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$1,000,000
June 2019

The kilometer-

topological fluids of light (TFL). Their investigation is a tightly integrated program of computational simulation and experimental measurement to discover and exploit two-body, few-body, and condensed matter dynamics of vortices. In particular, the team seeks to characterize the interaction physics of vortices in a quantum fluid, to diagram the emergent phases of TFL, and to produce vortex structures that exhibit non-abelian anyon behavior needed for topological quantum computing. Topological fluids of light provide exciting new opportunities for exploring and exploiting phenomena that are either difficult to capture or as yet have no counterpart in macroscopic quantum states, a new frontier in topological physics with the potential to enable room-temperature quantum science and computation.

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June 2019

Singlet fission (SF) is a process wherein a molecule in a photoexcited spin-singlet state transfers half of its energy to a neighbor, placing both in an excited spin-triplet state. As SF uniquely excites 2 electrons from a single photon, it has the potential to break barriers that presently limit the efficiency of light harvesting technologies. While the possible utility of SF has been recognized for nearly 40 years, semiconductor devices that leverage SF have not emerged. At the core of this problem is designing effecti

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