Robert Stein

Curriculum Vitae

Personal Data

Place and Date of Birth:	London | 10 June 1995
Citizenship:	British & Irish
Email:	rdstein@caltech.edu
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Education

July 2017 – Nov. 2021

PhD in Experimental Physics,
Humboldt University of Berlin / DESY Zeuthen
Thesis: "*Search for Multi-Messenger Transients with IceCube and ZTF*"
Research Advisor: A. Franckowiak
Graded "*Summa cum laude*" (with distinction)

- Cross-correlation of neutrinos with multi-wavelength catalogues
- Led response to neutrino alerts as the *IceCube realtime shifter*
- ZTF follow-up of neutrino/gravitational wave/GRB events

Sep. 2013 – June 2017

MSci in Physics with a Year In Europe,
Imperial College London / University of Hamburg
Thesis: "*Reconstruction of Charge Number of Heavy Cosmic Rays using Cherenkov Light*"
Research Advisor: D. Horns (University of Hamburg)
Graduated with First Class Honours

- Development of novel reconstruction method for heavy cosmic rays detected by IACTs, using direct Cherenkov light
- Estimates of performance for simulated CTA geometries

Academic Career

Nov. 2021 – Present

Postdoctoral Scholar in Astronomy,
California Institute of Technology
Mentor: M. M. Kasliwal

- ZTF follow-up of neutrino/gravitational wave/GRB events
- WINTER data analysis and multi-messenger follow-up

Selected Talks

29th Sep. 2022

Invited Talk, 18th Vulcano Workshop on Frontier Objects in Astrophysics and Particle Physics, Elba, IT
"*A tidal disruption event coincident with a high-energy neutrino*"

16TH SEP. 2022	INVITED TALK, DESY Astroparticle Seminar, Zeuthen, DE "*WINTER: a new IR telescope for time-domain and multi-messenger science*"
14TH SEP. 2022	INVITED TALK, IR Astronomy in Antarctica Workshop, FR "*High-energy neutrinos and Tidal Disruption Events*"
16TH SEP. 2022	CONTRIBUTED TALK, Time-Domain Astronomy and Multi-Messenger Workshop (TDAMM), Annapolis, USA "*Tidal Disruption Events in the TDAMM era*"
19TH AUG. 2022	INVITED TALK, UMD Seminar, College Park, USA "*Neutrino Follow-up with the Zwicky Transient Facility*"
11TH AUG. 2022	CONTRIBUTED TALK, TeV Particle Astrophysics (TeVPA), Kingston, CA "*Neutrino follow-up with the Zwicky Transient Facility*"
16TH JUNE 2022	CONTRIBUTED TALK, 240th American Astronomical Society, Pasadena, USA "*Neutrino follow-up with the Zwicky Transient Facility*"
3RD JUNE 2022	CONTRIBUTED POSTER, 30th International Conference on Neutrino Physics (Neutrino), KR "*Neutrino follow-up with the Zwicky Transient Facility*"
16TH FEB. 2022	CONTRIBUTED TALK, IR2021, JP "*High-energy neutrino sources in the IR*"
15TH SEP. 2021	CONTRIBUTED TALK, Astronomische Gesellschaft Annual Meeting, DE "*The ZTF Neutrino Follow-up Program*"
10TH SEP. 2021	CONTRIBUTED TALK, Keck Science Meeting, San Diego, USA "*A tidal disruption event coincident with a high-energy neutrino*"
13TH JULY 2021	INVITED PLENARY HIGHLIGHT TALK, 38th International Cosmic Ray Conference (ICRC), Berlin, DE "*A tidal disruption event coincident with a high-energy neutrino*"
6TH JULY 2021	INVITED TALK, AIRUB science seminar, Bochum, DE "*Neutrinos from shredded stars*"
29TH JUNE 2021	INVITED TALK, European Astronomical Society, Leiden, NL "*Neutrinos from tidal disruption events*"
16TH JUNE 2021	INVITED TALK, LIGO-GRITTS seminar, Pasadena/Cambridge, USA "*A tidal disruption event coincident with a high-energy neutrino*"
10TH DEC. 2020	INVITED TALK, Cosmic Rays and Neutrinos in the Multi-Messenger Era, Paris, FR "*Neutrinos from tidal disruption events*"
14TH OCT. 2020	INVITED TALK, ASTRON Astrolunch, Dwingeloo, NL "*A high-energy neutrino coincident with a tidal disruption event*"

25TH AUG. 2020	INVITED TALK, NASA GSFC ASD Colloquium, Greenbelt, USA "*A high-energy neutrino coincident with a tidal disruption event*"
5TH JUNE 2020	INVITED TALK, DESY Astroparticle Seminar, Zeuthen, DE "*A high-energy neutrino coincident with a tidal disruption event*"
26TH OCT. 2019	INVITED TALK, PAHEN Conference, Berlin, DE "*Neutrinos from optical transients with IceCube*"
30TH JULY 2018	INVITED TALK, ESO Thirty Minute Talk, Santiago, CL "*ZTF and the AMPEL Broker: Providing a realtime public astronomy survey*"

SCHOLARSHIPS, AWARDS AND HONOURS

26TH MAR 2021	Winner of the *IceCube Impact Award*, IceCube Spring 2021 Collaboration Meeting
2ND JULY 2020	Winner of first session poster competition, Neutrino 2020 Conference
16TH OCT 2019	Winner of the annual DESY Science Slam, DESY Hamburg
21ST NOV 2018	Winner of the annual Zeuthen Science Slam, DESY Zeuthen

SELECTED TELESCOPE TIME AWARDED

AUG. 2022 – JAN. 2023	Keck Observatory Program (PI) *Candidate Neutrino Sources*
OCT. 2020 – MAR. 2021	Australia Telescope Compact Array Program (Co-I) *Radio emission from stellar tidal disruption flares*
SEP. 2020 – FEB. 2021	Gran Telescopio Canarias Program (Co-I) *Spectroscopic classification of potential neutrino counterparts identified by ZTF*
JUNE 2020 – NOV. 2020	Very Large Array Program (PI) *VLA observations to establish the neutrino counterpart to a giant AGN flare*

SUPERVISION, TEACHING AND OUTREACH

OCT. 2019 – OCT. 2020	Supervision of master's degree student: J. NECKER *Search for high-energy neutrinos from core-collapse supernovae*
SEP. 2019 – SEP. 2020	Supervision of master's degree student: R. NAAB *The next-generation Optical Follow-Up (OFU) program for IceCube*
OCT 2018 – AUG. 2019	Supervision of bachelor's degree student: A. VAGTS *Investigation of the TXS 0506+056 neutrino spectrum*

June 2018 – July 2019	Teaching Assistant: *Experimental Astroparticle Physics* (2 semesters)

Oct. 2018 – Nov. 2019	Volunteer: *International Cosmic Day* (2 years)
June 2018 – June 2019	Volunteer: *Lange Nacht der Wissenschaft* (2 years)
March 2018	Organiser: *IceCube Masterclass*

Additional Information

Collaboration Membership	WINTER, ZTF, GROWTH, LSST-TVSSC
Programming Skills:	Python, LaTeX, Bash (Advanced)
Language Skills:	English (Native Speaker), German (Advanced - C1)

Selected Publications (*peer-reviewed)

2022 R. Stein et al., *Neutrino Follow-Up with the Zwicky Transient Facility*, (submitted)
Lead author, data analysis, statistical analysis, led follow-up program

*J. Necker et al., *ASAS-SN follow-up of IceCube high-energy neutrino alerts*, (2022)
Data analysis, statistical analysis, development of paper

*S. Reusch et al., *The candidate tidal disruption event AT2019fdr coincident with a high-energy neutrino*, Phys. Rev. Lett. 128, 221101 (2022)
Realtime follow-up and data analysis, statistical analysis, contributed radio data

S. van Velzen et al., *Establishing accretion flares from massive black holes as a major source of high-energy neutrinos*, (submitted)
Development of statistical analysis and interpretation

2021 R. Stein, *Tidal Disruption Events and High-Energy Neutrinos*, PoS(ICRC2021)009
Presenter of invited ICRC plenary talk, author of accompanying proceedings

*R. Stein et al., *A tidal disruption event neutrino coincident with a high-energy neutrino* 2021, Nat Astron 5, 510-518
Developed analysis framework, led follow-up program, modelling, statistical analysis

*S. van Velzen et al., *Seventeen Tidal Disruption Events from the First Half of ZTF Survey Observations: Entering a New Era of Population Studies* 2021, ApJ, 908, 4
Technical implementation of filtering and analysis pipeline, code development

2020 *M. M. Kasliwal et al., *Kilonova Luminosity Function Constraints based on Zwicky Transient Facility searches for 13 Neutron Star Mergers* 2020, ApJ, 905, 145
Developed one of three analysis frameworks, realtime follow-up and data analysis

*V. Paliya et al., *Multi-Frequency Observations of the Candidate Neutrino Emitting Blazar BZB J0955+3551* 2020, ApJ, 902, 29
Statistical analysis of chance coincidence probability, led neutrino data analysis

*A. Franckowiak et al., *Patterns in the multi-wavelength behaviour of candidate neutrino blazars* 2020, ApJ, 893, 162
Contributed to the discussion and interpretation of neutrino correlation

2019 R. Stein for the IceCube Collaboration, *Search for Neutrinos from Populations of Optical Transients*, PoS(ICRC2019)1016
Developed likelihood analysis code, TDE catalogue compilation, data analysis

Selected Software

2020 R. Stein et al., *NuZTF*, DOI: 10.5281/zenodo.4048335
Python code for ZTF data analysis, built using the AMPEL framework. Primarily used for neutrino, gravitational wave and gamma-ray burst searches.

R. Stein et al., *Flarestack*, DOI: 10.5281/zenodo.3619383
Likelihood analysis python code for neutrino data analysis, as well as for neutrino population and cosmology calculations