

New Staff at ESO

Dimitri Mawet

I arrived from California with my wife Jessica and our cat Ishi on 1 April 2011 (not a joke!) to fill a position as VLT operations staff astronomer on UT4-Yepun, which hosts two adaptively-corrected instruments (NAOS–CONICA and SINFONI) and the wide-field camera HAWK-I. As an exoplanet hunter, coronagraphist and adaptive optics/wavefront control aficionado, my medium-term goal at ESO is to ensure a smooth “Paranalization” and subsequent operation of SPHERE, one of VLT’s second generation instruments. SPHERE is an extreme adaptive optics system feeding a suite of three instruments almost entirely dedicated to imaging and characterisation of extrasolar planetary systems. SPHERE is one of the most ambitious and complex facilities to arrive at the VLT, and so presents an extremely exciting challenge. SPHERE is filled with amazing technologies and has a science case aimed at answering some of the most fundamental questions confronting human kind!

My passion for science and technology and in particular for everything related to outer space, dates back to my childhood. My parents offered me my first astronomy book when I was aged five. I obviously couldn’t read then, but these were unique bedtime stories! I remember feeling totally overwhelmed by the amazing photos of the giant planets that had just been taken by the NASA *Voyager* and *Pioneer* probes, and fascinated by the (then) brand new Space Shuttle, to me the most beautiful spacecraft ever made. It was more than enough to imprint my subconscious for the rest of my life. Later on at school, I fell in love with science and mathematics, but astronomy or space science still seemed far away. I remember the pragmatism of some of my old and respectable high school teachers, who argued that astronomy would be a suicidal career choice (!). Guided by this, I therefore enrolled into engineering at the University of Liege. When I took my first proper astronomy course a couple years later, I was far from imagining that I would do a PhD and that the dynamic lecturer Professor Jean Surdej would be my future thesis advisor!

The fifth and last year of the engineer–physicist course required an original pro-

ject. One of the proposed subjects was the “four-quadrant phase-mask coronagraph (FQPM)”. The FQPM, invented in 2000 by Daniel Rouan, is one out of many different types of coronagraphs using the wave nature of light to perform its contrast-enhancing role, as opposed to Lyot-type coronagraphs which simply block the light. After being set on the track of FQPM with a sample of new ideas to explore, I was almost given *carte blanche* — definitely the kind of challenge and freedom that would get my 100% focus! In fact, this subject and its ramifications would keep me busy for the next ten years, PhD thesis included. In particular, I would invent my own coronagraph, and even give it the very esoteric name: the “vector vortex coronagraph”.

My first research years at the Institut d’Astrophysique et de Geophysique de Liege were fantastic, I studied and worked with amazing people and the company of many colleagues from the department of physics, and the Centre Spatial de Liege (CSL) where I met my wife Jessica. Thanks to a Marie Curie fellowship, I also spent a great deal of time in Paris, first at the Observatoire de Paris–Meudon, working with the FQPM team. There, I contributed to the development of the FQPM technology for various instruments: VLT–NACO, JWST–MIRI, and for SPHERE, which I consider one of my major contributions! I also spent half a year at the Institut d’Astrophysique Spatiale in Orsay working with Alain Leger and his team on nulling interferometry for Darwin/TFP-I, and on the very interesting subject of Ocean Planets.

So I fell early into the exoplanet science and technology cauldron. While technology has always fascinated me, it became clear very soon that it would be very hard to compete on the astronomy faculty job market with a profile as a pure technologist. Doubly motivated, I then worked very hard to take my technological inventions to telescopes in order to do unique science. But it took many years — a NASA postdoc followed by a permanent position at the Jet Propulsion Laboratory (JPL) at the California Institute of Technology — to do just that. The culmination of this effort, which involved many people, was the imaging of the extrasolar giant planets around HR8799 with a small 1.5-metre



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portion of the 5.1-metre (200 inch) Palomar Hale telescope, using the coronagraph I invented; this involved the first on-sky tests of an extreme adaptive optics system and related high contrast imaging techniques. In parallel to these technical accomplishments, I started to get serious about observing programmes: my co-Is and I initiated extensive exoplanet hunt programmes using high contrast imaging at Palomar, Keck, VLT and Gemini. Our strategy has been to maximise the synergy between space and ground-based platforms: we use the output of survey missions such as Spitzer and WISE to form unique samples of identified extrasolar systems for ground-based follow-up.

At JPL-Caltech, I had the opportunity early in my career to be surrounded by prestigious colleagues from whom I learned a lot. I deeply enjoyed my 3.5-year stay at JPL. It was quite amazing to work at the very place that built the probes that took the fantastic images that had inspired me as a kid 25 years before! My wife and I totally blended in as Californians. But US budgets allocated to exoplanet research and in particular to the NASA Terrestrial Planet Finder (TPF) programme have been crumbling and so I started to look towards Europe and especially to ESO, which I still followed closely through my research and numerous contacts (I have been a user of the VLT for many years). So here I am, ready to close the loop with SPHERE, to which I first contributed almost ten years ago.