

**In the context of the « ICM 2022 in Paris » initiative,
the impressive growth of interest for mathematical research in industry in the
last decade**

The [Forward Look for Mathematics and industry](#) (FLMI) initiative, funded by the European Science Foundation, and the report that it produced, “sprung from the strong belief that European Mathematics has the potential to be an important economic resource for European industry, helping its innovation and hence its capacity of competing on the global market” and proposed very interesting strategic objectives to **build, develop and empower the (mathematical) community**. It also recommended that in every European country the community of mathematicians involved in industrial collaboration, get organized in an inclusive network of groups that coordinates activities and shares expertise, contacts and activities.

French enterprises, and especially the large ones, have a long tradition of collaboration with mathematical academic research. But an important difficulty is how to collaborate with SMEs, how to make visible the importance of Mathematics for their development and the improvement of their work. Following the recommendations of the FLMI, a national agency called [AMIES](#) (“Mathématiques en interaction avec l’entreprise et la société”) was created in 2011 within the framework of the national program ‘Investissements d’avenir’. This agency, steered by CNRS, Inria and the University of Grenoble (France), received a public funding of 5 M€ to improve and increase the collaboration between companies and companies. At its creation it was decided to focus its activity more specifically on SMEs (small and medium enterprises) and on training master and PhD students.



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AMIES launched its main programs in 2012:

- [PEPS](#): for initiating new collaborations with industry through open calls; about 100 new projects have been funded with a growing pace (6 in 2012, 15 in 2015, 25 in 2017, ...)
- [SEME](#): Teams of 4-6 PhD students work for a week on a problem proposed by companies (more than 500 PhD and 90 projects); this was deeply inspired from the successful ESGI program launched by Oxford University in 1968.
- [FEM](#): the Math Job Fair (see specific web page) with an increasing number of participants (companies and visitors) is co-organized with two learned societies: SMAI and SFdS.

AMIES also launched the initiative to order a “Study of the socio-economical impact of Mathematics in France” ([executive summary](#)), published in 2015. Its baseline was “Mathematics, an essential asset for addressing tomorrow’s challenges: knowledge, innovation and competitiveness” and it provided some key indicators (15% of the French GNP and 9% of the jobs in France are depended on the use of high level mathematics) rather close to previous similar studies in the United Kingdom in 2012

and in The Netherlands in 2013. The report also pointed five strategic mathematical domains from the companies' viewpoint and it got a large [media coverage](#).

AMIES has also begun a very serious campaign to talk to industrialists and advertise the importance of investing in Mathematics for the improvement of the competitiveness in the industrial sector. This has been done by intervention in meetings and discussions organized by Chambers of commerce and also by the [MEDEF](#), one of the main industrialists' group in France. The MEDEF is nowadays very aware of the existence of AMIES and favors interaction whenever possible in order to set-up new strategies.

The undertaken actions have produced impressive results. To give just one key indicator, let us note that the number of companies collaborating with mathematical researchers in Academia has passed from about 100 in 2011, to 200 in 2015 and more than 400 in 2018!

Based on the experiences lead by AMIES, it appears that two keys of success, for collaboration with small enterprises are *proximity* and *reactivity*. *Proximity* favors the needed trust to set-up long-term collaborations. *Reactivity* is very important because the time scale of development of new projects and products is related to the size of the companies.

So, the creation of AMIES has been instrumental for the improvement of collaborations between the economic sectors and academic mathematicians. But there was something that was missing, and that was already recommended by the FLMI project: to build a network of regional groups of mathematicians ready to invest themselves in this endeavor. Maimosine in Grenoble was such a structure and over the last years, it has been met by a number of similar structures that in all regions of France try to coordinate and reinforce the collaborations at the regional level. Their success is again linked to the keyword *proximity*, which again is vital in many cases. AMIES has helped to set-up the network of these regional groups or structures, which has taken the name [MSO network](#), for "Models, Simulations and Optimization".



Thus we see how French mathematicians have worked in the last years in order to set-up a multi-scale organization: at the regional level the MSO groups work with regional companies to establish new collaborations and make mathematical importance more visible for companies in their vicinity. At the national level AMIES organizes programs and activities that have a more global impact, and also is the link between the regional MSO groups and the European [EU-Maths-In](#), which was created after the FLMI project finished, in order to coordinate the activities organized around the link between Mathematics and the private sector in all European countries, in an attempt to

coordinate, but at the same time respecting the variety of organizations that were to be set-up in each country.

In recent years French mathematicians have invested an enormous amount of energy to create, animate and participate in this multi-scale organization. This kind of activity is gaining importance and it is more and more a general view that reinforcing the collaboration of academic Mathematics with companies is of the utmost importance for the future and for the economy of our countries. French mathematicians wish to increase still more this kind of activity and the organization of the ICM 2022 in France would give Mathematics a visibility that would help going into this direction. Already the work around Bid "ICM 2022 in Paris" has created an important dynamics and a large number of companies want to accompany the bid and be ready to sponsor the congress, but also to use this opportunity to accelerate the transfer on mathematical knowledge to their companies and to all companies in France. A large awareness is spreading quickly and the change can be crucial for the future.



<http://www.agence-maths-entreprises.fr/a/eisem>