Isabel Results

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The only way to have real success in science is to describe the evidence very carefully without regard to the way you feel it should be. If you have a theory, you must try to explain what's good and what's bad about it equally.

Richard Feynman

THE GOOD AND BAD IN ISABEL

Advantages of Isabel

- Time-like Monte Carlo code with "continuous phase-spase" model of the target
- Detailed treatment of π production (via Δ_{33} which may "charge exchange")
  No π potential
- No additional "fitting parameters" (e.g. cutoff on relative energies)

Disadvantages of current calculations with Isabel

- **Isabel is a semi-classical INC code – with all the limitations of those!**
- No “coalescence” – no production of “prompt” light composites
- No “pre-equilibrium” – problems in the “intermediate” energies regime
- High energy limitation (E_{inc}< ~2 GeV) due to limited elementary cross-sections (e.g. no multi-pion production)
- And…

The truth is rarely pure and never simple

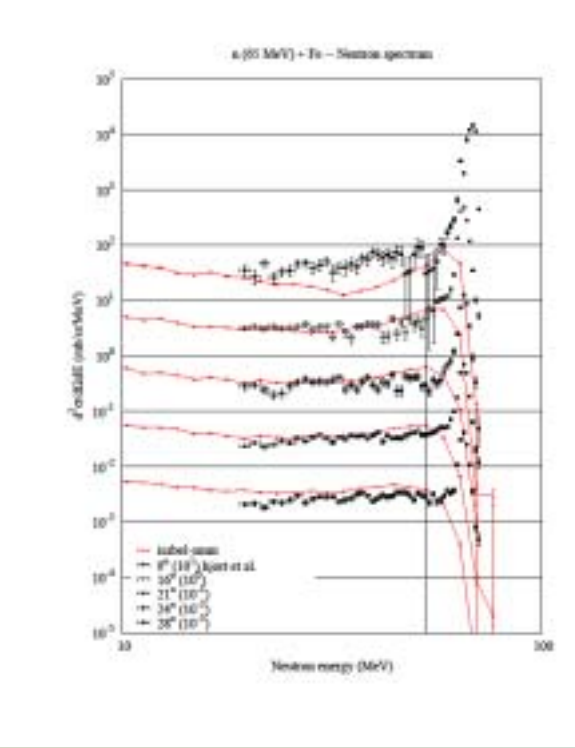
Oscar Wilde

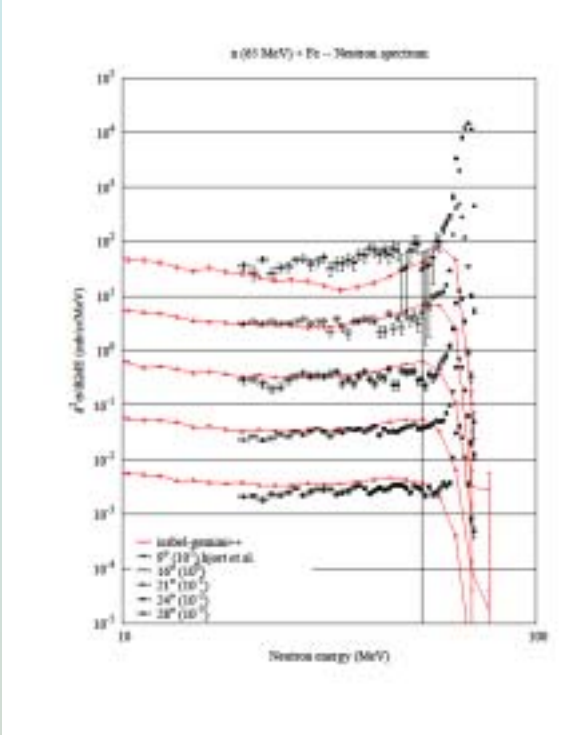
Le diable se cache dans les details!

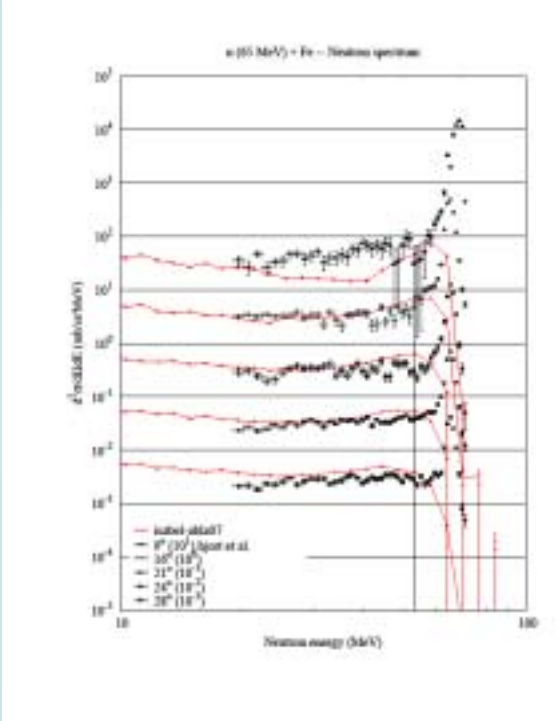
DOUBLE-DIFFERENTIAL CROSS SECTIONS

Fe (n,n')X, 65MeV Hjort

So-So. Too low energy for INC!



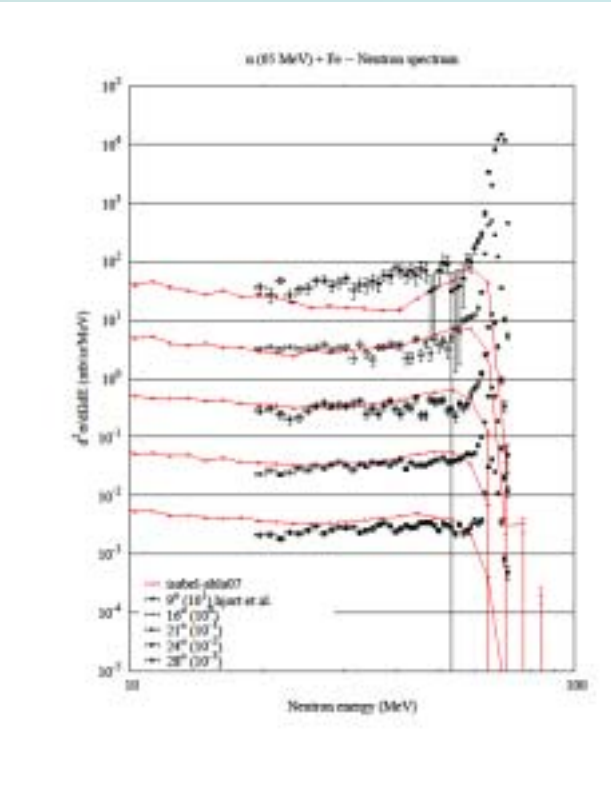


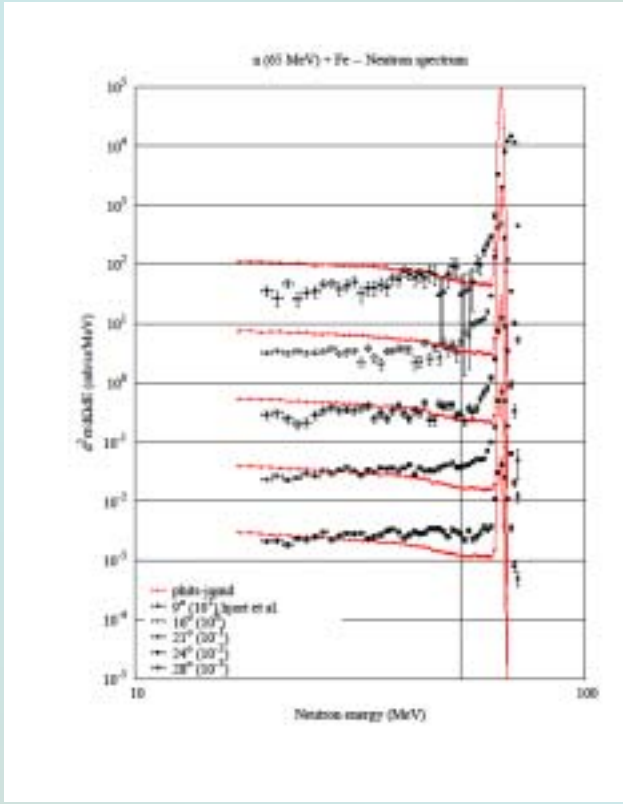


Fe (n,n')X, 65MeV Hjort

Isabel+ABLA07 vs. PHITS+JQMD

Does QMD help? Hardly!

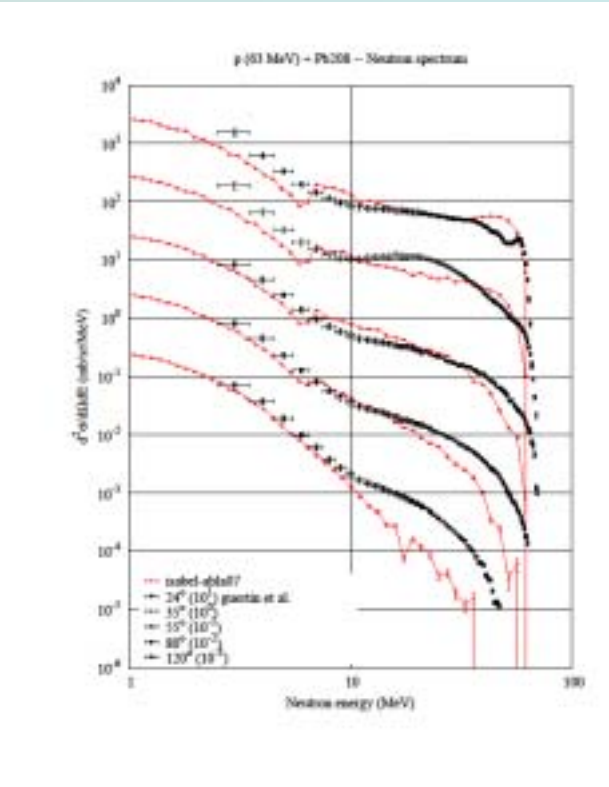


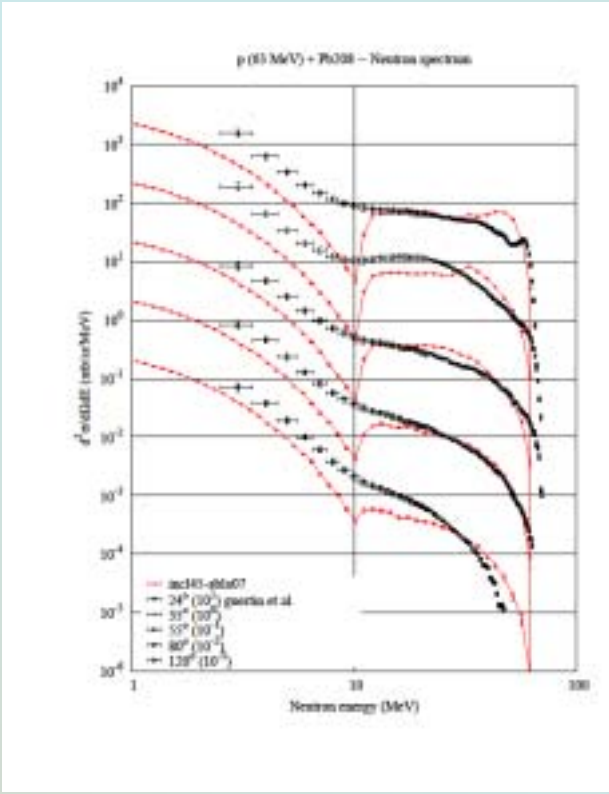


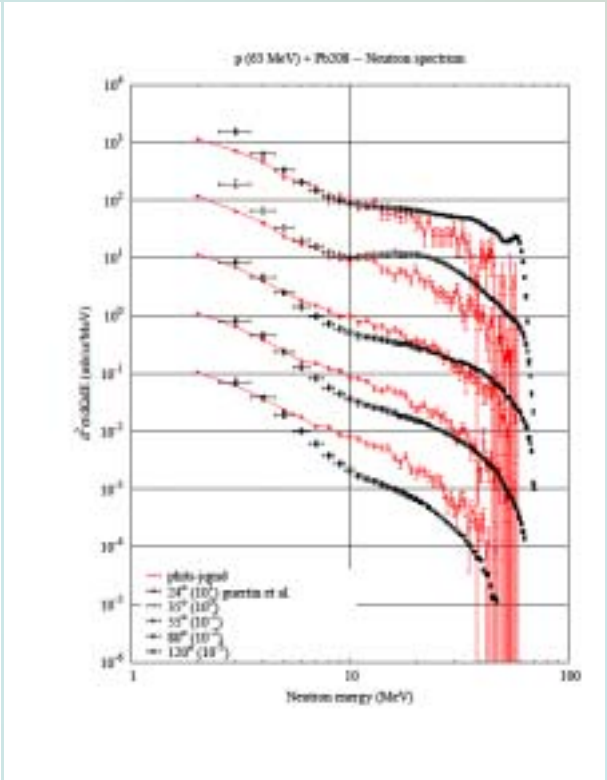
Pb (p,n')X, 63MeV Guertin

Isabel+ABLA07 vs. INCL4+ABLA07, PHITS+JQMD

It's not a problem of Fe being light? No.

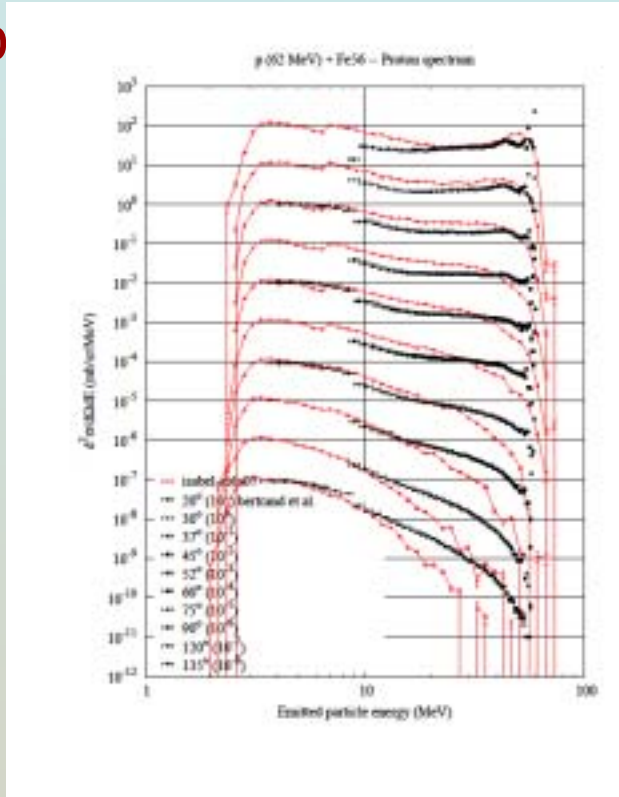


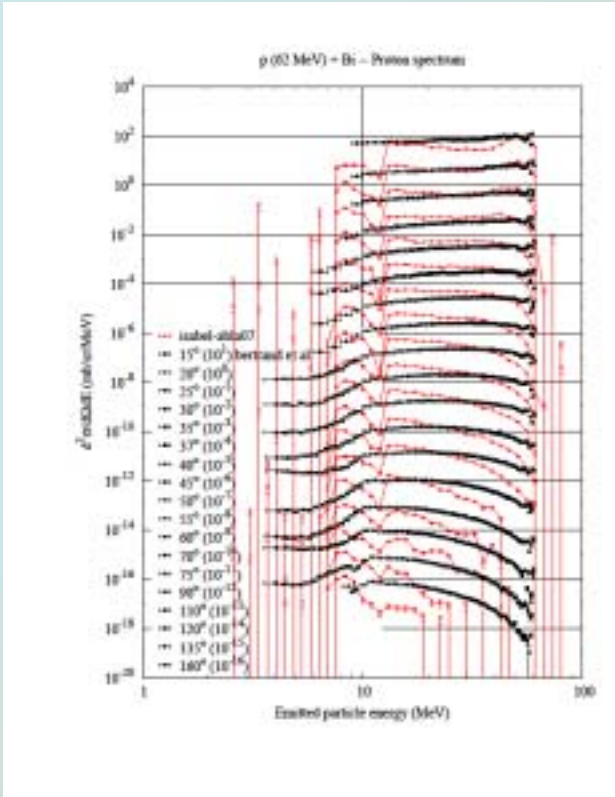




Fe (p,p')X,Bi(p,p')X, 62MeV, Bertrand

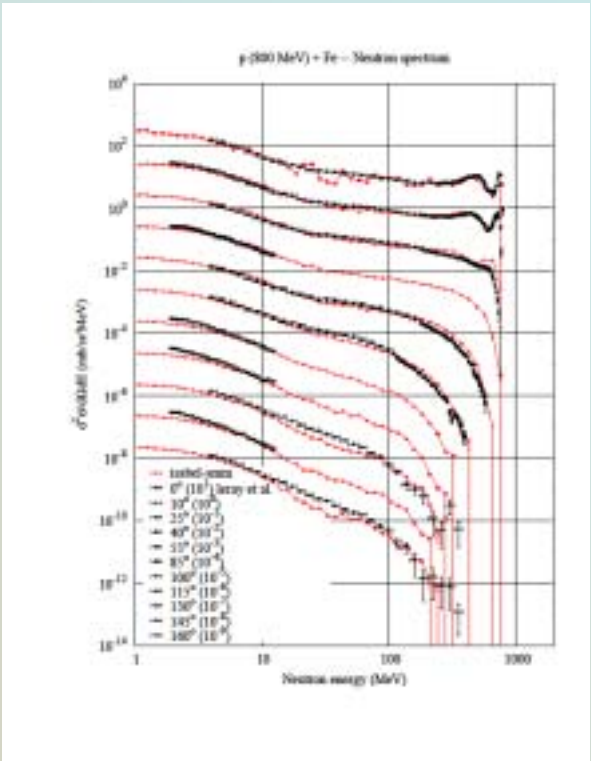
he situation with protons is not better – there is, in addition, final Co

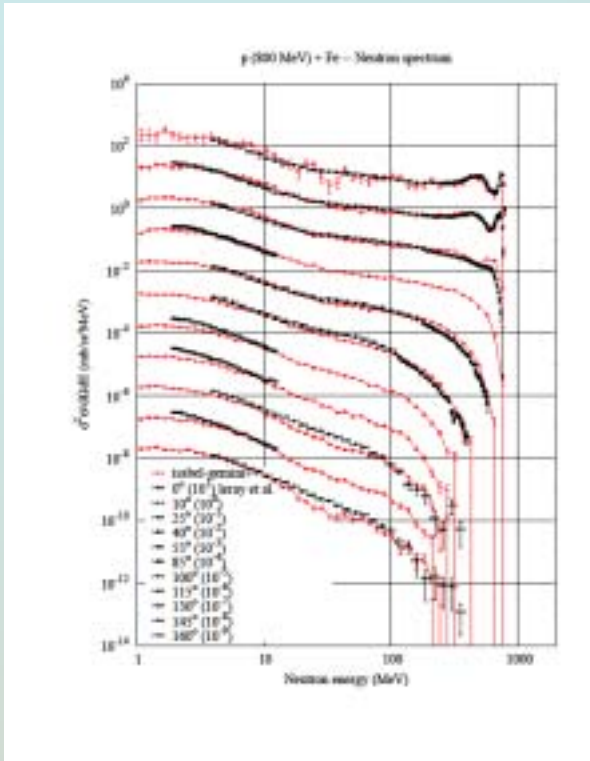


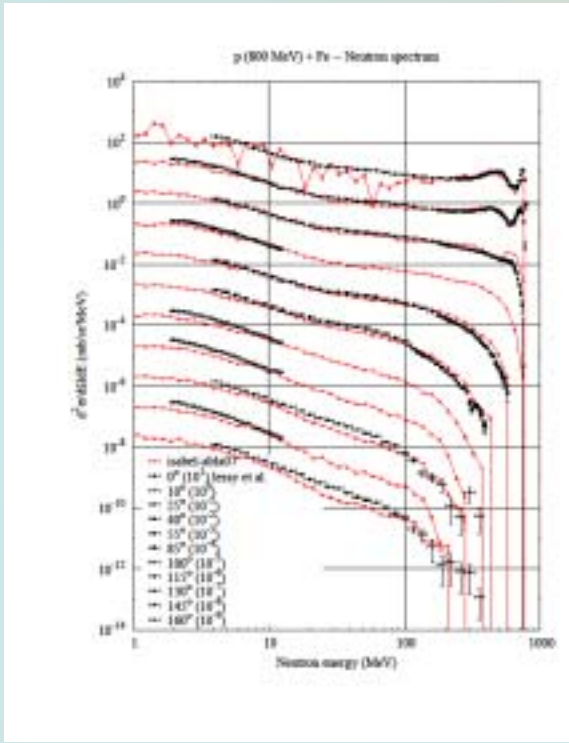


Fe(p,n)X, 800 MeV, Leray

Nice!

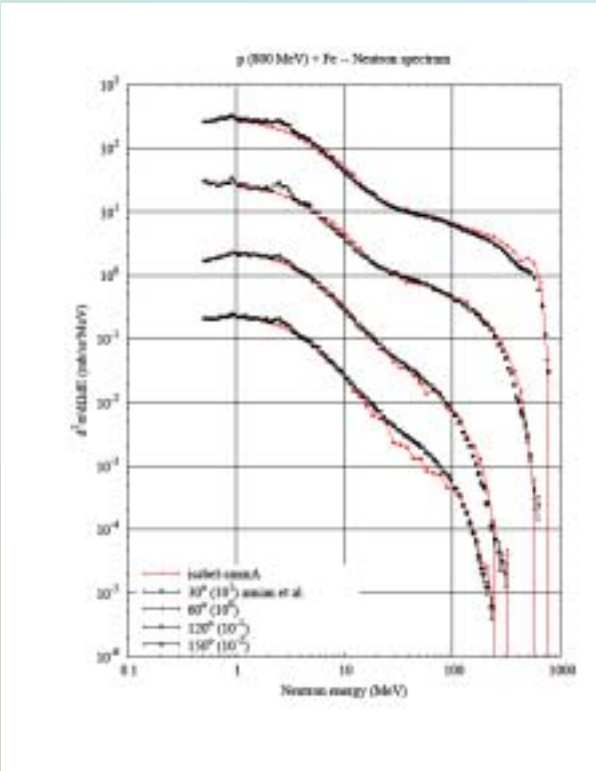


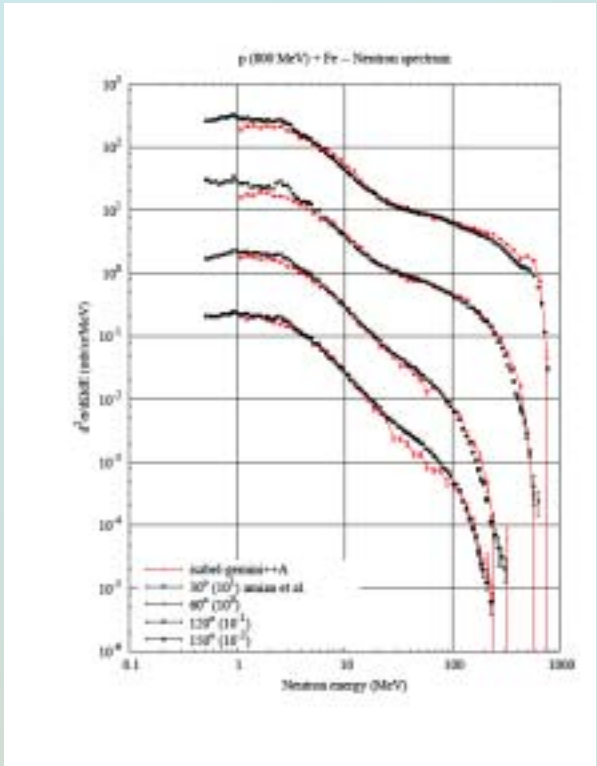


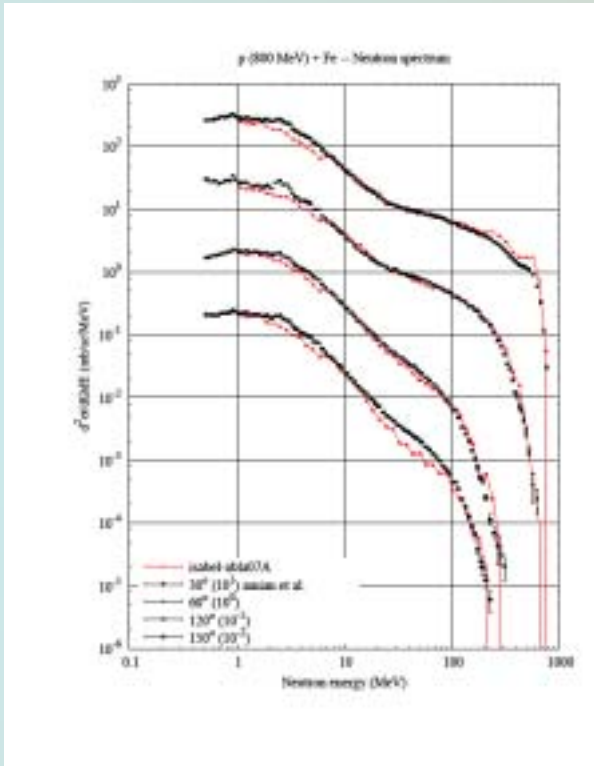


Fe(p,n)X, 800 MeV, Amian

Nice!

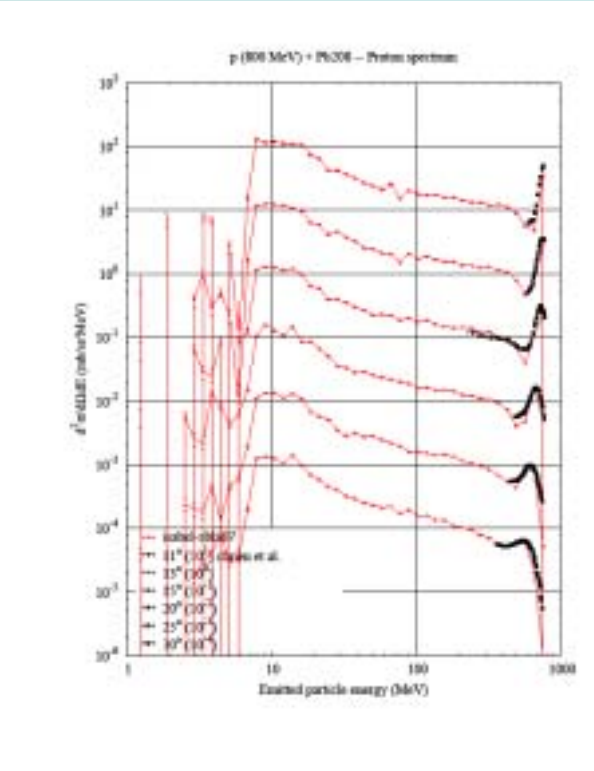


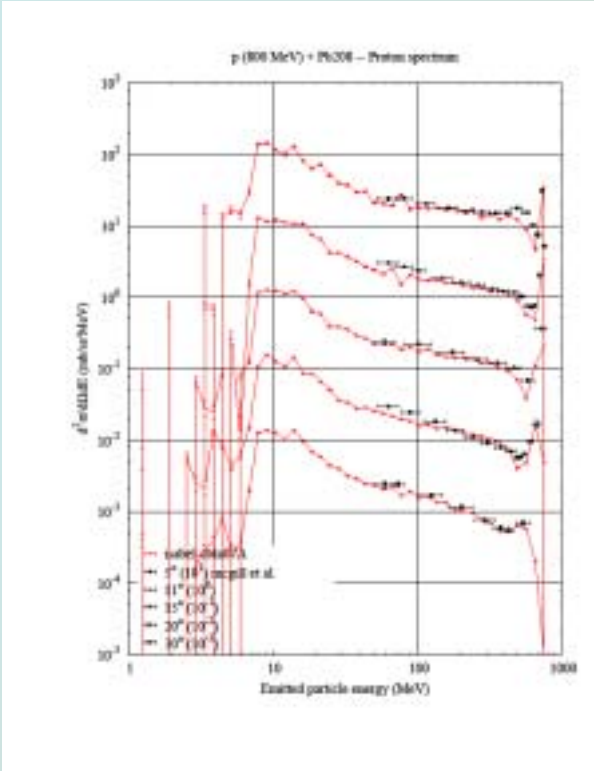




Pb(p,p')X, 800 MeV, Chrien, McGill

High energy protons are OK as well!

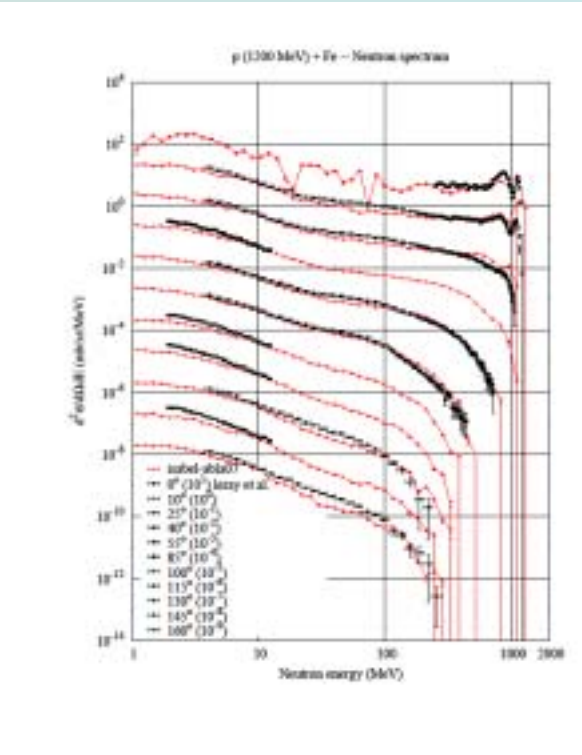


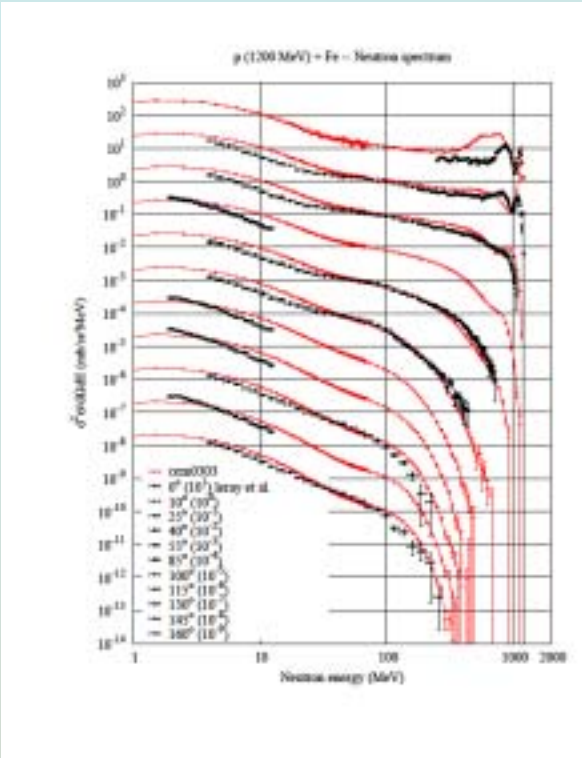


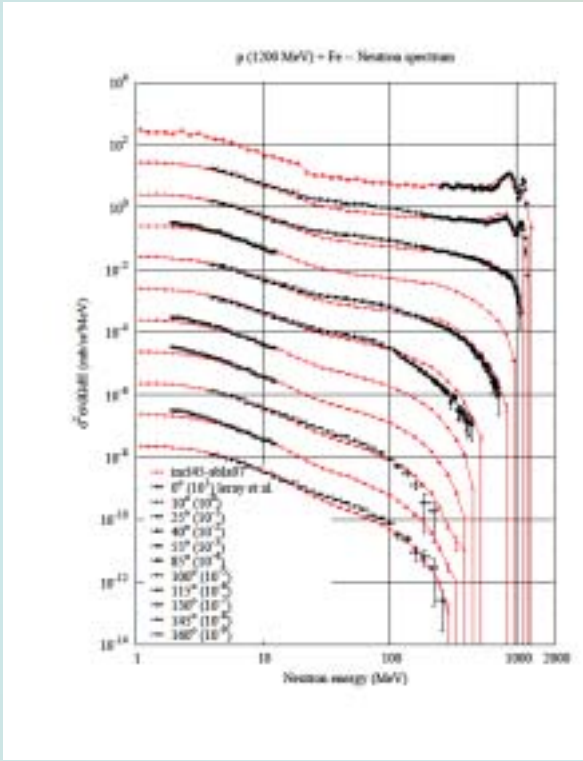
Fe(p,n)X, 1200 MeV, Leray

Isabel+ABLA07 vs. CEM303, INCL4+ABLA07

Quite nice, Isabel & INCL4 treat well the Δ_{33}



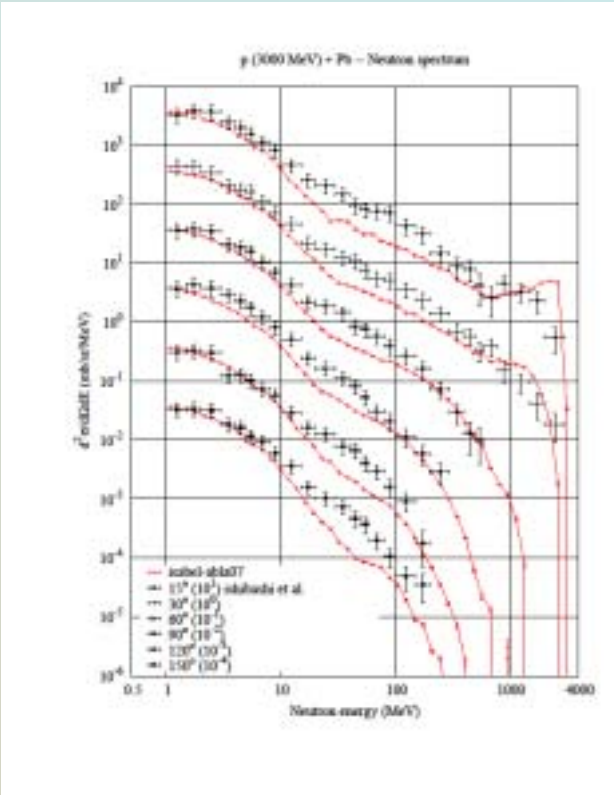


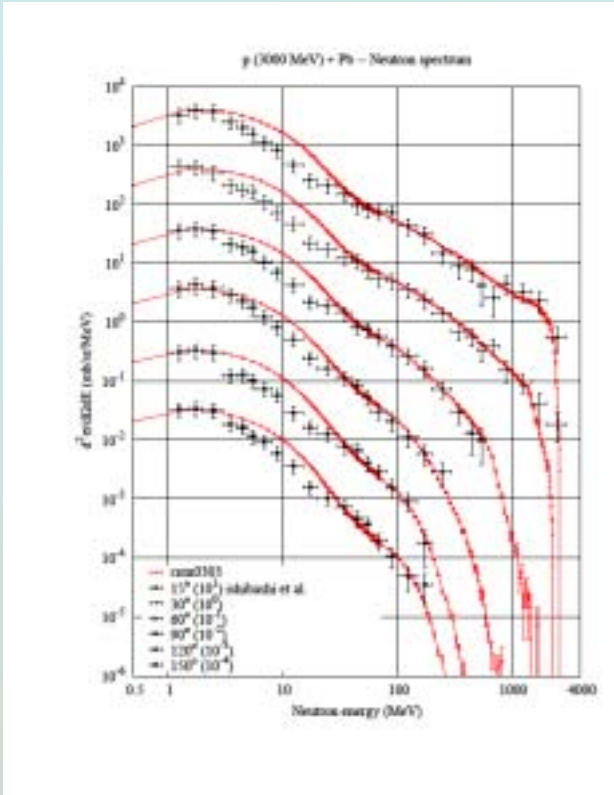


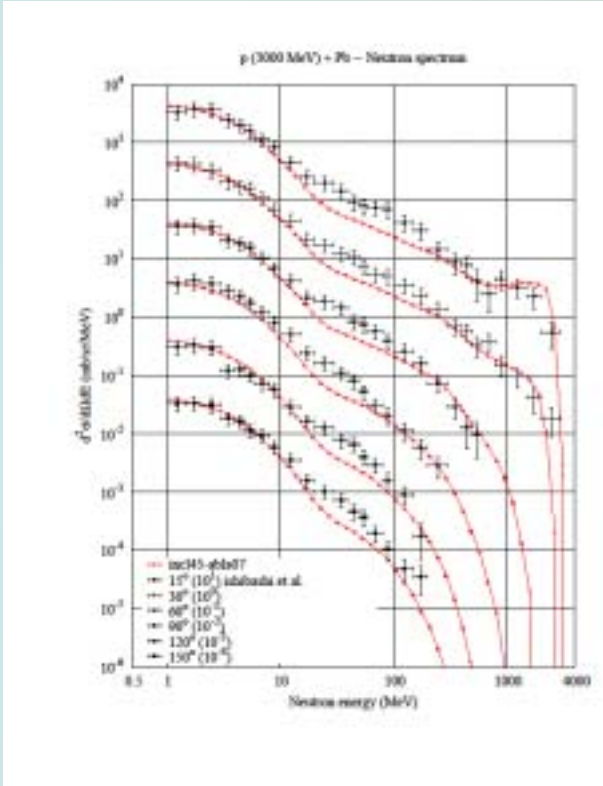
Pb(p,n)X, 3000 MeV, Ishibashi

Isabel+ABLA07 vs. CEM303, INCL4+ABLA07

High Energy, Isabel, Incl missing multi-π production?

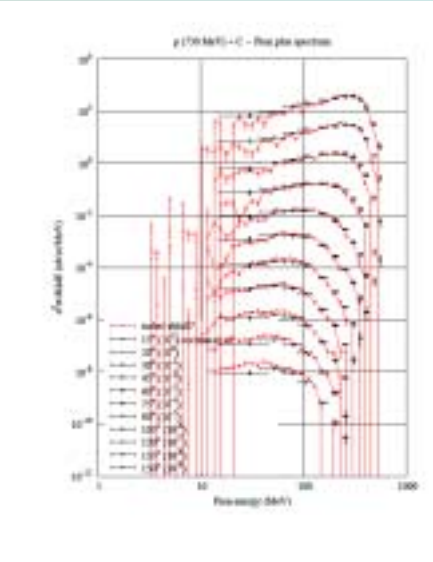


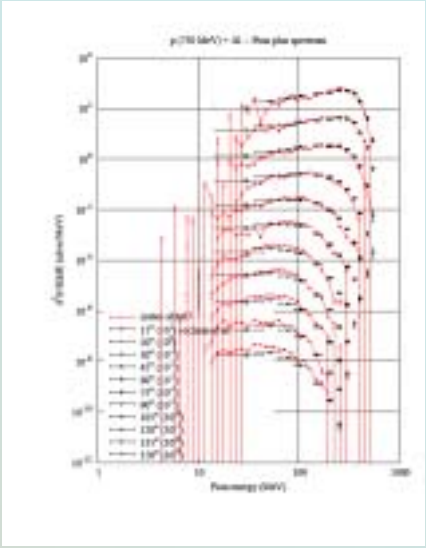


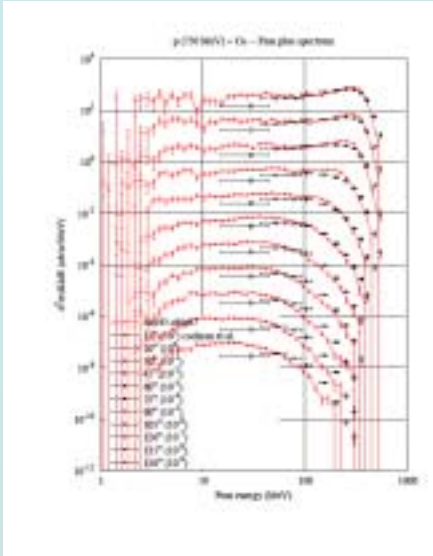


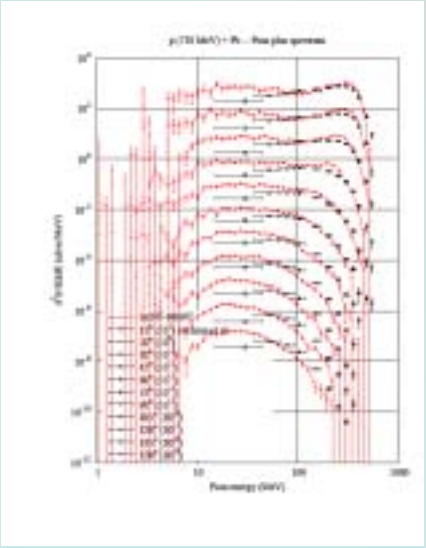
C,Al,Cu,Pb(p, π^+)X, 730 MeV, Cochran

π^+ OK



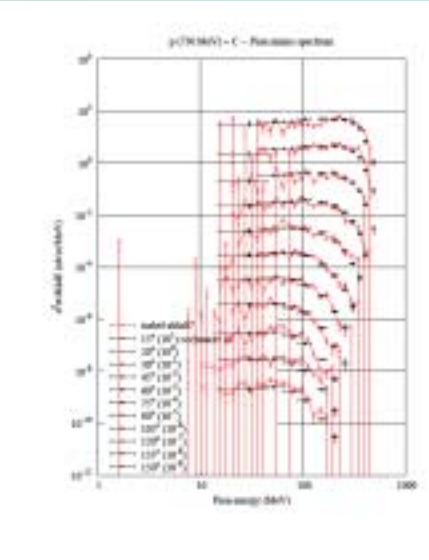


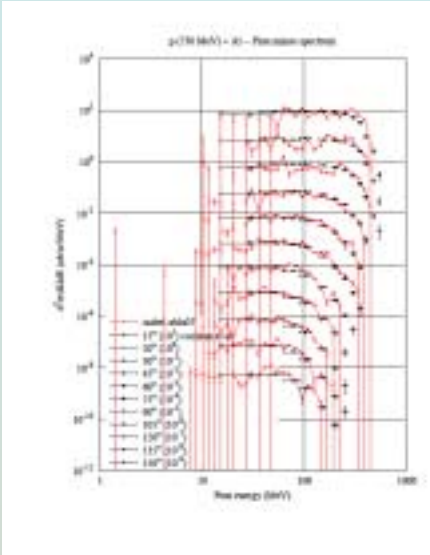


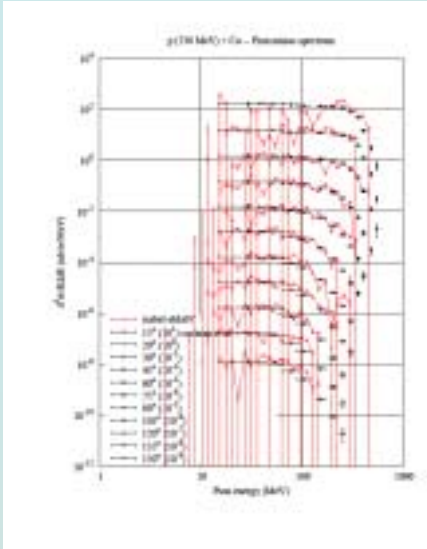


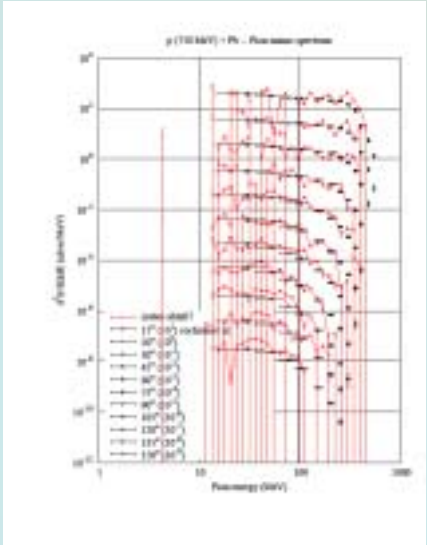
C,Al,Cu,Pb(p, π^-)X, 730 MeV, Cochran

π^- OK



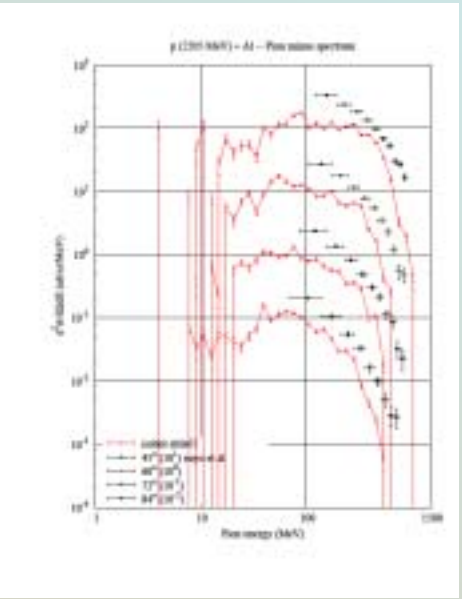


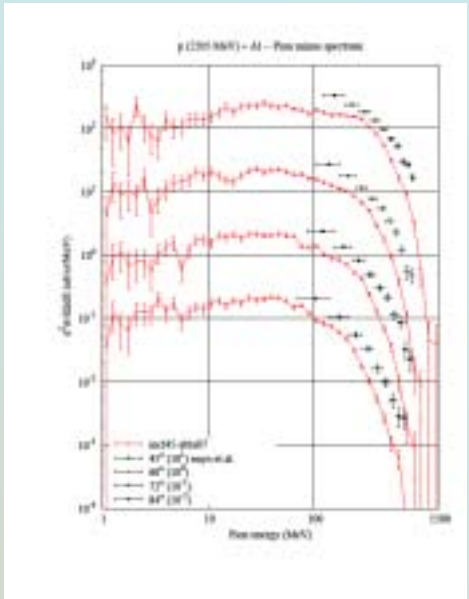


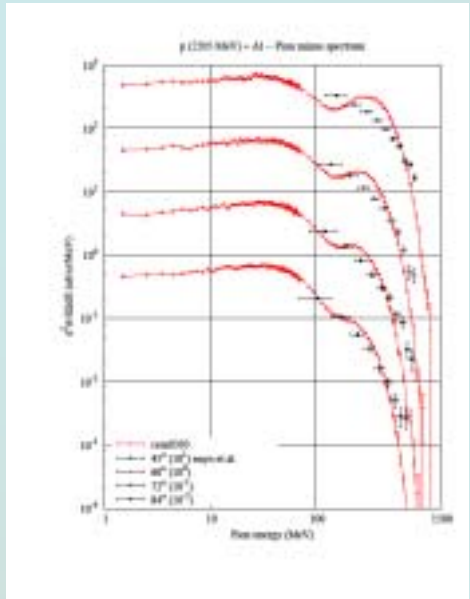


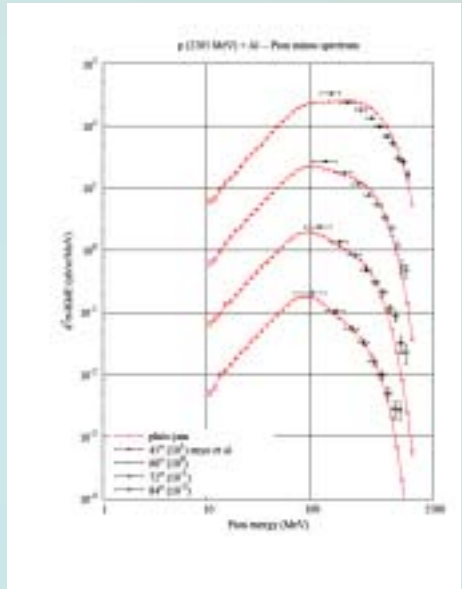
Al,Cu,Pb(p, π^-)X, 2205 MeV, Enyo

igh Energy, Isabel, INCL missing multi-π production?







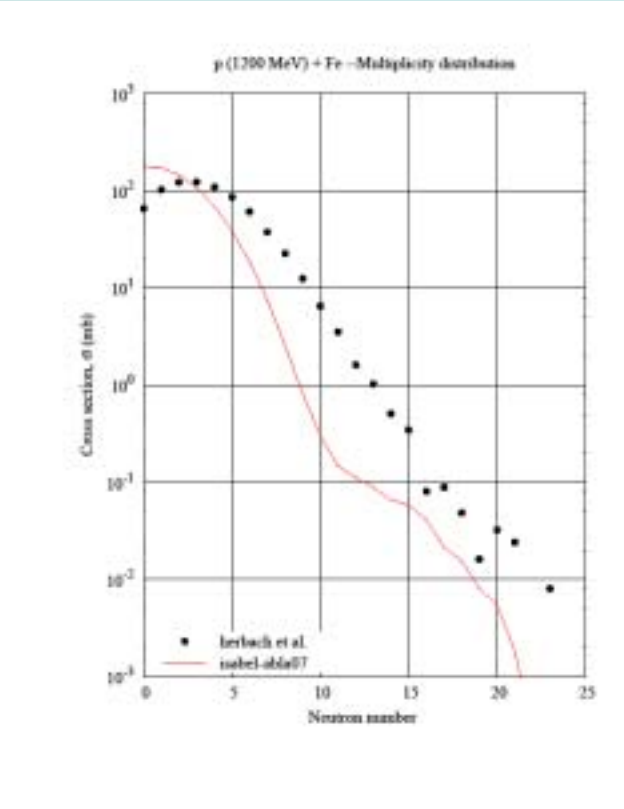


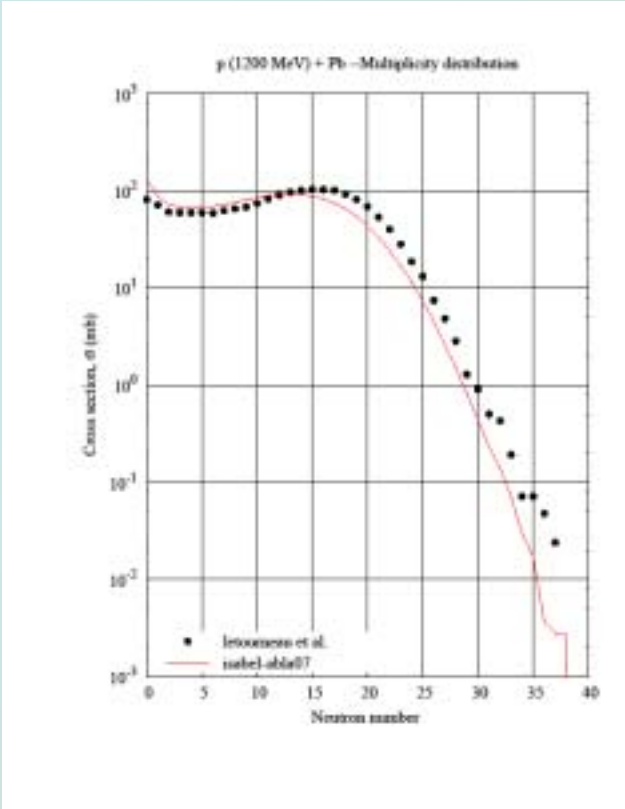
If the facts don't fit the theory,
change the facts
Albert Einstein

MULTIPLICITY DISTRIBUTIONS

Fe(p,Xn)X, Pb(p,Xn)X, 1200 MeV Herbach, Leturneau

Fe is bad, Pb is good (in everybody's calculations)! Why?





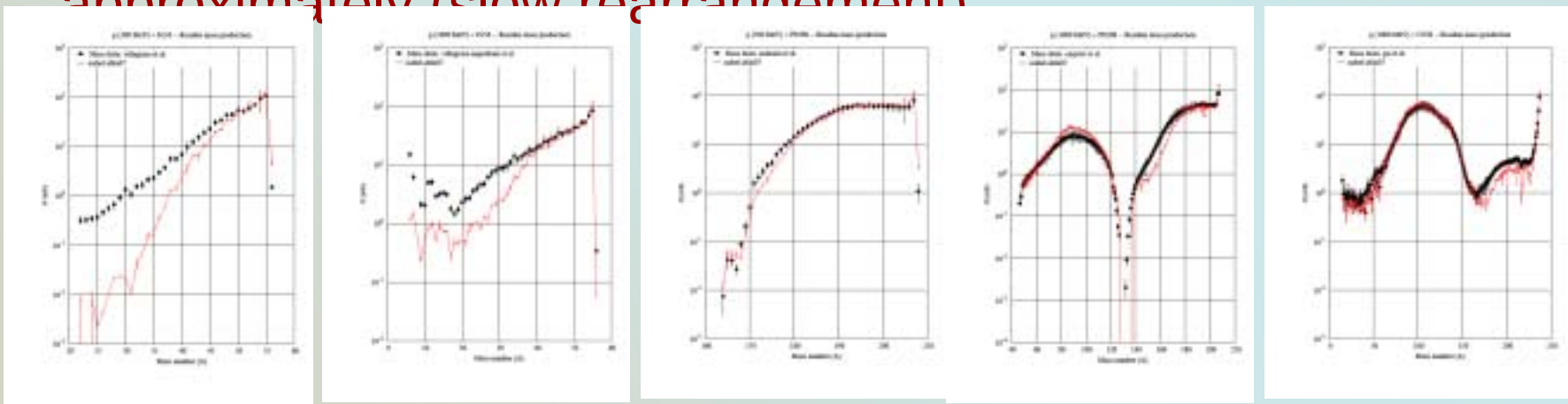
All models are wrong, but some are useful.
George E.P.Box

RESIDUE MASS & CHARGE PRODUCTION

Residue Mass

Fe(p,A)X, 300, 1000 MeV Villagrasa
Pb(p,A)X, 500 MeV Audouin
Pb(p,A)X, 1000MeV, Enquist
U(p,A)X, 1000MeV, GSI

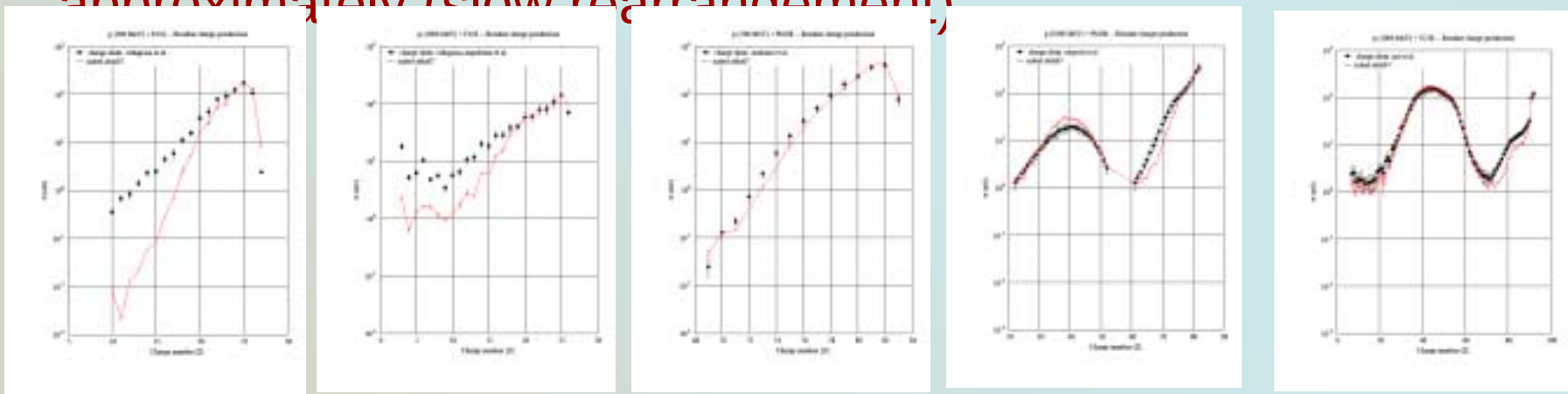
ice behavior close to target A. Deviations in light targets. In Isabel the structure of nuclear potential does not change during the reaction and the Fermi see depletion is treated approximately (slow rearrangement)



Residue Charge

Fe(p,Z)X, 300, 1000 MeV Villagrasa
Pb(p,Z)X, 500 MeV Audouin
Pb(p,Z)X, 1000MeV, Enquist
U(p,Z)X, 1000MeV, GSI

ice behavior close to target Z. Deviations in light targets. In Isabel the structure of nuclear potential does not change during the reaction and the Fermi see depletion is treated approximately (slow rearrangement)



Isotopic Distributions

Fe(p,Z)X, 300, 1000 MeV Villagrasa
Pb(p,Z)X, 500 MeV Audouin
Pb(p,Z)X, 1000MeV, Enquist
U(p,Z)X, 1000MeV, GSI

ice behavior close to target.
Deviations in light targets.
In Isabel the structure of nuclear potential does not change during the reaction and the Fermi see depletion is treated approximately (slow rearrangement).

he effect of this approximation is relatively less important for heavy targets

I have opinions of my own – strong opinions – but I don't always agree with them
George Bush

SUMMARY

美人迟暮 (měirén-chímù)

A beauty in her old age

- Isabel reproduces relatively well large amount of data with very few parameters and NO ADJUSTMENTS
- Possible improvements:
  - Better “final state” Coulomb trajectories
  - Better description of nuclear potential & phase space densities development during reaction
  - Extension of elementary cross sections to higher energies

The most exciting phrase to hear in science, the one that heralds new discoveries, is not ‘Eureca!’, but ‘that’s funny…’
Isaak Asimov

The great tragedy of science,
the slaying of a beautiful theory
by an ugly fact
Thomas Henry Huxley

THANK YOU!