Laudatio of Vasily Pestun

Luc Vinet

Dear colleagues and distinguished guests,

The Hermann Weyl Prize was established by the Standing Committee of the International Colloquium on Group Theoretical Methods in Physics in 2002 and is awarded every two years to recognize young scientists who have performed original work of significant scientific quality in the area of understanding physics through symmetries. To be eligible for the Weyl Prize, the candidate should be either under thirty-five years of age, or be within five years of having received the doctoral degree, at the time of the deadline of the application.

This year the members of the selection committee were:

- Edward Frenkel, UC Berkeley (Chair)
- Gitta Kutyniok, Berlin
- Neli Stoilova, Sofia
- Francesco Toppan, Rio de Janeiro
- Luc Vinet, Montreal

The Chair of our committee could not be here today and has asked me to introduce the 2016 winner of the prize which I am delighted to do.

It should first be said that the committee had a rather difficult task since there was a number of outstanding nominees that were all deserving to receive the prize. It is thus quite telling that in the end the members of the committee unanimously agreed to choose Vasily Pestun as the winner.

Vasily Pestun is currently a permanent professor at the IHS in Paris. Prior to this appointment he obtained his PhD in Physics from Princeton University under the supervision of Edward Witten; he has been a Junior Fellow at Harvard University and a member of the Institute for Advanced Study in Princeton. He has also received many awards including an ERC starting grant.

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Vasily Pestun is without doubt a leading mathematical physicist. His field of research is quantum field theory, its symmetries, and the use of symmetries in finding exact solutions of quantum field theory.

The groundbreaking result of Vasily Pestun is the computation of partition function of $N=4$ super-Yang-Mills theory on the four dimensional sphere. By an ingenious use of supersymmetric localization, he showed that this partition function, as well as the expectation values of the great circle supersymmetric Wilson loop, can be cast in the form of the correlation function of a two dimensional conformal field theory. This result led to tremendous activity in the field of BPS/CFT correspondence, with major discoveries in both two dimensional and four dimensional quantum field theories.

Let me now quote from the letter of recommendation of Nikita Nekrasov, himself a Weyl prize winner. Nikita writes:

Perhaps the most important consequence of Dr. Pestun’s work was its impact on the theoretical physics community. More than to 700 papers were written following up his work, extending it in various direction here I had to change Nekrasov’s text because the number of citations has grown by more than a hundred in the last 6 months. Continuing with Nikita’s comments: people found that the localization approach used by Pestun for the theories on spheres can be extended to the theories on ellipsoids, giving additional parameters to the partition functions one can play with. The structure of the partition function found by V. Pestun led to the discovery of the four-dimensional version of the tt-fusion found by Cecotti and Vafa in 1992, which was resisting generalizations for almost 15 years!

More recently Pestun has given a complete and definite treatment of the ordinary and quantized Seiberg-Witten geometry of 4- and 5-dimensional quiver gauge theory. The quantized Seiberg-Witten geometry and a connection with quantum integrable systems arise in the Nekrasov-Shatashvili limit. Pestun and collaborators have developed a very elegant and powerful way of untangling the complexities of this limit. It is based on the idea of q-characters that goes back to Frenkel and Reshetikhin almost 20 years ago, and is now rapidly gaining importance and appreciation in the mathematical physics community.

Furthermore with Kimura, Pestun has defined a general notion of deformed W-algebra, which makes sense for any quiver and specialized it to the algebra considered by Frenkel and Reshetikhin for ADE quiver. He then connected the conjectural formulas for the generating fields to the geometry of the corresponding Nakajima variety and also to the notion of qq-characters investigated by Nekrasov in recent years.

Commenting on these results of Pestun the Fields medallist Sacha Okounkov wrote:

This beautiful construction completes a very important circle of ideas and represents very important progress in understanding the structure of the deformed W-algebras and in applying it to solve important problems in mathematical physics.

Okounkov concludes his recommendation letter by the following:

Vasily Pestun is a highly original, exceptionally gifted, and very successful researcher working on the interface of supersymmetric gauge theories and what you may call geometric representation theory. Both of these topics obviously relate to symmetries, but from very different perspectives and in very different ways. The way in which they become intertwined in