

---

**STEFAN MENDEZ-DIEZ**, University of Alberta  
*K-theoretic Aspects of String Theory Dualities*

String theory is a physical field theory in which point particles are replaced by 1-manifolds propagating in time called strings. The 2-manifold representing the time evolution of a string is called the string worldsheet. Strings can be either closed (meaning their worldsheets are closed surfaces) or open (meaning their world sheets have boundary). A  $D$ -brane is a submanifold of the spacetime manifold on which string endpoints are constrained to lie. There are five different string theories that have supersymmetry and they are all related by various dualities. This talk will review how  $D$ -branes are classified by  $K$ -theory. We will then explore the  $K$ -theoretic aspects of a hypothesized duality between the type I theory compactified on  $\mathbb{T}^4$  and the type IIA theory compactified on a  $K3$  surface by looking at a certain blow-down of the singular limit of  $K3$ . We will see that classifying  $D$ -branes on the type II orientifold  $\mathbb{T}^n/\mathbb{Z}_2$  when the  $\mathbb{Z}_2$  action is multiplication by  $-1$  using equivariant  $K$ -theory provides added information about the ordinary  $K$ -theory of the blow-down of the singular limit of  $K3$ . We will discuss how combining features from a smooth  $K3$  and its orbifold limit,  $\mathbb{T}^4/\mathbb{Z}_2$ , seems largely to resolve the apparent problems with the theory that arise when only considering a smooth  $K3$  surface.