Nuclear data needs: LANL perspective

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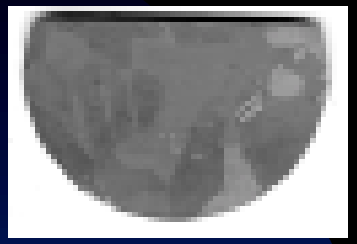
This talk is UNCLASSIFIED

Programs and topical areas

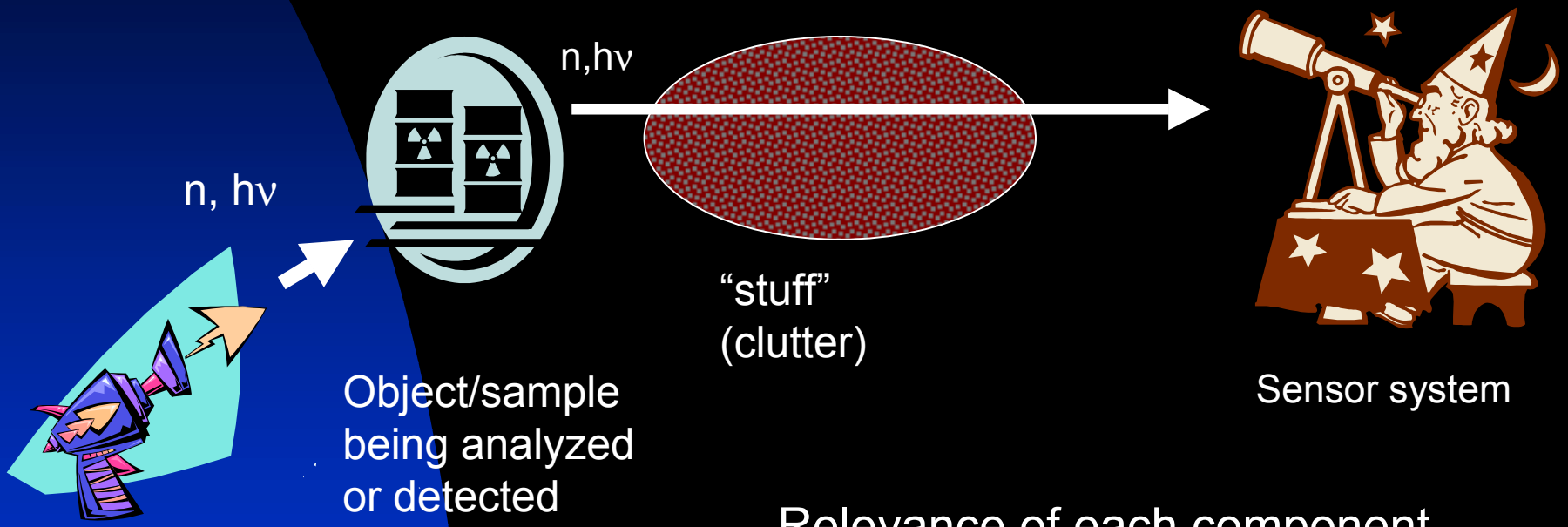
- Emergency Response (“NEST”)
  - Triage
  - Diagnostics/assessment
- Second Line of Defense and related perimeter-protection programs
- Safeguards and international initiatives
- “Attribution” (talk to Chadwick)



What we do at LANL

- Instrument and technique development to support end users
- Direct support of users through installations, operations
- Analysis of samples and information brought to the Laboratory (Triage, Attribution, etc.)
- Provide good advice…

An instrument developer's view of the universe



Relevance of each component (and of nuclear data *re* each component) varies from scenario to scenario.

Sensors

- In most applications, modeled phenomenologically, so less need for detailed cross sections, etc.
- Some value in improving neutron transport calculations for high-efficiency neutron counters
  - Angular correlations in neutron emission
  - Neptunium (of limited practical importance)
  - Problems with "high-α" materials (where (α,n) dominates fission) are not mainly due to cross section problems

- Better grasp of inelastic neutron reactions in novel γ-ray detectors (e.g. LuAP) nice, but not critical

Interrogators

- Nuclear data not directly a limiting factor in design of accelerators, neutron sources, etc. –
- -- But knowing whether the source will do anything useful is important and does involve improved nuclear data.
  - See comments on next two VGs.

Clutter

- "Clutter" in one scenario is "vital information" in another!
- With many inelastic neutron reactions (e.g. on C, N, O, Fe), field measurements don't agree well with calculations – not clear why
- Transport of n and γ beams with 10 MeV<E<50 MeV not perfectly understood even in air
  - Important for deciding whether moderate-energy interrogation is feasible

Source term: the main place where improvements are needed

- Attribution: much mature science, but significant room for improvement
  - Neutron interactions with short-lived, minor actinides
  - See Mark Chadwick for details
- More work is needed on neptunium

Some related Los Alamos projects

- Characterization of ^{237}Np
  - Experimental effort at LACEF wrapping up
  - Nuclear-data implications being worked
- Americium ΔA for attribution
  - *May need some new information here*
- Other advanced attribution computational projects
- Delayed neutrons from photofission
  - Goal: improved active interrogation
- Epithermal neutron interrogation
  - Nuclear-data needs unclear