



DNP LRP Meeting on Education and Innovation

Wednesday, 6 August 2014

7:00 PM Welcome Reception - NSCL Atrium

Thursday, 7 August 2014

8:30 AM *Breakfast*

9:00 AM **Plenary Session** - NSCL Lecture Hall

Introduction and Overview

Remarks by DOE

Remarks by NSF

NSAC report on workforce development

10:30 AM *Break*

10:45 AM **Plenary Session** - NSCL Lecture Hall

• *Workforce Development*

Analysis of workforce demographics

NNSA Workforce Development

The future MARS program at FIU

Educational aspects of the FRIB theory center

Workforce development in computational nuclear physics

12:00 PM *Lunch*

1:15 PM **Education** - NSCL Lecture Hall

• *Graduate Education*

2:30 PM *Break*

2:45 PM **Education** - NSCL Lecture Hall

• *Undergraduate Education*

4:00 PM *Break*

4:15 PM **Education** - NSCL Lecture Hall

• *K12*

5:30 PM *Break*

6:00 PM *Dinner* - NSCL Atrium

7:30 PM **Parallel discussions on draft recommendations**

Friday, 8 August 2014

8:30 AM *Breakfast*

9:00 AM **Education** - NSCL Lecture Hall

• *Public Outreach*

10:15 AM *Break*

10:30 AM **Plenary Session** - NSCL Lecture Hall

Summary discussions of recommendations

12:00 PM *Adjourn*

August 6-8, 2014
NSCL, Michigan State
University

*First official Town Meeting on Education
and Applications for a LRP*

Michael Thoennessen (MSU)
Jehanne Gillo (DOE)
Brad Keister (NSF)
Jolie Cizewski (Rutgers)

Michael Thoennessen (MSU)
Sean Liddick (MSU)
Joerg Reinhold (FIU)
Filomena Nunes (MSU)
Richard Fumstahl (OSU)

Parallel Sessions

Innovation - 1221A/B
• *Defense and Security*

Innovation - 1221A/B
• *Energy and Climate*

Innovation - 1221A/B
• *Health and Medicine*

Innovation - 1221A/B
• *Innovation, Art and Forensic*

74 total participants

Organizing committee:

Ed Hartouni (LLNL)

Anna Hayes (LANL)

Calvin Howell (Duke)

Cynthia Keppel (JLab)

Micha Kilburn (Notre Dame)

Amy McCausey (Michigan State, conf.
coordinator)

Graham Peaslee (Hope College, co-convenor)

David Robertson (Missouri)

Gunther Roland (MIT)

Mike Snow (Indiana)

Michael Thoennessen (Michigan State, co-
convenor)



Goals

Draft recommendations and write a white paper for the 2015 long range plan

SCHEDULE:

August/September:	3 town meetings focused on nuclear science
October 8 th :	Open discussion session at the DNP fall meeting in Hawaii
December:	White papers from town meetings are due
Jan-Mar 2015:	Resolution meeting
October 2015:	Report due at DOE/NSF



Town meeting outline:

Three broad areas:

- Education (4 sessions – K12, undergraduate, graduate, public)
- Applications/Innovation (4 sessions – Defense and Security, Energy and Climate, Health and Medicine, Art and Forensic)
- Workforce development (1 joint session)

Five questions to be addressed by presenters:

- What problem do you address or try to solve?
- What specifically is the role of nuclear physics?
- What are presently the biggest impediments?
- What resources do you require in the future?
- What is your overall vision to solve the issue in the future?

Thursday evening: Parallel discussion and drafting of recommendations

Friday morning: Joint summary session for discussion of recommendations

- Draft recommendations
- Solicit “one pagers” on innovation and outreach activities
- Update workforce statistics and demographics
- Write white paper

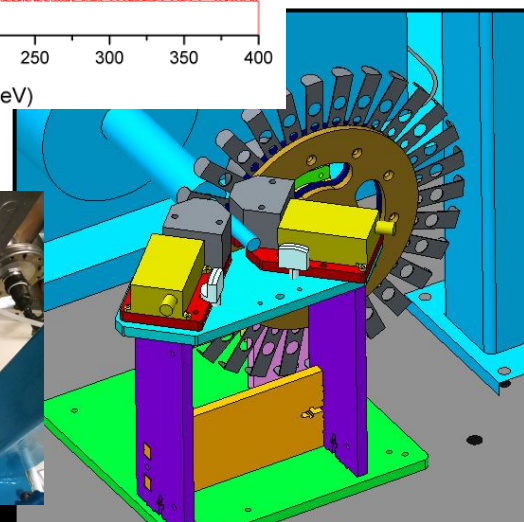
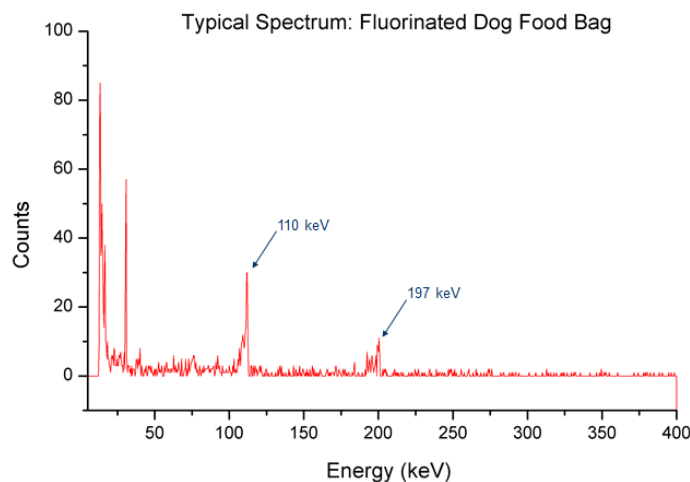
Presentations are available at the town meeting website:

<http://meetings.nscl.msu.edu/Education-Innovation-2014/program.htm>



Ion Beam Analysis of Consumer Products

- **Perfluorinated compounds (PFCs):** fluorine-containing chemicals with unique properties to make materials stain- and stick-resistant. Some PFCs are incredibly resistant to breakdown and are turning up in unexpected places.
- PFOA is a likely human carcinogen.



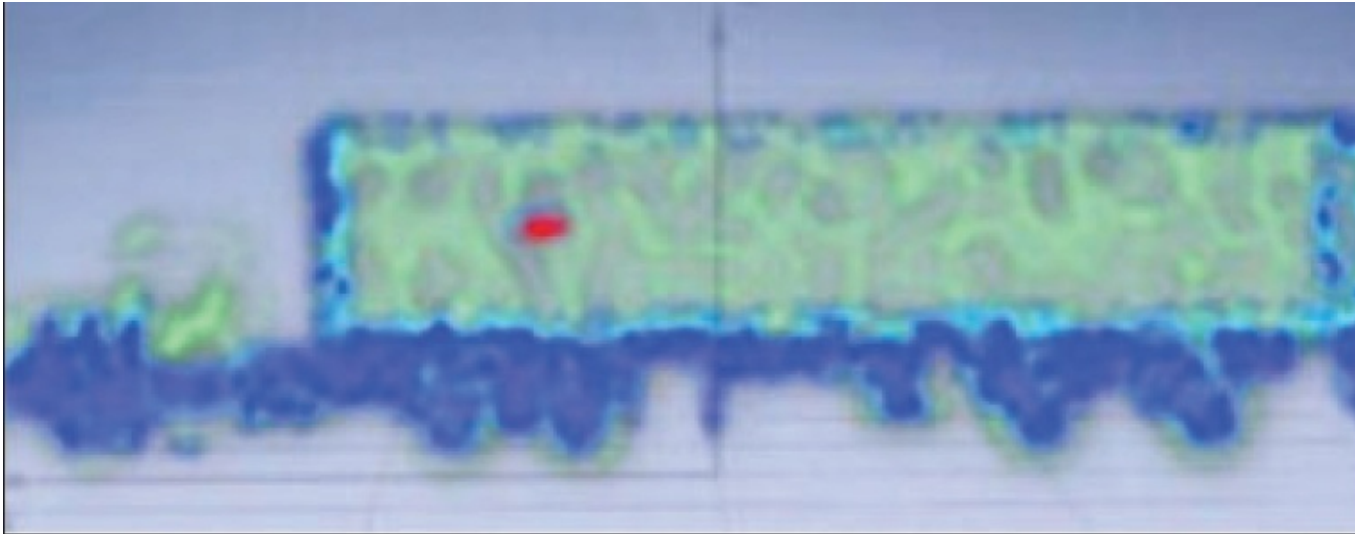


First Installed Commercial Muon Scanner





First Installed Commercial Muon Scanner



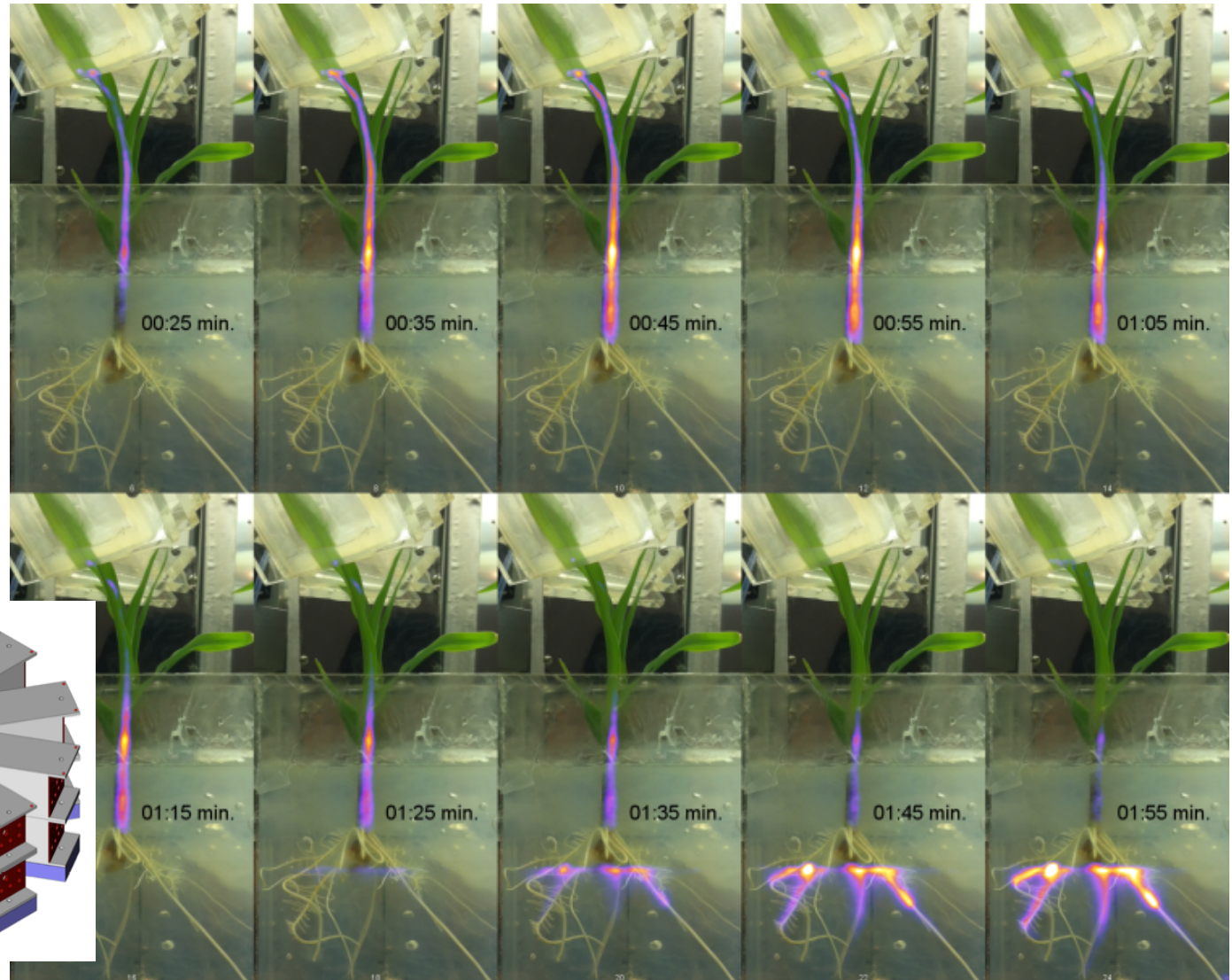
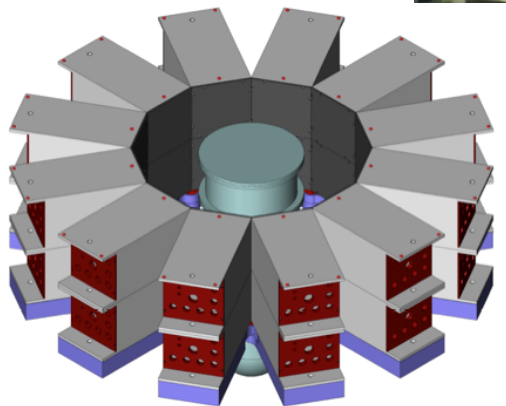
Less than one minute scanning time to detect 20 kg of U



Plant Biology Imaging

$^{11}\text{CO}_2$ (half life
= 20 min.)

Translocation of
sugars in corn –
indicator of
environmental
conditions

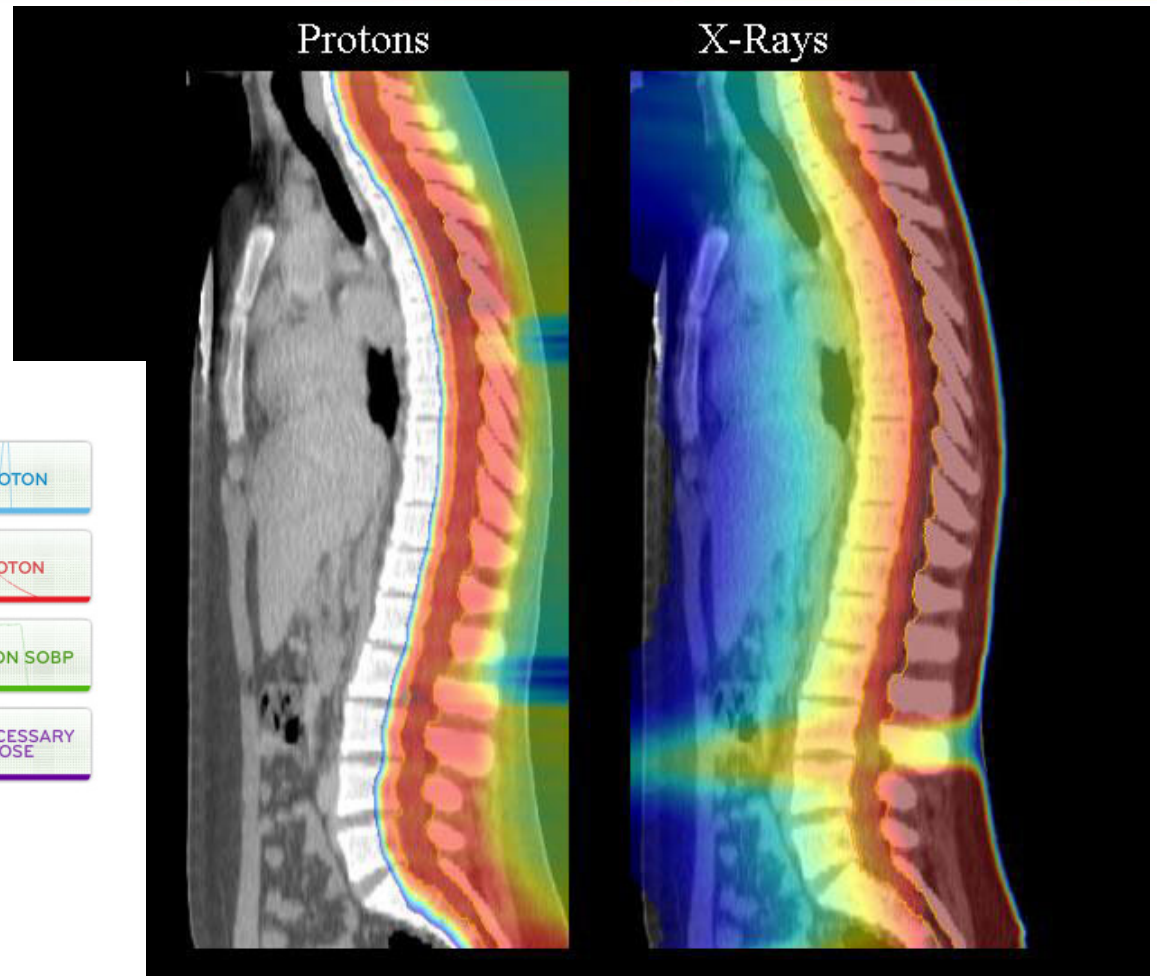
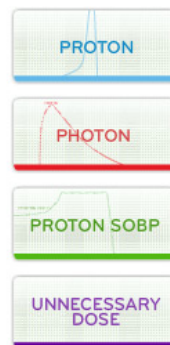
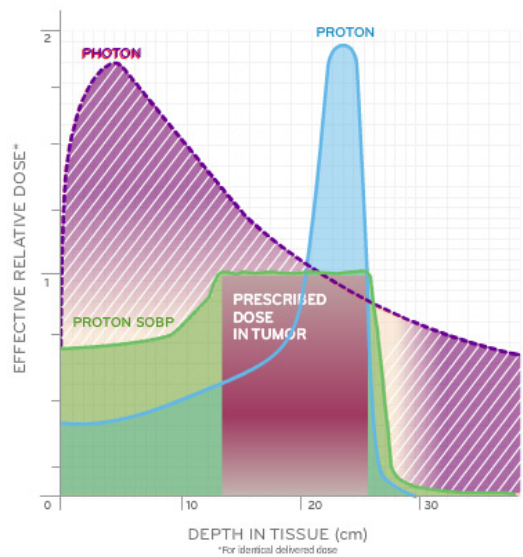




Proton Radiotherapy

Cancer radiation treatment – proton beams instead of X-rays

THE BRAGG PEAK



Medulloblastoma - pediatric cancer requiring irradiation of entire central nervous system



“One-pagers” on outreach activities

Physics of Atomic Nuclei @ Notre Dame

Organization: University of Notre Dame

Contact: JINA Outreach
(574) 631-5326
jjinaout@nd.edu

Grade Level: High school

Funding: NSF

Physics of Atomic Nuclei @ Notre Dame (formerly PIXE-PAN) hosted 15 high school students from 9 different states in its 6th year. Over the course of the week, students were presented with lectures by faculty in nuclear physics and astrophysics, performed modern lab experiments in the state of the art Jordan Hall of Science, and presented their findings in a poster presentation to parents and members of the physics department. The students entered the program with a high interest in science, and nuclear astrophysics in particular, and their interest remained high after. However, gains were seen in their attitudes towards basic nuclear research, and an understanding of what a career in research entails.

“I am really much more interested in nuclear science in general now”
The average score on the knowledge test, which covered lecture material as well as experimental concepts, rose from 47% to 73% after the week-long program. The students also found the program immensely enjoyable.

“Learning with a group of peers interested in science the way I am was one of the best educational experiences I’ve had so far”



website: www.jinaweb.org/outreach/PAN_ND/

As a result from the 2006 workshop on “Vision for Education and Outreach in Nuclear Science” in preparation for the 2007 LRP, a collection of “one-pager” of outreach activities was assembled.

Many nuclear scientists are very active in a variety of outreach activities and we would like to highlight them again in a similar collection.

Template is available at:

<http://meetings.nslc.msu.edu/Education-Innovation-2014>

Please send your contributions to Peggy Norris:

PNorris@sanfordlab.org



Request

***Seeking endorsement of the following
summary statements and recommendations....***



Summary Statements and Recommendations

- 1. Education and mentoring of the next generation nuclear scientists as well as dissemination of research results to a broad audience are integral parts of research. The funding agencies must ensure that these essential aspects become the responsibility of all researchers.**



Summary Statements and Recommendations

2. Nuclear science is an active and vibrant field with wide applicability to many societal issues. It is critical for the future of the field that the whole community embraces and increases its promotion of nuclear science to students at all stages in their career as well as to the general public.



3. Researchers in nuclear physics and nuclear chemistry have been innovative leaders in the full spectrum of activities that serve to educate nuclear scientists as well as other scientists and the general public in becoming informed of the importance of nuclear science. The researchers are encouraged to build on these strengths to address some of the challenges in educating an inclusive community of scientists as well as those on the path to future leadership in nuclear science.



Summary Statements and Recommendations

4. The interface between basic research in nuclear physics and exciting innovations in applied nuclear science is a particularly vital component that has driven economic development, increased national competitiveness, and attracts students into the field. It is critical that federal funding agencies provide and coordinate funding opportunities for innovative ideas for potential future applications.



Summary

- Education and dissemination has to be an integral part of research
- Nuclear science has to be promoted by the whole community
- Innovative approaches to address some of the challenges should be fostered and appreciated
- Development of future applications is critical
 - White paper work in progress
 - Continued input and feedback is highly encouraged



Summary

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1983 NSAC Long Range Plan

A LONG RANGE PLAN FOR NUCLEAR SCIENCE

A Report by the
DOE/NSF Nuclear Science Advisory Committee

DECEMBER 1983



U. S. DEPARTMENT OF ENERGY
OFFICE OF ENERGY RESEARCH
DIVISION OF NUCLEAR PHYSICS



AND
NATIONAL SCIENCE FOUNDATION
DIVISION OF PHYSICS
NUCLEAR SCIENCE SECTION

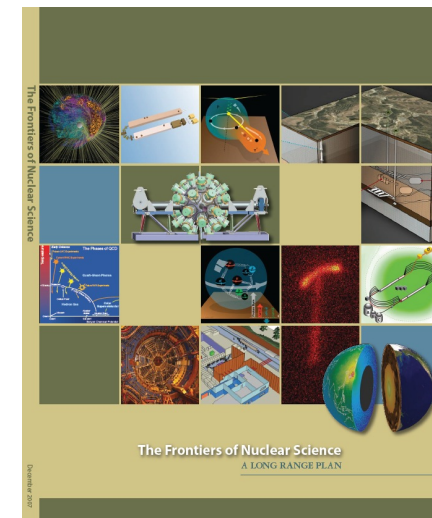
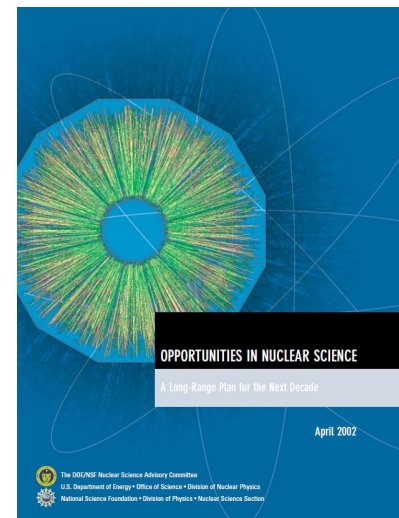
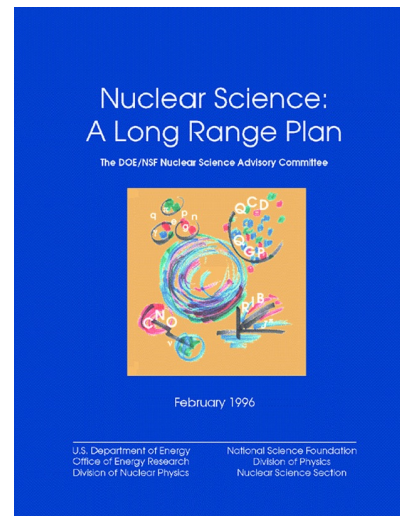
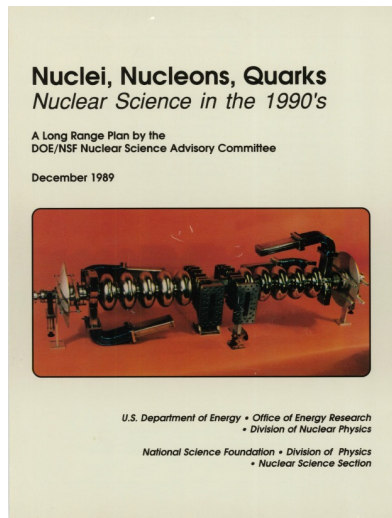
It is becoming apparent that the rate at which nuclear scientists are being trained will not be adequate to meet the country's needs within the decade. Every year a large

Recommendations:

1. Efforts should be made to strengthen and expand programs which involve undergraduates in nuclear science research
2. Increase the number of competitive predoctoral fellowships at NSF and commit funds at DOE
3. Fund a competitive program of new research initiative by young nuclear scientists
4. Support technical staff for university groups
5. Educational aspects should be considered in decisions on new facilities



1989-1996-2002-2007 NSAC Long Range Plans



- 2007 LRP:** The nuclear science community should endeavor to increase the number and diversity of students who pursue a graduate degree in nuclear science and to effect a change in the understanding of the field by the public, through:
- (1) the enhancement of existing programs and the inception of new ones that address the goals of increasing the visibility of nuclear science in undergraduate education and the involvement of undergraduates in research; and
 - (2) the development and dissemination of materials and hands-on activities that demonstrate core nuclear science principles to a broad array of audiences.