Curriculum Vitae

Dr. rer. nat. Martin Bies

Personal Details

Address:	Department of Mathematics David Rittenhouse Laboratory 209 South 33rd Street Philadelphia, PA 19104-6395
Email:	mbies@sas.upenn.edu
Nationality:	German
Date of birth:	15/12/1987

Summary

Education

PhD in Physics (Heidelberg university – defended on 01/02/2018)

Past research

Physics:

- Phenomenological aspects of standard models in **string theory**
- In particular **computation of massless spectra**

Mathematics:

- Root bundles
- Constructive approaches to **Freyd categories**
- Algorithms for cohomologies of **toric sheaves**

Software development via **github**:

- **Toric geometry** and **sheaf cohomologies** packages
- Experience in **gap**, **python**, **C++**, **git**, **LaTeX**

Teaching experience

Instructor in 2021:
Computational Linear Algebra at University of Pennsylvania)
Senior Tutor in 2016 and 2018 (Heidelberg University)
Tutor for 8 lecture courses (Oct. 2012 – Oct. 2018, Heidelberg University)

Language skills

German – mother tongue
English – fluent (**Imperial College International Diploma**)
French – (CEFR level B1)

Scholarships

Simons Postdoctoral Fellow (since Sept. 2020)
FWA – Foundation Wiener-Anspach (Oct. 2018 – Sept. 2020)
Studienstiftung des deutschen Volkes (Jan. 2010 – Feb. 2018)

Professional Experience

Since Sept. 2020	Simons Postdoctoral Fellow Department of Mathematics, University of Pennsylvania
Oct. 2019 – Sept. 2020	Long term visitor Mathematical institute, University of Oxford
Oct. 2018 – Sept. 2019	Postdoctoral Researcher Physique Théorique et Mathématique, Université Libre de Bruxelles
Feb. 2018 – Sept. 2018	Postdoctoral Researcher Institut für theoretische Physik, Ruprecht-Karls-Universität Heidelberg

Education

Mar. 2014 – Feb. 2018	PhD studies in physics (Heidelberg university) on the subject *Cohomologies of coherent sheaves and massless spectra in F-theory* Supervisor physics: Prof. Dr. Timo Weigand (Uni. Heidelberg) Supervisor mathematics: Prof. Dr. Mohamed Barakat (Uni. Siegen) Result: Magna cum laude (very good)
Sept. 2012 – Feb. 2014	Master studies in physics (Heidelberg university) on the subject *Cohomologies of holomorphic line bundles in smooth and compact normal toric varieties* Supervisor: Prof. Dr. Timo Weigand Result: 1.0
Oct. 2008 – Aug. 2012	Bachelor studies in physics (Heidelberg university) on the subject *Intersecting D6-brane models on* $T^2 \times T^2 \times T^2/(\sigma \times \Omega)$ *and* $T^2 \times T^2 \times T^2/(\mathbb{Z}_2 \times \mathbb{Z}_2 \times \sigma \times \Omega)$ *orientifolds* Supervisor: Prof. Dr. Timo Weigand Result: 1.1
Oct. 2010 – June 2011	Studies abroad at Imperial College (London, United Kingdom)

Software Development

I develop software via **github**. My scientific interest focuses on a collection of software packages which facilitate computations of sheaf cohomologies on toric varieties, see https://github.com/homalg-project/SheafCohomologyOnToricVarieties. These packages are written in the language `gap`, several of which designed as interfaces to C++-projects. Among others I am author of the following packages:

- TopcomInterface, cohomCalgInterface, SpasmInterface
- ToricVarieties
- FreydCategories
- SheafCohomologyOnToricVarieties

For a complete overview of my software developments take a look at my ***GitHub*-site https://github.com/HereAround** or my ***academic website* https://martinbies.github.io/**.

Scientific Publications

- *Statistics of Root Bundles Relevant for Exact Matter Spectra of F-theory MSSMs* (arXiv-ID: 2104.08297)
  Collaborators: M. Cvetič, M. Liu
- *Root Bundles and Towards Exact Matter Spectra of F-theory MSSMs* (arXiv-ID: 2102.10115)
  Collaborators: M. Cvetič, R. Donagi, M. Liu, M. Ong
- *Machine Learning and Algebraic Approaches towards Complete Matter Spectra in 4d F-theory* (arXiv-ID: 2007.00009)
  Collaborators: M. Cvetič, R. Donagi, L. Ling, M. Liu, F. Ruehle
- *Tensor products of finitely presented functors* (arXiv-ID: 1909.00172)
  Collaborator: Sebastian Posur
- *Cohomologies of coherent sheaves and massless spectra in F-theory* (arXiv-ID: 1802.08860)
  PhD thesis
- *Algebraic Cycles and Local Anomalies in F-theory* (arXiv-ID: 1706.08528)
  Collaborators: Christoph Mayrhofer and Timo Weigand
- *Gauge Backgrounds and Zero-Mode Counting in F-theory* (arXiv-ID: 1706.04616)
  Collaborators: Christoph Mayrhofer and Timo Weigand
- *Chow groups, Deligne cohomology and massless matter in F-theory* (arXiv-ID: 1402.5144)
  Collaborators: Christoph Mayrhofer, Christian Pehle and Timo Weigand

Conferences

June 2020	String Pheno 2020 (virtual conference)
Sept. 2019	strings and geometry (Oxford, United Kingdom)
Aug. 2019	gap singular meeting and school (Lambrecht, Germany)
July 2019	Strings (Brusels, Belgium)
Aug. 2018	CAP_days 2018 (Siegen, Germany)
May 2018	Kontaktseminar – Schwerpunkt Banken und Beratung (Bonn, Germany)
May 2018	Physiker im Beruf (Bad Honnef, Germany)
Mar. 2018	string_data 2018 (Munich, Germany)
Jul. 2017	String Pheno 2017 (Virginia, USA)
Dec. 2015	String Math (Sanya, China)
Sept. 2015	Third GAP Days (Trondheim, Norway)
Mar. 2015	Second GAP Days (Aachen, Germany)
Feb. 2015	Physics and Geometry of F-theory (Munich, Germany)
Dec. 2014	Homological Perturbation Theory (Galway, Ireland)
Aug. 2014	GAP Days (Aachen, Germany)
Feb. 2014	Geometry and Physics of String Compactifications (Heidelberg, Germany)

Teaching Experience

Jan. 2021 – May. 2021	Instructor	Computational linear algebra
Apr. 2018 – Oct. 2018	Senior tutor	Methods of mathematical physics 1
Oct. 2016 – Mar. 2017	Tutor	Theoretical physics I
Apr. 2016 – Sept. 2016	Senior tutor	General relativity
Apr. 2015 – Sept. 2015	Tutor	Theoretical physics IV
Oct. 2014 – Mar. 2015	Tutor	Quantum field theory
Oct. 2013 – Mar. 2014	Tutor	Theoretical physics III
Apr. 2013 – Sept. 2013	Tutor	Theoretical physics II
Oct. 2012 – Mar. 2013	Tutor	Theoretical physics I

Engagement at *Studienstiftung des deutschen Volkes*

June 2018	Member of the admission board *Heidelberg*
Dec. 2017	Member of the admission board *Ellwangen III*
May 2017	Training for admission board members – successfully completed
Nov. 2016	Member of the admission board *Heidelberg*