28th March, 2016

Dear Professors,

I am applying to the postdoctoral position in Theory and Computation of Stellar Accretion and Winds in the Astrophysics group of the University of Exeter. I am currently a third year graduate student at the AstroParticule & Cosmology laboratory in the University of Paris 7 Diderot. Since fall 2013, I have been conducting my PhD research in Computational Astrophysics under the supervision of Fabien Casse and Andrea Goldwurm and I am expected to defend in September 2016.

After my studies at the ENS, I volunteered to join Saul Rappaport at MIT in 2011-12. There, I contributed to his efforts to make the most of the Kepler satellite data. I used Doppler boosting to develop a photometric method to measure radial velocities in high mass ratio eclipsing stellar binaries and deduce the mass of the faint M-star. I also took part in the discovery and characterization of short-period transiting exoplanets. This inspiring insight into binary systems drove me into the study of one of their turbulent twilight, the X-ray binaries. Fabien Casse convinced me of the relevance of numerical simulations to complement the analytical skills I had acquired during the previous years. Indeed, the diversity of behaviours of those systems suggests an unavoidable need to pay attention to non-linear evolutions whose full analytical derivation remains beyond our current scope. If I have mostly got interested in winds of Supergiant stars in X-ray binairies for the last two years, I am now willing to adapt the parametrization I have set up to other systems such as young low-mass stars. The interplay between the stellar wind, rotation and magnetic activity along with the interaction with the surrounding disc offers a fruitful multi-Physics playground I am eager to explore. Thanks to new hardware technologies and optimized algorithms available, high performance MHD simulations can be game changers, provided we first rely on semi-analytical models to know where to look and what to look for.

I am applying to this postdoctoral position in Exeter for I believe my experience and commitment to computational and theoretical Astrophysics make me well qualified to meet the needs of the Theoretical Astrophysics group. I want to capitalize on the numerical expertise I have acquired and develop new numerical setups able to tackle multi-scale and multi-Physics problems. I think I can fit in an enthusiastic and stimulating environment such as the Theoretical Astrophysics Group.

Finally, I have passed the French Agrégation in Physics where I ranked second and was granted teaching responsibilities at the Paris 7 Diderot University for the last three years. I also actively took part in the organization of the *Rencontre des Jeunes Physiciens* (Meeting of the Young Physicists) and in the promotion of Physics in festivals. I do intend to pursue my outreach and organizing activities and would gladly teach and monitor junior fellows.

I look forward to hearing from you.

Sincerely,

Ileyk El Mellah