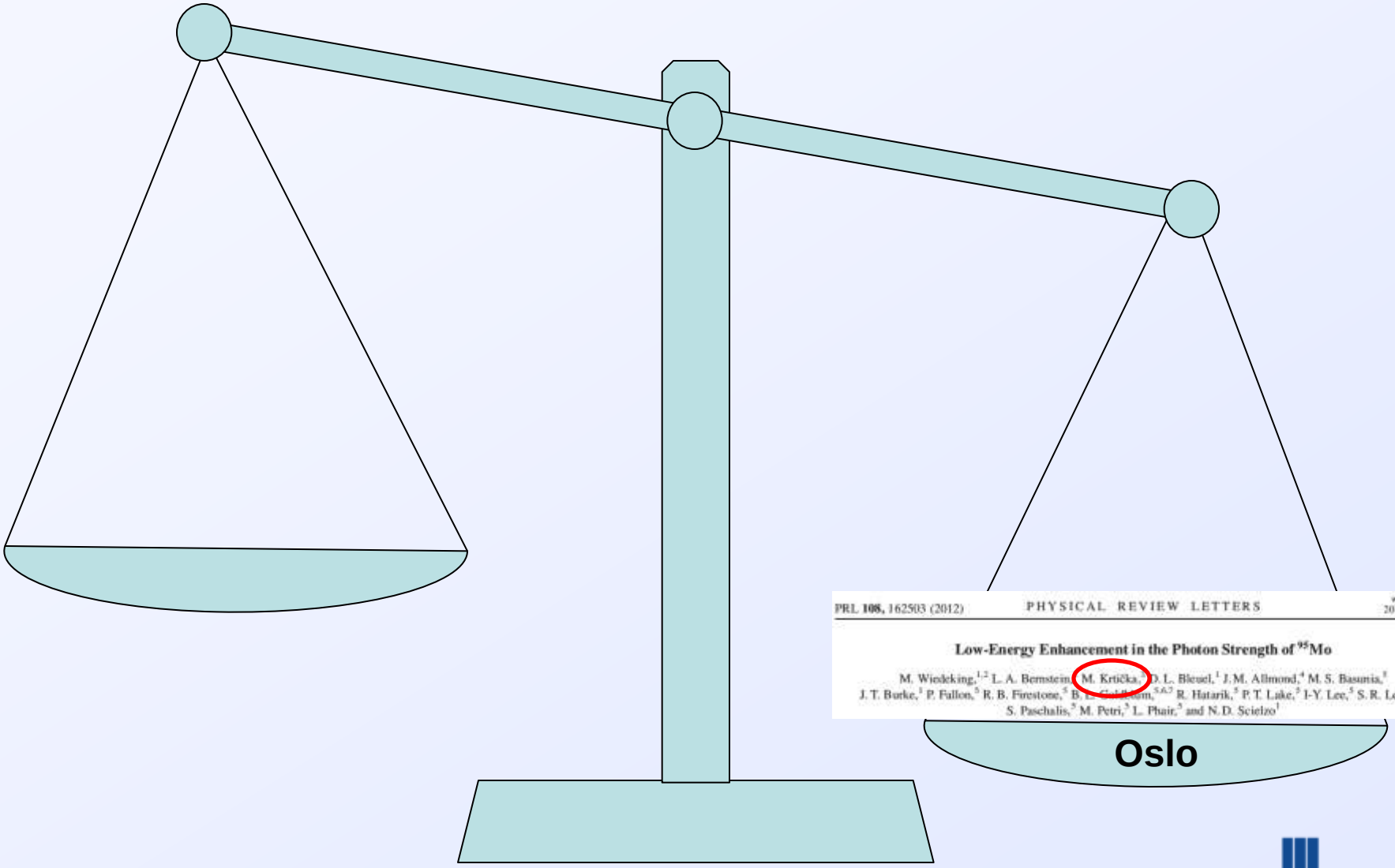
"…Predictions based on a combination of *E*1,*M*1, and *E*2 ***photon strength functions with no enhancement*** of the photon strength functions at low γ-ray energies are in good agreement with the two-step γ cascade data…"

S. A. Sheets,[1] U. Agvaanluvsan,[2] J. A. Becker,[2] F. Bečvář,[3] T. A. Bredeweg,[4] R. C. Haight,[4] M. Jandel,[4] M. Krtička,[3] G. E. Mitchell,[1] J. M. O'Donnell,[4] W. Parker,[2] R. Reifarth,[4] R. S. Rundberg,[4] E. I. Sharapov,[5] J. L. Ullmann,[4] D. J. Vieira,[4] J. B. Wilhelmy,[4] J. M. Wouters,[4] and C. Y. Wu[2]

[1]*North Carolina State University, Raleigh, North Carolina 27695, USA and Triangle Universities Nuclear Laboratory, Durham, North Carolina 27708, USA*
[2]*Lawrence Livermore National Laboratory, L-414, 7000 East Avenue, Livermore, California 94551, USA*
[3]*Charles University in Prague, CZ-180 00 Prague 8, Czech Republic*
[4]*Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA*
[5]*Joint Institute for Nuclear Research, RU-141980 Dubna, Russia*
(Received 29 August 2008; published 3 February 2009)

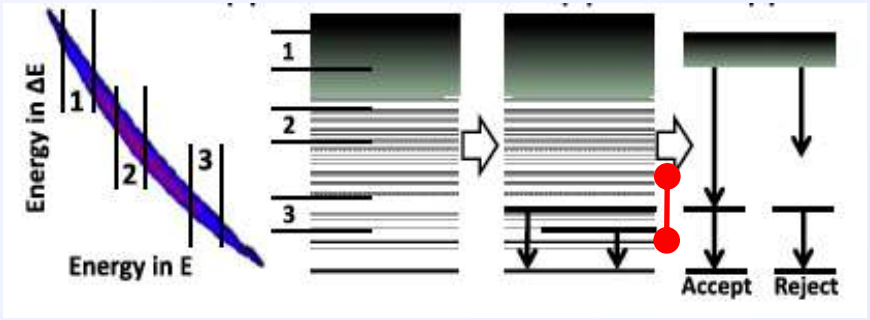
DANCE etc.

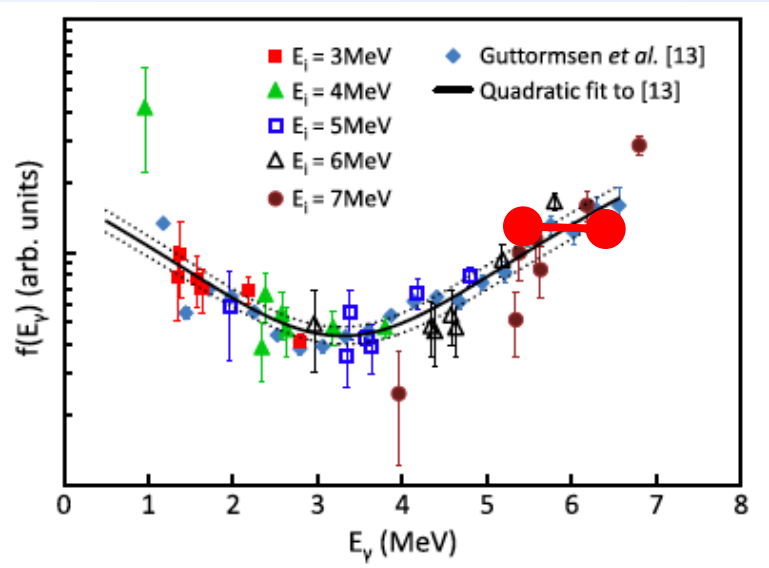
Then in 2011 the stalemate was broken



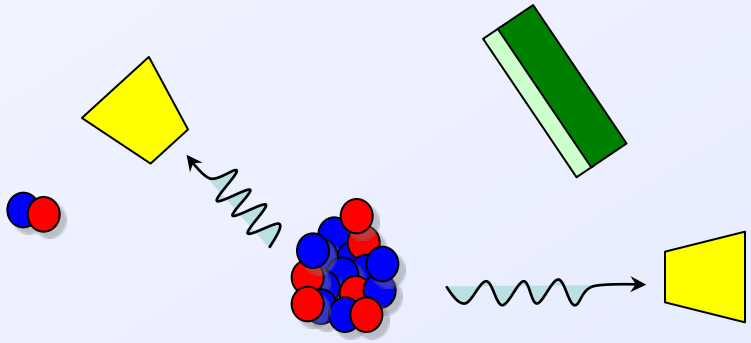
In 2011 we developed a technique to measure the shape of $F(E_\gamma)$ that combined the parts of Oslo and (n,2γ)

- A direct reaction populates a nucleus at a defined E_x *a la* Oslo.
- The ratio of 2 γ-ray cascades thru 2 known low-lying states provide a relative $F(E_\gamma)$ measurement
- No models are needed & most errors cancel





The enhancement is real!



M. Wiedeking *et al.*, PRL 108, 162503 (2012)

One last bit of business to help grow this field

- There will be a consultants meeting in Vienna at the IAEA this year
- Sunniva, Rick and a few others will be going there to propose a new database (format, etc.)
  - RSF?
  - LD?
  - …
- It would be great if this community expressed it's support for this effort

…and now for a show of hands…

Humble (but high altitude) beginnings Workshop 2007

My, how we've grown…

My, how we've grown…

My, how we've grown…

And now for the fun

- Thanks to everyone here in Oslo whose hard work made this possible (***Thomas***, Trine, Therese, Andreas, Hilde, Francesca, Sunniva R., Eda, Malin, Frank…

..and of course Sunniva S.!!!