SISSA – International School for Advanced Studies Journal of Science Communication
ISSN 1824 – 2049 http://jcom.sissa.it/

Comment

SOCIALIZATION OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH: FURTHER COMMENTS

Reflection on the collectivization of science through research groups

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ABSTRACT: Twenty five years after the introduction of the concept of "collectivization of science" by Ziman, the importance of the research team continues to suffer of a narrow space, both in scientific literature and in the definition of academic policy. The debate ranges from a macro level, represented by changes in scientific and technological research to micro-analyses on the figure of the individual researcher. Nevertheless the scientific processes are affected by the increasingly multidisciplinary nature and the plurality of actors involved, as well as the social and cultural dynamics, often overlooked if not ignored. Our contribution aims to emphasize the importance of the research groups as the elementary unit of analysis in the definition of policies and for a better governance of universities.

Most of the more recent analysis of research systems converge on one point: the scientific and technological research (STR) brings a wide variety of social factors into play that once seemed to be far less significant or at least less visible.

Already Ziman, in *The collectivization of science* (1983)[1], focusing on academic research, identified the changes occurring within it and the new problems that arise, and defined them as process of collectivization of science. It matters because increasingly collective actors, outside the academic world, decide how to displace the resources of scientific research, influencing researchers' methodological choices.

The consequences of these changes are different and affect both the profession and the organization to which the researcher belongs[2].

External interferences increase in the evaluation system of scientific merit to access resources: participation in colleges extends, for example, even to non-researchers importing external and more organizational or political logics. The researcher is required to demonstrate organizational and administrative skills, beyond scientific capabilities, with obvious distortions of the traditional system of recognition of professional merit.

The researcher's autonomy in choosing problems and means to address them, is reduced to make way for a new trans-disciplinary, cross-epistemic, scientific and organizational approach and where the team replace the individual scientist.

Professional changes match with some organizational changes.

The external pressures and demands on science increase as well as the dimensions, the costs and the complexity of scientific activity. On one hand, it encourages people to maintain even closer relationships with other social subjects; on the other hand, it fosters the organizational concentration of instrumental and financial resources in a reduced number of poles.

The spread of science and technology in many areas of social life generates a proliferation of institutions that carry out research oriented to more objectives and social subjects. A greater differentiation of organizational forms develops and joint research centres, local systems (such as the "silicon valleys") and mediation agencies (such as science parks) build up.

Within public organizations the influence of industrial models on training, disciplinary arrangements and methods of knowledge construction and scientific practice strengthens. Changing interests of public

research, the boundaries between disciplines, specializations and research areas are redrawn and the need for interdisciplinary research reinforces in order to solve problems with high social impact such as sustainable development, food shortage, renewable energy, etc.

These transformations are often managed with great difficulty, both by individual researchers and at the institutional level. Many scientific systems do not keep pace with organizational and professional innovation, not adapt to the contemporary real needs and eventually not reach the steady state.

The institutional impasse reflects a generalized trend to underestimate the social and cultural dynamics embedded in the processes of knowledge construction and the system in which they are placed.

The collective imagination suggests a representation of the researcher as not too young, strictly short-sighted, wearing glasses as thick as bottle bottoms and white coat and testing mysterious formulas, locked in a lab like many others, without windows, in total solitude, with no reference to the outside world.[3]

The repertoire of these figures, metaphors, analogies and references is continually fed by the popularization of science and the images of mass media and partly reflects a widespread view in the public debate on research that ignores the processes of selection and organization of reality rooted in the knowledge production and, sometimes dictated by needs and opportunities and by social and cultural factors.

Also several policy choices are stemmed from this naive vision of "making science", such as, for example, the new Italian law on patents (2001), which gives the ownership of the invention to the individual researcher, removing it to the University or the public institution which he belongs and where the research takes place; it consider the invention as a brilliant result of an individual researcher rather than as a product of a complex and lengthy system, springing from a research group which uses research infrastructures and in which skills are developed.

Thinking of researcher in terms of "self-made man" contradicts a way to make research belonging to team, towards which the "collectivized" model of science tends. In fact, the team management of the research practice, despite concrete relevance, is not fully recognized and a research group that really "works" becomes a kind of "social miracle" in the present university context. Giving birth and development to a research group is not a "natural" act and requires a set of intentions, capabilities and specific circumstances, able to gather different people, to lead to share cognitive and affective elements and to shape a stable configuration of relationship, in a not coercive and very intensive way from a motivational and emotional point of view. Since these are informal and unsteady groups, the research groups are more open to the outside world and have a high degree of dynamicity, but at the same time, in an setting of continuous change of scientific and technological research (STR) and in an "unsupportive" university environment, they are exposed to survival risks. As a matter of fact, predominantly there are researchers dealing with only teaching or individual research activities or very small groups (composed by two or maximum three people) or groups held together only by coercive and hierarchical structures, based on the "patron-client" relationship. Nevertheless, even the research groups characterized by a high degree of cohesion and demonstrating high consistency (in terms of number of members, available resources, visibility, etc.) are not immune to certain critical factors and their response tends to be idiosyncratic, i.e. each group moves according to different strategies.

To manage and understand in a unified way this broad range of phenomena, the SS-ERC project[4] analysed research teams, deepening their strategies of action and development.

In Italy, in particular, two research groups at the University of Tor Vergata in Rome have been studied: the first is a group of biology (Immunology and Microbial Pathology, IMP) and the second is a group of mechanical engineering (Technology and Processing Systems, TPS). In both cases, the process of scientific knowledge construction follows different routes from the "traditional" ones: the experimental groups present a high propensity for innovation and their research activity moves often towards the technology transfer boundary. This process for TPS is more natural, because its research activity has focused mainly on technology issues. For the IMP, the choice is rather less obvious, given that the group sets goals closer to basic research.

The IMP strategy has been to activate a process of "colonization" through the gradual establishment of sub-groups in different organizations. The tendency to "extroversion" of the group has given much visibility to it outside and has improved its "protection" from hostilities in the university. The need to find resources and support has meant that funds were sought elsewhere, defining non-standard paths to access resources (funds for international cooperation, technology transfer projects, project financing for

joint laboratories) and connecting different systems and actors in the research process. This adaptive process has produced the loss of a strong focus on research of the group and its orientation in other directions[5]. This shift towards applicative issues does not necessarily constitute a threat in itself, but carries a risk of decrease in the quality of research. Team members work mainly in laboratory, but they are often called to manage also organizational and administrative tasks and everyone deals with more or less everything. Suddenly the members have work overloads and changes in the objectives pursued or in lines of research conducted or in the tasks performed; the ability to formalize and save explicit and tacit knowledge is reduced and the available human resources are underexploited. This situation generates an excessive stress and a strong sense of frustration, even because of the feeling of constantly working on the front of the emergency, stopping some promising lines of research and weakly capitalizing the results obtained.

Under the pressure of the head researcher's strong pragmatism, the development strategy of the TPS is focused on relations with enterprises. The close link with businesses allows the TPS to develop an extensive network of relationships involving economic, administrative, political, institutional and academic actors and represents the main source of economic resources (otherwise unavailable) and a strong incentive to guide the research activity of the group. These resources are translated into a "temporal power"[6] that the group spends at the university to obtain, for example, spaces and resources to address the technical and political problems that arise in the university context.

The strategy adopted by the TPS group and the resulting temporal power allow the acquisition of equipment needed to research, strengthen the "political" weight of the group in the academic context, ensure an increase in the number of group members with a certain regularity, offsetting environmental situation (the Italian research system) unwilling to the emergence and development of research groups.

Both groups have adopted outward-oriented strategy models, both in terms of research goals (moved on the application side) both in terms of scientific relations, often in the absence of institutional support.

In the processes of transformation of the STR the university has opened outside through the so-called "third mission",[7] which adds the direct contribution to the economic development of the territory and society to the traditional research and training missions. In most cases, however, the transition to this new model of university has been driven by financial opportunities or by occasions to protect intellectual property, without defining a clear governance of processes, nor analyzing the strategies of the actors involved. The answer to the current problems of academic research is almost always provided by adopting a financial criterion and complaining about the availability of funds, as if this were the only factor limiting the development of research and its integration into society. The request for more funding for research risks being reduced to "rhetorical artifice", if university does not face the substance of "making science" as a complex social process that requires not only resources but new rules that enhance autonomy and contrast autoreferentiality.

To let groups not only survive but proliferate, it is therefore necessary to trigger a systemic and circular relationship among individual, groups and universities, able to penetrate the processes of scientific knowledge construction considering their social and cultural dimensions.

Notes and references

[1] J.M. Ziman (1983), *The Collectivization of Science*, in *Proceedings of the Royal Society* **219**, pp. 1-19

[2] As suggested by Whitley (1980), the scientific activity may be regarded as a professional organization, founded on a strong professional autonomy, with its own methodological standards, ethics, systems of reward and evaluation.

[3] C. Di Benedetto, F. Neresini, C. Boccato and L. Benacchio (2009), *Lo scienziato lo disegno così*, in *Sapere,* giugno 2009.

[4] In the Sixth Framework Programme of Research, the European Commission - DG Research has funded the "Social Sciences and European Research Capacities" project (SS-ERC), proposed by a network of six research institutions: the University of Rome Tor Vergata (project coordinator); the Danish Centre for Studies in Research and Research Policy of the University of Aarhus (Denmark); the University of Maastricht (Netherlands); Laboratory of Citizenship Sciences (Italy); the University of Primorska of Capodistria (Slovenia); the University La Rioja (Spain). For a full discussion of the theoretical framework of the project, see the Final Report of the first phase of the project at http://www.techresp.eu/IMG/pdf/Final_Report.pdf

[5] To understand better what it is talking about, you can refer to the claims by Laredo and Mustar (2000) about the focus of research groups. The information gathered indicates that, for example, the IMP is gradually moving from a focus on research to focus on other functions, particularly the production of public goods (in terms of production of services) and, in part, that of innovation (at least in some components of the group).

[6] P. Bourdieu (2003), *Il mestiere di scienziato,* Feltrinelli, Milano.

[7] OECD (1996), *The Knowledge-Based Economy*, OECD/GD(96)102, Paris, OECD.
[8] W.E. Bijker and L. D'Andrea eds. (2009), *Handbook on Socialisation of Scientific and Technological Research. Social Sciences and European Research Capacities (SS-ERC) Project,* River Press Group, Rome.
[9] P. Laredo and P. Mustar (2000), *Laboratory activity Profile: an Exploratory Approach*, *Scientometrics* **47**(3), 515-539.
[10] R.D. Whitley (1980), *Science as Organization,* Manchester, Manchester Business School

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HOW TO CITE: B. Blasi and S. Romagnosi, *Reflection on the collectivization of science through research groups*, *Jcom* **08**(04) (2009) C04