



U.S. Department of Energy
and the
National Science Foundation



October 29, 2018

Professor David Hertzog
Chair
DOE/NSF Nuclear Science Advisory Committee
Department of Physics
University of Washington
Seattle, Washington 98195

Dear Professor Hertzog:

This letter requests that the Department of Energy (DOE)/National Science Foundation (NSF) Nuclear Science Advisory Committee (NSAC) conduct a study to identify unique opportunities for U.S. nuclear physics research to contribute to advances in Quantum Computing and Quantum Information Science (QIS). In carrying out this study, NSAC should provide information assessing the relative importance and potential benefits of QIS to nuclear physics and the potential contributions that nuclear physics can make to QIS.

QIS research is playing an increasingly central role in the vision for the future of U.S. science and technology. Emerging QIS priority areas provide promising new avenues for addressing challenges of enormous complexity, including, for example dramatic extensions of the application of Quantum Field Theory to the analysis of physical systems at scale with heretofore intractably large numbers of degrees of freedom that cannot be addressed by conventional computing. In another area of rapid development, quantum entanglement in multi-particle states is opening new horizons in quantum sensing, quantum communication, quantum computing, and quantum simulations.

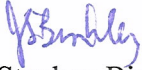
Decades of accumulated intellectual capital, extensive experience in interdisciplinary research, considerable technical infrastructure at labs and universities, and a long history of international leadership in collaborative research have positioned the DOE Office of Nuclear Physics and the NSF nuclear physics research programs to engage in QIS relevant research. However, QIS is newly emergent as a priority area for Research & Development (R&D) investment in nuclear science. Furthermore, private sector R&D investment in QIS, as well as investment by other Federal agencies, has been ongoing for some time. NSAC is therefore requested, in the context of Federal and private sector research efforts already underway, to articulate the unique role nuclear science research, aligned with the DOE and NSF nuclear physics programs, can and should play in Quantum Information Science. While unique, this role should nevertheless align broadly with the goals outlined in the national strategy for QIS¹.

¹ <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Strategic-Overview-for-Quantum-Information-Science.pdf>

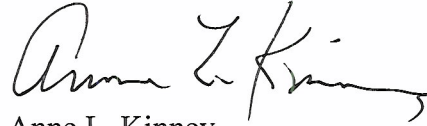


Please submit your report to DOE and NSF by summer of 2019. The agencies very much appreciate NSAC's willingness to undertake this task and anticipate that the information provided in this report will be important in guiding DOE and NSF nuclear physics investments in this newly emergent area for Federal R&D.

Sincerely,



J. Stephen Binkley
Deputy Director for Science Programs
Office of Science



Anne L. Kinney
Assistant Director, Directorate for
Mathematical and Physical Sciences
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