U.S. DEPARTMENT OF HOMELAND SECURITY

DOMESTIC NUCLEAR DETECTION OFFICE

NUCLEAR FORENSICS GRADUATE FELLOWSHIP PROGRAM

ACADEMIC YEAR: 2014-2015

Student Application Deadline: February 3, 2014

Awards Announced: April 2014

Administered by the South Carolina Universities Research and Education Foundation

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AN INTRODUCTION TO THE NUCLEAR FORENSICS GRADUATE FELLOWSHIP PROGRAM

PROGRAM DESCRIPTION

The United States Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) established the Nuclear Forensics Graduate Fellowship Program (NFGFP) in 2008 to provide fellowships to graduate students pursuing doctoral degrees in nuclear, geochemical, and other disciplines directly relevant to nuclear forensics. This program aims to develop the next generation of highly qualified scientists to meet U.S. Government needs for nuclear forensics expertise and to build a viable student career path in nuclear forensics.

Nuclear forensics is a top U.S. national security priority. Congress recognized the critical need for first-rate nuclear forensics experts to support this mission in the *Nuclear Forensics and Attribution Act* (P.L. 111-140), which the President signed on February 16, 2010. In addition, world leaders highlighted the importance of international nuclear forensics cooperation during both the 2010 and 2012 Nuclear Security Summits. Developing and sustaining an enduring expertise pipeline and workforce is one of the most important objectives of the nuclear forensics community today.

As a key component of the broader National Nuclear Forensics Expertise Development Program, the NFGFP enables fellows to gain unique, hands-on experience through laboratory practicums and close interaction with technical and policy experts throughout the nuclear forensics community. The program encourages these students to seek advanced education in technical areas related to nuclear forensics and provides incentives for universities to invest in and further develop radiochemistry and other nuclear forensics-related academic programs. Ultimately, the NFGFP gives highly motivated students an exceptional opportunity to apply their knowledge to enhance U.S. national security.

RELATED TECHNICAL AREAS

The purpose of the NFGFP is to meet U.S. Government needs for highly trained scientists and engineers in priority technical areas for nuclear forensics research and development. These areas include:

1. Technical Mission Area 1 (TMA 1): In general, the National Technical Nuclear Forensics (NTNF) community is interested in advancements in the analysis and characterization of nuclear and other radioactive materials. Of particular importance are innovations in the speed, accuracy, and precision of determining the physical, chemical, isotopic, micro-structural, and/or morphological properties of materials. The U.S. Government is specifically seeking significant developments in the quantification of micro-structural and morphological measurements of bulk uranium and plutonium materials in both oxide and metal forms.

2. Technical Mission Area 2 (TMA 2): Following the detonation of a nuclear device, solid debris samples to be analyzed are expected to contain trace-level quantities of nuclear materials combined with material from the immediate environment around the detonation site, which may have been activated and is assumed to have been vaporized and recondensed. As such, debris for dissolution is expected to have formed at high temperatures and contain silicates and other hard-to-dissolve materials. Solid fallout debris is typically in a glassy matrix containing parts per million (ppm) quantities of plutonium or uranium with radioactive fission products. Improvements are sought in the characterization and analysis of nuclear and non-nuclear constituents within these nuclear and post-detonation debris materials, including those present in trace quantities.

3. Technical Mission Area 3 (TMA 3): General studies that improve our understanding of how relevant stages of the nuclear fuel cycle create, persist, or modify discriminating material characteristics in the metal or oxide forms of uranium or plutonium. Activities should focus on identifying discriminating characteristics that help assess the process history and provenance of bulk uranium and plutonium

materials produced in the enrichment, conversion to oxides, and conversion to metal stages of the fuel cycle, and developing simulations that predict material characteristics from parameterized processes.

APPLICATION PROCEDURES

ELIGIBILITY

Students with undergraduate degrees in the physical sciences, life sciences, or engineering are eligible to apply for the Nuclear Forensics Graduate Fellowship Program. Graduate students in these technical disciplines who will have at least two full years of graduate work remaining at the beginning of September 2014 are also eligible. Applicants must be pursuing or planning to pursue doctoral study in specialties directly relevant to technical nuclear forensics. These specialties include but are not limited to radiochemistry, geochemistry, nuclear physics, nuclear engineering, materials science, and analytical chemistry.

Applicants must be U.S. citizens. It is the policy of DHS and its program administrators, the South Carolina Universities Research and Education Foundation (SCUREF) and the Medical University of South Carolina (MUSC), to recruit and nominate participants without regard to race, age, gender, religion, color, national origin, physical or mental disability, or special disabled or veteran status.

APPLICATION DEADLINE

The current competition cycle for this program is from November 2013 - February 3, 2014. **The MUSC Office of Special Programs must receive all parts of the application by February 3, 2014.** GRE scores are *required* for a complete application. Scores earned before November 2004 will not be accepted. MUSC will not process late and/or incomplete applications. Please include the fellowship program name on all correspondence.

A complete application includes the following components:

Application Form
Three (3) References
Official Transcripts (undergraduate and graduate transcripts must be sent directly from the university registrar)
GRE scores (GRE code 5949 – scores must be sent directly from ETS)
Proof of U.S. Citizenship (copy of birth certificate or U.S. passport)

Forms are located at www.scuref.org/forms under the NFGFP tab. Applicants should submit all materials electronically through the SCUREF website. If you are unable to submit the application electronically, you may mail completed application materials to the following address:

Medical University of South Carolina
Office of Special Programs, NFGFP
19 Hagood Avenue, HOT 304-H4
MSC 851
Charleston, SC 29425-8510

For additional information or assistance, please contact the MUSC Office of Special Programs at (843) 792-0832 or nhuchet@scuref.org.

FELLOWSHIP OBLIGATIONS

ENROLLMENT AND PERIOD OF APPOINTMENT

The initial fellowship appointment is for a 12-month period and is renewable for up to a total of 60 months or five years. Each appointment is prorated based on the amount of graduate work completed prior to the fellowship appointment date. Throughout the fellowship appointment, graduate students must be enrolled full time at an approved university and perform research within the objectives of the fellowship program. During the summer months, fellows are to continue working toward achieving a doctoral degree. Students may choose to conduct research relevant to their specialization, enroll in summer classes, complete a practicum assignment at a national laboratory, or do a combination of these three activities.

PROGRAMS AT PARTICIPATING UNIVERSITIES

A fellowship appointment is contingent upon acceptance into an education program at a DHS-approved university. Universities selected to participate in the program have demonstrated a commitment to building a sustainable academic program in key disciplines relevant to nuclear forensics. The list of participating universities and university fellowship coordinators is provided on page seven of this booklet. Interested applicants may contact these fellowship coordinators directly for detailed information related to the university's nuclear forensics program.

PRACTICUM

Each fellow is required to complete two 10-week practicums at a Department of Energy (DOE) national laboratory, a Department of Defense (DoD) laboratory, or a federal agency conducting research related to technical nuclear forensics. Fellows typically complete their practicums during the summer and any practicum may be used to support the Fellow's thesis research. Designated practicum locations and coordinators can be found on page nine of this booklet.

Upon acceptance of a practicum appointment at a DOE/DoD laboratory or a federal agency, fellows may be required to obtain a security clearance.

TERMS OF APPOINTMENT INCLUDING REQUIRED POST-GRADUATE EMPLOYMENT

NFGFP appointments are part of the National Nuclear Forensics Expertise Development Program, which is codified in the *Nuclear Forensics and Attribution Act* (P.L. 111-140). Fellows must agree to specific terms of appointment in accordance with this law. Recipients of the fellowship must complete their academic programs with a consistently high level of academic standing, and upon graduation must serve for two years in a post-doctoral or other staff position at a DOE national laboratory, a DoD laboratory, or a federal agency in a technical nuclear forensics-related specialty. The program sponsors will work closely with MUSC, DOE/DoD laboratory staff, federal agency personnel, and the fellows throughout their appointments to foster strong professional connections. These connections will be further strengthened during the fellows' two summer practicums at DOE/DoD laboratory facilities. It is also important to note that DHS funds post-doctoral laboratory fellowships for which graduating NFGFP participants are eligible to apply. The program sponsors work with the host organizations to ensure that salaries extended to post-graduates are commensurate with salaries offered in similar positions at that organization. Should an NFGFP participant choose not to comply with these terms of appointment, the total amount of the fellowship must be repaid to the U.S. Government, including interest at the prevailing rate current for graduate student loans at the time the fellowship was awarded (this rate is set at 5.41 percent through June 30, 2014). Applicants may request the full terms and conditions of this agreement by contacting the MUSC Office of Special Programs at (843) 792-0832 or nhuchet@scuref.org. These terms will be included for review and signature in successful applicants' official letters of appointment.

ANNUAL FELLOWSHIP RENEWAL

It is the responsibility of the award recipient to submit a completed application of renewal to the MUSC Office of Special Programs by February 1st of each year. For renewal consideration, participants should demonstrate superior academic performance and the continuation of an academic program of study and research consistent with the objectives of the fellowship program, as identified in the NFGFP Description. Fellows who have finished the program are required to complete annual questionnaires for MUSC to enable the federal sponsors to continually assess and evaluate the program.

All awards and renewals are subject to the continuing availability of funding.

FELLOWSHIP BENEFITS

TUITION AND FEES

During the appointment, MUSC is responsible for the payment of tuition and fees directly to the participating university. Optional, refundable, and penalty fees (such as late registration and duplication fees) are not payable by MUSC. MUSC pays health insurance fees only if they are required for all graduate students. Tuition and enrollment fees for the graduate program must be consistent with those made to regular graduate students. In August of each year, MUSC sends a notification letter to the university's bursar describing the procedures for invoicing tuition and fees on behalf of the fellow.

STIPENDS

In addition to tuition, fellows receive a monthly stipend of $2,400 throughout the duration of their appointment. Fellows will also receive a Dislocation Allowance of $500 (prorated) while on a practicum assignment. MUSC will either deposit stipends directly into the fellow's bank account or mail monthly stipends to the fellow.

While participating in the NFGFP, the fellow may accept other awards, prizes, and similar payments (including veteran's benefits) that do not require a product or service. If a fellow accepts another award, such as a research assistantship or other responsibilities in which funds are provided and the fellow is required to spend time on the project, MUSC must be informed in advance and funds may be deducted from the fellow's stipend. In addition, MUSC reserves the right to withdraw the fellowship if the fellow receives compensation without notifying MUSC as to the nature and extent of this payment.

TRAVEL

Travel expenses are approved by MUSC and DHS prior to actual travel and are based on U.S. General Services Administration accepted rates. In general, travel reimbursements are considered for seminars, conferences, and workshops associated with this program or any meeting for which the DHS Program Office requests attendance. Travel in excess of 50 miles to and from the approved practicum location will be reimbursed, in addition to the Dislocation Allowance provided during the practicum assignment. Travel expenses are also allowable on occasions requiring the fellow to consult with the university graduate committee and/or deliver a presentation of thesis/dissertation research.

THESIS RESEARCH AT PARTICIPATING LABORATORY FACILITIES

A fellow may request to work full or part-time on thesis/dissertation research at one of the participating DHS-approved facilities (see page nine of this booklet). Off-campus research requires that the fellow complete a request form (available from MUSC) and have it endorsed by the faculty advisor, university coordinator, and facility coordinator. Throughout the research assignment, the faculty advisor must agree to supervise the fellow's progress and coordinate activities with facility personnel, and the advisor may also take a trip to the facility to review the fellow's research. In addition, a research advisor assigned by the facility will mentor the

fellow and serve on the fellow's graduate thesis research committee, if approved by the university. Travel expenses are reimbursable in accordance with MUSC's Travel Policy.

EVALUATION OF APPLICATIONS

As the Program Administrator, MUSC ensures that each application package provides the requested information and materials. It is the applicant's responsibility to ensure that his or her application is complete. After the application deadline, MUSC will distribute the 2014-2015 NFGFP applications to an independent panel for review. Panel members are technical experts from national laboratories who are intimately involved in the DHS nuclear forensics program.

Applications are evaluated based on academic performance, relevant coursework, GRE scores, career and goals statements, and references. Other factors, including geographical criteria and specific DHS mission needs, are also considered. The number of fellowships awarded annually is contingent on the number of fellows graduating from the program and the availability of funds.

The panel of experts reviews each application and provides award recommendations to the Program Administrator. MUSC submits the panel's recommendations to the program sponsor for consideration. DHS conducts a final review of the applications and the panel's recommendations and selects the official NFGFP award recipients. MUSC will announce award recipients and notify all applicants in April 2014. Applicants not selected may receive "Honorable Mention" status in recognition of their achievements. Should additional funding become available, those receiving an Honorable Mention may qualify as award recipients.

MUSC is responsible for the daily administration of the NFGFP on behalf of the program sponsor; as such, MUSC assists fellows and universities with questions regarding stipends, payment of tuition and fees, practicum assignments, travel, and related issues.

NATIONAL NUCLEAR FORENSICS EXPERTISE DEVELOPMENT PROGRAM
NUCLEAR FORENSICS GRADUATE FELLOWSHIP PROGRAM (NFGFP)
PARTICIPATING UNIVERSITIES

Clemson University Timothy DeVol, Ph.D. Environmental Engineering and Earth Sciences 342 Computer Court Anderson, SC 29625-6510 864-656-1014 Tim.Devol@ces.clemson.edu	**Colorado State University** Thomas Johnson, Ph.D. Department of Environmental and Radiological Health Sciences 1681 Campus Delivery Fort Collins, Co 80523 970-491-0563 Tj@colostate.edu
Georgia Institute of Technology Franklin DuBose, Ph.D. Nuclear and Radiological Engineering and Medical Physics School of Mechanical Engineering Atlanta, GA 30332-0405 404-894-3606 franklin.dubose@me.gatech.edu	**Missouri University of Science and Technology** Carlos H. Castano, Ph.D. Nuclear Engineering Program 1870 Miner Circle Rolla, MO 65409 573-341-6766 castanoc@mst.edu
North Carolina State University Robin Gardner, Ph.D. Nuclear Engineering Department PO Box 7909 Raleigh, NC 27695-7909 919-515-3378 gardner@ncsu.edu	**Ohio State University** Lei "Raymond" Cao Department of Mechanical and Aerospace Engineering Nuclear Engineering Program E402, 201 W 19th Avenue Columbus, OH 43210-1142 614-247-8701 cao.152@osu.edu
Oregon State University Alena Paulenova, Ph.D. Nuclear Engineering & Radiation Health Physics 3451 SW Jefferson Way Corvallis, OR 97331 541-737-7070 alena.paulenova@oregonstate.edu	**Pennsylvania State University** Kenan Unlu, Ph.D. Radiation Science and Engineering Center 101 Breazeale Nuclear Reactor University Park, PA 16802 814-865-6351 k-unlu@psu.edu
Texas A&M University William S. Charlton, Ph.D. Nuclear Engineering Department 3473 TAMU College Station, TX 77843-3473 979-845-7092 wcharlton@tamu.edu	**Washington State University** Sue Clark, Ph.D. Department of Chemistry Fulmer 202B Pullman, WA 99164 509-335-1411 s_clark@wsu.edu
University of California, Berkeley Eric Norman, Ph.D. Department of Nuclear Engineering 4109 Etcheverry Hall, MC 1730 Berkeley, CA 94720-1730 510-643-9984 ebnorman@lbl.gov	**University of Cincinnati** Henry B. Spitz, Ph.D. Nuclear and Radiological Engineering Program College of Engineering and Applied Sciences 598 Rhodes Hall Cincinnati, OH 45221-0072 513-556-2003 Henry.spitz@uc.edu

University of Illinois at Urbana-Champaign Jim Stubbins, Ph.D. Department of Nuclear, Plasma, and Radiological Engineering 216 Talbot Laboratory, M/C 234 104 S. Wright Street Urbana, IL 61801 217-333-6474 jstubbin@illinois.edu	**University of Iowa** Michael Schultz, Ph.D. Departments of Radiology and Chemistry ML B180 FRRB 500 Newton Road Iowa City, IA 52246 319-335-8017 Michael-schultz@uiowa.edu
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University of Utah Tatjana Jevremovic, Ph.D. Nuclear Engineering Program 2298 MEB 50 South Central Campus Drive Salt Lake City, UT 84112 801-587-9696 Tatjana.jevremovic@utah.edu	**University of Wisconsin** Jake Blanchard, Ph.D. Engineering Physics Department Nuclear Engineering Program 1500 Engineering Drive Madison, WI 53706 608-263-0391 Blanchard@engr.wisc.edu

PARTICIPATING PRACTICUM CENTERS AND CENTER COORDINATORS

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PACIFIC NORTHWEST NATIONAL LABORATORY Jon Schwantes Pacific Northwest National Laboratory 902 Battelle Boulevard PO Box 999, MSIN J4-65 Richland, WA 99352 509-375-7378 Jon.schwantes@pnl.gov http://www.pnnl.gov	**SANDIA NATIONAL LABORATORIES** Jeffrey B. Martin Sandia National Laboratories Department 5734 P.O. Box 5800, MS 5734 Albuquerque, NM 87185-0406 505-844-0028 jbmart@sandia.gov www.sandia.gov
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