Education Charge Issues

- Where are we?
  - NSF database (Sherry Yennello)
    - 95% response rate
    - Lifetime follow-up of 10% sample with 85% response
- Where should we be headed?
- How do we get there?
- Charge + Workshop
- *Suggestive ideas…*

Future Demographics

- Major research thrusts (questions, tools)
- Associated national efforts
  - Security
  - Energy
  - Medicine
  - Materials
  - Other

Nuclear Science and National Security

Gamma-Ray Spectroscopy—A Tool for Basic Research and Security Applications

Advances in gamma-ray spectroscopy have enabled major discoveries in basic nuclear physics, while making critical contributions to medical imaging, characterization of radioactive materials, and nuclear safeguards. Central to these achievements has been the development of advanced nuclear instrumentation. Starting in the 60s, the basic research community developed spectrometers based on germanium detectors for many applications, replacing the earlier NaI(Tl) detectors. These detectors provide much higher energy resolution for radioisotope identification and high selectivity above background—the trade-off being higher cost, limited crystal size, and need to operate cryogenically. Since the 80s arrays of germanium detectors have evolved to their current 4π scale, as shown by the 110 element Gammasphere detector—seen being worked on by two technicians.

However, for gamma-ray identification in the field, e.g., by first responders to a radiological or nuclear threat, portability and ease of operation are essential. To go from a Gammasphere-scale device to a hand-held detector requires a team approach involving both science and engineering. For example, a portable spectrometer, CRYO-3 (at right), recently developed, has light weight (10 lbs.), requires low power (15 W DC) and is long-lived (6 months before a 4-day warm-up/cool-down cycle). Current R&D efforts in developing detectors with higher efficiency, lower-background and better position and directional sensitivity will have application in many applied areas.

Gammasphere

CRYO-3

- DOE-NSF Workshop
- MPS-IC Workshop
- NSF Charter
- *The next generation of nuclear scientists…*

Vision of the Field

- Where should it be 5, 10, 20 years from now?
  - What does "nuclear physicist" look like?
  - What does NP graduate education program look like?
    - "central education"
    - Peripheral: applications, common career trajectories
  - Workforce diversity

Education Practices

- Undergraduate: beyond REU?
  - Group projects
  - RUI partnerships
- Graduate
  - Intern/externships
  - Intentional preparation for career diversity
- Funding Models (examples)
  - Direct funding of graduate students (fellowships)
  - Block grants (traineeships)

Broader Connections

- Education in earlier years
  - Pathways to NP and related careers
- Public awareness
  - Perceptions of “nuclear” (energy, security)
  - Education for security issues: responders, …

Education Practices

Size & Scope

- Small groups
  - Outreach programs
- Large projects
  - Quarknet/LHC
  - STC's, PFC's have built-in components
  - Easier to build in at the ground floor

NSF Merit Review Criteria

Criterion 1: What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

Criterion 2: What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

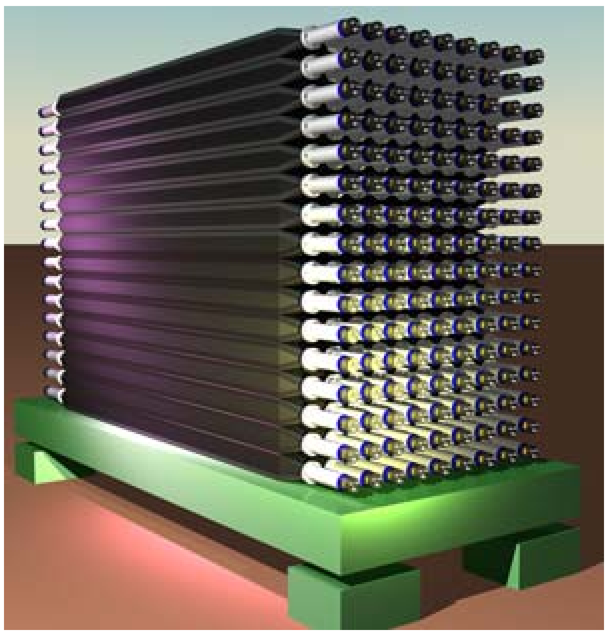
NSF NP Program

Some Education Success Stories…

Conference Experience for Undergraduates

- NSF funds, addl. support from DOE national labs
- Fall 2002 DNP: 73 students (30% women, 1 black, 1 Arabic, 1 Indian, 4 Asian)
- Very successful; follow-on recruiting

MoNA: Facility-RUI Partnership (MRI)



Logistics and Pathways

- Plan & Revise
- Anticipate varying level of impact
  - Some issues specific to NP
  - Others: physics, sciences, …
- Key principle: leverage the strengths of the research community
  - Will involve investment
  - Must retain strengths

Conclusions

- A beginning…
  - Long-term strategic planning for education
  - Central to long-term health of the field
- A continuation…
  - Opportunity to collect and articulate ongoing activities
  - Room to capitalize and improve