

COMBINATORIAL PHYSICS: SCHÜTZENBERGER FACTORIZATION AND NON-COMMUTATIVE DIFFERENTIAL EQUATIONS.

G H E DUCHAMP[†],
P BLASIAK[‡], A HORZELA[‡], HOANG NGOC MINH[†],
K A PENSON[◇] AND A I SOLOMON^{◇,‡}

Abstract

The original Hopf algebra inherent to the pre-Feynman diagrams (LDIAG) of the Quantum Field Theory of Partitions (QFTP) admits a three-parameter deformation. It turns out that the two first parameters (deformation of the structure of algebra) are of different natures : the first is due to the deformation of the (tensor) space by a commutation factor and the second to a perturbation of the comultiplication. Details for these tools used for deformation will be indicated (coloured products, dual laws, diagonal deformation, Sweedler's duals).

As a byproduct, one gets an unexpected deformation of the Euler-Zagier sums. It will be shown also how these sums arise from a non-commutative fuchsian differential equation which produces a group-like element. We indicate a way of regularizing them through Schützenberger factorization. The talk is based on the two papers [?, ?].

REFERENCES

- [1] G. H. E. Duchamp, C. Tollu, K. A. Penson, G. Koshevoy, *Combinatorial Deformations of Algebras: Twisting and Perturbations*, Sminaire Lotharingien de Combinatoire, to appear.
[arXiv:0903.2101v2](#)
- [2] G. H.E. Duchamp, Hoang Ngoc Minh, Allan I. Solomon, Silvia Goodenough, *An interface between physics and number theory*, Proceedings of Group 28 (Group-Theoretical methods in Physics), Newcastle 2010, to appear.
[arXiv:1011.0523v1](#)

^a LIPN - UMR 7030, CNRS - Université Paris 13, F-93430 Villetaneuse, France

[‡] H.Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences, ul. Eliasza-Radzikowskiego 152, PL 31342 Kraków, Poland

[◇] Laboratoire de Physique Théorique de la Matière Condensée,, Université Pierre et Marie Curie, CNRS UMR 7600, Tour 24 - 2e ét., 4 pl. Jussieu, F 75252 Paris Cedex 05, France

[‡] The Open University, Physics and Astronomy Department, Milton Keynes MK7 6AA, United Kingdom