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# THEP Journal Club

Sept. 2, 2016 at 12:30 p.m.  
Minkowski Raum, Staudinger Weg 7, 05-119

Pizza & Physics at Lunchtime

Luise Adams  
JGU Mainz

## **The sunrise and the kite integral in terms of an elliptic generalisation of multiple polylogarithms**

Feynman integrals are one of the most important tools of perturbation theory for high precision calculations in particle physics. Due to the presence of ultraviolet or infrared divergences these integrals may require regularisation where the dimensional regularisation is commonly used (the regularisation parameter  $\epsilon$  denotes the deviation from the number of space-time dimensions). The result for a Feynman integral is then presented as a Laurent series in  $\epsilon$ .

An interesting question to ask is which kind of functions appears in the contributions of different  $\epsilon$ -order.

In the  $\epsilon^0$ -term of one-loop integrals the logarithm and the dilogarithm occur. Many multi-loop integrals can be expressed in terms of generalisations of the logarithm and the dilogarithm, the so-called multiple polylogarithms. But there are some Feynman integrals which cannot be expressed within this class of functions of which the sunrise integral is the simplest one.

In this talk, we show how the multiple polylogarithms can be generalised to express  $\epsilon$ -terms of the Laurent expansion of the sunrise integral (for arbitrary masses) around two and four space-time dimensions. For the two-

dimensional equal mass case we will also explain an algorithm to compute an arbitrary  $\varepsilon$ -order of the Laurent expansion.

Recently, it has been shown that also the equal mass kite integral around four space-time dimensions with two massless and three massive propagators can be expressed in terms of these generalisations.

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