

Report

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The purpose of my visit to NORDITA was to participate in the program “Exact Results in Gauge-String Dualities”, which gathered together many scientists working on the interplay between integrability, gauge and string theories, and in particular to discuss with Konstantin Zarembo how integrability can be applied to the problem of string compactifications with $N = 2$ supersymmetry.

The main problem in this context is to find the full non-perturbative low energy effective action characterizing the compactified theory. Besides the gravitational part, this action has two sectors described by vector and hypermultiplets, respectively. Whereas in type II string theory the former is classically exact and well understood, the latter receives various instanton corrections and its exact description is still unknown.

During my stay in NORDITA the research devoted to this problem got a new twist. The point is that the $N = 2$ string compactifications appear not only in type IIA and type IIB string theories on a Calabi-yau manifold, which can be related by mirror symmetry, but also in heterotic string theories on $K3 \times T^2$. All the resulting low energy theories are related by dualities and therefore any results can in principle be transferred from one to another. The heterotic string compactifications have an advantage that their hypermultiplet sector receives only α' -corrections, but not g_s -corrections and in this respect it is similar to the vector multiplet sector in type II strings. This fact allows to hope that the problem of the full non-perturbative description of the hypermultiplets is easy to address on the heterotic side.

However, our knowledge of the α' -corrections to the heterotic hypermultiplets is very limited up to now. Therefore, first of all, we addressed the problem of how the results on quantum corrections already obtained on the type II side are mapped by the type II/heterotic string duality. In particular, we established how the dictionary between the physical fields of the two descriptions is affected by the one-loop correction. Moreover, we showed how the type II D-brane and NS5-brane instanton corrections are mapped to the heterotic worldsheet instantons.

These results do not seem to be sufficient yet for a publication. Nevertheless, completing the research along the developed directions will certainly result in a publishable work. Therefore, we are going to continue this research and consider a possibility for exchange visits in the future. In particular, there is already a planned visit of Konstantin Zarembo to Montpellier in the beginning of March.

Finally, it is worth to notice that I used the visit as an opportunity to give a talk on the above topics at the conference “Common trends in Gauge fields, Strings and Integrable models” which was a part of the program “Exact Results in Gauge-String Dualities”.