

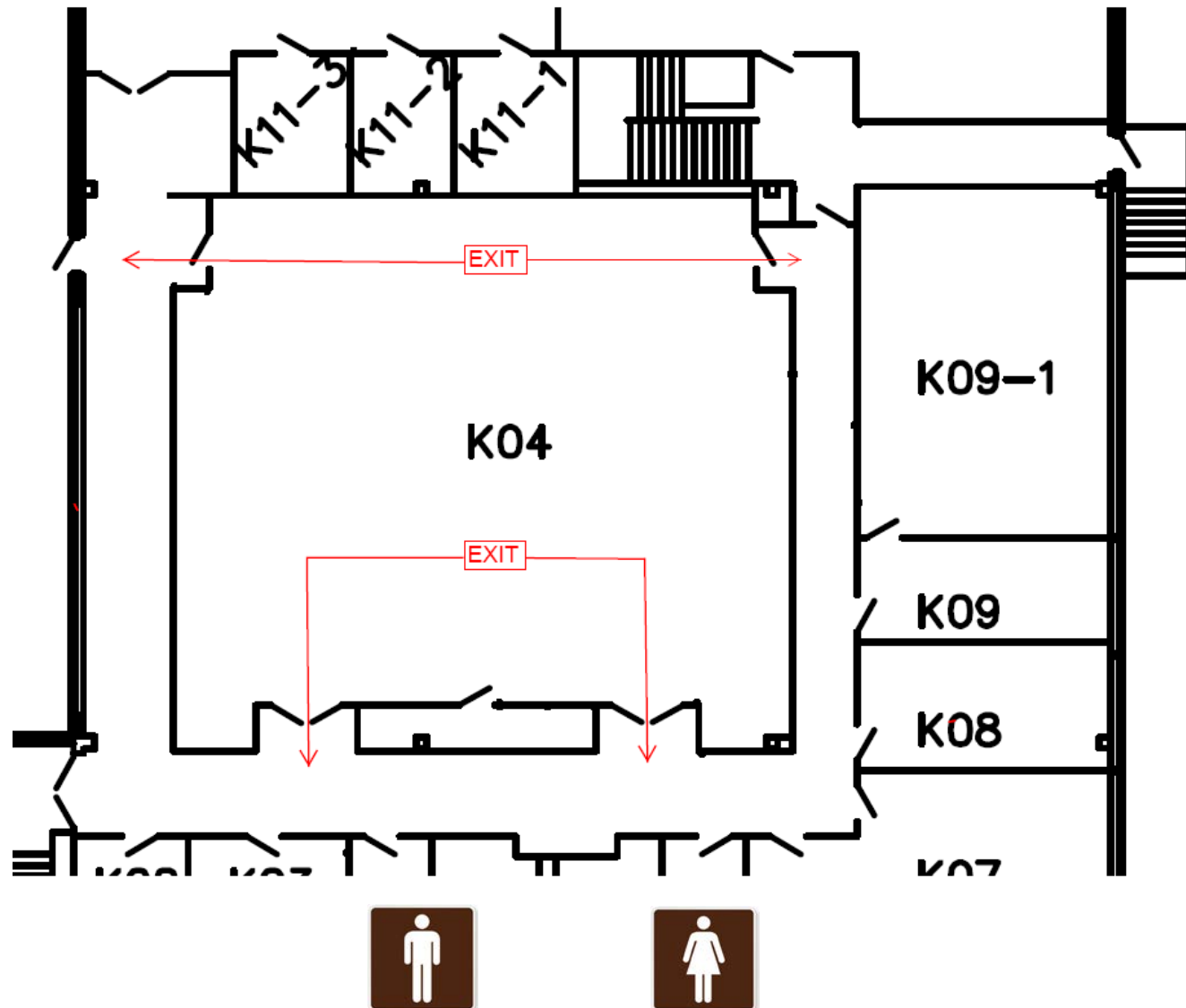


2018

NCNR

February 15, 2018

# EMERGENCY EXITS



NEWS

# SHUTDOWNS

Jan 20-22 & Feb 9 (9 hrs)





# NIST



Walt Copan  
NIST Director



Kent Rochford  
ADLP



Del Brockett  
ADMR



Walt Copan  
NIST Director

January 23, 2018

Rob

Thanks very much for your note. It's our pleasure. The user program is so important for NIST and our many stakeholders. We appreciate all that you and the NCNR team do to maintain our high standards of performance, to deliver value, and to assure user satisfaction.

Best,

Walt

BUDGET

# BUDGET

## FY 2018

CR until March 23<sup>rd</sup>



## FY 2019

President's budget released  
February 12<sup>th</sup> → Major reductions

The context changed before the  
budget was released;

Discretionary spending caps  
raised;

Reflects elimination of Budget  
Control Act sequestration;

On to Congress...



# BUDGET

## FY 2018

CR until March 23<sup>rd</sup>



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# BUDGET

## FY 2018

CR until March 23<sup>rd</sup>



## FY 2019

*"Simultaneous with our release of the budget, we will release an addendum laying out the administration's roadmap for how to account for the increased spending caps in a responsible manner. It will include additional FY19 funding for a limited set of administration priorities as well as proposals to fix certain budget gimmicks used to circumvent the spending caps. Separate from our FY19 budget request and addendum, we will also be providing technical assistance to Congress on how we recommend Congress allocate funding under the increased FY18 caps."*

Still on to Congress...

# NCNR PRIORITIES

# 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

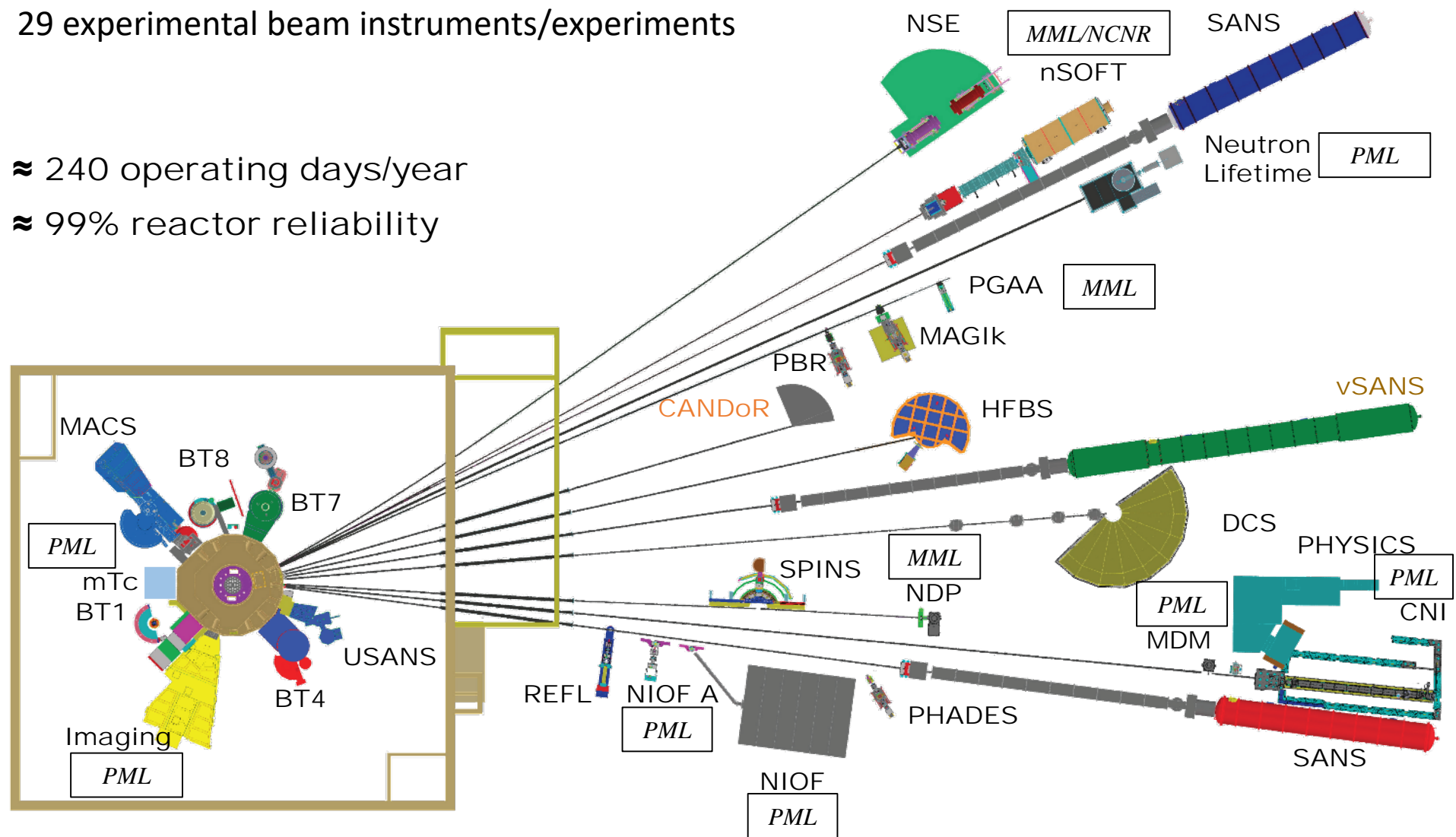
**Develop long-term plan for providing neutrons to the US research community**

# NCNR Overview

29 experimental beam instruments/experiments

≈ 240 operating days/year

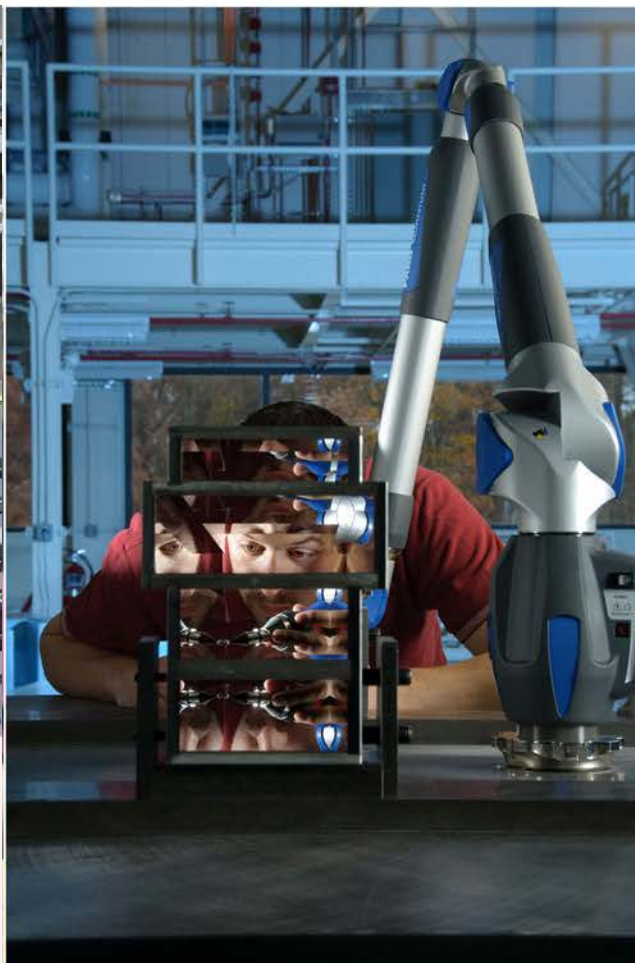
≈ 99% reactor reliability



≈ 2500 research participants/year

≈ 300 pubs/year

*The mission of the NIST Center for Neutron Research is to ensure the availability of neutron measurement capabilities to meet the needs of U.S. researchers from industry, university and other Government agencies.*

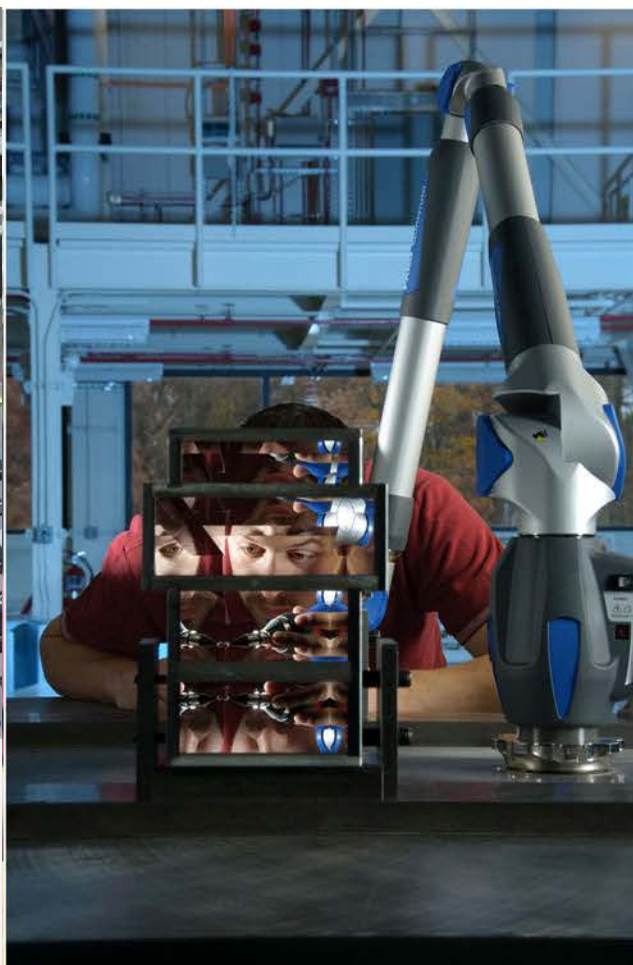




**Operate** the NIST Research Reactor cost effectively while ensuring the safety of the staff and general public



**Develop** neutron measurement techniques, develop new applications of these techniques, and **apply** them to science and engineering problems of national interest

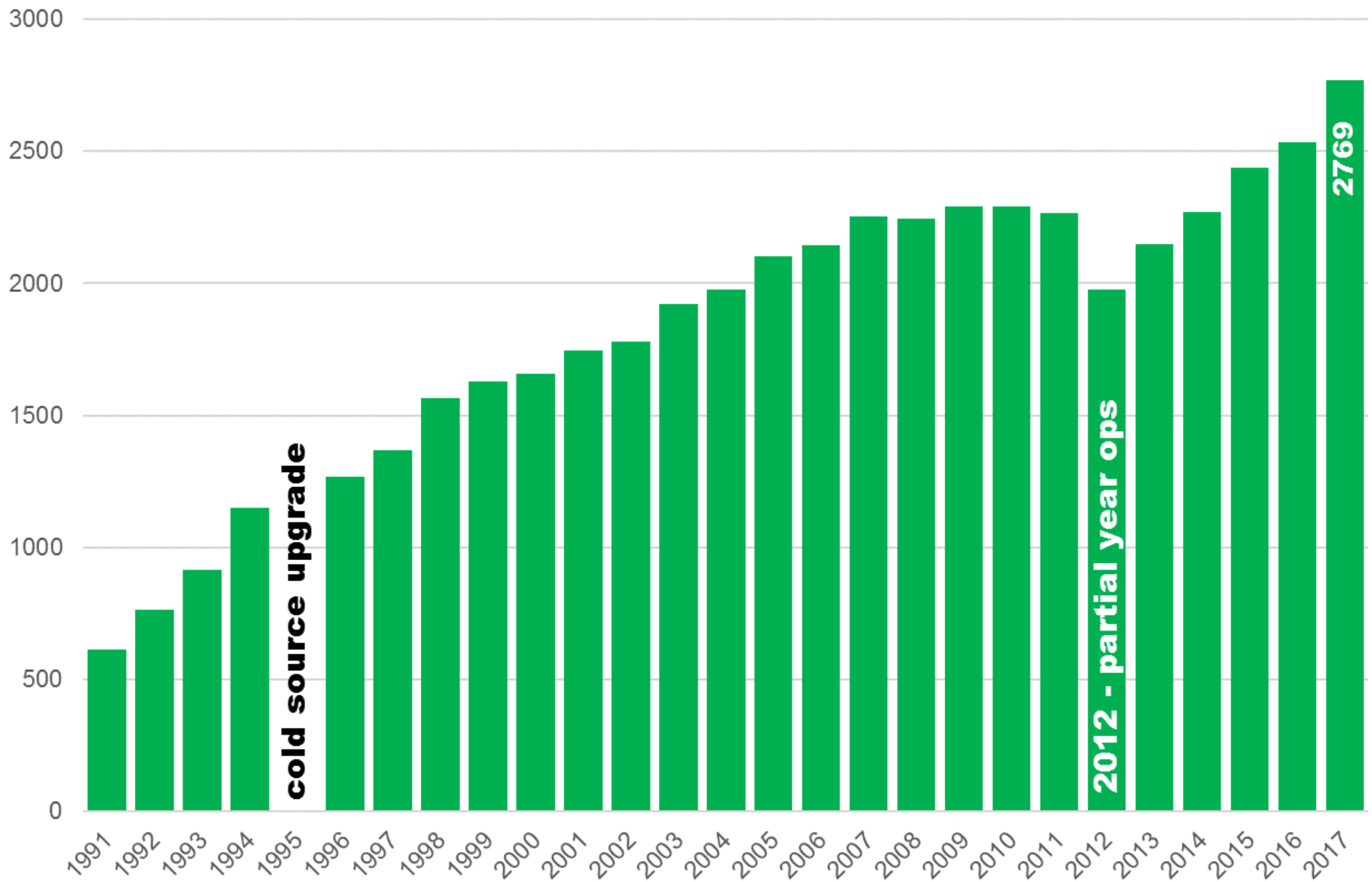


**Serve** the needs of researchers from industry, university, and government by operating the research facilities of the Center as a national user facility



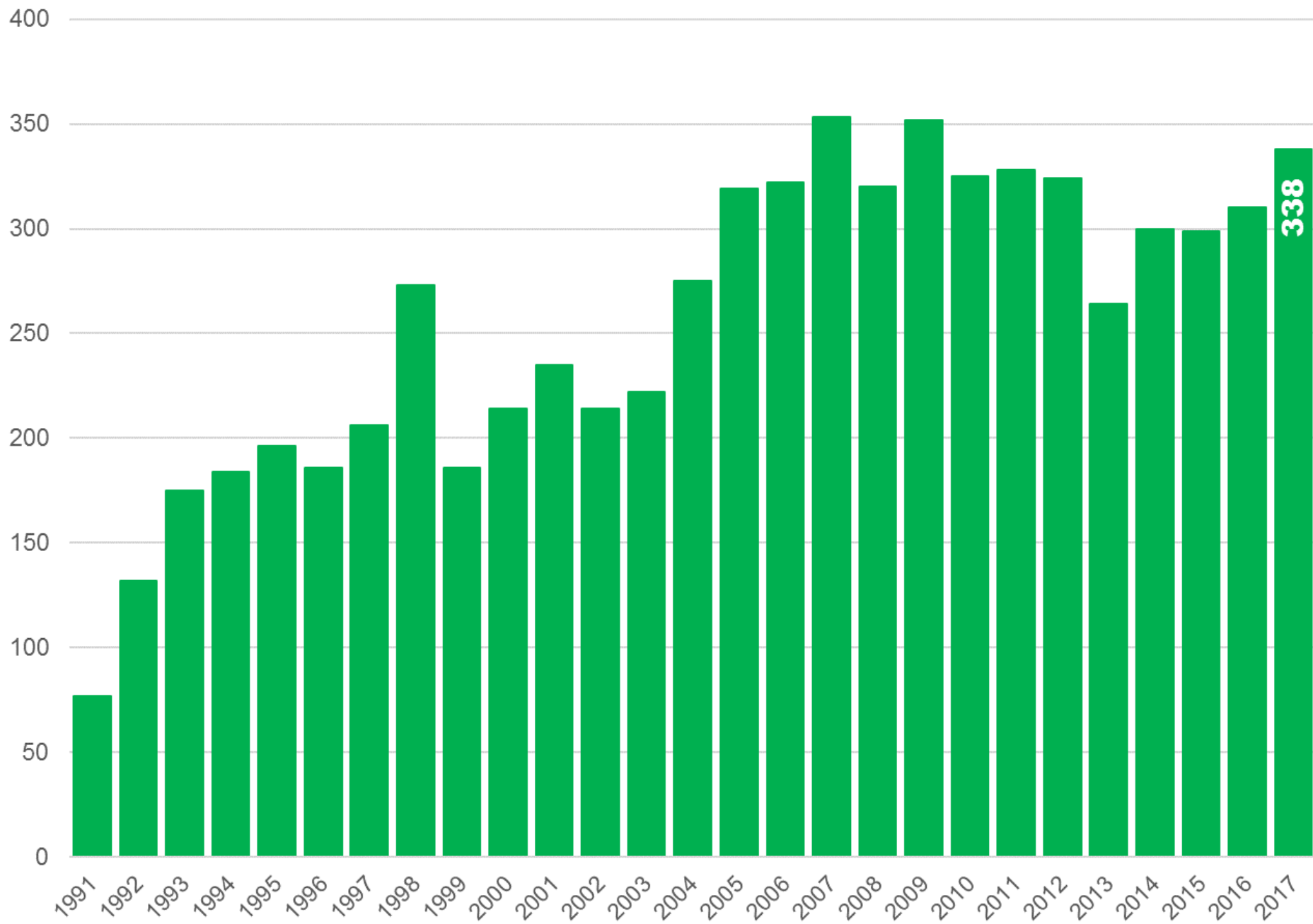
# RECENT ACCOMPLISHMENTS

# RESEARCH PARTICIPANTS

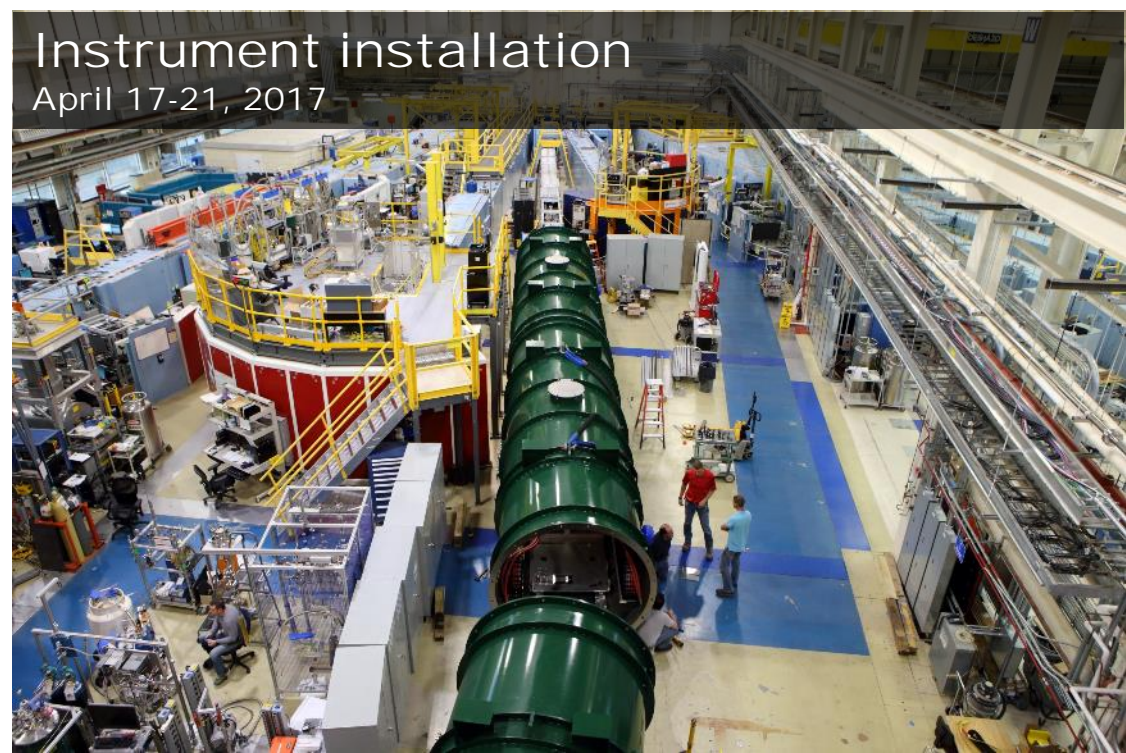


178 U.S. Universities | 42 U.S. Corporations | 42 U.S. Government Laboratories

# PUBLICATIONS









# August 11: First Neutrons on vSANS!

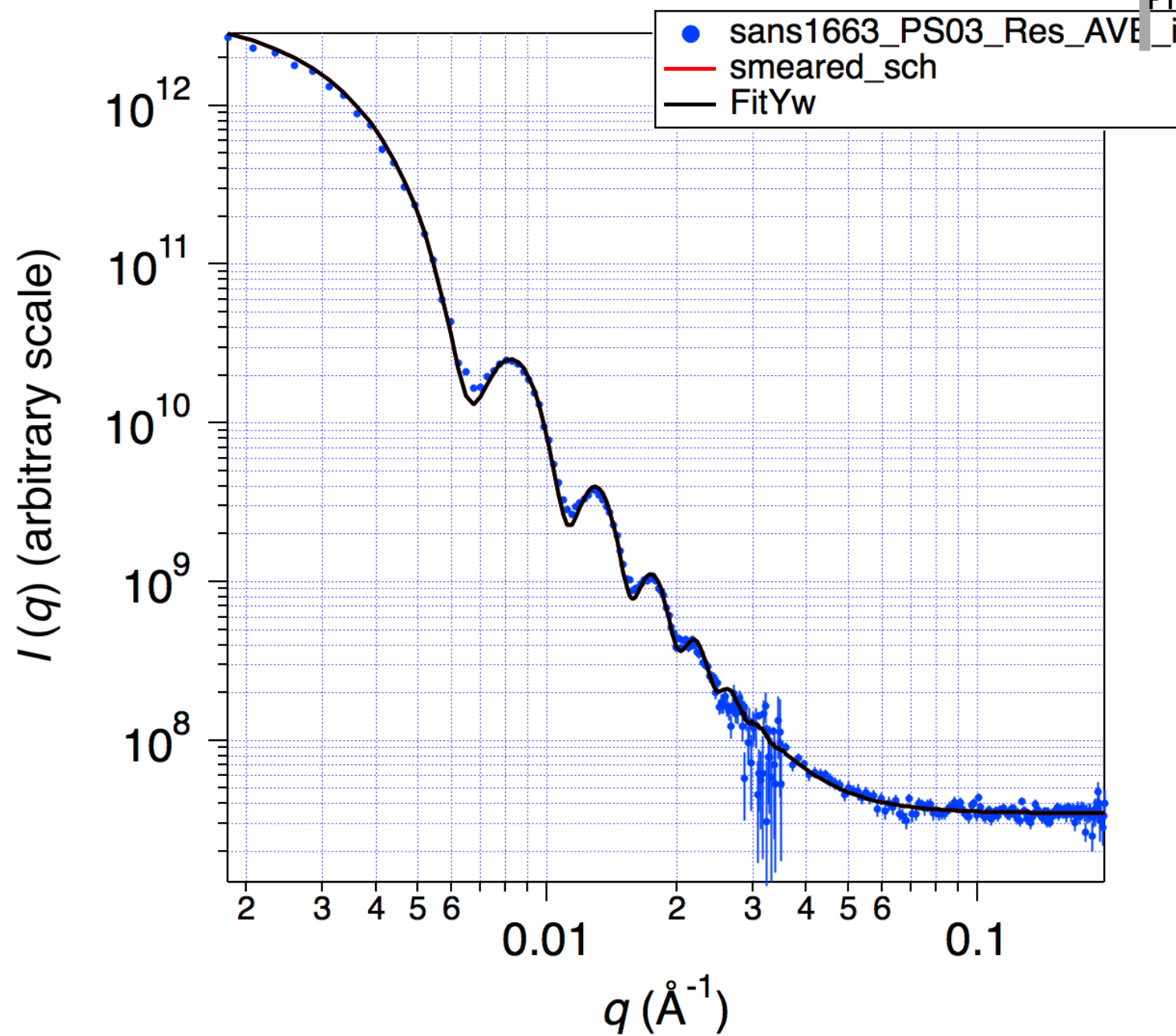
1,2 PRIORITY





# First measurement on vSANS

1, 2  
PRIORITY

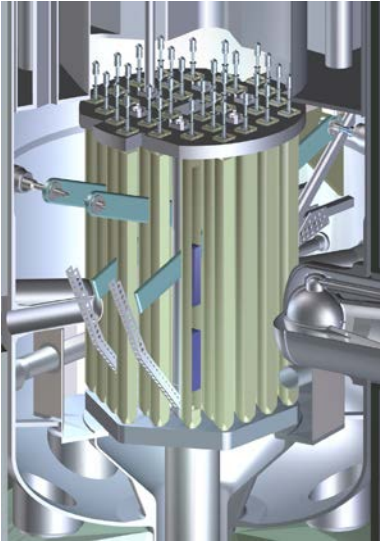


# FALL OUTAGE

September 10, 2017 - January 8, 2018

PRIORITY  
1

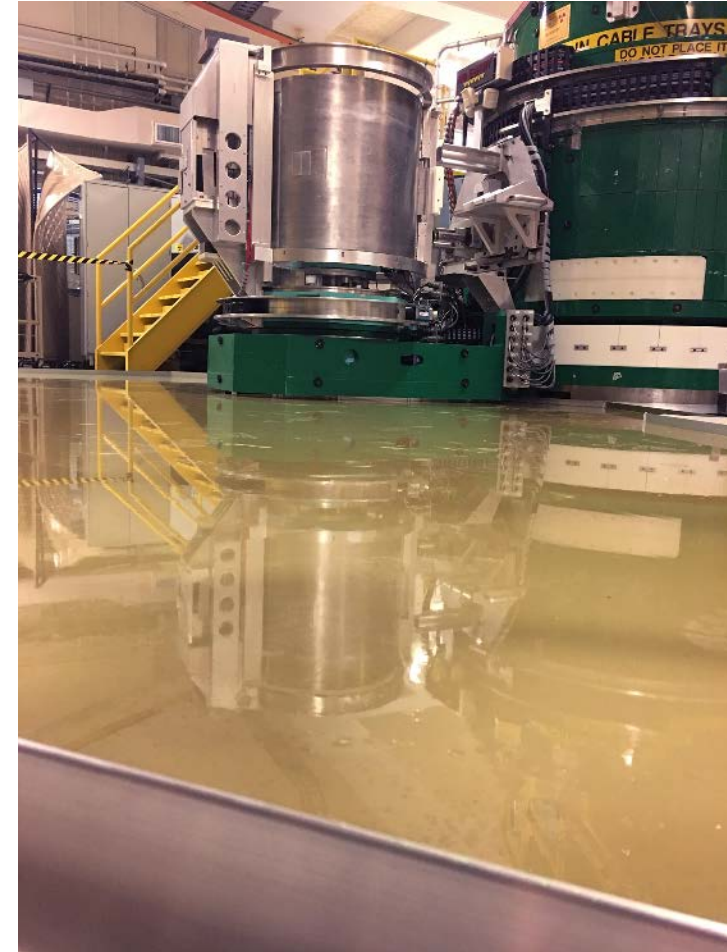
## SHIM ARM REPLACEMENT



## PRIMARY PUMP REPLACEMENT



## NEW EPOXY FLOOR AT BT7



Replacement epoxy floors at MACS & BT7

New epoxy floor, new monochromator and analyzer at BT8

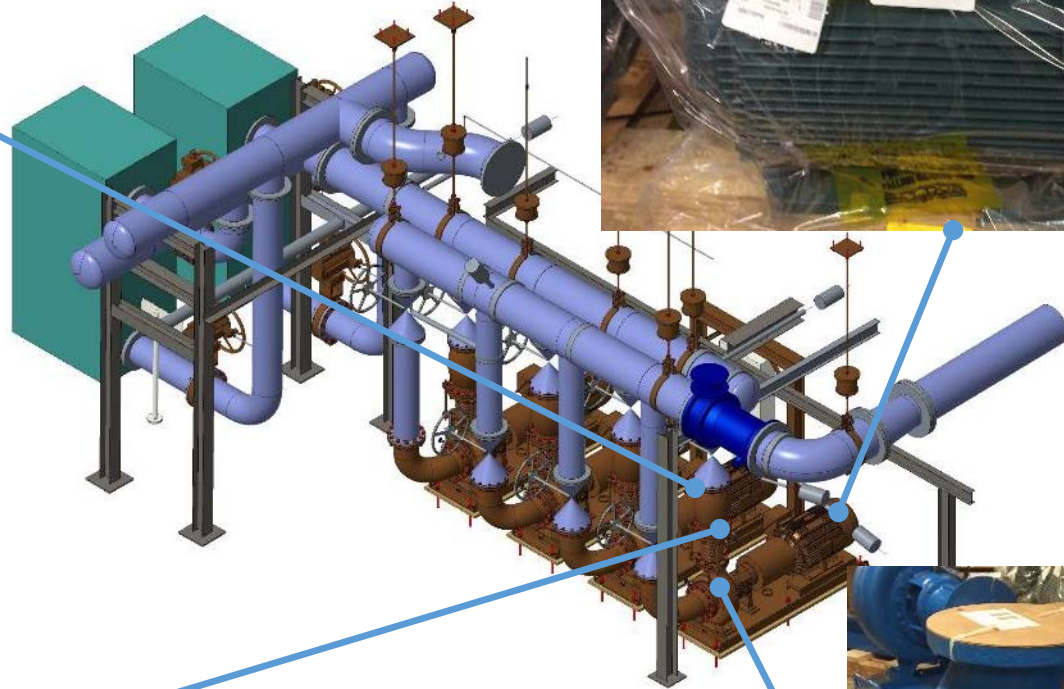
MACS alignment checks (components inside analyzer)

Paint G100 west floor and east walkways

NCNR storage facility completion (Bldg 321)

# NIST Reactor Primary Cooling System Upgrade

PRIORITY 1





# D<sub>2</sub> COLD SOURCE REFRIGERATOR

PRIORITY  
2

D<sub>2</sub> cold source gain: x2  
Projected installation: 2022

New 7 kW refrigerator  
commissioned in 2017

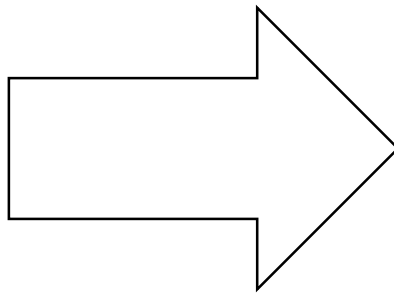
New refrigerator will be  
operational for cooling NCNR's  
two current H<sub>2</sub> cold sources  
starting in CY2018

**IKEA**  
model of refrigerator building



# CONTROL ROOM UPGRADE

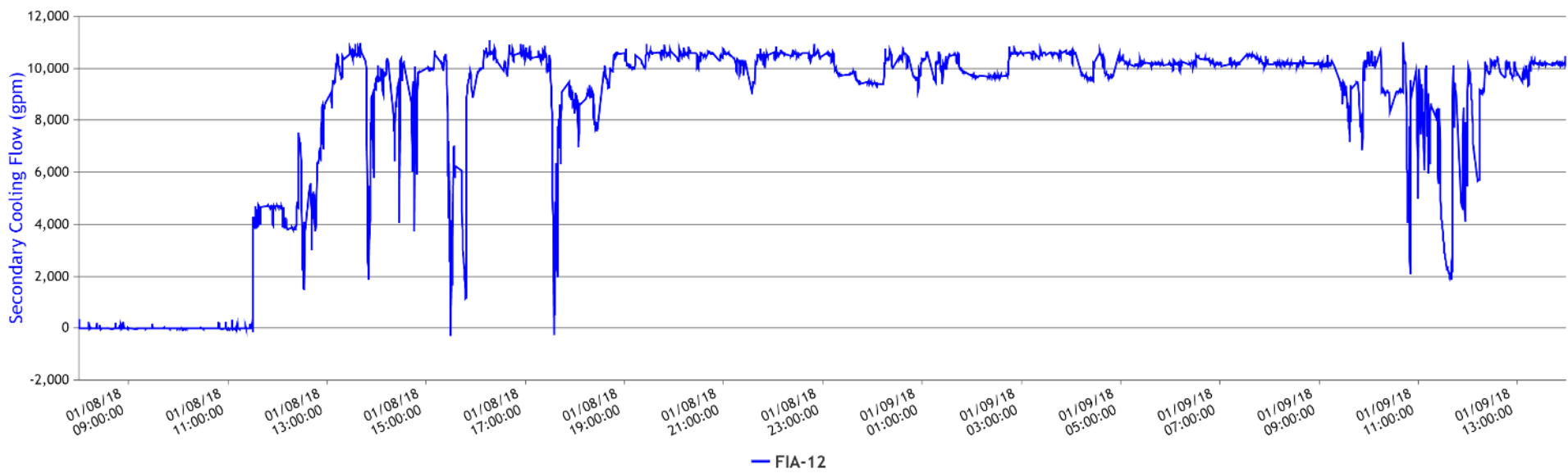
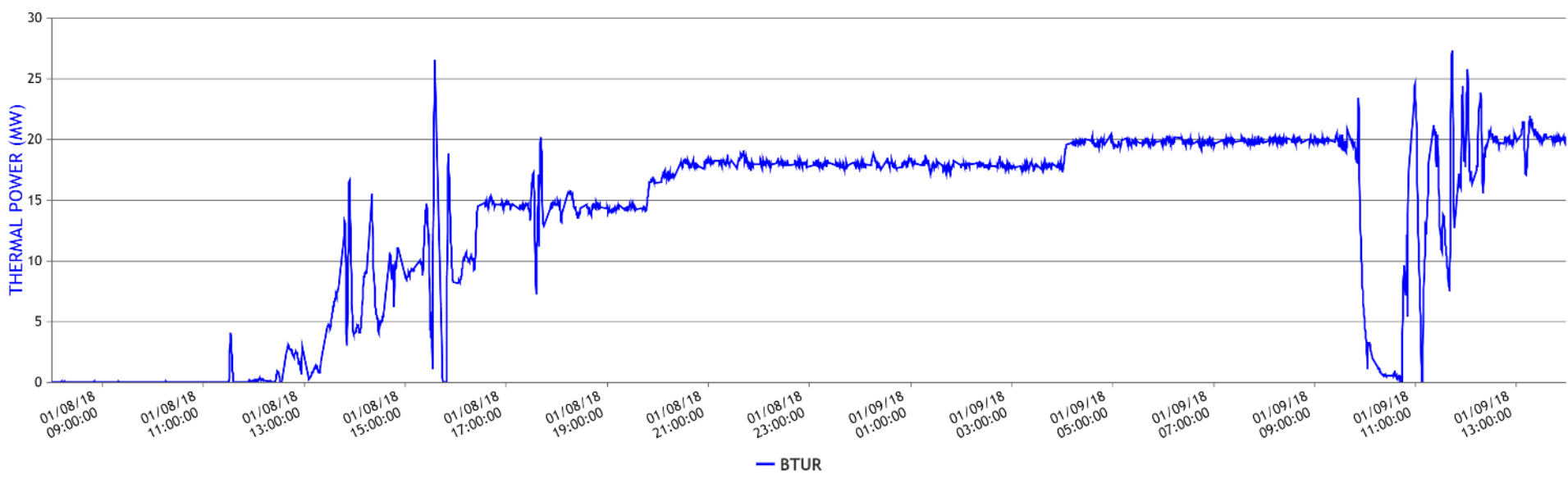
1  
PRIORITY



# REACTOR RE-START

PRIORITY  
1

...was a little rocky...





# REACTOR RE-START

PRIORITY  
1

...was a little rocky...



# FY2018 GOALS

Safely and reliably operate more than 180 days;

Serve more than 2300 researchers;

Complete long shutdown on schedule with all planned major work complete;



Commence vSANS user operations;

Perform the first neutron scattering experiment on a complex fluid flowing  $> 1,000,000 \text{ s}^{-1}$

SAFETY & SECURITY

# 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

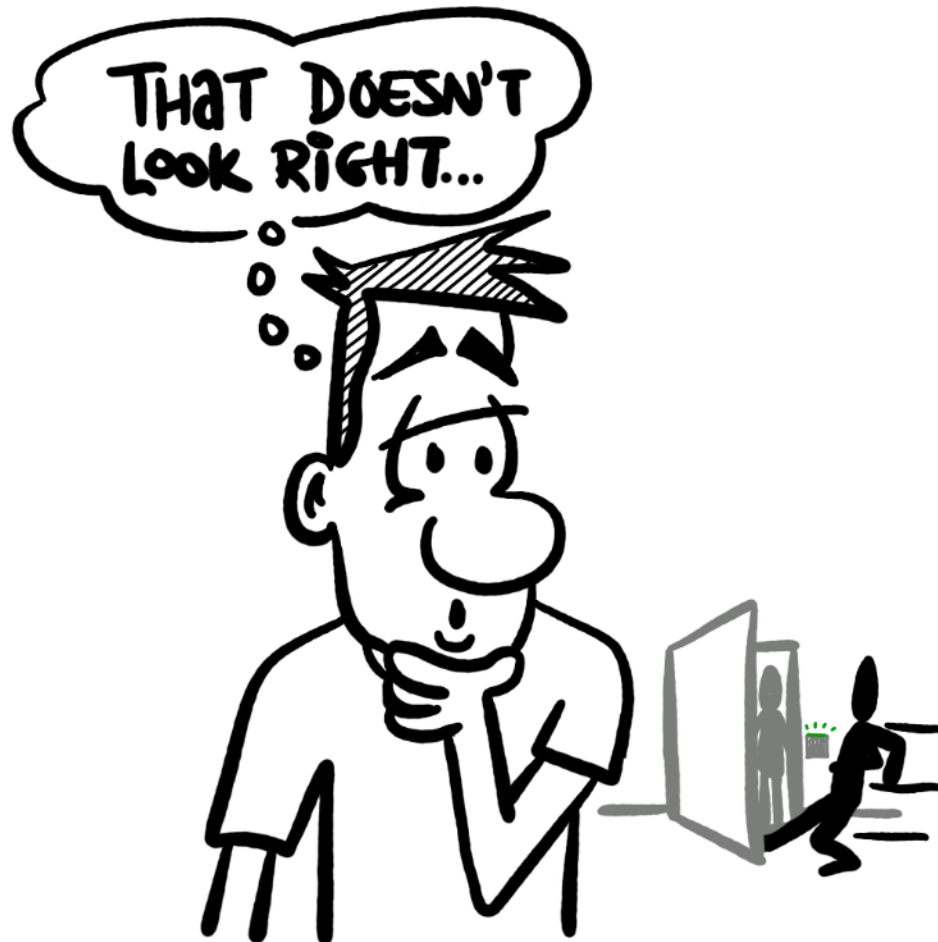
Maintain a tidy work environment

Take personal responsibility for your safety and the safety of others

# SECURITY

## MAINTAIN A QUESTIONING ATTITUDE

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



### *A FEW SELECT REMINDERS*

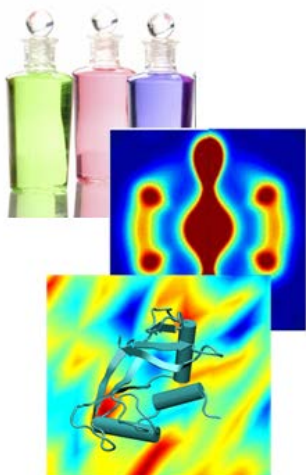
No tailgating or piggybacking

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.

# SCIENCE HIGHLIGHTS





# nSoft

*A consortium for the advancement of neutron-based measurements for manufacturing of soft materials.*

## nSoft

Yeah... we're kind of  
a big deal



Ron Jones, nSoft Director

**AMGEN**

Aramco Services  
Company



**Pfizer**



Procter & Gamble

**REGENERON**  
*science to medicine®*

**TOYOTA**

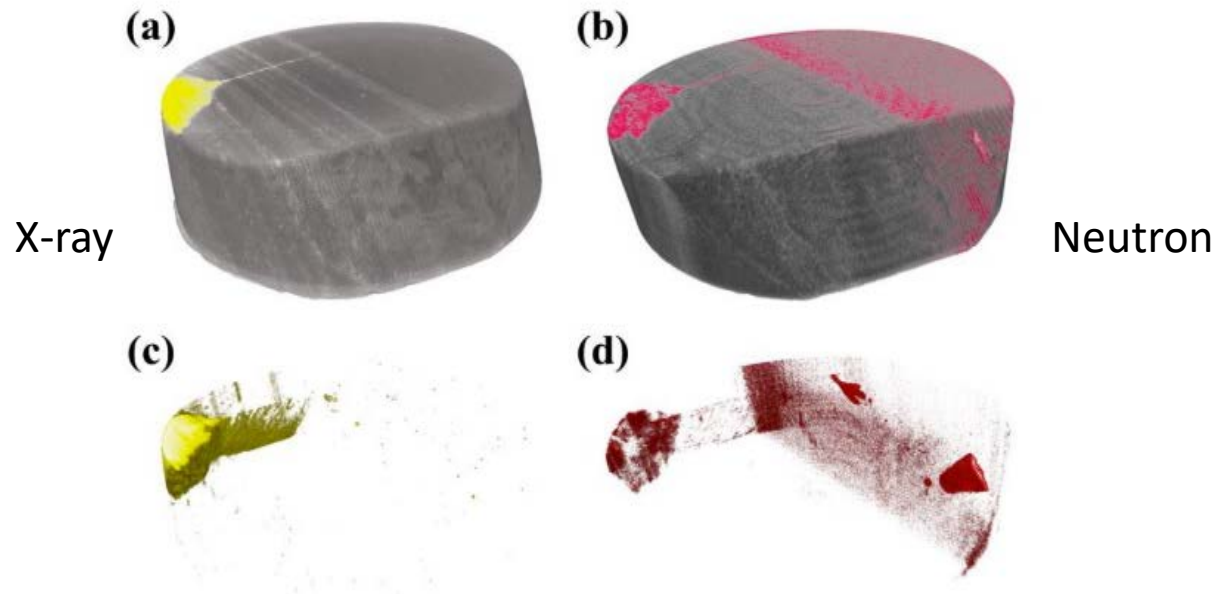
**L'ORÉAL**

**Genentech**  
*A Member of the Roche Group*

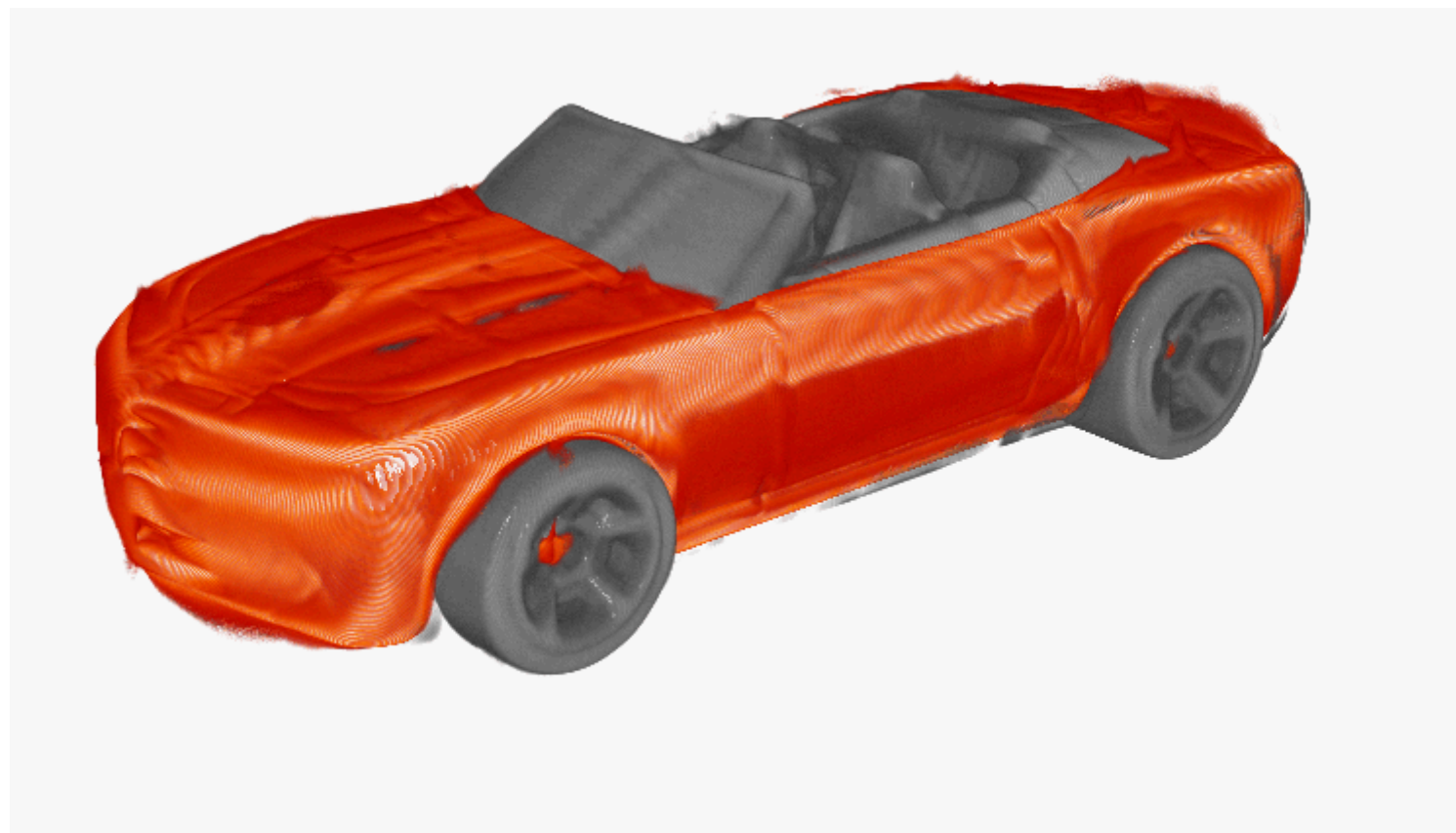


# Aramco Imaging of Shale Deposits

First 3-d simultaneous tomogram of shale core using both X-ray and Neutron sources. Data presented at international petroleum conference in 2017, and at the 2017 nSoft Annual Meeting (10.26.2017). Results highlight how the combination of X-ray and Neutron imaging was able to identify with accuracy and precision the location and quantity of a variety of minerals and organic deposits in shale core obtained by Aramco North American Services. The work has been submitted for publication.



Chiang et. al., Proceedings of the Society of Petrophysicists and Well-Log Analysts 58<sup>th</sup> Annual Logging Symposium, June 17-21, Oklahoma City.

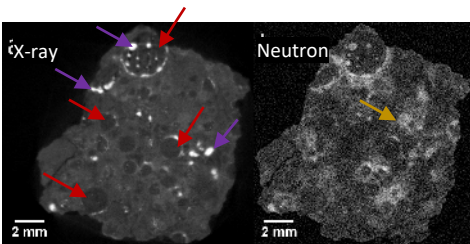


# SIMULTANEOUS NEUTRON AND X-RAY TOMOGRAPHY OF METEORITES

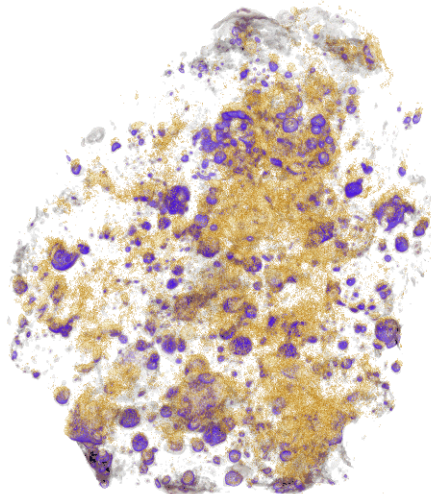
## CR2.8 Chondrite



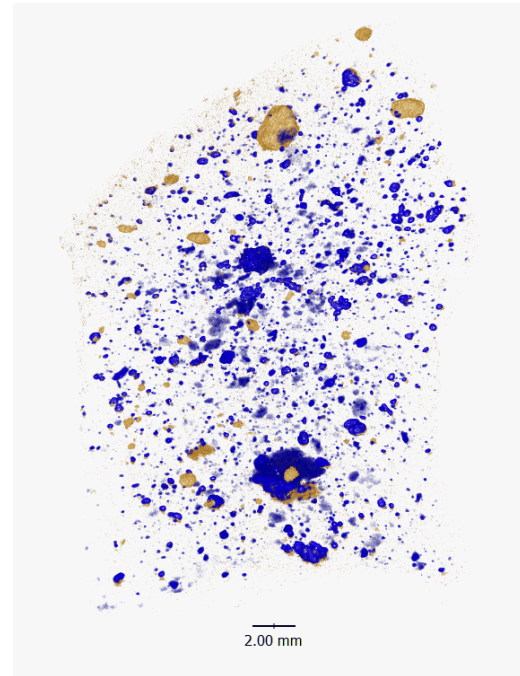
Mostly **magnesian chondrules** (Type 1) with abundant iron, ~12% phyllosilicates, and 1.3%wt H<sub>2</sub>O.



Neutron -> **Aqueously modified serpentine**  
X-ray -> **Fe chondrules**



## Howardite Achondrite



Neutron -> **H-rich C chondrite fragments**  
X-ray -> **Fe-rich metal and silicates**



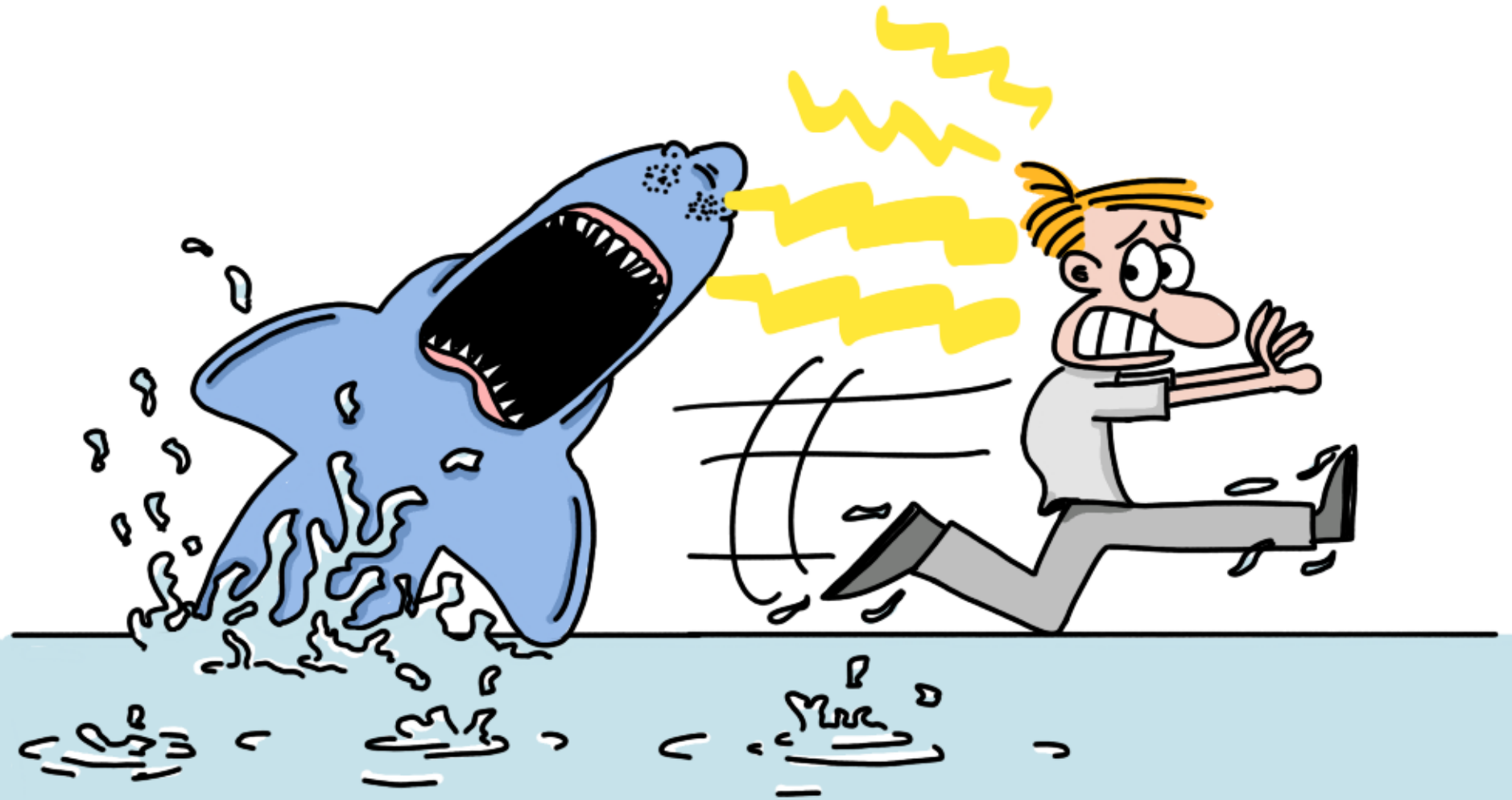
Stony meteorite originating from asteroid 4 Vesta in asteroid belt, ~15% Fe with H-rich chondrite fragments.



All living creatures produce an electric field via muscle contraction

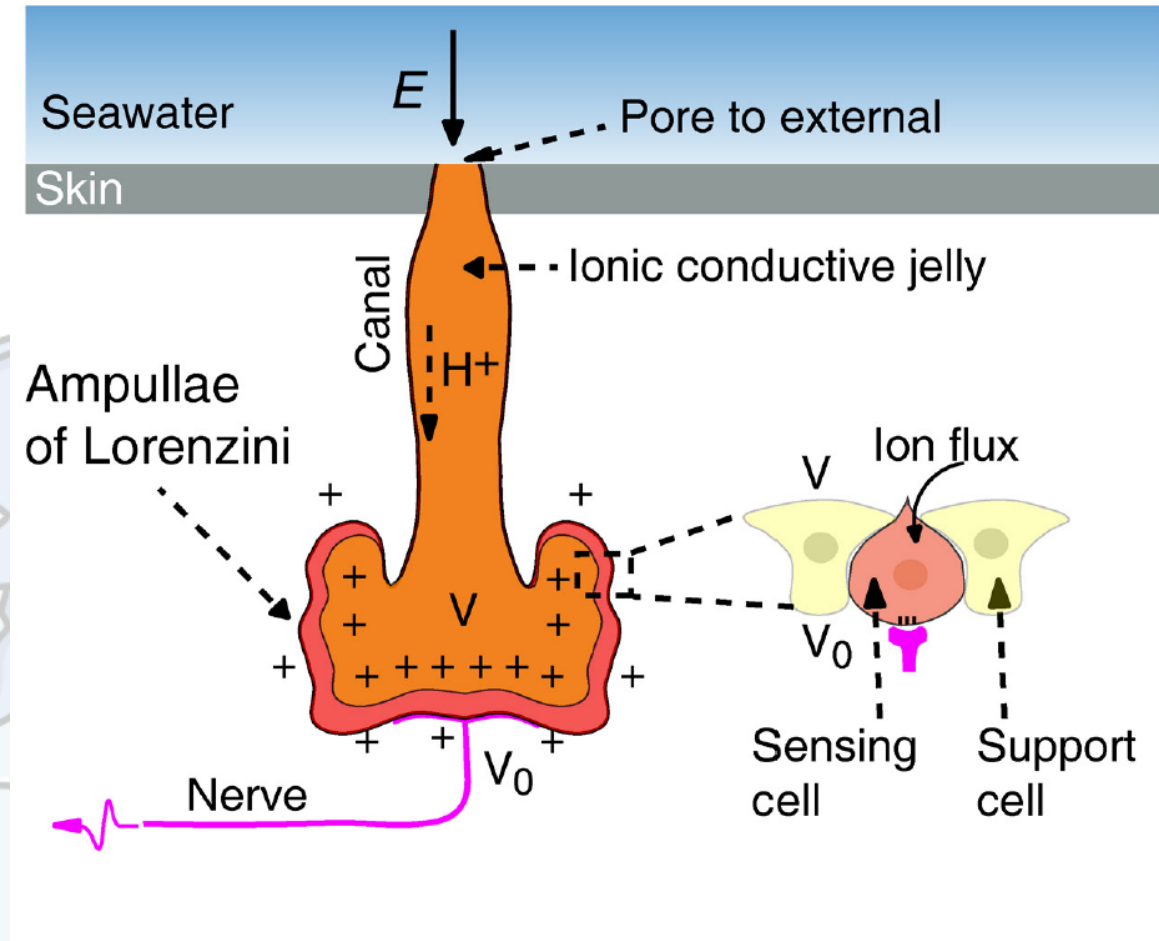


Some living creatures detect prey via electroreception



# How do sharks do it?

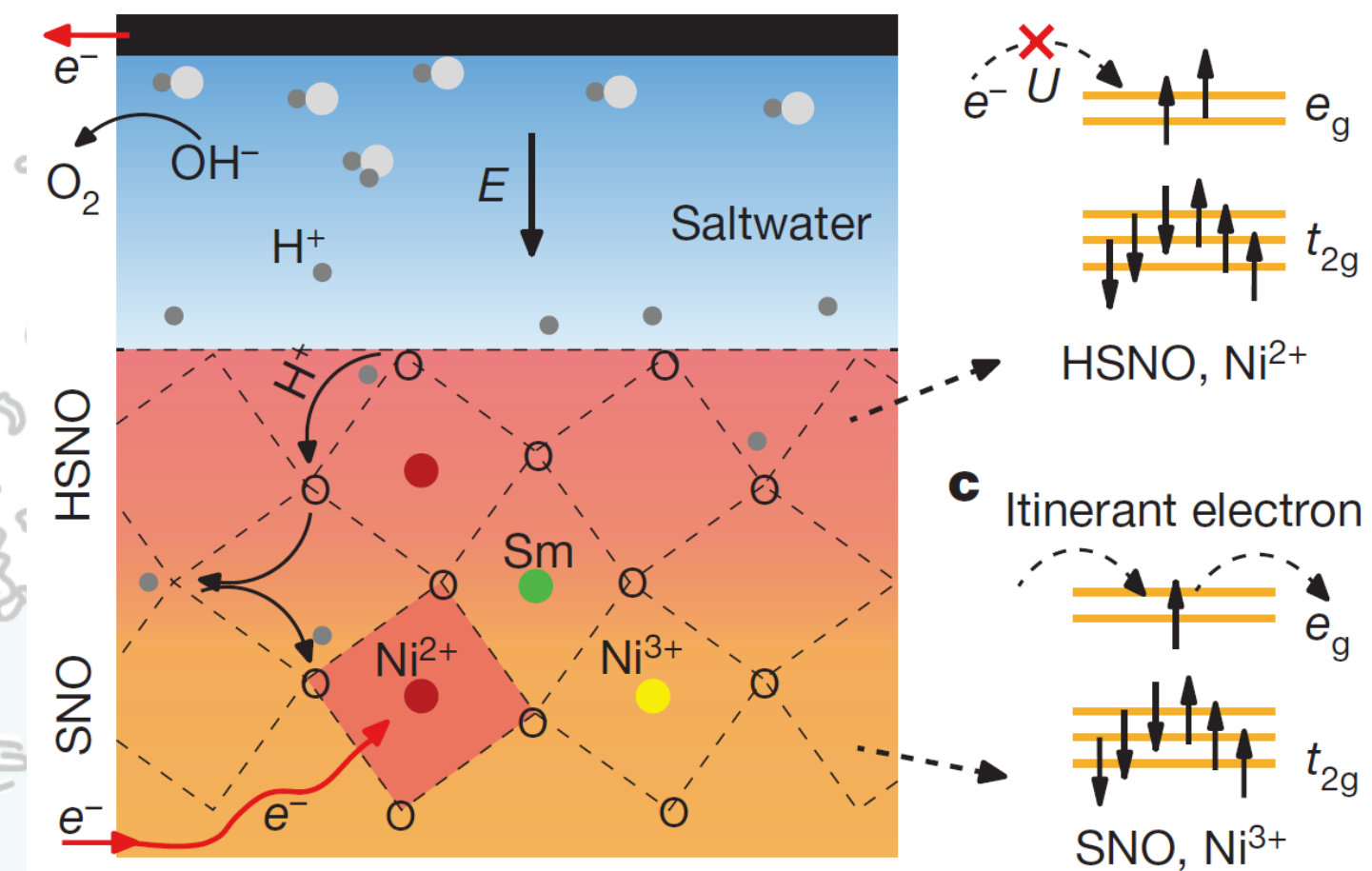
## *ampullae of Lorenzini*



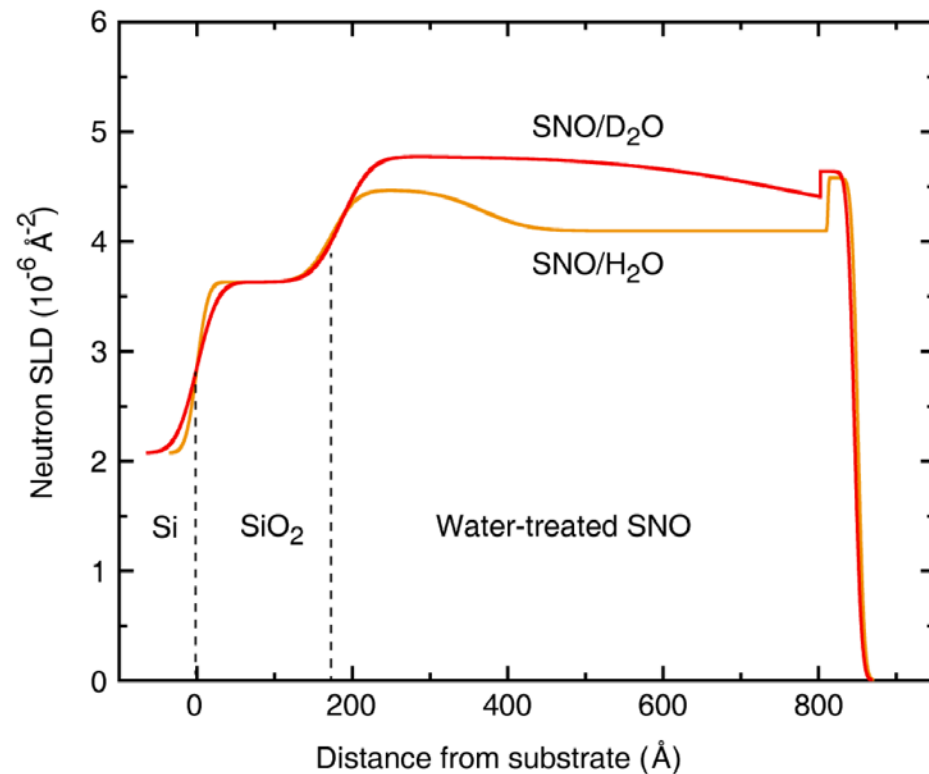
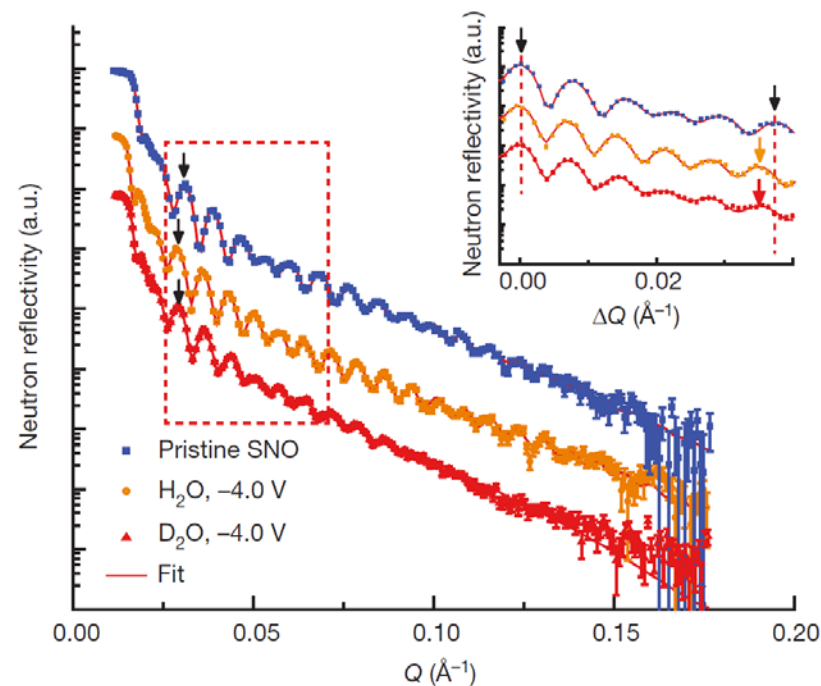


# Artificial ampullae of Lorenzini?

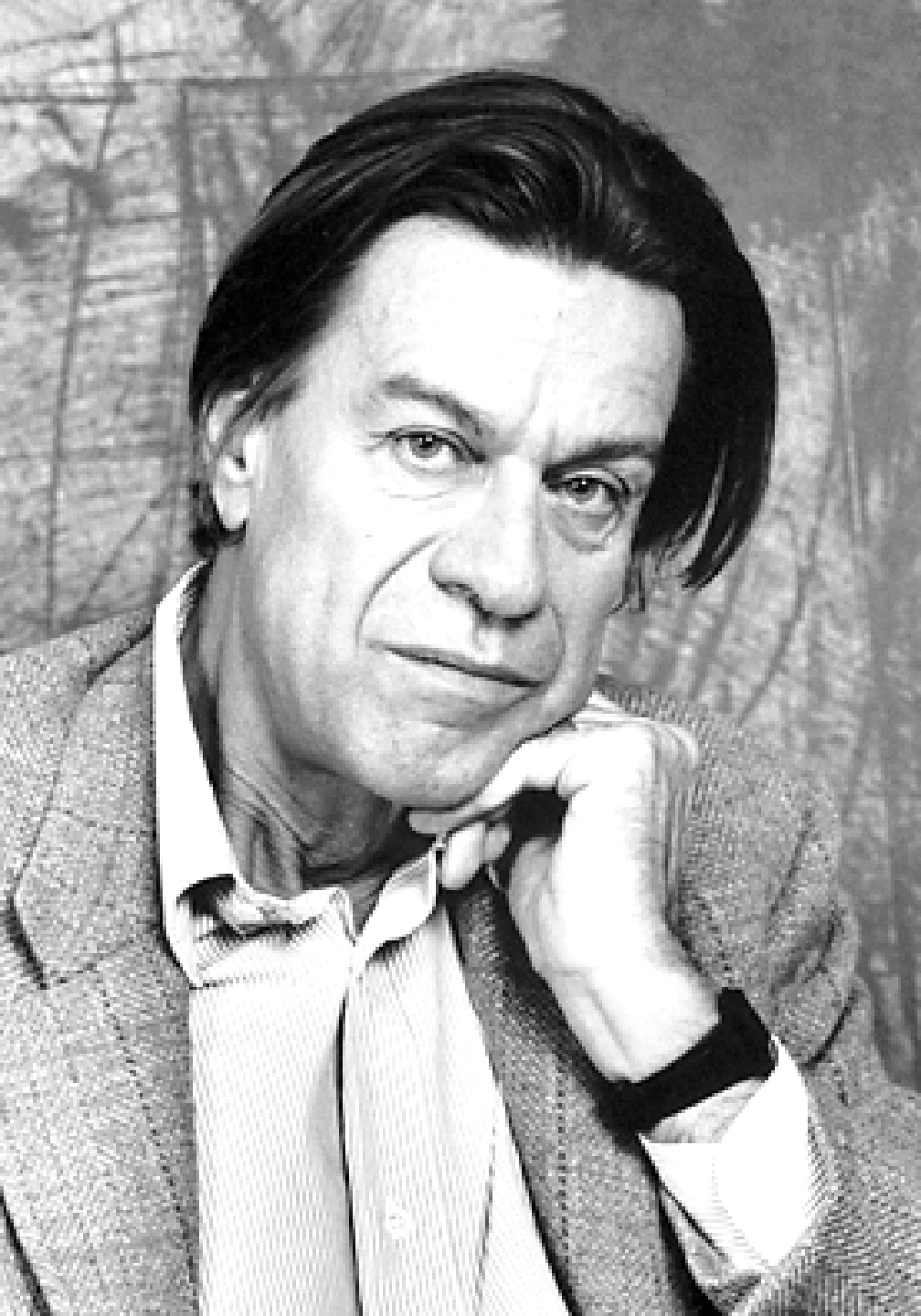
*SmNiO<sub>3</sub> (SNO)*



# Artificial ampullae of Lorenzini?



→ **NR shows intercalation and transport of  $\text{H}^+$  from solution to SNO...** similar to the ion transfer seen in the membranes of ampullae of Lorenzini



## 1991 Nobel Prize in Physics



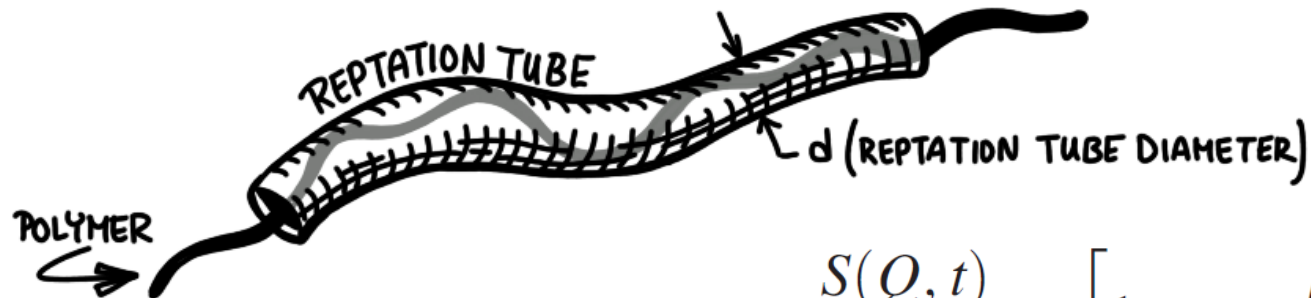
Pierre-Gilles de Gennes

*"...for discovering that methods developed for studying order phenomena in simple systems can be generalized to more complex forms of matter, in particular to liquid crystals and polymers."*



# WHAT DO POLYMERS AND SPAGHETTI HAVE IN COMMON?

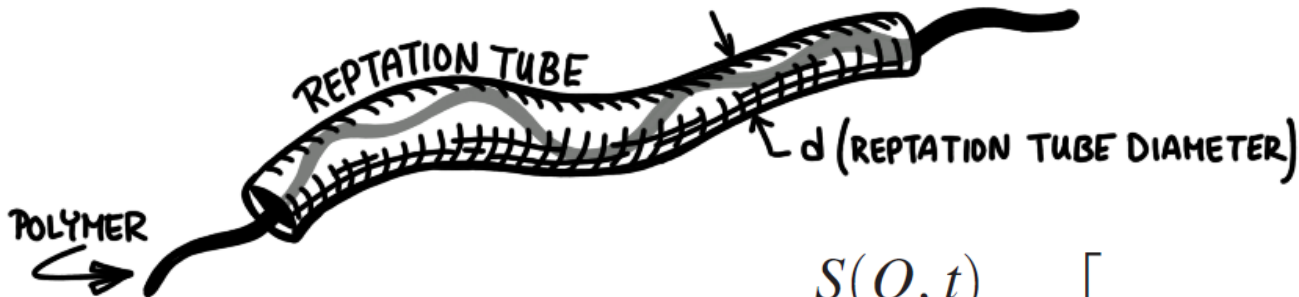
Senses et. al., Small particle driven chain disentanglements in polymer nanocomposites, Phys. Rev. Lett. Vol. 118, 7 April 2017, doi:10.1103/PhysRevLett.118147801



$$\frac{S(Q, t)}{S(Q, 0)} = \left[ 1 - \exp\left(-\frac{Q^2 d^2}{36}\right) \right] S_{\text{local}}(Q, t) + \exp\left(-\frac{Q^2 d^2}{36}\right) S_{\text{esc}}(Q, t)$$

# WHAT HAPPENS WHEN YOU ADD NANOPARTICLES (MEATBALLS)?

Senses et. al., Small particle driven chain disentanglements in polymer nanocomposites, Phys. Rev. Lett. Vol. 118, 7 April 2017, doi:10.1103/PhysRevLett.118147801

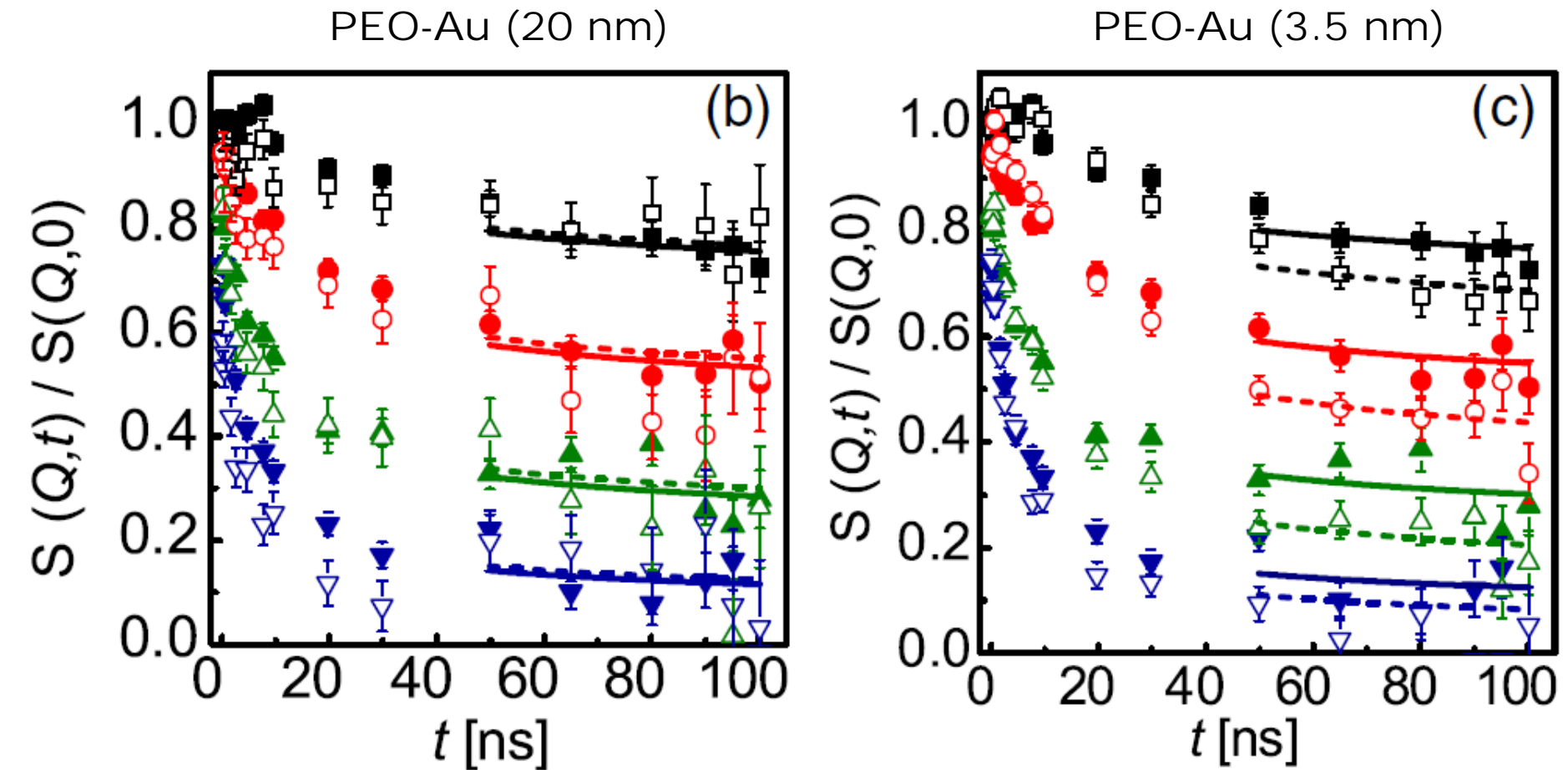


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Senses et. al., Small particle driven chain disentanglements in polymer nanocomposites, Phys. Rev. Lett. Vol. 118, 7 April 2017, doi:10.1103/PhysRevLett.118147801



→ **Larger** reptation tube diameter and enhanced viscosity with addition of small nanoparticles

# AWARDS



Boualem Hammouda  
Bronze Medal



Wei-Shan Chiang  
Society of  
Petrophysicists and  
Well Log Analysts  
Distinguished Speaker



Julie Kornfield  
(Caltech)  
Society of Rheology  
Bingham Medal



Rolf Zeisler  
2018 Hevesy Medal



Siddarth Khosla  
2<sup>nd</sup> Place ALEXA Open  
Data Skills Challenge



Brad Olsen  
(MIT)  
2018 APS John H. Dillon  
Medal

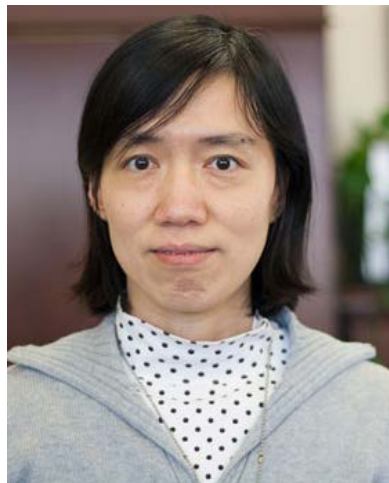


Colin Heikes  
International Workshop  
on Oxide Electronics  
Poster Prize

# AWARDS



Mike Hore  
(Case Western)  
APS UKPPG/DPOLY Lecturer  
&  
ACS Young Investigator  
Award



Hui Wu  
Bronze Medal



Justin Milner  
TMS Materials  
Processing &  
Manufacturing Division  
High Quality Poster  
Award



Taufique Hassan  
Sigma Xi Outstanding  
Poster Award



Mirjana Dimitrievska  
Sigma Xi Most  
Outstanding Poster  
Award



Pat Connelly  
Eugene Casson  
Crittenden Award



Eli Baltic  
Eugene Casson  
Crittenden Award



Cameron Shelton  
DPOLY Poster  
Competition  
1<sup>st</sup> Prize

?



?





2018  
NCNR

Photo credit: Brian Renegar