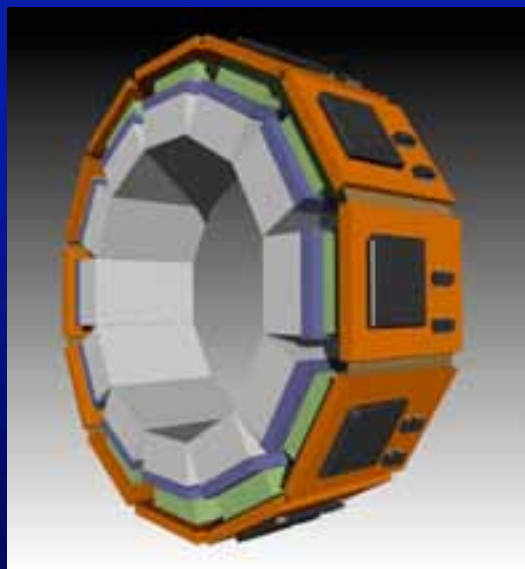


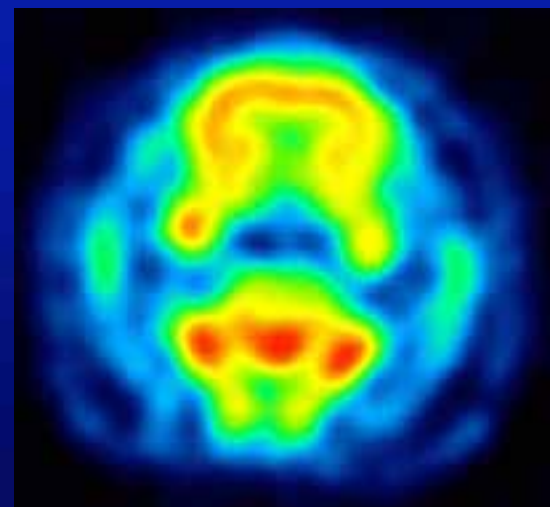
Physics & Instrumentation for Positron Emission Tomography (PET)

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Neuroimaging at BNL

- Neuroscience + nuclear medicine
 - Drug addiction, obesity, ADD, ...
- PET
 - Non-invasive, 3D
- Human studies
 - Important, but not efficient
- Small-animal models valuable
 - Genetic variants
- Center for “Translational” Neuroimaging
 - Extrapolate from bench to clinic
 - One of the top PET groups in the world!



Physics & Instrumentation at BNL

■ Physics

- Big instruments, small targets
- RHIC, NSLS, LHC
- Radiation detectors

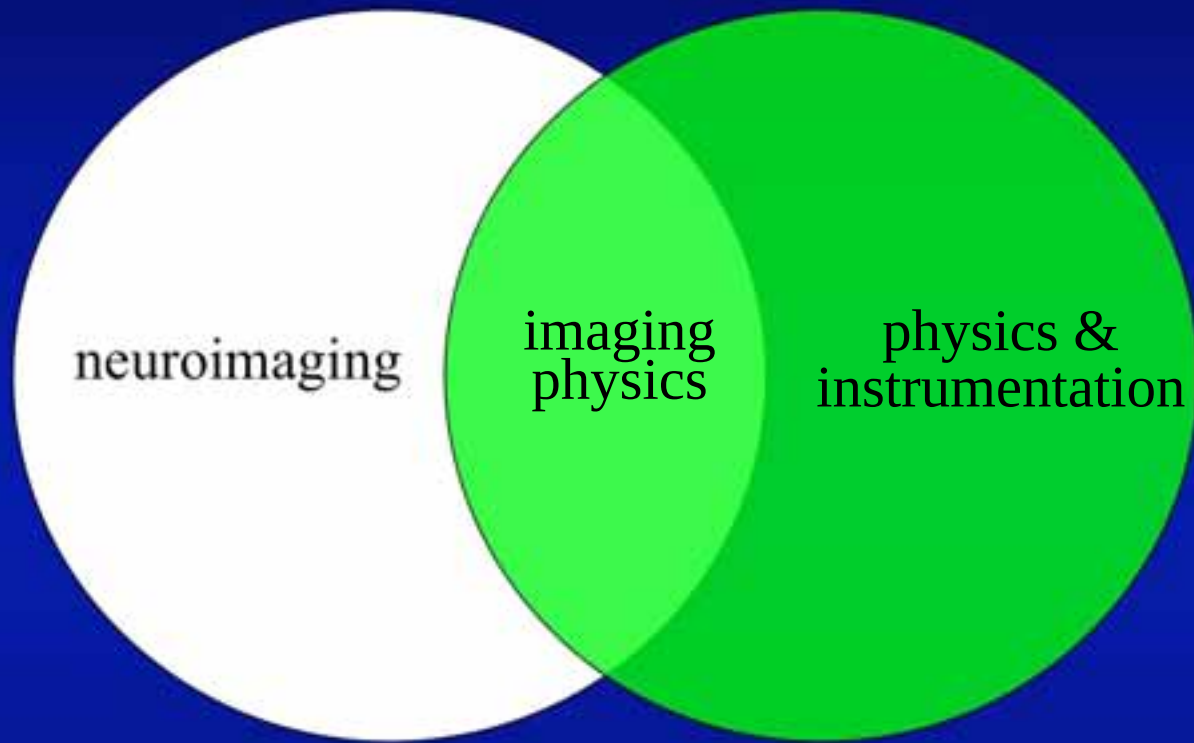


■ Instrumentation Division

- Microelectronics
- Ultra low-noise electronics



Medical Imaging Physics



- Neuroimaging can benefit from improved instruments
- BNL has an excellent environment to do it

The “Headshrinker”

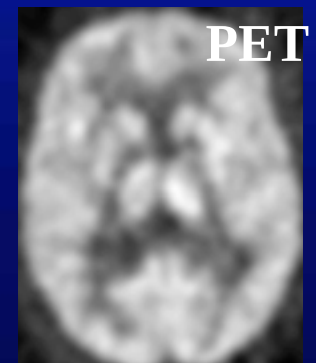
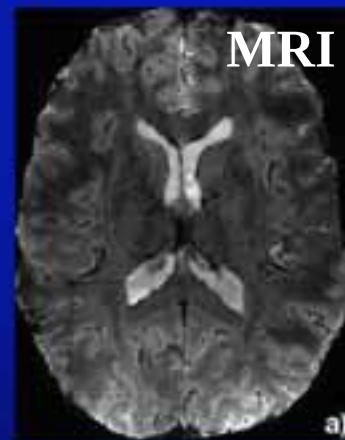
- BNL ca. 1962
- Rankowitz, Higinbotham, Rosenblum, & Robertson (Instrumentation and Medical)



Non-invasive Medical Imaging Techniques

■ Anatomical

- X-ray
- CT
- MRI
- Ultrasound

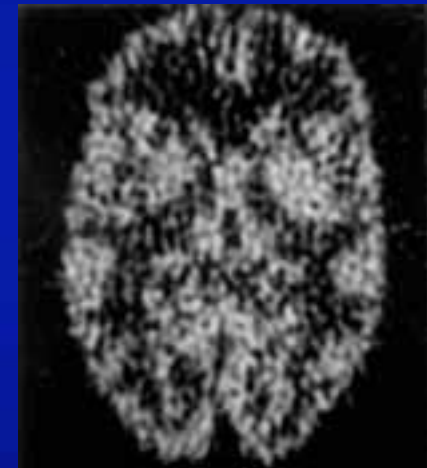


■ Functional

- “nuclear medicine” - PET, SPECT
- fMRI, optical, ...

Positron Emission Tomography

- New & growing
 - Reimbursed for only ~10 years
 - ~2000 sites in U.S.
 - >1M scans/yr
 - growth >25%/yr
- Challenges
 - Expensive
 - Low resolution (>2 mm)
 - Noisy
- Benefits
 - Extremely sensitive & quantitative
 - Unique functional capabilities



Applications of PET

■ Clinical

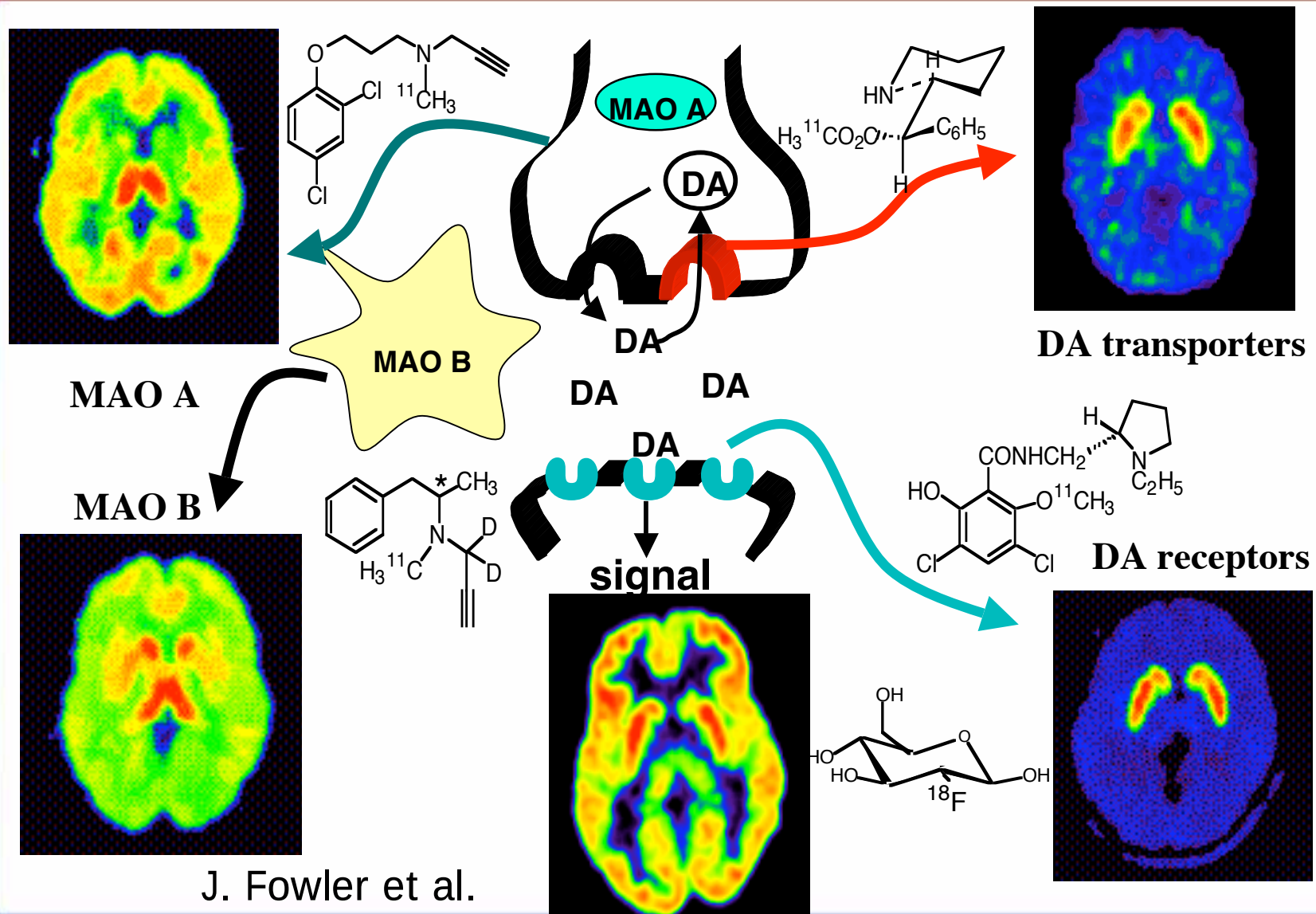
- cancer >90%
- cardiac
- brain

■ Research

- brain function
- animal studies



Radiotracers in Neuroscience



J. Fowler et al.

PET Imaging Physics

- Applying methods of nuclear physics to PET
 - Detector design
 - Electronics
 - Data processing

- Selected projects at BNL
 1. Conscious rat brain imaging
 2. Mouse brain PET
 3. Simultaneous PET and MRI imaging



Funded by DOE OBER Medical Applications



Medical

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