Careers in Research

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University of Notre Dame

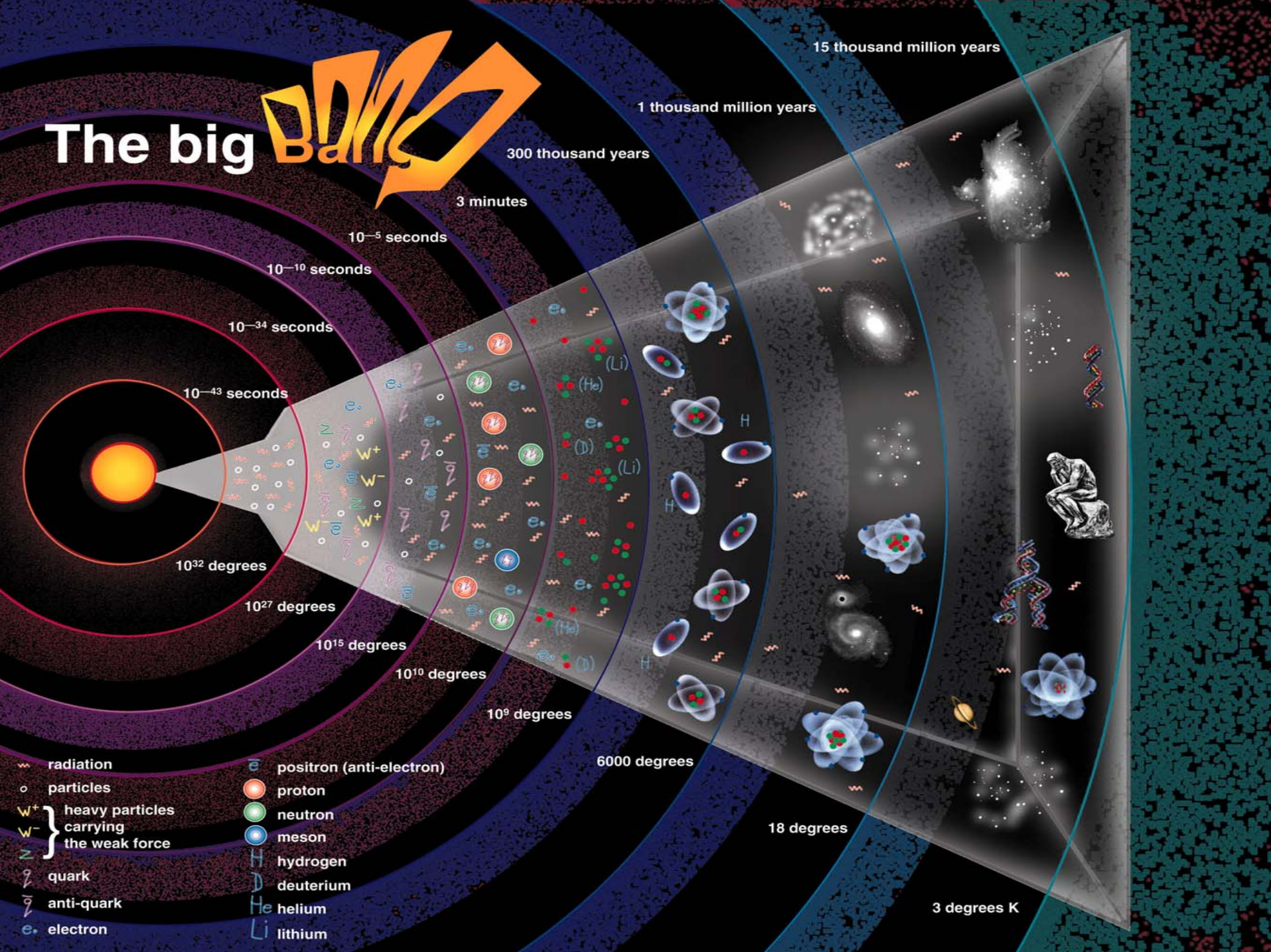
B.Sc., Nanjing University, China, 1990-1994

M.Sc., China Institute of Atomic Energy, China, 1994-1997

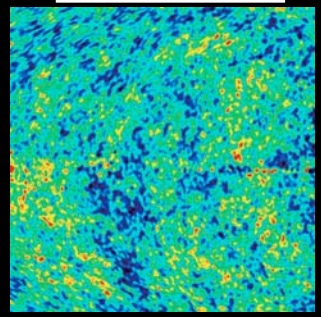
Ph.D., Texas A&M University at College Station, 1997-2002
Postdoc, 2002-2003

Postdoc, Argonne Nat'l Lab, 2003-2006

Ass. Prof., Physics, ND, 2006-


The big Bang
15 thousand million years
1 thousand million years
300 thousand years
3 minutes
10—5 seconds
10—10 seconds
10—34 seconds
10—43 seconds
10^32 degrees
10^27 degrees
10^15 degrees
10^10 degrees
10^9 degrees
6000 degrees
18 degrees
3 degrees K
radiation
particles
heavy particles carrying the weak force
quark
anti-quark
electron
positron (anti-electron)
proton
neutron
meson
hydrogen
deuterium
helium
lithium

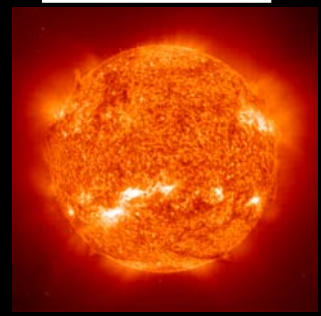
Big Bang



Asymptotic Giant Branch star

High Redshift Quasar

Main sequence star



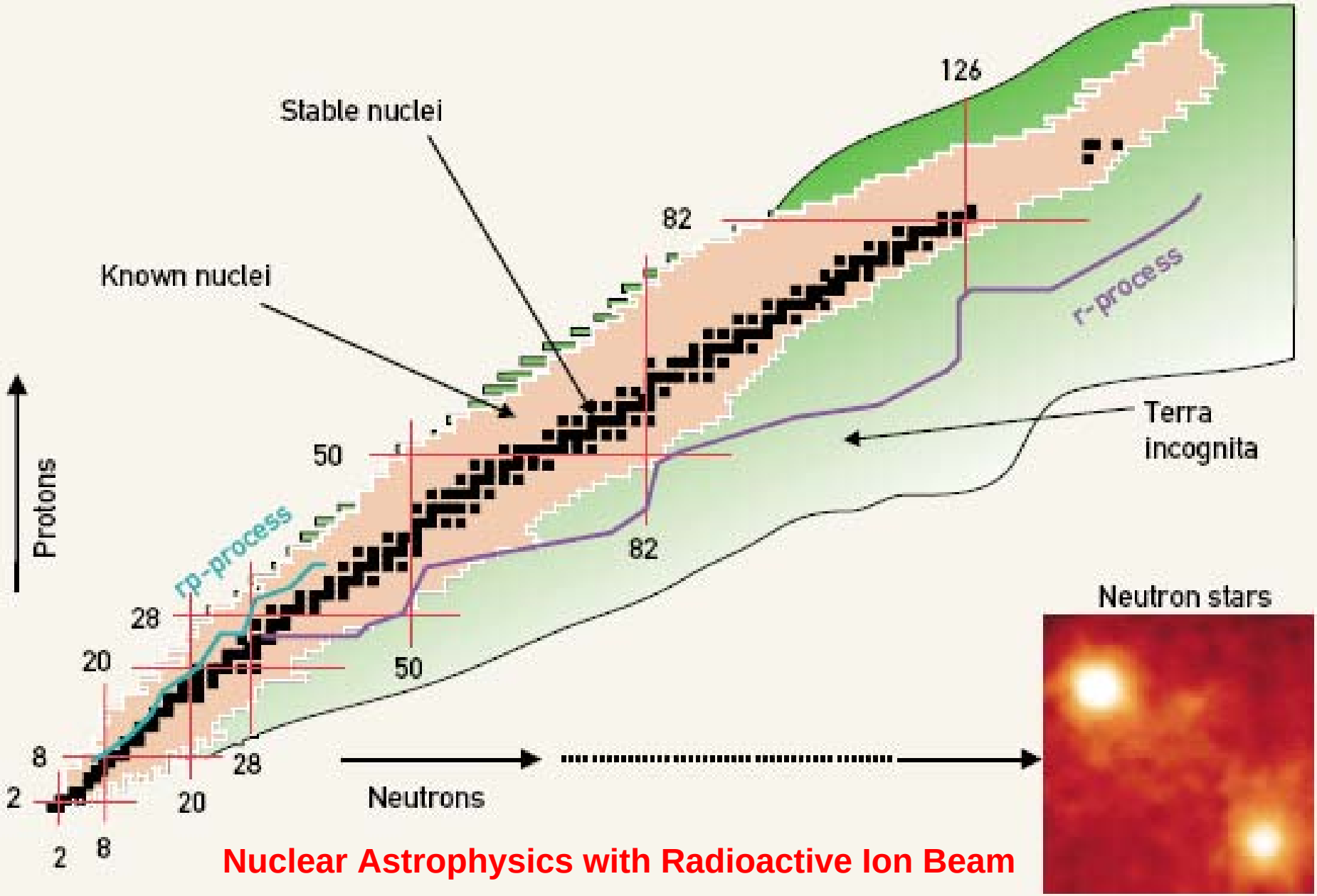
The ultimate goal of nuclear astrophysics is to understand how nuclear processes generate the energy of stars over their lifetimes and, in doing so, synthesize heavier elements from the primordial hydrogen and helium in the big bang which led to the expanding universe.

W. Fowler

Neutron star

Supernovae

Novae



Nuclear Astrophysics with Radioactive Ion Beam

K500 SUPERCONDUCTING CYCLOTRON FACILITY
TEXAS A&M UNIVERSITY CYCLOTRON INSTITUTE

ECR ION SOURCES

K500 CYCLOTRON

BEAM ANALYSIS SYSTEM 1994

RADIATION EFFECTS FACILITY 1994,2000

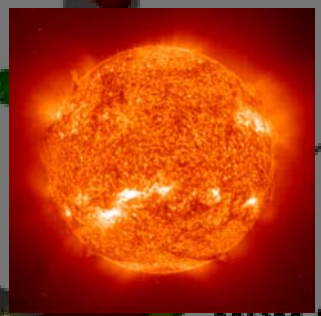
MARS RECOIL SPECTROMETER 1992

Faust

NIMR 1999

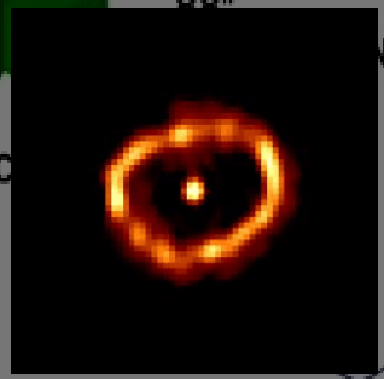
MDM SPECTROMETER 1993,2000

Precision On-Line Decay Facility 1999



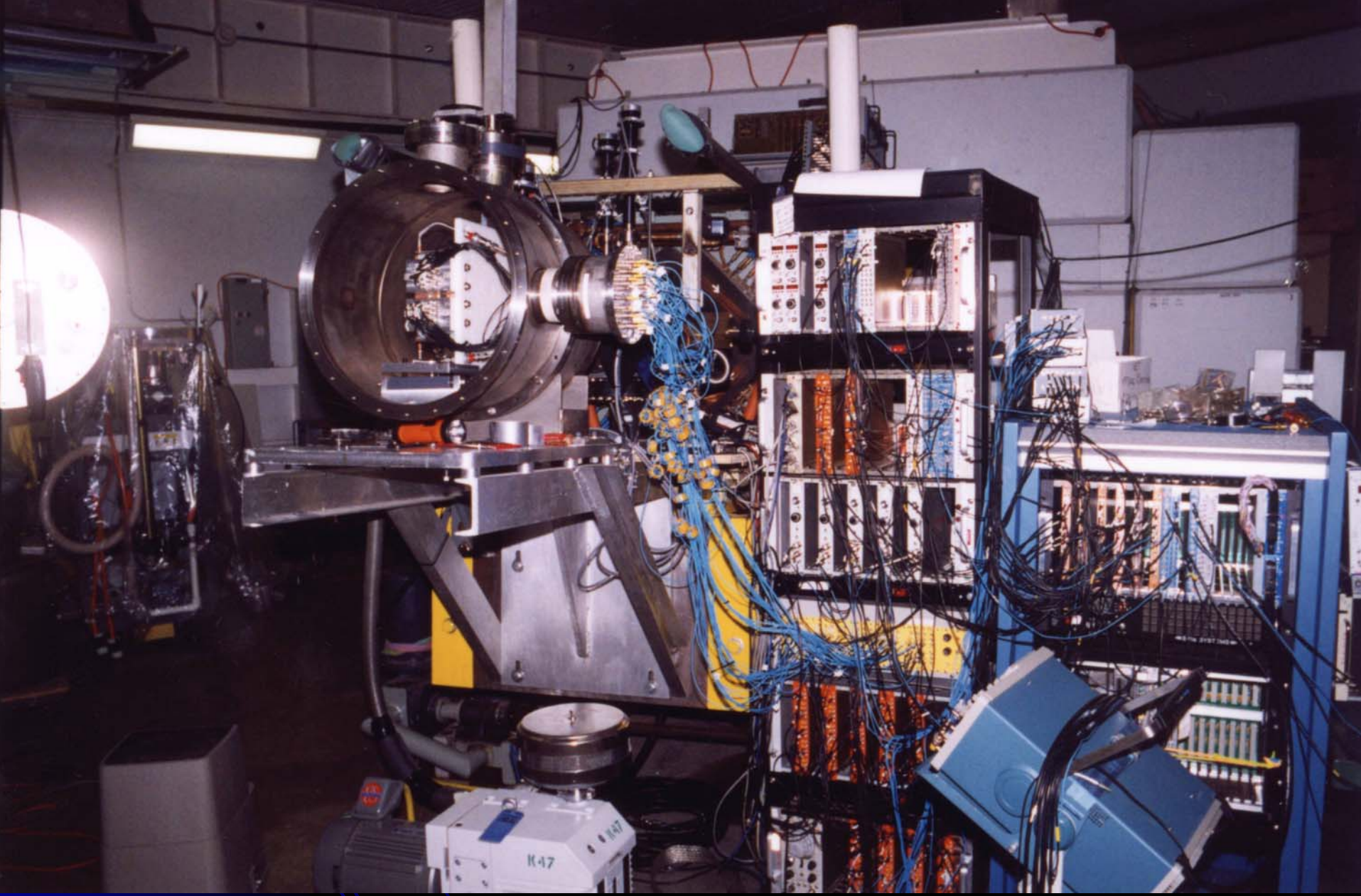
$^{7}Be(p,\gamma)^{8}B$

$^{11}C(p,\gamma)^{12}N$



$^{13}N(p,\gamma)^{14}O$

35 FEET



Small experiment with complete training

What can you do with nuclear Ph.D.?

- Academic Research
- Faculty

  Teaching, Research and Service

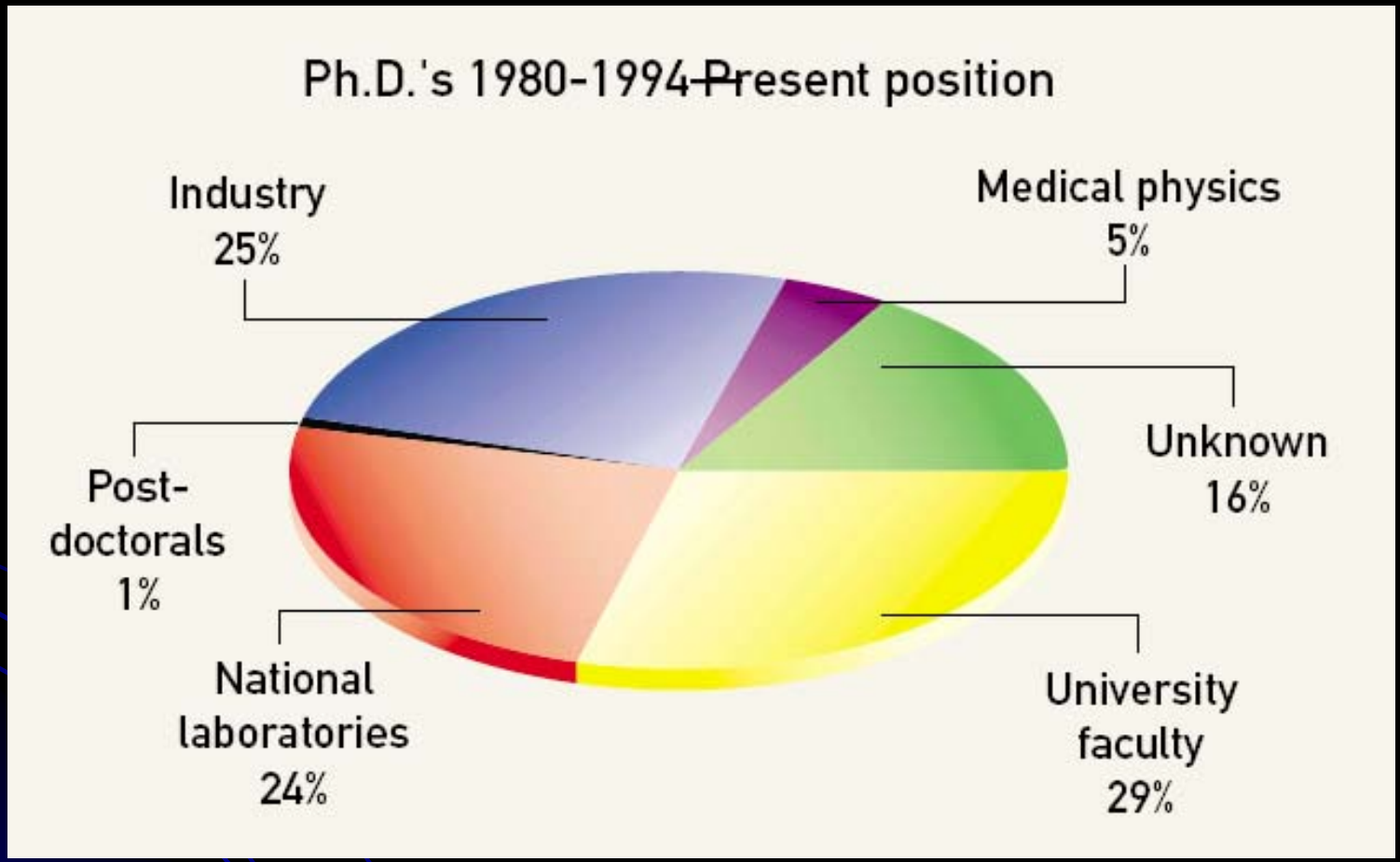
- Research Staff

  Research and Service

  Support outside users (National User Facility)

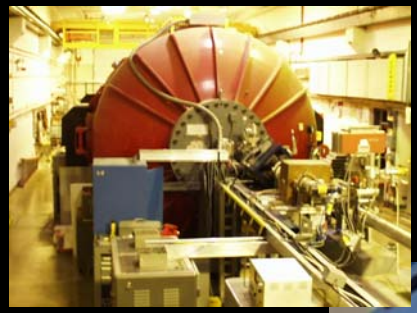
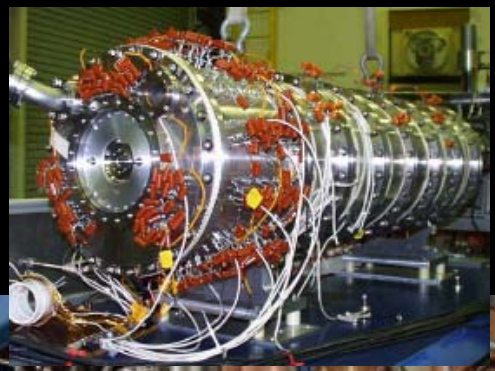
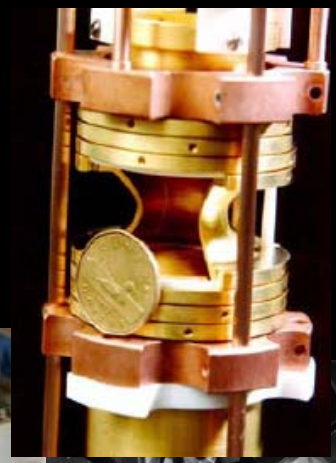
- Both positions require postdoc experiences.

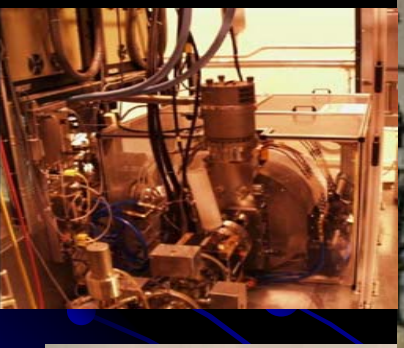
And you have more …

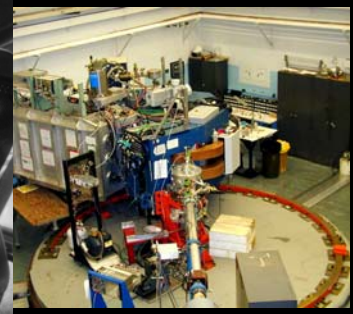


2002 NSAC Long Range Plan
http://www.sc.doe.gov/henp/np/nsac/docs/LRP_5547_FINAL.pdf

Argonne Tandem Linear Accelerator System





ARGONNE NATIONAL LABORATORY

Nuclear Astrophysics with Radioactive Beams at ATLAS

PRL 82, 3964(1999)

PRC 65, 035803(2002)

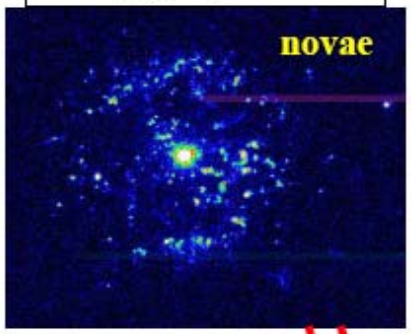
PRC 67, 065808(2003)

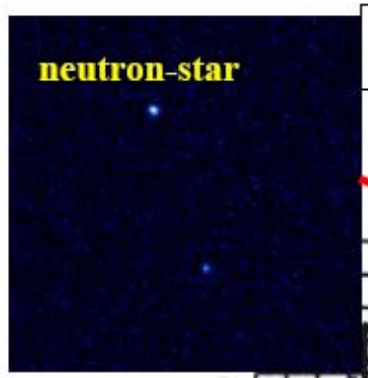
PRC 67, 065809(2003)

$^{21}Na(p,\alpha)^{18}Ne$

$^{15}O(\alpha,\gamma)^{19}Ne$

$^{17}F(p,\alpha)^{14}O$





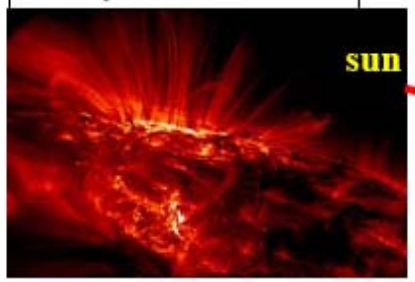
$^{56}Ni(p,\gamma)^{57}Cu$

PRL 80, 676(1998)

$^{11}C(p,\alpha)^{8}B$

NPA 734, 615(2004)

$^{8}B(\beta^{+},\nu) \rightarrow 2\alpha$



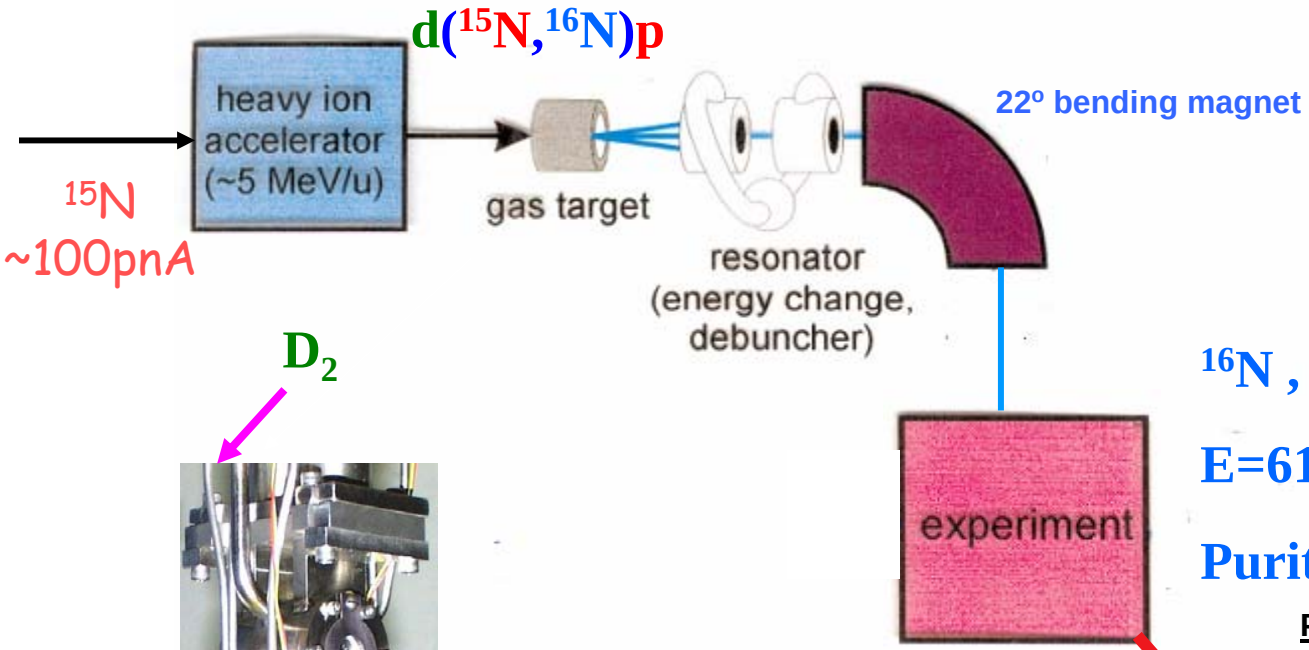
PRL 91, 252501(2003)

$^{12}C(\alpha,\gamma)^{16}O$

$^{44}Ti(\alpha,p)^{47}V$

PRL 84, 1651(2000)

Production of ^{16}N beam

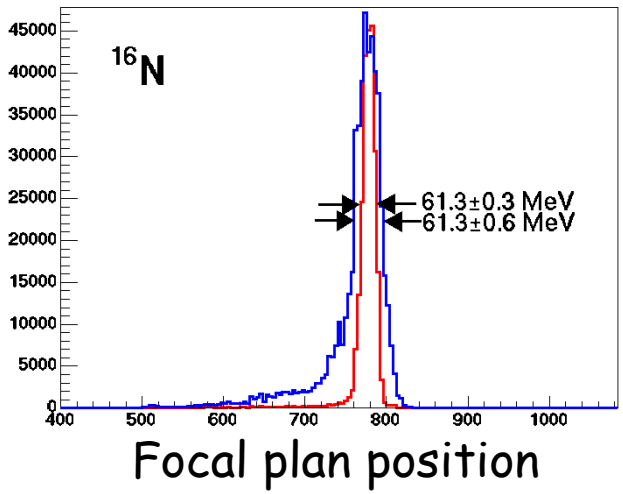


D_2

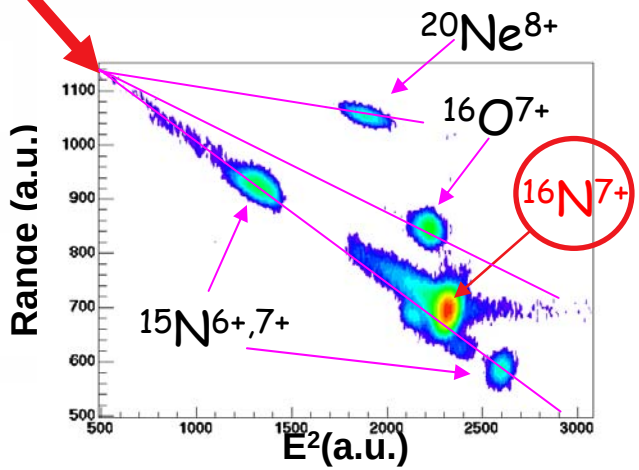
^{16}N , I ~ $3x10^6$/s

E=61.3±0.3 MeV

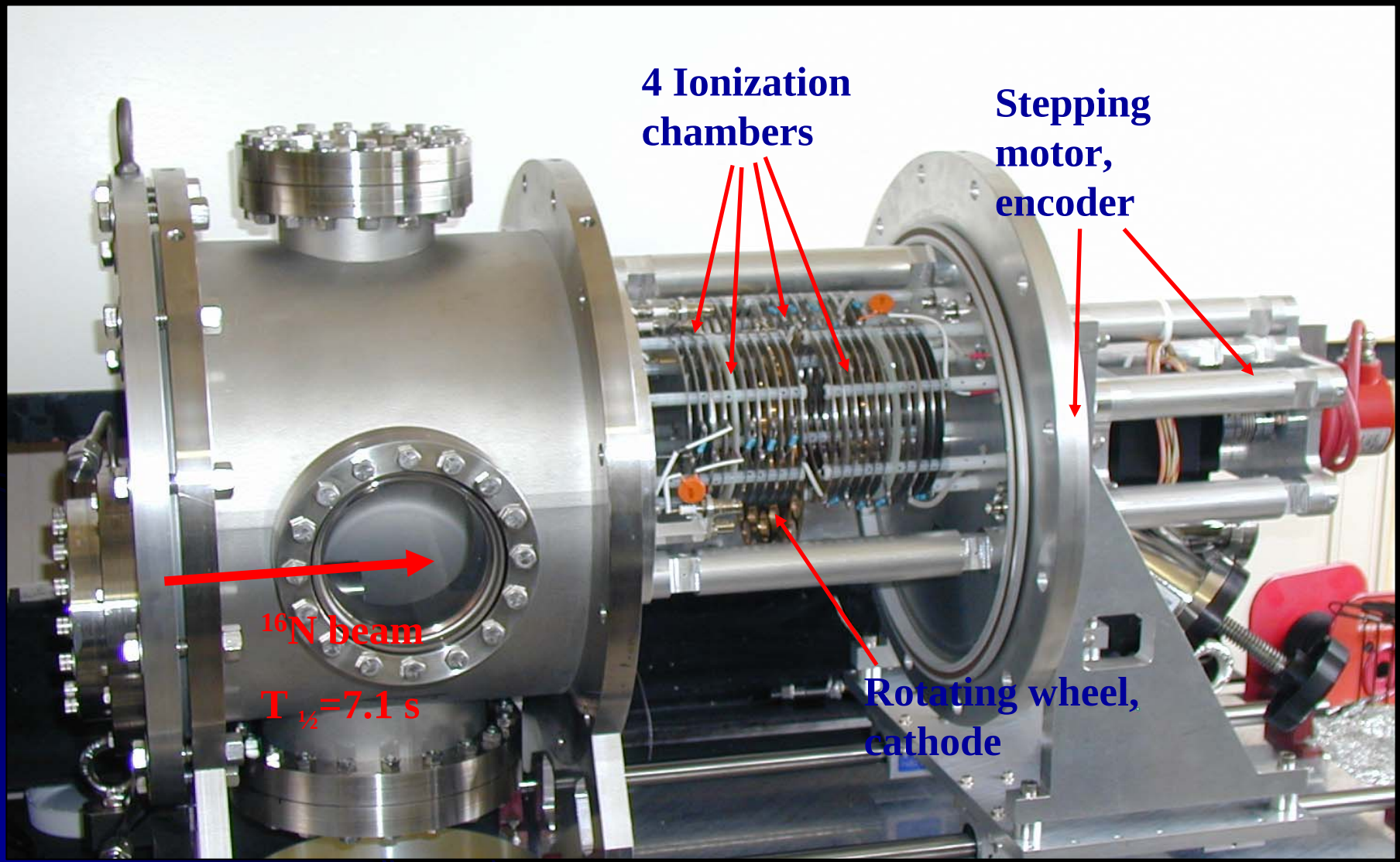
Purity~70%

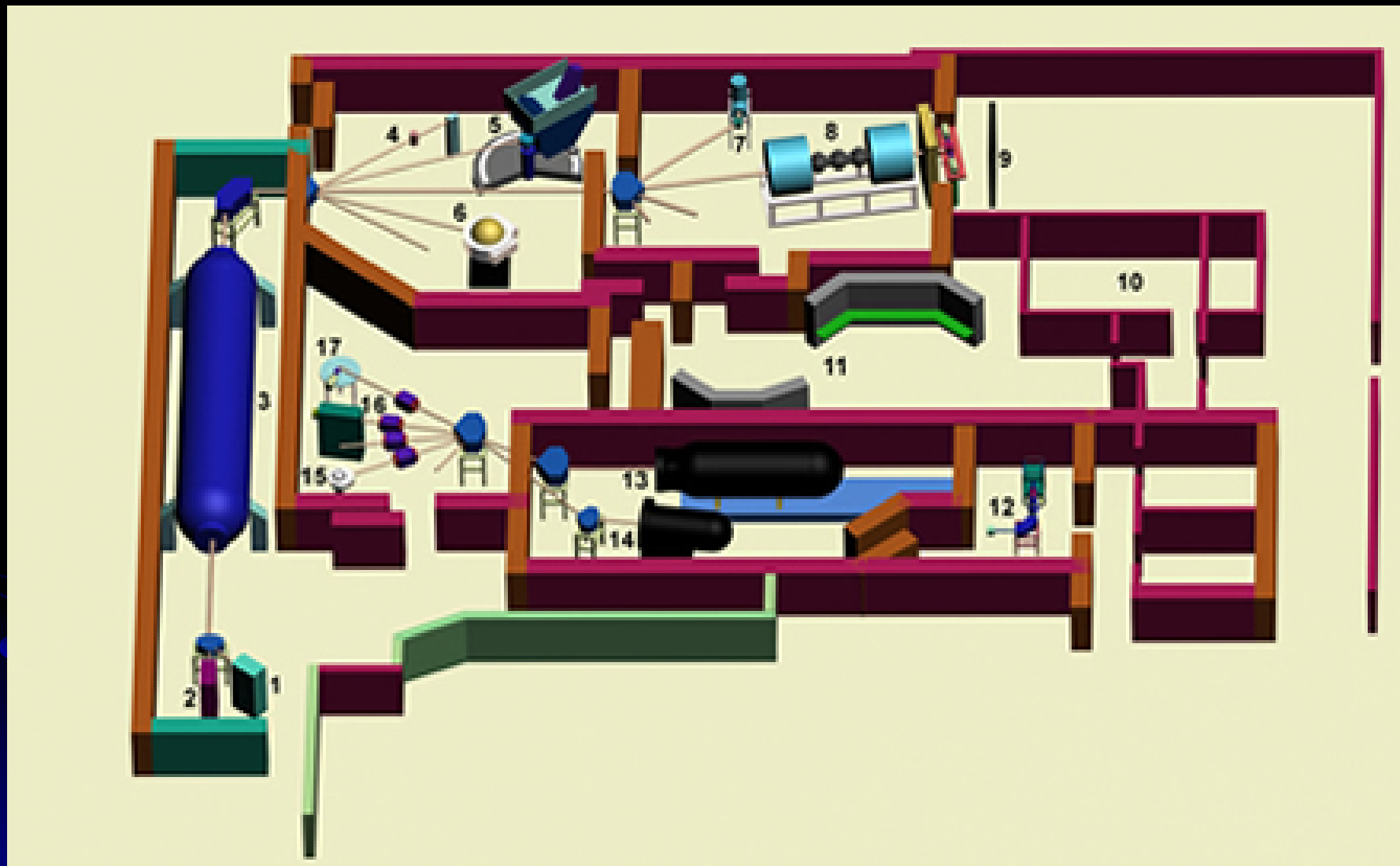


Particle identification

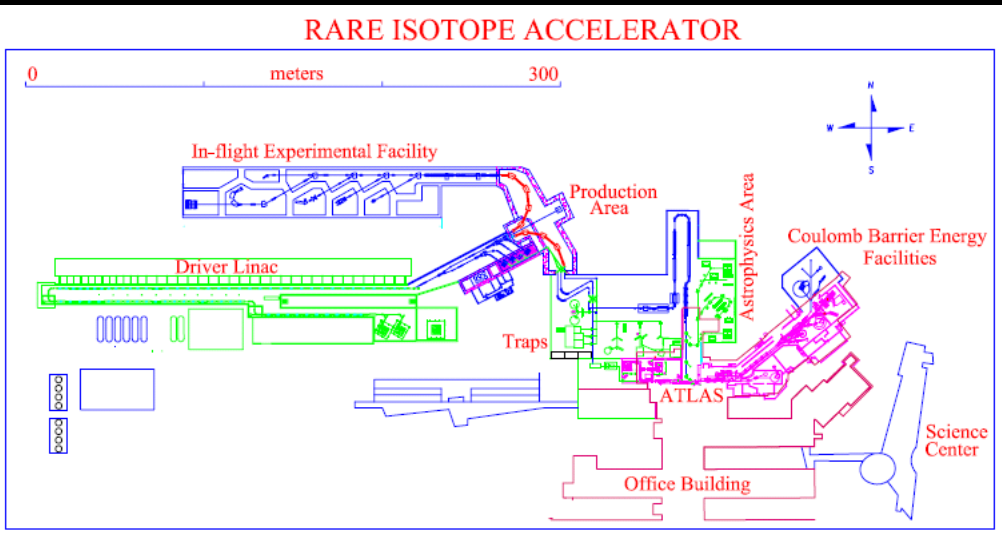


An experiment last more than 3 years.





Institute for Structure and Nuclear Astrophysics at University of Notre Dame



126
r-process
Terra incognita
50
82
Protons
rp-process
28
20
50
8
2
28
20
Neutrons
2
8
Neutron stars

2007 NSAC LRP Recommendations

- JLAB 12 GeV upgrade
- Construction of the Facility for Rare Isotope Beams (FRIB)
- Construction of a Deep Underground Science and Engineering Laboratory
- RHIC update

National User Facilities

Advantages:

- Professional
- Well maintained
- Well supported (many experts)
- Concentrate in physics
- Meet many different people from different places

Disadvantages:

- Every experiment need approval from PAC
- Everything need to be prioritized and scheduled
- Bureaucracy
- Expensive

Advantages of Cyclotron Institute

- Flexible beam time. (NO PAC)
- Unique research facilities at Cyclotron Institute. (eg. K500 + MARS, Cyclotron upgrade Project)
- Excellent teaching environment. You can be “expert” on many.
- Good support.
- Friendly environment.