

Project acronym: **MULTIMAT**

Project ID: **505226**

Project Participant: **Dipartimento di Metodi e Modelli Matematici per le Scienze
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NAME, First name	Nationality	Previous place of work/education	Start date	Duration (months)	Category ESR/ER	Place	Country
Perez-Reche, Francisco-Jose	Spanish	University of Barcelona	01/11/2005	21	ER	University of Padova	Italy

I obtained a PhD degree in physics (condensed matter) from the University of Barcelona. During this period I worked on different aspects of phase transitions in solids. The main focus was the study, both experimental and theoretical, of those transitions occurring through a sequence of avalanches that link different metastable states when sweeping an external driving parameter. An example of this kind of phase transitions is the martensitic transformation.

I started my participation in the MULTIMAT network as an Experienced Researcher (ER) in the University of Padova. **This was a valuable opportunity to collaborate with a community of experts in theoretical mechanics of solids and learn about topics totally new to me.** Besides working in close collaboration with researchers in Padova. I also had the opportunity to get in touch with the node at Ecole Polytechnique in Paris. Frequent travelling between Padova and Paris was possible thanks to the network mobility program. In my opinion, we obtained interesting results from this collaboration which, in fact, is still active. We have addressed several research issues. For instance, we have performed a theoretical study of plasticity-mediated martensitic transformations to explain experimental results that show the creation of defects during the transformation and an associated training towards a critical state. The possibility of having 'self-created' defects in shape memory alloys challenges the general wisdom which considers such transitions as fully reversible. We expect that the procedures presented in this study will also be useful to generate a model for avalanches in materials deformed plastically. Some of the obtained results were already published and we expect publishing some of our last results in the next months.