Integrability for Amplitudes and Correlators

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Outline

Academic Background

- Graduated from Theoretical Physics TCD 2018
  - Four year B.A. degree
  - Bachelor's thesis on a correspondence between certainly ordinary differential equations and integrable models
- Finished Part III Applied Maths Cambridge 2019
  - 9 month intensive masters 'MASt'
  - Courses on QFT, GR, string theory, Lie theory, supersymmetry
  - Master's essay on conformal bootstrap in $d \geq 3$
- ESR at Humboldt University since September 2019 ☺

Research Experience

- Summer projects during undergraduate
  - 2016 - Classical integrability/Neumann model perturbations
  - 2017 - Computational fluid dynamics
  - 2018 - Entanglement entropy calculations in XXZ spin chain
- Bachelor's/Master's theses
- Main interests: Integrability/QFT

Integrability for amplitudes and correlators

Goal is to understand appearance of integrable structures in the amplitudes/correlation functions of $\mathcal{N} = 4$ SYM and similar theories.

- Studying background material:
  - Elvang/Huang and Henn/Plefka for scattering amplitudes
  - Reading about important integrability techniques e.g. Bethe Ansatz
  - Learning about $\mathcal{N} = 4$ SYM and spectral problem

- First project on understanding the 'conformal' box integral in Minkowski space
  - Implementing numerically
  - Calculating integral for special configuration of points directly in Minkowski space

Training/Outreach

- Training
  - SAGEX events - Durham, DESY, and Amplitudes 2019 in TCD
  - Basics of amplitudes/strings/integrability in DESY school
  - Public speaking - gave talks in Durham, DESY, and soon Berlin
  - Time management, academic writing/practice
  - Taking German language course in Humboldt
- Outreach
  - Recorded 3 videos for Ekaterina
  - Talking to high-school physics association January 2020
  - Exhibition
- Secondment
  - Applying to Wolfram, still working out dates

Integration in SAGEX

- Always felt very welcome, even before I started
- Have got on very well with all the ESRs!
- Discuss often with first supervisor
- Also discuss occasionally with second supervisor
- Made preliminary contact with mentor

Future Plans

- Want to become a well rounded scientist during SAGEX
  - Independent research skills
  - Soft skills training
  - Outreach experience
- Hopefully postdoc afterwards!
- But will keep my options open in industry (secondments)