

# Tom Melia Les Houches

## Research Interests:

- **Precision QCD calculations**  
(particularly next-to-leading order with large number of legs)
- **LHC Phenomenology**

# Colour decomposition for n-gluon tree amplitude

$$A^{\text{full}} = \sum_{\sigma \in S_{n-1}} \text{tr}(\lambda^1 \lambda^{\sigma_1} \lambda^{\sigma_2} \dots \lambda^{\sigma_{n-1}}) \mathcal{A}(1, \sigma_1, \sigma_2, \dots, \sigma_{n-1})$$

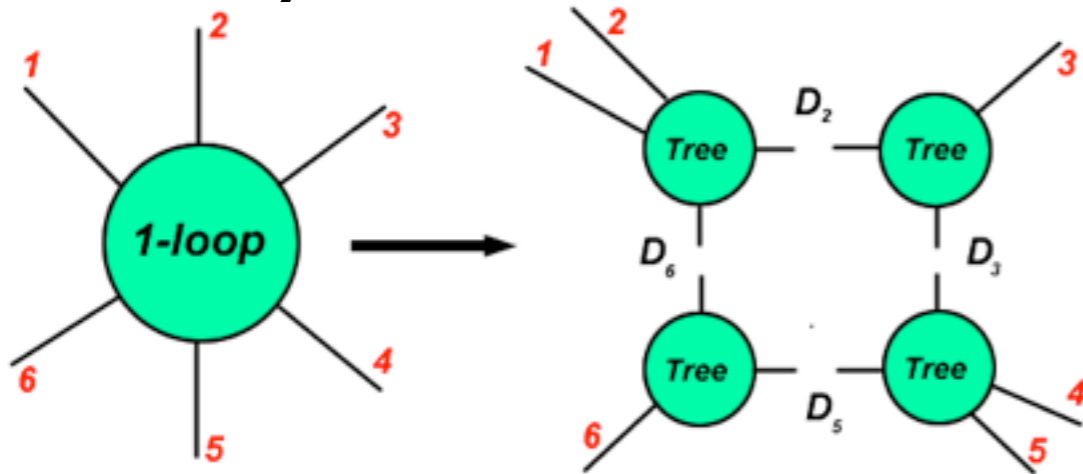
NLO QCD  
Calculations

Quick!

Interesting!

Nice properties!

- D-dimensional generalised unitarity method



- $1/N_c$  expansions (with Stefano)

- Gluon case well studied + surprising. Relation between primitives.

- Investigated general QCD case with quarks: **Dyck Words**

# Dyck words



Walther von Dyck  
German Mathematician 1856-1934

XY

XXYY XYXY

XXXYYY XXYXYY XXYYXY XYXXYY XYXYXY

- Count number of independent amplitudes under group theory relations (Kleiss-Kuijf relations)

Paper in next few days...

- Obtain all of massless tree-level QCD from one-flavour QCD
- Obtain all of massless tree-level QCD from N=4 SYM solution

# Recent papers

## Dyck Words and Multi-Quark Primitive Amplitudes

[Tom Melia \(CERN\)](#). Apr 29, 2013.

## Gluon fusion contribution to $W+W^-$ + jet production

[Tom Melia \(Oxford U., Theor. Phys.\)](#), [Kirill Melnikov \(Johns Hopkins U.\)](#), [Raoul Rontsch \(Oxford U., Theor. Phys.\)](#), [Markus Schulze \(Argonne\)](#), [Giulia Zanderighi \(Oxford U., Theor. Phys.\)](#). May 2012. 13 pp.

## Spin before mass at the LHC

[Tom Melia \(Oxford U., Theor. Phys.\)](#). Oct 2011. 17 pp.

## $W+W^-$ , $WZ$ and $ZZ$ production in the POWHEG BOX

[Tom Melia \(Oxford U., Theor. Phys.\)](#), [Paolo Nason \(INFN, Milan Bicocca\)](#), [Raoul Rontsch](#), [Giulia Zanderighi \(Oxford U., Theor. Phys.\)](#). Jul 2011. 20 pp.

## NLO QCD corrections for $W^+W^-$ pair production in association with two jets at hadron colliders

[Tom Melia \(Oxford U., Theor. Phys.\)](#), [Kirill Melnikov \(Johns Hopkins U.\)](#), [Raoul Rontsch](#), [Giulia Zanderighi \(Oxford U., Theor. Phys.\)](#). Apr 2011. 27 pp.

## $W^+W^+$ plus dijet production in the POWHEGBOX

[Tom Melia \(Oxford U., Theor. Phys.\)](#), [Paolo Nason \(INFN, Milan Bicocca\)](#), [Raoul Rontsch](#), [Giulia Zanderighi \(Oxford U., Theor. Phys.\)](#). Feb 2011. 16 pp.

## Next-to-leading order QCD predictions for $W+W+jj$ production at the LHC

[Tom Melia \(Oxford U., Theor. Phys.\)](#), [Kirill Melnikov \(Johns Hopkins U.\)](#), [Raoul Rontsch](#), [Giulia Zanderighi \(Oxford U., Theor. Phys.\)](#). Jul 2010. 16 pp.