Research Results

1. Yang-Baxter deformation

The discovery of the integrable structure in the AdS/CFT correspondence has enabled us to verify the correspondence even at a finite t'Hooft coupling λ. As a next step, generalizations to integrable systems with less supersymmetry or non-conformal symmetry have been considered. One of the approaches is to use the Yang-Baxter (YB) deformation. The method is a systematic method which describes integrable deformations of two-dimensional non-linear sigma models.

I have considered the class of homogeneous YB deformations of the $AdS_5 \times S^5$ superstring. I have attempted to understand (i) the homogeneous YB deformations themselves, (ii) spacetime structures and (iii) the gauge duals of the deformed backgrounds.

(i) We have demonstrated that homogeneous YB deformations can be regarded as generalized T-duality transformations in a series of works [2,5,7,9,10](see the publication list for the numbers). Moreover, we have reformulated in the Double Field Theory(DFT) [7] which is a framework with manifest T-duality covariance. One of the advantages of the reformulation is that we can apply "YB deformations" to almost all backgrounds.

(ii) The DFT enables us to discuss non-geometric backgrounds, so called T-fold, whose the structure group contains T-duality transformations. Thank to the results obtained in (i), we could clarified that some of the YB deformed backgrounds are T-folds [3].

(iii) In [4,6,8], we have introduced an open string picture of YB deformed backgrounds and proposed a way to read off the non-commutative structure of the dual gauge theories.

2. Generalized supergravity

A recent important progress of string theory is the discovery of generalized supergravity theory. A remarkable fact is that the equations of motion of this theory can be reproduced from the requirement of the κ-symmetry in the Green-Schwarz formulation. The result ensures the classical consistency of the superstring on generalized supergravity backgrounds. However, the quantum consistency of string theories defined on such backgrounds is not clear.

An important observation in [7] is that generalized supergravity can be reproduced from the DFT. Moreover, from this result, we could construct a possible counterterm to cancel the Weyl anomaly of string theory in generalized supergravity backgrounds[1,7]. In this sense, the usual supergravity backgrounds and the generalized supergravity backgrounds can be treated on an equal footing in string theory.