

**Opportunity Title:** 3D-Printing Shape Memory Ceramics  
**Opportunity Reference Code:** ORNL-HBCU-MEI-2019-0001

**Organization** Oak Ridge National Laboratory (ORNL)

**Reference Code** ORNL-HBCU-MEI-2019-0001

**How to Apply** All documents must be submitted via Zintellect. All application components **must** be completed and received in the system in order to be considered.

**Application deadline** January 11, 2019 at 11:59 pm EST.

For questions, please contact [HBCUMEI@ornl.gov](mailto:HBCUMEI@ornl.gov).

**Application Deadline** 1/14/2019 11:59:00 PM Eastern Time Zone

**Description** ORNL is the largest science and energy laboratory in the Department of Energy system. Areas of research include materials, neutron sciences, energy, high-performance computing, systems biology and national security. Visit <http://www.youtube.com/watch?v=NSCdUJ8cavw> to discover some exciting reasons why ORNL offers a great internship experience!

**Benefits:**

- Selected faculty spend 10 weeks (Summer Term) at Oak Ridge National Laboratory (ORNL) engaged in a research project under the guidance of a laboratory scientist.
- Faculty members build collaborative relationships with ORNL research scientists, become familiar with ORNL sponsored research programs, scientific user facilities, and potential funding opportunities.
- ORNL may provide laboratory tours, scientific lectures and seminars, workshops on accessing ORNL scientific user facilities.
- Host laboratories provide all required site specific training.

**Project:**

This project explores Shape Memory Ceramics (SMCs) for high temperature transformation applications. A multi-scale modeling approach involving first-principles and phase-field simulations will be used to design the SMC such that its functionality with respect to the desired shape memory effect (SME) in the operating temperature range and stability are optimized. The microstructural changes associated with the two-way SME in the designed SMC will be investigated using in-situ neutron diffraction studies as well as with other characterization techniques. The ability to 3D-print the designed SMC will be demonstrated using the binder jet approach and compared to traditional manufacturing approaches such as tape and gel casting. This project can benefit from a number of skillsets: Ceramics synthesis experience; laboratory skills such as SEM, profilometry, etc.; 3D-printing experience, first-principles and phase field numerical modeling.

**Faculty Mentor/Point of Contact (email address):** Patrick Geoghegan ([geogheganpj@ornl.gov](mailto:geogheganpj@ornl.gov))

**Qualifications** Applicant must be a faculty member at a HBCU/MEI at the time of application.



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- Eligibility Requirements**
- **Citizenship:** LPR or U.S. Citizen
  - **Degree:** Any degree .
  - **Discipline(s):**
    - **Chemistry and Materials Sciences** ([12](#) )
    - **Computer, Information, and Data Sciences** ([16](#) )
    - **Earth and Geosciences** ([21](#) )
    - **Engineering** ([27](#) )
    - **Environmental and Marine Sciences** ([14](#) )
    - **Life Health and Medical Sciences** ([45](#) )
    - **Mathematics and Statistics** ([10](#) )
    - **Physics** ([16](#) )
    - **Science & Engineering-related** ([1](#) )

**Affirmation** I am a faculty member at one of the nationally recognized HBCU or MEI institutions. I can provide certification of my faculty position, if requested.