Universiteit Leiden
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From electrons to stars : modelling and mitigation of radiation damage effects on astronomical CCDs

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Curriculum vitae

Born the 6th of December 1984 in Flers a small city of the north west of France, I spent most of my childhood in Normandy wandering in the countryside and occupying the numerous grey afternoons with books and computer related activities. From as far as I can remember, Isaac Asimov's popular astronomy books and a brand new Atari ST computer (a marvel at the time) my brother had received for Christmas are the most likely sparkles that triggered in me a profound interest in Science as well as a fascination for outer space and technology. Thanks to the subtle but constant support of my parents, Jean-Pierre and Isabelle, these passions are still alive today.

At the end of high-school, when the time of choosing a professional path arrived, I was still hesitating between studying physics or philosophy at the University or going to a two-year preparatory school to enter a prestigious engineering school. Over the summer 2002, I was selected in a nationwide contest to join a five-year program in one of the elite public-sector engineering schools of the INSA (National Institute for Applied Sciences) network. This offered a good compromise and my choice was made: I would go to Rennes in Brittany for five years. After two years of general courses in mathematics, physics, chemistry, electronics, and computer science, I chose the three-year specialization 'Materials and Nano-Technologies' where I studied the fundamentals of solid-state physics, material science, micro and optoelectronics. During my last year of study I also joined the MSc program in physics of the Rennes 1 University, and in June 2007 I graduated as both an Engineer in solid-state physics and a Master in physics.

During my studies I developed a particular interest in research by taking part as an intern to several projects such as the elaboration of novel satellite simulation tools at EADS Astrium Toulouse (France), the development of a new ion beam analysis method for a nuclear microprobe at the CEA Saclay (French atomic agency), and the study of radiation hard material in view of the nuclear fusion reactor ITER at the Cluj-Napoca Technical University (Romania). I also joined for one month the LATT (Toulouse-Tarbes Astrophysics Laboratory) as a graphic designer and got the chance to spend one night at the Pic du Midi observatory along with the astronomers mainly monitoring the humidity level.

In September 2007, I started a PhD in astronomy at the Leiden Observatory (The Netherlands) under the supervision of Dr. Anthony G.A. Brown and within the European Union Marie Curie research training network ELSA (European Leadership in Space Astrometry). During the past four years I focused on modelling radiation damage effects on astronomical CCDs and finding solutions to mitigate this threat to the science performance of the European Space Agency mission Gaia. My work consisted mainly in modelling, but I also participated to the analysis of tests carried out on irradiated Gaia CCDs by the Gaia main industrial partner EADS Astrium and took part to tests carried out on a non-irradiated device at the Instituto de Astrofísica de Canarias

(Spain) led by the Gaia calibration scientist Dr. Ralf Kohley (ESA/ESAC). Collaborations, visits and extended stays at several prestigious institutes across Europe have been a real catalyzer to this research in particular with Dr. Floor van Leeuwen and Dr. Scott Brown at the Institute of Astronomy in Cambridge (UK), with Prof. Dr. Lennart Lindegren and Berry Holl at the Lund Observatory (Sweden), and with Dr. Catherine Turon and Dr. Michael Weiler at the Paris Observatory in Meudon (France). I presented the results of my research in the form of talks and posters at meetings and conferences across the world in particular at the *Astronomical telescopes and instrumentation* SPIE conference in San Diego (USA), the *Gaia: at the frontiers of astrometry* ELSA conference in Paris (France), the *Milky Way and the local group - now and in the Gaia era* conference in Heidelberg (Germany), the IAU general assembly in Rio de Janeiro (Brazil) and at eight biannual Gaia Radiation Task Force meetings.

Over the past four years, I was given the opportunity to teach the exercise class of the gravitational lensing course by Prof. Dr. Koen Kuijken and to supervise the final research projects of two Master students of the Leiden Observatory dealing with CCD radiation damage in the context of Gaia and the ESA dark matter mission under study Euclid. These experiences greatly contributed to foster my education as a researcher as well as the participation to schools and workshops such as the project management course by Harrison and Associates at ESA/ESTEC (The Netherlands), the *First EIROforum school on instrumentation* at CERN (Switzerland), the *CCD modelling workshop* at Dutch Space in Leiden (The Netherlands), the *Scientific Writing for Young Astronomers* EAS school in Blankenberge (Belgium) and the ELSA schools in Leiden, Heidelberg and Barcelona (Spain). Finally I was a member of the scientific organizing committee of the *Gaia: at the frontiers of astrometry* ELSA conference.

I will defend my PhD thesis the 22nd of November 2011; in the future I intend to continue leading research and development activities related to detectors in the context of space-born experiments and space exploration.

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Secondly I would like to thank all my co-authors and close collaborators, it was always a pleasure to work with you and you substantially contributed to the work presented here. *Berry*, you made me discover that Science could be a great deal of fun; we make a fantastic team and I hope we will continue to collaborate on many projects. *Scott* and *Cian* thank you for answering my endless questions about Astrium's radiation campaigns and kindly providing your reduced data. *Lennart* your guidance and expertise have been essential; I learned a lot working along your side. *Michael* your subtle humour was a delight, I keep as an example your perfectionism in choosing the right words. *George* thank you for your enthusiasm, hard work, and for respecting my strict deadlines! To all the members of the *Gaia radiation task force* and in particular *Alex* and *Ralf*, thanks a lot for the feedback and nasty questions. To the *CTI dream team*, our collaboration was a success and our name is now more than ever legitimate!

The ELSA network has been one essential ingredient in my research. I first would like to acknowledge the EU and the network scientists in charge for giving me this fantastic opportunity and creating such a fostering environment. To the *ELSA fellows*, our meetings always felt like a family reunion; I truly enjoyed encountering such wonderful individualities. Our trips, parties, and passionate discussions are well placed among the highlights of these past four years. *Ester* and *Mihály* thanks for your friendship, joie de vivre, and persistent faith in my success.

A big thanks to all the people at the Leiden Observatory for making it a unique and multicultural professional environment. It was an honour to work with researchers always at the forefront of their discipline. Thanks my office mates and in particular *Michiel* for the numerous digressive philosophical chats! *Cyril* and *Erik*, thanks for smoothing my transition to the Dutch culture. *Giorgia*, *Tri*, *Daniel*, *Daniel & Carmen*, *Berni*, you are great persons I will always cherish the moments we spent together and thanks for tolerating my tempestuous temperament on a daily basis. *Atakan*, *Chael*, *Eva & Marcus*, *Jeroen*, *Michiko*, *Rafa* it was always a pleasure to share a break with you. *Hayden & Laura*, *Nikta*, I love you guys, I am looking forward to our next adventures.

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