Speaker: Tony Varily

Title: Failure of the Hasse principle on general $K3$ surfaces

Abstract: Transcendental elements of the Brauer group of an algebraic variety, i.e., Brauer classes that remain nontrivial after extending the ground field to an algebraic closure, are quite mysterious from an arithmetic point of view. These classes do not arise for curves or surfaces of negative Kodaira dimension. In 1996, Harari constructed the a 3-fold with a transcendental Brauer-Manin obstruction to the Hasse principle. Until recently, his example was the only one of its kind. We show that transcendental elements of the Brauer group of an algebraic surface can obstruct the Hasse principle. We construct a general $K3$ surface X of degree 2 over$\mathbb{Q}$, together with a two-torsion Brauer class α that is unramified at every finite prime, but ramifies at real points of X. Motivated by Hodge theory, the pair (X, α) is constructed from a double cover of $P_2 \times P_2$ ramified over a hypersurface of bi-degree (2, 2). This is joint work with Brendan Hassett.