

ARGONNE  
NATIONAL LABORATORY



United States  
Department of Energy

The University of Chicago

ENTRANCE

# *IPNS Overview*

*March 16, 2005,  
Ray Teller*

## **Argonne National Laboratory**



Office of Science  
U.S. Department of Energy

*A U.S. Department of Energy  
Office of Science Laboratory  
Operated by The University of Chicago*



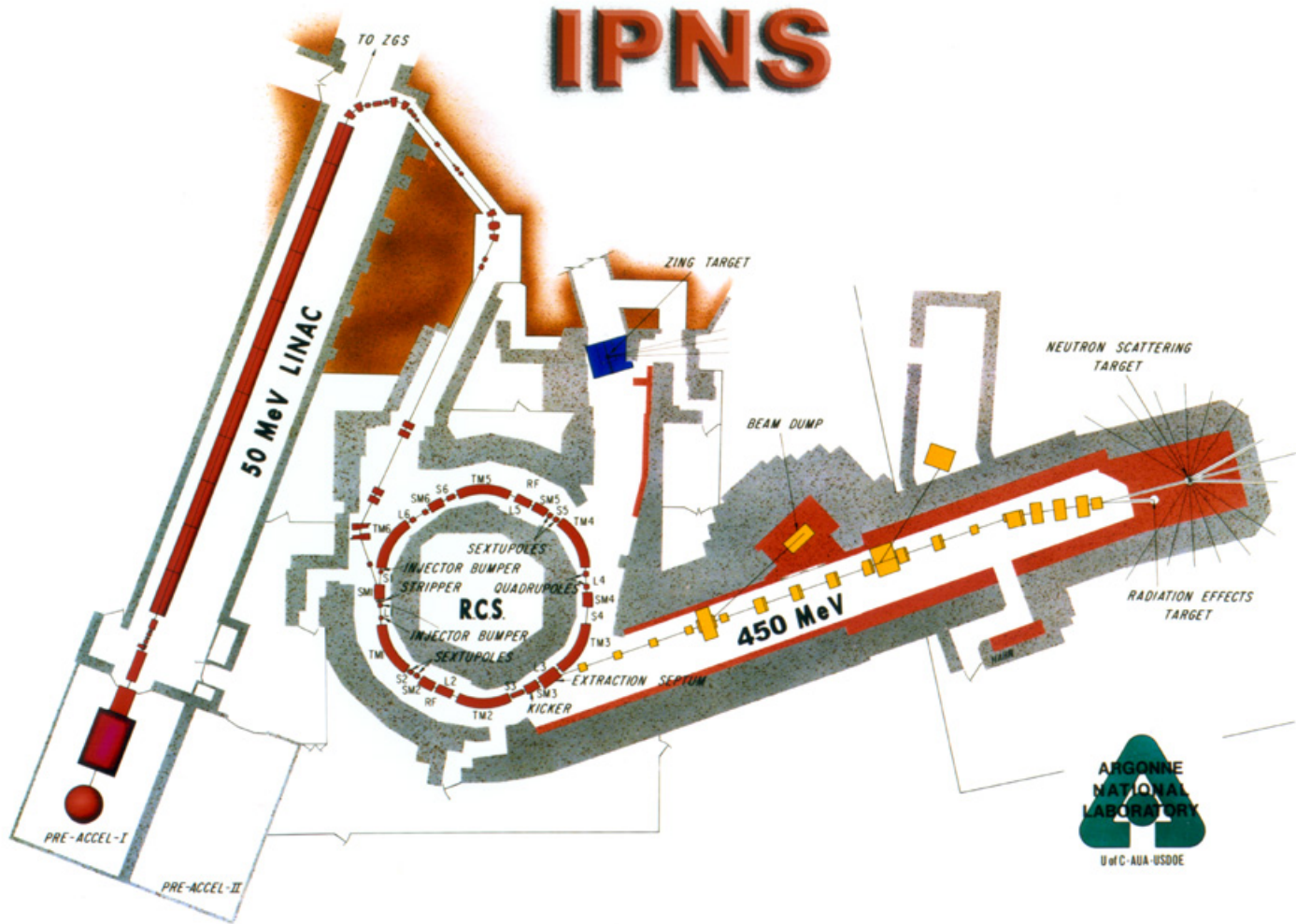
# *Messages*

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- Many important experiments are not flux-limited
- Access to samples and ideas are key
- IPNS-APS-CNM-user community linkages can serve to drive world-class science



# Intense Pulsed Neutron Source



75% of available time dedicated to user access through the proposal system

13 instruments

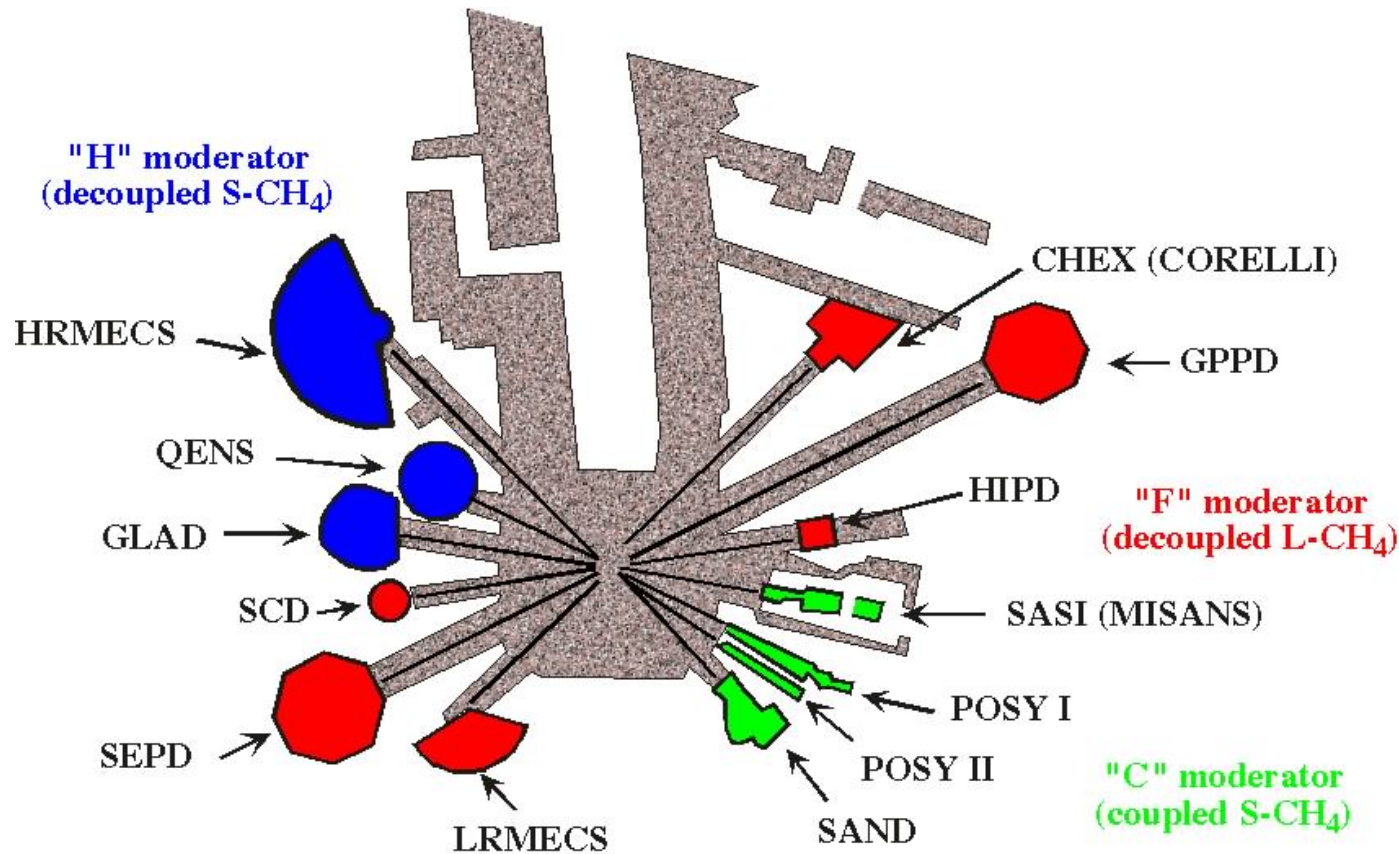
10 in user program

Operate 26 weeks/year

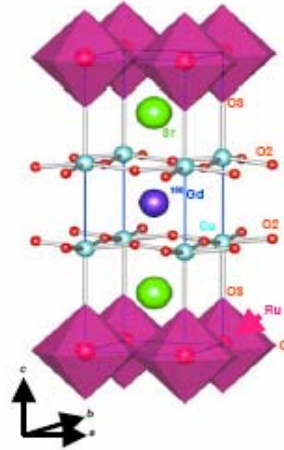
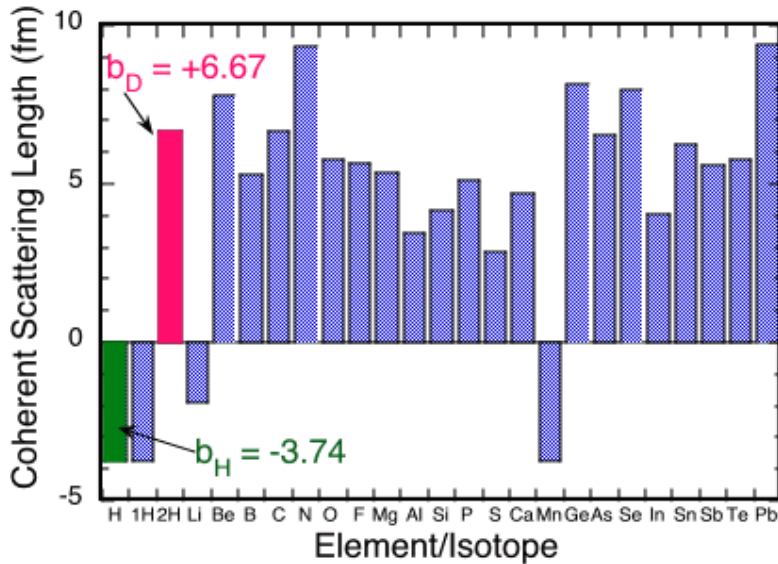
5 WA, 2 SA  
Diffraction

2 (Horiz, Vert)  
reflectometers

4 spectrometers



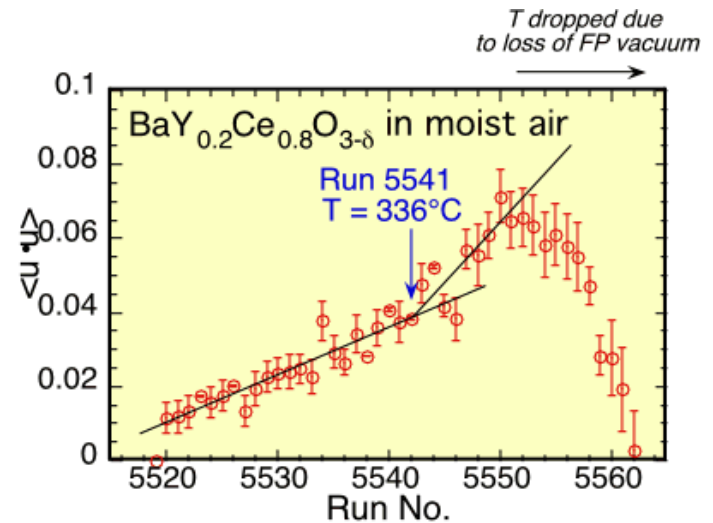
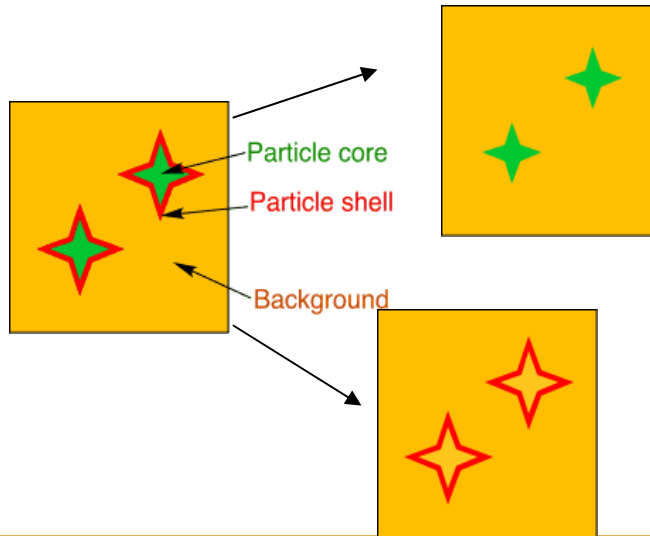
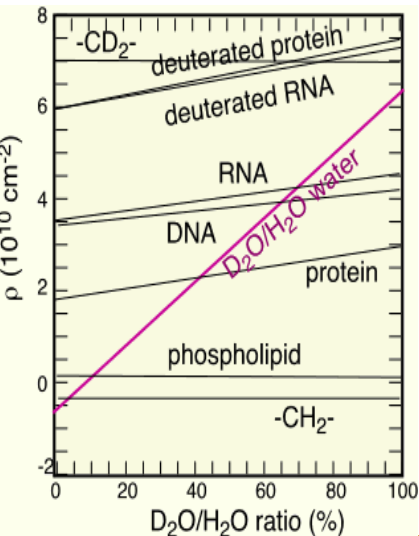
# Unique Neutron Properties

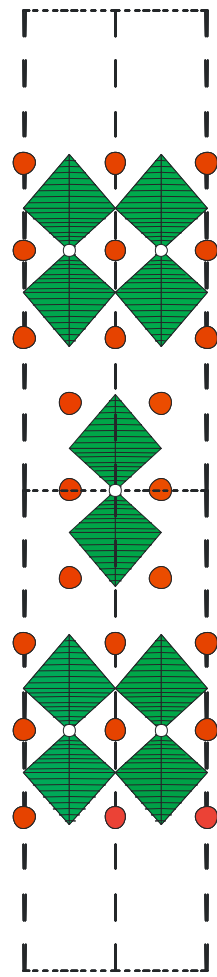


Neutron Magnetic Moment → magnetic structure studies

**In situ studies!**

Very large incoherent scattering by H-atom → proton motion understanding

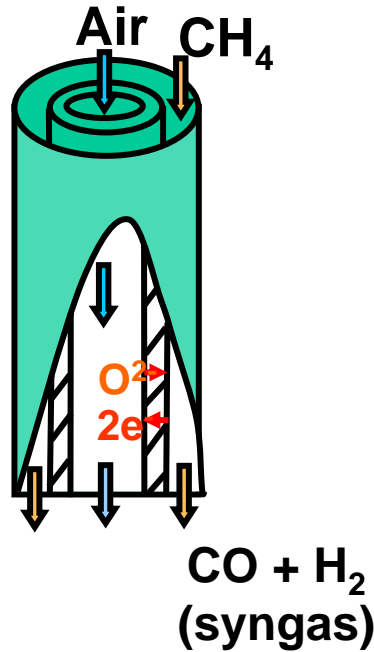




Rocksalt layer

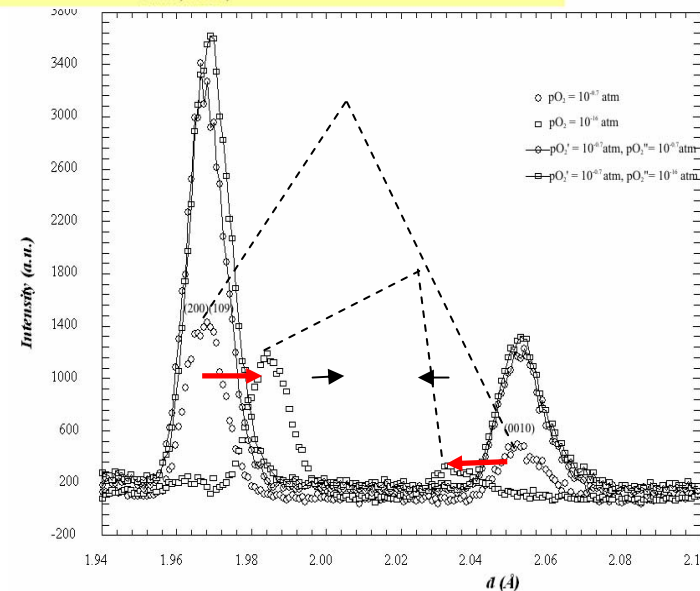
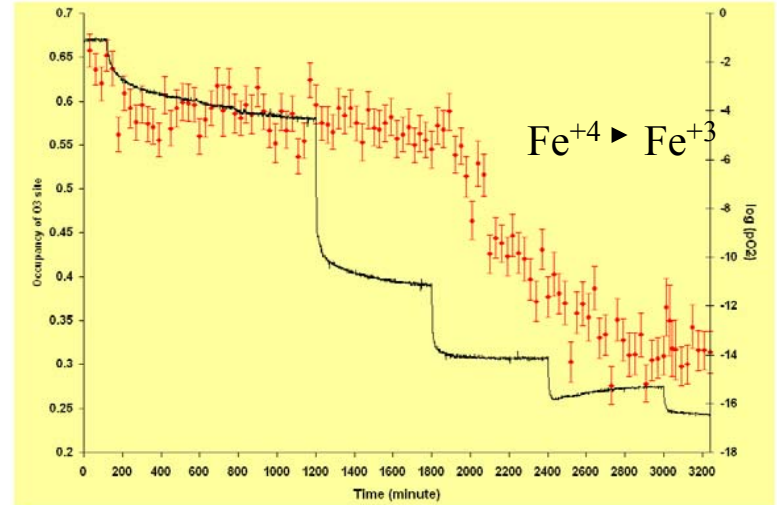
Perovskite layers

Rocksalt layer



Static vs simulated experiments  
Suggest a non-linear  $O_2$  effect  
Across the membrane

Richardson and Li, IPNS/ANL

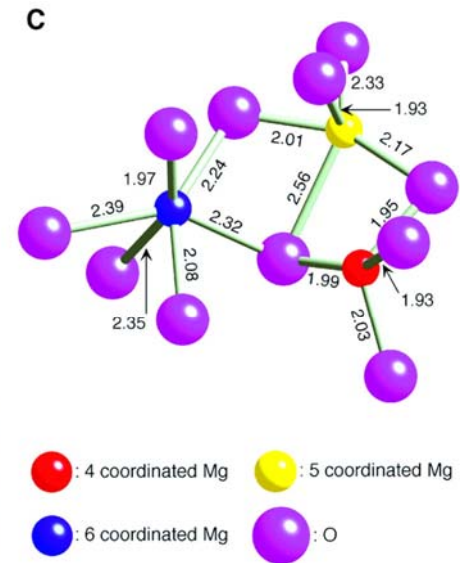
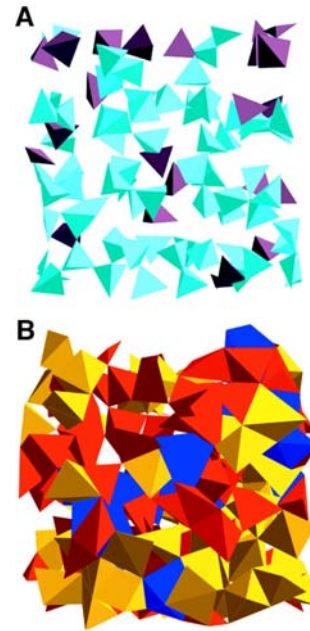
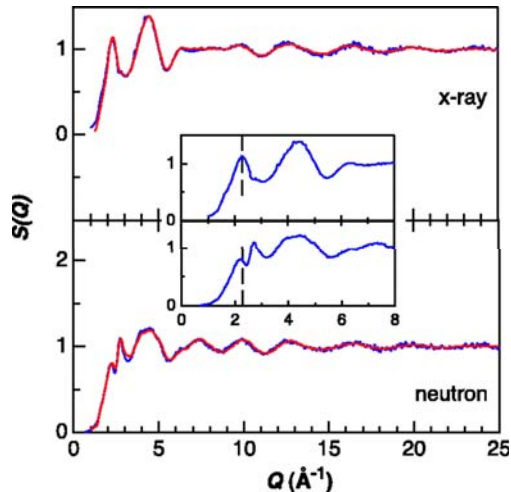
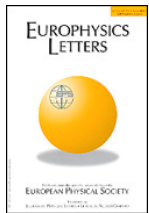


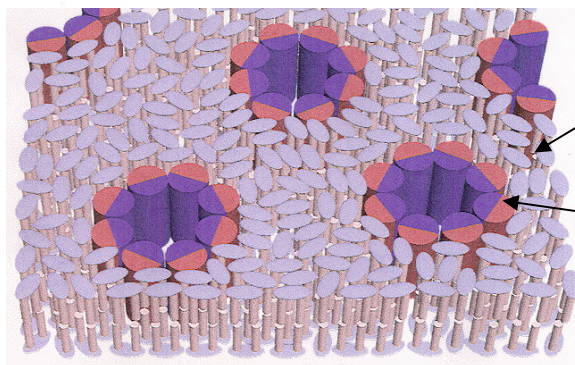
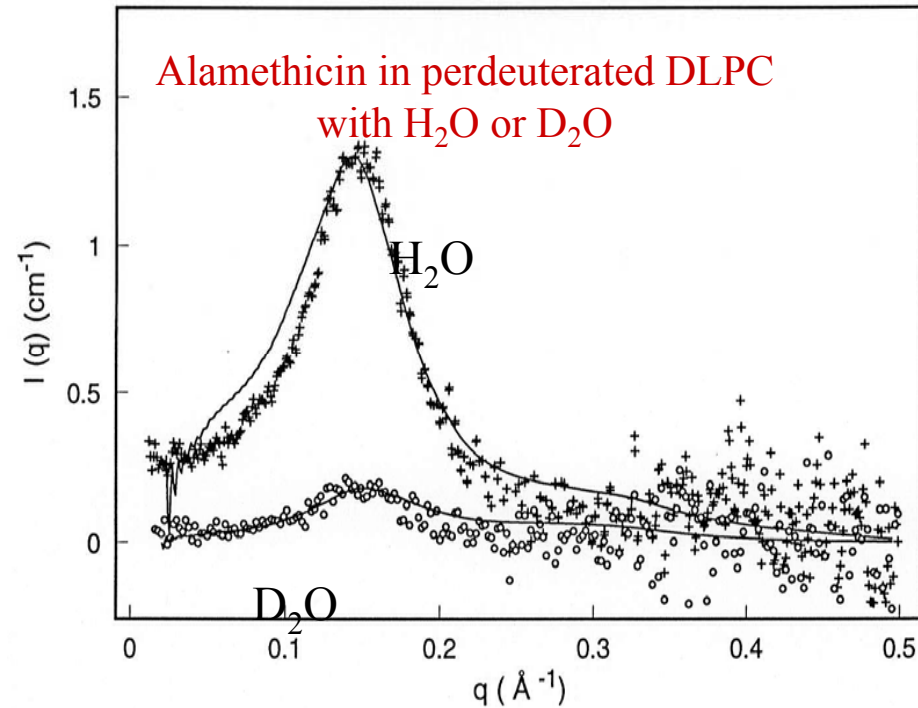
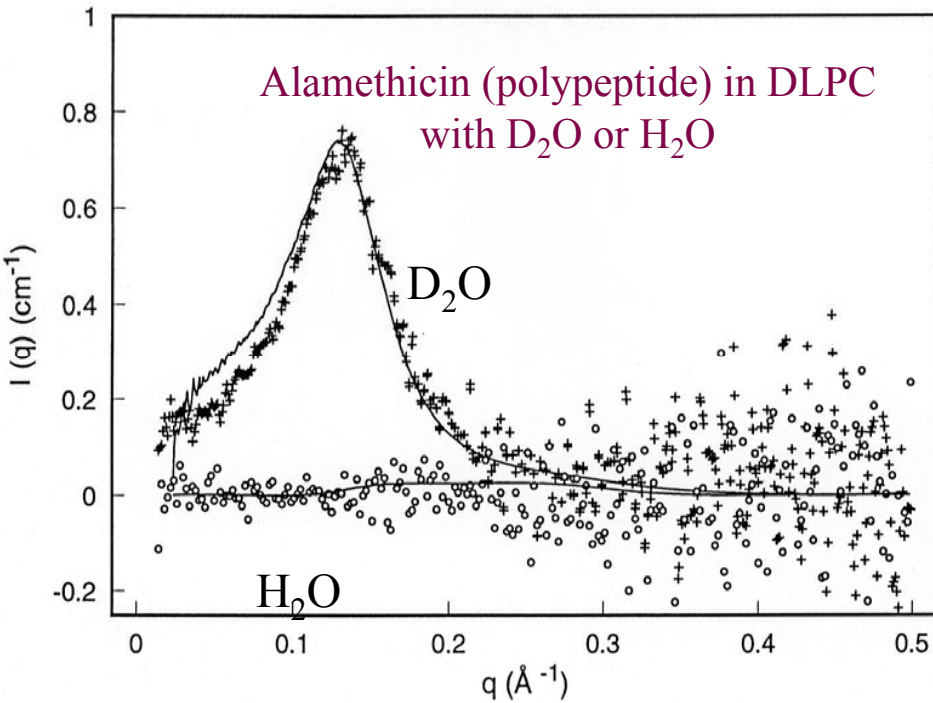
## Glass and liquid structure determinations need:

- Elemental contrasts (must have x-rays + neutrons)
- Very low neutron backgrounds
- The APS/IPNS program is the world's most productive!

**Future GLAD upgrades include additional detectors and collimators (~\$500K)**

**In this example a new glass ( $Mg_2SiO_4$ ) whose formation was contrary to conventional wisdom, was synthesized by containerless melting. Note the unusual Mg coord. (Science Vol 203, Mar 2004)**





Microbial membrane

Antimicrobial peptide forms “barrel staves” → membrane penetration

**H – D contrast make pores visible!**

**$R_I = 9\text{Å}$   $R_O = 20\text{Å}$**



- **Joint neutron/xray studies (amorphous, crystalline diffraction)**
- **In-situ, notably high pressure, studies**
- **Diffraction**
  - IPNS is competitive on the world stage
- **SANS**
  - NIST competitive
  - Joint APS-IPNS programs
- **Many inelastic experiments (H)**
- **Joint CNM/IPNS programs**
  - (reflectometry+ SANS)
- **Unique instruments (polarized neutrons, spin echo, diffuse scattering discrimination)**

