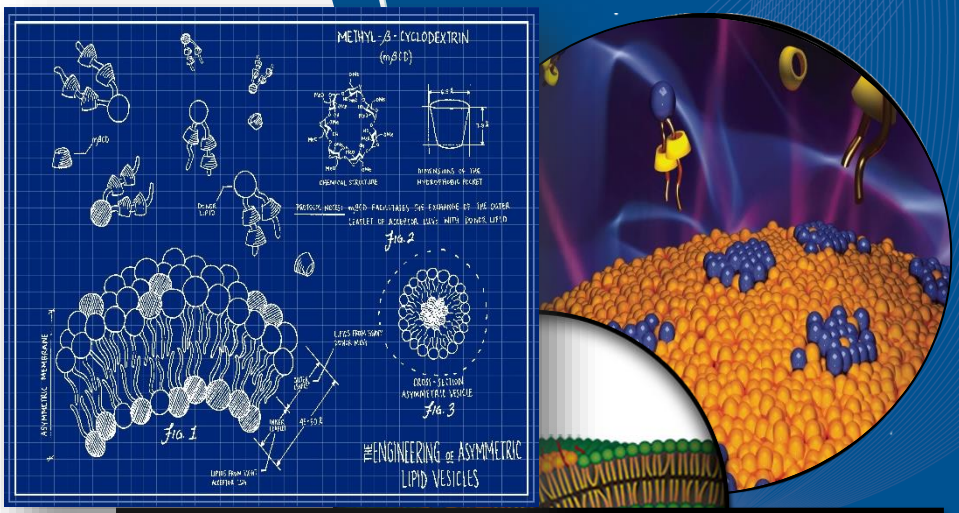
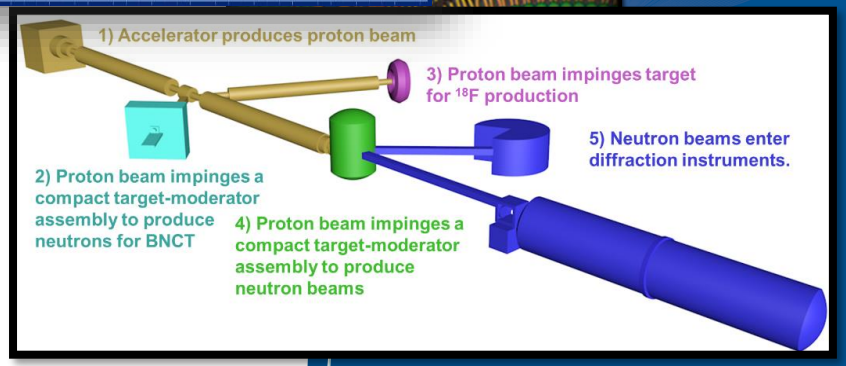
A CANS in Canada





Drew Marquardt

University of Windsor

Canadian Neutron Initiative roundtable towards a National Neutron Strategy
December 16, 2020

Sources of Neutrons

- Fission Reactor → $U^{235} + n$ (thermal)
  - Expensive ~$1B
- Spallation → Hg/W(*p*,*n*)
  - Expensive ~$1-2B
  - High energies
- Stripping-Reaction → Be/Li(p,n)
  - Low energy = small footprint = inexpensive
  - Modular
  - **Compact Accelerator Neutron Source (CANS)**

Canadian CANS Coalition

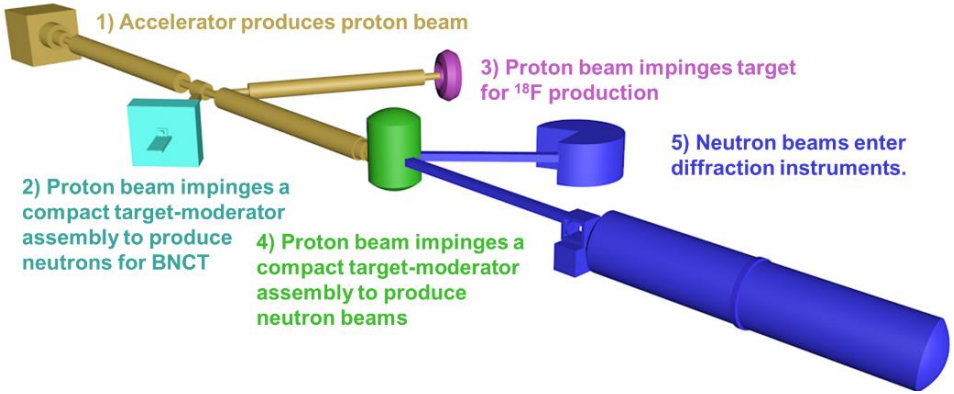
University of Windsor-TRIUMF led initiative to construct and operate a Compact Accelerator-based Neutron Source (CANS)

- **2019 -** 15 Researchers from 11 institutions from across Canada
- **2020 -** 40 researchers from 19 institutions spanning 4 countries (Germany, Japan, USA and Canada)

Vision for CANS prototype

Conduct research using the following neutron methods:

- Small-angle neutron scattering
- Neutron Imaging/Diffraction
- Boron Neutron Capture Therapy



Relative Performance		Conventional Sources	CANS
High	5–10+	SNS ($2B); ESS ($3B)	
Medium	1	ISIS ($850M); NRU (>$500M)	Canada-scale facility* ($100–$200M)
Medium–Low	1/5	MNR (>$100M)	**Our prototype*** ($10–$12M** + 3 instruments)
Low	1/25		NOVA ERA* ($6M** + 6 instruments); LENS; RANS

Importance Domestically and Globally

- Neutron beams are available at 15 large centralized facilities
  - Europe, the US, and East Asia
  - Many approaching the end of their life cycles.

- CANS role:
  - Possible replacement option for medium-flux nuclear reactors
  - Facilitate high-throughput or “workhorse” measurements
  - Preliminary or exploratory measurements prior to experiments at high brightness sources
  - Training facility to ensure expertise remains in Canada

Notable Accomplishments

- “The prospect of new neutron beam capability in Canada was seen by the reviewers as highly desirable as were the potential applications of this technology outlined in the submission.”
- We have built an incredible team of world-leading experts from Japan, the US, Germany and Canada
- We have achieved membership in UCANS, an international network of CANS expertise.
- Co-PI Ming Pan was Canadian designate at an IAEA
- We secured the support of the Windsor Regional Hospital for production of F-18 and interest in Boron Neutron Capture Therapy.
- Secured support of key partners who have contributed substantial in-kind support and will continue to play important roles in the design of the CANS and its associated instruments.
    - TRIUMF, Canadian Nuclear Laboratories, Fedoruk Centre, and TVB Associates

Outlook and Next Steps

- Design study will continue preparing for the next funding opportunity strengthening our case for future funding opportunities.
- Strategy for future funding opportunities
  - Build from the success of “Building a Future for Canadian Neutron Scattering”
  - Position a CANS prototype as a part of a long-term solution, beyond the lifetime of international access agreements.
  - First step in realizing a pan-Canadian network of CANS.

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