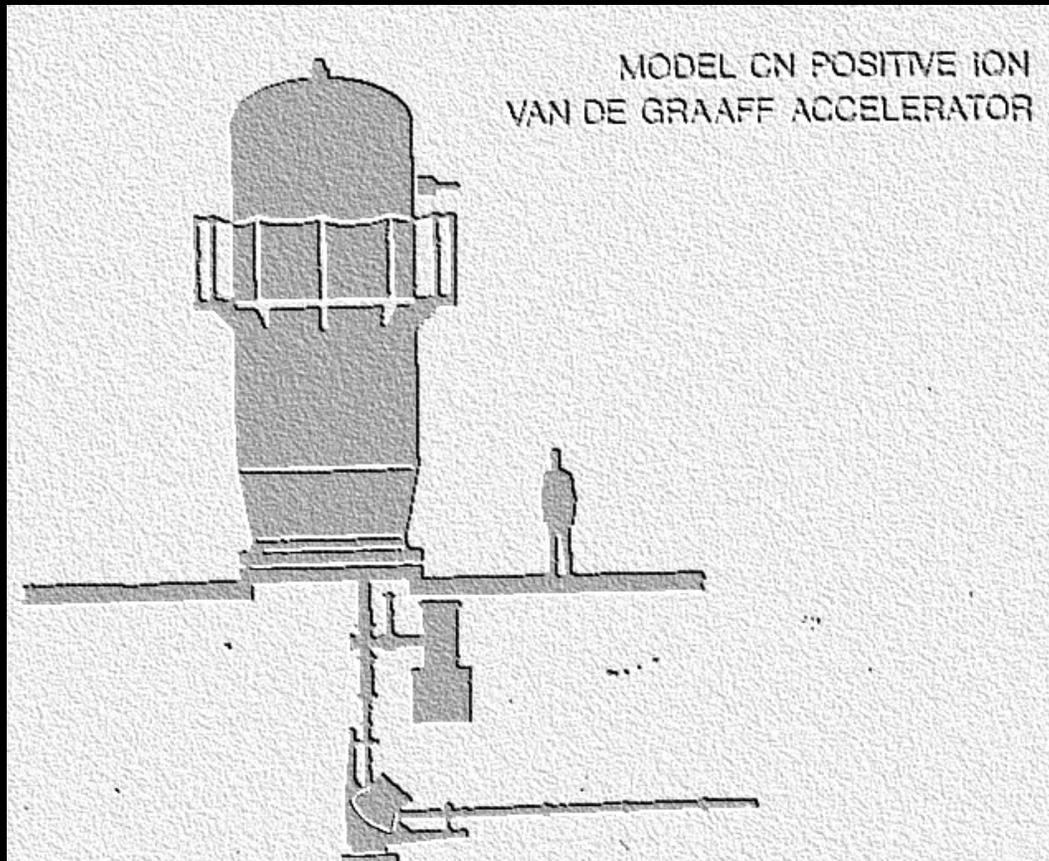


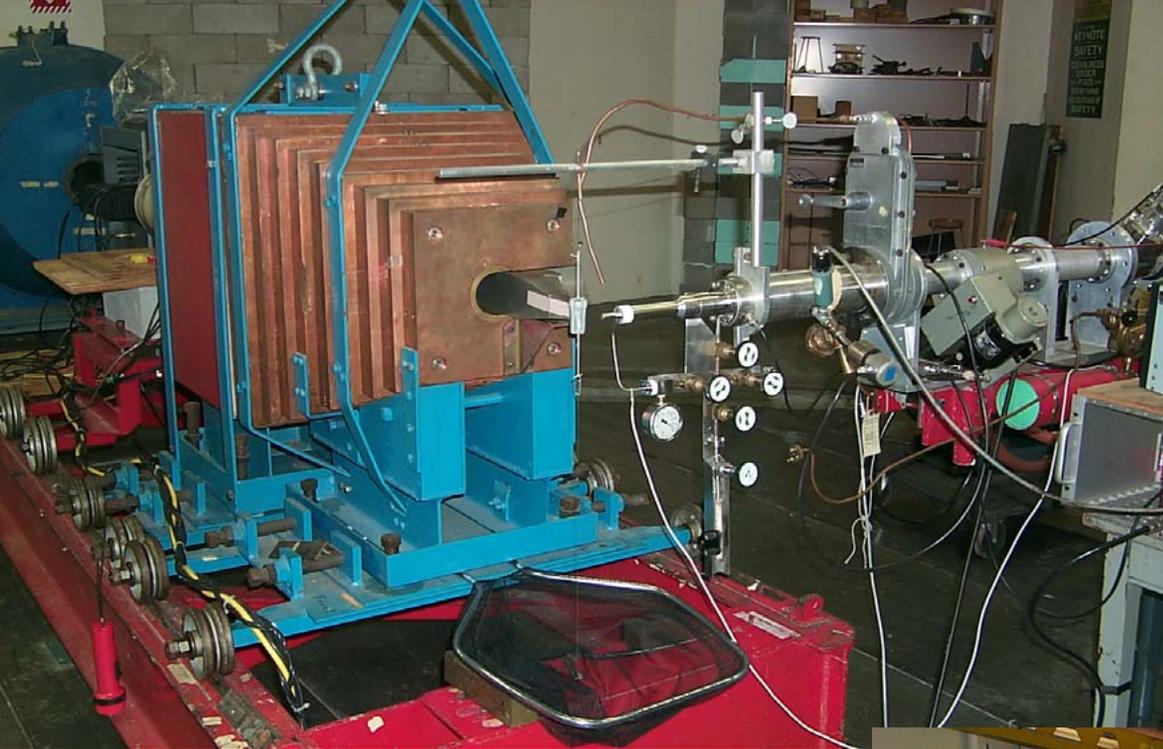
# University of Kentucky Nuclear Structure Lab Lexington, KY

Jeff Vanhoy, US Naval Academy



- Steve Yates
- Marcus McEllistrem
- 1-2 postdocs
- 2-4 grad students
- Numerous Ext Users
  - Sally & Jeff
  - U Cologne
  - Paul Garrett
  - Ga Tech

$V_{\max} \sim 7 \text{ MV}$ , pulsed beam 1.9 MHz @ 0.25-20 ns width, 300+ d/y



$$E_n \sim 0.25 - 20 \text{ MeV}$$

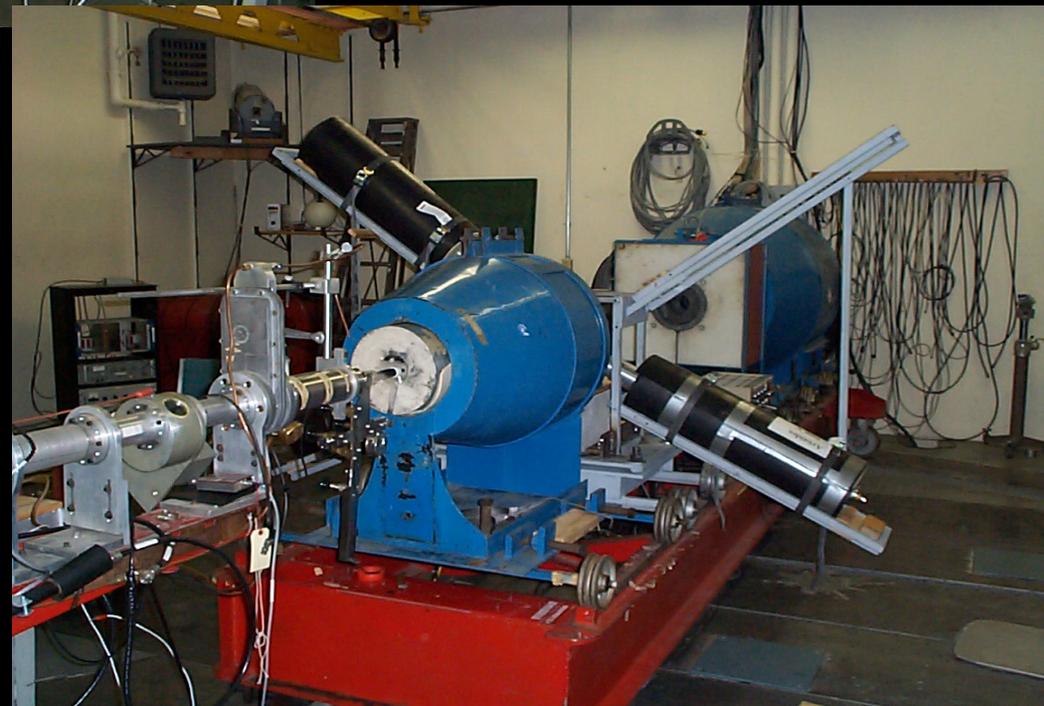
$$\Delta E_n < 0.15 \text{ MeV}$$

$${}^3\text{H} (p,n) \quad Q = -0.8 \text{ MeV}$$

$${}^2\text{H} (d,n) \quad Q = +3.3 \text{ MeV}$$

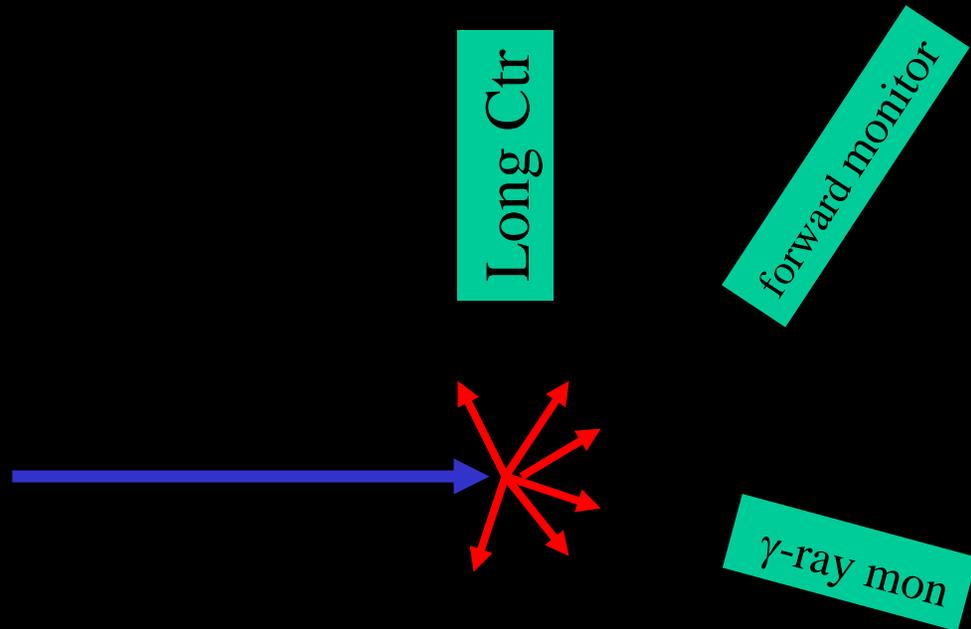
$${}^7\text{Li} (p,n) \quad Q = -1.6 \text{ MeV}$$

$${}^3\text{H} (d,n) \quad Q = +18. \text{ MeV}$$

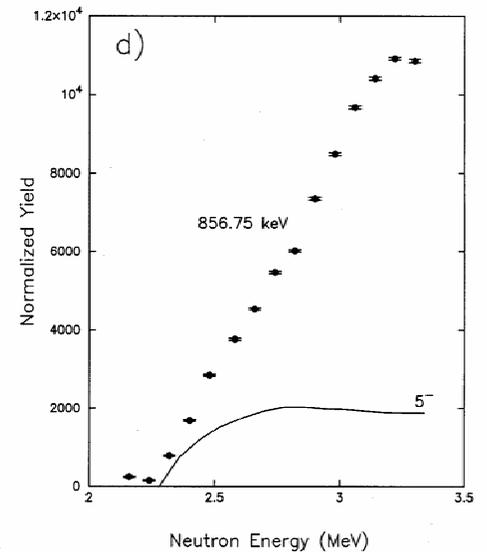
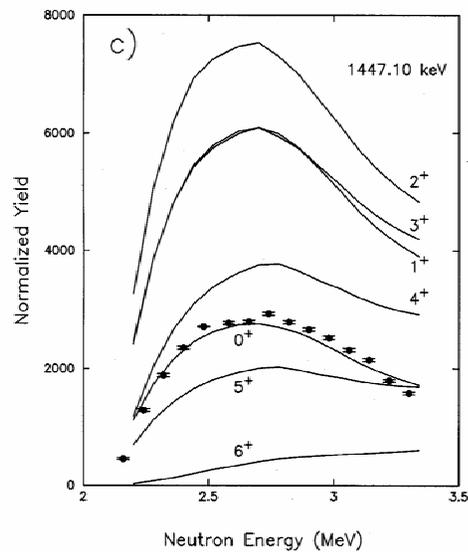
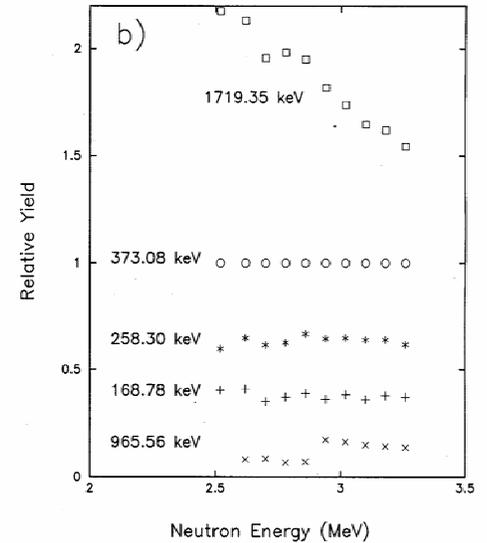
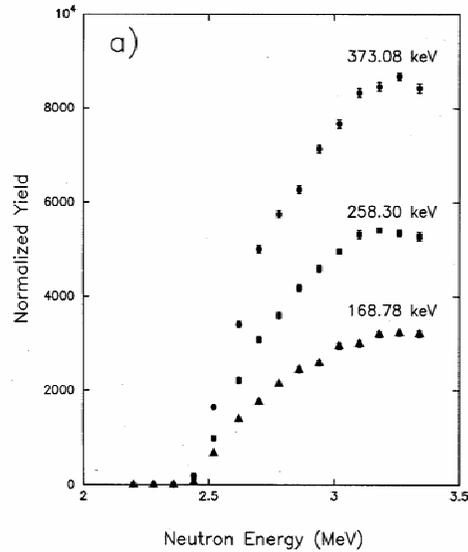
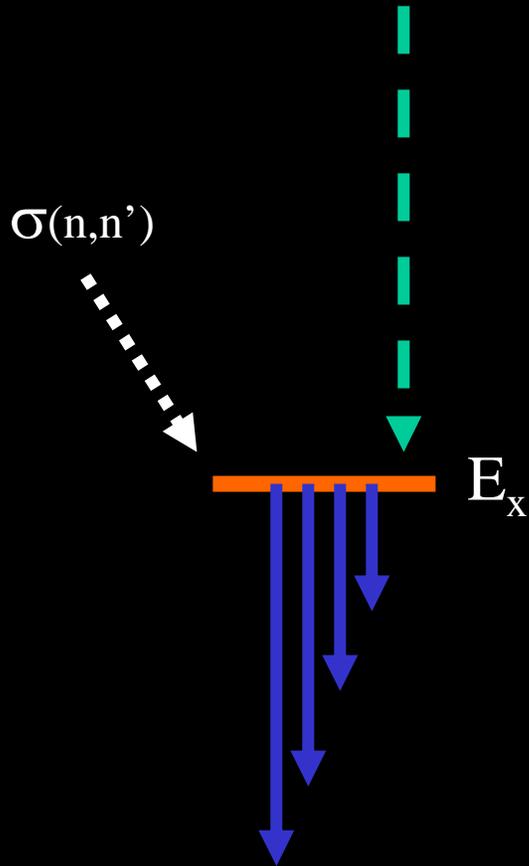


# Common Measurements

- $\gamma$ -ray detection    HpGe: tof
  - Excitation functions ( $\gamma$ -ray prod xs)
  - Angular distributions ( XL,  $I^\pi$ , br)
  - Level lifetimes (DSAM; transition rates)
  - $\gamma$ - $\gamma$  coincidence
- neutron detection    scintillator: tof w/ psd
  - 5 meter
  - (n,n') cross sections
- n- $\gamma$  coincidence detection



# $\gamma$ -ray Excitation Functions



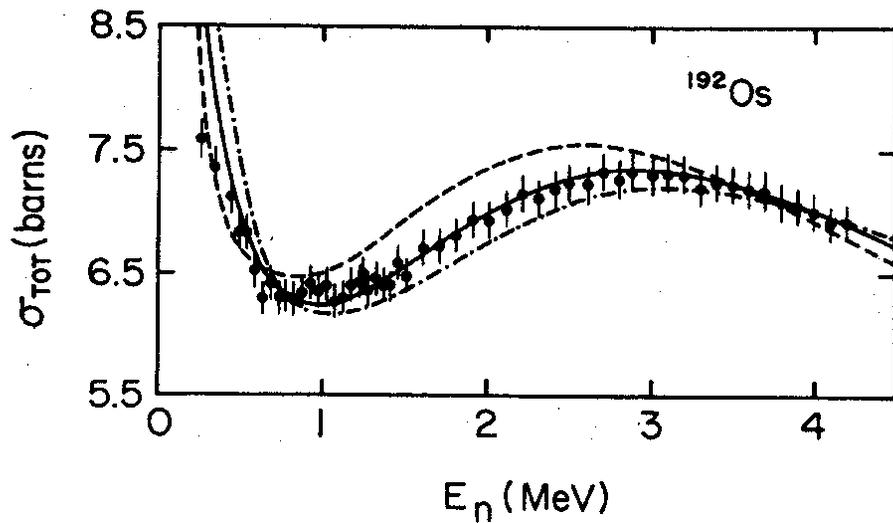


FIG. 3. The measured neutron total cross sections from  $^{192}\text{Os}$  are plotted along with model calculations. The solid curve is representative of calculations using either the ARM, DDT,  $\gamma$ -soft model, or the CE matrix elements. The dashed curve is from either the IBA-2 or the RVM (with the  $6^+$ ), while the dot-dashed curve is from the RVM (w/o the  $6^+$ ).

$\sim 5-8\%$

Hicks, PRC 40, 2509 ('89)

Hicks, PRC 41, 2560 ('90)

# neutron tof results

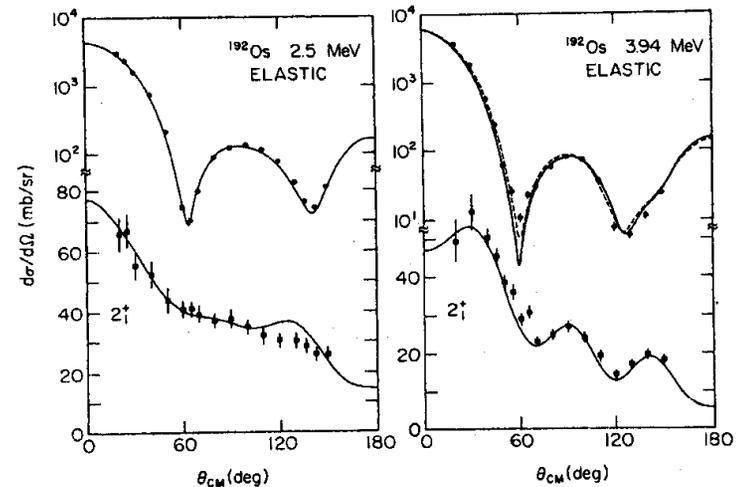


FIG. 4. Neutron elastic and inelastic scattering cross sections to the  $2_1^+$  level of  $^{192}\text{Os}$  at 2.50- and 3.94-MeV incident energies are presented in the left- and right-hand panels respectively. The solid curve is representative of CC calculations using reduced matrix elements from any of the better nuclear structure models discussed in this chapter. The dashed curve is from a CC calculation using a  $J$ -dependent potential, mimicked as an abnormally diffuse spin-orbit potential, as discussed in Sec. IV A.

# Kentucky's Niche

- Lab appropriate for 'common' targets:  $^{56}\text{Fe}$ ,  $^{23}\text{Na}$ , Cr, ...
- $E_n \sim 0.25 - 20 \text{ MeV}$
- Instrumentation exists for  $\gamma$ - & n- detection measurements
- Uncertainties 5-15% available now (OK, 1990).
- Achieving uncertainties in  $<5\%$  range requires careful examination of normalization factors.