ISOTOPES

uses, demand, and supply

at NIST

Rob Dimeo, Director
NIST Center for Neutron Research

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

NIST

“We believe that there is romance in precision measurement, and that ability to extend the absolute accuracy of measurement by one decimal place frequently demands as much in ingenuity, perseverance, and analytical competence as does the discovery of a new principle or effect in science.”

Allen V. Astin
May 1, 1953

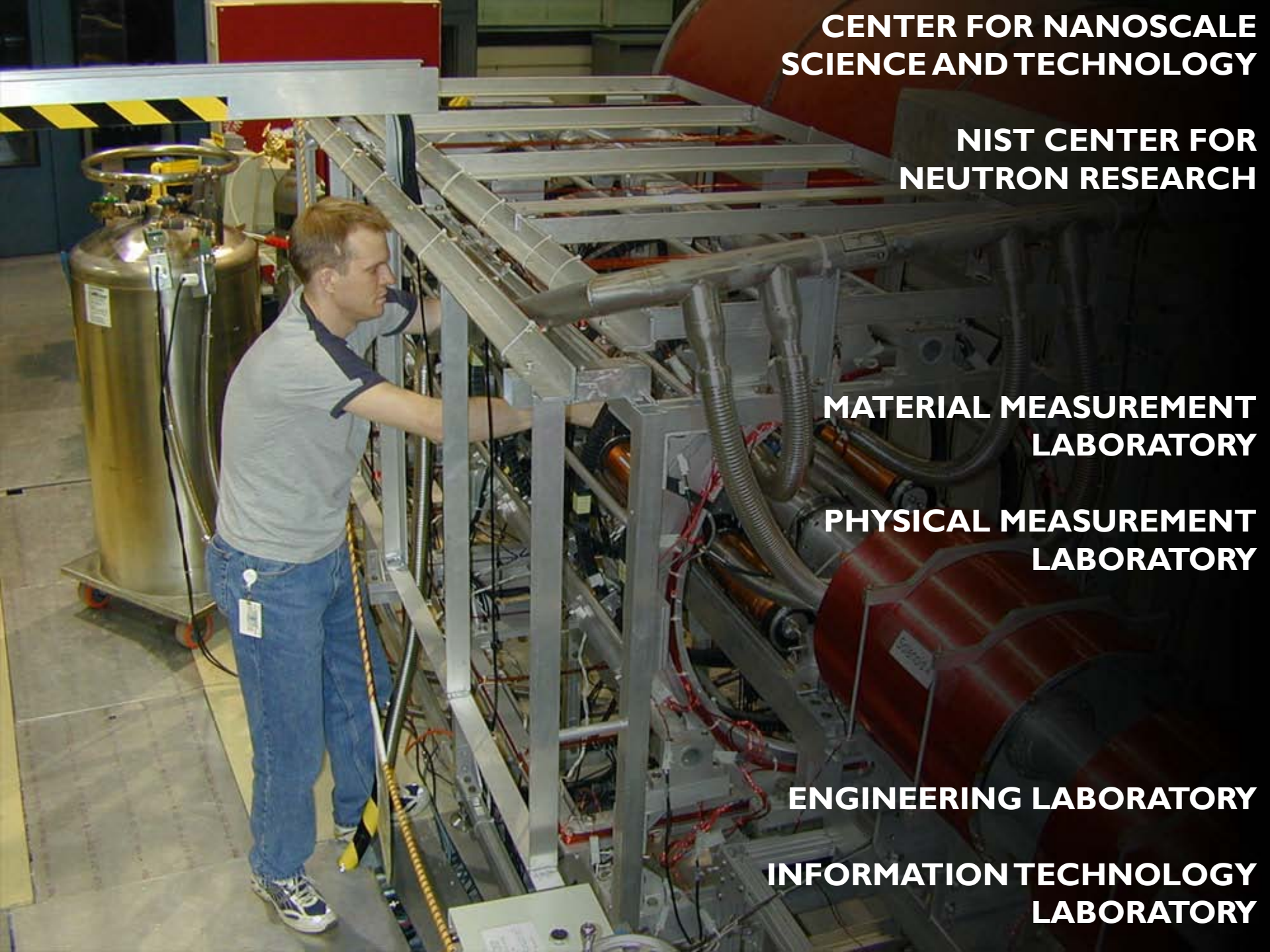
NIST

…promoting U.S. innovation and industrial competitiveness by advancing

measurement

science & standards & technology

…in ways that enhance economic security and improve our quality of life.



CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY

NIST CENTER FOR NEUTRON RESEARCH

MATERIAL MEASUREMENT LABORATORY

PHYSICAL MEASUREMENT LABORATORY

ENGINEERING LABORATORY

INFORMATION TECHNOLOGY LABORATORY

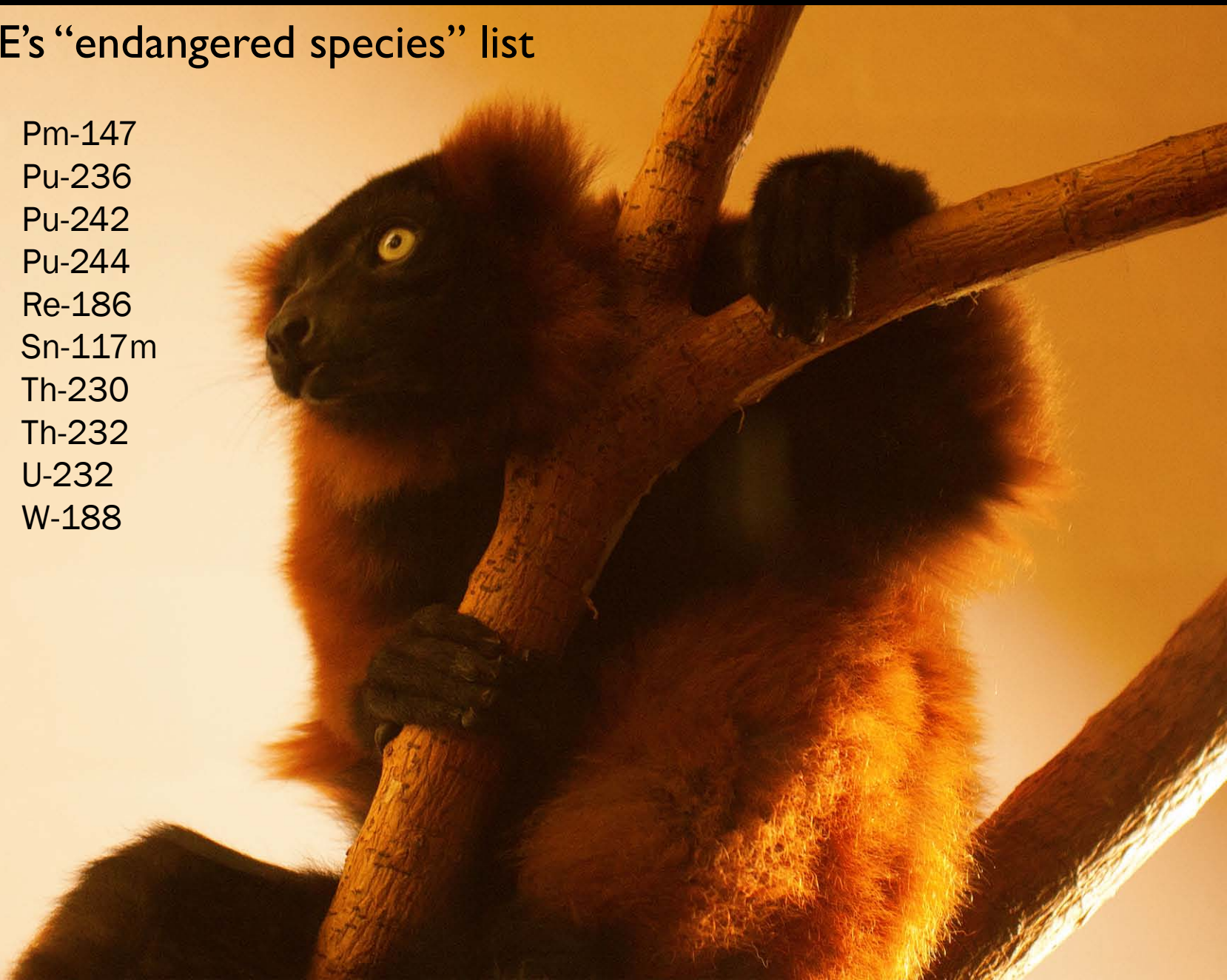
NIST Products & Services

Measurement research	**2200** pubs/year
Standard Reference Data	**100** types **6000** units sold/year **226** million data downloads/year
Standard Reference Materials	**1300** products available **30000** units sold/year
Calibration Tests	**18000** tests/year
Laboratory Accreditation	**800** accreditations of testing and calibration laboratories

NIST's projected isotope demand

From DoE's "endangered species" list

Am-241	Pm-147
Am-243	Pu-236
Cs-137	Pu-242
Cu-64	Pu-244
Ho-166	Re-186
Ir-192	Sn-117m
Kr-85	Th-230
Lu-177	Th-232
Np-237	U-232
Pa-233	W-188



Li-ion battery

1

significant loss

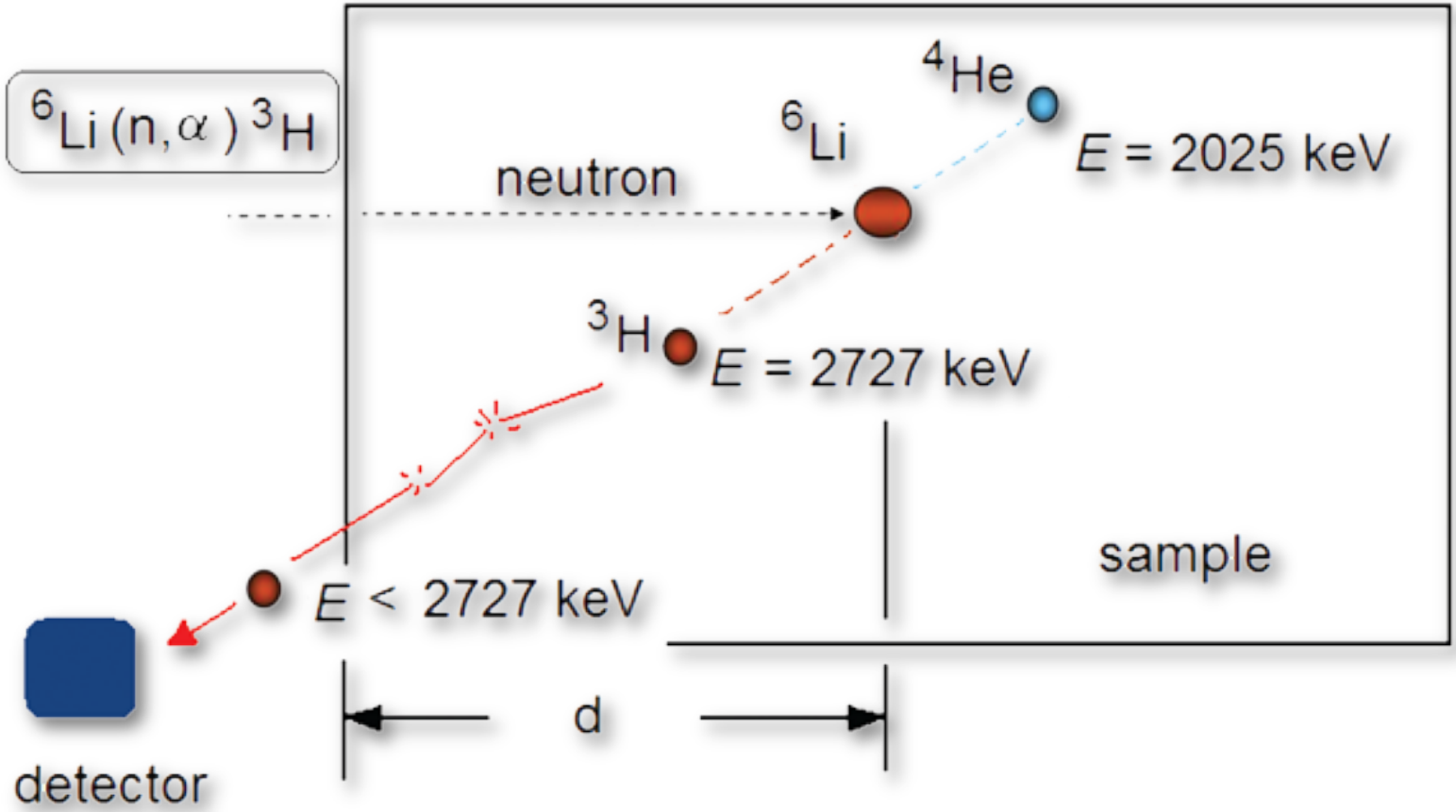
of storage capacity

2, 3, …

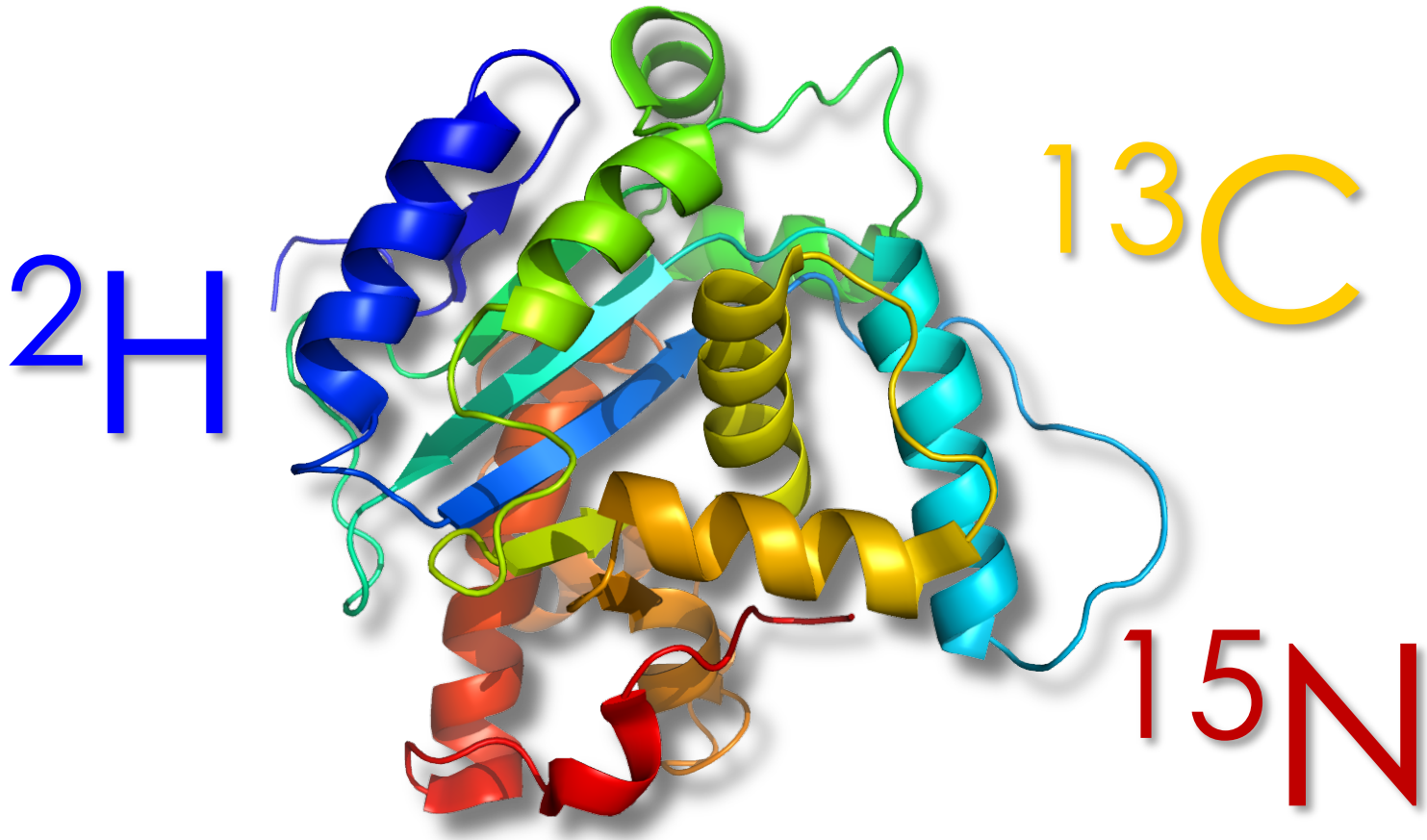
incremental loss

of storage capacity

Li-ion battery: *following the ^{6}Li using NDP*

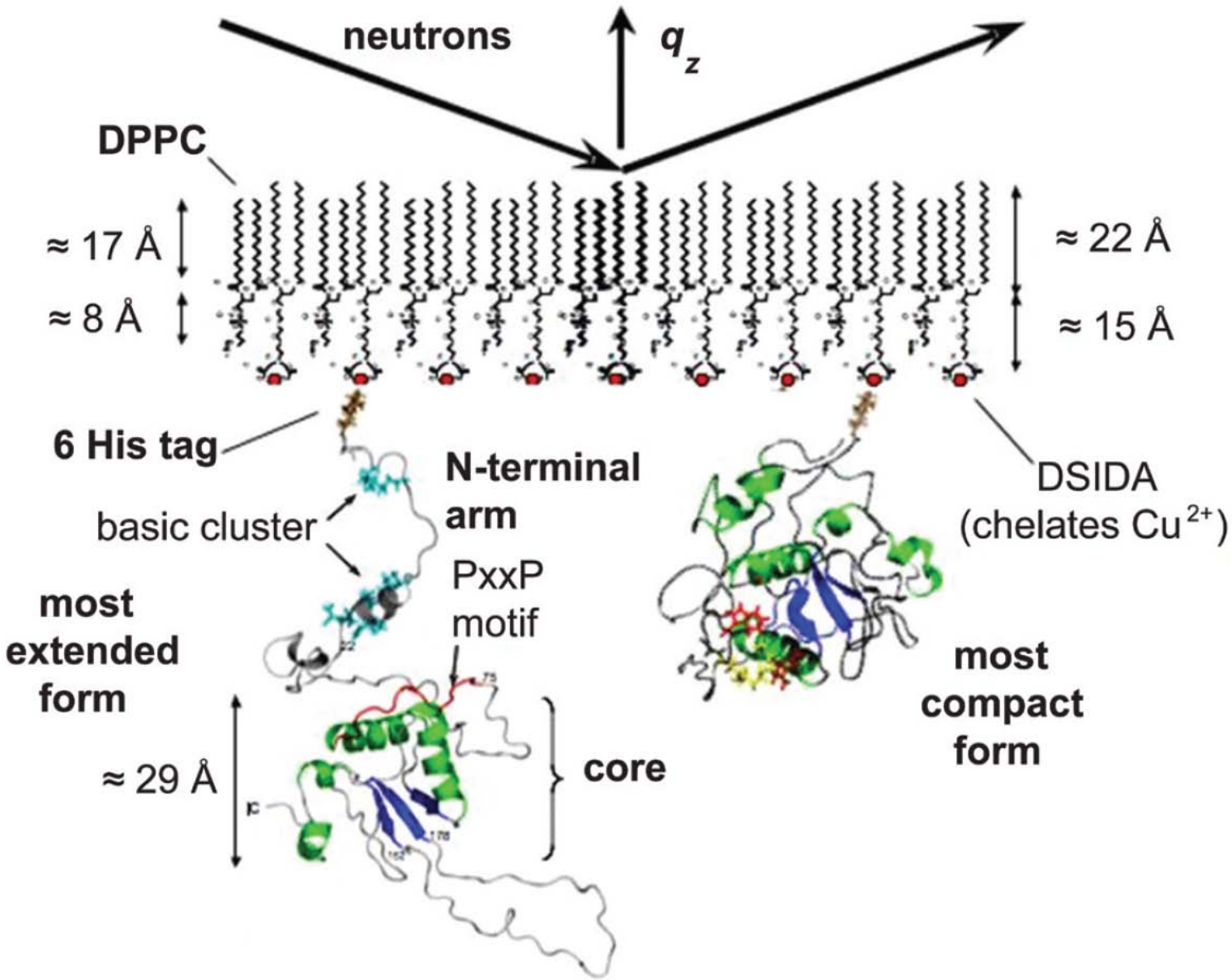


Biomolecular Labeling Laboratory



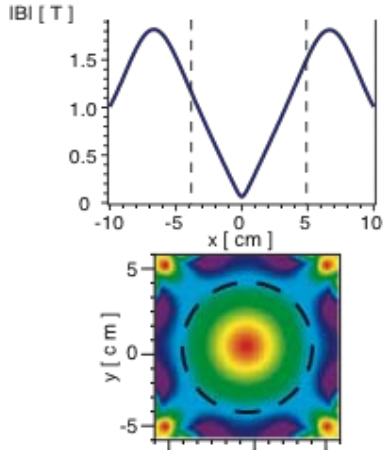
Biomolecular Labeling Laboratory

Neutron reflectometry study of the conformation of HIV Nef bound to lipid membranes



Ultra Cold Neutron Experiment

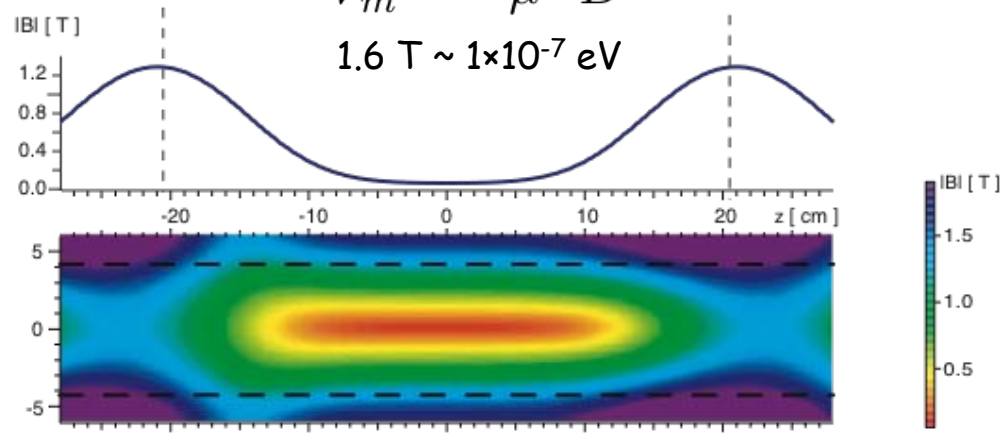
Radial Confinement

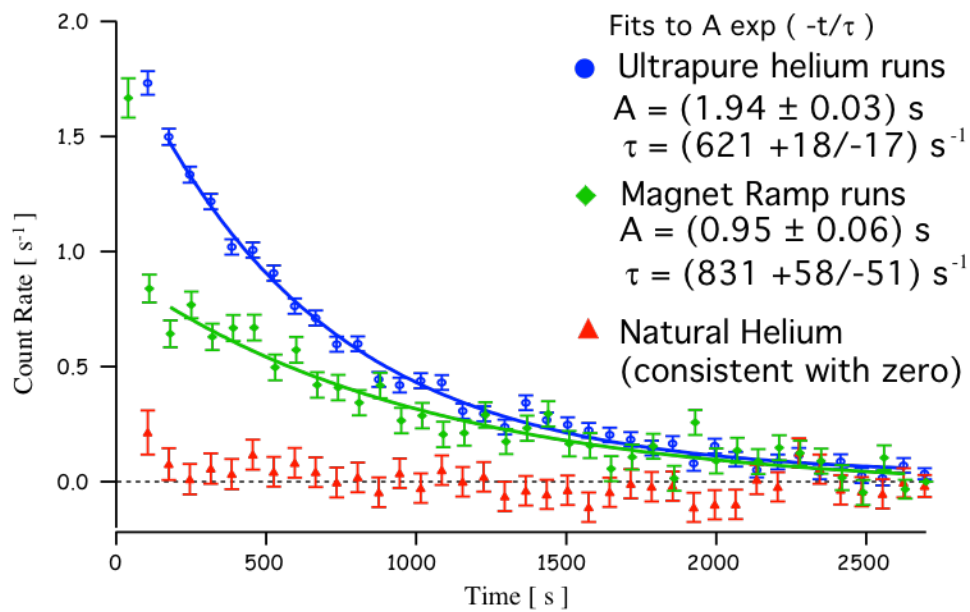


Axial Confinement

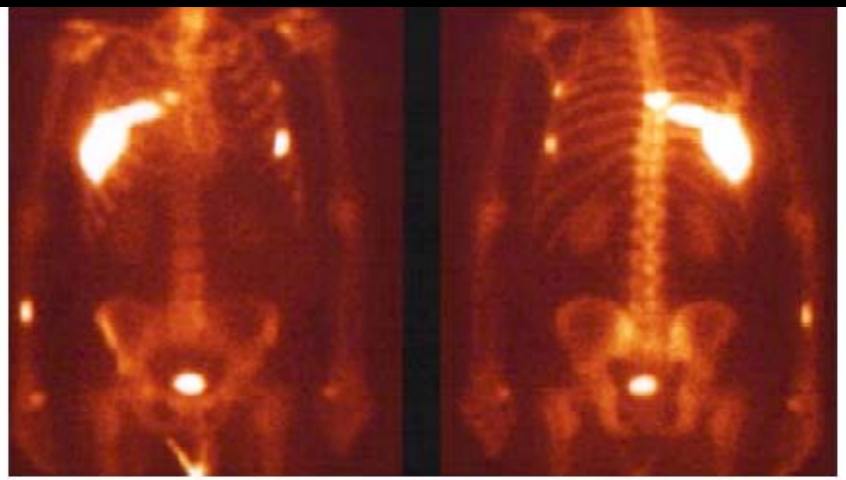
$$V_m = -\vec{\mu} \cdot \vec{B}$$

1.6 T ~ 1×10^{-7} eV

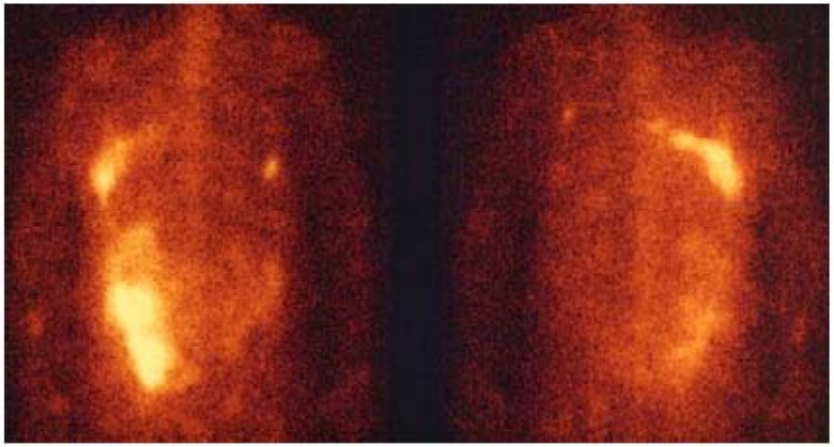




Standardization of Ra-223



^{99m}Tc-MDP



^{223}Ra

Anterior Posterior

Figure 4. Scintigraphic images demonstrating accumulation of ^{223}Ra in skeletal lesions in accordance with ^{99m}Tc-MDP uptake . Radium image taken 24 hrs post injection, hence radium excreted and in transit in the large bowel is evident in the lower left image. (Image quality is dependent on dose administered: 750 MBq ^{99m}Tc-MDP vs. 12 MBq ^{223}Ra)

Bone-seeking skeletal metastases treatment

α-emitter, targeted toxicity

FDA required dosage standardization prior to clinical trials

Thank You