

7th August, 2018

Dear Professors,

I am a [Pegasus]² Marie Skłodowska-Curie fellow in KU Leuven, at the Center for mathematical Plasma Astrophysics (CmPA), working in Computational Astrophysics with Rony Keppens. I joined the CmPA in October 2016 after defending my PhD on *Wind accretion onto compact objects*, under the supervision of Andrea Goldwurm and Fabien Casse. I apply to the Junior Professor position in Theoretical Astrophysics at the University of Potsdam for I believe my profile could match the expected requirements and since it would be a valuable asset to pursue and develop further my emerging academic career.

After my undergraduate studies at the Ecole Normale Supérieure, I volunteered to join the Kepler satellite data analysis effort under Saul Rappaport's lead at MIT. There, I was introduced to stellar evolution and binary systems and took an active part in the discovery and characterization of the first disintegrating exoplanet in 2012. My involvement also contributed to the identification of 30 new triple star systems and to a detailed analysis of the shortest-period exoplanets, those right in the spotlight of their host star. This seminal long term experience in Research laid the foundations of my scientific program : a better understanding of stellar objects and their compact remnants in interaction with their environment.

As I started my PhD, I turned to numerical tools to complement the analytical skills I had acquired during the previous years and model the turbulent twilight of binary systems, the X-ray binaries. I got familiar with advanced techniques such as solvers for hyperbolic partial differential equations and parallel computing, in the context of the finite volume MHD code MPI-AMRVAC. With several successful proposals on Tier-1 clusters and the code development I carried out, I could run the widest dynamics simulations of wind accretion onto compact objects.

By the end of my first postdoctoral year in KU Leuven, I was granted a 3-years [Pegasus]² Marie Skłodowska-Curie fellowship. I also joined a collaboration with Lida Oskinova, Silvia Martínez-Núñez and Peter Kretschmar to gather observers and theoreticians from the X-ray binaries and massive stars winds communities. It enabled me to design and confront simulations of the accretion process in Supergiant X-ray binaries to the most recent observations of Vela X-1. Thanks to simulations of the internal shocks and stratification in the wind of isolated massive stars by Andreas Sander, Jon Sundqvist and collaborators, we could evaluate the impact of the wind micro-structure on the time variability of the mass accretion rate onto the neutron star.

Beyond my research activity, I also proved my teaching abilities first in 2011 by passing the French Agrégation in Physics where I ranked second in 1,500 candidates. Since then, I regularly volunteered to be granted teaching responsibilities in a wide range of contexts. The present position is a unique occasion for me to fulfill my will to practice research jointly with teaching.

I am now willing to extend my investigations to deepen our understanding of the wind structure using the orbiting accretor as a probe. The expertise already available at the University of Potsdam in the domain would be a decisive asset to pursue this goal. May you judge my application admissible, I remain fully available to bring further information you might need.

Sincerely,

Ileyk El Mellah