Results of research

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We construct a new infinite family of quiver gauge theories which blow down to the $X^{p,q}$ quiver gauge theories. This family includes a quiver gauge theory for the third del Pezzo surface. These theories generically have irrational R-charges ([17] of Publication List).

The κ-symmetry-fixed Green-Schwarz action in the $AdS_5 \times S^5$ background is treated canonically in a version of the light-cone gauge ([18]). The action is written in terms of the phase space variables. We convert it into the standard action written in terms of the fields and their derivatives. We obtain a Nambu-Goto type action which has the correct flat space limit ([23]).

We explicitly calculate the Riemannian curvature of D-dimensional metrics recently discussed by Chen, Lü and Pope. We find that they can be concisely written by using a single function. It is shown that the metrics are of type D ([19]).

Assuming the existence of a single rank-2 closed conformal Killing-Yano tensor with a certain symmetry we show that there exist mutually commuting rank-2 Killing tensors and Killing vectors. We also discuss the condition of separation of variables for the geodesic Hamilton-Jacobi equations ([20]).

We classify all spacetimes with a closed rank-2 conformal Killing-Yano (CKY) tensor. It is shown that the D-dimensional Kerr-NUT-de Sitter spacetime constructed by Chen-Lü-Pope is the only spacetime admitting a non-degenerate closed CKY tensor ([21]). For spacetimes with general closed CKY tensor, they give a generalization of Kerr-NUT-de Sitter (KNdS) spacetimes. The metric of the generalized KNdS spacetime is a metric of the fiber space whose base spaces are several Kähler spaces and at most one general space, and its fiber is the KNdS space ([24, 25]).

It is shown that the Dirac equations in general higher dimensional Kerr-NUT-de Sitter spacetimes are separated into ordinary differential equations ([22]).

In the generalized Kerr-NUT-de Sitter spacetime, it is shown that certain type of tensor perturbation admits separation of variables and the linearlized Einstein equation (the Lichnerowicz equation) turns into ordinary differential equations ([26]).

We consider β-deformation of the quiver matrix models in the light of the recent progress on 2d-4d connection of conformal field theories, in particular, the Alday-Gaiotto-Tachikawa (AGT) conjecture. A quantum spectral curve is introduced in the case of SU(n) quiver matrix model. Residue analysis is provided both for the curve of the SU(3) matrix model with the " multi-log " potential and for the Seiberg-Witten curve in the case of SU(3) with six flavors, leading to the matching of the mass parameters ([27]).