

Interview: Peregrina Quintela



Today we are interviewing Professor Peregrina Quintela from the Universidade de Santiago de Compostela, known mainly for her incessant activity in the promotion of Industrial Mathematics. She was President of the 2016 ECMI Conference Organizing Committee, which was held in Santiago de Compostela in June 2016, and a leading figure in the creation and support of national networks of Industrial Mathematics.

You have been a promoter and first president of the Spanish Network for Mathematics & Industry in 2011. What led you to promote this initiative?

Actually the creation of the “math-in” network was something natural: in Spain there are numerous research groups with a

special inclination to developing new technologies applicable to the industry. At some point, with all the accumulated experience, it was clear that an effort had to be made to make companies aware of the great potential of Mathematics, something that many of them did not know. This became a challenge for all of us, Spanish mathematicians. We were looking for a way to show with practical cases and simple language the ability of Mathematics to provide solutions adapted to each industry demand. We needed to establish a structure that was broad and coordinated so we could quickly connect a company with the most experienced researcher in their area. And obviously, being such a heterogeneous group of researchers scattered throughout Spain does not help. It was necessary to establish synergies among us, quickly connect supply and demand and, above all, to sensitize companies to generate new demands. That is how the “math-in” network was launched, completely fitted to respond to these needs.

What strategies have been followed to achieve these objectives that you have highlighted?

We cannot talk about a single strategy, but a combination of several. In the first place, a climate of trust among the mathematicians themselves was generated; this allowed us defining a single catalogue of mathematical technologies for the industry in Spain. At the same time, we carried out a macro survey to establish a demand map for mathematical technology that would allow us to better understand our industry and its needs. Both studies were combined with multiple informative efforts, such as visiting

representative enterprises, organization of dissemination days and workshops, participation in technology platforms and forums in which the majority of attendants are from the industry.

How many research groups and researchers participate in math-in?

Nowadays, about thirty research groups of almost 20 Spanish universities and research centers are membership of "math-in"; this means more than 450 Spanish researchers. We also have sponsor companies such as Arcelor Mittal, BSH Electrodomésticos, or Repsol.

How is the involvement of the Spanish network in EU-MATHS-IN? You are also part of the Board Committee, right?

Actually, "math-in" was one of the six founding networks of EU-MATHS-IN. We started this initiative in 2013 seeking to intensify collaboration with industry at a European level. To achieve this, EU-MATHS-IN tries to connect the national networks of the different countries –currently there are already 17– and harmonize a joint path. In this sense, a lot of work has been done using several complementary strategies too. We have pushed to place Modelling, Simulation and Optimization (MSO) as an emergent technology in the European institutions, and in particular in the strategic lines of the H2020 Programme. We started an initiative to implement a European technological platform for which a good number of big European companies have been mobilized, all of them convinced of the essential role that Mathematics must play in their processes improvement. I am convinced that achievements in this area will soon be seen. Attention has also been given to industrial doctorates, which allow for effective collaborations between Academia and Industry in the training of young researchers. This new worker profile is of great interest for the industry and will be

our best ambassadors in the future. Just recently, two H2020 proposals have also been submitted, targeting industry and innovation through MSO. So since at "math-in" we are convinced that international cooperation can be a determining factor in the future of Industrial Mathematics and the society in general, "math-in" itself is collaborating, supporting, and promoting joint initiatives with EU-MATHS-IN.

In addition, you are the director of the Technological Institute of Industrial Mathematics (ITMATI) that was created in 2013. Why did the need arise to create this Institute?

ITMATI was the result of an agreement between the three Galician universities to unite around 150 researchers with a strong vocation towards the effective transfer of knowledge developed in their universities. We are talking about a region in north-western Spain that constitutes a microcosm with a history of more than thirty years effectively collaborating with the industry. ITMATI was launched in 2013 as a new concept of the Technology Transfer Unit, since it not only promotes and facilitates the transfer but also executes its own projects and transfer contracts. Senior researchers who pass a selective process can dedicate up to 25% of their day to the institute, and this is our greatest asset.

How do you think the transfer activity developed in ITMATI enrich the microcosm to which you referred?

There is no doubt that it has professionalized the transfer activity towards companies, and it provides more agile responses. ITMATI has also created an Academia-Industry bridge for the training of recent graduates, both for the completion of Master's thesis and industrial doctorates. So I think that it is indirectly improving the social projection of mathematicians and their professional outings towards

non-academic works, since many of our contracted are being successfully inserted in the industry. Also the research groups are enriched with our activity since they maintain a continuous renewal of their lines of research orienting them more towards the real demand. So this microcosm continues to grow with ITMATI activities.

How is financing found for this kind of initiatives? Are they well supported by universities or other public institutions?

Actually, these are initiatives that are the result of the illusion and unselfish contribution of many researchers. In this sense I believe that we mathematicians can organize ourselves with no strong self-interests, making it easier to drive efforts towards a common good and a better future for all. However, many institutions just do not believe it and still do not bet on initiatives like "math-in" or ITMATI. For example, math-in does not have direct public funding; it only has financing from its partners' fees, or indirectly through the contracts it promotes. In ITMATI the financing is being obtained mainly thanks to the private sphere, which for example in 2017 has meant a turnover of 90% of its budget. Of course, I would tell the institutions responsible for Science to bet on these modern intermediate infrastructures that agglutinate the interests of a large group and with great potential for advancement and smart digitization of the industry.

You belong to the Mathematical Engineering research group of the Universidade of Santiago de Compostela. What does your group fundamentally work on?

Our group, led by Professor Alfredo Bermúdez, focuses on modelling, mathematical analysis, and the numerical simulation of industrial problems. It is a group with very varied fields of interest, ranging from Solid Mechanics to Fluids, Heat

Transfer, Acoustics, Chemical Kinetics, Combustion, or Electromagnetism, and the multiple coupling of several of these phenomena. This has allowed contributions to the industry in very different fields and sectors. The list would be very long, so just to name a few, I would like to mention the thermoelectric simulation of aluminium electrolysis cells, the adaptation and optimization of vacuum furnaces for the evaporation of impurities, the modelling and optimization of gas transport networks, the development of efficient silicon production strategies, the prediction of the quality of water in the recovery of coal extraction mines as lakes, or the acoustic insulation of buses and cars. Our research group has maintained stable objectives since the year of its creation in 1986, always with a focus on applied and industrial research, and that is what has also motivated me to accept responsibilities aimed at consolidating this Mathematics and Industry tandem.

Finally, what actions do you think should be addressed to further enhance the presence of Mathematics in the industry?

I believe that Mathematics are the DNA of Industry, they are everywhere, but many times, as you cannot see them, you are not aware of it. Therefore, to continue moving forward, I believe that a lot of fieldwork is necessary. We need to relate more to companies, become more reliable and competent partners for them, and to erase the idea from the collective subconscious that university researchers are dilators, who do not come down to reality. On the other hand, it is also necessary to end the idea that many mathematicians have that industrial mathematics are interesting but not very prestigious.

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