Daniel Pauli

March 10, 1997, born in Warstein, Germany
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Astrophysicist working at the forefront of the studies of massive stars and binaries at low metallicity. Specialized in spectroscopic analysis and stellar evolution. Expert in the modern non-LTE model stellar atmosphere code PoWR and the stellar evolution code MESA. Principle investigator of three pioneering ESO VLT programs, hunting for post-interaction massive binaries in low metallicity galaxies, and co-PI on several HST, JWST and ESO VLT programs. Experience in undergraduate teaching, lecturing and public outreach.

Academic career

10/2024 - 09/2027 KU Leuven	**Independent fellowship** (FWO) 'Revolutionizing spectral synthesis: From isolated massive stars to unresolved stellar populations in the Early Universe'
10/2020 - 09/2024 University of Potsdam	**PhD** (astrophysics) grade: summa cum laude 'Unraveling massive star and binary physics in the nearby low-metalliciy galaxy, the Small Magellanic Cloud, as a proxy for high-redshift galaxies' supervisor: Lidia Oskinova
10/2018 - 10/2020 University of Bonn	**Master of Science** (astrophysics) grade: 1.3 (95/100) 'The Evolution of Very Massive Binary Systems' supervisor: Norbert Langer
10/2015 - 10/2018 University of Bonn	**Bachelor of Science** (physics) grade: 2.4 (77/100) 'Investigation of the galactic WNE stars' supervisor: Norbert Langer

Skills and Qualifications

Languages

German	★★★★★	native (C2)
English	★★★★	fluent (B2)

Programming Languages

Python	★★★★★	expert
FORTRAN	★★★★	advanced
C/C++	★★★★	advanced

Software

`PoWR`	non-LTE stellar atmosphere code	★★★★★	expert
`Phoebe`	ecclipsing binary model software	★★★★★	expert
`MESA`	detailed stellar evolution code	★★★★★	expert
`ComBinE`	rapid stellar evolution code	★★★★	advanced

Leadership and Community Service

Reviewer for international astrophysical journals (MNRAS)	12/2024 - present
Convenor of a splinter session at the annual meeting of the German Astronomical Society	09/2023
Founder and Organizer of an Astrophysical Journal club	01/2021 - 09/2024
Leader of a subgroup of the ULLYSES collaboration	08/2021 - present

Teaching

Supervision and mentoring of B. Sc. Ludwig Schulz	05/2023 - 03/2024
Supervision and mentoring of M. Sc. Julian Stähle	05/2022 - 05/2023
Astrophysical lab demonstrator	10/2021 - 03/2022
Teaching at the Astrophysical Lab Seminar	10/2021 - 03/2022
Teaching 'Computational Physics'	04/2020 - 09/2020
Teaching 'Introduction into Astrophysics'	10/2019 - 03/2020
Teaching 'Computational Physics'	04/2019 - 09/2019
Teaching 'Introduction in Computational Physics'	10/2018 - 03/2019
Teaching 'Computational Physics'	04/2018 - 09/2018

Observing experience

GO 17704	HST	COS	PI: A. Sander	Co-I: **D. Pauli**
GO 17732	HST	COS	PI: L. Oskinova	Co-I: **D. Pauli**
GO 17723	HST	COS	PI: R. Lefever	Co-I: **D. Pauli**
PID 114.27G8	ESO VLT	UVES	PI: K. Sen	Co-I: **D. Pauli**
PID 114.276E	ESO VLT	UVES	PI: **D. Pauli**	
PID 114.277F	ESO VLT	MUSE	PI: P. Zeidler	Co-I: **D. Pauli**
PID 17426	HST	COS	PI: A. Sander	Co-I: **D. Pauli**
GO 3855	JWST	NIRSpec	PI: L. Oskinova	Co-I: **D. Pauli**
PID 112.25R7	ESO VLT	FLAMES/GIRAFFE	PI: T. Shenar	Co-I: **D. Pauli**
GO 17104	HST	STIS	PI: M. Rickard	Co-I: **D. Pauli**
GO 17074	HST	STIS/COS	PI: V. Ramachandran	Co-I: **D. Pauli**
PID 110.24CU	ESO VLT	UVES	PI: **D. Pauli**	
PID 109.2326	ESO VLT	FORS2	PI: L. Oskinova	Co-I: **D. Pauli**
PID 109.22V0	ESO VLT	X-Shooter	PI: **D. Pauli**	

Impact and Public Outreach Activities

Invited speaker on the YouTube channel 'Urknall, Weltall und das Leben' 2024
'Doppelsterne im Austausch - Masseausgleich von Sternen'

Invited article in the university's magazine 'Portal' 2023
'Stark im Doppel'

Invited guest in the scientific podcast Listen.UP 2023
'Was uns das Leben eines Sterns über das Universum verrät'

Invited author in the German science magazine 'Sterne und Weltraum' 2023
'Kosmisches Karussell: Doppelsterne im Austausch'

Press release in the newspaper 'The Independent' 2023
Two massive stars 'touching' each other will merge as black holes

Press release in the magazine 'New Scientist' 2023
One star being eaten by another will take revenge as a black hole

Collaboration Member

VLT-FLAMES Tarantula Survey (VFTS) collaboration
Hubble UV Legacy Library of Young Stars as Essential Standards (ULLYSES)
The ULLYSES and X-Shooter massive stars collaboration (XShootU)
Binarity at LOw Metallicity (BLOeM) collaboration

Presentations and Posters

IAU G2 online conference series *IAU G2 commission - Massive stars*	invited talk	online Oct. 2024
Massive star conference on multiple systems *LIAC41: The eventful life of massive multiples*	talk	Liège, Belgium July 2024
XShootU Collaboration meeting *XShootU Wide Workshop 2023*	talk	Prague, Czech Rep. Sept. 2023
Meeting of the German Astronomical Society *Cosmic evolution of matter on all scales*	talk	Berlin, Germany Sept. 2023
Invited: Hengstberger Symposium on stellar yields *Understanding the massive-star origin of our elements: A unified understanding of stellar yields*	invited talk	Heidelberg, Germany Sept. 2023
Massive star conference on multiple systems *3,2,1: Massive Triples, Binaries and Mergers 2023*	talk	Leuven, Belgium July 2023
Massive star conference on Wolf-Rayet stars *The Wolf-Rayet phenomenon in the Universe*	talk	Morelia, Mexico June 2023
Invited: International Space Science Institute team meeting II *Multiwavelength View on Massive Stars in the Era of Multimessenger Astronomy*	invited talk	Bern, Switzerland April 2023
VFTS Collaboration Meeting *VFTS and Friends*	talk	Garching, Germany March 2023
Invited: Seminar at University of Cambridge *Milky Way and Local Group Stars group meeting*	seminar talk	Cambridge, UK Nov. 2022
Invited: Workshop at the Lorentz Center *ULLYSES New Horizons*	invited talk	Leiden, Netherlands Nov. 2022
IAU Symposium 361 *Massive Stars Near and Far*	poster	Ballyconnell, Ireland May. 2022
Invited: Workshop at the Lorentz Center *ULLYSES Sets Sail: Massive Star Spectroscopy with the HST and the ESO VLT*	invited talk	Leiden, Netherlands Dec. 2021
Invited: International Space Science Institute team meeting I *Multiwavelength View on Massive Stars in the Era of Multimessenger Astronomy*	invited talk	Bern, Switzerland Nov. 2021
NUVA eMeeting 2021 (covid lockdowns) *Status and new UV results from HST, Astrosat and LUT*	talk	online Oct. 2021
IAU 361 Virtual Preview Meeting (covid lockdowns) *Massive Stars Near and Far*	poster	online May 2021

Publication Record (with links)

0000-0002-5453-2788 — ADS library — arXiv

First-authored publications:

20 **D. Pauli**, L. M. Oskinova, W. -R. Hamann, D. M. Bowman, H. Todt, T. Shenar, A. A. C. Sander, C. Erba, V. M. A. Gómez-González, C. Kehrig, J. Klencki, R. Kuiper, A. Mehner, S. E. de Mink, M. S. Oey, V. Ramachandran, A. Schootemeijer, S. Reyero Serantes, A. Wofford — A&A, 674, A40 2023
Spectroscopic and evolutionary analyses of the binary system AzV 14 outline paths toward the WR stage at low metallicity

19 **D. Pauli**, N. Langer, D. R. Aguilera-Dena, C. Wang, P. Marchant — A&A, 667, A58 2022
A synthetic population of Wolf-Rayet stars in the LMC based on detailed single and binary star evolution models

18 **D. Pauli**, L. M. Oskinova, W. -R. Hamann, V. Ramachandran, H. Todt, A. A. C. Sander, T. Shenar, M. Rickard, J. Maíz Apellániz, R. Prinja — A&A, 659, A9 2022
The earliest O-type eclipsing binary in the Small Magellanic Cloud, AzV 476: A comprehensive analysis reveals surprisingly low stellar masses

17 M. J. Rickard and **D. Pauli**† (equal contribution) — A&A, 674, A56 2023
A low-metallicity massive contact binary undergoing slow Case A mass transfer: A detailed spectroscopic and orbital analysis of SSN 7 in NGC 346 in the SMC
† stellar evolution modeling (`MESA`); orbital analysis (`PHOEBE`); contribution to the spectral analysis (`PoWR`), text and figures

Co-authored publications:

16 H. Sana; T. Shenar; J. Bodensteiner; N. Britavskiy; N. Langer; D. J. Lennon; L. Mahy; I. Mandel; S. E. de Mink; L. R. Patrick; J. I. Villaseñor; M. Dirickx; M. Abdul-Masih; L. A. Almeida; F. Backs; S. R. Berlanas; M. Bernini-Peron; D. M. Bowman; V. A. Bronner; P. A. Crowther; K. Deshmukh; C. J. Evans; M. Fabry; M. Gieles; A. Gilkis; G. González-Torà, G. Gräfener; Y. Götberg; C. Hawcroft; V. Hénault-Brunet; A. Herrero; G. Holgado; R. G. Izzard; A. de Koter; S. Janssens; C. Johnston; J. Josiek; S. Justham; V. M. Kalari; J. Klencki; J. Kubát; B. Kubátová; R. R. Lefever; J. Th. van Loon; B. Ludwig; J. Mackey; J. Maíz Apellániz; G. Maravelias; P. Marchant; T. Mazeh; A. Menon; M. Moe; F. Najarro; L. M. Oskinova; R. Ovadia; **D. Pauli**†; M. Pawlak; V. Ramachandran; M. Renzo; D. F. Rocha; A. A. C. Sander; F. R. N. Schneider; A. Schootemeijer; E. C. Schösser; C. Schürmann; K. Sen; S. Shahaf; S. Simón-Díaz; L. A. C. van Son; M. Stoop; S. Toonen; F. Tramper; R. Valli; A. Vigna-Gómez; J. S. Vink; C. Wang; R. Willcox — Nat Ast (accepted) 2025
A high fraction of close massive binary stars at low metallicity
† contributions to the text and scientific discussion

15 M. J. Rickard; R. Hainich; **D. Pauli**†; W.-R. Hamann; L. M. Oskinova; R. K. Prinja; V. Ramachandran; H. Todt; E. C. Schösser; A. A. C. Sander; P. Zeidler — A&A, 692, A149 2024
Determining stellar properties of massive stars in NGC346 in the SMC with a Bayesian statistic technique
† calculation of the stellar atmosphere grid and contributions to the development of the fitting tool

14 T. Shenar; J. Bodensteiner; H. Sana; P. A. Crowther; D. J. Lennon; M. Abdul-Masih; L. A. Almeida; F. Backs; S. R. Berlanas; M. Bernini-Peron; J. M. Bestenlehner; D. M. Bowman; V. A. Bronner; N. Britavskiy; A. de Koter; S. E. de Mink; K. Deshmukh; C. J. Evans; M. Fabry; M. Gieles; A. Gilkis; G. González-Torà; G. Gräfener; Y. Götberg; C. Hawcroft; V. Hénault-Brunet; A. Herrero; G. Holgado; S. Janssens; C. Johnston; J. Josiek; S. Justham; V. M. Kalari; Z. Z. Katabi; Z. Keszthelyi; J. Klencki; J. Kubát; B. Kubátová; N. Langer; R. R. Lefever; B. Ludwig; J. Mackey; L. Mahy; J. Maíz Apellániz; I. Mandel; G. Maravelias; P. Marchant; A. Menon; F. Najarro; L. M. Oskinova; A. J. G. O'Grady; R. Ovadia; L. R. Patrick; **D. Pauli**†; M. Pawlak; V. Ramachandran; M. Renzo; D. F. Rocha; A. A. C. Sander; T. Sayada; F. R. N. Schneider; A. Schootemeijer; E. C. Schösser; C. Schürmann; K. Sen; S. Shahaf; S. Simón-Díaz; M. Stoop; S. Toonen; F. Tramper; J. Th. van Loon; R. Valli; L. A. C. van Son; A. Vigna-Gómez; J. I. Villaseñor; J. S. Vink; C. Wang; R. Willcox — A&A, 690, A289 2024
Binarity at LOw Metallicity (BLOeM) A spectroscopic VLT monitoring survey of massive stars in the SMC
† contributions to the text

13 S. Reyero Serantes; L. Oskinova; W.-R. Hamann; V. M. A. Gómez-González; H. Todt; **D. Pauli**†; R. Soria; D. R. Gies; J. M. Torrejón; T. Bulik; V. Ramachandran; A. A. C. Sander; E. Bozzo; J. Poutanen — A&A, 690, A347 2024
Multi-wavelength spectroscopic analysis of the ULX Holmberg II X-1 and its nebula suggests the presence of a heavy black hole accreting from a B-type donor
† contributions to the stellar atmosphere modeling and text on the discussion of the evolutionary status

12 K. Sen; I. El Mellah; N. Langer; X.-T. Xu; M. Quast; **D. Pauli**† — A&A, 690, A256 2024
Whispering in the dark - Faint X-ray emission from black holes with OB star companions
† stellar evolution modeling (`MESA`); contributions to text

11 F. Martins; J.-C. Bouret; D. J. Hillier; S. A. Brands; P. A. Crowther; A. Herrero; F. Najarro; **D. Pauli**†; J. Puls, V. Ramachandran; A. A. C. Sander; J. S. Vink and the XShootU Collaboration — A&A, 689, A31 2024
X-Shooting ULLYSES: Massive stars at low metallicity. V. Effect of metallicity on surface abundances of O stars
† contributed to the discussion and figures

10 A. A. C. Sander; J.-C. Bouret; M. Bernini-Peron; J. Puls; F. Backs; S. R. Berlanas; J. M. Bestenlehner; S. A. Brands; A. Herrero; F. Martins; O. Maryeva; **D. Pauli**†; V. Ramachandran; P. A. Crowther; V. M. A. Gómez-González; A. C. Gormaz-Matamala; W.-R. Hamann; D. J. Hillier; R. Kuiper; C. J. K. Larkin; R. R. Lefever; A. Mehner; F. Najarro; L. M. Oskinova; E. C. Schösser; T. Shenar; H. Todt; A. ud-Doula; J. S. Vink — A&A, 689, A30 2024
X-Shooting ULLYSES: Massive stars at low metallicity. IV. Spectral analysis methods and exemplary results for O stars
† stellar atmosphere modeling (`PoWR`) and contributions to the text and figures

9 H. Sana; F. Tramper; M. Abdul-Masih; R. Blomme; K. Dsilva; G. Maravelias; L. Martins; A. Mehner; A. Wofford; G. Banyard; C. L. Barbosa; J. Bestenlehner; C. Hawcroft; D. J. Hillier; H. Todt; C. J. K. Larkin; L. Mahy; F. Najarro; V. Ramachandran; M. C. Ramírez-Tannus; M. M. Rubio-Díez; A. A. C. Sander; T. Shenar; J. S. Vink; F. Backs; S. A. Brands; P. Crowther12, L. Decin; A. de Koter; W.-R. Hamann; C. Kehrig; R. Kuiper; L. Oskinova; **D. Pauli**†; J. Sundqvist; O. Verhamme and the XSHOOT-U Collaboration — A&A, 688, A104 2024
X-Shooting ULLYSES: Massive stars at low metallicity II. DR1: Advanced optical data products for the Magellanic Clouds
† contributions to the discussions on the data reduction and text

8 T. N. Parsons; R. K. Prinja; M. Bernini-Peron; A. W. Fullerton; D. Massa; L. M. Oskinova; **D. Pauli**†; M. J. Rickard; A. A. C. Sander — MNRAS, 527, No. 4 2024
Optically-thick structure in early B type supergiant stellar winds at low metallicities
† contributed to text and figures

7 V. Ramachandran, J. Klencki, A. A. C. Sander, **D. Pauli**†, T. Shenar, L. M. Oskinova, W. -R. Hamann — A&A, 674, L12 2023
A partially stripped massive star in a Be binary at low metallicity: A missing link towards Be X-ray binaries and double neutron star mergers
† stellar evolution modeling (`MESA`); contributed text and figures

6 Jorick S. Vink, A. Mehner, P. A. Crowther, A. Fullerton, M. Garcia, F. Martins, N. Morrell, L. M. Oskinova, N. St-Louis, A. ud-Doula, A. A. C. Sander, H. Sana, J. -C. Bouret, B. Kubatova, P. Marchant, ..., **D. Pauli**† ,... et al. (65 additional authors not shown) — A&A, 675, A154 2023
X-Shooting ULLYSES: massive stars at low metallicity. I. Project Description
† contributions in working groups 3, 4, and 9; contribution of text

5 C. Hawcroft, H. Sana, L. Mahy, J. O. Sundqvist, A. de Koter, P. A. Crowther, J. M. Bestenlehner, S. A. Brands, A. David-Uraz, L. Decin, C. Erba, M. Garcia, W. -R. Hamann, A. Herrero, R. Ignace, N. D. Kee, B. Kubátová, R. Lefever, A. Moffat, F. Najarro, L. Oskinova, **D. Pauli**†, R. Prinja, J. Puls, A. A. C. Sander , et al. (4 additional authors not shown) — A&A, 688, A105 2023
X-Shooting ULLYSES: Massive stars at low metallicity. III. Terminal wind speeds of ULLYSES massive stars
† contributions in working group 3; contributions to text

4 K. Sen, N. Langer, **D. Pauli**†, G. Gräfener, A. Schootemeijer, H. Sana, T. Shenar, L. Mahy, C. Wang — A&A, 672, A198 2023
Reverse Algols and hydrogen-rich Wolf-Rayet stars from very massive binaries
† stellar evolution modeling (`MESA`); contributions to text

3 V. Ramachandran, L. M. Oskinova, W. -R. Hamann, A. A. C. Sander, H. Todt, **D. Pauli**†, T. Shenar, J. M. Torrejón, K. A. Postnov, J. M. Blondin, E. Bozzo, R. Hainich, D. Massa — A&A, 667, A77 2022
Phase-resolved spectroscopic analysis of the eclipsing black hole X-ray binary M33 X-7: System properties, accretion, and evolution
† contributions to stellar evolution modeling (`MESA`), text and figures

2 M. J. Rickard, R. Hainich, W. -R. Hamann, L. M. Oskinova, R. K. Prinja, V. Ramachandran, **D. Pauli**†, H. Todt, A. C. C. Sander, T. Shenar, Y. -H. Chu, J. S. Gallagher III — A&A, 666, A189 2022
Stellar wind properties of the nearly complete sample of O stars in the low metallicity young star cluster NGC 346 in the SMC galaxy
† contributions to spectral analysis (`PoWR`), text and figures

1 D. R. Aguilera-Dena, N. Langer, J. Antoniadis, **D. Pauli**†, L. Dessart, A. Vigna-Gómez, G. Gräfener, Sung-Chul Yoon — A&A, 661, A60 2022
Stripped-Envelope Stars in Different Metallicity Environments I. Evolutionary Phases, Classification and Populations
† invention of the τ-criterion used to identify WR stage, contributions to stellar evolution modeling (`MESA`), text and figures