Spin-photon interfaces for quantum computing and quantum communication

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Non-classical states of light, such as single photons and entangled photon states, are essential for novel quantum technologies, including photonic quantum computing, quantum communications and key distribution, and the quantum internet. Large two-dimensional highly entangled ‘cluster’ states of photons are a class of so-called graph states which constitute a universal resource for quantum computing. Photons also carry information between nodes in a network, and photonic graph states can be used for such quantum networks. A crucial question is therefore how these states can be created efficiently. I will present our work focusing on the deterministic generation of photonic graph states from spinful quantum emitters such as semiconductor quantum dots and color centers for quantum computing and quantum networks.

Bio – Sophia Economou is a researcher at the interface of quantum information science, condensed matter physics and quantum optics. She is an associate professor in the Department of Physics at Virginia Tech since 2015. Prior to that she was a staff Research Physicist at the Naval Research Lab (2009-2015). She earned her PhD from the University of California, San Diego in 2006. Her research focuses on understanding and designing ‘quantum hardware’ for future quantum technologies. Her interests include quantum computing and communication, spin qubits, nanophotonics, superconducting qubits, quantum control and decoherence.