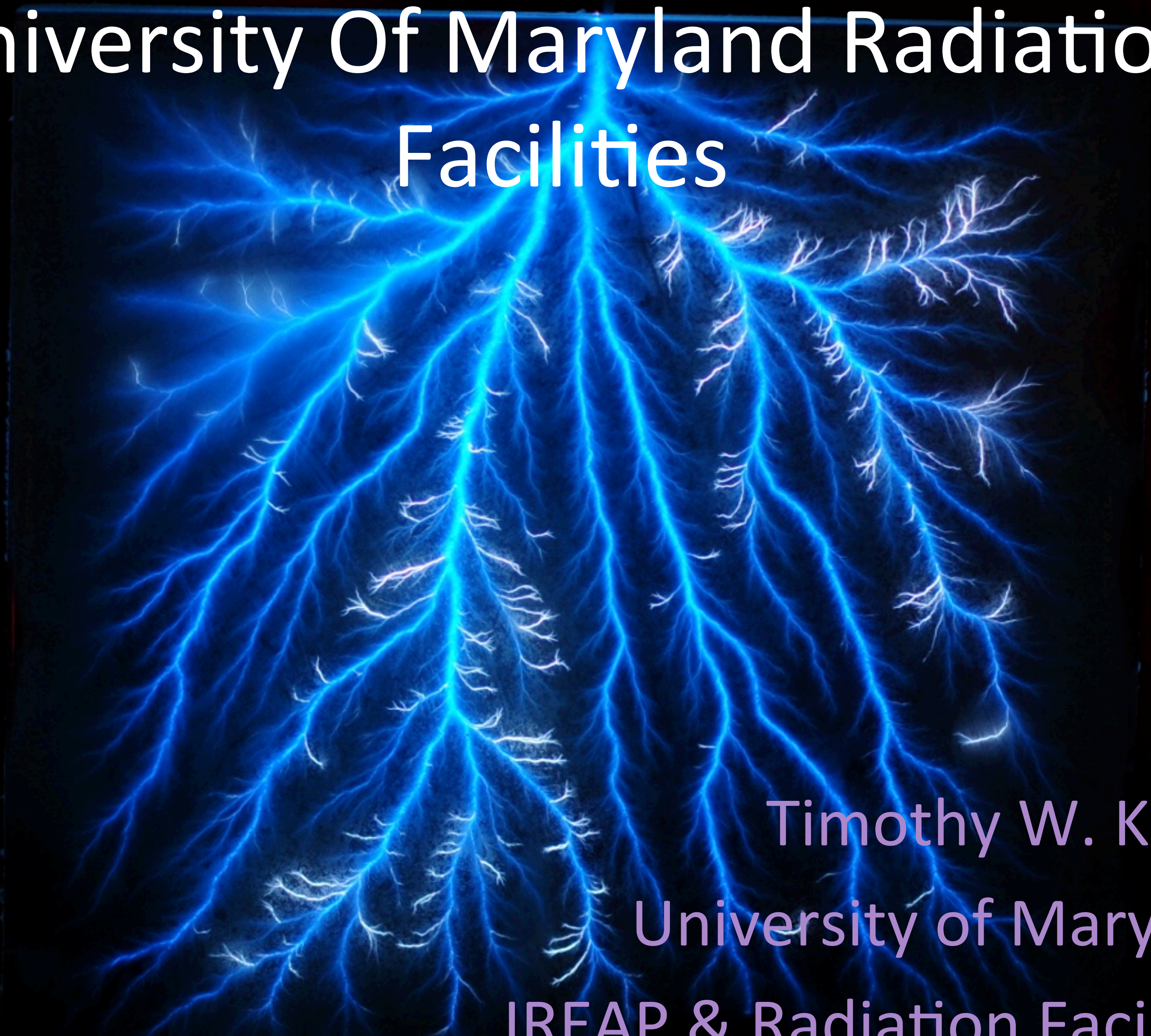
University Of Maryland Radiation Facilities



Timothy W. Koeth
University of Maryland
IREAP & Radiation Facilities

Three Major Components

I. Tunable 2 → 10 MeV 1kW electron Linear Accelerator

Fixed 10 MeV 17 kW electron Linear Accelerator (being assembled)

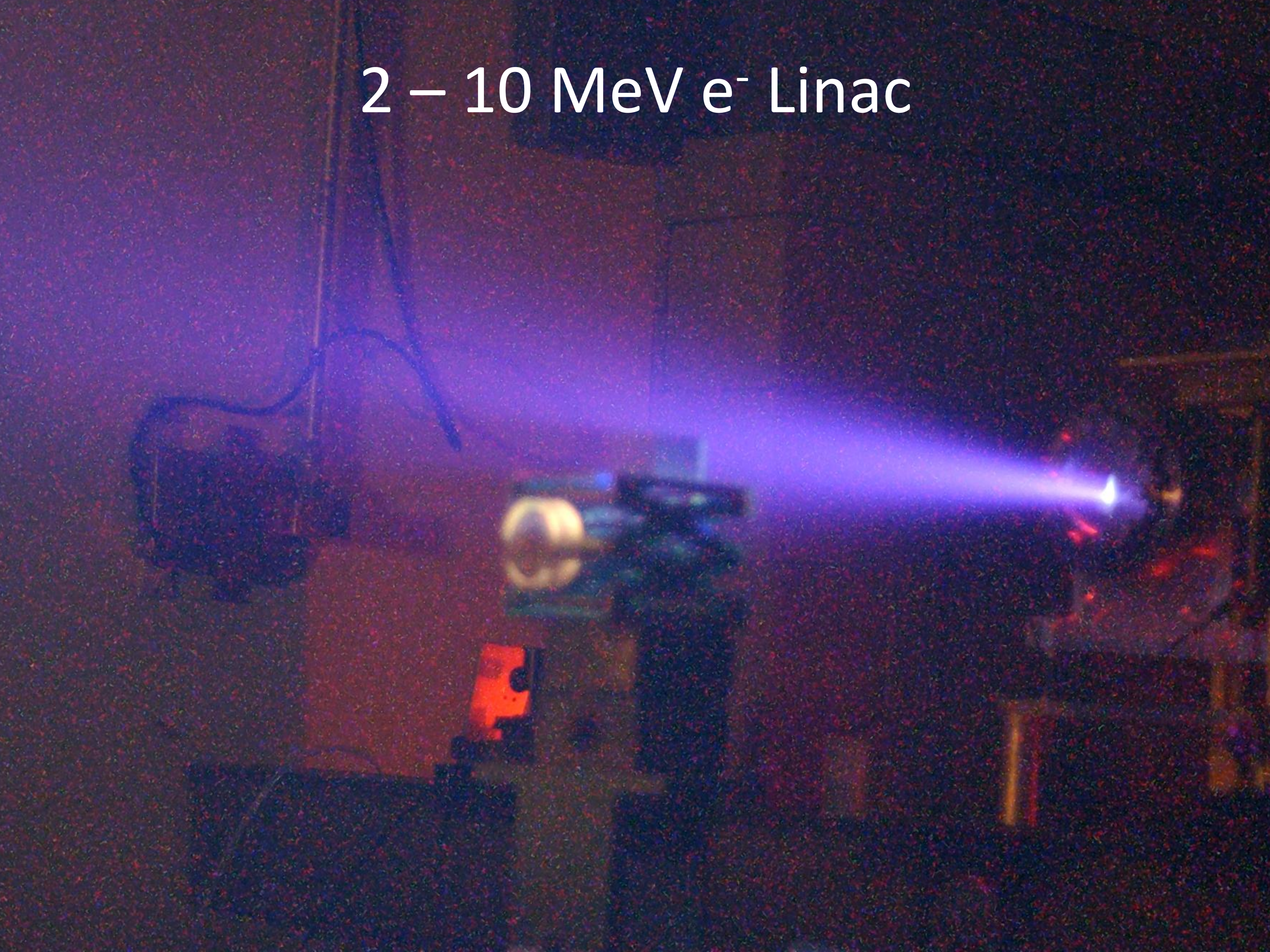
II. ^{60}Co Panoramic Gamma Irradiator

III. 250 kW TRIGA Training Reactor

IV. Coming Soon: 2 → 5 MeV Proton Cyclotron

Varian Clinac 6: 2 – 10 MeV e^- Linac

2 – 10 MeV e^- Linac



2 – 10 MeV e^- Linac

^{60}Co Panoramic Irradiator

(NOTE: this is ANSTO's Irradiator - NOT UMD's)

Features

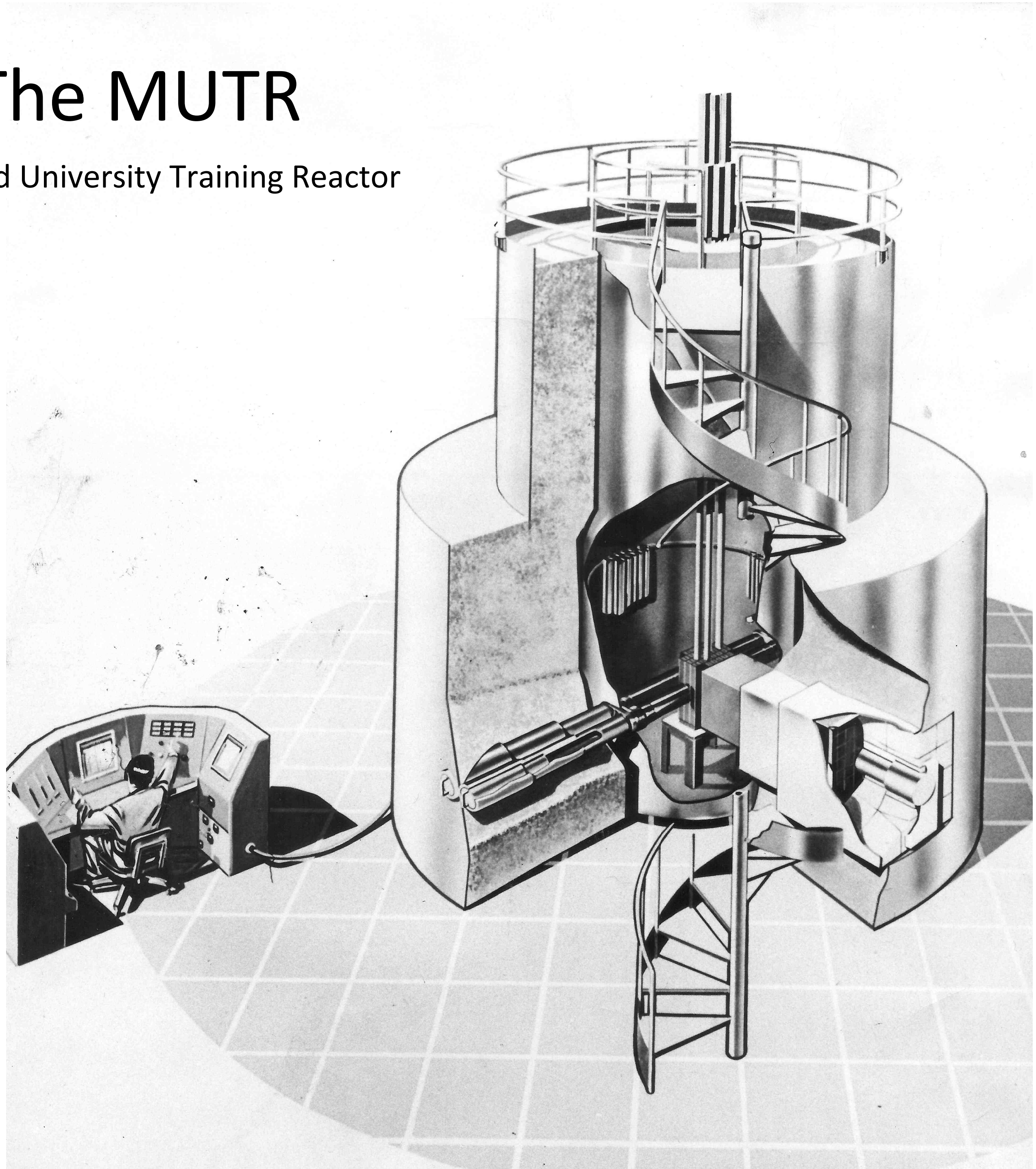
- Large Irradiation Vault
- Dose rates from a few hundred kilorad – a few Megarad
- Non-activating
- Close proximity to other resources

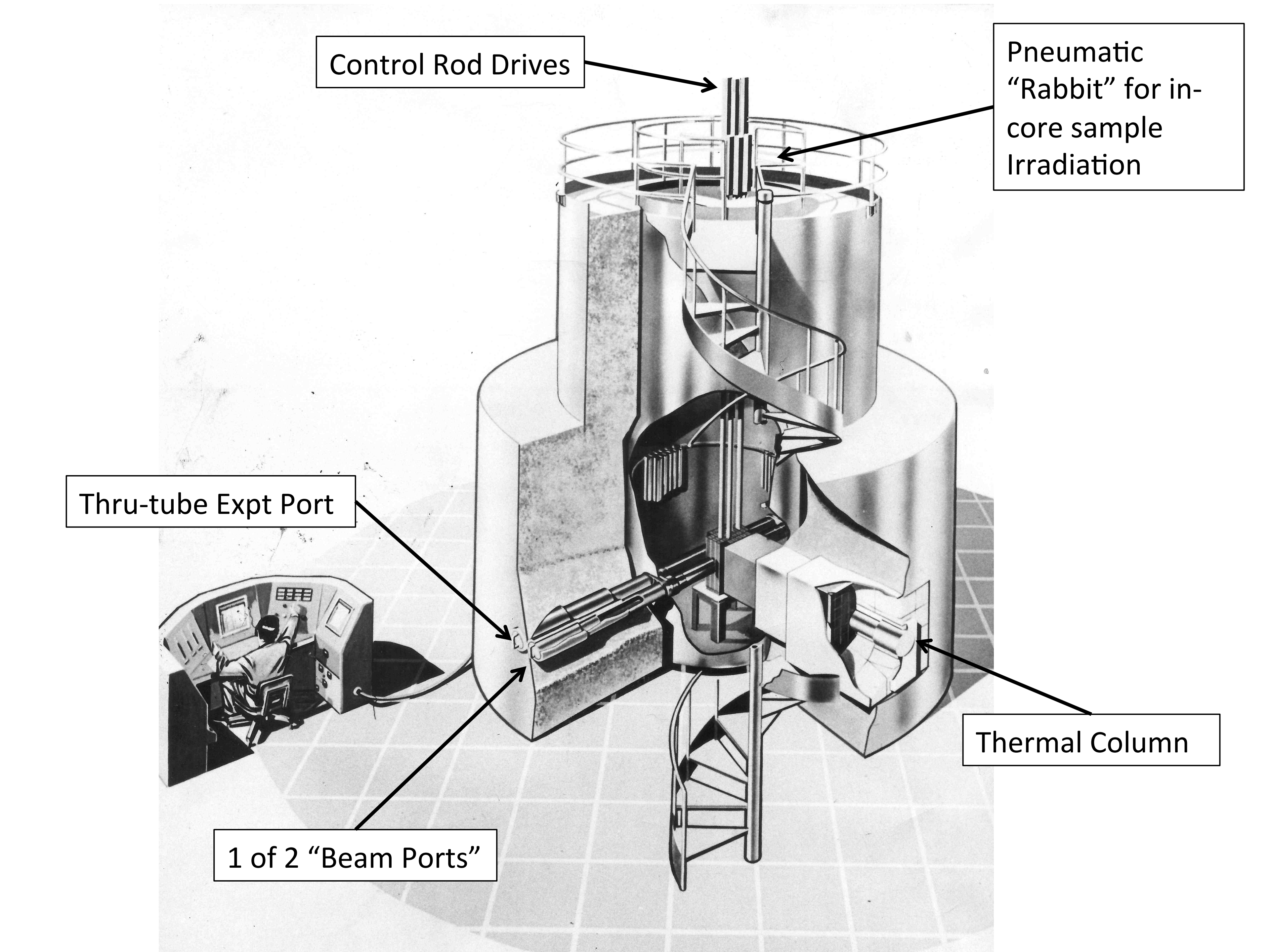
Applications

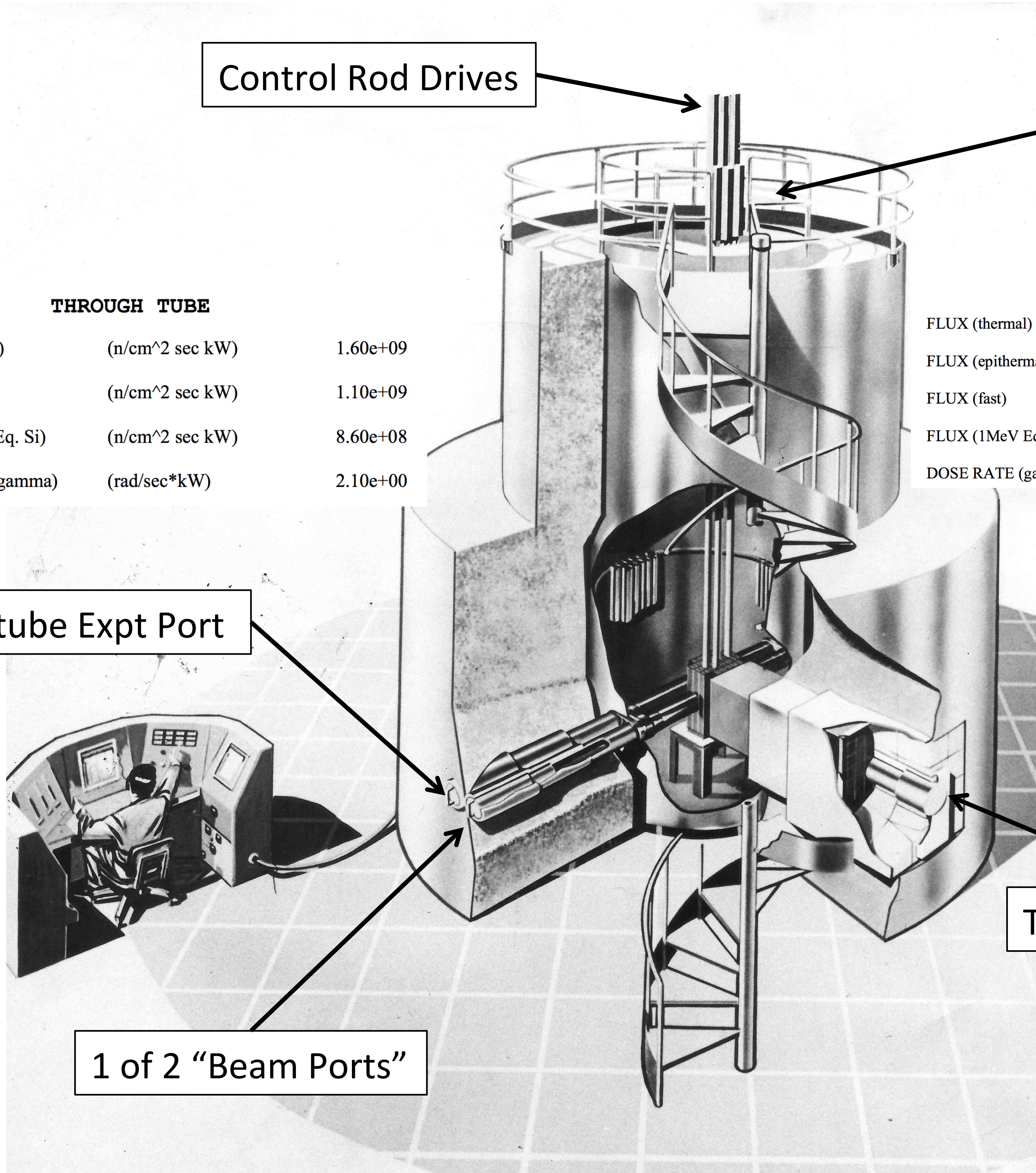
- Accelerated space flight/radiation environment testing
- Product Qualification for Nuclear industry
- Aging/degradation studies
- Sterilization R&D
- Polymeric science

The MUTR

Maryland University Training Reactor




Control Rod Drives
Pneumatic "Rabbit" for in-core sample Irradiation
Thru-tube Expt Port
Thermal Column
1 of 2 "Beam Ports"



THROUGH TUBE

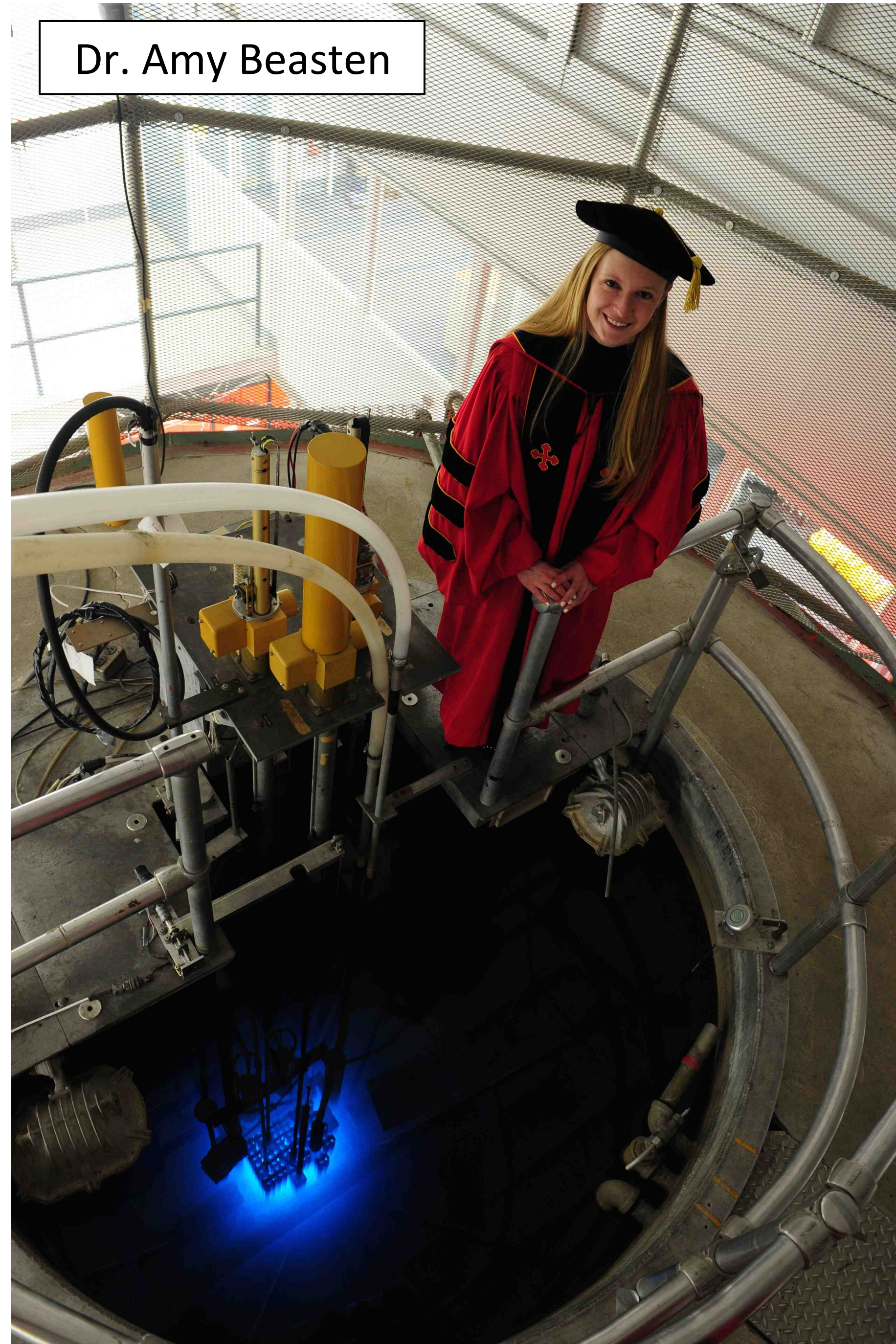
FLUX (thermal)	(n/cm^2 sec kW)	1.60e+09
FLUX (fast)	(n/cm^2 sec kW)	1.10e+09
FLUX (1MeV Eq. Si)	(n/cm^2 sec kW)	8.60e+08
DOSE-RATE (gamma)	(rad/sec*kW)	2.10e+00

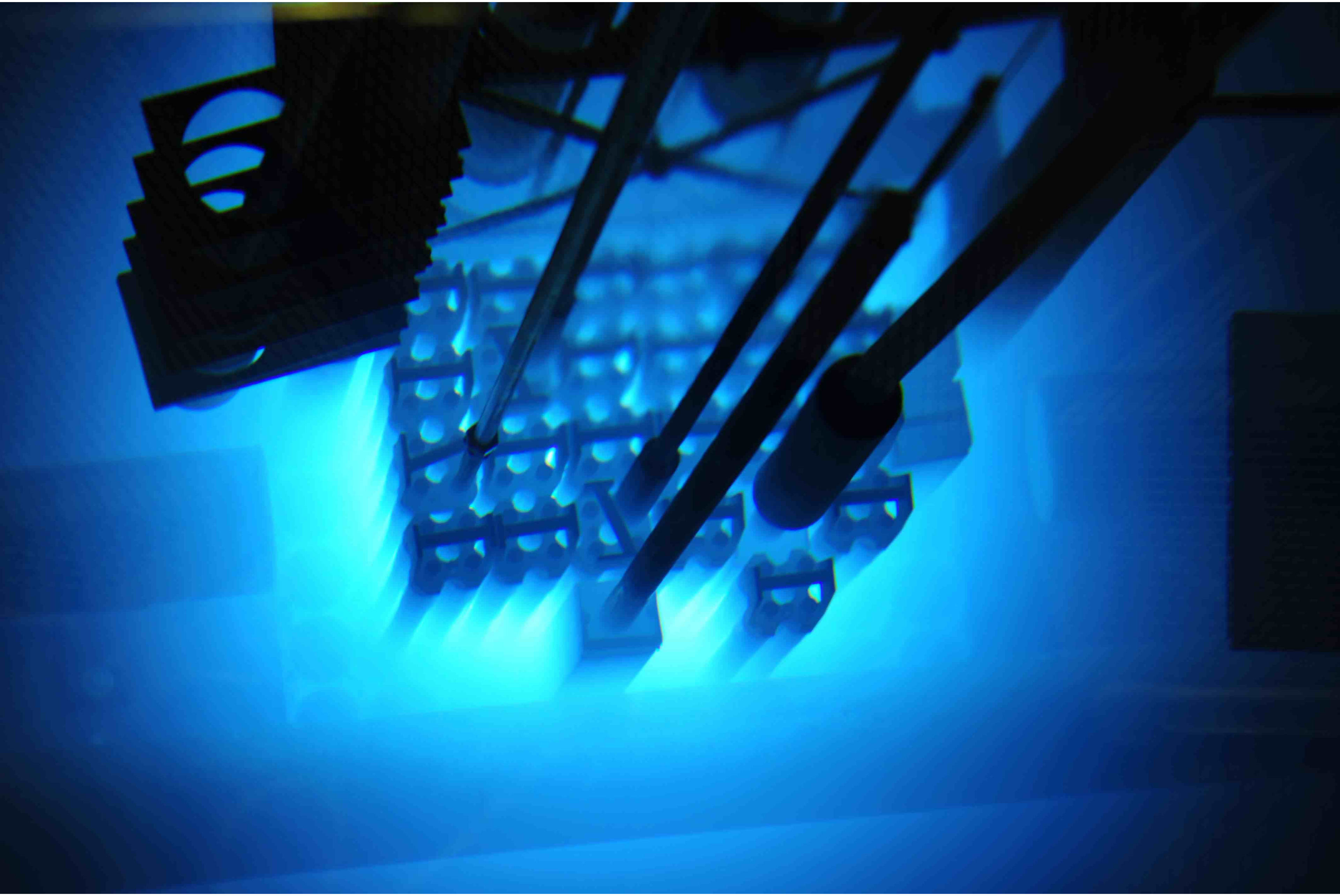
RABBIT

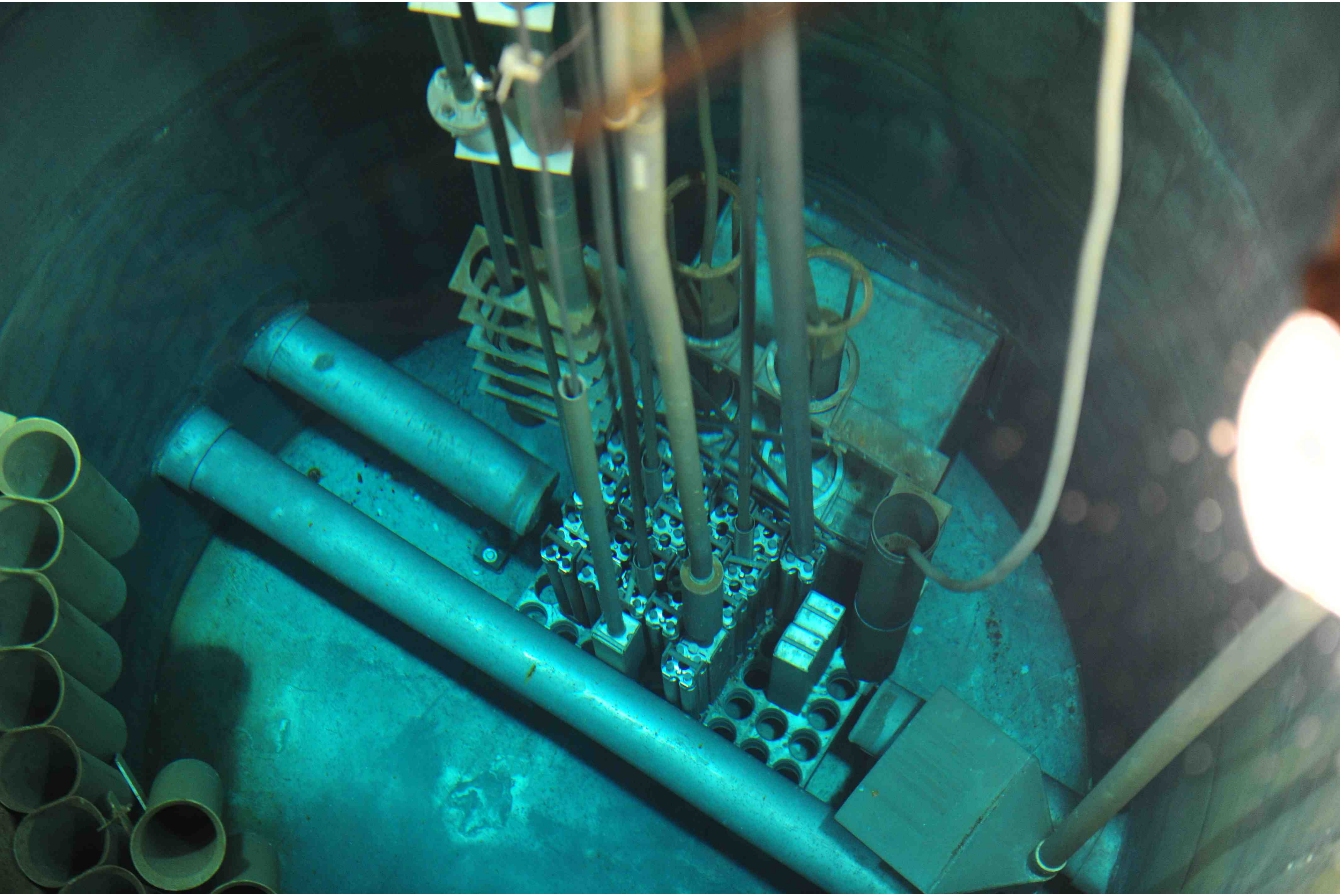
FLUX (thermal)	(n/cm^2 sec kW)	1.60e+10
FLUX (epithermal)	(n/cm^2 sec kW)	3.00e+08
FLUX (fast)	(n/cm^2 sec kW)	8.00e+09
FLUX (1MeV Eq. Si)	(n/cm^2 sec kW)	6.90e+09
DOSE RATE (gamma)	(rad/sec*kW)	1.90e+01

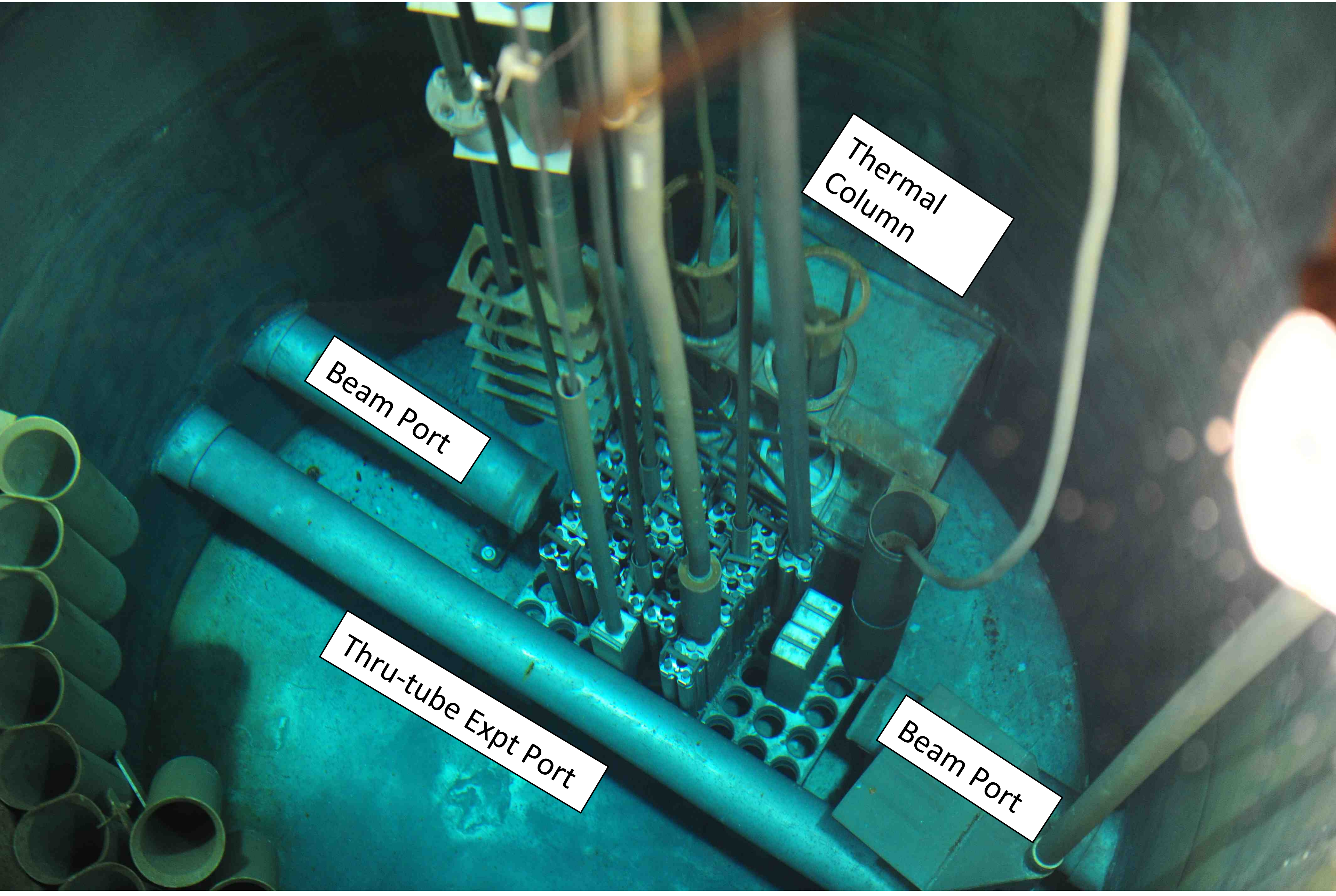
1960: UMD President Visits New Reactor

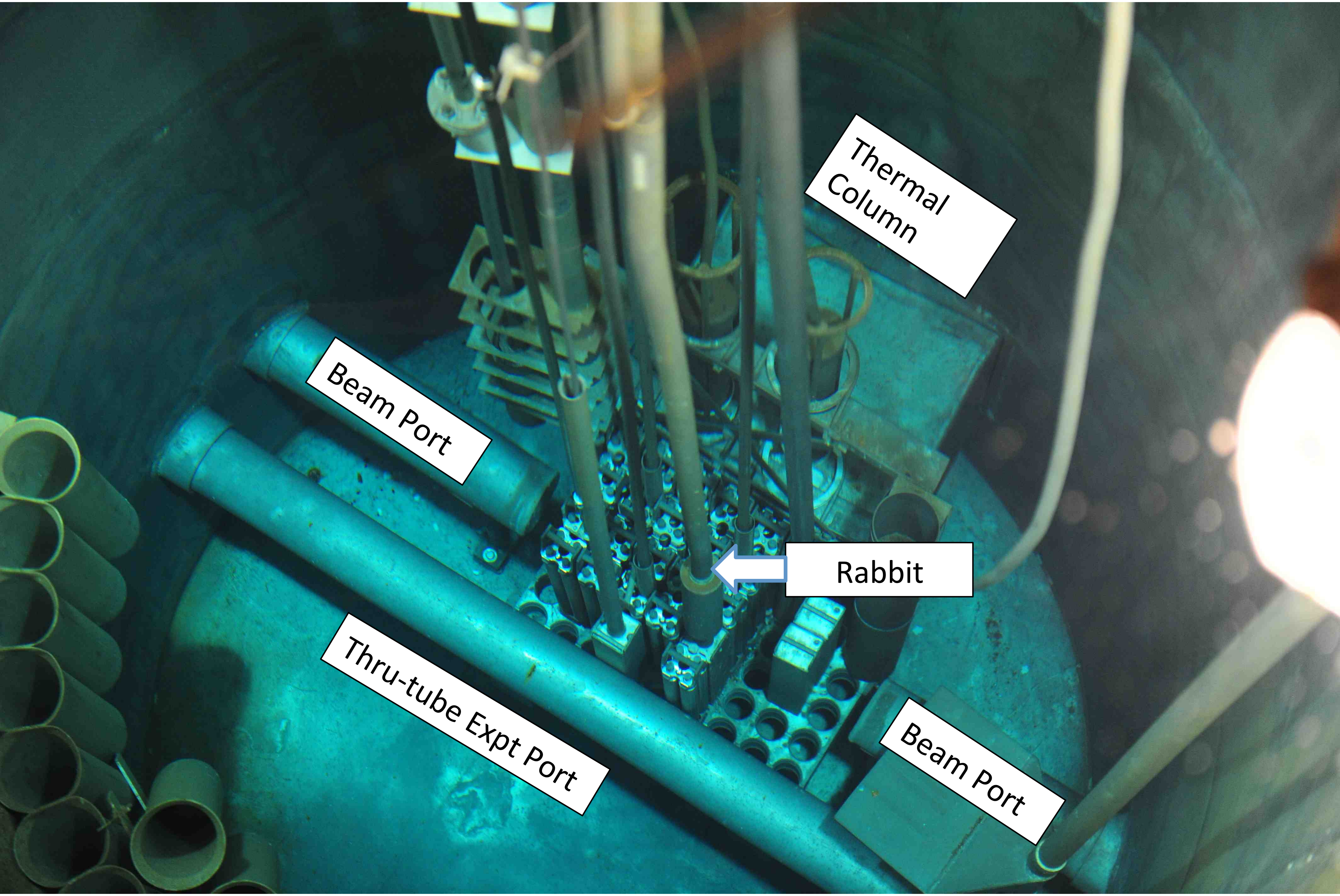

2015


Dr. Amy Beasten

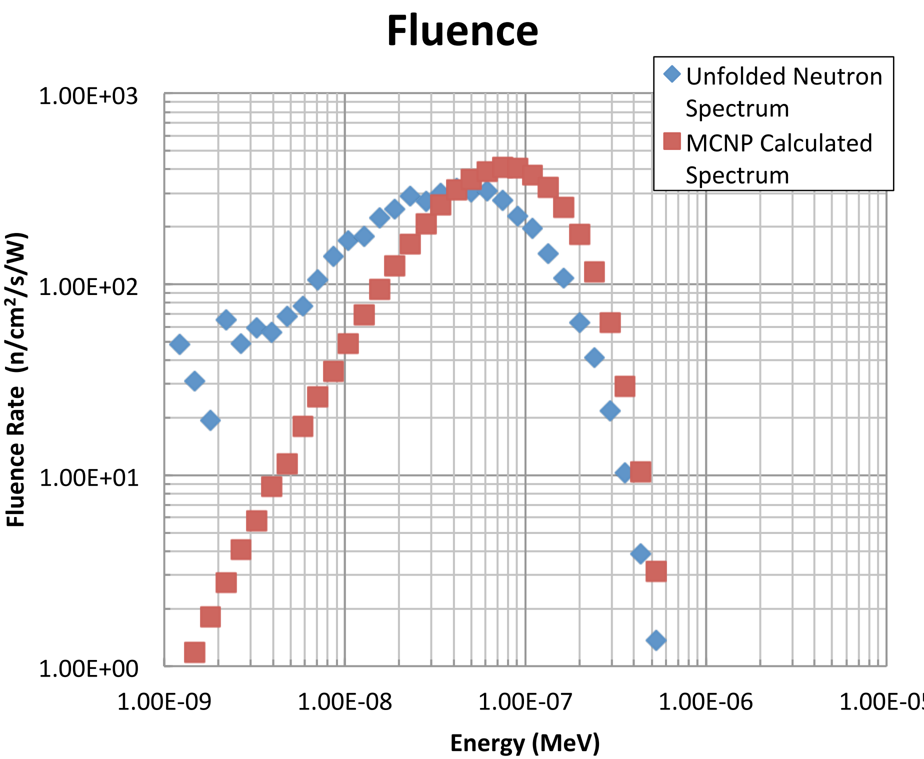





Thermal Column
Beam Port
Thru-tube Expt Port
Beam Port


Thermal Column
Beam Port
Rabbit
Thru-tube Expt Port
Beam Port

Thermal Column



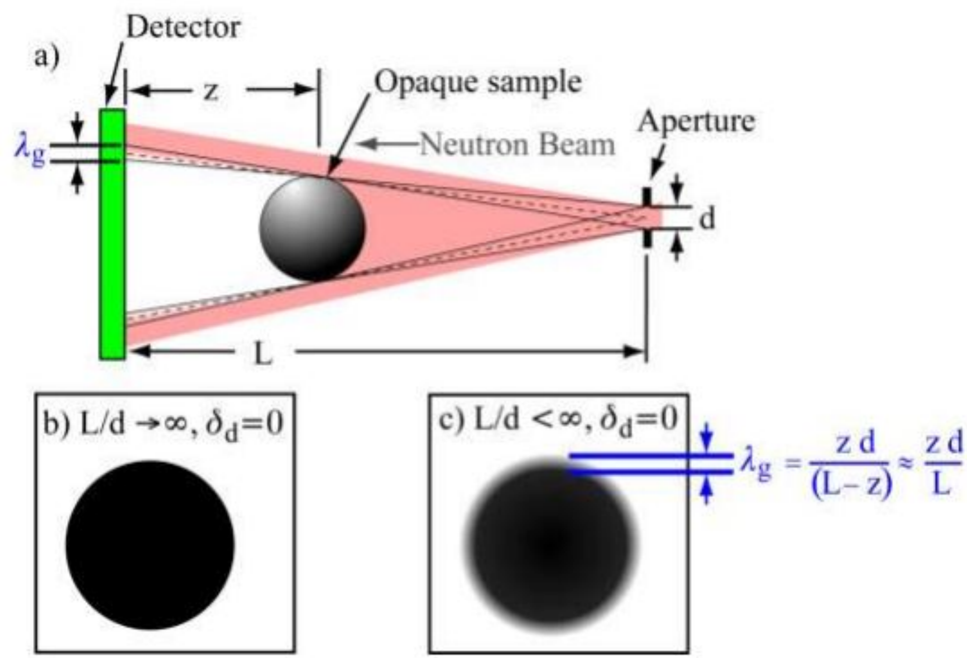
New Facility: Neutron Imaging

Method: Neutron Image formation

- Pinhole optics is basis for images
- Poke hole in reactor wall, form image of core at detector
- Optimal resolution when object contacts detector
- Geometric blur is given approximately by:

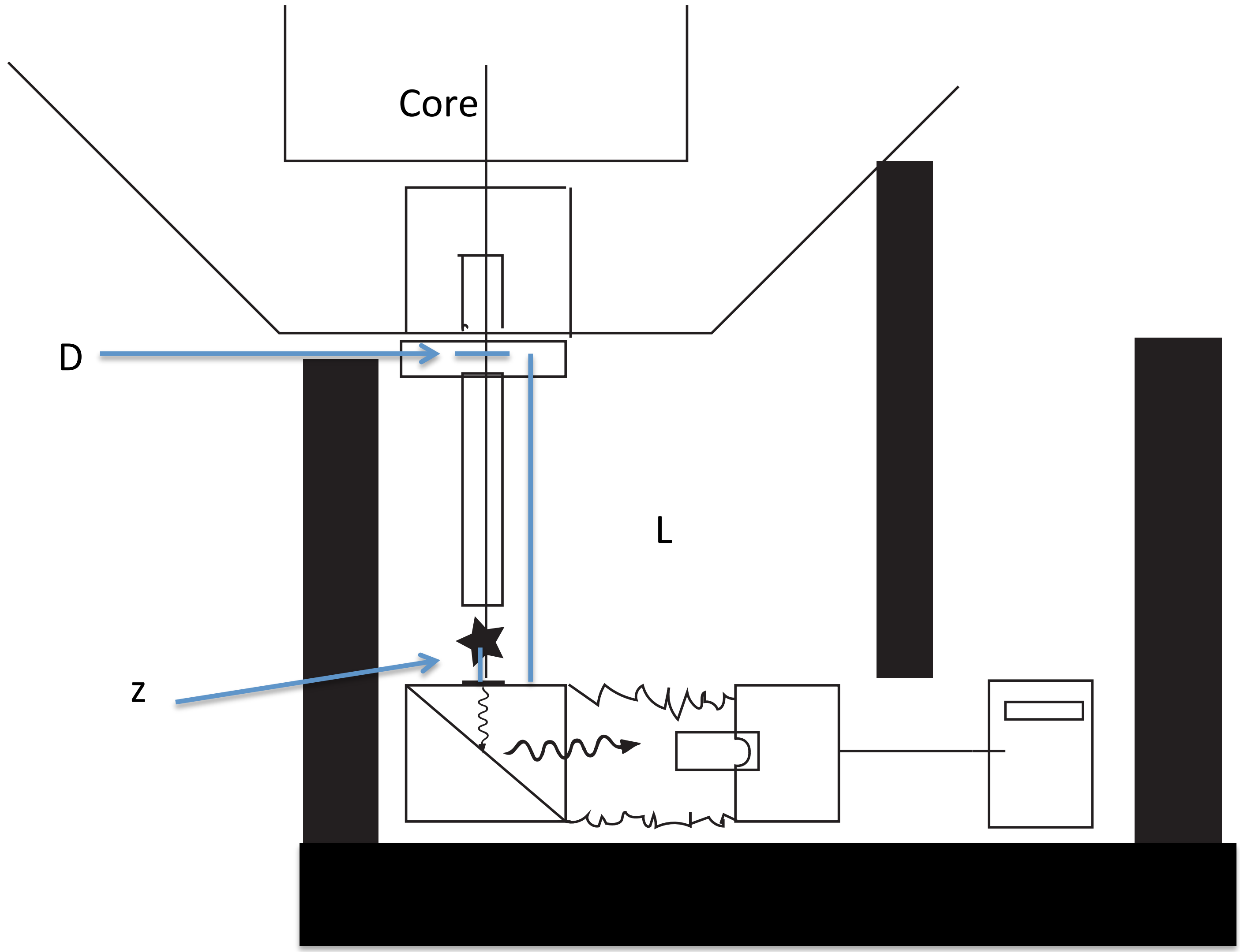
$$\lambda_g \approx z\, d \,/\, L$$

- High resolution of finite objects requires small aperture (d) or large L/D
- Small d or large L → small flux → ☹
- No magnification, so intrinsic detector resolution only path to higher resolution



Slide and Imaging Station Courtesy of NIST's Arif, Hussey, & Jacobson

Facility Plan



Undergrad Reactor Operators (in training)

Undergraduate Reactor Operator Program

Volunteer for 9 Months of Rigorous Training: Theory, Operational, Experiments

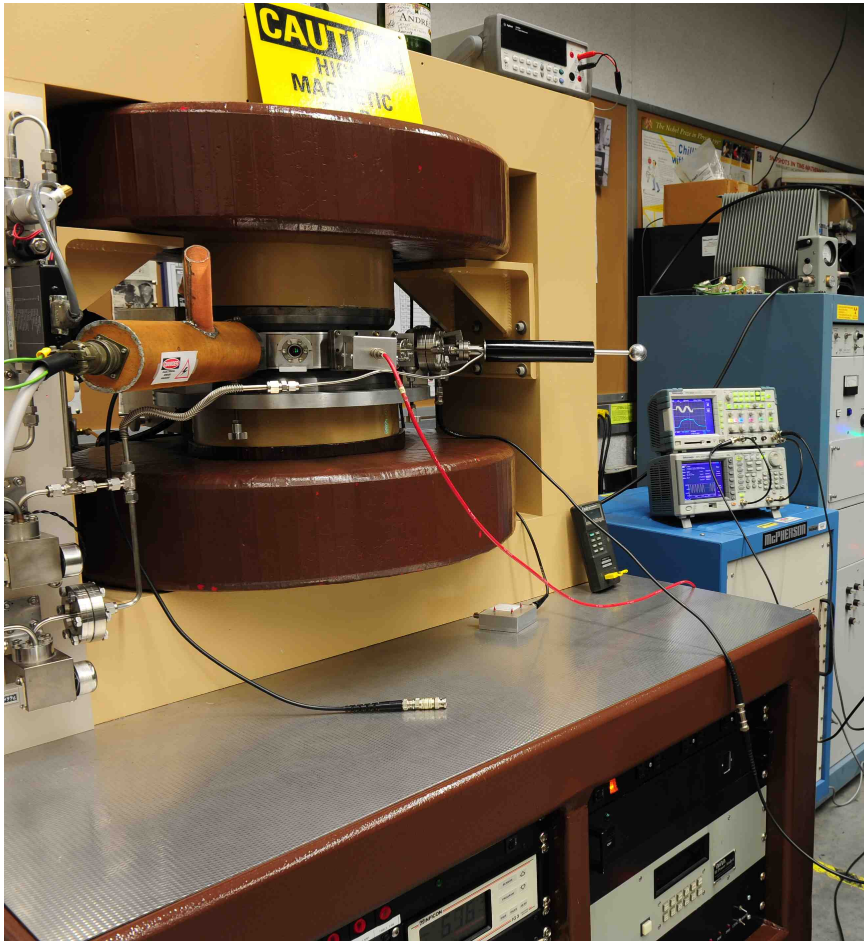
Undergraduate Reactor Operator Program

3 Part NRC Exam: written, oral interview, operational

Student Built Cyclotron

19.5 Inch, 1.5 Tesla, 5 MeV protons

12 Inch, 1.0 Tesla, 5 MeV Proton



www.physics.rutgers.edu/cyclotron