

Italian Research at a Turning Point: An Opportunity that Cannot Be Missed

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Italy is undoubtedly a country of great contradictions: a magnificent artistic heritage and a wonderful landscape in constant threat of negligence and bad administration, if not from corruption. Italy has the record of the most ancient university in Europe—Alma Mater Studiorum was established in Bologna about three centuries earlier than the university in Heidelberg—but it is, at the same time, one of the European countries with the lowest investments in research and education. While salaries of professors and technical staff, as well as structural investments for research and teaching activities, are granted by central government and student fees, research activity is mainly supported through calls for projects launched infrequently by the Italian Ministry of Education, University and Research (MIUR). Local support and collaboration with industries are an additional source of funding, but they are neither comparable to current situations in other countries, nor to the investments in industrial research that characterized the 1950s and 1960s, which was the golden age of our only Nobel Laureate in Chemistry, Giulio Natta.

European funds are vital for Italian scientists and strongly striven for but, unfortunately, with a low success rate—a sore point for Italian research in general. Taking the Ideas Program of the European Research Council as an example, a survey of the awarded ERC grants in the domains of relevance for

chemistry shows that only about 4% of the funded projects are carried out in Italy. This value is well below the amount of money that Italy invests in the program. The situation is equally bad for the Proof-of-Concept Program. Interestingly, the rate of Italian success is higher if only the nationality of the principal investigators is taken into account, which suggests that the quality of Italian researchers is not the weak point. The motto “veni, vidi, vici” does not help here, rather structural investments are needed.

The general economic crisis of Europe can only partially be claimed as the origin of the situation. Much before the looming of the crisis, the turnover of personnel in Italian universities was cut to about 20%, that is, five retirements were needed for the appointment of a new professor. This significantly changed the scenario of many departments. Temporary employment is nowadays in general the rule up to the age of 35 years, or even more. In addition, there is a severe lack of support for junior researchers in acquiring independence, especially in the management of research activity. The lack of independence is often evaluated as the weakest point in the applications from Italian junior scientists for international funding programs. It must be said that our government has recently tried to improve the situation. The latest program fully targets the above-mentioned objective, the name of the initiative being “Scientific Independence of Young Researchers” (SIR). About 19 million Euros have been dedicated to projects in the physical and engineering (PE-ERC) sectors. Though far from opulent, this investment is anyhow significant. If distributed on an annual

basis, it could actually represent twice the average funding received by Italian junior scientists as ERC Starting Grants. However the use of the conditional term is mandatory here: to this day, even months after submission (March 2014), a reliable agenda on when the applications will be evaluated is still missing. In the meantime, the new call for the ERC Starting Grants has been launched and, again, Italian applicants cannot prove their skills in attracting and managing research funds simply because no Italian research funds have been made accessible to them. The situation is made more critical by a recent law that limits postdoctoral fellowships to four years, while tenure-track positions are still scarce.

Is the atmosphere so gloomy in this traditionally sunny country? The answer is no. First of all our education system still compares well to that of other countries. The level of competences acquired by graduates and PhD students is appreciated worldwide. The quality of teaching is indeed a positive side effect of another structural problem of Italian academia: researchers are nonmigrating animals who develop their career often at the university where they studied. This peculiarity has a complex origin. Low salaries, especially in early career stages, do not stimulate mobility, which is further hampered by difficulties for spouses accompanying researchers to find a job in a different location. Moreover, universities have developed a short-term response to financial straits by favoring internal promotions rather than appointing new researchers. If on one hand, the limited mobility reduces

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the possibility to keep pace with the rapid evolution of research fields, on the other hand, this allows a continuity so that competences are transmitted from one generation to the next.

Funding is not the only, and probably not the first, criterion to evaluate success in research. Forgetting about patents, which are another sore point, Italian chemists are fairly placed in publication ranks of scientific results. In 2013, Italian chemists published about half the number of manuscripts compared to those published by German colleagues, taking into account journals in the area of chemistry. The number of Italian academic researchers is also about half of the German ones, though the number of professors is larger in Italy than in Germany, and productivity seems therefore comparable.

My research activity is placed at the interface between chemistry and physics and I notice that my physicist colleagues are doing slightly better than us in attracting European funds for blue-sky research. There could be several reasons for that but I would like to stress one in particular. There is a longstanding tradition among physicists about joining efforts to face big challenges such as the construction of large infrastructures and facilities. Beyond the National Institute of Nuclear Physics, which has flanked the academic research in this area with significant dedicated funds, other large initiatives, of relevance also for chemists, like the Elettra Synchrotron and the Free Electron Laser in Trieste or the Italian Institute of Technology, have been mainly propelled by physicists.

The lack of synergy in research has been accentuated by the structure of our academic system. In fact, until 2011, universities used to be organized in faculties, which had the task of distributing resources, that is, permanent positions, basing their choices mainly on

teaching commitments. The result was that collective decisions on strategic developments in research could hardly be reached. There are, of course, noticeable examples of large strategic investments, the closest one—just visible from my office window—is the Magnetic Resonance Center, CERM. Nowadays it represents a world-leading institution in the structural biology of metalloproteins and it is attracting increasing amounts of international funds to expand its infrastructure.

The situation of the second pillar of public research, the Consiglio Nazionale delle Ricerche, CNR, is slightly different. It consists of about half the number of people of the equivalent French institution. Although suffering from the serious lack of resources transferred from MIUR to the CNR network and from leveling off of scientific careers, the CNR approaches problems with stronger synergy and dynamism compared to universities. The CNR has frequently mobilized research units from different institutes and departments to quickly respond to precise needs. This easy way to create a critical mass of researchers with complementary skills is particularly appreciated by industries, which are an important external funding source for the CNR.

It is evident that our research system needs a change but skepticism about the efficiency of reforms is very high among Italian scientists. The many reforms that have been enforced over the years have only been reducing efficiency. Nevertheless, some relevant structural changes have occurred with the recent abrogation of the faculties and the shift of the decision-making power to departments. Administration for the manpower dedicated to research is now carried out where the research is actually done, and the teaching organization is instead a task of the newly founded schools. This is a simple solution that is adopted in many countries and—we all hope—will

lead to a more rational use of the resources and a more efficient recruitment process. The new structure of departments should also lead to a stronger synergy and to an easier formation of a critical mass of researchers aiming at a common target.

Last but not least, in order to take the opportunity of this change, we have to also fight enemies within the scientific world. Firstly, lobbies bound to the anachronistic rigid categorization in subdivisions play against the creativity of multidisciplinary research. The second enemy is monstrous and inefficient bureaucracy, whose major goal seems to be reducing personal responsibility instead of increasing efficiency. Our policy-makers should understand the special role of universities. We are engaged at the frontline to shape the future of our society and we cannot avoid our responsibilities.

In this Editorial I intentionally avoided the word excellence. It is a fundamental concept, unfortunately becoming a buzzword nowadays. I see excellence as the top of the iceberg that in order to float needs a much larger mass hidden below sea level. We are well aware that results published in top journals are based on many works in basic research. We must, however, be ready to acknowledge merit at any level.

To summarize, the situation of research in Italy can appear to our foreign colleagues as a *Mistero buffo* (*Comical Mystery*), the title of the masterpiece of an Italian Nobel Laureate for Literature, Dario Fo. We are, in fact, able to achieve outstanding results in research with very little funds but, at the same time, we are unable to adopt efficient strategies to solve our structural weaknesses. But even if we become better at this task, more funds will be needed for our research to avoid Italy becoming left behind by other European countries.