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X-ray spectroscopy of interstellar dust: from the laboratory to the Galaxy

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Curriculum Vitae

I was born on December 15th 1985 in the city of Alkmaar. I lived in Broek op Langedijk, where I attended the local primary school de Phoenix. My interest in astronomy started when my father took me to Dwingeloo when I was 8 years old, where we visited the local planetarium and the radio telescope. I was totally fascinated and it inspired me to give a talk in class about the solar system, for which I made models of the planets and the Sun from Styrofoam. From that moment on, I wanted to know as much as possible about this mysterious universe we live in. I attended het Han Fortmann college and chose the specialisation science and technology, which would give me access to study astronomy in Leiden. Although astronomy was not yet officially part of the physics curriculum, we did occasionally spend some time on it at school. I will never forget racing back to school in 2004 when the summer holiday already started to see the Venus transit. After obtaining my gymnasium diploma, I started the astronomy bachelor in 2004 in Leiden. In my bachelor research project, I studied the gas content variation in the mass-metallicity relation of galaxies under the supervision of Jarle Brinchmann. In 2009, I obtained my bachelor diploma and consequently started the scientific astronomy master. For my minor master research project, I worked on the modelling of weak gravitational lensing in galaxy clusters. My major master research project was about the feasibility of transit photometry in debris disks, under supervision of Matt Kenworthy. This resulted in a paper published in 2014. It was this project that made me very enthusiastic about doing research. During my studies and between obtaining my master's degree and starting a PhD, I worked as a tour guide at the historical Old Leiden Observatory. I was also involved in the organisation of the many outreach events which were held is in this building. For these efforts, I was awarded the Kaiser outreach prize in 2013.

In the same year, I was selected to join the application round for a PhD position in Leiden. I accepted the offer to start a PhD with Elisa Costantini and Xander Tielens about interstellar dust. I worked both in Leiden at the observatory and in Utrecht at SRON. This combination, although it involved quite some travelling between the two cities, proved to be very nice and refreshing experience. As part of my teaching duties in Leiden I assisted Ignas Snellen and Michiel Hogerheijde with the course Praktische Sterrenkunde (2013-2015). This involved assisting with the observing practicum with the telescopes at the Old Observatory. In 2015 I was chair in the board of the Kaiser Lente Lezingen, a series of lectures for the general public. During my PhD, I attended two schools: the SUCCESS 2014 school about X-ray spectroscopy in Les Houches, France and the ASTRO-H school on spectroscopy in Tokyo, Japan. In 2017, I went to the Soleil Synchrotron facility in Paris to perform XAFS measurements on interstellar dust samples. I had the opportunity to present my work at various conferences and workshops in Amsterdam, Boston, Prague (EWASS 2017), Taipei, Tokyo, Heidelberg, Garching, Dublin and in Kopenhagen, where I gave an invited talk at the Cosmic Dust conference which is organised every 5 years. I will continue my scientific career at the ASIAA in Taipei, Taiwan.

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And of course, there are my friends from Leiden throughout the years! Arthur, Jesse,

Stephanie, Emanuele, Alex, Dominique, Josha, Xiaohu and Dennis. I would like to thank my office mates from office 529: Heather, Alessandra, Mher, Maria, Isabel, Irene, Cameron, Corentin, Martijn and Dario and of course the other current and former ISM group members who were not also inhabitants of 529: Francisco, Liz, Pedro, Marcelo, Pablo, Kim, Kirstin, Claudia, Daniel Harsono and Cornelia. Heather, Isabel and Alessandra, thanks for all the uplifting and supportive conversations we had and for your good advice! Alex, we share a great interest in the history of Leiden Observatory which led to the organisation of many interesting events (such as the Kaiser Lente Lezingen) and lovely distractions throughout my PhD. You are a great friend and I wish you all the best with your PhD project in Sweden.

Tessa, Suzan, Mandy, Maaike, Liset en Marleen, wat fantastisch dat onze vriendschap sinds de middelbare school heeft standgehouden. Bedankt voor alle keren dat jullie mij uit mijn werk hebben getrokken en voor al jullie gezelligheid! Ik wil hier ook graag Kees Kerstens bedanken: Kees, zonder jouw advies was ik met veel minder zelfvertrouwen naar de middelbare school gegaan. My thanks to Hélène and Jos for all the great weekends I could spend in Limburg, it always felt like a very welcome holiday during stressful times. My brothers, Guido (how great that we both did a PhD at the same time, although in different countries!), Esben (my other paranimph!), Mathé (good luck with your PhD at CWI) and Benthen (good luck with your PhD at the mathematical institute in Leiden), I want to thank you for all your support and understanding. Having diplomas from all the different studies of the Leiden beta faculty is quite a unique thing. We should combine our knowledge in a paper one day! A big thank you to my parents, Marianne and Siem, who put up with all my frustrations, but luckily you were also there to share the great moments with me. It was a lot of fun to be able to let you take part in my PhD journey, sometimes literally when you joined me for a short vacation after a conference. You taught me never to give up and that is why this thesis is dedicated to you both. Many thanks also to my mother, Marianne, for designing the beautiful thesis cover! Gilles, thank you for always being there for me. In the moments that I have doubts about a thousand things at the same time, you master the art of calming me down. I still feel so lucky to have met you during the second year of my studies and that from then on, we were able to share this experience from the bachelors to the PhD and now further into the future, wherever it may bring us.

Thank you all,
Sascha

List of acronyms

ACIS: Advanced CCD Imaging Spectrometer
ACS: Advanced Camera for Surveys
ADT:Anomalous Diffraction Theory
AGB: Asymptotic Giant Branch
ALMA: Atacama Large Millimeter/submillimeter Array
AU: Astronomical Unit
CC: Continuous Clocking
CCD: Charge-Coupled Device DDA: Discrete dipole approximation
FFT: Fast Fourier Transform
FWHM: Full Width Half Maximum
GC: Galactic Center
GEMS: Glass with Embedded Metal and Sulphides
HAC: Hydrogenated Amorphous Carbon
HEG: High Energy Grating
HETG: High-Energy Transmission Grating
HETGS: High-Energy Transmission Grating Spectrometer
HRC: High Resolution Camera HST: Hubble Space Telescope
ID: Interstellar Dust
ISM: Interstellar Medium
LETGS: Low Energy Transmission Grating Spectrometer
LMXB: Low Mass X-ray Binary
LOS: Line Of Sight
LUCIA: Line for Ultimate Characterisation by Imaging and Absorption
LURE: Laboratory for the Use of Electromagnetic Radiation
MEG: Medium Energy Grating
MRN: Mathis-Rumpl-Nordsieck
NWO: Nederlandse Organisatie voor Wetenschappelijk Onderzoek
PAH: Polycyclic aromatic hydrocarbons
PSF: Point spread function
ROSAT: Röntgensatellit
TE: Time Exposure
TGCat: Chandra Transmission Grating Catalog
SED: Spectral Energy Distribution
SOLEIL: Optimized Light Source of Intermediate Energy to LURE
STIS: Space Telescope Imaging Spectrograph
SW: Stellar Wind
UV: Ultraviolet

IR: Infrared
XAFS: X-ray Absorption Fine Structure
XARM: X-ray Astronomy Recovery Mission
XIFU: X-ray Integral Field Unit

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