Applications are being sought for the 2007 NASA Space Radiation Summer School (NSRSS), a three-week course designed to offer graduate students, postdoctoral fellows, and faculty an integrated curriculum of radiation biology, chemistry and physics, culminating in hands-on accelerator-based experiments using the synchrotron facility at the NASA Space Radiation Laboratory.

Up to 15 students will be selected for the course to be held in June 2007 at the Brookhaven National Laboratory (BNL) on Long Island, New York. Topics will include the radiation environment, physics and biochemistry of charged particle interaction with condensed matter, ionizing radiation dosimetry and accelerator operations, DNA damage and repair, genotoxicity measurements, cell cycle checkpoints and apoptosis, signal transduction including bystander effects, genomic instability, neurodegeneration, tissue remodeling, and the relationships of these processes to carcinogenesis and late degenerative effects following exposure to space radiation.

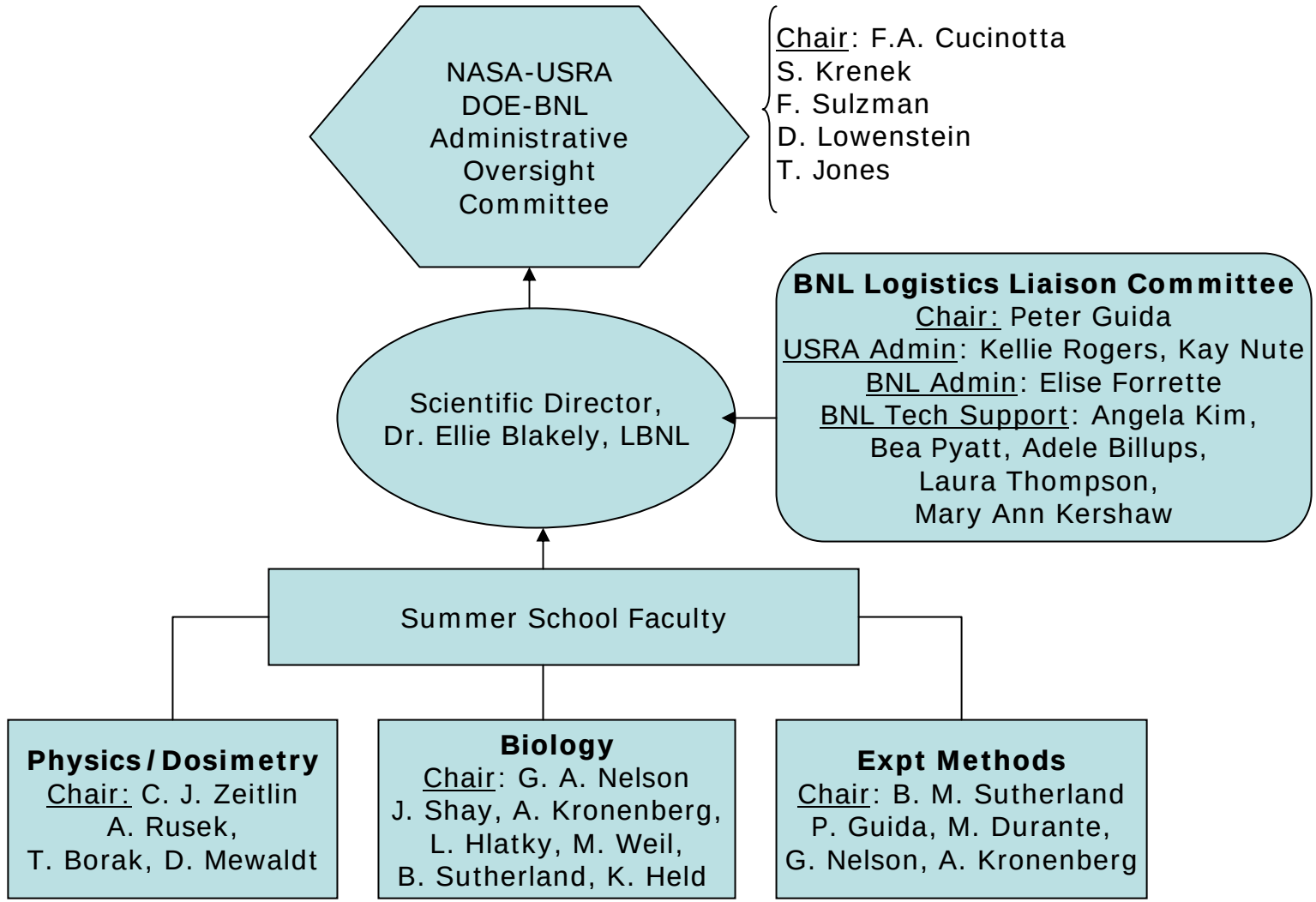
Course faculty will consist of leading university and national laboratory biologists and physicists actively engaged in NASA space radiation research and BNL experts in heavy ion experimentation and methods.

Application instructions may be found at www.dsls.usra.edu/spacerad/2007/

The application deadline is 5:00pm CT on February 28, 2007. Both foreign nationals and U.S. citizens may apply. All selected students must satisfy BNL safety and security requirements in order to be admitted. Due to the intense nature of the course, selected students must demonstrate oral and written proficiency in the English language. Expenses for travel within the U.S.and for room and board will be covered for those selected for the program. Successful applicants from outside the U.S. must provide for their travel to and from the U.S. Course sponsors are the NASA Space Radiation Research Program, the U.S. Department of Energy, Brookhaven National Laboratory, Lawrence Berkeley National Laboratory, and the Universities Space Research Association.

The NSRL is a $34-million facility that was built by the staff of Brookhaven Lab with funding from NASA with the cooperation of the Office of Nuclear Physics within the U.S. Department of Energy's Office of Science. Operational since 2003, NSRL is one of the few places in the world that can simulate the harsh cosmic and solar radiation found in space. The facility is part of Brookhaven's Collider-Accelerator complex, which is maintained by the DOE Office of Science's nuclear physics program and receives incremental operations and maintenance funding from NASA. It employs beams of heavy ions extracted from Brookhaven's Booster accelerator that are the best in the U.S. for studying the effects of radiation on living organisms. Scientists from more than 20 research institutions from throughout the U.S. and abroad work year-round at NSRL, supported mainly by NASA funding, to learn about the possible risks to space explorers exposed to deep-space radiation.

NASA Summer School Organization - 2007



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NASA Summer School Organization - 2007

NASA-USRA-DOE-BNL- Administrative Oversight Committee

Chair: Francis A. Cucinotta

Committee Members: S. Krenek, F. Sulzman, D. Lowenstein, T. Jones

Role: Overall responsibility for program budget management and oversight for implementation of scientific goals of the program and student selection

Scientific Director: Eleanor A. Blakely

Role: Overall responsibility for course curriculum, faculty selection and lecture schedule, and the experimental program, and participate in student selection process and testing for mastery of academic modules

BNL/USRA Logistics Liaison Committee

Chair: Peter Guida

Role: Overall responsibility to coordinate NASA summer school beam needs as a NSRL user, BNL contact for student site access, training, housing, per diem and local travel arrangements, coordination of text material for course modules, coordination of technical support for cell and animal lab work in experimental method module, and access to low-LET radiation sources

USRA Administrative Support: Kay Nute, Kellie Rogers

BNL Administrative Support: Elise Forrette

BNL Technical Support: Angela Kim, Bea Pyatt, Adele Billups, Laura Thompson, Mary Ann Petry

NASA Summer School Organization - 2007

Summer School Faculty

Physics/Dosimetry Module

Chair: Cary J. Zeitlin

Faculty: TBD

Course scope to include basic particle physics, accelerators and dosimetry and to introduce the students to the operation of the NSRL beam facility and important scientific issues of radiations with enhanced ionization quality as relevant to the space radiation environment

Biology Module

Chair: Greg A. Nelson

Faculty: TBD

Course scope to include the fundamentals of radiation biology and chemistry with a focus on molecular, cellular and organismic biology as they relate to human physiology in the space environment

Experimental Methods Module

Chair: Betsy M. Sutherland

Faculty: TBD

Course scope to include an experimental hands-on program that integrates radiobiological concepts at the molecular, cellular and animal level with principles of particle physics, with the tools to design and implement safe practices in the use of accelerator beams.

NASA Summer School - 2007

Goals for the student successfully completing the NASA Summer School

I. PHYSICS/DOSIMETRY MODULE

- Aware of pertinent issues in planning and assuring safe travel for humans in space with regard to the space radiation environment and the limitations of other factors such as microgravity
- Trained in radiation safety
- Familiar with key dose concepts, units, and the language of acronyms used in particle physics, dosimetry and radiobiology
- Able to explain what ionizing and non-ionizing radiations are, familiar with the different types of ionizing radiation and how to measure each type as absorbed dose in condensed matter
- Aware of the importance of field uniformity and geometry to defining a radiation exposure and familiarity with simple transport codes and utilities
- Understand the concepts of particle track structure, the Bragg ionization curve, secondary particle fragmentation, particle fluence and linear energy transfer
- Familiar with how an accelerator can produce a particle beam, what are the types of accelerators and what are the key hardware components required to prepare and monitor beam dynamics
- Understand what is known about solar flares and likely particle dose- rate scenarios in outer space between Earth, the Moon and Mars

NASA Summer School - 2007

Goals for the student successfully completing the NASA Summer School

II. BIOLOGY MODULE

- Understand the radiochemistry of water and macromolecules
- Familiar with the broad array of radiobiological endpoints measurable at the molecular, cellular tissue and organismic level, and examples of radiosensitivity and radioresistance for each
- Familiar with radiation effects on the cell reproductive cycle and checkpoint controls
- Able to describe types of low-LET and high-LET radiation-induced DNA damage and repair response mechanisms they may induce and pertinent signaling transduction pathways
- Aware of the different types of radiation-induced mutation and evidence for genomic instability
- Able to describe cell transformation and the different kinds of cancer associated with radiation effects, as well as the organ-specificity of cancer radiosensitivities
- Aware of low-dose and low-dose-rate radiation effects such as prodromal symptoms
- Able to describe the dose-dependent, temporal appearance of physiological changes and the early and late consequences of exposures to acute doses of low-LET and high-LET radiations
- Familiar with radiation-induced effects on the cardiovascular and immune systems
- Familiar with the concepts of tissue microenvironment and remodeling
- Understand the concept of bystander and adaptive effects
- Familiar Aware of physical, nutritional and biochemical countermeasures and their scope of use

NASA Summer School - 2007

Goals for the student successfully completing the NASA Summer School

III. EXPERIMENTAL METHODS MODULE

PHYSICS

- Participate in 3D-demonstration of Bragg curve ionization effects on and off axis
- Practical experience in implementing particle dosimetry and controlling experimental parameters, such as particle fluence and collimation
- Practical experience in dealing with particle beam scattering, fragmentation and field uniformity and comparisons with comparable X-ray set ups

CELL BIOLOGY

- Participate in biological investigations of several biological endpoints of cell survival
- Participate in demonstration of particle track structure effects on DNA/chromatin targets

ANIMAL BIOLOGY

- Participate in animal experiment with particle irradiations to understand the practical considerations necessary for executing the study in a particle accelerator environment
- Understand the concept of physical and biological variability and learn tools for analysis of statistical confirmation
- Successful completion of a NSRL user proposal and request for beam time.