

CURRICULUM VITAE

DR. RER. NAT. MARTIN BIES

PERSONAL DETAILS

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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:

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

Software development via **github**:

- **Toric geometry** and **sheaf cohomologies** packages (language **gap**)
- Experience in **gap**, **python**, **C++**, **git**, **L^AT_EX**

Teaching experience Tutor for 8 lecture courses (Oct. 2012 – Oct. 2018)
Senior Tutor in 2016 and 2018

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

Scholarships **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)
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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, cohomCalcInterface, 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

- *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)
- *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 (Brussels, 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

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 <i>Heidelberg</i>
Dec. 2017	Member of the admission board <i>Ellwangen III</i>
May 2017	Training for admission board members – successfully completed
Nov. 2016	Member of the admission board <i>Heidelberg</i>