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Research domain(s), discipline(s)/sub-discipline(s)

New phenomena in condensed matter physics, especially spintronics, superconductivity, spin caloritronics

Title of Response

Discovery of new phenomena depends less on data-intensive research

Abstract

Data-intensive research does not play significant roles in the discovery of new phenomena in spintronics, spin triplet superconductors, and spin caloritronics,

Question 1 (maximum 400 words) – Data-Intensive Research Question(s) and Challenge(s). Describe current or emerging data-intensive/data-driven S&E research challenge(s), providing context in terms of recent research activities and standing questions in the field. NSF is particularly interested in cross-disciplinary challenges that will drive requirements for cross-disciplinary and disciplinary-agnostic data-related CI.

Discovery of new phenomena in condensed matter physics, in our case spintronics, spin triplet superconductivity, and spin caloritronics, does not rely significantly on data-intensive research. Instead, it is primarily driven and inspired by other related phenomena or new theoretical suggestions.

Question 2 (maximum 600 words) – Data-Oriented CI Needed to Address the Research Question(s) and Challenge(s). Considering the end-to-end scientific data-to-discovery (workflow) challenges, describe any limitations or absence of existing data-related CI capabilities and services, and/or specific technical and capacity advancements needed in data-related and other CI (e.g., advanced computing, data services, software infrastructure, applications, networking, cybersecurity) that must be addressed to accomplish the research question(s) and challenge(s) identified in Question 1. If possible, please also consider the required end-to-end structural, functional and performance characteristics for such CI services and capabilities. For instance, how can they respond to high levels of data heterogeneity, data integration and interoperability? To what degree can/should they be cross-disciplinary and domain-agnostic? What is required to promote ease of data discovery, publishing and access and delivery?

In our research, we do not rely CI for advancing research.

Question 3 (maximum 300 words) – Other considerations. Please discuss any other relevant aspects, such as organization, processes, learning and workforce development, access and sustainability, that need to be addressed; or any other issues more generally that NSF should consider.

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