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To whom it may concern,

I am extremely pleased to write in support of the application of Ms. Nora Nicolas for a PhD in Cosmology. I am a Research Fellow at the University of Glasgow, having held this position previously at the Cavendish Laboratory in Cambridge, where I was also a Fellow of Sidney Sussex College.

I have known Ms. Nicolas since the summer of 2017, when she joined my group to do a project for three months, consisting of investigating via computational work the efficient fabrication and of nano-magnetic circuits for spintronic applications. Nora worked with us during that time in Cambridge, under my direct supervision, and being daily supervised by one of my PhD students, Dédalo Sanz.

In my group, we investigate the extension of nanomagnetic systems to three dimensions (Nature Comm. 2017). For this, we primarily used Focused Electron Beam Induced Deposition (FEBID), a direct-write nanolithography technique with a unique ability to prototype magnetic nanostructures. Using this method, we have for instance shown that magnetic domain walls can be injected from the substrate plane into 3D nanowires (ACS Nano 2017), opening a new route to study new effects in racetrack memory systems. One of the challenges of expanding nanomagnetism (and in general nanotechnology) to three dimensions is that most of the techniques used to create and characterise nanostructures have been designed and are mostly optimised for 2D planar structures. Working in 3D demands for new and holistic approaches integrating new experimental and computational tools.

In this context, Nora's project with us consisted of developing new code to achieve a greater control on the growth of 3D magnetic nanowires using FEBID. This code, written on MATLAB by Nora, allowed us to interact with the microscope in which the FEBID process is carried out, at the same time that it could generate a geometry that could be input onto the open source micromagnetic code Mumax. The versatility of this code allowed us therefore to create and model complex 3D nanostructures in a consistent way. She also implemented a nice interface where complex 3D circuits formed by multiple pieces could be put together.

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During this project, Nora showed excellent computational skills and a great interest towards experimental and computational work. As explained above, she was daily supervised by one of my students, but in general developed her work with a high degree of independence. I would especially highlight that she worked extremely hard during the project, delivering a very significant amount of high-quality work in a short period of time. This clearly shows her desire to thrive and passion towards science.

Since the end of the project, I have not interacted too much with Nora, but I am really pleased that she has brilliantly continued her studies, now more specialised towards theoretical physics, and that she is now carrying out an internship in Cosmology that she is enjoying very much.

Based on the time in my group, via the feedback from other group members and my personal impression, I believe Nora has excellent skills to thrive in a PhD and I would like to strongly support her for her application in your institution.

Please do not hesitate to contact me if you need further information.

Yours faithfully,

Dr Amalio Fernández-Pacheco