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Social Stars: Modeling the Interactive Lives of Stars in Dense Clusters

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This talk discusses computational modeling of phases of dramatic interaction that intersperse stellar lifetimes. In galactic centers stars trace dangerously wandering orbits dictated by the combined gravitational force of a central, supermassive black hole and all of the surrounding stars. During this talk, I will describe how stellar dynamics intertwines with stellar evolution and hydrodynamics to determine the properties of interactions between stars and black holes in galactic centers. These interactions can partially or completely disrupt stars through tidal forces, and they can fuel accretion-driven flares of the black hole. Disruptions of stars across the evolutionary spectrum give rise to transients with different characteristic timescales, luminosities, and wavelengths. I will focus on how the properties of these transients can reveal the demographics of black holes and the stellar populations that surround them.