**Idaho State University  
Physics Colloquium**

***Room Temperature Superconductivity in a Carbonaceous Sulfur Hydride***  
  
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One of the long-standing challenges in experimental physics is the observation of room-temperature superconductivity. Recently, high-temperature conventional superconductivity in hydrogen-rich materials has been reported in several systems under high pressure. An  important discovery leading to room-temperature superconductivity is the pressure-driven disproportionation of hydrogen sulfide (H2S) to H3S, with a confirmed transition temperature of 203 kelvin at a very extreme pressure of 155 gigapascals. By introducing methane at low pressures into the H2S + H2 precursor mixture for H3S, molecular exchange is allowed within a large assemblage of van der Waals solids that are hydrogen-rich with H2 inclusions; these guest–host structures become the building blocks of superconducting compounds at extreme conditions. I will present our recent observation of superconductivity in a photochemically transformed carbonaceous sulfur hydride system, starting from elemental precursors, with a maximum superconducting transition temperature of 287.7 ± 1.2 kelvin achieved at 267 ± 10 gigapascals. I will also highlight pathways for reducing the pressure to create these remarkable quantum materials, along with a projection of future technology.

**Monday, February 8 2021**  
**Via Zoom(**[**https://isu.zoom.us/j/85099625908**](https://isu.zoom.us/j/85099625908)**)  
4:00 – 4:50 pm**