LEPLAr Day 2: Cross-section modeling panel

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LEPLAr Day 2: Questions for cross-section modeling panelists

1. What should the process be for improving experimentalists' tools for low-energy (0-75 MeV) interaction simulations? Can we expand existing LArSoft-friendly generators, like MARLEY? If so, how does this work? If not, why not?
2. Same question, but for MeV-scale physics associated with GeV-scale neutrino interactions and relevant generators (neutron production, de-excitations, etc.)
3. What existing datasets from existing experiments should be analyzed/produced to provide improved inputs for low-energy (0-75 MeV) generators? Are these inputs sufficient, or are additional datasets (i.e. new experiments) necessary?
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    1. Theorists need to think about and calculate more exclusive final states and less inclusive response functions. It may be more important to be correct (agree with experiment for a certain state) than to be consistent.
    2. 0-75 MeV involves different energy sub-domains where the importance of describing every single state is different. Does MARLEY get uglier as you go up in energy?
2. What existing datasets from existing experiments should be analyzed/produced to provide improved inputs for low-energy (0-75 MeV) generators? Are these inputs sufficient, or are additional datasets (i.e. new experiments) necessary?

Energy resolution is very important for SN!

- If nu oscillations or BSM physics introduces a “sharp” energy feature in the SN nu_e spectrum, how large and how sharp must this feature be for DUNE to see it?
- How well can we determine the small difference between the nu_e and anti-nu_e mean energies? This is important for oscillations and for nucleosynthesis.
- Neutrino driven wind in a SN is an important nucleosynthesis site. Composition of wind (neutron rich vs proton rich) depends sensitively on mean nu_e vs aniti-nu_e energies.
- Extracted mean nu_e energy may have large systematic errors from cross section uncertainties.
- Important to measure CC Ar cross section with pion decay at rest nus (probably at SNS).