

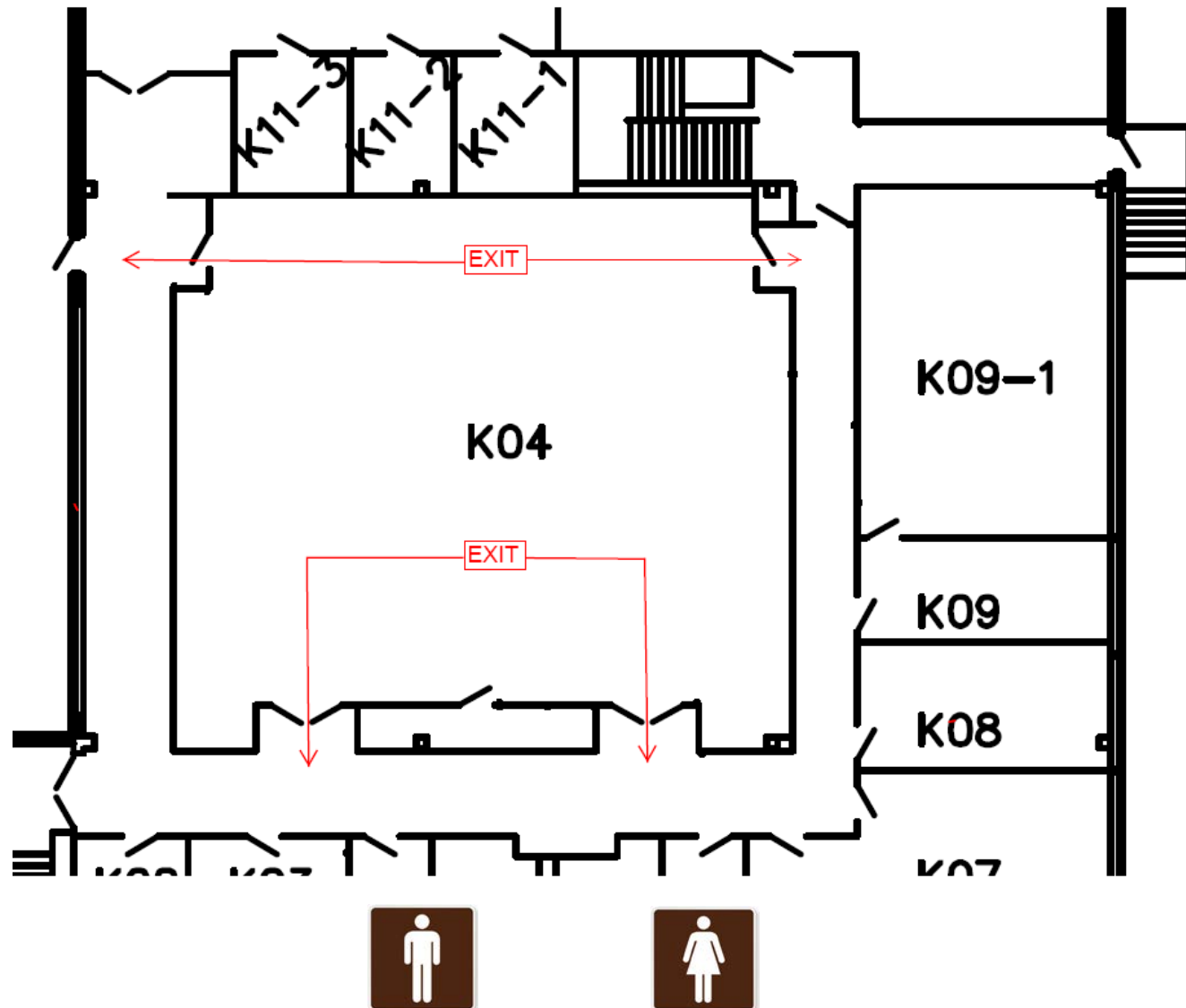
A close-up photograph of a circular mechanical assembly, likely a robotic gripper or a specialized actuator. The central part is a polished metal disc with a circular hole in the middle. Surrounding this center are eight black, rectangular actuators arranged in a circular pattern. Each actuator is connected to a silver-colored metal arm. The actuators have a textured, ribbed surface. The background is a blurred industrial setting with various mechanical parts and tools.

2017

NCNR
Update

January 12, 2017

EMERGENCY EXITS



NIST TRANSITIONS



Willie May
Retired Jan 3rd



Kent Rochford
ADLP
Acting NIST Director



Laurie Locacsio
MML Director
Acting ADLP

PRIORITIES

1

Provide safe, reliable operations and robust user support

2

Develop new neutron measurement capabilities in response to the needs of the US research community

3

Develop long-term plan for providing neutrons to the US research community

BUDGET

FY 2017

CR through April 28th

Base adjustment for reactor fuel

FY 2018

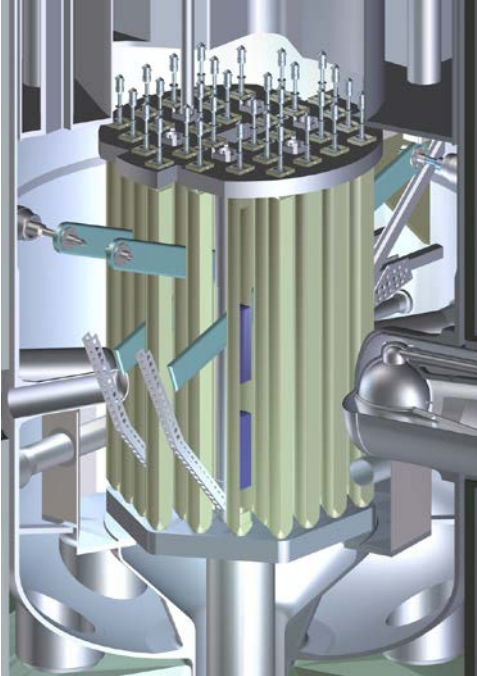
?

FALL OUTAGE

EXACT DATES TBD

~September - December

SHIM ARM REPLACEMENT



PRIMARY PUMP REPLACEMENT



Replacement epoxy floors at MACS & BT7

New epoxy floor, new monochromator and analyzer at BT8

MACS alignment checks (components inside analyzer)

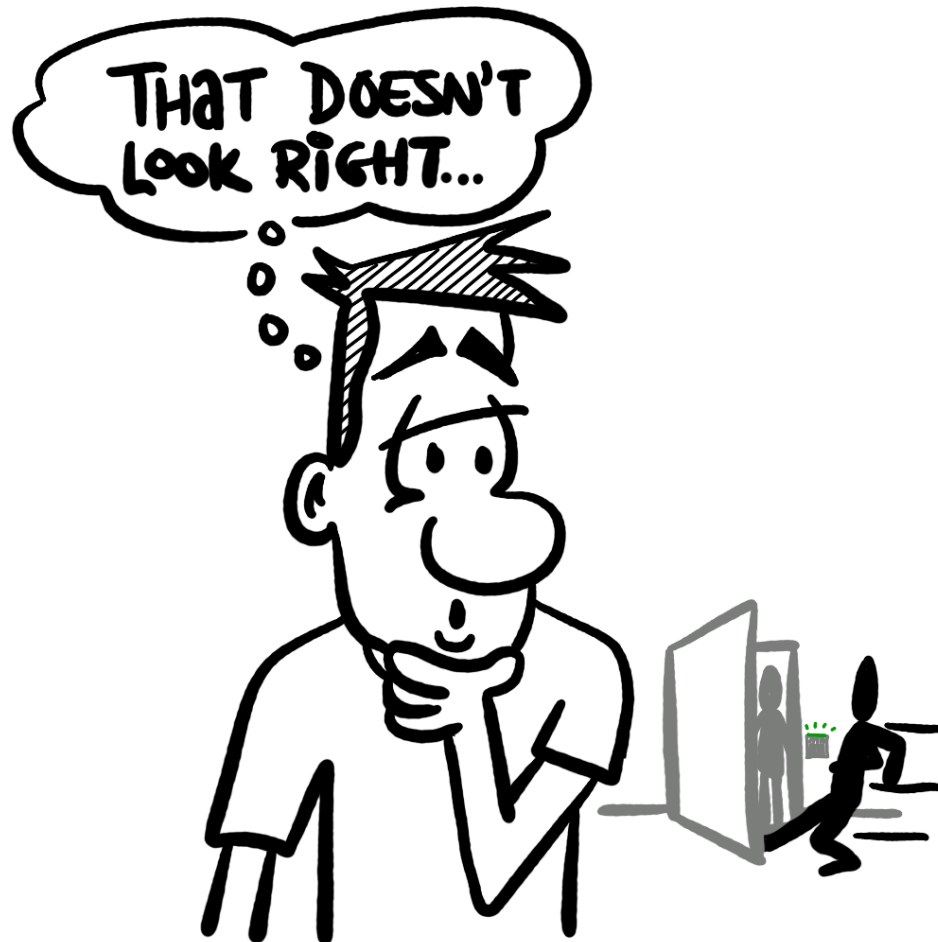
Paint G100 west floor and east walkways

Late spring – NCNR storage facility completion (Bldg 321)

SECURITY

MAINTAIN A QUESTIONING ATTITUDE

If you see something unusual, report it to management, NIST Police, or Reactor Control



A FEW SELECT REMINDERS

No tailgating

No outside entrances may be left open unattended

Visitors in posted radiation areas must be escorted at all times. Your visitors are always your responsibility on the premises.

SAFETY

MAINTAIN A QUESTIONING ATTITUDE

If you see an unsafe condition, address it if possible – or raise the matter to management



A FEW SELECT REMINDERS

Know the radiation conditions in your work area

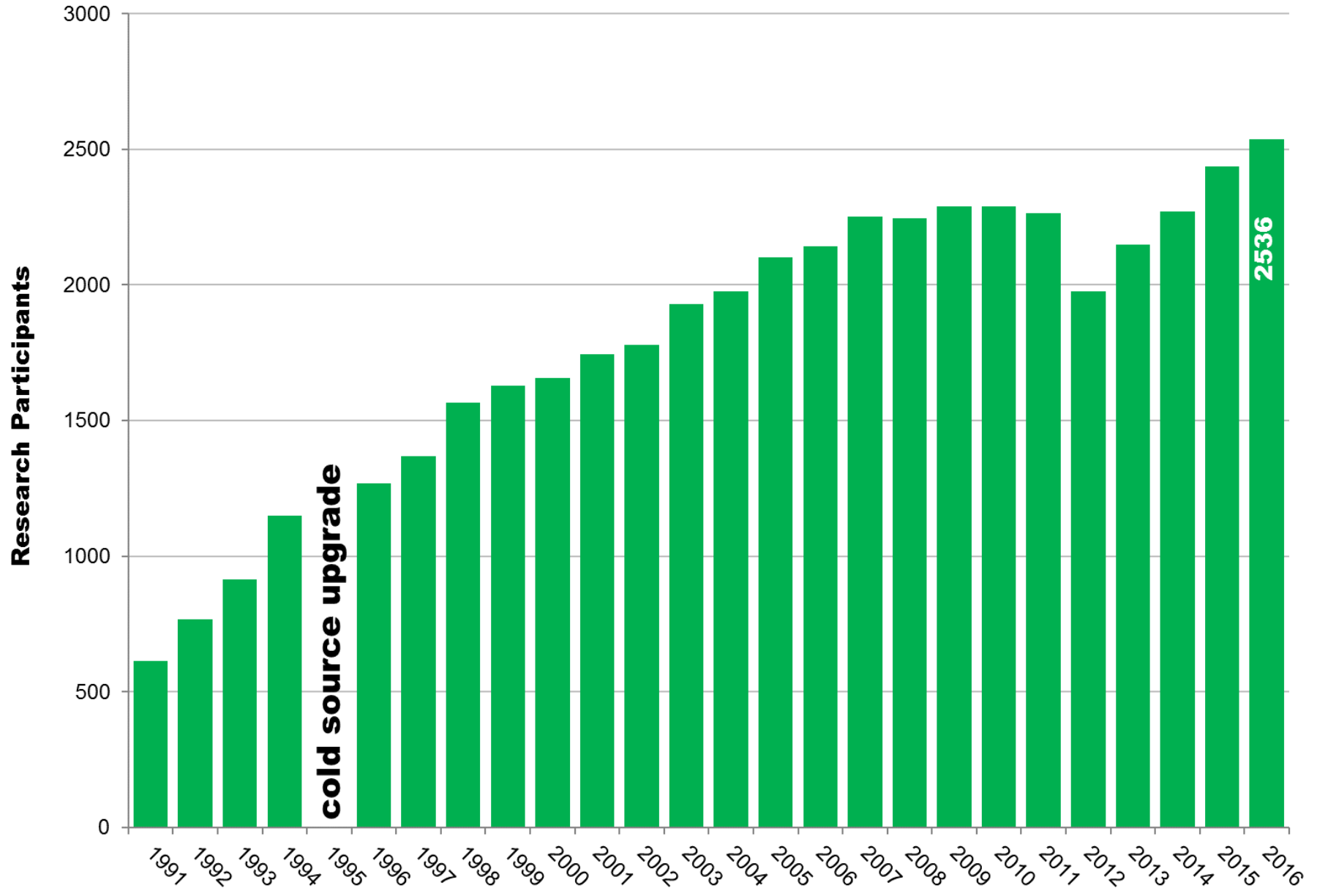
Assume your sample is radioactive after a beam experiment

Plan all work that involves hazards

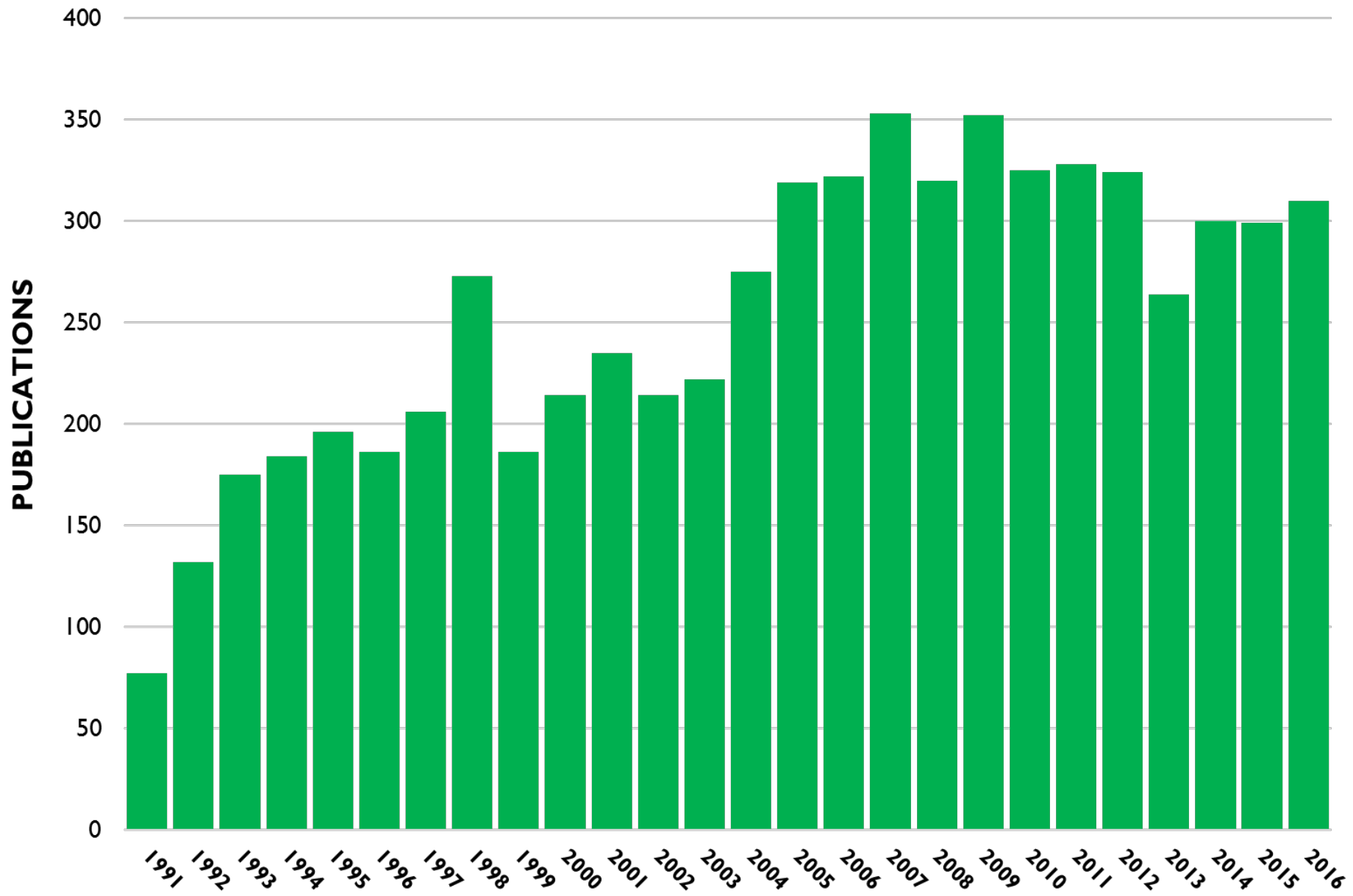
Maintain a tidy work environment

Take personal responsibility for your safety and the safety of others

PERFORMANCE



PERFORMANCE



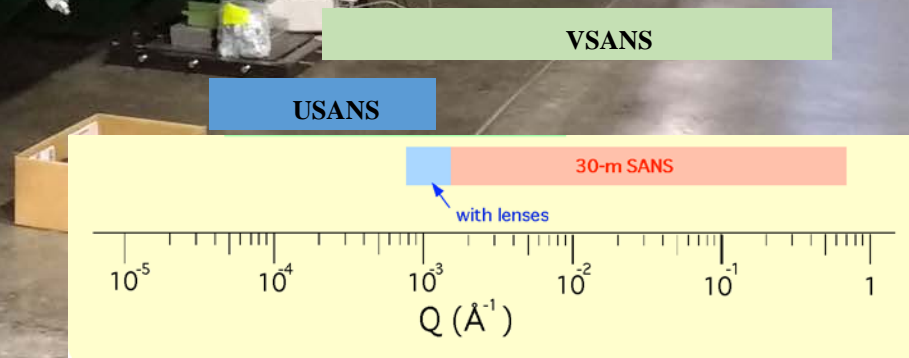
VSANS

Data collection rate
~10× SANS

~300× uSANS

Extended Q-range
 $2 \times 10^{-4} - 1 \text{ \AA}^{-1}$

Flexibility
2%/13.5%/30%
wavelength bands



First neutrons on detector: June 2017

Delivery and fit-out of detector vessel

Install/testing of detector carriages

Install/testing of 8 detector panels

First SANS experiment: August 2017

Sample area installed

Basic data acquisition software tested

Tube detector NISTO software tested

Basic data reduction software tested

Full polarized beam operation: January 2018

Polarizer installed

RF flipper installed

Guide fields installed

NICE software polarized beam option tested

Data reduction software for polarized beam tested

VSANS

Kinetic SANS: January 2018

Event mode data output (software) from tube detectors (built/tested)

Event mode option in NICE software (built/tested)

Event mode data reduction in IGOR software (built/tested)

Very small Q: High resolution mode: January 2018

Install/test high resolution detector

Build/install rear carriage

New NISTO software to handle the detector

New NICE software to handle the detector

Data reduction software to handle new detector histogram

Procure/install chiller for MgF_2 prisms and lenses

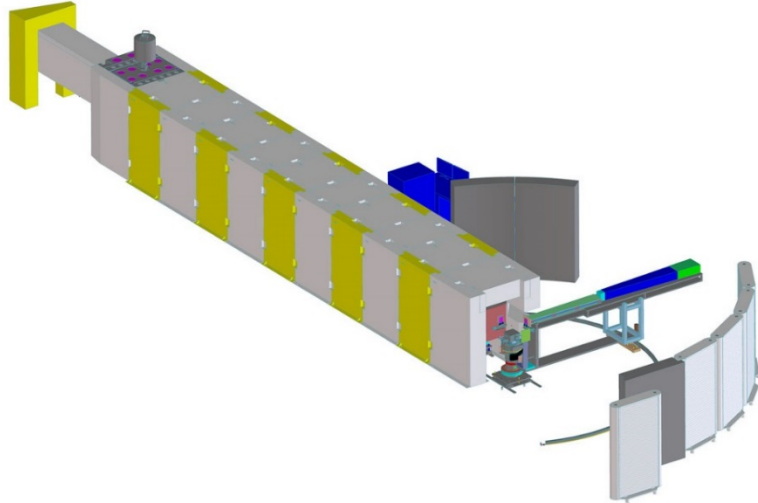
Build/install/align converging beam apertures

Graphite monochromator: March 2018

Procure/deliver HOPG

Install graphite

CANDOR



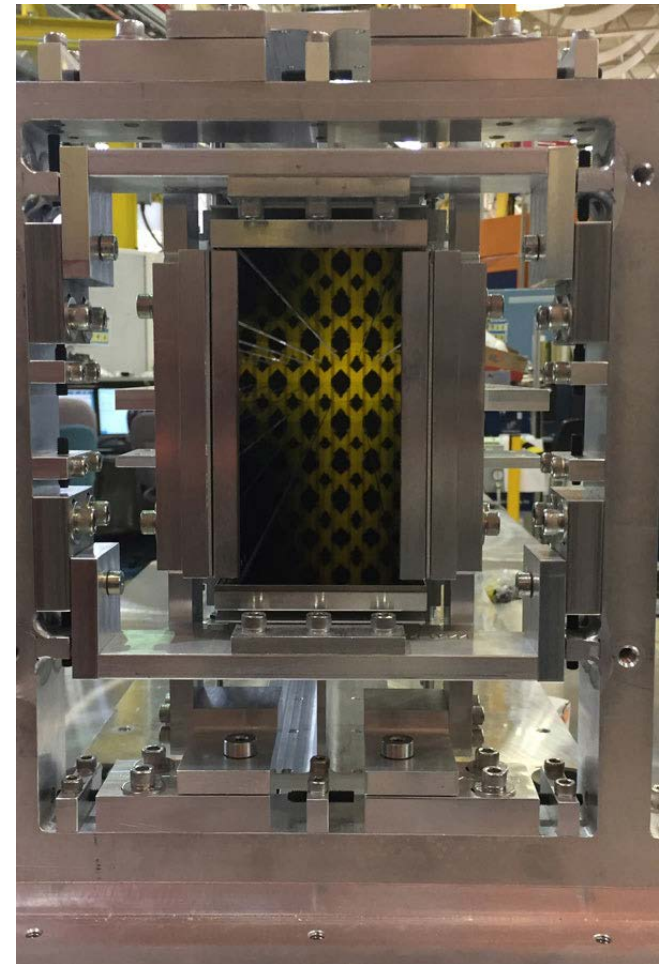
$$\begin{array}{ccc} 30 & \times & 54 = 1620 \\ \text{channels} & & \text{dets/array} \quad \text{total detectors} \end{array}$$



$0.3 \text{ nm} \rightarrow 10 \text{ } \mu\text{m}$

$\delta Q/Q \approx 0.025$

$\delta \lambda/\lambda \approx 0.015$



CANDOR

First neutrons on detector: May 2018

Scintillator detector production/repeatability

Data acquisition electronics

Installation/testing of detector

First specular reflection experiment: July 2018

Sample area installed

Basic NICE software features tested

Basic data reduction software (built/tested)

Full polarized beam operation: July 2018

Polarizer installed

RF flipper installed

^3He polarization analysis

Non-specular capability available: July 2018

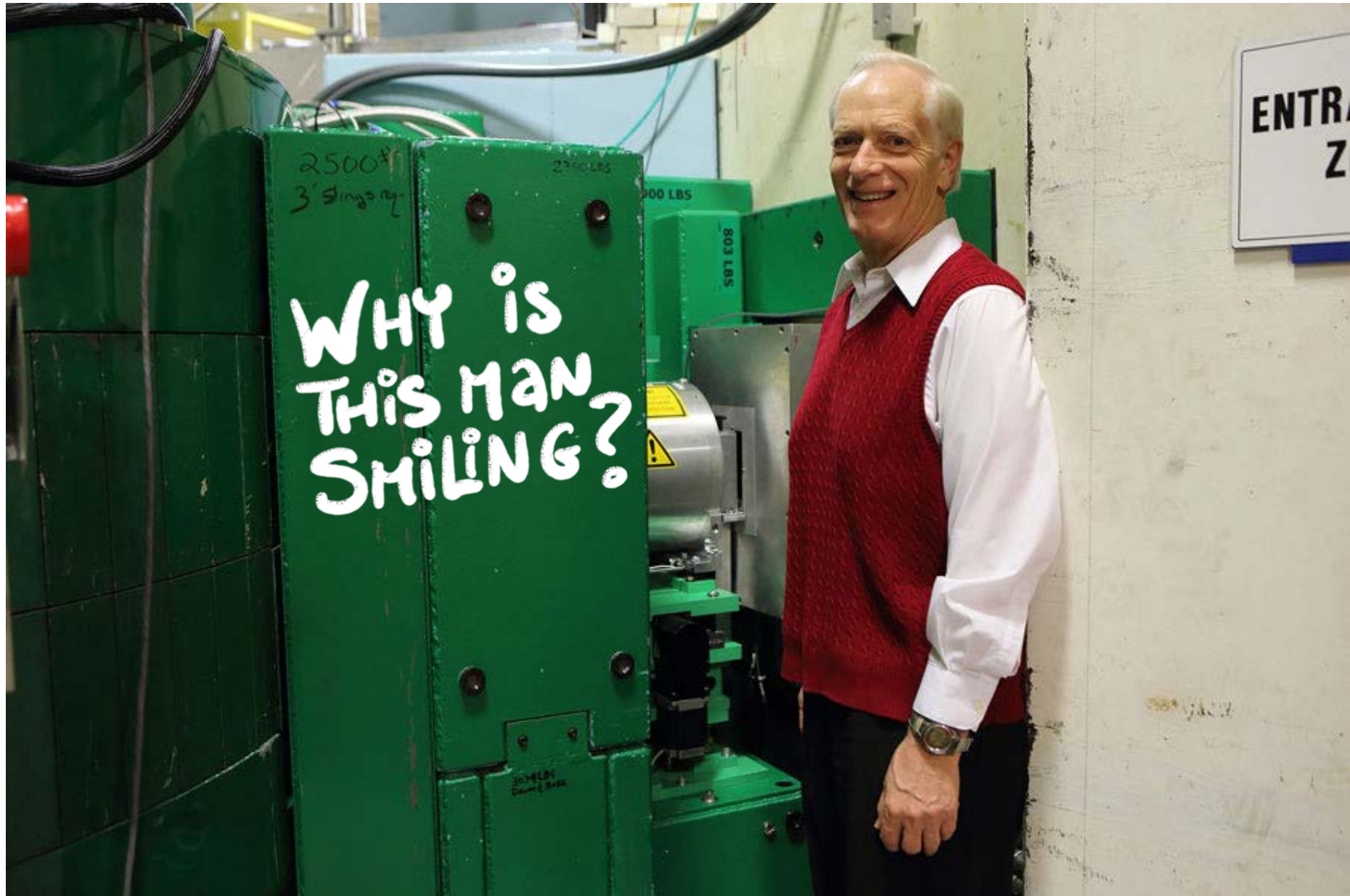
Data reduction software (built/tested)

Event mode available: August 2018

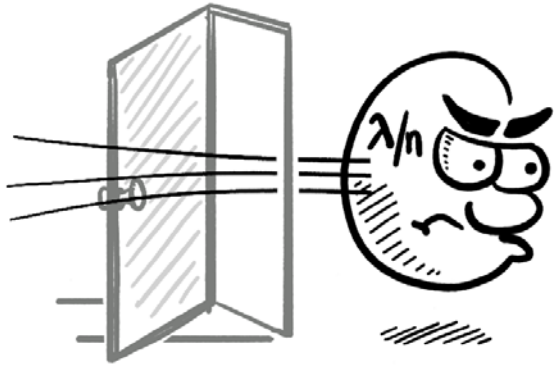
Event mode option in NICE software (built/tested)

Event mode data reduction software (built/tested)

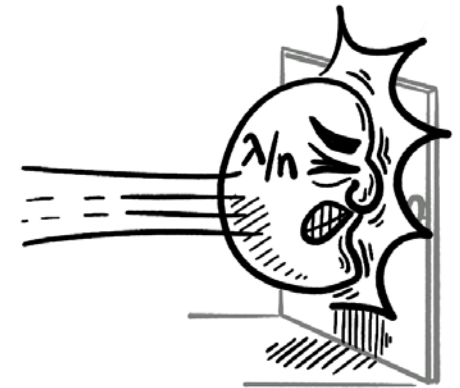
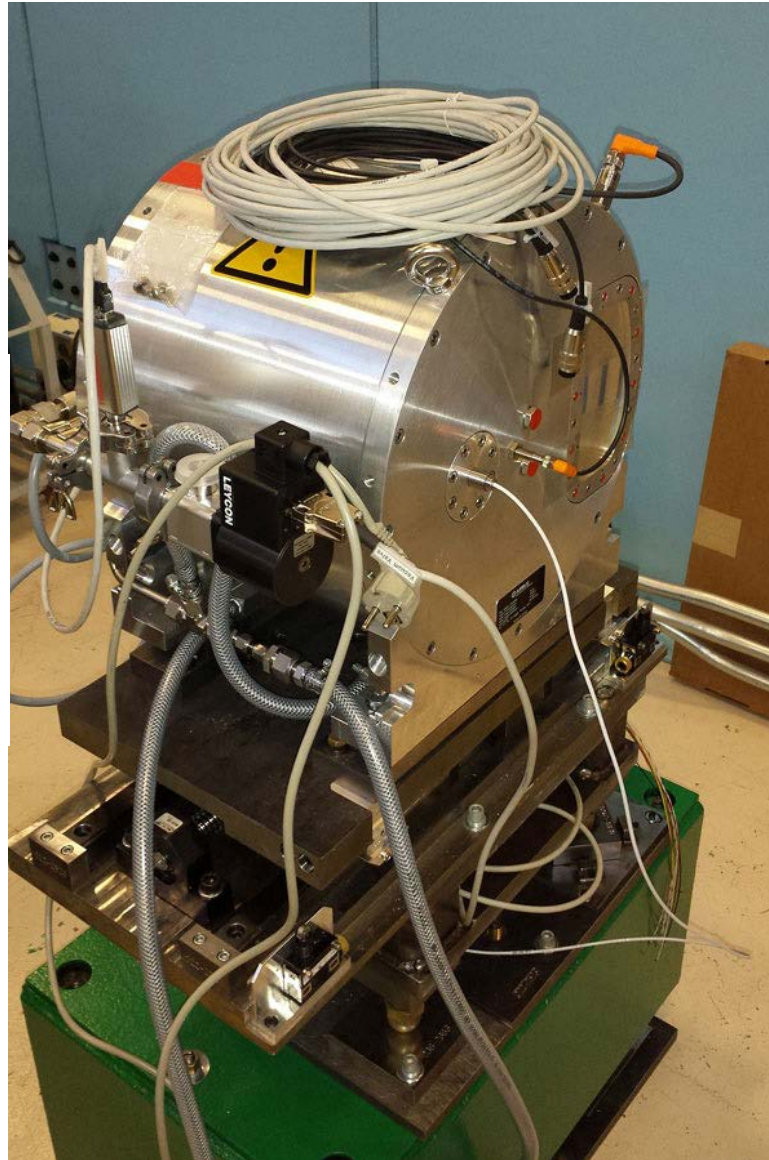
BT7 NEUTRON VELOCITY SELECTOR



BT7 NEUTRON VELOCITY SELECTOR

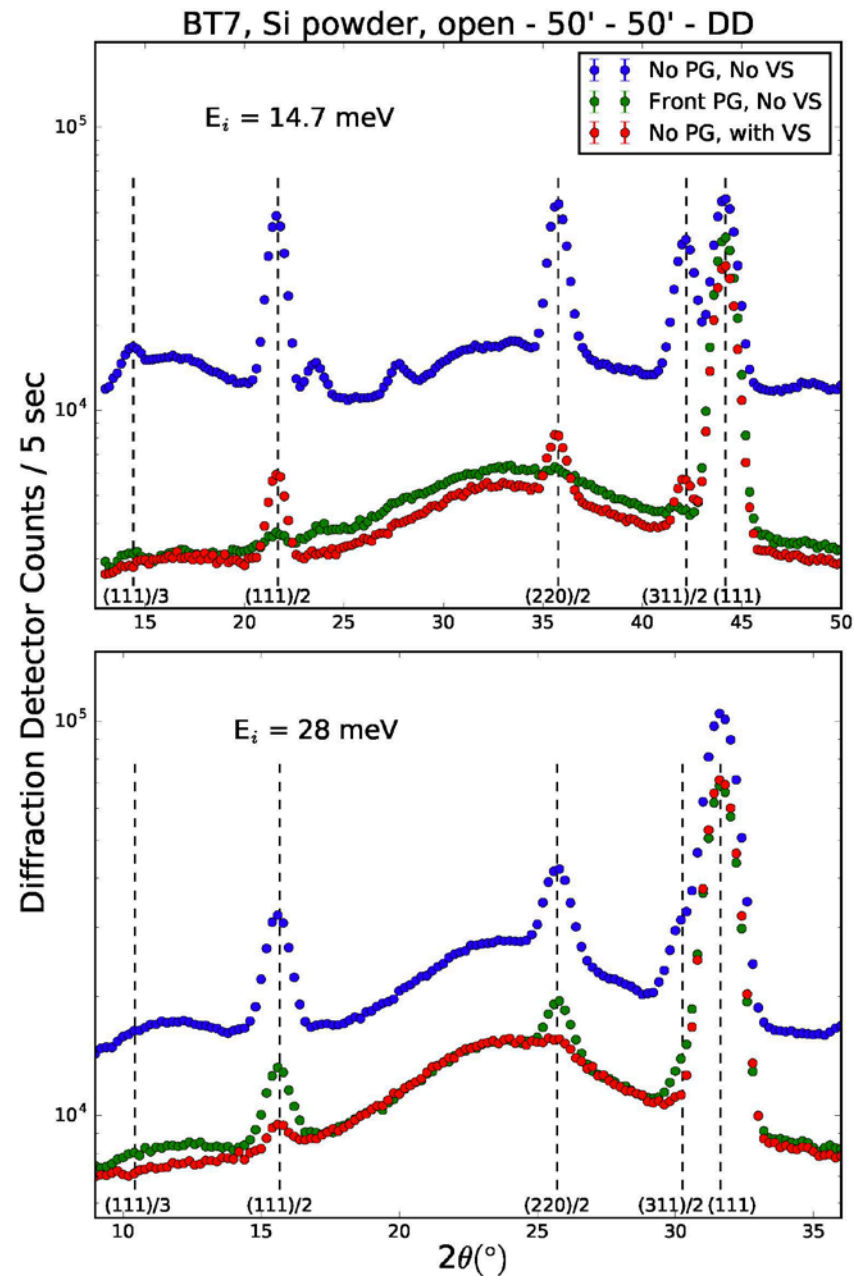


NO NVS

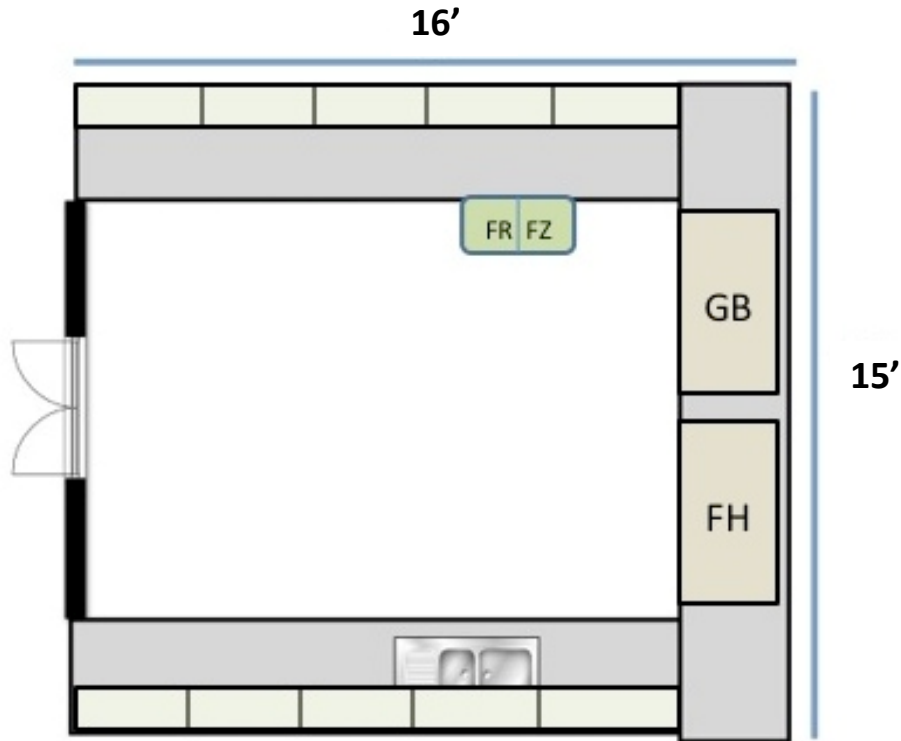


NVS

BT7 NEUTRON VELOCITY SELECTOR



GUIDE HALL LABORATORY



Handling of activated samples

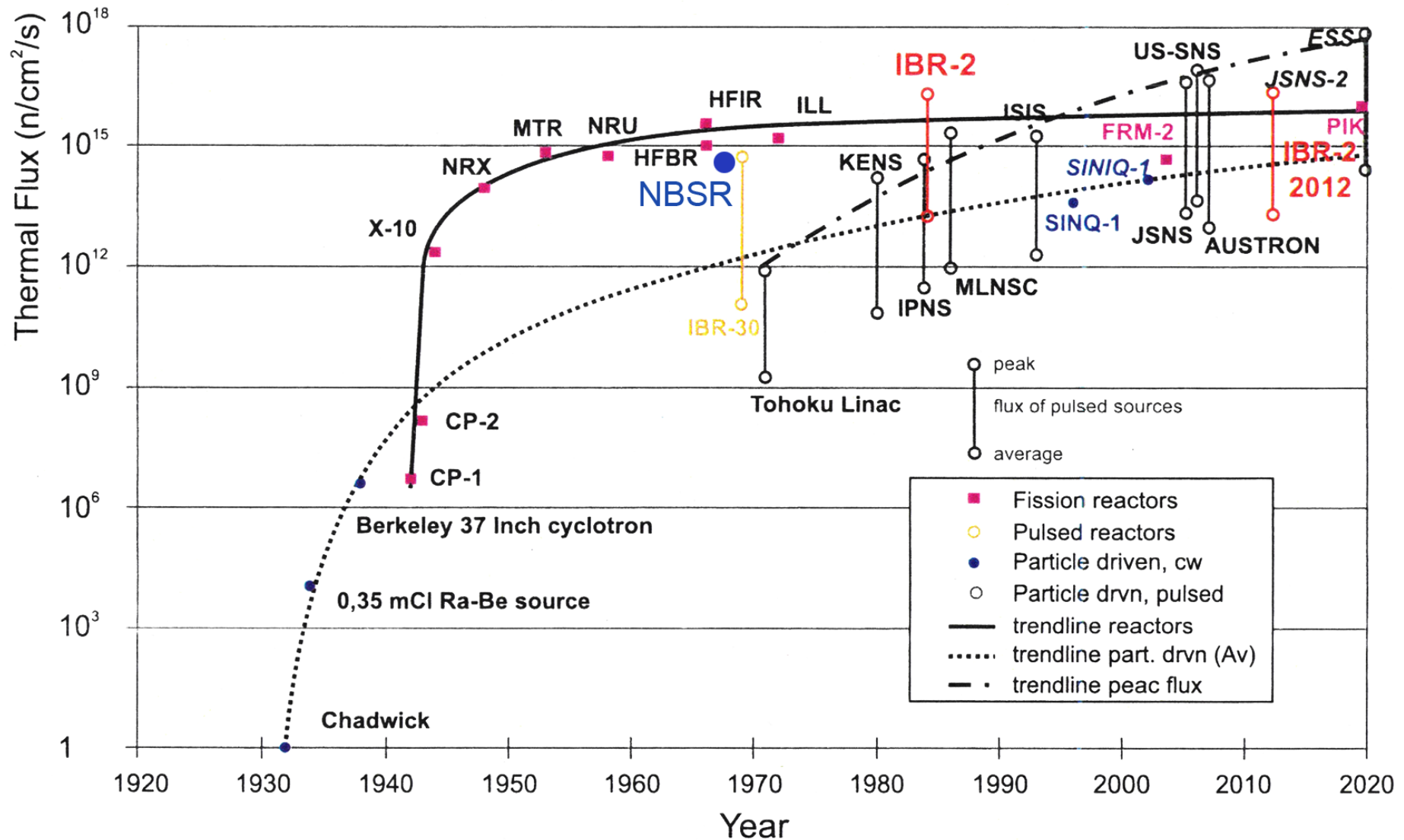
Primary users: SANS, Spin Echo,
Reflectometry

Hood, freezer, refrigerator, general
laboratory supplies and utilities for
future glove box installation

Schedule to be available for users at the
end of April 2017

PLANNING FOR THE FUTURE

Recent neutron source improvements *evolutionary* not *revolutionary*

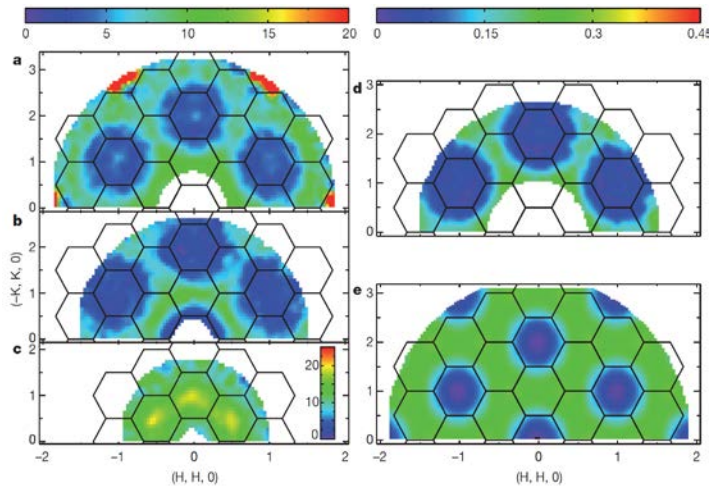


PLANNING FOR THE FUTURE

Revolutionary advances in science with neutrons come from instrument advances and novel sample environments

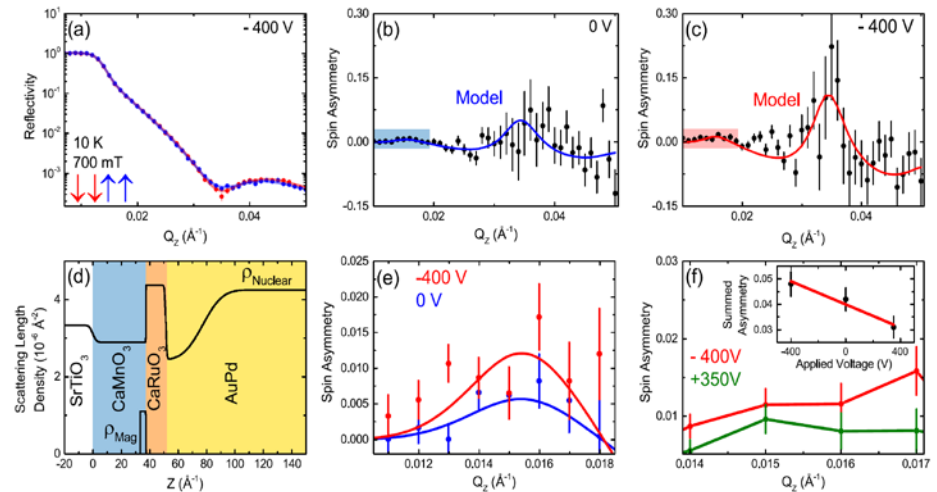
$$s = 1/2$$

Han et. al., Nature, (2012)



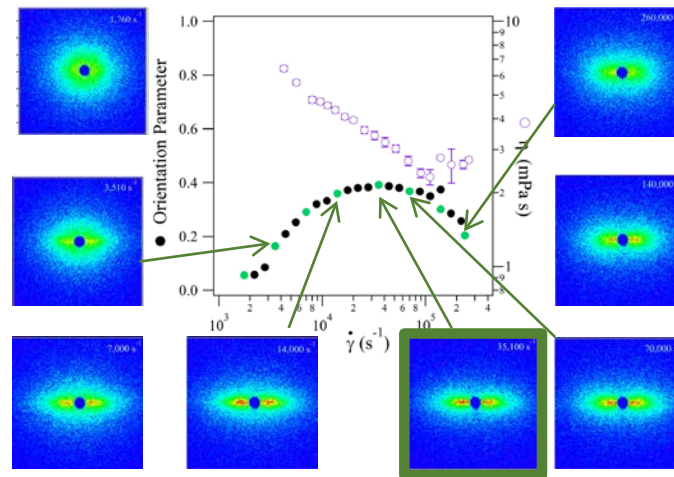
Interfacial magnetism

Grutter et. al., PRL, (2015)



High flow

Weigandt et. al., (2016)



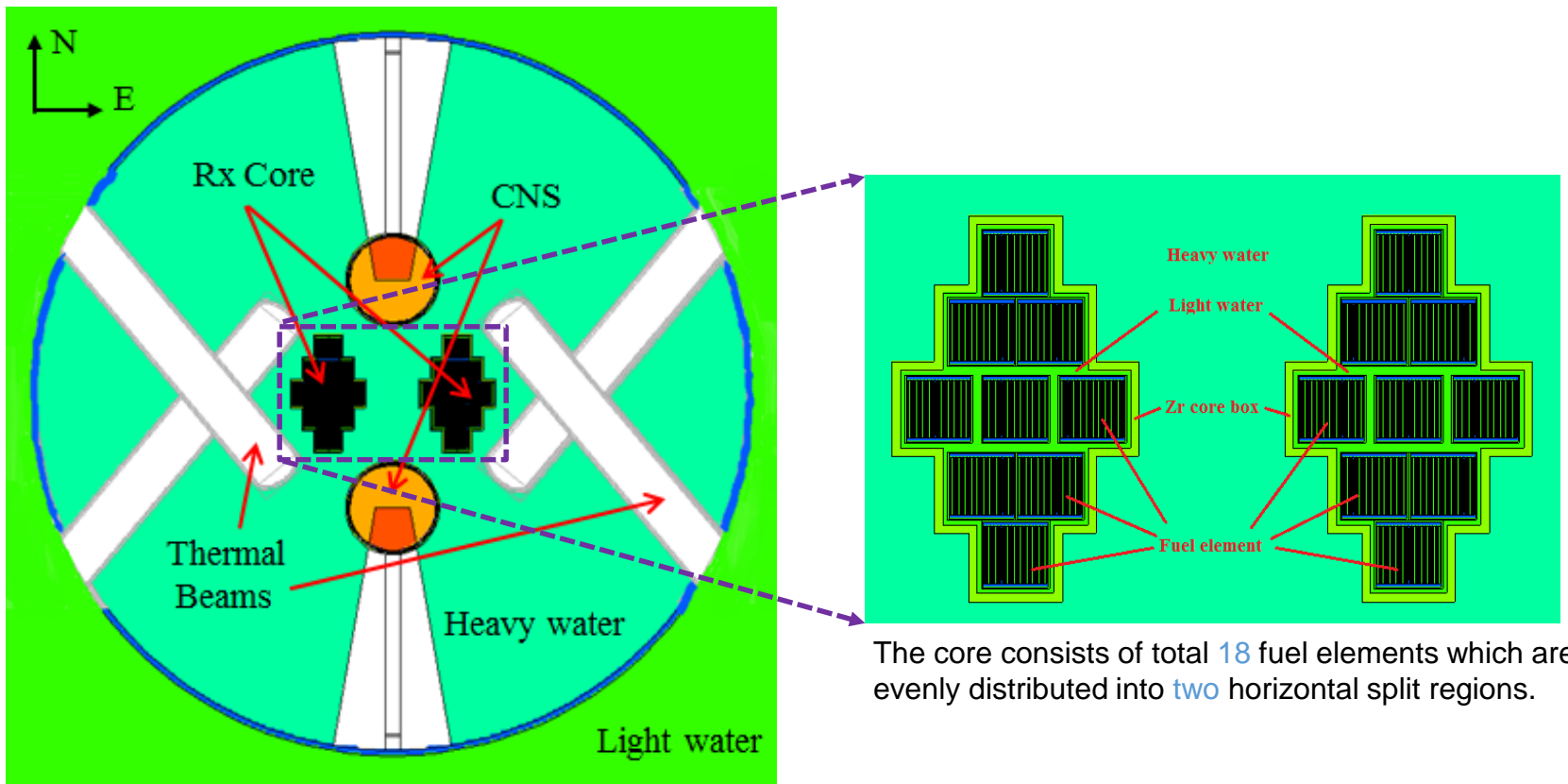
PLANNING FOR THE FUTURE

Future NIST Neutron Source: options under consideration

Upgrade NBSR for higher performance with LEU

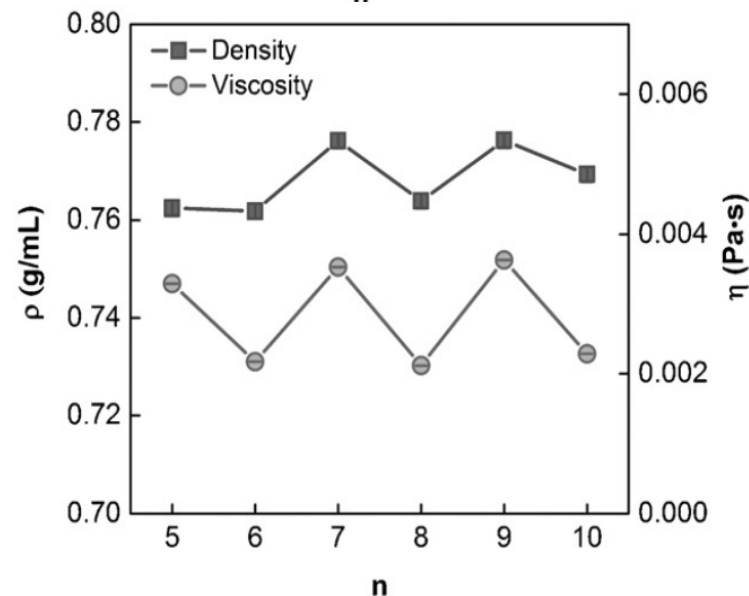
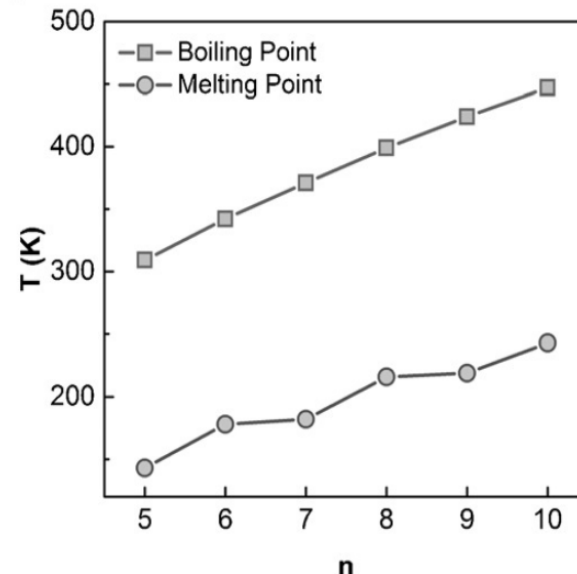
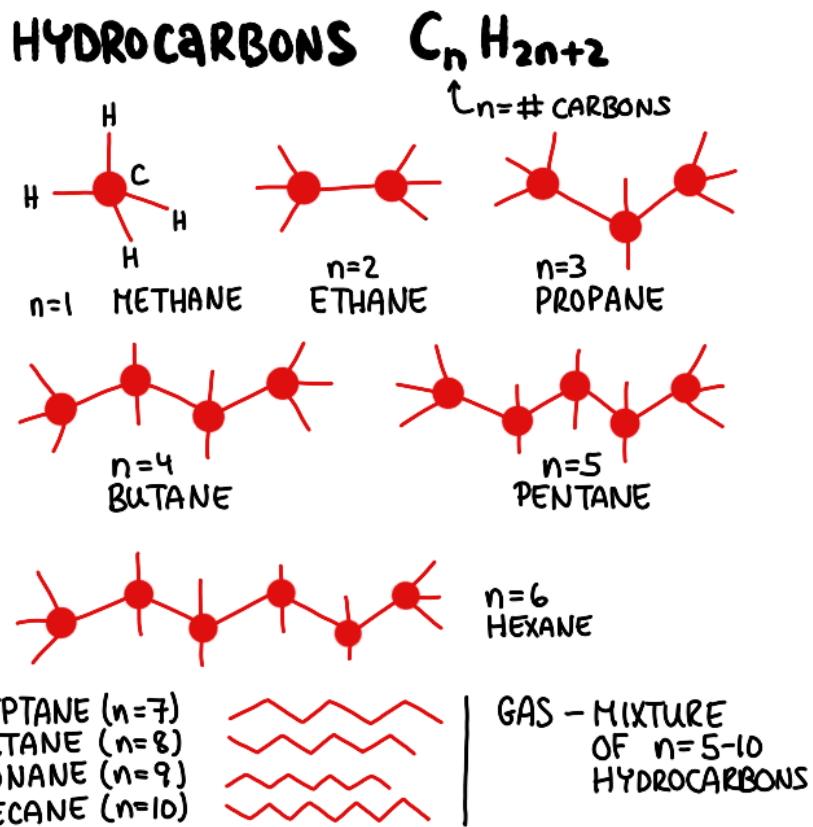
Report from ROE team expected in Spring 2017

New LEU-based reactor



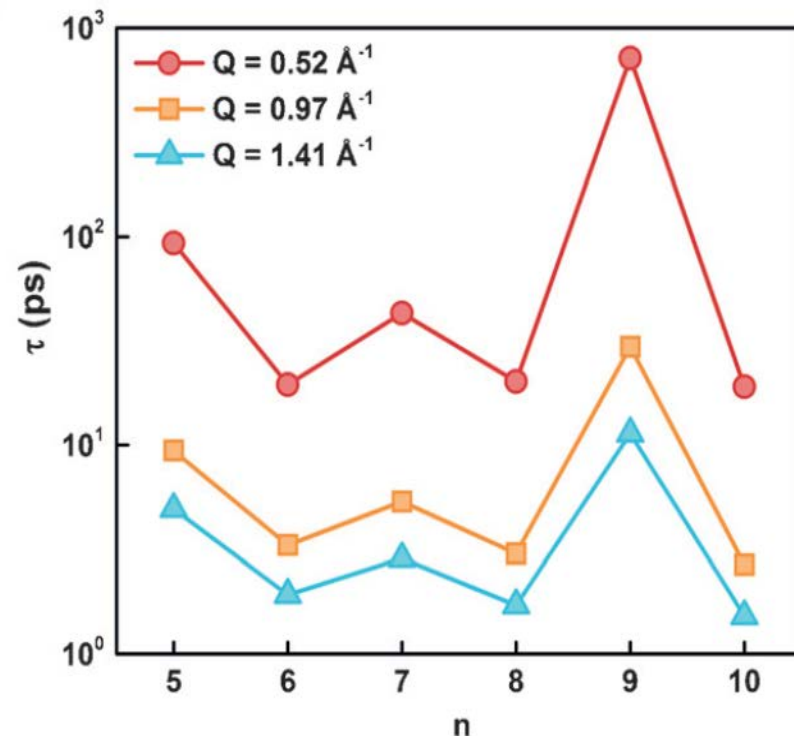
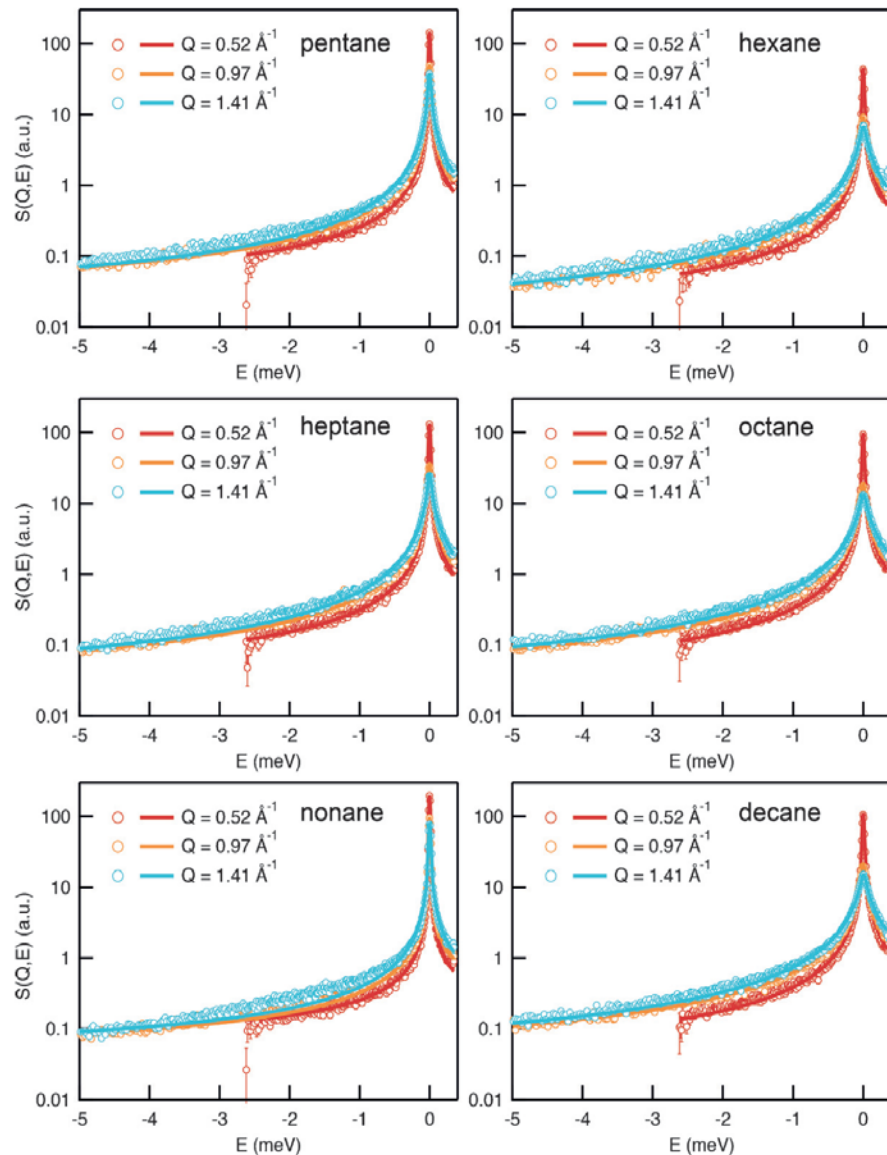
ODD-EVEN EFFECT IN LIQUID n-ALKANES

Yang et. al., "Dynamic Odd-Even Effect in Liquid n-Alkanes near Their Melting Points," *Angew. Chem. Int. Ed.* **2016**, 55, 14090-14095.



ODD-EVEN EFFECT IN LIQUID n-ALKANES

Yang et. al., "Dynamic Odd-Even Effect in Liquid n-Alkanes near Their Melting Points," Angew. Chem. Int. Ed. **2016**, 55, 14090-14095.



FASTER GASOLINE?

DYNAMIC ODD-EVEN EFFECT IN LIQUID n-ALKANES NEAR THEIR MELTING POINTS

YANG ET AL., ANGEW. CHEM. INT. ED. 2016, 55, 14090-14095.



The Nobel Prize in Physics 2016



© Trinity Hall, Cambridge University. Photo: Kiloran Howard

David J. Thouless

Prize share: 1/2



Photo: Princeton University, Comms. Office, D. Applewhite

F. Duncan M. Haldane

Prize share: 1/4



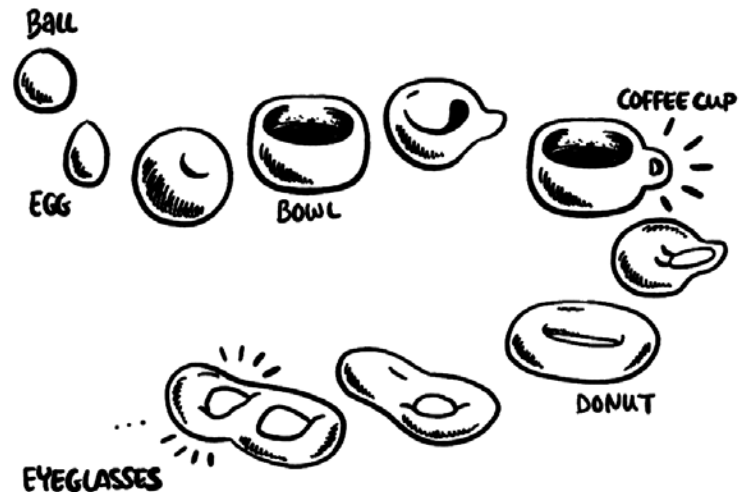
Ill: N. Elmehed. © Nobel Media 2016

J. Michael Kosterlitz

Prize share: 1/4

for theoretical discoveries of topological phase transitions and topological phases of matter

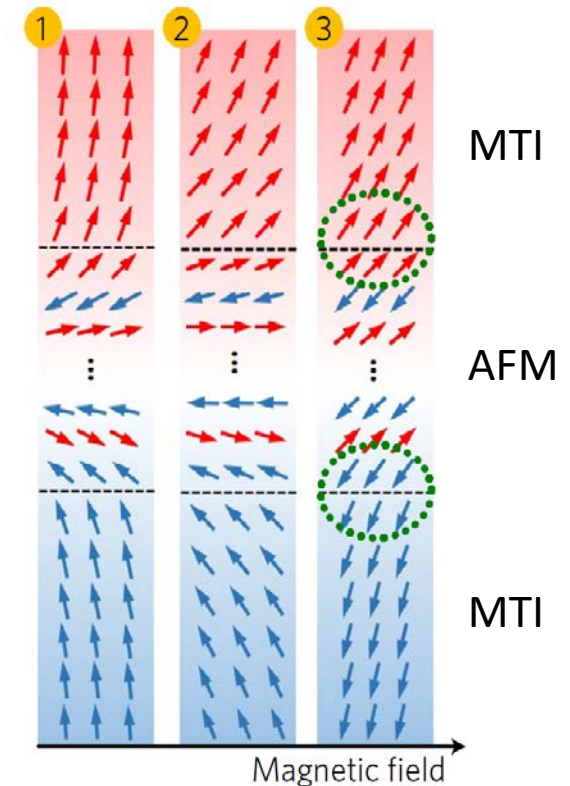
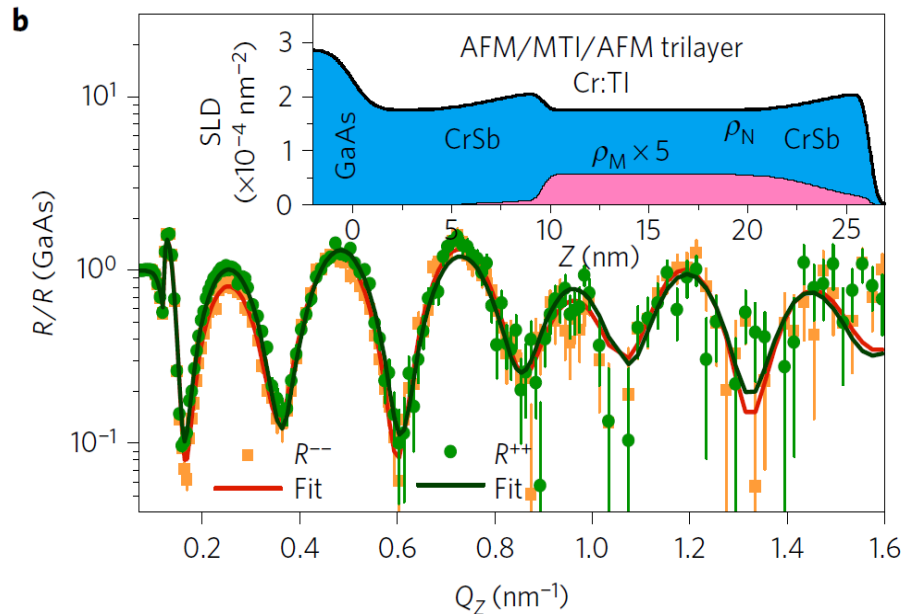
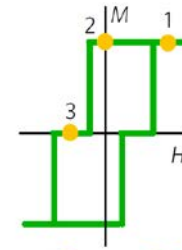
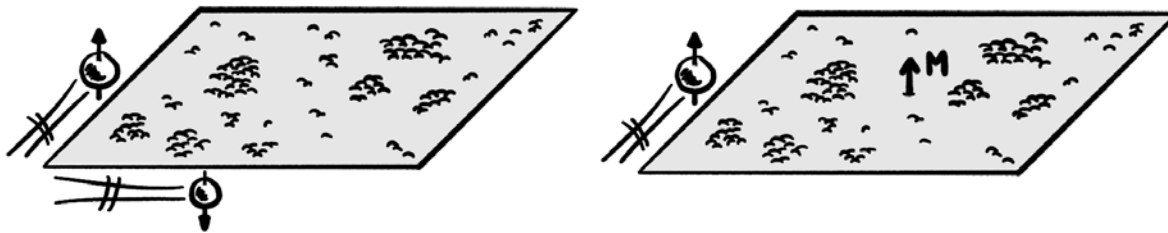
Their discoveries have brought about breakthroughs in the theoretical understanding of matter's mysteries and created new perspectives on the development of innovative materials.



ENGINEERED HETEROSTRUCTURES



Q.L. He et. al., "Tailoring exchange couplings in magnetic topological-insulator/antiferromagnet heterostructures," Nature Materials **16**, 94-100 (2017)



MIST PREVENTION IN JET FUEL

Wei et. al., "Megasupramolecules for safer, cleaner fuel by end association of long telechelic polymers," *Science* **350** (6256) 72-75, 2015.

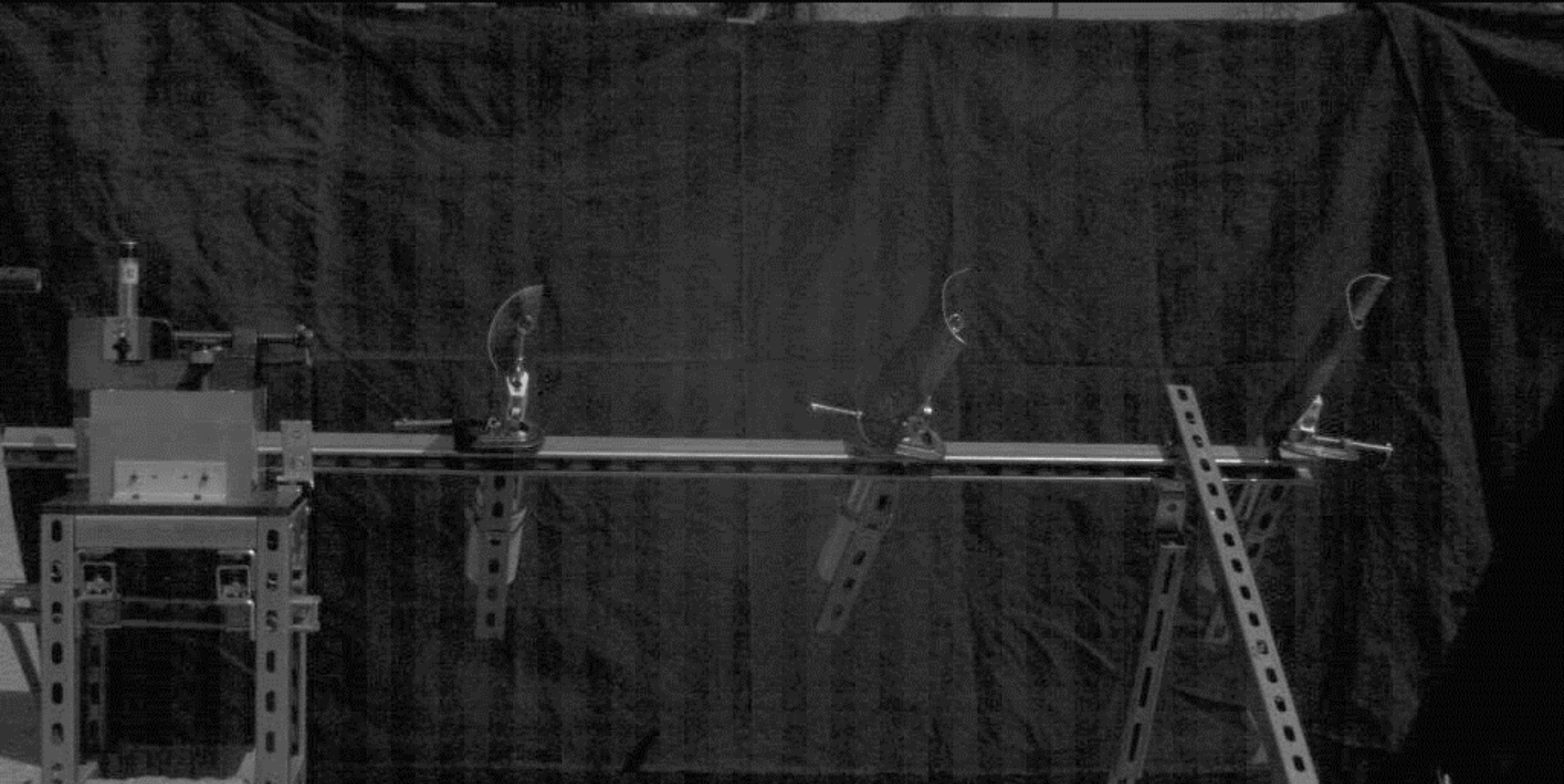
40%

MIST PREVENTION IN JET FUEL

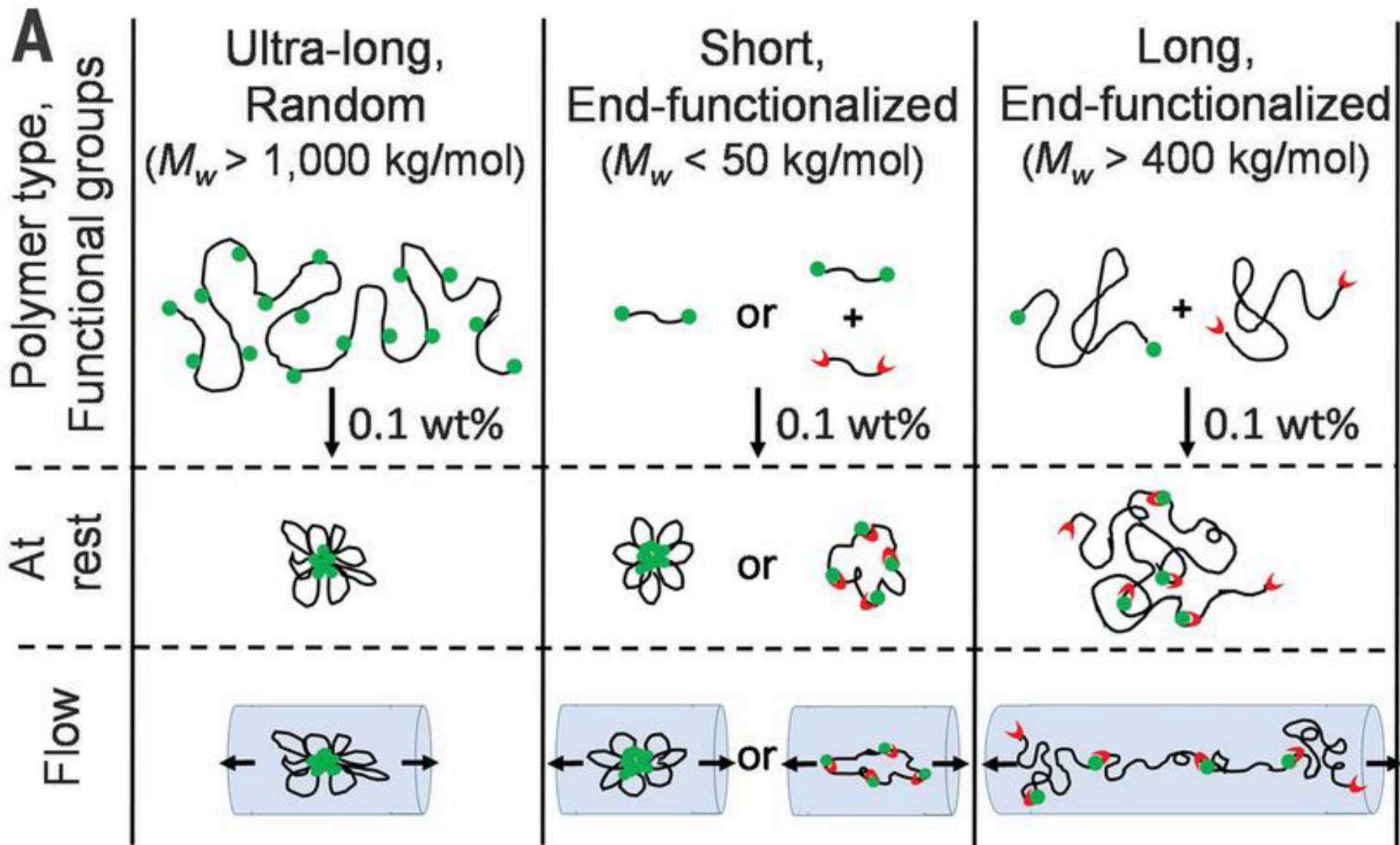
10000 fps
Manual 43583
Date : 2013/3/22

1/10000 sec
frame : 0
MCK Jet-A-10

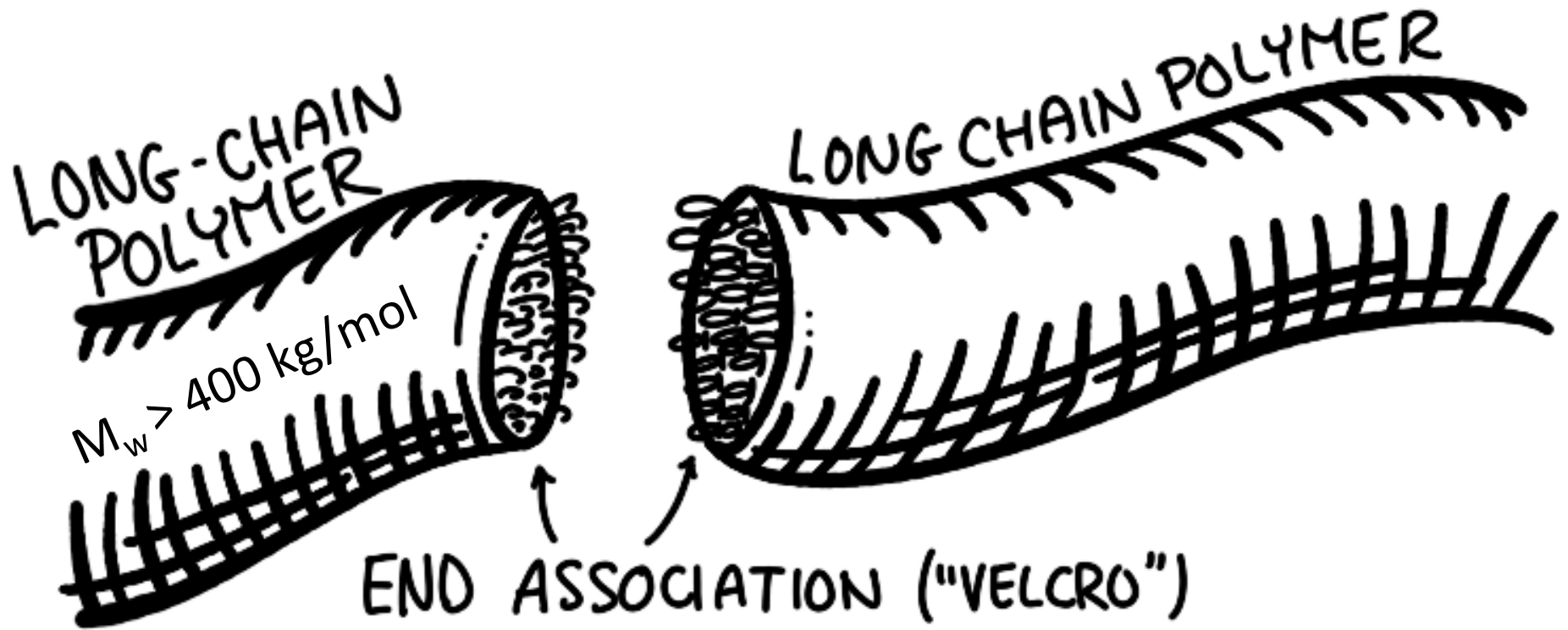
1024 x 512
+0.0 ms



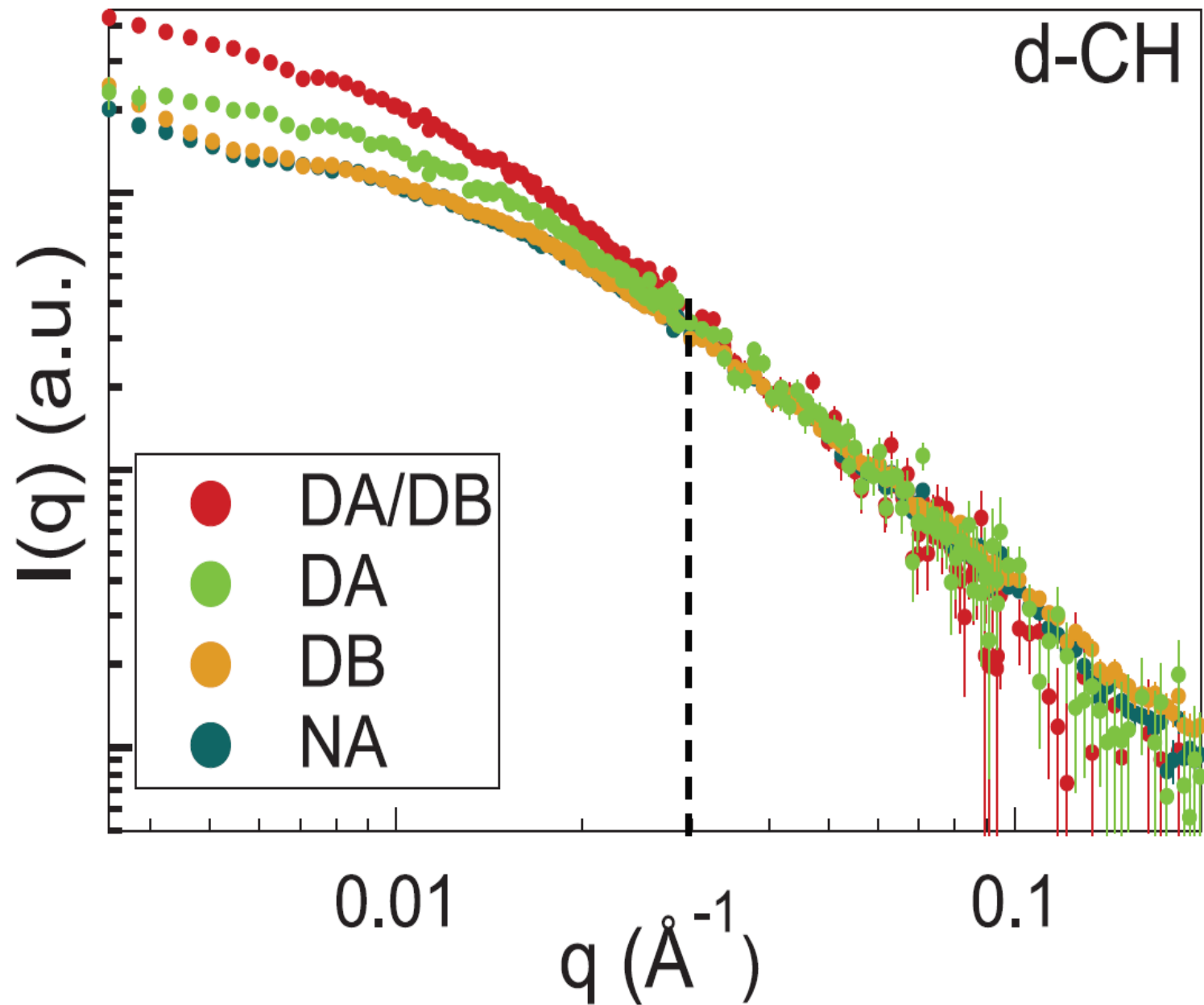
MIST PREVENTION IN JET FUEL



MIST PREVENTION IN JET FUEL



MIST PREVENTION IN JET FUEL

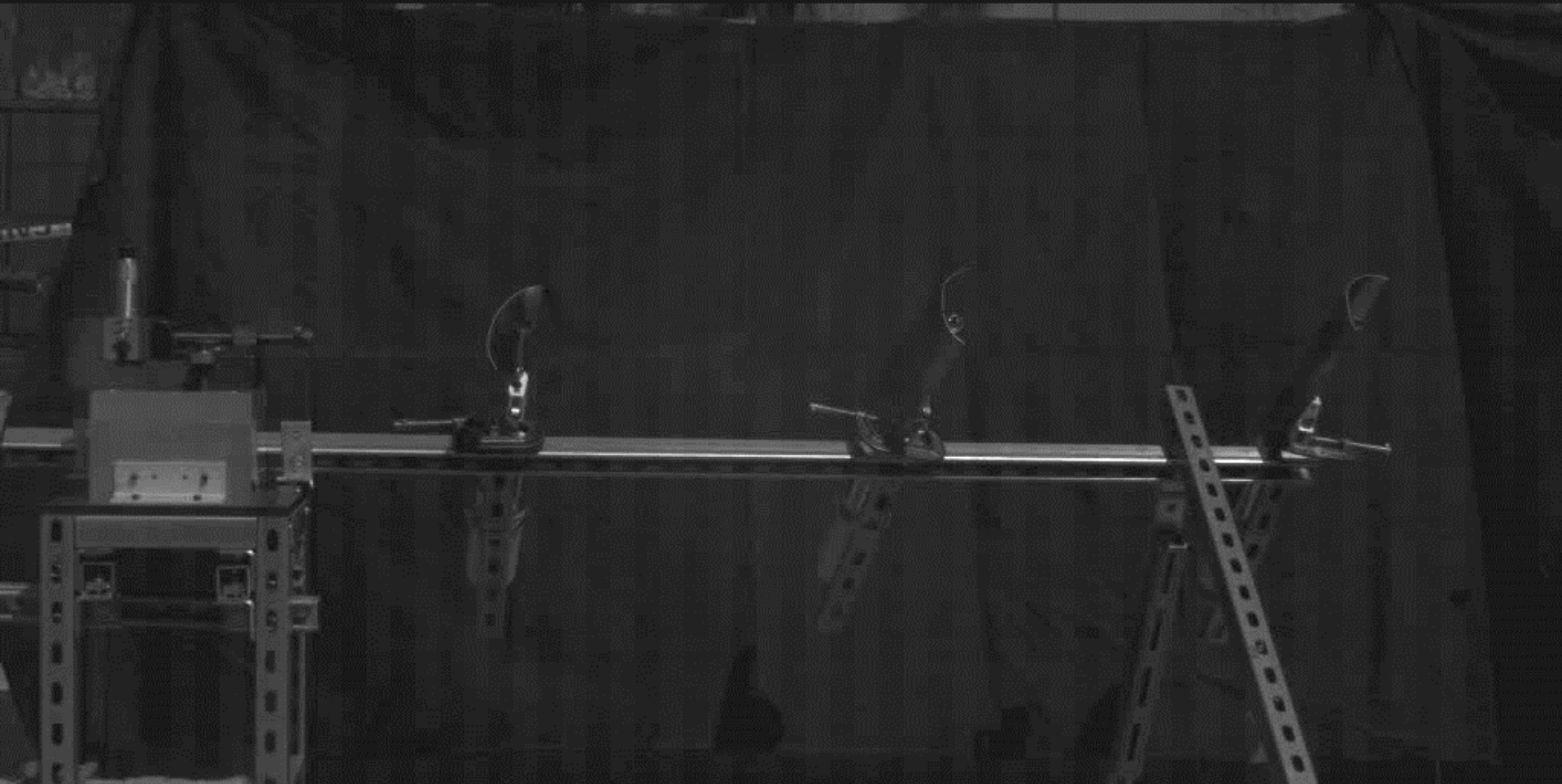


MIST PREVENTION IN JET FUEL

10000 fps
Manual 43583
Date : 2013/3/22

1/10000 sec
frame : 6
MCK-Run12 4.2 PIB Unsheared

1024 x 512
+0.6 ms



AWARDS



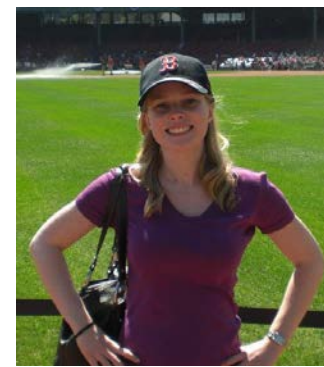
Nick Butch
PECASE
&
Katharine B. Gebbie
Young Investigator
Award - NIST Sigma Xi



Robert Cava
(Princeton)
2016 MRS Medal



Guy Marcus
(JHU)
Forbes 30 Under 30



Michelle Jamer
Gordon Research
Conference on
Multiferroics and
Magnetoelectric
Materials Best Poster
Prize



Julie Borchers
NSSA Outstanding
Service Award



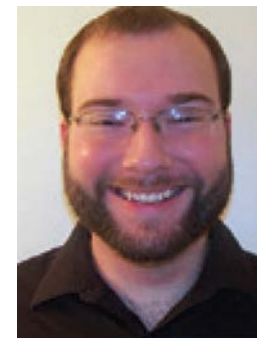
Thomas Epps
(U. Delaware)
APS John H. Dillon
Medal



Kate Ross
(Colorado State U.)
APS George E. Valley
Jr. Prize



Liz Kelley
Sigma Xi Most
Outstanding Poster



Jacob LaManna
Runner-up Sigma Xi
Poster

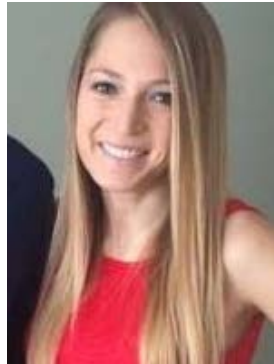


Piero Baglioni
(U. Florence)
Overbeek Gold Medal

AWARDS



Ramon Castaneda Priego
(Universidad de Guanajuato)
Mexican Academy of Science's
Award for Young Scientists
("ciencias exactas")



Michelle Calabrese
(U. Delaware)
ACNS Student Poster
Award



John Copley
NSSA Fellow



Craig Brown
Samuel Wesley Stratton
Award
&
DOE 2016 Hydrogen
Storage Award (w/Jeff
Long UC Berkeley)



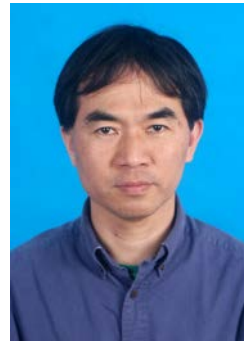
Terry Udovic
DOC Bronze Medal



Michi Nagao
Hamon President's
Choice Award



Ron Jones
George A. Uriano Award



Pengcheng Dai
(Rice U.)
NSSA Sustained Research
Prize



Jose Rodriguez
Investigado Nacional -
nivel 1 by the National
Council of Science &
Technology of Mexico



Dan Hussey
Arthur S. Flemming
Award

AWARDS



Norm Wagner
(U. Delaware)
National Academy of
Inventors Fellow



Mircea Dinca
(MIT)
Alan T. Waterman Award



Efrain Rodriguez
(U. Maryland)
Journal of Materials
Chemistry C Emerging
Investigator



Matt Helgeson
(UCSB)
ACS Unilever Award

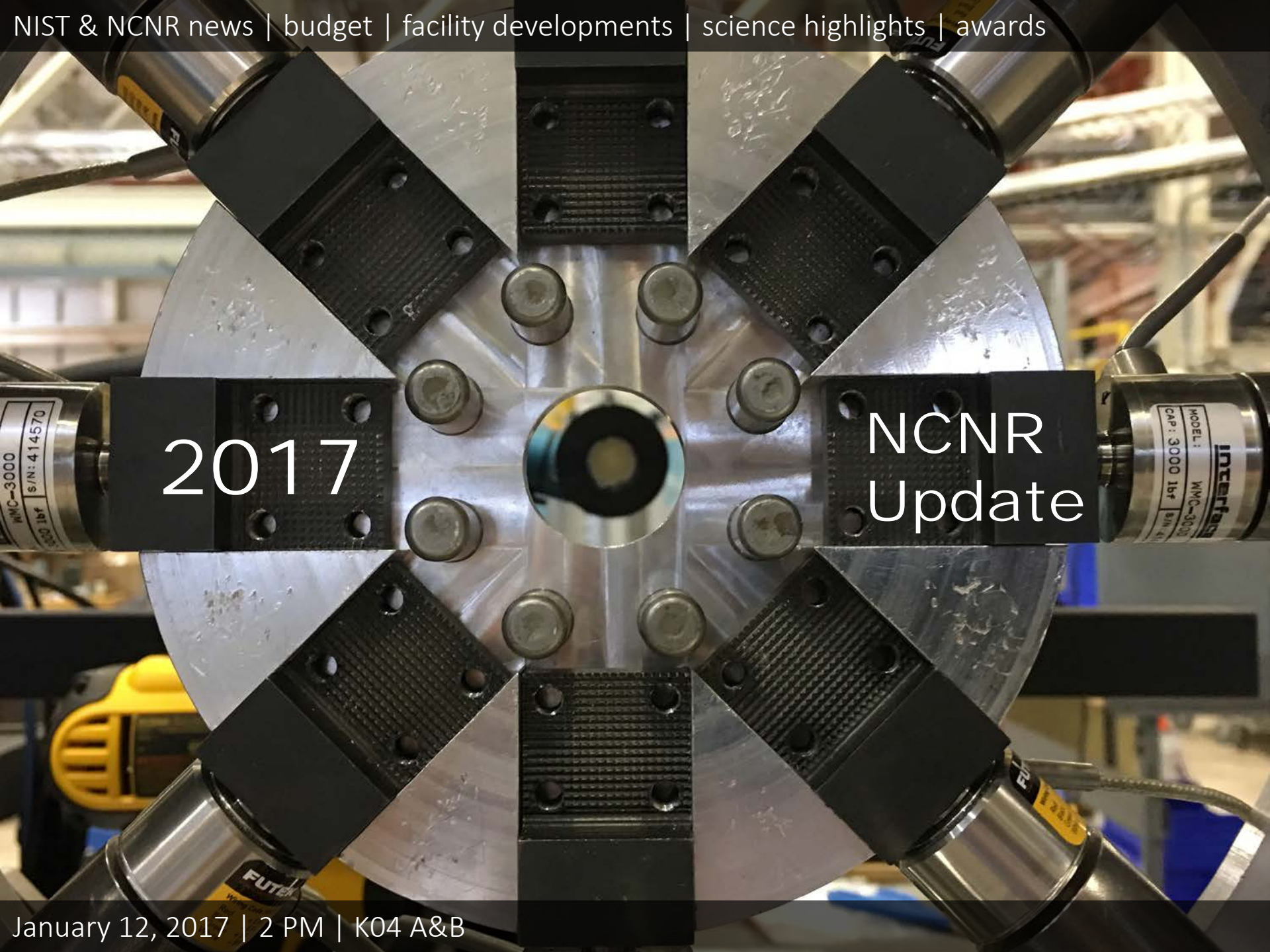


Amber Larson
(U. Maryland)
Margaret C. Etter
Student Lecturer Award



Daniel Taylor
(U. Maryland)
Margaret C. Etter
Student Lecturer
Award
&
Ludo Frevel
Crystallography
Scholarship





2017

NCNR
Update