



**NATIONAL SCIENCE FOUNDATION  
4201 WILSON BOULEVARD  
ARLINGTON, VIRGINIA 22230**

**NSF 16-008**

## **Dear Colleague Letter: Request for Information (RFI) on Science Drivers Requiring Capable Exascale High Performance Computing**

---

October 13, 2015

Dear Colleague:

The White House Executive Order issued on July 29, 2015 established the National Strategic Computing Initiative (NSCI) as a whole-of-government effort designed to create a cohesive, multi-agency strategic vision and federal investment strategy, executed in collaboration with industry and academia, to maximize the benefits of High Performance Computing (HPC) for the United States. The National Science Foundation (NSF), Department of Energy (DOE), and Department of Defense (DOD) are the lead agencies for this effort to support a significantly advanced HPC ecosystem within the next decade.

Pursuant to the goals of the NSCI, NSF, DOE and the National Institutes of Health (NIH) have jointly issued a Request for Information (RFI) to identify scientific research topics and applications that need HPC capabilities that extend 100 times beyond today's performance on scientific applications. The RFI can be accessed using the following link on the NIH website: <http://grants.nih.gov/grants/guide/notice-files/NOT-GM-15-122.html>.

Currently, computational modeling and simulation, as well as data assimilation and data analytics are used by an increasing number of researchers to answer more complex multi-spatial, multiphysics scientific questions with more realism. As the scientific discovery horizon expands and as advances in high performance computing become central to scientific workflows, sustained petascale application performance will be insufficient to meet these needs. In addition, HPC is expanding from traditional numerically oriented computation to also include large-scale analytics (e.g., for Bayesian approaches in model refinement, large-scale image analysis, machine learning, decision support, and quantifying uncertainty in multimodal and multi-spatial analyses). Architectures and technologies used for modeling and simulation currently differ from those used for data integration and analytics, but are increasingly converging. The extreme computing ecosystem must therefore accommodate this broad spectrum of growing data science activities.

NSF encourages the research communities supported by NSF to respond to the RFI referenced above. Of particular interest are responses in disciplines and research areas that would require a 100-fold increase over today's application performance for (1) large-scale numerically intense analysis such as, but not limited to, simulations of nuclear physics, biomolecular physics, weather and climate modeling, and materials science; and/or (2) deriving fundamental understanding from large-scale data science, such as image analysis, data assimilation, visualization and data analytics. The received responses will be used to assist NSF to plan its investments in an advanced HPC ecosystem required to support future scientific research, and to inform the research, engineering and development process of this advanced HPC ecosystem.

## SUBMISSION PROCESS

---

NIH has agreed to coordinate the collection of submissions in response to the RFI on behalf of the participating agencies. To submit a response, please use the following link to the Request for Information on the NIH website, <http://grants.nih.gov/grants/guide/notice-files/NOT-GM-15-122.html>, and follow the submission instructions in the RFI. **As noted in the RFI, all responses must be submitted to [NIGMS\\_exascale@nigms.nih.gov](mailto:NIGMS_exascale@nigms.nih.gov) by November 13, 2015\***.

NIH has agreed to forward *all* submissions it receives to NSF and DOE. *It is thus neither necessary nor encouraged to send a copy of the submission directly to NSF.*

For questions about this Dear Colleague Letter and NSF's interests pursuant to the RFI, please contact William L. Miller, Science Advisor, Division of Advanced Cyberinfrastructure, NSF, at [wlmiller@nsf.gov](mailto:wlmiller@nsf.gov), 703-292-7886.

Sincerely,

James Kurose  
Assistant Director  
Directorate for Computer and Information Science and Engineering  
National Science Foundation

\* N.B. The deadline was extended from the original date of October 16, 2015 (see <http://grants.nih.gov/grants/guide/notice-files/NOT-GM-15-123.html>).