Research Achivement

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My research interest is non-supersymmetric string theories. I considered what kind of top-down approaches are possible under the assumption that supersymmetry is broken at very high energy scale. In particular, I focused on the question of whether it is posssible to realize very small cosmological constant without supersymmetry, and if so, whether the moduli can be stabilized under such conditions.

- **Cosmological constant and moduli stability**

  It is known that in string models in which supersymmetry is broken by the Schark-Schwarz mechanism, the cosmological constant can be exponentially suppressed if the Bose-Fermi degeneracy is realized only in the massless level. In a series of our studies([1,3,4] in the publication list), I investigated whether such a special condition is realizable or not in the heterotic models, and found some points in the moduli space that satisfy the condition. I also analyzed the stability of the moduli and clarified that the points with suppression of the cosmological constant correspond to saddle points of the potential.

- **T-duality of non-supersymmetric strings**

  It is known that the gauge symmetry is enhanced at extrema of the potential, and such points correspond to fixed points under T-duality transformations. In [6] in the publication list, I investigated the structure of T-duality in the models constructed by using the Schark-Schwarz mechanism, and found that T-duality transformations in non-supersymmetric models are restricted to congruent subgroups of the T-duality group of supersymmetric ones.

- **Non-supersymmetric string model with reduced rank**

  The models studied so far are constructed by starting from a maximally supersymmetric model in which the rank of a gauge group is $16+2d$ and breaking the supersymmetry by the Schark-Schwarz mechanism. In [8] in the publication list, I constructed non-supersymmetric models whose rank is reduced to $8+2d$ by starting from so-called CHL string model which has maximal supersymmetry and reduced rank, and showed that the gauge symmetry can be enhanced to non-simply-laced group. I also studied the cosmological constant and the moduli stability in such models.