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To whom it may concern,

I know Barthélémy Pradines since I have been one of the two supervisors of his PhD thesis. This gives me the opportunity of explaining which kind of researcher he is.

The PhD thesis of Barthélémy consisted in studying the physical properties of magnetic materials and nanomaterials, more precisely of the full Heusler alloys  $\text{Co}_2\text{MnSi}$ ,  $\text{Co}_2\text{FeAl}$ ,  $\text{Co}_2\text{MnAl}$  and  $\text{Co}_2\text{MnSn}$ . Thanks to their exceptional properties (half-metallicity or high spin-polarization at the Fermi level, low magnetic damping coefficient) these crystals are very interesting for spintronic applications. Most of the PhD work of Barthélémy consisted in understanding if these exceptional properties remain in the presence of the partial alloy disorders that cannot be avoided in this kind of crystals, or at the interfaces of spintronic devices. The work of Barthélémy, which allowed understanding the effect of several kinds of partial atom disorders on the magnetic properties, should be very interesting for experimentalists working in this field. He also proposed several new "all Heusler" interfaces which preserve the half-metallicity of  $\text{Co}_2\text{MnSi}$  and should allow designing very efficient magnetoresistive devices.

Barthélémy obtained all his results with first-principles methods based on the density functional theory (DFT). As an experienced user, he has now a good mastery of a rich panel of DFT-based codes: SPRKKR (relativistic code based on the multiple scattering theory and on the CPA approximation), Wien2k (an all electron code) and VASP. Barthélémy has also an experience in coding : during his PhD, he wrote small codes which allowed him calculating macroscopic physical properties (that can be compared to experimental measurements) from the atomic scale quantities obtained with DFT codes. As an example, he calculated the macroscopic exchange constants from the exchange integrals.

Barthélémy has now a good experience in performing intensive numerical calculations on the supercomputers of a HPC center: He performed several millions of hours of calculation per year on the supercomputer EOS of the south-west France HPC center CALMIP.

This PhD thesis has been fruitful: the results obtained by Barthélémy have up to now been published in 4 articles (one of them comparing his numerical results with the measurements of our experimentalist colleagues); a 5<sup>th</sup> article has been submitted recently for publication and two other articles are still in preparation. I must precise that

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Barthélémy has always written the first detailed draft of all these manuscripts. He thus has a solid experience in writing articles.

To summarize, Barthélémy has now a solid research experience which allows him using several DFT-based codes, working with supercomputers in HPC centers, writing efficient small codes, writing scientific articles. I would also add that he is used working with experimentalists and comparing calculated and measured results. Barthélémy thus possess all the required qualities for working in your team as a postdoctoral researcher and I do recommend him warmly.

Finally, you must know that Barthélémy is a very pleasant and enthusiastic person to work with.

Best regards,



Lionel Calmels,  
Professor at the University of Toulouse

