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K-theoretic matrix theory and D-branes

Friday, December 5, 2025 10:20 AM (1 hour)

We study matrix theories constructed from non-BPS D-particle/D-instanton systems in type IIA/B string theory. In addition to the matrices describing the positions of the D-particles or D-instantons, these theories contain a tachyonic matrix, which plays a central role. The main claims of this talk are as follows:
1) Any D-brane configuration can, in principle, be realized within these matrix theories.
2) Such D-brane configurations are classified by K-homology, in a manner consistent with the K-theory classification of D-brane charges.
3) The effective actions of the resulting D-branes can be derived using the boundary-state formalism.
4) As an application, the Atiyah–Singer index theorem can be obtained through physical considerations.
This talk is an invited review of a series of works carried out in collaboration with T. Asakawa and S. Terashima during the period 2001–2003.

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