The NASA Radiation Interuniversity Science and Engineering (RaISE) Project:

A Model for Inter-collaboration and Distance Learning in Radiation Physics and Nuclear Engineering

P. Denkins, P. Saganti, V. Obot, and R. Singleterry
A NASA *Radiation Interuniversity Science and Engineering* (RaISE) Project

- Undergraduate/graduate program in radiation physics and nuclear engineering

Collaborators

- NASA Johnson Space Center
- NASA Langley Research Center
- Prairie View A&M University (PVAMU)
- Texas Southern University (TSU)

Funded by NASA/Explorations Systems Mission Directorate
Background

- Radiation is one of the top five risks for human space exploration.
- NASA has a critical need to further its knowledge in radiation science and the mitigation of this risk.
- NASA must expand its pool of research scientists and engineers trained to meet the challenges of human space flight and long-term planetary missions.
- White House Executive Order 12876, which mandates the support of HBCUs, strongly emphasizes developing the human resource potential represented by students served by HBCUs.
Strategy

- Participating Institutions
  - Prairie View A&M University (PVAMU)
  - Texas Southern University (TSU)

- Justification
  - Both these institutions are located within fifty miles of NASA Johnson Space Center, a lead center for Space Radiation Health Program.

- Projected Outcome
  - Contribution to human resource development through special emphases on enhanced and advanced degree curriculum in this critical area among underrepresented minority students
Strategy (con’t)

- Curriculum Focus
  - Radiation Physics
  - Radiation Biology
  - Radiation Measurements
  - Radiation Transport
  - Nuclear Engineering

- Course implementation and delivery will be a staged approach with each institution delivering the courses as they are developed within their respective academic environments and on-line delivery between the universities via the NASA Goddard Minority University Space Interdisciplinary Network (MU-SPIN)
Institutional Assets

- Both, PVAMU and TSU, have NASA University Research Centers (URC) of Excellence
  - PVAMU: Center for Applied Radiation Research (CARR)
  - TSU: Center for Environmental Sciences and Biotechnology (CESB)

- Physics Programs
  - PVAMU - expanding existing undergraduate program and developing a new graduate (RaISE) program
  - TSU – expanding undergraduate program with RaISE emphasis

- Engineering
  - PVAMU – Expanding undergraduate nuclear engineering program and developing a graduate program with RaISE emphasis

- Biology
  - TSU – Expanding a graduate program with RaISE emphasis with radiation biology emphases
Guiding Principles for ESMD Support

- Content
- Deliverables
- Accessibility
- Relevance
- Customer Focus
- Pipeline
- Diversity
- Management Plan
- External Partners and Collaborations
- Timeline
- Metrics and assessment
- Cost Effectiveness
- Value-added
Courses Conducted

- Methods in Biomedical Sciences (Fall '05)
- Molecular Biology I (Fall '05)
- Radiation Biology (Spr '06)
- Computational Methods in Physics I (Spr '06)
- Mathematical Methods in Physics I (Spr '06)
- Intro to Electromagnetic Theory (Spr '06)

Forty-eight students have enrolled in and completed the courses.
Courses and Laboratories Planned …

- **Prairie View**
  - Intro to Nuclear and Particle Physics: Radiation Applications – 15 students expected (Fall 06)
  - Intro to Modern Physics and Radiation Science – 15 students expected (Fall 06)
  - Physical Sciences for non-majors (mostly education majors) – 300 students total, 30 students for RaISE emphasis (Fall 06)
  - Computation Methods in Radiation Transport (Spring 07)
  - Nuclear Engineering II (Spring 07)
  - Space Environments (Fall 07)
  - Radiation Measurements – Laboratory (Spring 07)
  - Radiation Quantities – Laboratory (Spring 07)
Courses and Laboratories Planned …

- **Texas Southern University**
  - Computational Methods in Physics II (Fall 06)
  - Mathematical Methods in Physics II (Fall 06)
  - Electricity and Magnetism I (Fall 06)
  - Molecular Biology I (Fall 06)
  - Molecular Biology I – Laboratory (Fall 06)
  - Nuclear Physics I (Spring 07)
  - Radiation Science I (Spring 07)
  - Radiation Damage and DNA Repair (Spring 07)
  - Radiation Biology (Spring 07 or Spr-08 depending on demand)
Online Delivery Planned…

- Online Curricula
  - PV: Intro to Modern Physics and Radiation Science (Spring 07)
  - PV: Intro to Nuclear and Particle Physics: Radiation Applications (Fall 07)
- Course Video Teaching (MUSPIN)
  - Technical difficulties are hampering this effort
  - Looking for alternatives
Text/Reference Material Development Planned…

- Sample Series
  - Volume I: Space Radiation Environment
  - Volume II: Nuclear and Atomic Physics Measurements
  - Volume III: Radiation Transport Methodologies
  - Volume IV: Radiation Damage and Risk Management
  - Volume V: Space Design for Radiation Mitigation
Additional Progress…

- Equipment Acquisition Through Leveraging
  - TSU: ~10 Ci Cs-137 Radiation source (NASA - URC/TSU)
  - PV: 4-processor SGI Tzero W/S (NASA - CARR Sponsored)
  - PV: Gamma Spec Instrument (TAMU - DOE Sponsored)
- Advisory Committee Development
  - PV and TSU are identifying persons for the advisory committee
- Student Surveys and Tracking
  - Student survey data will be acquired through annual state-required surveys
  - Student demographics are being collected
More to come and other places to go……

- Increase student enrollment
- Promote student participation in internships, etc.
- Finalize graduate degree program in Physics
- Expand to other institutions